

Centropyge shepardi, a New Angelfish from the Mariana and Ogasawara Islands

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Abstract The pomacanthid fish *Centropyge shepardi* is described from specimens collected on reefs in the Mariana and Ogasawara (Bonin) Islands in the depth range of 10 to 56 m. It most closely resembles the wide-ranging Indo-Pacific *Centropyge bispinosus*, sharing with it similar color, morphometric, and meristic data. It differs in having modally 17 instead of 16 pectoral rays, a slightly instead of strongly rounded caudal fin, and more lightly pigmented median fins. In life it lacks the wash of blue over the head and median fins and a blue-edged orange-red spot at the pectoral base.

In 1968~1970 the senior author and associates made five collections of a colorful angelfish of the genus *Centropyge* in Guam which seemed to represent an undescribed species. It is encountered more often on Guam reefs at depths greater than about 15 m than any other species of the genus. It resembles *Centropyge bispinosus* (Günther), a well-known species which ranges throughout the tropical Indo-West-Pacific except a few isolated regions such as the Red Sea and Hawaiian Islands. Both are mainly orange on the body with narrow dark brown bars. Usually the bars are confined to the upper half of the body on the Guam fish. The most obvious differences are the lighter and less rounded caudal fin of the Guam fish and the lack of blue over the head and median fins which is characteristic in life of *C. bispinosus*.

No individuals of typical *C. bispinosus* had been collected or observed at that time in the Mariana Islands. Because *C. bispinosus* is generally common wherever it occurs, the possibility that the Guam fish represented a Marianas variant of *C. bispinosus* had to be admitted. A decision was made to defer the description of the Guam specimens until it could be demonstrated that the two forms are sympatric.

The junior author obtained two specimens like the Guam fish from the Ogasawara (Bonin) Islands in 1975. The occurrence in the Ogasawara group is not unexpected since

these islands are essentially a northern extension of the Mariana chain.

We contacted John W. Shepard of the Marine Laboratory of the University of Guam to be on the alert for typical *C. bispinosus* while diving on Guam reefs. With the assistance of Jack T. Moyer and John Eads he collected two specimens of *C. bispinosus* in 30 and 45 m. They noted that the species is rare at Guam and evidently confined to relatively deep reefs.

Specimens of the new *Centropyge* have been deposited at the following institutions: Academy of Natural Sciences of Philadelphia (ANSP); Australian Museum, Sydney (AMS); Bernice P. Bishop Museum, Honolulu (BPBM); British Museum (Natural History), London (BM(NH)); California Academy of Sciences, San Francisco (CAS); Museum of the Tokyo University of Fisheries (MTUF); Tatsuo Tanaka Memorial Biological Station, Miyakejima (TMBS); U.S. National Museum of Natural History, Washington, D.C. (USNM); and the University of Guam (UG).

We follow Randall and Wass (1974) in the methods of counts and measurements. More measurements are given in Table 1 than are summarized in the text. Data in parentheses in the description apply to paratypes.

With the description of *C. shepardi* below, we raise to 28 the number of species known in the genus *Centropyge*.

Centropyge shepardi, sp. nov.

(New Japanese name: Daidai-yakko)

(Figs. 1~3)

Holotype: BPBM 8450, 56.0 mm SL, male, Mariana Islands, Guam, Cocos Island, NW side, base of fringing reef in 22~30 m, rotenone, J. E. Randall, R. S. Jones, H. T. Kami, A. J. Stark, and G. E. Fosse, 30 June 1968.

Paratypes: BPBM 8464, 48.2 mm SL, same locality as holotype, 29~37 m, rotenone, J. E. Randall, P. Helfrich, R. S. Jones, and H. T. Kami, 28 May 1968; BPBM 8529, 2, 55.7~55.9 mm SL, Mariana Islands, Guam, west side at Lover's Leap (south of NCO Beach), 37.5 m, spear, J. E. Randall, 23 June 1968; BPBM 6371, 54.2 mm SL, same locality as

holotype, 22~40 m, rotenone, J. E. Randall and H. T. Kami 25 June 1968; BM(NH) 1978. 11.6.1, 34.1 mm SL, CAS 41742, 41.7 mm SL, USNM 218883, 54.2 mm SL, all with same data as preceding; BPBM 22397, 5, 21.9~61.4 mm SL, ANSP 139658, 53.0 mm SL, AMS I.20530-001, 45.5 mm SL, all with same data as holotype; BPBM 9388, 2, 45.8~49.0 mm SL, Mariana Islands, Guam, Cocos Island, southern end, gorgonian-lined crevice in reef in 52~56.5 m, rotenone, J. E. Randall, A. R. Emery, R. S. Jones, H. T. Kami, A. J. Stark, and R. Struck, 7 April 1970; MTUF 23923-4, 2, 52.2~56.0 mm SL, Ogasawara Islands, Chichijima, Miyanohama Beach, stranded by storm, S. Yoneyama, 6 November 1975; UG 5386, 3, 43.0~56.0 mm SL,

