

## Review of the Dragonets (Pisces: Callionymidae) of the Hawaiian Islands, with Descriptions of Two New Species<sup>1</sup>

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**ABSTRACT:** Eight species of dragonets, family Callionymidae, are reported from the Hawaiian Islands: *Callionymus caeruleonotatus* Gilbert, known from 12 specimens taken by trawling in 43–252 m, the male with the two middle caudal rays greatly prolonged; *C. comptus*, a new species described from nine Hawaiian specimens, 15.0–30.3 mm SL, characterized by eight soft dorsal and seven anal rays, usually a small spinule on lower side of preopercular spine (in addition to the antrorse spine at the base), and a color pattern of a narrow midlateral yellow stripe edged in pale blue spots and overlaid with six brownish orange blotches; *C. decoratus* (Gilbert), known to 208 mm SL, the male with a caudal fin that may exceed the standard length; *Draculo pogognathus* (Gosline) from shallow water in sand, unique in lacking a membrane connecting the inner pelvic ray to the pectoral-fin base and in having a fringe of papillae on the lower lip; *Synchiropus corallinus* (Gilbert) with a small cirrus on the eye, previously classified in *Callionymus*, *Paradiplogrammus*, and *Minisynchiropus*, also known from Japan and New Caledonia; *S. kinmeiensis* (Nakabo, Yamamoto & Chen), a red species represented by 186 Hawaiian specimens, 56–136 mm SL, trawled from 220–532 m (previously misidentified as the Japanese species *S. altivelis*); *S. rosulentus*, a small species (largest, 21.5 mm SL) described as new from 20 specimens from the Hawaiian Islands and Johnston Island (it is one of a complex of six allopatric species, the males of which have the first dorsal fin about twice the height of the second dorsal and two small elliptical jet black spots above the base of each pelvic fin); and *S. rubrovinctus* Gilbert, known from three male specimens, 14.2–19.5 mm SL, trawled from 51.5–79 m between Maui and Lāna'i, and one female specimen, 21.5 mm SL, collected in a tide pool at Izu Peninsula, Japan; both sexes are characterized by a long filamentous first dorsal spine and three broad red bars dorsally on the body.

CALLIONYMIDAE IS A LARGE family of over 150 species of small benthic fishes popularly known as dragonets. They are characterized by having a strong spine at the corner of the preopercle that usually bears barblike spinules; a depressed head; large eyes that are oriented as much dorsally as laterally; a very small gill opening on the upper side of the head; no scales; two dorsal fins (except one

species of *Draculo*), the first of I to IV spines; usually 7 + 14 vertebrae (Nakabo 1983); and the pelvic fins of I, 5 rays usually joined by membrane to the pectoral-fin base.

With the exception of two euryhaline species, all callionymid fishes are marine; they occur in tropical to temperate seas from the shallows to depths of about 900 m. They are most often found on mud or sand substrata. The mouth of these fishes is strongly protrusible, angling downward when protruded; they feed mainly on small benthic invertebrates. Most species are sexually dimorphic (Harrington 1997), the males often with a higher first dorsal fin and usually more col-

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orful. Pair spawning has been observed, and the eggs are pelagic.

Our knowledge of the Callionymidae in the Hawaiian Islands began with Gilbert (1905), who described four new species, *Callionymus caeruleonotatus*, *Calliurichthys decoratus*, *Synchiropus corallinus*, and *S. rubrovinctus*, from a survey of the deeper-water fishes by trawling and dredging during the period March to August 1902. Jordan and Jordan (1922) described two more new species in the family, but these were correctly placed in the synonymy of *Calliurichthys decoratus* Gilbert by Fowler (1928). Gosline (1959) described *Pogonimus pogognathus* as a new genus and species from six specimens collected in shallow water in Kaua'i. Gosline and Brock (1960) reclassified *Calliurichthys decoratus* in the genus *Callionymus* Linnaeus. They recognized four species of dragonets in Hawai'i, but they mistakenly placed *C. corallinus* Gilbert in the synonymy of *C. decoratus* (Gilbert). Tinker (1978) reported the same four species; he erred in regarding *corallinus* as the female of *C. decoratus*.

Fricke (1983) recognized 126 species in a revision of the Callionymidae of the Indo-Pacific region. He reclassified *Pogonimus pogognathus* Gosline as *Draculo pogognathus* and recorded the deep-water *Synchiropus altivelis* (Temminck & Schlegel) from the Hawaiian Islands. He recognized *corallinus* as a valid species of *Callionymus*. Nakabo (1991) redescribed *corallinus*, reclassified it in the genus *Paradiplogrammus* Nakabo, and recorded it from Japan.

A major problem exists with respect to the genera of the Callionymidae. Nakabo (1982) revised the genera of the family, recognizing 19 genera, 7 of which he described as new. Fricke (1983) classified the Indo-Pacific species in only nine genera. Fricke's concept of genera is adopted here for Hawaiian species, except for the placement of *corallinus* in *Synchiropus* instead of *Callionymus*. However, it is clear that a comprehensive study is needed to resolve the differences in the generic classification of this family.

Eight Hawaiian species of callionymid fishes are treated in this paper, including two

new species. The Hawaiian species regarded as *Synchiropus altivelis* by Fricke (1982, 1983) is reidentified as *S. kinmeiensis* (Nakabo, Yamamoto & Chen, 1982).

#### MATERIALS AND METHODS

Type specimens of the new species were deposited in the Australian Museum, Sydney (AMS); Bernice P. Bishop Museum, Honolulu (BPBM); National Science Museum, Tokyo (NSMT); Staatliches Museum für Naturkunde, Stuttgart (SMNS); and the U.S. National Museum of Natural History, Washington, D.C. (USNM). Paratypes of callionymid fishes were sent on loan from the California Academy of Sciences (CAS) and the U.S. National Museum of Natural History.

Lengths recorded for specimens are standard length (SL), the straight-line distance from the tip of the snout in the median plane to the base of the caudal fin (end of hypural plate). Body depth is the greatest depth; body width is measured at the base of the pectoral fins. Head length is measured from the front of the upper lip in the median plane to the upper end of the gill opening (the head of callionymid fishes is longer; however, the opercular membrane of most species is fused with the body, so there is no posterior point where one can take an accurate measurement); head width is measured to the inner base of the preopercular spine; snout length is taken from the front of the upper lip to the fleshy edge of the orbit. Orbit diameter is the greatest fleshy diameter; interorbital width is the least fleshy width. Caudal-peduncle depth is the least depth, and caudal-peduncle length is the horizontal distance between verticals at the rear base of the anal fin and the base of the caudal fin; lengths of spines and rays of fins are measured from their extreme bases in a straight line to their tips. Pectoral-fin length is the length of the longest ray; pelvic-fin length is measured from the base of the spine to the tip of the longest ray.

In the description of the new species, meristic and morphometric data given in parentheses refer to paratypes. Tables 1 and 2

provide measurements of type specimens of the new species as percentages of the standard length. Table 3 records the pectoral-fin counts of three related species of *Synchir-*

*opus*. Proportional measurements in the text are rounded to the nearest 0.05.

Photographs were taken by the author.

KEY TO SPECIES OF CALLIONYMIDAE OF THE HAWAIIAN ISLANDS  
(Species accounts are presented alphabetically)

- 1a. Innermost pelvic ray connected by membrane to base of pectoral fin; branched caudal rays 7 or 8; gill opening a small hole above opercle; no fringe of papillae on lower lip; preopercular spine nearly as long as to longer than orbit diameter . . . . . 2
- 1b. Innermost pelvic ray not connected by membrane to base of pectoral fin; branched caudal rays 6; gill opening at upper posterior end of opercle, covered laterally by opercular membrane; fringe of large papillae on lower lip; preopercular spine small, less than half orbit diameter . . . . . *Draculo pogognathus*
- 2a. Preopercular spine with a straight tip and a single forward-curved spinule on dorsomedial edge; all dorsal soft rays branched; lower 4–5 branched rays of caudal fin of males prolonged and filamentous; color in life red; depth of capture 220–532 m . . . . . *Synchiropus kinmeiensis*
- 2b. Preopercular spine with a straight to upcurved tip and 2 to 15 spinules on dorsomedial edge; all dorsal soft rays not branched (except in *S. rubrovinctus*); lower branched rays of caudal fin of males not prolonged; color in life not red overall; depth of capture 1–134 m . . . . . 3
- 3a. Body very elongate, the depth 7.6–10.7 in SL; occiput rugose; caudal fin of males extremely long, varying from 1.7 in SL to 1.4 times SL . . . . . 4
- 3b. Body not very elongate, the depth 4.55–7.35 in SL; occiput smooth; caudal fin of males not very long, 2.4–3.5 in SL . . . . . 5
- 4a. No branch of lateral line across top of caudal peduncle; preopercular spine with an upcurved tip and 3–5 forward-curved spinules on dorsomedial edge; pectoral rays 16–19; male without a filamentous dorsal spine; occiput moderately rugose, the result of numerous very small contiguous shallow depressions . . . . . *Callionymus caeruleonotatus*
- 4b. Two transverse branches of lateral line across top of caudal peduncle connecting lateral line of each side; preopercular spine with a straight tip and 6–13 straight spinules (at SL greater than 25 mm) on dorsomedial edge that angle forward about 45°; pectoral rays 18–21; first dorsal spine of male an elongate filament; occiput strongly rugose, the result of numerous nodular projections . . . . . *Callionymus decoratus*
- 5a. Snout short, about three-fourths orbit diameter; branched caudal rays 8; preopercular spine with 2 curved spinules on dorsomedial edge, in addition to upcurved tip; no antrorse spinule ventrally at base of preopercular spine; first dorsal spine of males filamentous and long, extending beyond rear base of second dorsal fin; body in life with four red bars, each ending on lower side in an irregular dark brown blotch . . . . . *Synchiropus rubrovinctus*
- 5b. Snout not short, equal to or greater than orbit diameter; branched caudal rays 7; preopercular spine with 3–6 curved spinules on dorsomedial edge (except smallest *C.*

- comptus* and *S. rosulentus* with 2); antrorse spine ventrally at base of preopercular spine present or absent; first dorsal spine of males not filamentous and not much longer than remaining spines; color not as in 5a ..... 6
- 6a. Dorsal soft rays 9; anal rays 8; no downward-directed spinule on ventral edge of preopercular spine; first dorsal fin of males about twice as high as second dorsal fin; color not as in 6b ..... 7
- 6b. Dorsal soft rays 8; anal rays 7; small downward-directed spinule usually present on ventral edge of preopercular spine (in addition to antrorse spine at base); first dorsal fin of males much shorter than second dorsal fin; body of male in life with narrow lateral yellow stripe edged in pale blue spots and overlaid by six orangish brown to orange red blotches..... *Callionymus comptus*, n. sp.
- 7a. Base of ventral edge of preopercular spine with a forward-directed spinule (may be concealed in soft tissue); a small slender cirrus usually present dorsoposteriorly on eye; males with blackish bars in first dorsal fin paralleling spines, and blackish spots in basal part of fin; males without two black spots on gill membranes ..... *Synchiropus corallinus*
- 7b. Base of ventral edge of preopercular spine without a forward-directed spinule; no small cirrus on eye; males with dusky yellow bars in spinous dorsal fin and dusky yellow spots basally in fin (faint in preservative); males with two small elliptical jet black spots on gill membranes above base of each pelvic fin..... *Synchiropus rosulentus*, n. sp.

