

Fig. 4. *Chromis analis*, BPBM 9503, 63 mm SL, Palau Islands.

lapping of *C. margaritifer* and *C. atripes* at the upper levels and *C. atripes* and *C. ovatformis* at deeper levels. *C. alleni* is a member of this guild, but is the least common species in the group at all habitats except in the Bonin Islands (Ogasawara), where it is the only species of the guild present. In other localities, it seems to be an opportunist, appearing in abundance only where the other species are rare or lacking entirely, e.g. in coral rubble at a depth of 20 m at the bottom of a coral canyon at Nakagusuku Bay, Okinawa, and in tall lava columns under *Acropora* corals at depths of 10 to 12 m over a 25 to 30 m bottom at Miyake-jima. In this respect, *C. alleni* appears to be a "fugitive species" similar to Sale's (1974, 1975) findings concerning *Pomacentrus wardi* Whitley at Heron Island.

We name the species in honor of Dr. Gerald R. Allen of the Western Australian Museum in recognition of his noteworthy contributions to our knowledge of the classification and biology of pomacentrid fishes.

Chromis analis (Cuvier)

(Japanese name: Kogane-suzumedai)

(Figs. 2R, 4)

Heliasis analis Cuvier in Cuvier and Valenciennes, 1830: 496 (type locality, Ambon).

Materials. MNHN 8164, 79 mm, holotype; ZUMT 40382, 115 mm, locality unknown; ZUMT 47118, 102 mm, Kochi-ken; ZUMT

19563, 115 mm, Kashiwajima, Kochi; BSKU 7161, 120 mm, Kochi; ZUMT 47147, 128 mm, Kochi; BSKU 7488, 95 mm, Okinoshima, Kochi; BSKU 8515, 100.3 mm, Okinoshima, Kochi; BSKU 8554, 127 mm, Kochi; TMBS 750518, 2: 138~141 mm, Miyake-jima; FSKU 751013, 2: 62.5~79 mm, Futo, Izu Peninsula; BPBM 21112, 111 mm, Keelung, Taiwan; BPBM 22599, 3: 45.5~125 mm, Sukumo Bay, Shikoku; BPBM 22698, 140 mm, Miyake-jima.

Description. Dorsal rays XIII, 11 to 13 (usually 12); anal rays II, 11 or 12; pectoral rays 18 to 20; caudal spinules 3/3; tubed lateral-line scales 16 to 19; scales above lateral line 3 or 4 (usually 4); scales below lateral line 9 or 10 (usually 10); gill rakers 6 or 7+17 to 19.

Depth of body 49.5~57.8% SL; head length 28.5~34.3; orbit moderate, the diameter 9.0~11.0 in adults (12.6~15.5 in four juveniles 45.5~63 mm SL); interorbital width 10.6~13.9; snout length 8.3~10.6; least depth of caudal peduncle 14.0~16.7; longest dorsal spine 13.7~21.6 (spine longer in smaller individuals, in general); second anal spine moderately long, 17.1~24.3.

Interspinous membranes of dorsal fin moderately incised; third dorsal soft ray the longest; anal soft rays progressively shorter anteriorly to posteriorly; posterior margins of soft dorsal and anal fins rounded; caudal fin forked, the tips of the caudal lobes acute but not filamentous, the caudal concavity 12.4 to 21.2% SL

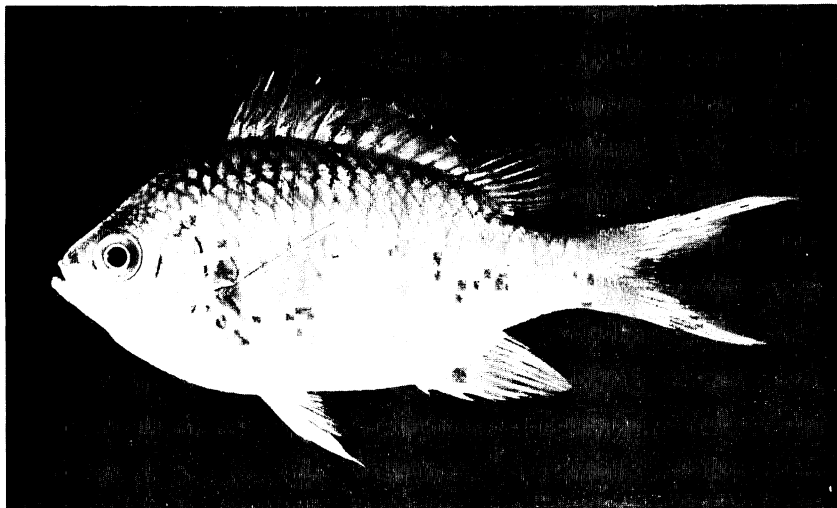


Fig. 5. *Chromis atripectoralis*, BPBM 11415, 70 mm in SL, New Caledonia.

(greater, generally, in smaller individuals).

Free margin of suborbital very short, extending to vertical at front edge of pupil; preopercular margin smooth. Anterior nasal opening with a membranous rim which is higher posteriorly; posterior nasal opening small, slit-like, but distinct, near margin of orbit; supraorbital pores small.

Color golden yellow to brownish yellow, often darker dorsally (back and scaly sheath of dorsal fin may be tinged with violet); dorsal fin above basal sheath bright yellow except distal part of membranes of soft portion of fin which is hyaline; caudal fin white in life, altering to yellow after death; remaining fins yellow, this color on paired fins mainly on rays; a small faint black spot at upper corner of pectoral base; anus usually narrowly edged with blackish.

Remarks. Often misidentified by Japanese authors. Kamohara (1960) used the name *C. cinerascens* Cuvier in Cuvier and Valenciennes for three adult specimens of *C. analis*, and Masuda et al. (1975) identified their material of this species as *C. xanthochir* (Bleeker).

Distribution and habitat. *C. analis* occurs in moderately deep water. Although we have observed individuals in as little as 10 m, this fish is not common in less than 30 m. The senior author collected specimens in Luzon in 53 m; undoubtedly it ranges into water deeper than this. It is found on outer reef slopes of coral reefs or on rock or large boulder bottoms, but seems to

achieve its greatest abundance in association with steep drop-offs. It may be seen as solitary individuals or in aggregations. Males prepare nests on bare rock or dead coral after removing algae and fanning away sand with rapid caudal movements.

This species is distributed from the East Indies and Melanesia to southern Japan. The specimens from Izu Peninsula, Honshu, represent the northernmost record. Smith (1960) reported *C. analis* from Baixo Pinda, East Africa; however, this is a misidentification.

Chromis atripectoralis Welander et Schultz
(New Japanese name:
Aoba-suzumedai)
(Figs. 2Q, 5)

Chromis atripectoralis Welander et Schultz, 1951: 107, fig. 1 (type locality, Bikini Atoll, Marshall Islands).

Materials. USNM 112397, 67 mm, holotype; ZUMT 11278, 77.5 mm, Okinawa; ZUMT 15211, 72 mm, Okinawa; FSKU 750918, 2: 63~68 mm, Sesoko-jima, Okinawa; FSKU 751117, 60 mm, Nakagusuku, Okinawa; FSKU 790610, 66.9 mm, Motobu, Okinawa; TMBS 760622-A, 10: 69.6~83.8 mm, Kuroshima, Yaeyama Group, Ryukyu Islands; BPBM 19100, 67 mm, Sesoko-jima, Okinawa.

Description. Dorsal rays XII, 9 or 10 (rarely 9); anal rays II, 9 or 10 (usually 10); pectoral rays 18 to 20; caudal spinules 3/3; tubed lateral-line

scales 15 or 16; scales above lateral line 3; scales below lateral line 8; gill rakers 8 to 10+21 to 23.

