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FIVE NEW INDO-PACIFIC PIPEFISHES

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During the 1946 fish investigations at Bikini Atoll in the Marshall Islands, V. E. Brock and Herald carried out the first moderate-depth rotenone stations for the collection of fishes. Since this was before the development of scuba, the diving gear consisted of Brock's modified Monson lung rebreather with other divers receiving air supplied through a standard dive line attached to a small compressor. It was soon evident from these collections that an important break occurred in the vertical distribution of the fishes. Many were confined to the intertidal zone or a few feet below; others were common in water of about 15 feet or greater and rarely, if ever, were seen in shallow water. The Syngnathidae provided a good example of this faunal break. Of the ten species of pipefishes (47 specimens from 26 stations) which were collected in the Marshall Islands, five were found only at depths below 15 feet, and three of those were undescribed.

With the exception of *Dentirostrum janssi*, the other four species of pipefishes described as new herein appear to belong to the deeper water group, being taken at depths ranging from 20 to 160 feet. One species was collected in the Hawaiian Islands, one in the Marianas, the third in the

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TABLE 1. Meristic comparisons for the *Dunckerocampus* complex.

	Num- ber of Speci- mens	Trunk Rings			Tail Rings								Dorsal Fin Rays					
		15	16	17	16	17	18	19	20	21	22	23	20	21	22	23	24	25/30
<i>Dunckerocampus multiannulatus</i> ¹	9 ¹		7	2 ¹			1	7 ¹		1 ¹			1 ¹	5 ¹	3			
<i>D. pessuliferus</i>	1			1					1									1
<i>D. c. caulleryi</i>	1		1					1									1	
<i>D. c. chapmani</i>	3		1	2		1	2										1	2
<i>D. dactyliophorus</i>	59		1	58			10	37	10	2			2	13	18	14	8	5
<i>D. baldwini</i>	20		20					1	12	6	1		1	5	12	2		
<i>Dentirostrum janssi</i>	34		34						1	4	26	3		1	3	16	14	

¹ Includes literature holotype data for *D. multiannulatus* and *D. ben-tuviae*. It is probable that trunk ring counts for these two types should be recorded as 16 rather than 17.

Ryukyus, and the fourth at Easter and Pitcairn islands. These are island groups in which considerable fish collecting has been carried out in shallow water in recent years.

The following abbreviations are used for institutions in this paper: AMS (Australian Museum-Sydney); ANSP (Academy of Natural Sciences of Philadelphia); BM(NH) [British Museum (Natural History)]; BPBM (Bernice P. Bishop Museum); CAS (California Academy of Sciences); LACM (Los Angeles County Museum of Natural History); SMF (Senckenberg Museum); and USNM (United States National Museum).

Technical assistance in making counts and measurements has been provided by Mr. D. Anderson.

THE *DUNCKEROCAMPUS* COMPLEX

Seven long-nosed species of very spiny belly-pouch Indo-Pacific pipefishes are members of the *Dunckerocampus* complex. All of these including the related *Doryrhamphus* and *Oostethus* pipefishes have a first trunk ring, i.e., the one bearing the pectoral fins, that is twice as long as any of the remaining trunk rings. Although it is actually double, it is counted as a single ring. In meristic characters these species are very similar (table 1). Based on pigment patterns or the absence thereof, members of the *Dunckerocampus* complex fall into four categories: the first is the narrow-banded group whose two members usually have 4 or 5 very narrow pigment bands on the opercle, two or more on each trunk ring and sometimes on each tail ring. *Dunckerocampus multiannulatus* (Regan) 1903, was described from Mauritius and was characterized by a lack of banding on the snout.

Dunckerocampus ben-tuviae Fowler and Steinitz 1956, described from the Red Sea had the same meristic characters but did have banding on the snout. Dr. Eugenie Clark advises us that Red Sea pipefishes of the *D. multiannulatus*/*D. ben-tuviae* group have a wide range of snout banding variability so that *D. ben-tuviae* will need to be considered a synonym of *D. multiannulatus*.