*Callionymus caeruleonotatus* Gilbert

Figure 1

*Callionymus caeruleonotatus* Gilbert, 1905: 648, pl. 89 (type locality: east coast of Maui, Hawaiian Islands).

DESCRIPTION: Dorsal rays IV + 9 (one of 11 specimens with 8); anal rays 8 (one of 11 specimens with 9); dorsal and anal rays unbranched except last, branched to base; branched caudal rays 7; pectoral rays 17-19, the uppermost and lower two or three un-

branched; inner pelvic-fin ray attached by membrane to base of tenth to twelfth pectoral-fin rays; body elongate, the depth 7.7-10.5 in SL; body width 5.2-6.4 in SL; head depressed; head length (to gill opening) 3.7-4.3 in SL; head width 4.1-5.3 in SL; orbit diameter 2.6-2.85 in head length; snout length 2.5-2.8 in head length; interorbital space narrow, 9.8-12.5 in head length; preopercular spine 3.75-4.5 in head length, with an up-curved tip, 4-5 forward-curved spinules on dorsomedial edge, and an antrorse spinule at base on ventral edge; teeth in jaws in a villi-

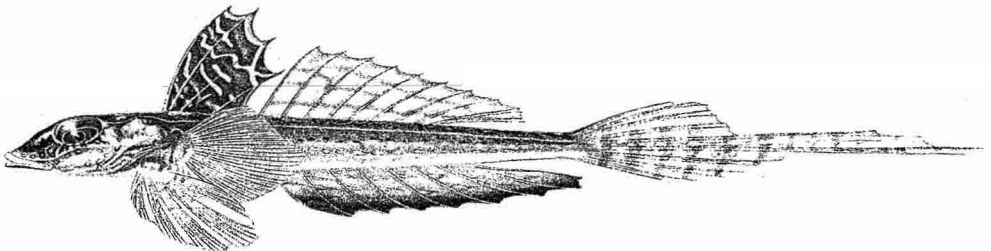


FIGURE 1. Holotype of *Callionymus caeruleonotatus*, USNM 51603, male, 49 mm SL, Maui (after Gilbert 1905).

form band except two incurved inner teeth about halfway back in lower jaw about twice as large as remaining teeth; lateral line of each side connected by a transverse branch across occiput, but none across upper part of caudal peduncle; occiput moderately rugose from numerous very small contiguous depressions on bony surface; first dorsal fin of male slightly higher than second dorsal fin, none of the spines filamentous; second dorsal spine usually longest but sometimes equal to first, 3.15–4.8 in SL in males, 6.0–6.25 in females; dorsal fins separated by a space narrower than that between adjacent dorsal soft rays; first dorsal soft ray usually longest, 4.5–5.45 in SL in males, 5.4–6.0 in SL in females; origin of anal fin below base of second dorsal soft ray; caudal fin of males very long as a result of a prolongation of the fourth and fifth branched rays, the fin length 1.2–1.7 in SL; caudal-fin length of females 3.4–3.6 in SL. Color in alcohol (from Gilbert, evidently soon after preservation): “dusky olive on top of head and dorsal half of body, finely vermiculated with narrow dusky lines inclosing very small spots of the ground color; lower half of sides of head and body, including branchiostegal membrane, the upper surface of ventral fins with the membranes connecting them to base of pectoral, and the lower half of caudal fin golden-yellow, marked with bright blue spots and lines, each blue mark with a wide dusky margin; on lower side of head and trunk the blue spots frequently coalesce to form lengthwise lines; belly and lower parts generally plain dusky; a quadrate black blotch under spinous dorsal, a narrow dark bar under last dorsal rays, sometimes one also under first dorsal rays, and one on back of tail, these dark bars all faintly marked; a blackish streak from eye around tip of snout; spinous dorsal dusky golden, crossed by zigzag blue lines, each narrowly edged with blackish; soft dorsal translucent dusky golden, with irregular blue lines and blotches, arranged for the most part longitudinally. Anal fin similar to second dorsal, the blue lines more oblique, the marginal third of fin black; darker markings on caudal fin arranged in the form of cross-bars.”

Of the females, Gilbert wrote, “the middle caudal rays are not produced, and no trace of the blue and golden coloration can be detected. The anal is translucent, with a narrow black edge, the median caudal rays are faintly barred, and the spinous dorsal is black with narrow oblique lighter lines.”

Largest specimen examined: CAS 108629, 53.9 mm SL.

REMARKS: Gilbert designated USNM 51603, 49 mm SL, as the holotype; it was taken by trawling from the R/V *Albatross* in the depth range of 89–322 m off the east coast of Maui. Paratypes were collected in two *Albatross* stations, 3857 and 3858, in Pailolo Channel between Maui and Moloka'i at depths of 233–252 m. Gilbert did not mention the number of additional specimens nor their place of deposition. In addition to the holotype, the U.S. National Museum of Natural History has three lots of *Callionymus caeruleonotatus* listed as paratypes: USNM 51668, three specimens, with no *Albatross* station number; USNM 160483, one specimen, from *Albatross* station 3847 (hence it could not be a paratype, because the station number was not given by Gilbert); and USNM 231820, one specimen, from the old University of Iowa collection without a station number (David G. Smith, pers. comm.). Böhlke (1953) listed four paratypes at Stanford University, SU 8629, now CAS 108629. Fricke (1983) wrote that only males are known, but he overlooked Gilbert's comments on the females, and one of the four specimens of CAS 108629 that he examined is a female, as well as the specimen of USNM 231820. Fricke reported two additional male specimens from Pailolo Channel off the east coast of Maui (he meant northwest coast), CAS 30161, taken by T. Iwamoto et al. in 1973.

The shallowest depth at which *C. caeruleonotatus* has been collected is 42–44 m (USNM 160483 from off the south coast of Moloka'i). Clarke (1972:Table 2) recorded submarine observations of this species from off O'ahu at depths of 250–325 m.

Proportional measurements in the description above are based on 11 specimens, 36.0–53.9 mm SL.

TABLE 1  
 PROPORTIONAL MEASUREMENTS OF TYPE SPECIMENS OF *Callionymus comptus* EXPRESSED AS PERCENTAGES  
 OF THE STANDARD LENGTH

SEX	HOLOTYPE		PARATYPES				
	BPBM	USNM	BPBM	NSMT-P	BPBM	USNM	BPBM
	37290	347771	37849	54410	37846	347771	37243
	MALE	FEMALE	FEMALE	MALE	MALE	MALE	MALE
Standard length (mm)	27.9	16.8	19.0	20.7	24.3	25.5	30.3
Body depth	13.3	15.5	15.7	15.0	14.4	14.3	13.4
Body width	17.3	20.2	19.5	19.3	17.7	18.8	16.3
Head length	26.4	29.5	28.9	28.2	26.7	27.4	25.4
Head width	20.1	22.4	21.0	22.6	19.8	20.4	22.8
Snout length	11.8	11.7	11.2	11.8	11.6	11.7	11.5
Orbit diameter	9.0	11.6	11.1	9.9	9.1	8.9	8.6
Interorbital width	1.8	2.0	2.1	1.7	2.0	1.9	1.8
Preopercular-spine length	7.8	9.6	9.8	9.7	8.3	7.9	7.8
Caudal-peduncle depth	7.7	8.3	7.9	8.2	7.6	7.3	6.9
Caudal-peduncle length	21.5	20.8	21.1	21.8	20.2	22.0	19.8
Predorsal length	29.4	33.9	32.9	32.9	30.2	30.8	29.5
Preanal length	50.0	53.9	53.5	52.6	50.0	49.6	50.3
Prepelvic length	25.6	27.9	26.9	28.1	27.1	25.5	26.4
Upper-jaw length	13.3	12.2	13.2	13.8	12.8	12.3	13.1
First dorsal spine	14.5	10.8	11.1	14.5	12.5	12.6	13.2
Longest dorsal spine	15.7	11.3	12.8	14.9	13.2	13.7	14.5
First dorsal ray	21.2	21.4	21.0	22.4	20.3	20.8	19.8
Last dorsal ray	21.4	16.1	16.3	20.0	21.3	19.8	20.6
First anal ray	11.1	13.1	broken	11.7	10.7	11.7	10.1
Last anal ray	24.0	19.4	21.3	23.2	24.1	23.5	23.3
Caudal-fin length	41.3	30.5	27.9	34.4	39.1	35.4	37.2
Pectoral-fin length	25.0	26.8	26.4	24.9	24.5	23.1	23.8
Pelvic-spine length	8.1	8.3	8.2	8.7	8.2	7.8	7.3
Pelvic-fin length	29.1	30.4	29.0	29.0	30.0	29.2	28.9

MATERIAL EXAMINED: CAS 108629, 4:37.8–53.9 mm (paratypes of *Callionymus caeruleonotatus*), Hawaiian Islands, Pailolo Channel off east coast of Moloka'i; CAS 30161, 2:37.8–42.8 mm, Pailolo Channel, 218 m; USNM 160483, 40.5 mm, off south coast of Moloka'i; USNM 231820, 36 mm and USNM 51668, 3:48.8–52.0 mm, Hawaiian Islands, presumed to be paratypes (station numbers and locality data lost).

*Callionymus comptus* Randall, n. sp.

Plate IA, B; Table 1

DIAGNOSIS: Dorsal rays IV + 8, only the last soft ray branched to base; anal rays 7; branched caudal rays 7; pectoral rays 16–18; body moderately elongate, the depth 6.35–7.5 in SL; head length 3.4–3.95 in SL; snout

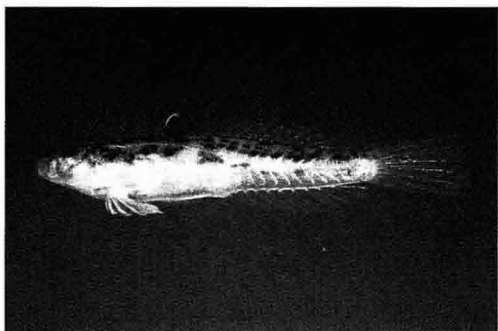
length 1.7–2.0 in head length, longer than orbit diameter; preopercular spine with an upcurved tip, 2–6 forward-curved spinules on dorsomedial edge, an antrorse spinule ventrally at base, and usually a very small slightly curved spinule ventrally near base; first dorsal fin a little over half height of second dorsal in females, about three-fourths height of second dorsal fin in males; caudal fin 2.4–3.6 in SL, about equal to head length in females, up to 1.5 times longer than head length in males. Body of males with a narrow lateral yellow stripe edged in pale blue spots and overlaid by six orangish brown to orange red blotches; cheek yellowish with a dusky orange red spot and irregular blue lines and spots; first dorsal fin yellowish anteriorly and blackish to black posteriorly. Females whitish with irregular brown blotches dor-



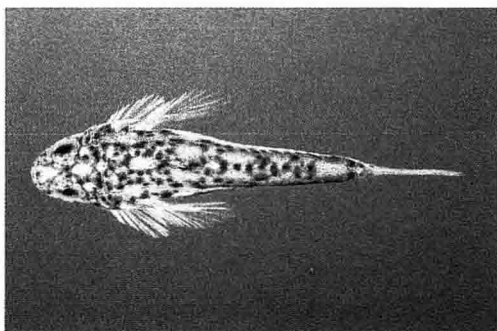
A. Paratype of *Callionymus comptus*,  
BPBM 37849, female, 19 mm SL, Oahu.