Depth of body 46.2~49.6% SL; head length 28.1~30.9; orbit diameter 8.1~9.8; interorbital width 10.0~11.3; snout length 7.5~9.0; least depth of caudal peduncle 12.4~14.2; longest dorsal spine 14.4~16.7; second anal spine 9.2~10.6.

Interspinous membranes of dorsal fin not incised; soft portion of dorsal fin rounded, the middle rays longest; caudal fin deeply forked, the tips slightly filamentous, the caudal concavity 21.7~34.5% SL.

Suborbital covered with scales, hence without a free margin below eye; margin of preopercle smooth. Pores of lateralis system of head small; anterior nostril without a rim; posterior nostril small and indistinct.

Color blue-green, shading to whitish ventrally; a wedge-shaped dusky bar on about upper two-thirds of pectoral fin base; axil of pectoral fin black; a bright blue line from tip of snout to eye; iris mainly bright blue.

Distribution and ecological notes. This species is known from most of Oceania (notable exceptions are the Hawaiian Is., Marquesas and Pitcairn Group) and in the western Pacific from the Ryukyu Is. to the Capricorn Group of the southern Great Barrier Reef. The only record from the Indian Ocean is Western Australia (Allen, 1975); however, the senior author has observed and photographed *C. atripectoralis* underwater in the Seychelles.

As noted by Hiatt and Strasburg (1960), *C. atripectoralis* occurs in large aggregations around branching coral heads (particularly *Acropora* and *Pocillopora*) in calm water of lagoons and leeward ocean reefs. Unlike the closely related *C. caerulea*, large adults range over a fairly wide area from their place of shelter on the reef. Adults tend to hide in dead coral whereas juveniles retreat to shelter among the branches of live coral. *C. atripectoralis* penetrates deeper water, in general, than *C. caerulea*. Hiatt and Strasburg (1960) examined the digestive tracts of 24 specimens of *C. atripectoralis* from the Marshall Islands; these fish fed on small animals of the zooplankton, especially copepods, shrimp nauplii, and mysids.

In most areas where this species occurs sympatrically with *C. caerulea*, the latter is more

abundant. In Japanese waters, however, *C. atripectoralis* seems to greatly outnumber *C. caerulea*. Most of the catches of commercial drive-in nets include only *C. atripectoralis*. The majority of papers reporting *C. caerulea* from Japan seem to refer to *C. atripectoralis*, e.g. Masuda et al., 1975.

Chromis atripes Fowler et Bean

(Japanese name: Hireguro-suzumedai)

(Figs. 2E, 6)

Chromis atripes Fowler et Bean, 1928: 43, pl. 2 (type locality, Mindoro, Philippines).

Materials. USNM 89952, 42 mm, holotype, Mindoro; FSKU 751001-F, 3: 37.5~50 mm, Okinawa; FSKU 751205, 34.6 mm, Okinawa; FSKU 780225, 3: 38~45.7 mm, Kuroshima, Yaeyama Islands; FSKU 790228, 3: 43.7~51 mm, Kuroshima; TMBS 751005-C, 35.3 mm, Miyake-jima; BPBM 19112, 46 mm, Okinawa.

Description. Dorsal rays XII,12; anal rays II,12; pectoral rays 15 to 17; caudal spinules 2/2; tubed lateral-line scales 14 or 15; scales above lateral line 3; scales below lateral line 9; gill rakers 6 to 9+18 to 22.

Depth of body 48.8~58.4% SL; head length 30~33.3; orbit diameter 9.3~12.5; interorbital width 9.3~13.7; snout length 7.6~10.5; least depth of caudal peduncle 14.7~16.8; longest dorsal spine 12.5~16.2; second anal spine 13.8~17.7.

Interspinous membranes of dorsal fin rather deeply incised; distal margin of soft portion of dorsal fin distinctly angular, the fifth ray longest, the tips of the two branches of this ray often filamentous; caudal fin forked, the second upper and lower branched rays prolonged and filamentous, the caudal concavity of adults 24.5~37% SL.

Free margin of suborbital nearly reaching a vertical at hind edge of pupil; margin of preopercle smooth; pores of lateralis system on head prominent; posterior nasal opening very small.

Color orangish brown with a faint light bluish to lavender iridescence on lower head and thorax; a wedge-shaped blackish spot (broader dorsally) on upper half to two-thirds of pectoral base, the rest of base orange; upper half of pectoral axil black; upper and lower edges of caudal peduncle and adjacent caudal fin blackish, this zone broadest at caudal base; outer part of dorsal fin to

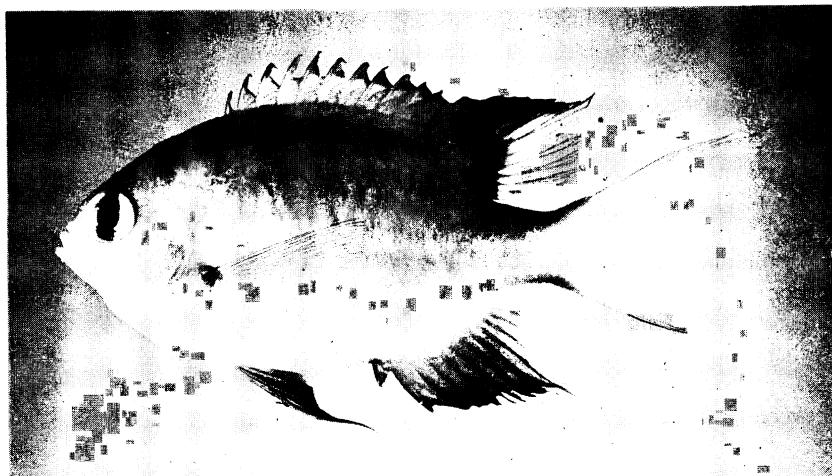


Fig. 6. *Chromis atripes*, BPBM 19112, 48 mm SL, Okinawa, Japan.

fourth soft ray blackish, the posterior part hyaline with dusky rays except basal scaled part which is brown and a blackish spot at rear base; anal fin similar, the demarcation at seventh soft ray, but with an indistinct orangish spot at rear base; caudal fin orange-yellow basally (except blackish edges), this color extending more onto lobes than central part of fin; rest of fin clear with dusky rays; pectoral fins clear, the edges of the rays narrowly dark; pelvic fins blackish; a narrow dark edge around orbit; iris pale yellow with a blackish blotch dorsally and ventrally.

Distribution and habitat. This small damselfish is known from southern Japan to New Guinea and throughout Melanesia; it ranges into Micronesia as far as the Gilbert Islands. We observed it to be common at Okinawa on steep outer reef walls between 12 and 20 m and at Kuroshima, Yaeyama Islands in slightly shallower water on patch reefs. At Miyake-jima it is not uncommon along lava cliffs between 14 and 20 m. At all these localities it tends to be segregated from *C. margaritifer* and *C. ovatiformis* by depth, the former occurring in shallower water, in general, and the latter in deeper.

Remarks. The illustration of *C. atripes* (presumably of the holotype) by Fowler and Bean (1928: pl. 2) is in error in showing a black band along the entire upper and lower margin of the caudal fin. None of the types exhibit such bands on the fins; even the most melanistic specimens

have the dark pigment restricted to the basal part of the fin.

Chromis caerulea (Cuvier)

(Japanese name: Deba-suzumedai)

(Figs. 2P, 7)

Heliases caeruleus Cuvier in Cuvier and Valenciennes, 1830: 497 (type locality, New Guinea).