The remaining species in the narrow-banded group, *Dunckerocampus pessuliferous*, is distinct from other *Dunckerocampus* in having a high dorsal fin count of 30 as compared with a normal range of 20–25. It is known from the holotype taken by dredge at a depth of 144 feet at Sulade Island in the southern Philippines.

The two species in the wide-band group usually have a single pigment ring for each trunk and tail ring. The most common species is the central and western Pacific *D. dactyliophorus*; it has a single ring around the opercle which differentiates it from the twin opercular rings of *D. caulleryi* Chabanaud known only from Amboina and New Caledonia. This latter species has two subspecies: *D. c. caulleryi* with 19 tail rings, and *D. c. chapmani* Herald with 16 or 17 tail rings. More material is needed to determine the status of these two.

The third category is represented by the striped Hawaiian endemic described as new herein: *Dunckerocampus baldwini*. This species extends the generic range from the Austral Islands northward to the Hawaiian region, a distance of about 2800 miles. And, finally, the fourth category is that group of pipefishes that, unlike *Dunckerocampus*, developed the brood pouch folds; the new genus and species for this is *Dentirostrum janssi* described as follows:

Dentirostrum Herald and Randall, new genus

DIAGNOSIS. Spiny, long-snouted Doryrhamphine pipefish with abdominal brood area protected by lateral membranous folds but without protecting plates. Lateral trunk ridge continuous with inferior tail ridge at anal ring; superior trunk and tail ridges discontinuous at end of dorsal fin; lateral tail ridge ending free at anal ring. Tail non-prehensile. Dorsal fin rays 21–24, anal 4, pectoral 19–21, caudal 10; trunk rings 16; tail rings 20–23. Named *Dentirostrum* in reference to the magnificent spines present on the median snout ridge of males and to a lesser extent on females.

DISCUSSION. *Dentirostrum* is most closely related to *Dunckerocampus* from which it differs, (1) in having brood pouch flaps rather than having the eggs nakedly attached to the abdomen, (2) in its extremely spinose nose ridge, and (3) in the presence of a secondary spine behind the primary spine at the ring juncture of the superior and inferior trunk ridges. *Dentirostrum* and *Doryrhamphus* are similar in that both have brood-pouch folds, but the latter differs in its small size and its short snout.

The type species of *Dentirostrum*, *D. janssi*, is new and is the only known member of the genus. The description of *D. janssi* based on 34 specimens (14 males 61–126 mm. SL and 20 females 52–110 mm. SL) from 19 localities in the Indo-Malayan region is as follows:

Dentirostrum janssi Herald and Randall, new species.

(Figure 1.)

From the PALAU ISLANDS: 13 types, 6 localities.

HOLOTYPE. CAS 14139, male 125 mm. SL, with 126 brood patch sockets—a few with eggs; Arappu Point of Koror to Ho Island, south side of reef; 0–50 feet; H. DeWitt; November 19, 1957 (GVF 1442).

PARATYPES. CAS 14140, male 123 mm. SL; same data as holotype. CAS 14141, male 105 mm. SL; south entrance to small bay on west side of Ngalab Point, Koror Island; 0–50 feet; H. DeWitt; November 21, 1957 (GVF 1445). CAS 14142, female 89 mm. SL; Iwayama Bay, off Kaibakku Island; 0–45 feet; H. DeWitt; October 3, 1957 (GVF 1408). AMS 16144-001, male 103 mm. SL; female 105 mm. SL; LACM 32123-1, male 105 mm. SL; SMF 11425, male 111 mm. SL; channel between Sanryo Island and Ngatkumer Island, Iwayama Bay; 0–50 feet; H. DeWitt; October 31, 1957 (GVF 1433). CAS 14143, 3 females, 53 mm., 97 mm., 103 mm. SL; channel between Sanryo Island and Kamori Island, Iwayama Bay; 0–42 feet; H. DeWitt; November 18, 1957 (GVF 1439). BPBM 11937, male 102 mm. SL; female 83 mm. SL; western tip of Ngargol Island; 20–40 feet, coral; J. E. Randall, E. S. Helfman, O. Custer; June 8, 1968.