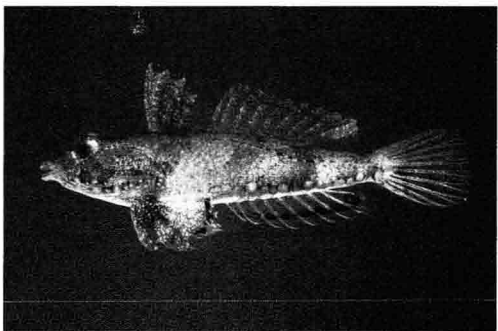
B. Holotype of *Callionymus comptus*,  
BPBM 37290, male, 27.9 mm SL, Oahu.



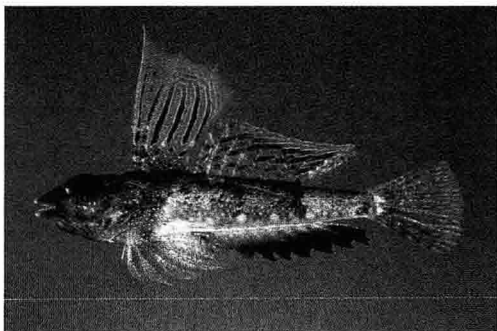
C. *Draculo pogognathus*, BPBM 27233,  
24 mm SL, Oahu.



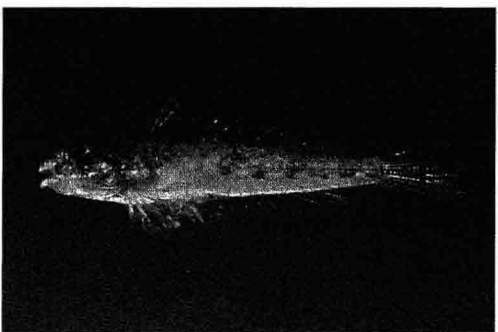
D. Dorsal view of *Draculo pogognathus*,  
BPBM 27233, 24 mm SL, Oahu.



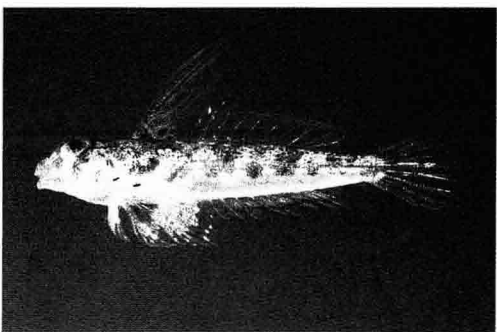
E. *Synchiropus corallinus*, BPBM 34538,  
female, 29.5 mm SL, Midway Atoll.



F. *Synchiropus corallinus*, BPBM 34538,  
male, 30 mm SL, Maui.



G. Paratype of *Synchiropus rosulentus*,  
BPBM 37855, female, 16.0 mm SL, Oahu.



H. Holotype of *Synchiropus rosulentus*,  
BPBM 37260, male, 21.5 mm SL, Oahu.

sally on head and body, and a midlateral row of six roundish brown spots; posterior two-thirds of first dorsal fin black.

**DESCRIPTION:** Dorsal rays IV + 8; anal rays 7; all dorsal and anal soft rays unbranched (except last, branched to base); pectoral rays 17 (16–18), the upper 4 or 5 and lower 5 of adults not branched; pelvic rays I,5; principal caudal rays 10, the uppermost and lower 2 unbranched; upper and lower procurvent caudal rays 2.

Body moderately elongate, the depth 7.5 (6.35–7.5) in SL; ventral part of head and abdomen flat; body wider than deep, the width 5.8 (4.9–6.15) in SL; head length 3.8 (3.4–3.95) in SL; head width 5.0 (4.4–5.05) in SL; occipital region nearly flat, without any bony protuberances, the surface slightly rugose from numerous very small contiguous depressions; snout length 1.7 (1.7–2.0) in head length; dorsal profile of snout slightly concave; eye moderately large, the orbit diameter 2.95 (2.55–3.1) in head length; inter-orbital space narrow, 14.7 (13.4–16.5) in head length; caudal peduncle slender, the least depth 3.4 (3.5–3.8) in head length; caudal-peduncle length 4.65 (4.55–5.05) in SL.

Preopercular spine 3.4 (2.9–3.5) in head length, with an upcurved tip and 4 (2–6) forward-curved spinules on dorsomedial edge, an antrorse spinule ventrally at base, and a very small forward-curved spinule ventrally near base (spinule usually present; absent or represented only by a small protuberance on two paratypes).

Mouth protrusible and inferior, the lower lip fitting inside upper when mouth fully closed; gape very slightly oblique; maxilla extending slightly posterior to a vertical at anterior edge of orbit, the upper-jaw length 2.0 (1.95–2.4) in head length; upper jaw with a band of incurved villiform teeth anteriorly, ending about halfway back in jaw in a series of three larger strongly recurved teeth (these teeth about twice as long as largest of villiform teeth); lower jaw with a band of incurved villiform teeth larger than those of upper jaw on anterior two-thirds of jaw, the inner row of posterior half of tooth band

with enlarged strongly recurved teeth about twice as long as those of outer row; palate edentate. Nostril behind first pore of supra-orbital canal, with a slight rim; lateralis system of head as illustrated by Nakabo (1991: fig. 3) for *Callionymus corallinus*, the pores conspicuous; lateral line slightly arched below first dorsal fin, the pores on very short branches; lateral line of each side connected by a branch across occiput, but none dorsally across caudal peduncle.

Gill opening directed upward in a small V-shaped aperture adjacent and posterior to transverse commissure of lateral line on occiput at level of upper third of eye, and covered from below by opercular membrane.

Origin of first dorsal fin above posterior tip of preopercular spine, the predorsal length 3.4 (2.95–3.4) in SL; dorsal spines slender, flexible, none filamentous, the first 6.95 (9.0–9.25 in females, 6.9–7.95 in males) in SL; second or third dorsal spines longest, 6.35 (7.8–8.85 in females, 6.7–7.65 in males) in SL; origin of second dorsal fin about a half orbit diameter posterior to first dorsal fin; first soft dorsal ray 4.75 (4.5–5.05) in SL; last dorsal soft ray 4.65 (4.7–6.2) in SL; origin of anal fin slightly posterior to a vertical at base of second dorsal soft ray; first anal ray 9.0 (7.65–9.9) in SL; last anal soft ray 4.15 (4.15–5.15) in SL; caudal fin rhomboid (rounded when fully spread), 2.4 (3.3–3.6 in females, 2.55–2.9 in males) in SL; pectoral fins pointed, the middle rays longest, 4.0 (3.7–4.3) in SL; pelvic fins joined by membrane to base of pectoral fins at level of eleventh or twelfth pectoral ray; fourth pelvic ray longest, reaching origin of anal fin, 3.45 (3.3–3.45) in SL.

Color of holotype when fresh: Body pale tan dorsally, with irregular orangish brown blotches along back, and finely spotted with orange brown flecks, shading to white ventrally; a midlateral narrow pale yellow stripe with dusky-edged pale blue spots along margins (some round, but most horizontally elliptical) and overlaid with six dusky orange red spots about three-fourths orbit diameter, the last spot containing a small dark reddish brown spot; side of head pale yellow with irregular pale blue lines, some interconnected,



and a vertically elongate orange red spot on cheek; a narrow orange red streak at lower edge of snout; first dorsal fin dusky yellow anteriorly with a whitish blotch at origin, becoming blackish posterior to third spine; three tiny pale blue spots on leading edge of fin, and a very narrow pale blue distal margin; second dorsal fin with translucent pale yellow membranes, the rays finely banded with orange brown and pale blue (the blue bands much narrower); anal fin translucent pale yellow with a narrow dusky band just below incised part of membranes, and below this an oblique pale blue streak on each membrane except the first; caudal fin with near-transparent membranes (the lower three with a row of dark-edged elliptical pale blue spots) and whitish rays except the sixth, which is pale blue with a series of small dusky orange red spots; pectoral fins with transparent membranes and whitish rays that become dusky distally; a small dark orange red spot at upper base of pectoral fin; pelvic fins with transparent membranes and whitish rays.

Color of holotype in alcohol: Tan with five irregular brown blotches dorsally on body, the first beneath first dorsal fin, the second just posterior to this fin but linked to first with dusky pigment; side of body with two longitudinal rows of small dusky spots (pale blue in life) and six faint large dusky spots, the last posteriorly on caudal peduncle containing a more darkly pigmented spot; irregular dusky lines on cheek (pale blue in life); a butterfly-shaped dusky blotch on occiput and nape as viewed from above; fins pale except for dusky posterior half of first dorsal fin and a small dusky spot at base of each soft ray; upper base of pectoral fin with a small dusky spot.

Color of female when fresh: Body whitish, finely mottled with brown dorsally, white ventrally, with large irregular brown blotches dorsally on head and body; a midlateral yellowish to white line with a series of six roundish brown blotches; a reddish brown line on side of snout extending to pupil, and an oblique black line on upper lip; a small brown spot on cheek and another at upper base of pectoral fin; fins pale except black

posterior two-thirds of first dorsal and some opaque white areas and a few small dark brown markings on pelvics.

REMARKS: This small species of dragonet is named *Callionymus comptus* from the Latin for ornamented or adorned, in reference to the many colorful markings of the male.

One specimen was collected from off Mākena, Maui, the rest from around O'ahu; all were taken on sand substrata near outer ocean reefs in clear water in the depth range of 3–27.5 m.

The species most similar to *C. comptus* is *C. marquesensis* Fricke (1989), described from nine specimens, 22.3–38 mm, from the Marquesas Islands. The two share the count of 8 dorsal soft rays and 7 anal soft rays, similar body shape and preopercular spine, and in having a midlateral row of dark spots (red on males of *C. comptus*, brown with black centers in *C. marquesensis*), joined above and below by two broken pale lines (blue in *C. comptus*, bluish white in *C. marquesensis*). *Callionymus comptus* is readily distinguished by its short first dorsal fin (slightly higher than second dorsal in female *C. marquesensis*, and much higher in the male). Also the male of *C. marquesensis* has a longer as well as an asymmetrical caudal fin, and it attains larger size (to 38 mm SL). *Callionymus comptus* is unusual in having a very small forward-curved spine on the ventral edge of the preopercular spine on at least one side (in addition to the larger, more anteriorly directed spinule at the base). Of the nine type specimens, two are lacking the small ventral spinule: BPBM 37612, 19.8 mm (one preopercular spine shot away by spear), and USNM 347771, 25.5 mm, with a small protuberance on one side where the spinule would be expected. Also the species is unusual because the male has the broad posterior part of the first dorsal fin blackish.