Materials. MNHN 5644, 2: 49.5~60.5 mm, syntypes of *Heliases caeruleus*; MNHN A. 253, 3: 38.5~47 mm, syntypes of *H. frenatus* Cuvier in Cuvier and Valenciennes, Guam; FSKU 790610, 6: 56.5~68 mm, Motobu, Okinawa; TMBS 760622-B, 6: 49~65 mm, Kuroshima, Yaeyama Islands.

Description. Dorsal rays XII, 9 or 10 (rarely 9); anal rays II, 10; pectoral rays 17 or 18 (rarely 17); caudal spinules 3/3; tubed lateral-line scales 15 or 16; scales above lateral line 3; scales below lateral line 8; gill rakers 8 to 10+20 to 24.

Depth of body 45.3~48.9% SL; head length 28.6~31.5; orbit diameter 9.1~9.3; interorbital width 10~10.6; snout length 8.9~9.2; least depth of caudal peduncle 12.9~13.8; longest dorsal spine 12.8~15.2; second anal spine 10.5~11.1.

Interspinous membranes of dorsal fin not incised; soft portion of dorsal and anal fins rounded, the middle rays longest; caudal fin deeply forked, the caudal concavity 19~29.8% SL.

Suborbital covered with scales, hence without a free margin below eye; margin of preopercle

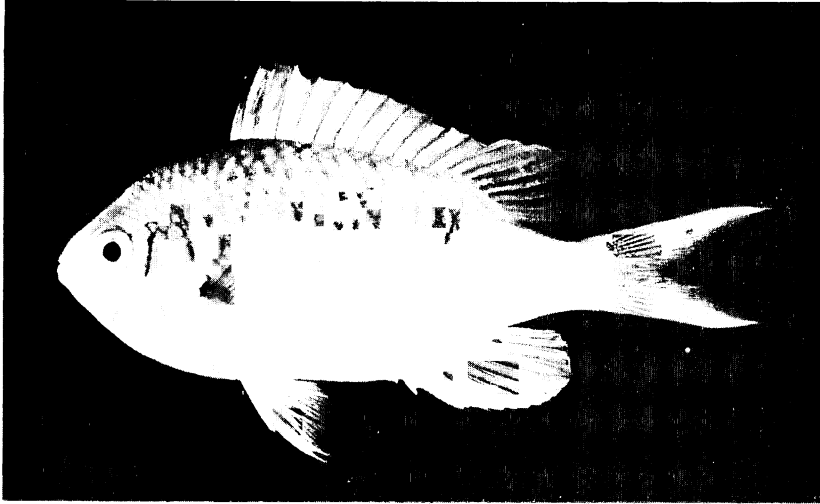


Fig. 7. *Chromis caerulea*, BPBM 6322, 69 mm SL, Enewetak, Marshall Islands.

smooth. Pores of lateralis system of head small; anterior nostril without an elevated rim; posterior nostril small and indistinct.

Color blue-green, shading to whitish ventrally; a faint dusky spot at upper base of pectoral fin; axil of pectoral fin pale; a blue line from front of snout to eye; iris mainly light yellow except dorsally where blue.

Distribution and ecological notes. This species is widespread in the Indo-West Pacific from East Africa and the Red Sea to French Polynesia. It is absent from the Hawaiian Islands, however. It is an abundant species at most localities in its habitat of coral reefs in protected waters. In the Japanese area it is known only from the Ryukyu Islands where it is notably less common than the closely related *C. atripectoralis*.

Remarks. As mentioned in the remarks under *C. atripectoralis*, most Japanese records of *C. caerulea* appear to be misidentifications of *C. atripectoralis*. The two species are distinguished primarily by the black pectoral axil of *C. atripectoralis* and pectoral fin-ray counts (modally 18 in *C. caerulea* and 19 in *C. atripectoralis*). *C. caerulea* does not appear to reach as large a size as *C. atripectoralis*. The largest *C. caerulea* from all localities measures 68 mm SL (from Okinawa); very few, however, exceed 60 mm SL. The largest *C. atripectoralis*, from Tahiti, is 76 mm SL.

As noted by Randall (1955) and Hiatt and Strasburg (1960), *C. caerulea* is closely tied to

live branching coral (especially *Acropora* spp.). It seeks refuge among the coral branches when frightened. Like *C. atripectoralis*, it feeds individually on the smaller animals of the zooplankton, mainly copepods and crustacean larvae. Hiatt and Strasburg (1960) reported 60% of 11 specimens from Arno, Marshall Islands, collected at the time of spawning had eaten their own ova. Swerdloff (1970) described the courtship and spawning and illustrated the eggs which are transparent, elliptical (0.60~0.66 mm in length), and attached to algal filaments.

Chromis chrysurus (Bliss)

(Japanese name: Amami-suzumedai)

(Figs. 2J, 8)

Heliastes chrysurus Bliss, 1883: 56 (type locality, Mauritius).

Materials. MCZ 6094, 96 mm, holotype; ZUMT 39814, 102.9 mm, Okinawa; ZUMT 14328, 99 mm, Naha market, Okinawa; ZUMT 14330, 103.1 mm, Okinawa; TMBS 740715, 73 mm, Miyake-jima; TMBS 741119-A, 2: 103~137 mm, Miyake-jima; TMBS 741120, 117 mm, Miyake-jima; BPBM 18998, 72.5 mm, Miyake-jima; BPBM 22697, 86 mm, San-Shien Tai, east coast of Taiwan.

Description. Dorsal rays XIII, 14 or 15 (usually 14); anal rays II, 13; pectoral rays 18 or 19 (usually 19); caudal spinules 2/2; tubed lateral-line scales 17 to 19; scales above lateral line 4; scales below lateral line 10 or 11; gill rakers 8 to

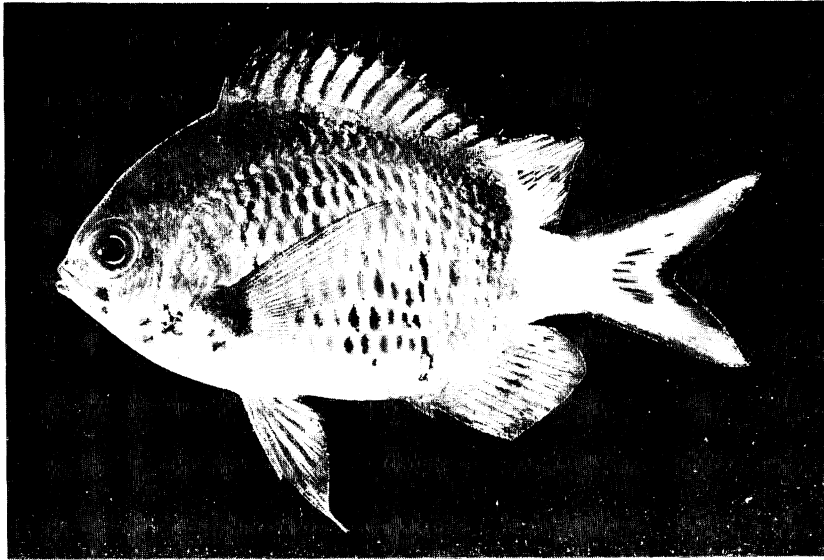


Fig. 8. *Chromis chrysurus*, BPBM 11418, 88 mm SL, New Caledonia.

10+21 to 23.

Depth of body 55~59.9% SL; head length 28.1~30.1; orbit diameter 8~10.3; interorbital width 10.9~12.4; snout length 7.7~8.7; least depth of caudal peduncle 13.9~15.1; longest dorsal spine 15.5~18; second anal spine 17.4~22.6.