From THAILAND: 16 paratypes, 9 localities.

BPBM 11938, female 91 mm. SL; NW. side of Koh Kroi Island about 5.5 miles ESE. of Ban Pae Fisheries Training Center, Rayong Province; 0–4 meters; H. A. Fehlmann; April 30, 1960 (GVF 2183). CAS 14146, male 77 mm. SL; NW. side of Goh Samet Island, Rayong Province; 0–2 meters; B. Bronson; April 29, 1960 (GVF 2180). CAS 14147, 3 females, 62 mm., 64 mm., 83 mm. SL; NW. side of Goh Raed about 1.5 miles ESE. of Prachuap Khiri Khan town, Prachuap Khiri Khan Province; 0–15 feet (photo 3-79 a-c); H. A. Fehlmann; June 19, 1961 (GVF 2651). USNM 206654, male 126 mm. SL; female 78.5 mm. SL; CAS 14148, 2 males 80 mm. and 61 mm. SL; female 59 mm. SL; W. side of Goh Luem ca. 3 miles SE. of Prachuap Khiri Khan Town, Prachuap Khiri Khan Province; 0–15 feet; H. A. Fehlmann; June 18, 1961 (GVF 2648). CAS 14149, 2 females 95 mm. and 102 mm. SL; W. side of Goh Luem, Prachuap Khiri Khan Province; 0–15 feet; H. A. Fehlmann; June 17, 1961 (GVF 2646). CAS 14150, female 111 mm. SL; on fringing reef at head of Gulf of Siam, Goh Sak Island, about 35 miles NE. of Prachuap Khiri Khan town, Prachuap