Table 1. Proportional measurements of type specimens of *Centropyge shepardi* expressed as a percentage of the standard length.

	Holotype BPBM 8450	Paratypes							
		BPBM 22397	BPBM 22397	BPBM 8464	MTUF 23923	BPBM 6371	BPBM 8529	BPBM 22397	TMBS 780323-2
Standard length (mm)	56.0	21.9	45.6	48.2	52.2	54.2	55.9	61.4	68.8
Depth of body	53.6	52.5	50.9	51.5	50.2	50.6	55.5	54.9	54.1
Width of body	19.6	18.3	18.0	18.9	19.3	20.3	18.8	19.4	19.6
Head length	29.1	35.4	31.1	30.6	29.7	29.3	29.5	28.5	29.2
Snout length	9.1	10.7	10.9	10.8	10.2	9.6	9.1	9.0	9.3
Orbit diameter	10.5	14.6	11.2	10.4	10.5	10.7	10.3	10.0	9.4
Bony interorbital width	8.9	8.9	8.7	8.4	9.2	8.9	8.9	9.1	8.9
Preopercular spine	11.4	8.4	8.6	10.0	10.9	10.7	11.6	13.5	11.6
Least depth of caudal peduncle	13.2	13.7	12.7	12.8	13.0	13.4	12.9	13.4	13.0
Length of caudal peduncle	12.5	13.2	12.2	11.6	12.3	12.7	11.8	12.1	11.5
Snout to dorsal origin	35.9	41.8	38.4	38.5	38.4	36.2	37.9	35.5	35.6
Snout to pectoral insertion	29.3	33.8	30.5	29.0	28.7	27.6	28.8	28.2	27.3
Snout to pelvic insertion	36.1	42.2	37.3	35.2	38.3	35.2	37.4	35.7	34.9
Snout to anal origin	64.3	67.6	63.6	62.7	63.2	61.8	64.6	61.8	64.7
Dorsal fin base	69.6	63.5	67.1	66.4	69.3	68.4	70.1	71.8	71.1
First dorsal spine	7.3	9.4	7.9	7.3	7.7	7.9	7.0	7.5	6.7
Second dorsal spine	9.8	17.8	11.2	12.8	12.3	12.9	broken	11.6	11.5
Third dorsal spine	12.5	19.6	14.3	14.1	15.3	14.6	12.2	15.5	14.5
Last dorsal spine	20.4	24.6	21.3	22.2	21.1	20.3	21.5	22.1	20.3
Longest dorsal ray	23.4	22.6	21.9	23.9	22.2	21.6	22.4	23.6	23.1
Anal fin base	36.6	36.1	36.0	36.9	37.9	37.3	37.0	38.6	38.1
First anal spine	11.1	13.2	12.4	11.6	broken	12.2	12.0	11.9	11.9
Second anal spine	17.0	18.3	19.5	19.1	17.1	18.5	18.8	18.4	16.9
Third anal spine	22.1	20.6	22.6	23.4	23.0	22.7	22.9	24.3	23.5
Longest anal ray	24.5	26.0	26.1	26.3	24.9	broken	25.0	27.7	26.0
Caudal fin	26.8	30.6	27.6	27.6	27.4	25.6	27.5	28.8	27.0
Pectoral fin	27.3	30.8	28.4	27.4	28.7	26.2	28.1	28.2	26.9
Pelvic spine	18.2	21.5	19.3	19.2	18.0	18.5	19.7	18.4	18.3
Pelvic fin	32.2	34.2	34.2	33.8	32.6	31.7	34.0	33.4	32.1