Interspinous membranes of dorsal fin slightly incised; margin of soft portions of dorsal and anal fins rounded; caudal fin forked, the lobe tips pointed but not filamentous, the caudal concavity 16.1~22.5% SL.

Free margin of suborbital very short, ending below anterior rim of orbit; preopercular margin smooth; anterior nostril with a low fleshy rim which is slightly higher posteriorly; nostril small, usually slit-like; pores of lateralis system on head small.

Color blackish to dark brown, the centers of the scales of the body blackish, the edges yellowish brown (sometimes bluish); caudal peduncle abruptly white, dorsal and anal fins dark like body anteriorly, whitish posteriorly on soft portions in line with dark-light demarcation of body (slightly anterior to front of caudal peduncle); caudal fin pale salmon becoming whitish centro-posteriorly, the upper and lower edges dark brown; pectoral fins hyaline with blackish rays, a large blackish spot covering base and axil; pelvic fins dark brown. The young are more

colorful, blue on head and thorax with an arched bright blue line above and below eye; a large saddle-like white spot on caudal peduncle; tips of spinous portion of dorsal fin blue; soft portion of dorsal fin hyaline; caudal fin hyaline with a trace of blue in lobes; pelvic fins largely blue.

Distribution and habitat. *C. chrysurus* has an interesting discontinuous range: southern Japan to Taiwan in the northern part of the western Pacific, and the Coral Sea and adjacent areas (New Caledonia, New Hebrides, Fiji Islands, Great Barrier Reef) in the southern part; Allen (1975) recorded the southernmost specimens from near Sydney. In the Indian Ocean the species occurs in Mauritius and Réunion. Clearly it exhibits an antitropical distribution.

C. chrysurus occurs in outer reef areas of the Ryukyu Islands to depths in excess of 30 m; it is often seen in aggregations. Like *C. albomaculata*, it covers a rather large home range. Nests have been observed at Miyake-jima on volcanic cliff surfaces in about 10 m. The patches of eggs of guarding males sometimes overlap. The males defend their nests very aggressively.

Remarks. No doubt in part because of the unusual distribution, the species has been named several times. Randall and Swerdloff (1973) showed that *Siphonochromis lepidostethicus* Fowler (1946) from the Ryukyu Islands and *Lepicephalochromis westalli* Whitley (1964) from

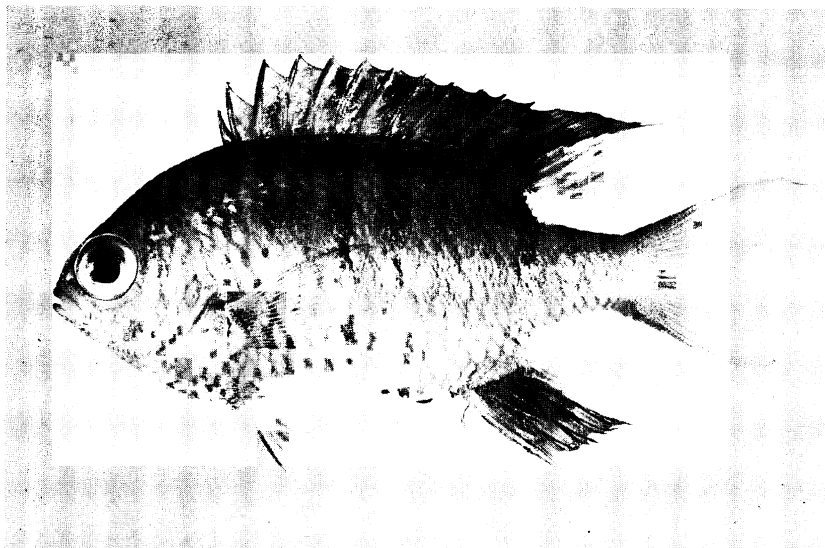


Fig. 9. *Chromis elerae*, BPBM 22608, 52 mm SL, Taiwan.

the Coral Sea are junior synonyms of *Dascyllus isharae* Schmidt (1930). The collection of this species by the senior author in Réunion and Mauritius in 1973 led to the realization that *Heliastes chrysurus* Bliss (1883) is the oldest name.

Chromis elerae Fowler et Bean

(New Japanese name: Taiwan-suzumedai)

(Figs. 2C, 9)

Chromis elerae Fowler et Bean, 1928: 52, pl. 4 (type locality, Pasacao, Ragay Gulf, Luzon).

Materials. USNM 89955, 45 mm, lectotype, Philippines; BPBM 22608, 5: 17.8~51.3 mm, Nan Wan, Taiwan

Description. Dorsal rays XII,11; anal rays II, 10; pectoral rays 17 or 18; caudal spinules 2/2; tubed lateral-line scales 15 to 17; scales above lateral line 3; scales below lateral line 10; gill rakers 7 to 9+19 to 22.

Depth of body 45 to 49% SL, deeper, generally, on larger fish (up to 52% for specimens extralimital to Taiwan); head length 30.9~35.8 (relatively longer in smaller specimens); orbit diameter 10.9~13.7; interorbital width 9.9~11; snout length 7.2~9.6; least depth of caudal peduncle 14.2~15.4; longest dorsal spine 18.2~20; second anal spine long, 24.2~26.1.

First few interspinous membranes of dorsal fin deeply incised, the remaining membranes only

slightly so; soft portions of dorsal and anal fins angular as a result of slight elongation of middle rays (fifth dorsal soft ray and fourth anal soft ray longest); caudal fin forked, the second upper branched ray slightly prolonged, the caudal concavity 7 to 14.5% SL.

Free margin of suborbital extending to or posterior to a vertical at hind edge of pupil, the posterior edge sometimes serrate on adults; upper margin of preopercle serrate; anterior nasal opening large, round, with a low fleshy rim (highest dorso-posteriorly); posterior nasal opening minute; openings of superorbital canals large.

Color grayish brown; the edges of scales a little darker than centers, which may be a little orangish or bluish; posterior half of soft portion of dorsal and anal fins pale, in contrast to dark brown of the more anterior part of these fins; a white or cream spot as large as or larger than pupil at rear base of dorsal and anal fins (these spots are prominent in life and clearly the most distinctive color markings); region of anus blackish; spines of anal and pelvic fins blue; caudal fin slightly lighter than ground color of body; paired fins pale to slightly dusky; a small blackish spot at upper base of pectoral fin, the axil pale.

Distribution and habitat. This constitutes the first record of *C. elerae* from Taiwan. Our only

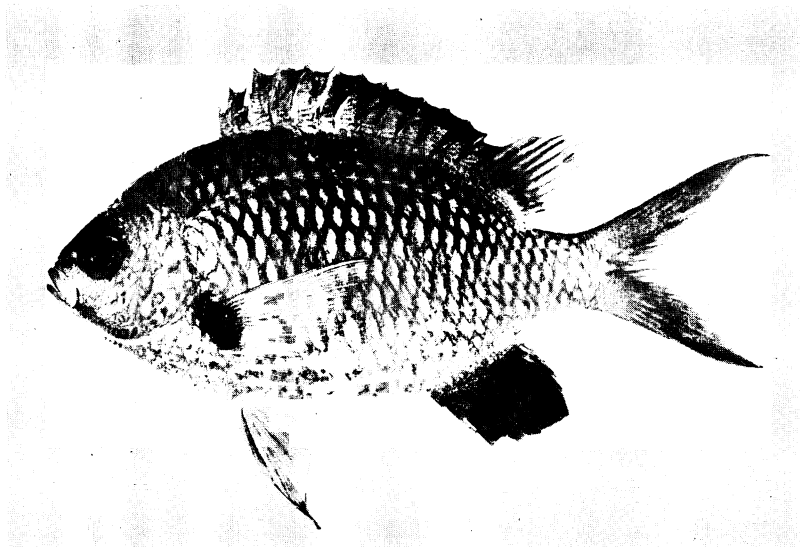


Fig. 10. *Chromis flavomaculata*, BPBM 18959, 102 mm SL, Miyake-jima, Japan.

specimens of this species from this island are five taken in 24~30 m in a crevice of a rocky pinnacle at the south end of Nan Wan; we have also examined Bishop Museum specimens from the Solomon Islands and the D'Entrecasteaux Group, New Guinea. Although we have not seen this fish in Japanese waters, it may be expected from the southern Ryukyus, at least.