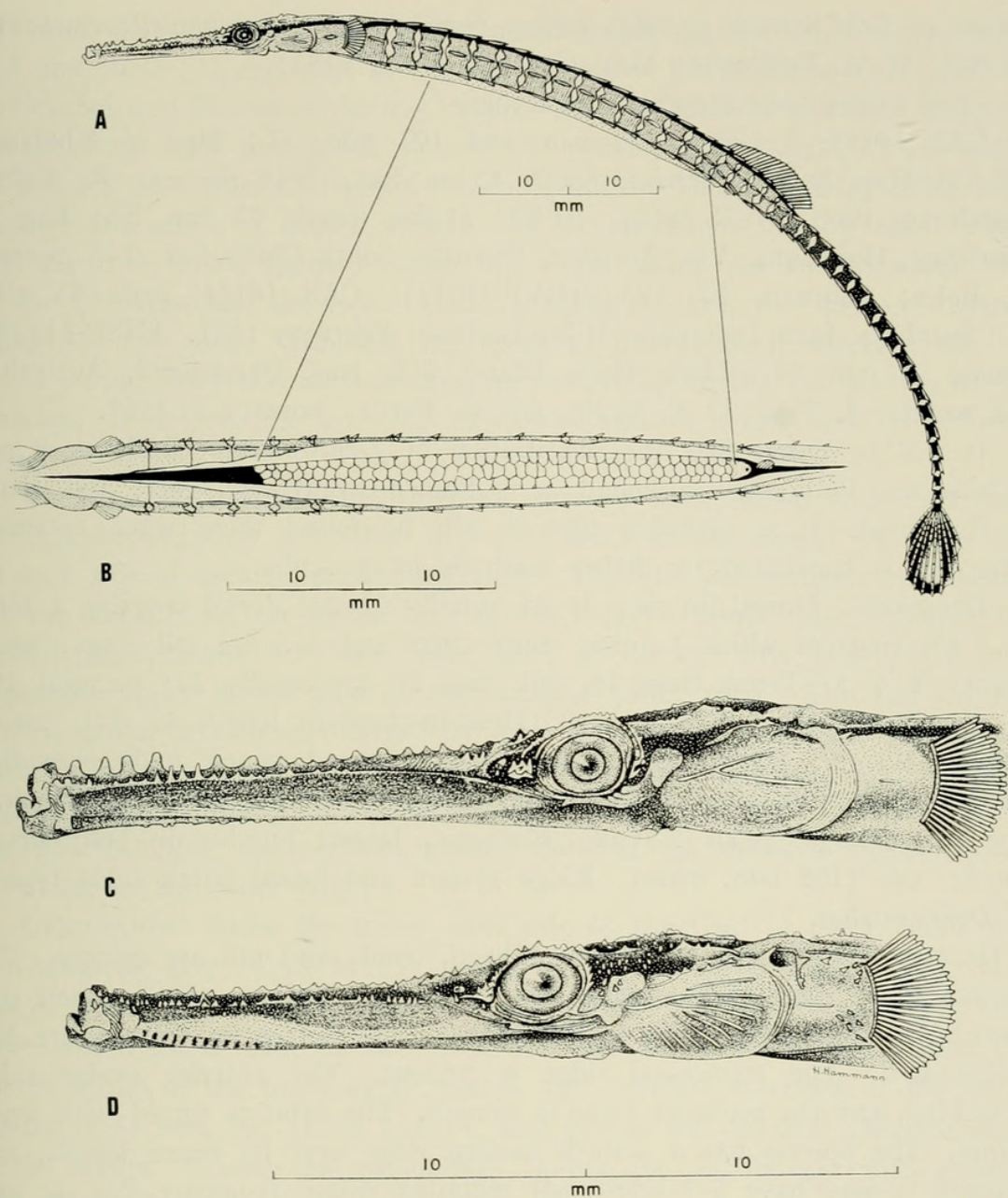


FIGURE 1. *Dentirostrum janssi* Herald and Randall, Holotype; male 125 mm. SL (CAS 14139); (a) lateral view; (b) expanded ventral view of brood patch area; (c) head detail male holotype compared with (d) head detail female 111 mm. SL paratype (CAS 14150). Drawing by H. Hamman.

Khiri Khan Province; 0-20 feet; H. A. Fehlmann and R. Rofen; October 24, 1957 (GVF 1460). CAS 14151, female 58 mm. SL; SW. point on Goh Chorakhay, Chumphon Province; 0-16 feet; B. Bronson; May 25, 1960 (GVF 2199). CAS 14152, male 91 mm. SL; fringing reef on NW. side of Goh Maprao, Chumphon Province; 0-12 feet; H. A. Fehlmann; May 18, 1960 (GVF 2186). CAS 14153, male 105 mm. SL; Prond Bay at SW.

corner of Goh Samed, ca. 100 meters from shore, Chumphon Province; 0–10 feet; H. A. Fehlmann; May 17, 1960 (GVF 2185).

From OTHER LOCALITIES²: 5 paratypes.

CAS 14145, 2 females 96 mm. and 107 mm. SL; Bay of Nhatrang SW. of Hon Long, Vietnam, South China Sea; 1–15 meters; R. Bolin; March 14, 1960 (GVF 2116). BPBM 11939, female 93 mm. SL; Bay of Nhatrang, Hon Long, Ving Damlon, Vietnam, South China Sea; 1–6 meters; R. Bolin; February 23, 1960 (GVF 2072). CAS 14144, male 93 mm. SL; Surabaya, Java, Indonesia; Hilmi Oesman; February 1961. ANSP 119933, female 99 mm. SL; Little Hope Island, NE. end, Queensland, Australia; 5–8 meters; J. Tyler, C. L. Smith, and G. Bettle; January 3, 1969.

It will be noted that the distribution of *Dentirostrum janssi* does not include the Philippines although it is known from west, east, and south of that area. It is probable that it will be found there when rotenone collecting is conducted by diving methods using scuba.