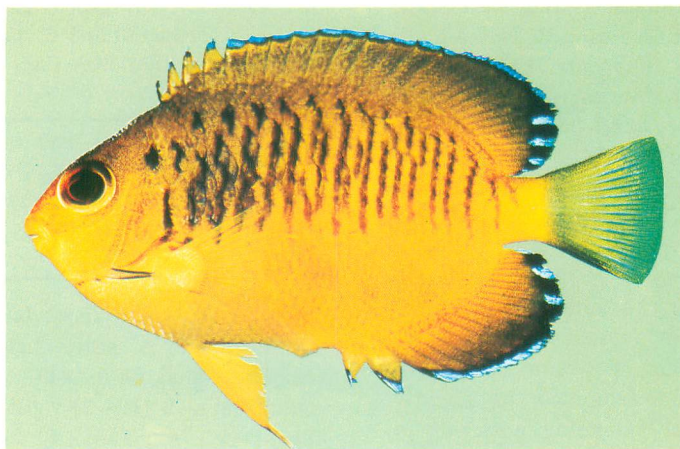


Fig. 1. Holotype of *Centropyge shepardi*, BPBM 8450, 56.0 mm SL, male, collected from Guam, Mariana Islands.



Fig. 2. Underwater photograph of *C. shepardi*, about 80.0 mm TL, taken at a depth of 20 m by J. E. Randall at Guam, Mariana Islands.



Fig. 3. Underwater photograph of *C. shepardi*, about 30.0 mm TL, taken at a depth of about 15 m by J. E. Randall at Guam, Mariana Islands.

Mariana Islands, Anahatan Island, west coast, spear, R. S. Jones, H. T. Kami, R. H. Randall, and R. Struck, 14 February 1971; TMBS 780323-2, 68.8 mm SL, Mariana Islands, Guam, off Tanguisson, 45 m, hand net, J. T. Moyer and J. Eads, 23 March 1978.

Diagnosis. Dorsal fin rays XIV, 16~18; anal fin rays III, 17~18; pectoral fin rays 16~17 (usually 17); gill rakers 7~8+17~19; depth of body 1.8~2.0 in SL; caudal fin slightly rounded; first 4 interspinous membranes of dorsal fin incised one-fourth or more length of spines; posterior margin of dorsal and anal fins rounded to slightly pointed, the rays not extending posterior to mid-length of caudal fin; cirrus at upper end of each spinous membrane of dorsal fin small, not extending above spine tips; no notably enlarged spines on preorbital (4~8 small to moderate spines present); head and body orange, dusky dorsally, the upper-half of body with narrow dark brown bars (bars slightly irregular, sometimes broken); caudal fin yellowish the upper and lower margins dark brown basally; dorsal and anal fins dusky orange, darker distally, the margins blue; paired fins orange-yellow.

Description. Dorsal fin rays XIV, 18 (16~18, usually 17); anal fin rays III, 18 (17~18, usually 17); pectoral fin rays 17 (16~17, usually 17; see Table 2), the upper 1 or 2 and the lower 1 or 2 unbranched; pelvic rays I, 5; principal caudal rays 17 (uppermost and lowermost unbranched); pored lateral-line scales (upper series) 35 (34~38); scale rows from upper end of gill opening to mid-caudal base

Table 2. Pectoral fin-ray counts made on both sides of specimens of *Centropyge bispinosus* and *C. shepardi*.

Species	15	16	17	18
<i>C. bispinosus</i> ¹	5	47	12	
<i>C. shepardi</i> ²		9	59	1

¹ Bishop Museum specimens from the Society Islands, Marshall Islands, Fiji Islands, Palau Islands, Philippine Islands, and the Great Barrier Reef.

² Includes counts of 16 specimens of the collection of the University of Guam made by John W. Shepard.

Table 3. Gill-raker counts of *Centropyge bispinosus* and *C. shepardi*. Counts for the lower limb include a raker at the angle.

Species	Upper limb			Lower limb			
	6	7	8	16	17	18	19
<i>C. bispinosus</i>	3	18	1	2	11	8	1
<i>C. shepardi</i>		7	13		2	12	6

46 (45~47); scales above lateral line to origin of dorsal fin 6; scales below lateral line to origin of anal fin 19 (17~20); circumpeduncular scales 21 (19~21); gill rakers 8+17 (7~8+17~19) (see Table 3); branchiostegal rays 6; vertebrae 10+14.

Body moderately deep, the depth 1.9 (1.8~2.0) in standard length, and compressed, the width 2.7 (2.5~2.9) in depth; head length 3.4 (2.8~3.5) in standard length; dorsal profile of head forming an angle of about 43 degrees to the horizontal; snout 3.2 (2.8~3.5) in head; orbit diameter 2.8 (2.4~3.1) in head; interorbital space slightly convex, the bony width 3.3 (3.1~4.0) in head; caudal peduncle deeper than long, the least depth 2.2 (2.1~2.6) in head.