Remarks. Fowler and Bean (1928) selected their two Philippine specimens with "Albatross" field number 1255 (error for 1253) as syntypes. We here designate the larger of these (USNM 89955, 45 m SL), as lectotype (the one illustrated by Fowler and Bean, pl. 4).

Chromis flavomaculata Kamohara
(Japanese name: Kihoshi-suzumedai)
(Figs. 2L, 10)

Chromis flavomaculatus Kamohara, 1960: 2, 5, fig. 2 (type locality, Susaki, Kochi-ken, Japan).

Materials. BSKU 4944, 82.4 mm, paratype of *C. flavomaculata*; AMS IB. 4973, 77 mm, holotype of *C. kennensis* (Whitley), Kenn Reef, Coral Sea; ZUMT 19588, 125 mm, Tokyo market; ZUMT 19591, 122 mm, Tokyo market; ZUMT 46611~46614, 4: 97~119 mm, Hachijo-jima; TMBS 730725, 2: 110~124 mm, Miyake-jima; TMBS 741117-A, 2: 57~108 mm, Miyake-jima; TMBS 741231-B, 104 mm, Miyake-jima; BPBM 6880, 93 mm, Ishigaki; BPBM 11989,

69.4 mm, Ishigaki; BPBM 18959, 5: 101~129 mm, Miyake-jima; BPBM 19073, 2: 86.8~88.4 mm, Sesoko-jima, Okinawa.

Description. Dorsal rays XIII (rarely XIV), 11 to 13 (usually 12); anal rays II, 10 or 11 (usually 11); pectoral rays 18 to 20; caudal spinules 2/2; tubed lateral-line scales 17 to 19; scales above lateral line 4; scales below lateral line 9 or 10; gill rakers 8 to 10+21 to 25.

Depth of body 42.1~50.4% SL; head length 27.8~32.2; orbit diameter 8.2~10.6; interorbital width 9.4~12; snout length 7.1~9.1; least depth of caudal peduncle 13.8~15.4; longest dorsal spine 13~16.4; second anal spine 16.9~20.2.

Only the anterior three interspinous membranes of dorsal fin incised; remaining membranes slightly indented; margin of soft portions of dorsal and anal fins rounded to slightly angular; caudal fin forked, the tips of the lobes sharply pointed but not extended as long filaments, the caudal concavity 19.1~25.8% SL.

Free margin of suborbital very short, reaching at most to a vertical at anterior edge of pupil; preopercular margin smooth; anterior nasal opening with a short membranous rim; posterior nasal opening small but distinct; pores of lateralis system of head small.

Color usually olive green, the edges of the scales broadly blackish, but the scale centers may

be olivaceous brown to bluish; ventral part of head and body paler, often with light blue-green iridescence; spinous portion of dorsal fin and lower soft portion blackish except for basal scales which are olive; outer soft portion hyaline with dusky olive rays; anal fin blackish except front edge which is bluish and posterior part which is light olive to whitish; caudal fin varies from yellowish to yellowish brown, shading to nearly clear posteriorly, the yellow extending onto caudal peduncle, the tips of the caudal lobes blackish; a whitish to yellow spot often present at rear base of dorsal fin (some populations nearly always have the spot whereas others may lack it); pectoral fins with clear membranes and olive rays, the base and axil with a large roundish black spot; pelvic fins dusky, sometimes bluish on lateral edge; region of anus black.

Distribution and ecological notes. *C. flavomaculata* is confined to the western Pacific. Like *C. chrysurus* it exhibits antitropical distribution. It occurs in the northern latitude from southern Japan to Taiwan (Taiwan record by Shen and Chen, 1978). Masuda et al. (1975) recorded it (as *Chromis* sp.) from the Bonin Islands. In the southern part of its range it is found at islands and reefs in the Coral Sea (described as *Chromis kennensis* by Whitley, 1964, from Kenn Reef), New Caledonia, Loyalty Islands south to Lord Howe Islands and Sydney (Allen, 1975).

This species is the most abundant *Chromis* in southern Japanese waters from Miyake-jima to Okinawa, slightly less so in the Yaeyama Islands. It inhabits a wide variety of habitats from lagoons to outer reef slopes in Okinawa and Yaeyama, and along lava cliffs, around moderately large boulders, and over coral heads at Miyake-jima. It is abundant to depths of 40 m so evidently ranges into greater depths. It forms large aggregations that occupy a rather limited home range for extended periods of time. Three such aggregations at Miyake-jima have been under observation, each in its own small area, for over five years. Intensive spawning takes place at Miyake-jima in the spring and autumn when sea temperatures reach 21~23°C.

Remarks. Some authors, such as Aoyagi (1941), have confused *C. flavomaculata* with *C. notata*, which is understandable as these two species are closely related. The caudal coloration provides a useful separation. The fin of *C.*

flavomaculata is yellow to yellowish brown, the lobe tips blackish; if dark, the pigment is not concentrated in a band in each caudal lobe. The fin of *C. notata* is dark brown, shading to paler at posterior or margin, the dark pigment tending to be concentrated in two broad bands, one submarginal in each caudal lobe; there is a narrow pale bluish upper and lower margin. *C. flavomaculata* has modally 12 dorsal soft rays, whereas *C. notata* has modally 13 (see Table 2). In addition, the soft portions of the dorsal and anal fins are more angular on *notata*.

***Chromis fumea* (Tanaka)**

(Japanese name: Matsuba-suzumedeai)

(Figs. 2K, 11)

Pomacentrus fumeus Tanaka, 1917: 9 (type locality, Nagasaki market).

Materials. ZUMT 7337, 80 m, collected by Shigeo Tanaka from Nagasaki market; ZUMT 18748, 20361, 20362, 20542, 22487, 39706, 6: 54.5~84.3 mm, from Kii Peninsula collection of Hozo Ui, registered by Shigeo Tanaka; MSM 11-60, 79-222, 79-221, 3: 45-79 mm, Suruga Bay; TMBS 741129, 30 mm, Miyake-jima; NTUM 02822, holotype of *Chromis caudofasciata* Shen and Chen, 54.4 mm, northern Taiwan; FSKU 751205, 51 mm, Nakagusuku, Okinawa; FSKU 760225, 2: 50.2~54.2 mm, Nakagusuku, Okinawa; BPBM 18660, 3: 25~31 mm, northern Taiwan; BPBM 18695, 4: 55~63 mm, Wan Li, northern Taiwan; BPBM 21113, 81.8 mm, Izu Marine Park; BPBM 22303, 55.5 mm, Sesoko-jima, Okinawa; BPBM 22696, 12: 65~96 mm, Sukumo Bay, Shikoku; BPBM 22700, 7: 58~68.5 mm, Yeh-liu, northern Taiwan.