DIAGNOSIS. Dorsal fin rays 21–24, usually 23–24; dorsal covering a total of 5–6½ rings of which 1–2 are trunk rings and 4–5 are tail rings; usual count: 1 + 5. Trunk rings 16, tail rings 20–23, usually 22; pectoral 19–21, usually 20; anal 4, caudal 10. Head-in-standard length 4.2–5.0; snout-in-head 1.5–1.9; dorsal-base-in-head 1.9–2.8; brood pouch folds extending from second trunk ring to anal ring, and occasionally as far as 4th tail ring. Eggs large, about .75 mm. diameter; largest number in belly brood patch: 195 (105 mm. male). Ridge system and brood patch folds typical of *Dentirostrum*.

DESCRIPTION. Nearly all ridges of head, trunk, and tail are spinose. The median snout ridge of the males has 15–21 large spines, and on each side there is a lateral ridge with smaller spines. The spines on females are less accentuated. The supranasal ridge is present. The anterior ocular ridge is lacking, and the posterior ridge is smooth. The orbit is ringed with small spines. The opercle has a smooth median ridge over its entire length, and beneath it may have 5–7 additional radiating ridges (compare figs. 1c and 1d). The pectoral cover plate has 1 or 2 spines on its upper anterior edge, and a single spine in the center. Superior and inferior trunk ridges have double spines at each ring juncture, but on the tail only a single spine at each ring. The lateral trunk ridge has double spines for the first 5–7 rings, and then a single spine for the next 9–11 rings.

Between 62 and 80 mm. the future brood patch folds show their presence by a pair of darkly pigmented lines on the abdominal surface of the male. Among the 14 males only two had eggs attached to the brood patch: the

² A new male *Dentirostrum janssi* (106 mm. SL) has just arrived; it is a depth record (100 feet) captured at Kranket I., Madang, New Guinea; G. R. Allen, May 15, 1972.

125 mm. male holotype (126 brood patch sockets, a few with eggs) and a 103 mm. male (21 eggs and 135 empty sockets = 156). These were collected in October and November in the Palaus. Another male of 111 mm. collected at the same time and place showed 156 empty egg sockets. Two males, 91 and 105 mm. from Chumphon Province, Gulf of Thailand (May collection), showed 106 and 195 empty sockets. All 33 specimens had 16 trunk rings, and the male brood patch folds usually cover 15 of the 16. However, five of the 14 males had the folds extending upon the tail, the furthest distance being $3\frac{1}{2}$ tail rings. Although the range of brood pouch coverage was 15 to $19\frac{1}{2}$ rings there was no indication of vascularity on the tail portion of the pouches. It is probable that this small tail section is not used as a brood area.

The overall color of *Dentirostrum janssi* is light brown with two pairs of dark brown lines extending from the head to the dorsal fin with one on each side of each superior trunk ridge. The first pair extends from above the eye dorsally on the inside edge of the superior trunk ridge, whereas the second pair extends from the center part of the eye over the opercle and along the upper lateral side of the superior trunk ridge. The tail fin has a clear center section surrounded by a dark reddish black area. The junior author's field notes on two males collected in the Palaus at Ngargol Island indicate that the body is blackish anteriorly and posteriorly with orange in the middle. Also, the pigment around the tail fin shows a small amount of white on the outer edge.

DISCUSSION. From the upper west side of the Gulf of Siam (GVF 64: BanAangtong Bay; CAS 14155), we have three small specimens (33, 33.5, and 42 mm. SL) that have all of the characteristics of *D. janssi* except that they have a single spine on each ring of trunk and tail and are lacking the double spines of the trunk of *D. janssi*. Our smallest specimen of the latter species is 58 mm. SL (CAS 14151), and it has the physical characteristics of the adults. Among the syngnathids, spines are usually lost with growth, not added. Because of the lack of spines on these three specimens, we are faced with the possibility of another species of *Dentirostrum* existing in this area. However, we will not describe these as new at this time, but will await the collection of adult material from the same area.

At this same GVF station 64, juvenile representatives of two additional species of syngnathids were collected: 8 specimens (average length 44 mm.) of *Corythoichthys* species (CAS 14318) and a 61 mm. specimen tentatively identified as *Syngnathus maxweberi* (CAS 14317).

Named '*janssi*' in honor of Mr. Edwin Janss, Jr., whose keen interest in tropical marine biology has resulted in important field investigations in many regions.