TYPE MATERIAL: Holotype: BPBM 37290, male, 27.9 mm, Hawaiian Islands, O'ahu, Kahe Point, sand patch in reef, 3 m, hand net, J. L. Earle, 2 July 1994. Paratypes: BPBM 37612, 19.8 mm, Hawaiian Islands, Maui, off Mākena, sand, 20 m, spear, J. E. Randall, 23 March 1989; BPBM 37243,

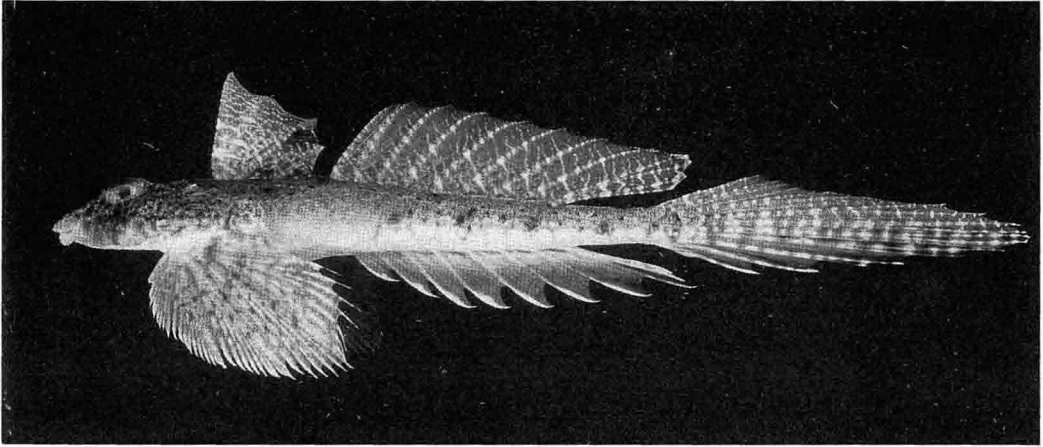


FIGURE 2. *Callionymus decoratus*, BPBM 28210, female, 149 mm SL, O'ahu.

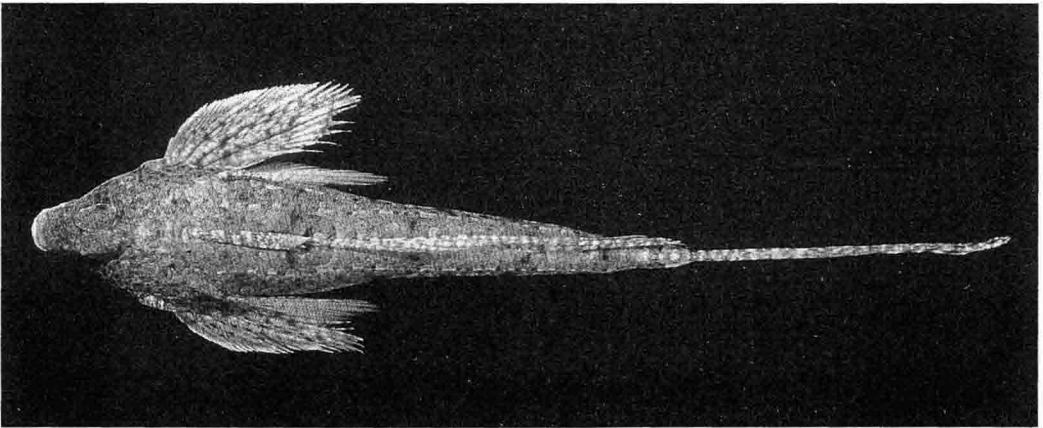


FIGURE 3. Top view of *Callionymus decoratus*, BPBM 28210, female, 149 mm SL, O'ahu.

30.3 mm, O'ahu, Mākaha, off Lahilahi Point, sand floor of large cave, 25 m, hand net, J. L. Earle, 5 May 1991; SMNS 19357, 24.2 mm, O'ahu, Ka'ena Point, sand, 11 m, hand net, R. R. Holcom, November 1995; USNM 347771, 2: 16.8–25.5 mm, O'ahu, Mākua, sand patch in reef, 10 m, caught in plastic bag, R. R. Holcom, 27 July 1996; NSMT-P 54410, 20.7 mm, same data as preceding; BPBM 37846, 2: 15.0–24.3 mm, O'ahu, north shore, off fire station at Pūpūkea, sand near reef, 23 m, hand net, R. R. Holcom, early June 1997; BPBM 37849, 19.0 mm, same loca-

tion as preceding, 10 m, plastic bag, R. R. Holcom, 23 August 1997.

*Callionymus decoratus* (Gilbert)  
Figures 2–5

*Calliurichthys decoratus* Gilbert, 1905: 651, pl. 90 (type locality: Penguin Bank, Hawaiian Islands).

DESCRIPTION: Dorsal rays IV + 9; anal rays 8; dorsal and anal rays unbranched except last, branched to base, and each of these

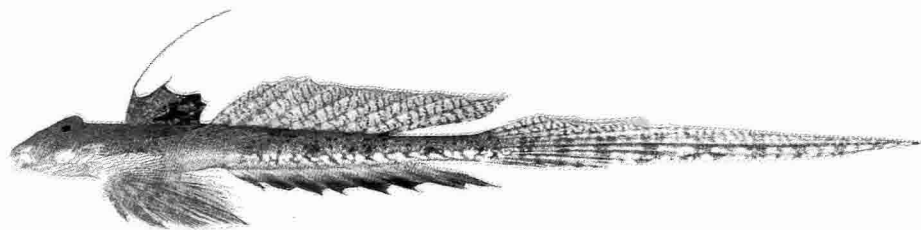


FIGURE 4. *Callionymus decoratus*, BPBM 21010, male, 208 mm SL, O'ahu.

branches bifurcate; branched caudal rays 7; pectoral rays 18–21, adults with the uppermost two and sometimes the lowermost unbranched; inner pelvic ray linked by membrane to pectoral-fin base at level of seventh to ninth pectoral ray; body elongate, the depth 7.6–10.7 in SL; body width 4.9–6.5 in SL; head length 3.35–4.2 in SL (head relatively shorter with growth); width of head 3.85–5.3 in SL; orbit diameter 2.55–4.15 in head length; snout length 1.95–2.5 in head length; interorbital space narrow, 13.3–20.8 in head length; preopercular spine 2.2–5.0 in head length, with a straight tip, 3–15 antrorse spinules on dorsomedial edge, and an antrorse spinule at base of ventral edge; a band of very small villiform teeth in jaws; lateral line of each side connected by a transverse branch across occiput and two across upper part of caudal peduncle; gill opening at level of lower third of eye; first dorsal spine of adult males a prolonged filament, 1.35–3.0 in SL; first dorsal spine of females not prolonged, its length 4.3–5.3 in SL; first and second dorsal fins separated by a gap about equal to half space between bases of adjacent dorsal soft rays; first dorsal soft ray 4.9–5.95 in SL; last dorsal ray longest in adults, 3.75–4.55 in SL; origin of anal fin below base of second dorsal soft ray; last anal soft ray longest, 4.3–6.25 in SL (relatively longer with growth); caudal fin of adults long and pointed in adults, the fourth and fifth branched rays longest; remaining rays gradually shorter laterally; caudal-fin length varies in males from 1.4 in SL in a 26.5-mm male to as much as 1.4 times the SL in large males; caudal-fin length of females 1.3–2.4 in SL.

Color in life of adult females: Dorsal half of body light brown, finely mottled with small whitish blotches and very small dark brown spots (many of which lie on lateral line), with a midlateral row of seven dark brown blotches about size of pupil; ventral half of body abruptly white with a faint reticulum of narrow light brown lines posterior to origin of anal fin; abdomen and ventral part of thorax white; head mottled brown, becoming white on lips and ventrally; first dorsal fin light yellowish brown with numerous irregular oblique dark-edged white lines of various widths, small dark brown spots, and a large black spot in outer part of third membrane; second dorsal fin translucent with numerous irregular oblique white lines and small yellowish brown spots on membranes, the rays with small white spots and smaller yellowish brown spots; anal fin whitish basally, blackish distally, the rays white; caudal fin similar to second dorsal, but with fewer white lines (and these only on dorsal half of fin); paired fins whitish, finely flecked with brown.

Small males are colored much like females, but large males lose the black spot in the first dorsal fin, adding instead large irregular dark brown spots on the posterior half of the fin; large males have a midventral dark brown to black band on throat (may bifurcate at front of pelvic girdle) and numerous oblique dark brown lines (with lighter brown centers) on gill membranes.

A 20-mm juvenile is shown in Figure 5. In life it was light brown dorsally with dark brown and whitish blotches of various sizes, and whitish ventrally.

Largest specimen examined: BPBM 21010,

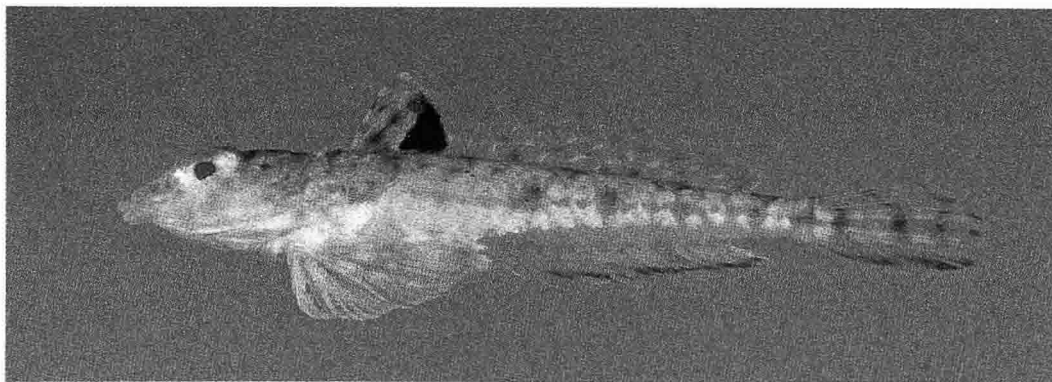


FIGURE 5. *Callionymus decoratus*, BPBM 19652, juvenile, 20 mm SL, O'ahu.

a male, 208 mm SL. The largest female is BPBM 26522, 171 mm SL.

REMARKS: The holotype of *Callionymus decoratus* (Gilbert), USNM 51609, is a male, 91 mm SL, 183 mm TL, taken by trawling in 49.5 m on the Penguin Bank (southwest of the western end of Moloka'i). Gilbert mentioned other specimens from Moloka'i, Pailolo Channel, and Penguin Bank collected in 49.5–95 m, but he did not state that these are paratypes. He added that a female specimen was obtained later from Laysan Island.

Fricke (1983) placed *Callionymus decoratus* in the subgenus *Calliurichthys* Jordan & Fowler. Nakabo (1982) treated *Calliurichthys* as a genus.