Description. Dorsal rays XIII or XIV (usually XIII), 10 to 12 (rarely 10); anal rays II, 9 or 10 (rarely 9); pectoral rays 18 to 20 (usually 19); tubed lateral-line scales 17 to 19; scales above lateral line 4; scales below lateral line 9 or 10; gill rakers 7 to 10+19 to 24.

Depth of body 40.2~48.8% SL; head length 29.1~31.5; orbit diameter 9.8~11.4; interorbital width 9.7~10.5; snout length 7~9; least depth of caudal peduncle 12.9~14.5 longest dorsal spine 14.7~19.1; second anal spine 16.7~22.9.

First four interspinous membranes of dorsal fin moderately incised, the more posterior membranes only slightly so; margin of soft dorsal and

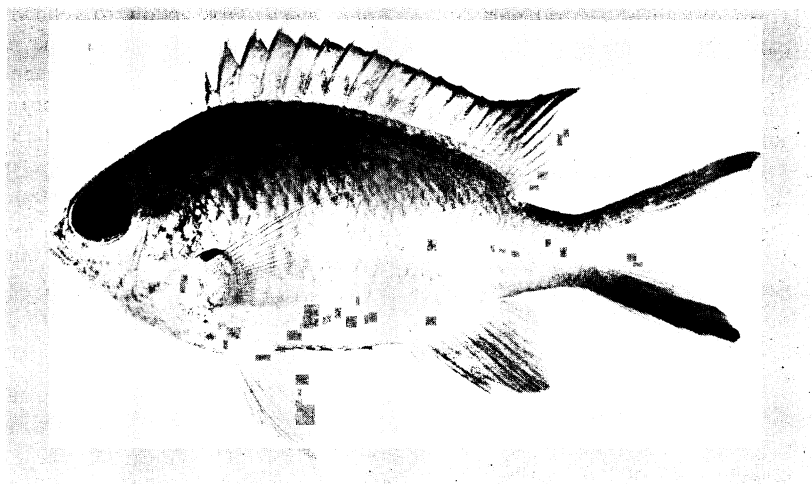


Fig. 11. *Chromis fumea*, BPBM 18695, 61 mm SL, Taiwan.

anal fins angular; caudal fin forked, the lobe tips pointed to slightly rounded, the caudal concavity 12.5~22.5% SL.

Free margin of suborbital short, reaching only to a vertical at front edge of pupil; upper preopercular margin and corner usually serrate; anterior nostril with a short fleshy rim that is slightly higher dorso-posteriorly; posterior nostril small, usually a short slit; pores of lateralis system of head small.

Yellowish gray, shading ventrally to whitish with a light blue or blue-green iridescence, sometimes with a faint longitudinal banding of yellowish following scale rows; a conspicuous white or greenish white spot below and adjacent to rear base of dorsal fin; dorsal fin yellowish gray, except posterior membranes clear, the margin bluish white, the submarginal region narrowly blackish; anal fin yellowish gray, less pigmented posteriorly, the spines bluish; caudal fin with a broad blackish band in each lobe, the upper and lower edges bluish white, the centro-posterior part of fin with clear membranes and light salmon rays; pectoral fins light gray, their base pale but with a large jet-black spot in axil that extends slightly above the base; pelvic fins pale, the rays light salmon except spine and filamentous first ray which are whitish.

Remarks. This species was described in Japanese by Tanaka as a *Pomacentrus*, and no illustration was included. It is therefore not surprising that the description as a valid species of

Chromis was overlooked except by Allen (1976), who recorded it from Western Australia. The holotype could not be found at the Zoological Museum of the University of Tokyo; however, Tanaka's description is diagnostic for this species and seven other ZUMT specimens identified as *Pomacentrus fumeus* by him are the same as our material. Shen and Chen (1978) described *C. caudofasciata* from Taiwan; we have examined the holotype and conclude that it is conspecific with *C. fumea*. Their name is also a homonym; *Dascyllus caudofasciatus* Montalban is a junior synonym of *Chromis lepidolepis*.

Distribution and ecological notes. Most of our material of this species is from southern Japan to Taiwan. Fourmanoir and Laboute (1976: 246, upper right figure) illustrated it (as *Chromis* sp.). The senior author collected four specimens (BPBM 21962, 35~42 mm) at Pulau Chebeh off the east coast of Malaysia (2°56'N; 104°06'E). No other records of the species are known except that of Allen (1976) from western Australia, but further collecting should result in additional localities of significance.

C. fumea occurs in lagoons and exposed outer reef or rocky areas. Our specimens have been taken from the depth range of 3 to 22 m, but the species is most commonly found in 5 to 10 m. In Okinawa, juveniles are usually associated with live coral and may be seen in feeding aggregations with *C. atripectoralis* and *Pomachromis richardsoni* (Snyder); it superficially resembles

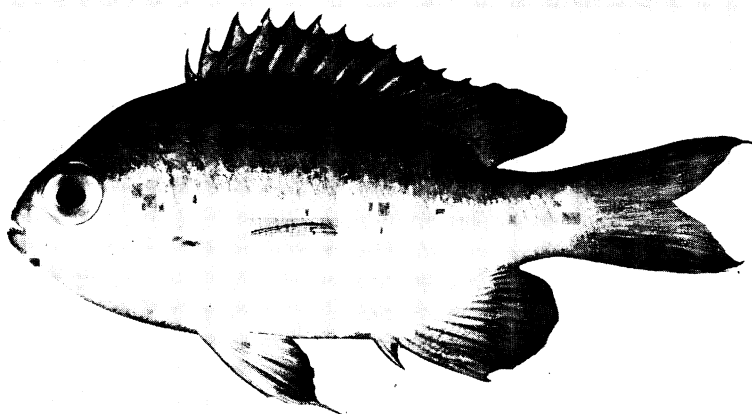


Fig. 12. *Chromis lepidolepis*, BPBM 6889, 51 mm SL, Palau Islands.

the latter. When pursued, like juvenile *C. atripectoralis*, it usually seeks protection among the branches of live coral (by contrast *P. richardsoni* hides in crevices of rock or dead coral). At Miyake-jima, *C. fumea* is rather common in summer and autumn but its numbers decrease steadily after late August, apparently from predation (perhaps related to the lack of sufficient coral cover). The species rarely survives Miyake-jima winters.

Chromis lepidolepis Bleeker
(Japanese name: Sasa-suzumedai)
(Figs. 2A, 12)

Chromis lepidolepis Bleeker, 1877: 389 (type locality, Timor)

Materials. RMNH 6515, 48.6 mm, holotype; FSKU 730803, 58.5 mm, Yonesu, Okinawa; FSKU 731005-b, 30.3 mm, Ishigaki; FSKU 740920, 750531, 751001-c, 770821, 770913, 7: 40.1~58.5 mm, Sesoko-jima, Okinawa; TMBS 741117-B, 2: 31~36 mm, Miyake-jima; BPBM 11804, 59.2 mm, Nan Wan, southern Taiwan; BPBM 19143, 59 mm, Sesoko-jima, Okinawa; BPBM 22694, 19 mm, Nan Wan, southern Taiwan; USNM 220410, 11: 22.8~36 mm, southern Taiwan.

Description. Dorsal rays XII, 11 to 13 (usually 12); anal rays II, 11 or 12 (rarely 12); pectoral rays 17 to 19 (usually 18); caudal spinules 2/2; tubed lateral-line scales 15 to 18 (modally 11); scales above lateral line 3; scales below lateral line 9; gill rakers 8 to 10+20 to 22.