Mouth small, the upper jaw slightly protruding, the gape horizontal; maxilla reaching to or slightly beyond a vertical at posterior nostril. Upper lip slightly broader than lower, its height about one-third orbit diameter of adults. Teeth slender, elongate, close-set, flexible in jaws, tricuspid (central cusp notably longer than the laterals), in 3 rows at front of jaws (teeth of inner rows much smaller), about 60 teeth in outer row of each jaw of holotype; no teeth on roof of mouth, but numerous papillae present. Tongue short and broadly rounded, the upper surface papillate.

Nostrils anterior to center of eye, the posterior separated from edge of orbit by a distance about equal to average posterior nostril diameter, the two nostrils separated by a gap about equal to diameter of anterior nostril; posterior nostril about twice as large as anterior, the opening elliptical to egg-shaped; anterior nostril with a membranous rim which is elevated into a flap dorso-posteriorly. Gill membranes narrowly attached to isthmus.

Longest gill filaments on first arch about half orbit diameter. Longest gill raker about 4.2 in orbit diameter.

A large horizontally-directed spine at corner of preopercle varying in length from specimen to specimen, but often longer than orbit diameter; a single spine on lower margin of preopercle, its length approximately one-third that of spine at corner; 21 (13~28) small spines on upper margin of preopercle; margin of interopercle with 3 (1~4) spines; margin of subopercle with 9 (2~9) small spines; ventro-posterior margin of preorbital with 5 (4~8) spines, none very enlarged; lower margin of preorbital free for about half distance from lowermost point to eye.

Scales coarsely ctenoid (up to 31 ctenii on margins of scales of holotype), the exposed part strongly ridged; body and head completely scaled except for lips; dorsal and anal fins scaled nearly to margins except outer part of spinous portion; caudal fin scaled on basal two-thirds; pectoral fins scaled on about basal fifth; pelvic fins with narrow band of scales extending out on rays but not membranes except edge of first membrane.

Lateral line steeply ascending from upper end of gill opening, gradually approaching the dorsal contour of body, and ending beneath rear base of dorsal fin; a few pored scales mid-laterally on caudal peduncle.

Caudal fin slightly rounded, its length 3.7 (3.3~3.9) in standard length. Origin of dorsal fin above upper end of gill opening. Dorsal spines progressively longer, the last 4.9 (4.1~4.9) in standard length; longest dorsal soft ray (sixth to eighth) 4.3 (4.2~4.6) in standard length; first 4 interspinous membranes of dorsal fin incised one-fourth or more length of spines; a small cirrus projecting from membrane just posterior to tips of dorsal spines, these cirri not extending above the spine tips; posterior margin of dorsal and anal fins rounded to slightly angular, the longest rays not reaching posterior to mid-caudal length; origin of anal fin beneath base of tenth dorsal spine; third anal spine 4.5 (4.1~4.9) in standard length; longest anal soft ray (fifth to seventh) 4.1 (3.6~4.0) in standard length; pectoral fins slightly pointed, the fourth ray usually longest, reaching a

vertical a short distance posterior to anus; origin of pelvic fins below lower base of pectoral fins; filamentous first soft ray of pelvic fins longest, reaching posterior to origin of anal fin (in some specimens to base of third anal spine).

Color in alcohol light brown, a little darker dorsally on head and anterior upper part of body, with near-vertical narrow dark brown bars on body which tend to follow every other scale row, these bars beginning on or slightly below lateral line and extending to or slightly below mid-lateral line of body (bars broader anteriorly; some, particularly posteriorly, may be broken and there may be short segments between the longer bars); a series of dark brown spots along or just above lateral line beginning with the most prominent one above upper end of gill opening, these spots sometimes linked to dark bars, especially posteriorly; upper part of opercular membrane and membrane of long preopercular spine dusky; dorsal and anal fins brown, darkest distally on soft portions, with a blackish margin; caudal fin pale except for a basal dusky bar which continues broadly on upper and lower edges about two-thirds length of fin; paired fins pale. Juveniles with a large dark brown spot distally on the longest dorsal soft rays and adjacent membranes (hence on most posterior part of dorsal fin).