Proportional measurements given in the description above are based on 12 specimens, 20.9–208 mm SL. The 208-mm specimen (407 mm total length) was collected in a hand net by Arnold Y. Suzumoto at a depth of 2 m on sand in the lagoon of 'Aina Moana State Park (Magic Island).

This species is unusual in the broad depth range from which it has been collected, from less than 1 to 134 m, and in being found in lagoons and bays to well offshore. It is usually encountered on fine sand substrata not ordinarily disturbed by surge.

*Callionymus decoratus* is known only from the Hawaiian Islands. Within the archipelago

it is has been found from Moloka'i to French Frigate Shoals (the latter locality reported by Uchida and Uchiyama 1986). Judging from its representation in museums, it is the most common species of the family in the Islands. The Bishop Museum has 24 lots, as indicated below in Material Examined, and the fish collection of the University of Hawai'i contains 12 lots.

MATERIAL EXAMINED: BPBM 4898–99, 5: 113–166 mm, O'ahu; BPBM 10530, 25 mm and BPBM 25440, 52.5 mm, O'ahu, off Wai'anae; BPBM 11999, 2: 58–73 mm, BPBM 14649, 38 mm, BPBM 15400, 2: 42.5–48 mm, BPBM 19652, 2: 20–30 mm, and BPBM 30862, 29 mm, O'ahu, Kāne'ohe Bay; BPBM 15435, 105 mm, O'ahu, off Barbers Point [now Kaeloia]; BPBM 21010, 208 mm and BPBM 28210, 149 mm, O'ahu, Magic Island; BPBM 22886, 2: 82–96 mm, BPBM 23929, 2: 80–128 mm, BPBM 23959, 5: 71–111 mm, and BPBM 33451, 3: 65–92 mm, O'ahu, off Hale'iwa; BPBM 24404, 3: 65–122 mm and BPBM 24116, 4: 75–148 mm, O'ahu, off Ka'ena Point; BPBM 24131, 5: 79–106 mm, Moloka'i, off NW coast; BPBM 26552, 170 mm, French Frigate Shoals; BPBM 30211, 9: 10–16 mm SL, O'ahu, off Mākaha; BPBM 36780, 13: 13.5–53 mm, O'ahu, off Kahe Point; BPBM 37071, 72 mm and BPBM 37310, 21 mm, O'ahu, off Mākua.

*Draculo pogognathus* (Gosline)  
Plate IC,D

*Pogonymus pogognathus* Gosline, 1959: 72,  
fig. 4 (type locality: small cove west of  
Hanalei Bay, Kaua'i, Hawaiian Islands).

DESCRIPTION: Dorsal rays II–IV (usually III) + 7–10 (rarely 7 or 10), no soft rays branched except the last, branched to base; anal rays 9–10, all rays branched; branched caudal rays 6; pectoral rays 20–25, the uppermost and lower three or four unbranched; inner pelvic ray not joined by membrane to pectoral-fin base; body not elongate, the depth 5.3–6.9 in SL; body width 5.0–5.7 in SL; head length 3.0–3.4 in SL; width of head 3.8–5.0 in SL; orbit diameter 2.7–3.15 in head length; snout length 3.1–3.4 in head length; interorbital space 6.3–7.5 in head length; preopercular spine small, 5.85–6.75 in head length, with an upcurved tip, a single upward-directed spinule on dorsomedial edge, and no antrorse spinule at base of ventral edge; edge of lower lip with a fringe of 10–16 prominent papillae; mouth oblique, forming an angle of about 30° to horizontal axis of head and body; two rows of small incurved conical teeth anteriorly in jaws, narrowing to a single row of smaller teeth posteriorly; lateral line of each side connected by a transverse branch across occiput and one across upper part of caudal peduncle; gill opening directed backward at upper posterior end of opercle; spines of first dorsal fin weak and flexible, the first longest, 8.3–8.6 in SL in females, 6.7–7.7 in SL in males; first and second dorsal fins separated by a gap about equal to base of first dorsal fin; fourth or fifth dorsal soft ray usually longest, 7.0–7.8 in SL in females, about 6.4 in SL in males; origin of anal fin below base of second dorsal soft ray; fifth anal soft ray usually longest, 6.8–7.9 in SL in females, 6.6–6.7 in SL in males; caudal fin truncate, 3.15–3.55 in SL in females, 2.8–3.1 in males.

Color in life of 24-mm female: Upper half of head and body light greenish gray with scattered yellowish brown blotches averaging pupil in size, the lateral line white; ventral half of body white with a few small brownish

yellow blotches on posterior half of body and three on head below eye; first dorsal fin black except white first spine; remaining fins with whitish rays and transparent membranes. Males similar in color except for the first dorsal fin, which is pale, and a little blackish distally; the testes of males are blackish.

Largest specimen examined: BPBM 37235, 25.0 mm SL.

REMARKS: Gosline (1959) described this dragonet as a new genus and species, *Pogonymus pogognathus*. Fricke (1982) reclassified it in *Draculo* Snyder, and Nakabo (1982) in *Eleutherochir* Bleeker.

The holotype of *Draculo pogognathus* (USNM 175010, 25 mm SL) and five paratypes (USNM 175011, 11–22 mm SL) from Kaua'i are housed in the National Museum of Natural History, Washington, D.C.

This species is currently known only from the Hawaiian Islands. It lives in clean sand off beaches in 1–4 m, burying just under the surface of the sand with the eyes exposed. The fringed lower lip serves to keep sand out during respiration.

Females appear to attain slightly larger size than males. The three lots of Bishop Museum specimens include 18 females, 16.0–25.0 mm SL (12 more than 20 mm SL), and 3 males, 18.5–20.5 mm SL. Fricke (1983) reported three males, 18.8–22.1 mm SL, from USNM 232272.

Proportional measurements were made on eight specimens, 18.5–25 mm SL.

MATERIAL EXAMINED: BPBM 22480, 24.9 mm, Moloka'i, Pāpōhaku Beach; BPBM 37233, 3:18.5–24.0 mm and BPBM 37235, 18:16.0–25.0 mm, O'ahu, Mākua.

*Synchiropus corallinus* (Gilbert)  
Plate IE,F

*Callionymus corallinus* Gilbert, 1905: 649,  
fig. 251 (type locality: Avau ['Au'au]  
Channel between Maui and Lāna'i,  
Hawaiian Islands).

DESCRIPTION: Dorsal rays IV + 9; penultimate dorsal soft ray and anterior major branch of last dorsal soft ray of adults

branched (one Hawaiian specimen with seventh ray also branched); anal rays 8, only the last ray branched to base; branched caudal rays 7; pectoral rays 17–20, the upper two or three and lowermost unbranched; inner pelvic ray joined by membrane to base of fifth to seventh pectoral rays; body depth 4.55–5.9 in SL; body width about equal to body depth; head length 3.0–3.3 in SL; head width 3.85–4.6 in SL; orbit diameter 2.85–3.1 in head length; a slender cirrus dorsoposteriorly on eye; snout length 2.3–2.65 in head length; interorbital space narrow, the fleshy width 7.9–10.1 in head length; preopercular spine 3.9–4.5 in head length, with an up-curved tip, 3–5 slightly forward-curved spinules on dorsomedial edge, and an antrorse spinule at base of ventral edge; lateral line of each side connected by a transverse branch across occiput, but none across upper part of caudal peduncle; gill opening at level of lower half of eye; first dorsal fin of male slightly higher than second dorsal fin, none of the spines filamentous; some males with one or two tiny cirri anteriorly on first dorsal spine; second dorsal spine longest, 2.2–2.9 in SL in males, 3.75–5.0 in females; last spine of first dorsal fin nearly reaching base of first dorsal soft ray; first dorsal soft ray usually longest, 4.95–5.2 in SL; origin of anal fin below base of third dorsal soft ray; last anal soft ray longest, 4.8–5.5 in SL; caudal fin rounded, shorter than head, 3.25–3.5 in SL.

Color in life of females: Body light orangish gray to red dorsally and on side, with numerous faint small dark-edged pale spots and four large irregular dusky (darker red on red individuals) saddlelike blotches on back, the first beneath first dorsal fin, the second and third below second dorsal, and the fourth posteriorly on caudal peduncle; lower side with an irregular row of dark-edged white spots, some a little larger than pupil of eye; head mottled with brown or reddish brown and finely speckled with small whitish spots; ventral part of head and body white; first dorsal fin faintly dusky to light red with many small pale spots, the first interspinous membrane finely dotted with orange; second dorsal fin faintly dusky, especially near margin, with whitish dots concentrated on or

near rays and a few blackish dots; anal fin nearly transparent with a conspicuous blackish submarginal band; caudal fin with three dusky bars; pelvic fins broadly dusky to blackish at base with some small blackish blotches near margin between third and fifth rays.

Males similar in color on body and head except lower half of head and pectoral-fin base with distinct small bluish white to blue spots and oblique lines, and lower part of head with a large triangular diffuse blackish spot; first dorsal fin with five or six black to blackish bands that parallel spines in middle of fin, but curve and interconnect dorsally, where they become pale orange yellow with dark edges; lower part of fin dusky with small whitish flecks and black spots; some males finely dotted with orange on first interspinous membrane of dorsal fin; second dorsal fin with oblique dusky bands edged in pale blue; anal fin dusky with small dark-edged pale blue spots basally, shading to black on outer half.

REMARKS: Gilbert (1905) described *Callionymus corallinus* from a single specimen, 40 mm in total length, taken by trawl in 58–68 m in Avau [‘Au‘au] Channel between Maui and Lāna‘i. As mentioned above, Fowler (1928), Gosline and Brock (1960), and Tinker (1978) mistakenly placed this species in the synonymy of *C. decoratus* Gilbert.

Fricke (1983) recognized *C. corallinus* as a valid species; he based his description and illustration on one specimen, BPBM 22584, 28 mm SL, from Maui (listed by him as a male, but it is a ripe female). Nakabo (1991) redescribed *corallinus* from four Hawaiian and four Japanese specimens and reclassified it in his new genus *Paradiplogrammus*. In his 1982 key to genera, Nakabo separated *Paradiplogrammus* and another new genus, *Minisynchiropus*, by the former having 8 dorsal and 7 anal rays, in contrast to 9 and 8, respectively, for the latter. Because *corallinus* has 9 dorsal and 8 anal rays, it is presumed that he should have classified *corallinus* in *Minisynchiropus*.