Depth of body 45.4~53.1% SL; head length 29~34.1; orbit diameter 10.3~12.9; interorbital width 10.6~14.1; snout length 7.5~11; least depth of caudal peduncle 14.2~17.7; longest dorsal spine 16.1~18.8; second anal spine 20~22.7.

Some scales of nape and anteriorly on back with auxiliary scales. Outer conical teeth at front of jaws large.

Interspinous membranes of dorsal fin moderately incised anteriorly, slightly so posteriorly; margins of soft portions of dorsal and anal fins rounded; caudal fin slightly forked, the caudal concavity 12.4~19.3% SL.

Free margin of suborbital extending to or posterior to hind edge of pupil; upper margin and corner of preopercle distinctly serrate, but lower margin entire; anterior nostril with a slight rim; posterior nostril not detected; pores of lateralis system dorsally on head very small.

Olivaceous brown to greenish with some bluish iridescence ventrally on head and body; dorsal and anal fins olive-brown, becoming paler posteriorly, the distal margin blackish (except posteriorly); caudal fin with a broad brown band in each lobe at upper and lower margins. the tips of the lobes blackish; a small dusky spot at upper base of pectoral fins; axil of pectoral fins pale; orbit with narrow dark brown rim; region of anus blackish.

Distribution and habitat. *C. lepidolepis* is a small species, rarely exceeding 60 mm SL. It is widespread in the Indo-Pacific from East Africa

to Oceania as far east as the Line Islands; it is unknown from French Polynesia and the Hawaiian Islands. In the Ryukyu Islands it inhabits lagoons, patch reefs and outer reef areas in from 2 to 20 m. At Miyake-jima it appears from mid-summer to late autumn along the upper edges of lava cliffs and around outcroppings of *Acropora* coral. Occasionally it survives Miyake-jima winters.

***Chromis leucura* Gilbert**

(Japanese name: Fukami-suzumedai)

(Fig. 2D; Pl. 1B)

Chromis leucurus Gilbert, 1905 (in part): 620, pl. 77, fig. 2 (type locality, Avau Channel between Maui and Lanai, Hawaiian Islands).

Materials. USNM 51587, 50.4 mm, holotype, Hawaiian Is.; RUB 1977-9-14, 38.1 mm, Okinawa; BPBM 7917, 46 mm, Oahu; BPBM 11883, 36 mm, Fatu Hiva, Marquesas; BPBM 15054, 2: 43~45 mm, Hawaii; BPBM 15526, 52 mm, Oahu; BPBM 22317, 33 mm, Okinawa.

Description. Dorsal rays XII,14; anal rays II, 13 to 15; pectoral rays 16~17 (usually 16); caudal spinules 2/2; tubed lateral-line scales 13 to 15; scales above lateral line 3; scales below lateral line 9 or 10 (usually 9); gill rakers 6~7+18~20.

Depth of body 50.5~54.5% SL; head length 32.4~34.1; orbit diameter 11.9~13.3; inter-orbital width 9.3~11.5; snout length 6~10; least depth of caudal peduncle 15.6~16.9; longest dorsal spine 16.9~20.8; second anal spine 20~20.7.

Interspinous membranes of dorsal fin deeply incised except posteriorly; distal margin of soft portions of dorsal and anal fins angular, the sixth (occasionally the fifth or seventh) dorsal ray longest and the seventh anal ray usually longest; caudal fin forked, the second upper and lower branched rays prolonged as filaments (the two branches of each free from membranes), the caudal concavity 21.1~39.4% SL.

Margin of suborbital free to or nearly to a vertical at posterior edge of pupil; margin of preopercle smooth; anterior nasal opening moderate in size with a distinct fleshy rim; posterior nasal opening small but distinct; pores of supra-orbital canals large.

Color dark brown to nearly black (the Marquesas specimen was observed to be deep blue in

life, altering to blackish on death), the posterior half of caudal peduncle and caudal fin abruptly white with a suffusion of light blue along upper and lower edges of caudal lobes; posterior part of dorsal and anal fins also abruptly pale; dorsal and anal fins otherwise brown, the spines partly blue, the interspinous membranes tipped with blue; anterior membranes of dorsal fin with a broad submarginal area of yellow (progressively less yellow on more posterior membranes); pectoral fins pale with a large dark brown to black spot at base (spot narrowing ventrally on base), followed by a prominent zone of yellow (whitish in preservative); a comparable dark spot in pectoral axil; pelvic fins yellow to brownish yellow, the spine and part of first ray brown, often partly blue; blue markings on snout, sub-orbital rim, and behind eye; iris mainly blue.

Distribution and habitat. The holotype was taken within the depth range of 62 to 119 m in the Hawaiian Islands. The remaining specimens reported herein are from 21 to 68 m, all from coral reefs or rocky bottoms. The 33.0 and 38.1-mm specimens from Okinawa were collected off Sesoko Island in 43 m.

Because of its predilection for deeper water, *C. leucura* is not well represented in museums. Undoubtedly its range will be greatly extended beyond its present known distribution of Hawaiian Islands, Marquesas, and Ryukyu Islands by future collecting.

Remarks. As pointed out by Randall and Swerdloff (1973), the paratype of *C. leucura* from Kauai, Hawaiian Is., is a specimen of *C. verater*. The name *C. leucura* (generally as *leucurus*) has erroneously been applied to other species, especially *C. agilis* Smith and *C. hanui* Randall et Swerdloff.

***Chromis margaritifer* Fowler**

(Japanese name: Shikoku-suzumedai)

(Figs. 2G, 13)

Chromis dimidiatus margaritifer Fowler, 1946: 140, figs. 9~10 (type locality, Aguni Shima, Ryukyu Islands).

Materials. ANSP 72008, 49 mm, holotype; FSKU 701013, 40.8 mm, Iriomote-jima, Yaeyama Is.; FSKU 741020, 40 mm, Sesoko-jima, Okinawa; FSKU 751001-e, 47 mm, Sesoko-jima, Okinawa; FSKU 761222, 52.2 mm, China, Okinawa; FSKU 760724, 49 mm, Kabira,

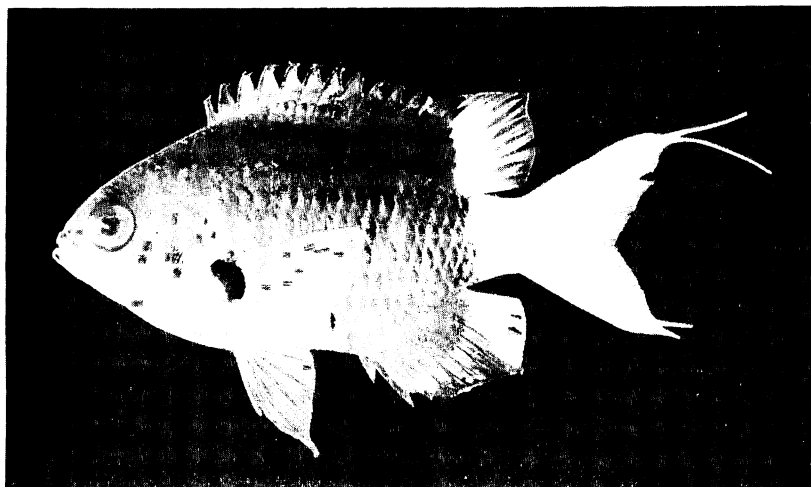


Fig. 13. *Chromis margaritifer*, BPBM 19117, 46 mm SL, Okinawa, Japan.