In life the ground color is brownish orange dorsally on the head and body shading to orange-yellow on side of head, thorax and pectoral base and to orange elsewhere on body except posteriorly where the color grades into yellow; dorsal fin brownish orange, becoming dark brown over much of soft portion of fin, with a bright blue margin (except posteriorly) and black submarginal line; anal fin similar to dorsal, but with more orange basally, and 2 to 4 somewhat quadrangular bright blue spots in outer posterior part of fin; on males, such as the holotype, similar blue spots appear distally in the posterior part of the dorsal fin, and blackish pigment develops between the blue spots on both fins; caudal fin with yellow rays and hyaline membranes, the base and upper and lower edges broadly dusky, this pigment disappearing on distal third of fin; paired fins orange-yellow.

Remarks. This species is named for John W. Shepard who not only collected *C. bispinosus* in Guam, thus showing it co-exists with *C. shepardi*, but called our attention to the difference in pectoral ray counts of the two species.

These two fishes have essentially the same fin-ray counts except for the number of pectoral rays being one higher on the average for *C. shepardi* (Table 2). The number of lateral-line pores is the same for both, but there is a slight difference in the gill-raker counts (Table 3). The most significant morphological difference is the shape of the caudal fin. It is slightly rounded in *C. shepardi* but strongly rounded in *C. bispinosus*. Also the caudal is longer on *C. bispinosus*; the length of this fin (expressed as a percentage of the standard length) in 12 specimens from 40 to 75 mm SL varies from 27.0 to 30.7 (mean 28.7). The length of the caudal fin of 10 type specimens of *C. shepardi* (48 to 69 mm SL) ranges from 25.6 to 28.8 (mean 27.0).

Although there is some basic similarity in color pattern, both species having an orange ground color with narrow vertical dark brown bars, there are some noteworthy differences. The dark bars on all the specimens of *C. shepardi* except one (BPBM 22397, 61.4 mm SL) are restricted to the upper half of the body or extend only slightly below the mid-lateral point. By contrast, the bars of *C. bispinosus* run all the way ventrally or nearly so. The caudal fin of *C. shepardi* is pale to slightly dusky except for a dusky zone at the base and along the proximal part of the lobes. The caudal fin of *C. bispinosus* is dark brown. Though the dorsal and anal fins of *C. shepardi* tend to be dark brown, especially distally, they are much darker on *C. bispinosus*. In life the median fins and head of *C. bispinosus* are usually suffused with deep blue; this color is lacking on *C. shepardi*. There is an orange-red spot (brown on preserved specimens) at the pectoral base of *C. bispinosus* which is broadly surrounded by blue; this spot is not present on *C. shepardi*.

Centropyge shepardi is presently known only from the Mariana and Ogasawara Islands.

Possibly it will prove to be endemic to this sector of Oceania. We have observed this species from the depth range of 10 to 56 m. No deeper observations were made, thus the maximum depth of occurrence remains unknown.

Centropyge shepardi was observed at Guam to graze on benthic algae. Examination of stomach and intestinal contents revealed considerable detritus, including fine sand, as well as algae. The gut of this species is very long, as would be expected for a herbivore; the alimentary tract of the holotype is 6.5 times longer than the standard length.

Moyer and Nakazono (1978) have shown that the Japanese angelfish *Centropyge interruptus* (Tanaka) is a protogynous hermaphrodite, the males maintaining a harem within a defended territory. The males exhibit a different color pattern from the females, the most notable feature being streaks of bright blue posteriorly on the dorsal and anal fins. There is evidence that *C. shepardi* is also protogynously hermaphroditic, as the smaller individuals of the type series are females and the larger ones, in general, males. Furthermore, males have short segments of bright blue posteriorly on the dorsal and anal fins. Underwater observations by the senior author, Shepard, and Moyer in Guam suggest that this species is also territorial and that males appear to have harems.

Literature cited

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マリアナ諸島及び小笠原より採集されたキンチャクダイ類の1新種

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マリアナ諸島及び小笠原産の標本にもとづいて、キ

Randall and Yasuda : A New Angelfish

ンチャクダイ類の新種ダイダイヤッコ *Centropyge shepardi* を記載した。

本種は、主にインド・西太平洋熱帯域に広く分布する近似種の *Centropyge bispinosus* に似るが、胸鰭鰭条の最頻値が17であること、尾鰭後縁がほぼ截形であること、生時に見られる頭部及び垂直鰭の青色部及び胸鰭基部の青色でふちどられた橙赤色斑が欠如するこ

と、また、体側の横縞は普通体の上半部に限られていることなどで容易に区別される。

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