Fricke (1983:14) separated the genera *Callionymus* and *Synchiropus* by four char-

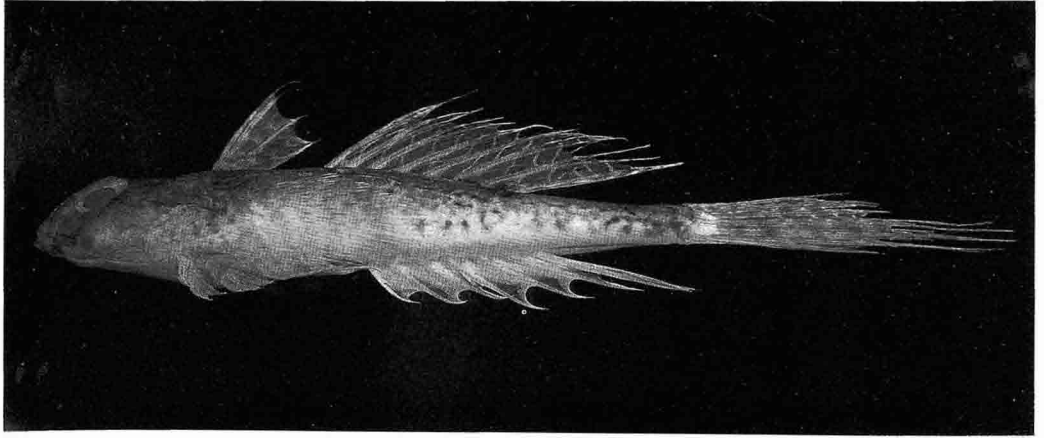


FIGURE 6. *Synchiropus kinmeiensis*, BPBM 23679, male, 124 mm SL, channel between Maui and Moloka'i.

acters in his key to Indo-Pacific species: *Callionymus* lacks branched soft dorsal rays except for the last, which is branched to base (soft dorsal rays branched in *Synchiropus* larger than 25 mm SL); gill opening dorsal in position (sublateral or lateral in *Synchiropus*, these positions not diagrammed or adequately defined); usually an antrorse spinule at base of preopercular spine (usually none in *Synchiropus*); and snout usually longer than eye diameter (usually shorter in *Synchiropus*).

Fricke and Brownell (1993) recorded *Callionymus corallinus* from New Caledonia and Miyake-jima, Japan (thus it might eventually prove to be an antitropical species). They noticed that large specimens have the fifth to ninth dorsal soft rays branched, adding that the species resembles *Synchiropus* in this character.

Four paratypes of *Synchiropus kiyoae* Fricke & Zaiser were shown by Nakabo (1991) to be specimens of *corallinus*. The two species are so similar in general configuration and coloration (note especially the color of the first dorsal fin of males in Plate I, *H* and *J*) that it seems unreasonable to classify them in different genera. *Callionymus corallinus* is therefore provisionally placed in the genus *Synchiropus*.

The counts and measurements recorded in the description above are based on nine Hawaiian specimens, 13.0–20.5 mm SL.

Within the Hawaiian Archipelago, this species is known from Midway Atoll (reported by Randall et al. 1993), O'ahu (most collections), Maui, and the Penguin Bank. The specimens were collected in the depth range of 11 to 122 m (the latter depth at Penguin Bank with rotenone from a submarine), all in clear offshore areas; they were usually taken on sand, but one specimen was from a dead coral substratum and another from a bottom dominated by algae.

MATERIAL EXAMINED: BPBM 10971, 16.8 mm, O'ahu, off 'Āina Haina; BPBM 22584, 28.0 mm, O'ahu, off Mākua; BPBM 28624, 13.0 mm, Penguin Bank off Moloka'i; BPBM 34538, 30.0 mm, Maui, off Kanaio; BPBM 34853, 29.5 mm, Midway Atoll, SE side of Sand Island; BPBM 36801, 11.5 mm and BPBM 36803, 2:23.2–24.6 mm, O'ahu, off Pūpūkea; BPBM 37067, 25.0 mm, O'ahu, off Mākua; BPBM 37122, 25.0 mm, O'ahu, off Ka'ena Point.

*Synchiropus kinmeiensis* (Nakabo,  
Yamamoto & Chen)  
Figure 6

*Synchiropus altivelis* (non Temminck &  
Schlegel), Fricke, 1981:55  
(Hawaiian Islands).

*Synchiropus (Synchiropus) altivelis* (non Temminck & Schlegel), Fricke, 1983: 576 (Hawaiian Islands).

*Foetorepus kinmeiensis* Nakabo, Yamamoto & Chen, 1983: 349, figs. 1, 2 (type locality: Kinmei Seamount, 35° 20.2' N, 171° 24.1' E).

DESCRIPTION: Dorsal rays IV + 8, all soft rays branched; anal rays 7; branched caudal rays 7; pectoral rays 19–21 (uppermost and lowermost unbranched); inner pelvic ray linked by membrane to base of tenth to twelfth pectoral rays; body not very elongate, the depth 5.95–6.8 in SL; body width 4.5–5.25 in SL; head length 3.3–3.55 in SL; width of head 4.15–4.7 in SL; orbit diameter 2.85–3.3 in head length; snout length 3.0–3.6 in head length; interorbital space narrow, 12.1–17.0 in head length; surface of occiput smooth, but a low distinct bony protuberance on each side behind eye; preopercular spine long, with a straight tip, a single forward-curving spinule on dorsomedial edge, and no antrorse spinule at base of ventral edge; mouth slightly oblique; a band of small villiform teeth in jaws, broad anteriorly and narrowing posteriorly; lateral line of each side connected by a transverse branch across occiput, but none dorsally on caudal peduncle; gill opening small, at level of upper third of eye; first dorsal spine longest, prolonged as a filament in females and small males (as much as one-third spine length filamentous), 3.2–5.2 in SL in females, and 3.9–5.35 in SL in males; first dorsal soft ray 3.35–4.6 in SL (longest ray in all but largest females); last dorsal soft ray 2.9–4.85 in SL (longest in males); origin of anal fin below or just posterior to a vertical at base of third dorsal soft ray; last anal soft ray longest, in females 4.6–5.4 in SL, notably longer in males, 3.0–4.0 in SL, caudal fin in females 2.7–2.9 in SL; lower four or five branched caudal rays prolonged and filamentous in males, the fin length 1.7–2.25 in SL.

Color in life (from Nakabo et al. 1983): Upper part of body red with three broad transverse deep red bands, the first around first dorsal fin, the middle one below second dorsal fin, and the third on caudal peduncle;

lower part of body white; first dorsal fin red with a large dark spot between third and fourth spines.

Specimens in alcohol retain the deep red transverse bands as irregular dusky bars that extend only faintly, if at all, below the lateral line; the dark ocellus on the last membrane of the first dorsal fin is about three-fourths orbit diameter, darker in females than males, and becoming faint or broken into small dark blotches in large males; anterior edge of first dorsal spine with six small blackish spots; margin of upper half of caudal fin of females blackish.

Largest specimen examined: BPBM 24216, a male, 131 mm SL.

REMARKS: Fricke (1981, 1983) included Hawaiian specimens in his treatment of *Synchiropus altivelis* (Temminck & Schlegel). Nakabo et al. (1983) noted that Fricke was mistaken in identifying Hawaiian specimens as this species. They described *Foetorepus kinmeiensis* from two specimens, the holotype from the Kinmei Seamount (also spelled Kimmei Seamount) in 350 m, and the paratype from the Kammu Seamount (32° N, 173° E), in 355–375 m; the latter is the southernmost of the Emperor Seamounts. Those authors regarded their two specimens as similar to the species from the Hawaiian Islands, differing “in having filamentous caudal fin rays in the male and no darker mark on the anal fin in the female” (they must have meant first dorsal fin instead of anal fin). The Hawaiian specimens, however, are *S. kinmeiensis*; the males have filamentous caudal rays, and the females have a better developed dark ocellus on the first dorsal fin than the males.

The male holotype of *S. kinmeiensis*, HUMZ 68699, 105.5 mm SL, was deposited in the Laboratory of Marine Zoology of Hokkaido University.

The Bishop Museum specimens of *Synchiropus kinmeiensis* were taken in trawls in channels between the main islands in the depth range of 220–318 m and at Hancock Seamount in 532 m.

*Synchiropus kinmeiensis* is unusual for a callionymid because the adult females have a



higher first dorsal fin than the adult males, and the first dorsal spine is more filamentous than that of the male.

Males of this species attain larger size than females. The 17 specimens of BPBM 23874, all taken in the same trawl haul, consist of 11 females, 82–110 mm SL, and six males, 97.5–121 mm SL. Only the smallest male was shorter than the largest of the females. The 40 specimens of BPBM 24237, also from a single trawl haul, consist of 22 females, 62.5–117 mm SL, and 18 males, 80–127 mm SL. Only eight of the females are larger than 100 mm SL, whereas only three of the males are less than 100 mm, and nine are longer than 117 mm SL.

The 130.3-mm female paratype of *S. kinmeiensis* illustrated by Nakabo et al. (1983: fig. 1) is unusual in its large size and by not having a distinct dark ocellus on the first dorsal fin. The dark ocellus of the first dorsal shown for the male in the same figure is the marking one would expect for the female.

Proportional measurements were made on 14 specimens, 79–123.5 mm SL.

**MATERIAL EXAMINED:** BPBM 23679, 12: 56–122 mm, Pailolo Channel (between Maui and Moloka'i); BPBM 23874, 17: 79–121 mm, Pailolo Channel; BPBM 24188, 2: 115–123.5 mm, Pailolo Channel; BPBM 24216, 56: 67–133 mm, Pailolo Channel; BPBM 24237, 40: 62.5–127 mm, Pailolo Channel; BPBM 38358, 99.5 mm, Kinmei Seamount (other BPBM lots on loan).

*Synchiropus rosulentus* Randall, n. sp.

Plate IG,H; Tables 2, 3

*Synchiropus rubrovinctus* (non Gilbert),

Gosline and Brock, 1960: 272 (Maui).

**DIAGNOSIS:** Dorsal rays IV + 9; anal rays 8; only the last dorsal and anal soft rays branched to base; branched caudal rays 7; pectoral rays 17–19 (usually 18); body depth 5.15–5.7 in SL; head length 3.5–3.65 in SL; snout length 2.5–2.75 in head length, about equal to orbit diameter; preopercular spine with an upcurved tip, 2–5 forward-curved spinules on dorsomedial edge, and no an-

trorse spinule ventrally at base; first dorsal fin of females shorter than second dorsal fin, of males about twice as high as second dorsal; caudal fin about equal to head length, 3.3–3.65 in SL. Males with five irregular brown blotches dorsally on body and a row of seven orange pink blotches along side linked dorsally by a midlateral narrow orange pink stripe; two small jet black spots above base of each pelvic fin; broken blue lines (brown in preservative) on head below eye, continuing onto gill membranes and pectoral-fin base where alternating with yellow; first dorsal fin with long dusky yellow to orange pink streaks on membranes; females similar but lacking the two small black spots and the blue and yellow striping of the lower head and pectoral-fin base; posterior two-thirds of the short first dorsal fin black.

**DESCRIPTION:** Dorsal rays IV + 9; anal rays 8; dorsal and anal soft rays unbranched, except last, branched to base; pectoral rays 19 (17–19), the upper 2 and lowermost not branched in holotype (more rays unbranched in smaller specimens); pelvic rays I,5; principal caudal rays 10, the uppermost and lower 2 unbranched; upper procurent caudal rays 3; lower procurent caudal rays 2.