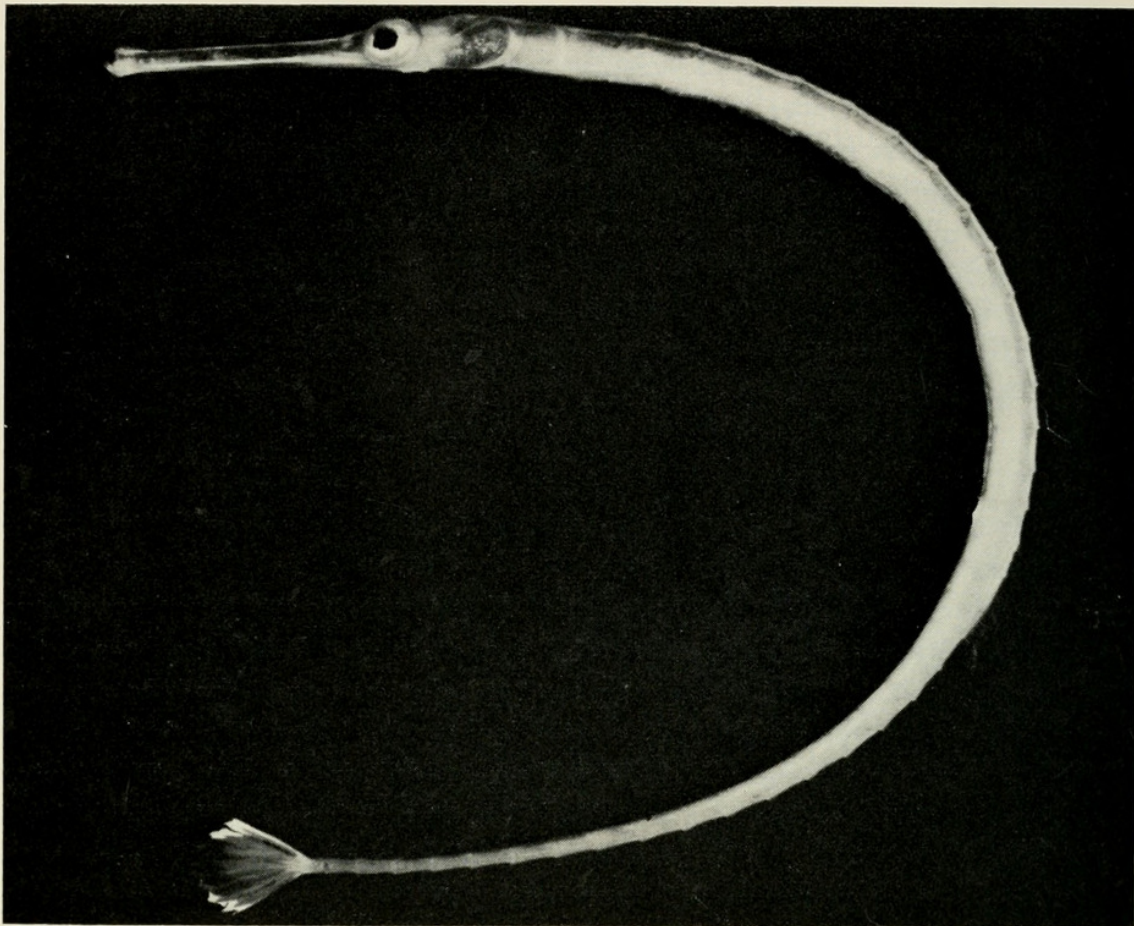


FIGURE 2. *Dunckerocampus baldwini* Herald and Randall, Holotype; male 125 mm. SL (CAS 24734); cave SE. of Pokai Bay, Waianae coast, Oahu; 70 feet. Photograph by J. E. Randall.

***Dunckerocampus baldwini* Herald and Randall, new species.**

(Figure 2.)

Twenty type specimens from the Hawaiian Islands: Oahu (17), Hawaii (2), and Maui (1). Capture methods: by hand, quinaldine, and chemfish ichthyocide. Depth range 20–160 feet; size range 63–131 mm. SL.