Ishigaki; FSKU 770706, 61.9 mm, Kerama; TMBS 730920-A, 32 mm, Miyake-jima; TMBS 750712, 22.5 mm, Miyake-jima; TMBS 760821, 53.2 mm, Miyake-jima; TMBS 790823-A, 2: 28.2~32.5 mm, Miyake-jima; BPBM 6878, 54.5 mm, Ishigaki; BPBM 8739, 2: 40~55 mm, Sesoko-jima, Okinawa; BPBM 19117, 44.4 mm, Sesoko-jima, Okinawa; USNM 220411, 6: 49~58 mm, southern Taiwan; USNM 220413, 10: 20.3~59.4 mm, southern Taiwan; BPBM 22705, 2: 28.5~31.6 mm, Miyake-jima.

Description. Dorsal rays XII, 12 or 13 (usually 12); anal rays II, 11 or 12 (rarely 11); pectoral rays 16 to 18 (usually 17); caudal spinules 2/2; tubed lateral-line scales 16 to 18 (rarely 16); scales above lateral line 3; scales below lateral line 9; gill rakers 7 to 9+19 to 21.

Depth of body 49.6~53.1% SL; head length 29.4~33.8; orbit diameter 10.7~11.9; inter-orbital width 11.7~13.7; snout length 6.6~10; least depth of caudal peduncle 14.7~15.7; longest dorsal spine 13.2~17.5; second anal spine 13.5~17.5.

Interspinous membranes of dorsal fin deeply cised; soft portions of dorsal and anal fins angular, the fourth dorsal ray longest, somewhat prolonged as a filament; caudal fin forked, the second and twelfth branched rays filamentous, the caudal concavity 29~37.7% SL.

Free margin of suborbital extending to below posterior edge of pupil; margin of preopercle smooth; anterior nasal opening with a well de-

veloped membranous rim which is distinctly higher dorso-posteriorly; posterior nasal opening small; pores of lateralis system dorsally on head relatively small but those on snout large.

Color dark brown to blackish anteriorly, becoming white on body and median fins posterior to a sharp demarcation that runs through bases of about the sixth to eighth dorsal soft rays and the last two or three anal rays; pectoral fins hyaline with large black spot at base, often with a rim of whitish on the posterior edge of spot; pectoral axil black.

Remarks. This damselfish has been identified in the older literature mainly as *Chromis dimidiata* (Klunzinger) or *C. leucura*. The former is an Indian Ocean species with the black-white demarcation on the body more anterior (in line with spinous portions of dorsal and anal fins), while the latter is a deeper water fish with the demarcation on the caudal peduncle (see previous species account). *C. margaritifer* has also been confused with *C. iomelas* Jordan and Seale, but the latter has the demarcation even more anterior than that of *C. dimidiata* (anterior to the anal fin).

Macleay (1883) briefly described a *Chromis* under the name *Gliphidodon bicolor* which seems to be this species, in spite of a dorsal-ray count of XII, 14. The type appears to be lost; it is not at the Queensland Museum (Gerald R. Allen, personal communication). *Chromis bicolor* (Macleay), however, is a secondary homonym pre-empted by *Heliasstes bicolor* Rochebrune (1880)

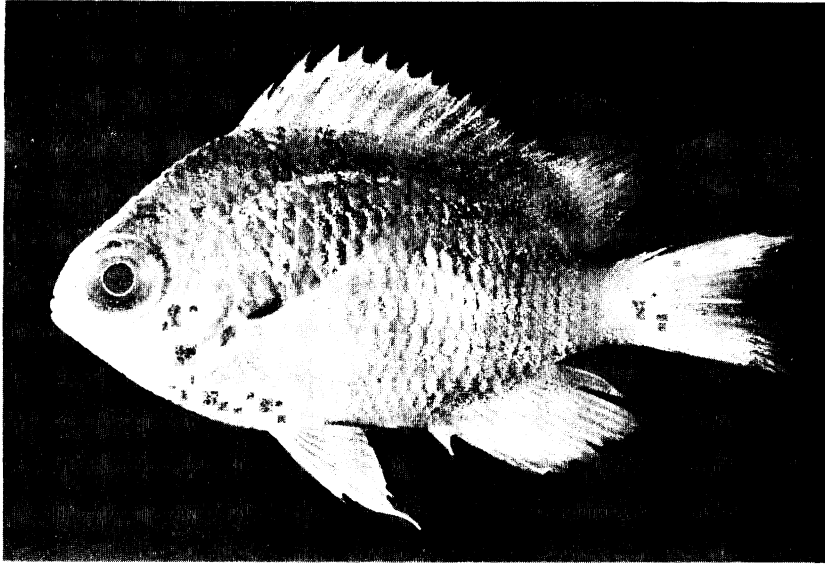


Fig. 14. *Chromis mirationis*, FSKU 761106, 44.0 mm SL, Futo, Izu Peninsula, Japan.

from Senegal. Wood (1977) placed *H. bicolor* Rochebrune in the synonymy of *Chromis insolatus* (Cuvier) in Cuvier and Valenciennes.

Distribution and habitat. *C. margaritifera* is widely distributed in the central and western Pacific as far east as French Polynesia; it does not occur in the Hawaiian chain. Allen (1975) recorded the first specimens from the Indian Ocean from a collection at Dampier Archipelago, Western Australia made by the senior author, and Allen and Steene (1979) have recorded it from Christmas Island in the eastern Indian Ocean. In the Ryukyu Islands this species inhabits the outer reef slopes from less than 3 to about 10 to 12 m where it tends to be replaced by *C. atripes*. At Miyake-jima it is common along lava cliffs to 20 m.

Chromis mirationis Tanaka
(Japanese name: Tokai-suzumedai)
(Figs. 21, 14)

Chromis mirationis Tanaka, 1917: 8 (type locality, off Goto Islands, Nagasaki-ken, Japan).

Materials. ZUMT 3627, 77 mm, holotype; ZUMT 24310, 85 mm, Shikoku; BSKU 1537, 90 mm, Mimase, Kochi-ken; SMBL-F 72067, 90.6 mm, holotype of *C. fraenatus* Araga and Yoshino, off Minabe, Wakayama-ken, Japan; SMBL-F 73391, 91 mm, paratype of *C. fraenatus*, same locality as holotype; FSKU 761106, 44 mm,

Futo, Izu Peninsula; KSHS 5139, 106 mm, Kochi-ken; KSHS 5770, 105 mm, Kochi-ken; BPBM 22711, 92 mm, Osumi Peninsula, Kyushu.

Description. Dorsal rays XIV, 13 or 14; anal rays II, 11 to 13 (usually 12); pectoral rays 19 or 20 (usually 19); caudal spinules 2/2; tubed lateral-line scales 16 to 18; scales above lateral line 4; scales below lateral line 10 or 11 (usually 10); gill rakers 8 or 9+19 to 21.

Depth of body 46.7~53.4% SL; head length 32.6~36.3; eye large, the orbit diameter 12.2~13.6; interorbital width 11.7~12.7; snout length 8.6~9.4; least depth of caudal peduncle 13.8~14.7; longest dorsal spine 17.8~21; second anal spine 19.7~21.4.

Interspinous membranes of dorsal fin moderately incised anteriorly, little so posteriorly; margin of soft portions of dorsal and anal fins rounded; caudal fin forked, the lobes pointed, the caudal concavity 12.2~18.5% SL.

Free margin of suborbital long, extending well beyond a vertical at rear edge of pupil; margin of preopercle smooth; anterior nostril small with a low rim at the front and a well-developed flap posteriorly; posterior nostril unusually large, slit-like, near edge of orbit just above level of upper margin of pupil; pores of lateralis system dorsally on head large.

Dusky whitish, the edges of the scales dorsally on body brown and ventrally white; a broad mid-