Body depth 5.3 (5.15–5.7) in SL; ventral part of head and abdomen nearly flat; body wider than deep, the width 5.05 (4.55–5.3) in SL; head length 3.6 (3.5–3.65) in SL; head width 4.75 (4.3–4.65) in SL; occipital region slightly convex and smooth, without any bony protuberances; snout length 2.55 (2.5–2.8) in head length; dorsal profile of snout nearly straight; eye moderately large, the orbit diameter 2.75 (2.55–2.7) in head length; interorbital space concave and narrow, 12.1 (11.0–15.9) in head length; caudal peduncle slender, the least depth 3.0 (2.8–3.55) in head length; caudal-peduncle length 4.8 (4.8–5.3) in SL.

Preopercular spine 3.15 (2.8–3.3) in head length, with an upcurved tip and 4 (2–5) forward-curved spinules on dorsomedial edge, but without an antrorse spinule ventrally at base.

Mouth protrusible and inferior, the lower lip fitting inside upper when mouth fully

TABLE 2

PROPORTIONAL MEASUREMENTS OF TYPE SPECIMENS OF *Synchiropus rosulentus* EXPRESSED AS PERCENTAGES OF THE STANDARD LENGTH

SEX	PARATYPES						
	HOLOTYPE						
	BPBM 37260 MALE	BPBM 36806 MALE	BPBM 37849 FEMALE	BPBM 37123 FEMALE	BPBM 38399 FEMALE	BPBM 38397 MALE	USNM 348991 FEMALE
Standard length (mm)	21.5	14.8	16.0	17.8	18.8	19.4	20.0
Body depth	18.8	17.5	17.5	17.7	19.4	19.3	19.5
Body width	19.8	20.3	18.8	21.1	21.9	20.8	20.5
Head length	27.9	28.8	28.6	28.0	28.7	28.0	27.5
Head width	21.1	22.6	21.8	22.9	21.9	21.6	23.2
Snout length	10.2	11.4	10.5	10.8	10.2	10.6	10.0
Orbit diameter	9.9	11.2	10.9	10.3	10.6	10.8	10.7
Interorbital width	2.3	2.0	1.8	1.9	2.1	2.1	2.5
Preopercular-spine length	8.9	8.8	8.8	9.7	9.1	8.4	9.8
Caudal-peduncle depth	9.3	8.1	8.8	8.1	8.8	8.1	9.8
Caudal-peduncle length	20.9	19.6	18.8	20.8	18.9	20.5	19.4
Predorsal length	30.2	31.0	31.9	33.0	31.6	30.4	31.4
Preanal length	51.3	51.7	50.5	52.5	53.3	50.6	52.8
Prepelvic length	26.1	28.8	26.4	28.6	27.8	26.3	28.5
Upper-jaw length	9.6	11.1	10.6	10.2	9.6	10.3	10.0
First dorsal spine	44.0	46.5	17.8	17.2	16.9	53.6	17.5
Last dorsal spine	26.2	30.4	11.5	11.3	10.6	31.0	11.7
First dorsal ray	21.8	22.7	19.0	21.2	19.7	22.3	21.0
Last dorsal ray	20.0	18.9	16.6	16.0	17.0	20.4	18.5
First anal ray	12.6	17.8	13.4	12.0	11.7	16.5	13.5
Last anal ray	16.5	15.9	16.2	15.7	16.0	16.7	16.0
Caudal-fin length	28.0	30.7	27.5	28.6	28.7	29.6	30.0
Pectoral-fin length	28.2	28.8	27.4	28.3	27.1	27.8	27.7
Pelvic-spine length	10.4	11.1	10.9	11.1	10.9	10.2	10.5
Pelvic-fin length	37.1	35.8	37.5	38.5	37.2	36.0	36.0

closed; gape nearly horizontal; maxilla extending to below anterior edge of orbit, the upper-jaw length 2.9 (2.6–3.0) in head length; upper jaw with a band of slender, inward-projecting, conical teeth anteriorly, narrowing to 1 row posteriorly; lower jaw with a band of slender conical teeth larger than those of upper jaw in 3–4 rows anteriorly, narrowing to 1 row posteriorly, the anterior teeth projecting somewhat forward, the posterior teeth curved medially and posteriorly. Nostril with a slight rim, at level of upper edge of pupil about 2 nostril diameters from edge of orbit; lateralis system of head as illustrated by Nakabo (1983:fig. 21D) for *Synchiropus laddi*, the pores conspicuous; lateral line broadly arched over pectoral fin,

with a short branch angling toward upper base of pectoral fin; lateral line of each side connected by a branch across occiput, but none dorsally across caudal peduncle.

Gill opening directed upward in a small V-shaped aperture adjacent and posterior to transverse commissure of lateral line on occiput at level of middle of eye, and covered from below by opercular membrane.

Origin of first dorsal fin above posterior part of preopercular spine, the predorsal length 3.3 (3.0–3.3) in SL; dorsal spines slender, flexible, and none filamentous; first dorsal fin of males at least twice as high as second dorsal, the first spine longest, 2.3 (1.85–2.15) in SL; first dorsal fin of females shorter than second dorsal fin, the first spine barely

longest, 5.6–5.9 in SL; last membrane of first dorsal fin joined to base of first ray of second dorsal fin; first soft dorsal ray 4.6 (4.5–5.25) in SL; last dorsal soft ray 5.0 (4.9–6.25) in SL (longer in males than females); origin of anal fin below base of third dorsal soft ray; first anal ray 7.95 (5.6–8.55) in SL; last anal soft ray 6.05 (6.0–6.4) in SL; caudal fin rounded and symmetrical, about equal to head length, 3.6 (3.25–3.65) in SL; pectoral fins pointed, the middle rays longest, 3.55 (3.5–3.7) in SL; pelvic fins joined by membrane to base of pectoral fins at level of fourth to sixth pectoral ray; fourth pelvic ray longest, reaching to above base of third anal ray, 2.7 (2.6–2.8) in SL.

Color of holotype when fresh: Upper half of body white, densely mottled with very small orange pink spots; five irregular brown blotches on back as described above; some dark dashes along lateral line; a longitudinal series of seven orange pink blotches with dusky centers (blotches as large as or larger than pupil), linked along their dorsal edge with a narrow orange pink midlateral stripe; lower part of body whitish with two faint longitudinal yellowish lines, the upper joining the lower edges of the orange pink blotches; ventral part of head, gill membranes, and base of pelvic fins yellow with irregular pale blue lines; two small narrowly elliptical jet black spots above base of each pelvic fin, the more anterior spot on gill membranes below base of preopercular spine; first dorsal fin with five long streaks paralleling spines, the first two dusky orange pink and the last three dusky yellow; base of fin with blackish yellow spots; second dorsal fin with whitish rays and transparent membranes, oblique dusky yellow bands, and an indistinct whitish margin; anal fin translucent bluish white with whitish rays and a blackish submarginal band; caudal fin transparent with whitish rays and dusky pink spots on rays forming three faint bars, the two middle rays with some dashes of pink and white; paired fins transparent with whitish rays, those of the pelvics with some narrow broken pink streaks; pelvics with large diffuse white areas.

Color of holotype in alcohol: Pale yellowish with five irregular dusky blotches on

back, the largest below first dorsal fin and extending below lateral line, the next three below second dorsal fin (one at origin, one at rear base and one in middle), none extending below lateral line, and the fifth on caudal peduncle; a series of dark dashes on lateral line; a dusky blotch on midside below outer fourth of pectoral fin, another on lateral line at start of straight posterior portion; a longitudinal series of seven dusky blotches on lower side, the first two beneath pectoral fin and the last at base of caudal fin; two small, horizontally elliptical, jet black spots above base of each pelvic fin; side of head with broken oblique dusky lines continuing irregularly and more horizontally onto gill membranes with irregular horizontal dusky lines, some continuing onto pelvic rays and base of pectoral fin; posterior edge of occiput dusky; throat with a large triangular dusky area; first dorsal fin with dusky streaks paralleling spines and darker spots near base; second dorsal fin with faint oblique dusky bands; anal fin dusky, the outer triangular part of each membrane transparent; caudal fin with three dusky bars resulting from dark spots on and adjacent to rays; pectoral fins pale with a small dusky blotch at upper base; pelvic fins pale except for the dusky lines continuing onto rays and a dark spot on the fourth and one on the fifth ray.

Life color of a 17.5-mm female: Whitish, the upper half of body with tiny blackish dots and small brownish red spots (most round, some oblong, and some as short segments); a broken midlateral brownish red line that forms the upper end of a series of seven brownish red blotches with subtriangular pale centers, the first two blotches below pectoral fin, the last at base of caudal fin (partly overlaid posteriorly with a dusky bar at caudal-fin base); a brownish red blotch anterior to base of pectoral fins that resembles a Chinese character; first dorsal fin with brownish red dots and blackish dots, the latter in posterior half of fin (few dots of either color anteriorly at base of fin); caudal fin with three dusky bars in addition to one at base; pelvic fins with five small blackish spots on rays. In alcohol the occiput of this specimen is bright pink. The 18.8-mm female

paratype also has a largely pink occiput, as well as pink markings on the body and much of the iris.

**REMARKS:** This dragonet is named *Synchiropus rosulentus* from the Latin meaning full of roses, in reference to the series of pink roselike blotches along the side of the body. It is known only from the Hawaiian Islands and Johnston Island. The 20 specimens were collected from sand or sand and rubble substrata at depths of 5–24.5 m, usually within a few meters of coral reef or rocky substratum.

*Synchiropus rosulentus* is one of a complex of six very small allopatric species, the males of which have the first dorsal fin about twice as high as the second dorsal, with long dusky streaks and dark spots at the base; in addition with a distinctive pair of small black spots above the base of each pelvic fin. The others are *S. laddi* Schultz (1960) from the Marshall Islands (recorded also from the Tuamotu Archipelago, Palau, and the Philippines by Fricke 1981, 1983); *S. postulus* Smith (1963) from Natal and St. Brandon's Shoals; *S. minutulus* Fricke (1981) from the Maldives and Chagos Archipelago; *S. springeri* Fricke (1983) from Fiji; *S. kiyoeae* Fricke & Zaiser (1983) from the Izu Islands, Japan; and *S. randalli* Clark & Fricke (1985) from Easter Island (although it has only a single jet black spot above the base of the pelvic fin). Fricke (1992) included *S. claudiae* Fricke (1990) and *S. kuiteri* Fricke (1992) in this complex, although they appear to lack the pair of small black spots.

I first identified *S. rosulentus* as *S. kiyoeae*, which has the same general morphology and the same basic color pattern; however, *S. kiyoeae* is much more melanistic and lacks the pink markings (see color illustrations of *S. kiyoeae* in Fricke and Zaiser 1983:fig. 2; Masuda et al. 1984:pl. 308, figs. *E*, *F*; and Randall et al. 1997:pl. 16, fig. *A*), having instead black blotches along the side with one or two rows of pale blue to bright blue dashes between the black blotches. The first dorsal fin of *S. kiyoeae* may be as much as 4 times longer than the first dorsal soft ray, whereas the first dorsal fin of males of *S. rosulentus* is less than 2.5 times longer than the first dorsal

soft ray. Also *S. kiyoeae* attains larger size. The largest of the 20 specimens of *S. rosulentus* measures 21.5 mm SL. Of the 18 type specimens of *S. kiyoeae*, seven are larger than 21.5 mm. Three specimens of *S. kiyoeae* in the Bishop Museum collection from the Ogasawara Islands (BPBM 35156–57) measure 22–26 mm SL, and four of six specimens of *S. kiyoeae* (FAKU 61601-02-09, 63776, 63785) sent on loan by Tetsuji Nakabo of Kyoto University measure 22–27 mm SL.

The color of *S. laddi* in preservative is essentially the same as that of *S. rosulentus*. I took a black-and-white photo of a male specimen from Kwajalein Atoll, reproduced herein as Figure 7. Unfortunately the life color was not recorded, but the specimens were probably not very colorful; otherwise I would have taken a color photograph. As shown in Table 3, the modal count of pectoral rays is 17, in contrast to 18 for *S. rosulentus* and *S. kiyoeae*. From checking the measurements given by Schultz for *S. laddi*, it was noted that the pectoral-fin length is shorter in *S. laddi*. This was confirmed by measurements on two lots of *S. laddi* I collected in the Marshall Islands (BPBM 17744, 10:11–19 mm; BPBM 18444, 6:13–20 mm). The pectoral-fin length of *S. laddi* is 25.0–26.5% SL, compared with 27.7–28.8% for *S. rosulentus*.

Suspicion was aroused that *S. springeri* from Fiji might be the same as *S. rosulentus* when it was noted that one male reported by Fricke (1983) has a bright rose pink occipital region. No specimens of *S. springeri* have been examined; however, the count of 19–21 pectoral rays given by Fricke, and two of his measurements (preanal length 54.7–60.2% SL and caudal-fin length 26.05–26.5% SL), seem to indicate that *S. springeri* is specifically different.

**TYPE MATERIAL:** Holotype: BPBM 37260, 21.5 mm, Hawaiian Islands, O'ahu, off Sampan Channel to Kāne'ōhe Bay, spur and groove habitat, 12 m, rotenone, D. W. Greenfield, G. Cockrell, and J. Mahon, 30 August 1991. Paratypes: USNM 348991, 2:12.5–20 mm, Hawaiian Islands, Maui, Baldwin Packers' property (about 3 miles

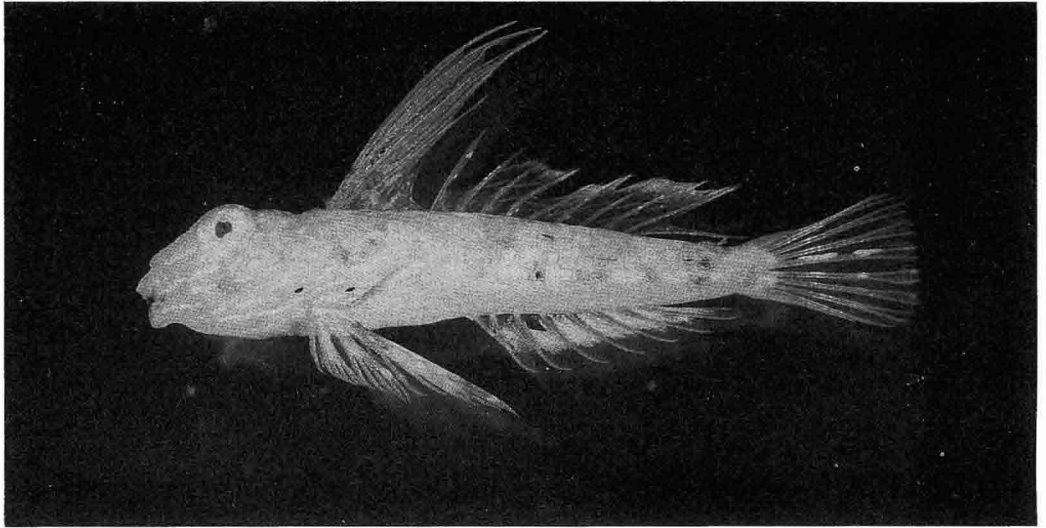


FIGURE 7. *Synchiropus laddi*, BPBM 18444, male, 19 mm SL, Kwajalein Atoll, Marshall Islands.

TABLE 3  
PECTORAL-RAY COUNTS OF THREE SPECIES OF *Synchiropus*

TAXON	16	17	18	19
<i>S. kiyooae</i>		4	5	1
<i>S. laddi</i>	4	7	2	1
<i>S. rosulentus</i>		2	14	4

[4.8 km] west of Lahaina), W. A. Gosline and E. Hunter, 5 August 1955; BPBM 34807, 13.1 mm, Northwestern Hawaiian Islands, Midway Atoll, south of Sand Island, outside reef, 13 m, J. L. Earle, 14 September 1991; BPBM 38397, 19.4 mm, O'ahu, off Portlock, rubble bottom, 10 m, caught with plastic bag, T. Yoshikawa, 21 March 1993; AMS I.38795-001, 2:10.8–14.8 mm, Hawaiian Islands, O'ahu, off Sampan Channel to Kāne'ohē Bay, spur and groove habitat, 13.5–15 m, rotenone, D. W. Greenfield and S. Cole, 8 July 1993; NSMT-P 55041, 2:10.5–16.4 mm and SMNS 20269, 2:10.4–17.3 mm, same data as preceding; BPBM 36806, 14.8 mm, O'ahu, north shore off Pūpūkea, 24.5 m, R. R. Holcom, May 1995; BPBM 37613, 4:10.8–18.5 mm, Johnston Atoll, Sand Island, off west end wharf, sand and

rubble, 4.5–7 m, P. S. Lobel, May 1995; BPBM 38398, 15.8 mm, O'ahu, off Kāne'ohē Bay, 21° 28' 41" N, 157° 47' 14" W, spur and groove habitat, 12 m, rotenone, K. R. Longenecker, 25 August 1995; BPBM 37123, 17.5 mm, O'ahu, off Hālonā Blowhole, R. R. Holcom, November 1995; BPBM 38399, 18.8 mm, same data as BPBM 38398 except 12 May 1996; BPBM 37855, 16.0 mm, O'ahu, Hālonā Blowhole, sand, 10 m, R. R. Holcom, 15 November 1997.

*Synchiropus rubrovinctus* Gilbert

Figure 8

*Synchiropus rubrovinctus* Gilbert, 1905:650, fig. 252 (type locality: channel between Maui and Lāna'i, Hawaiian Islands).

DESCRIPTION: Dorsal rays IV + 8–9, the dorsal soft rays branched; anal rays 7–8; branched caudal rays 8; pectoral rays 17–19 (uppermost and lower three rays unbranched in 19.5-mm paratype); inner pelvic ray linked by membrane to pectoral-fin base at level of ninth pectoral ray; body not elongate, the depth 4.95–5.7 in SL; body width about equal to body depth; head length 2.85–3.05 in SL; width of head 4.45–4.75 in SL; orbit

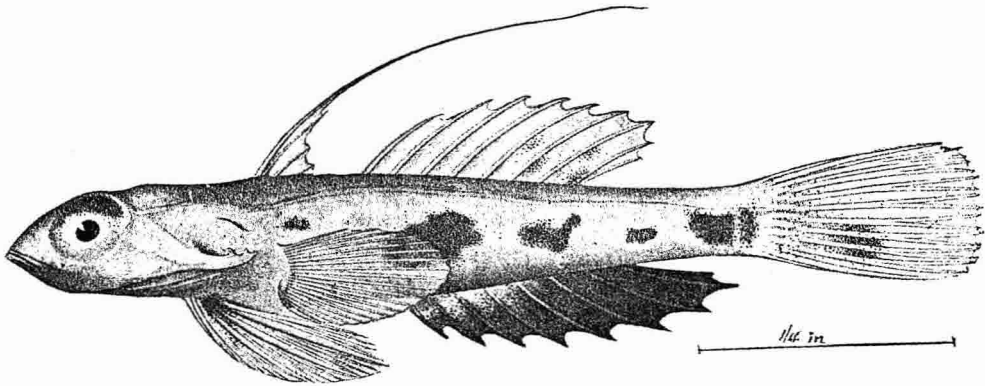


FIGURE 8. Holotype of *Synchiropus rubrovinctus*, USNM 51580, male, 24 mm TL, between Maui and Lānaʻi (after Gilbert 1905).

diameter 2.65–3.05 in head length; snout length 3.2–3.55 in head length; interorbital space narrow, 10.5–14.0 in head length; preopercular spine 2.5–3.0 in head length, with upcurved tip, 2 forward-curved spinules on dorsomedial edge, and no antrorse spinule at base of ventral edge; mouth oblique, forming an angle of about  $30^\circ$  to horizontal axis of head and body; a band of very small villiform teeth in jaws; lateral line of each side connected by a transverse branch across occiput, but none dorsally on caudal peduncle; gill opening at level of middle of eye; first dorsal spine of males a prolonged filament, reaching posterior to rear base of second dorsal fin, 1.7–1.75 in SL; first dorsal soft ray 4.75–4.85 in SL; origin of anal fin on a vertical between bases of second and third dorsal soft rays; last anal soft ray longest, about 5.3 in SL; caudal fin 3.25–3.45 in SL.

Color in life (after Gilbert): “Back with four bright red bars extending nearly to middle of sides, the first bar broad, occupying nape and base of spinous dorsal; the second broader, underlying anterior half of soft dorsal; the third less than half the width of the second, located under last dorsal rays; the fourth on caudal peduncle, again wider; lower half of sides marked with 4 irregular brownish black blotches, each forming a downward continuation of one of the red bars, the anterior blotch very small, the second the largest, the spaces between these blotches pearly white; a dark blotch in the

middle of the lower caudal rays, a smaller one near tips of rays, 2 very narrow blue bands near middle of fin; anal black throughout; a small black spot in axil of ventral fins; dorsals whitish, unmarked; upper surface of head, including upper half of eye but not snout, reddish; lower parts whitish.”

Paratypes in alcohol pale overall (no dark markings remain).

REMARKS: Gilbert (1905) described *Synchiropus rubrovinctus* from three specimens: the holotype, USNM 51580, a male, 24 mm TL, collected by trawl in 51.5–79 m in the channel between Maui and Lānaʻi; and two paratypes, also males, CAS 108567, 14.2–19.4 mm SL, taken at the same locality and depth.

The two paratypes of *S. rubrovinctus* were obtained on loan from the California Academy of Sciences. They are in poor condition, very flaccid, with the tissues cleared. They are the basis for the description above except for the notes of the life color. Measurement data from these specimens must be regarded as approximate.

Nakabo and Aizawa (1991: 69, figs. 1,2) reported a female specimen of this species (as *Neosynchiropus rubrovinctus*), 21.5 mm SL, from a tide pool at Izu Peninsula, Honshu, Japan. It had four bright red bars on the dorsal half of the head and body and two broad red bars in the caudal fin; the first dorsal spine was elongate and filamentous, twice the height of the second dorsal fin,

though not as long as that of the holotype of *S. rubrovinctus* (which they obtained on loan). They correctly concluded that the two specimens from Maui reported as *S. rubrovinctus* by Gosline and Brock (1960) could not be this species. Those specimens, BPBM 38303, 12–20 mm SL, as noted above, are *S. rosulentus*.

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