HOLOTYPE. CAS 24734, male 120.5 mm. SL (125.5 mm. total length); cave SE. of Pokai Bay, Waianae coast, Oahu; 70 feet; J. E. Randall and S. Swerdloff; July 20, 1969.

PARATYPES. CAS 24735, female 125 mm. SL; same data as holotype. LACM 32126-1, female 126 mm. SL; CAS 14138, 2 males 106.5 and 129 mm. SL; 3 females 129, 131, and 131 mm. SL; Waianae coast off Makaha Shores Condominium, Oahu; 45 feet; J. E. Randall and A. R. Emery; April 26, 1970. BPBM 11941, 2 females 63 and 128 mm. SL; Waianae coast off Lahilahi Point, Oahu; 40 feet; J. E. Randall and P. M. Allen; July 11, 1970. SMF 11426, female 128 mm. SL; Kawaihoa Point, Maunalua

Bay, Oahu; 35 feet, lava caves; Jane Culp; November 15, 1971. AMS 15607-001, female 123.5 mm. SL; CAS 14137, female 134 mm. SL; Kawaihoa Point, Maunalua Bay, Oahu; 35 feet, lava caves; Jane Culp and James Moore; December 18, 1971. USNM 204683, female 92 mm. SL; off north side at base of dropoff, Moku Manu, Oahu; 160 feet; J. E. Randall, T. Stark, W. Baldwin; October 9, 1969. BM(NH) 970.1.26:1, female (?) 72 mm. SL, Moku Manu, Oahu; 85 feet; J. E. Randall and W. Baldwin; October 6, 1969. BPBM 7783, male 124 mm. SL; female 125 mm. SL; Kanohe Bay at channel entrance, Oahu; 95 feet; J. E. Randall, D. Chave, W. Hashimoto; October 10, 1969. BPBM 11940, male 102 mm. SL (tail broken at 11th ring; caudal regenerated); north end of Honaunau Bay, Kona coast, Hawaii; 150 feet; J. E. Randall, E. S. Hobson, J. R. Chess; August 16, 1969. BPBM 11942, male 130 mm. SL; first point north of Hanakahau Boat Harbor, Kona Coast, Hawaii; 100 feet; J. E. Randall; August 18, 1970. CAS 14979, female 117 mm. SL; 1½ miles north of Lahina, Maui, Hawaii; 20 feet; Steinhart Divers; June 29, 1972.

DIAGNOSIS. Holotype belly brood area covering $\frac{1}{2}$ 12 $\frac{1}{2}$ trunk rings with 143 egg sockets—73 on right and 70 on left. Dorsal fin rays 21–23; pectoral 19–21; anal 4; caudal 10; dorsal fin covering $\frac{1}{3}$ –1 trunk ring and $3\frac{3}{4}$ tail rings; usually $\frac{3}{4}$ + 3; total rings covered by dorsal $3\frac{3}{4}$ – $4\frac{1}{4}$; trunk rings 16; tail rings 20–21; head-in-standard length 4.5–5.2; snout-in-head 1.5–1.7; dorsal fin base-in-head 2.9–3.5. Ridge system typical of *Dunckerocampus*, i.e., lateral trunk ridge continuous with inferior tail ridge; median tail ridge extending forward to anal ring. Tail fin long, 5–7 mm. in adults of 100 mm. or larger. General appearance except color similar to other members of genus *Dunckerocampus*. Color in life reddish, fading to dark with preservation. Red stripe along upper part of body from snout to tail. Edges of caudal fin white.

DESCRIPTION. Median snout ridge with many serrations; orbital, opercular, nuchal, and pectoral cover plate crests faintly visible. Eye very large, the orbit diameter contained almost two times in minimum snout depth or $\frac{3}{4}$ length of opercle. Intermedial scutella between rings small and equal in width to one-half distance between scutella. Body ridges well developed with sharp spine projecting at posterior edge of juncture of each ring.

The following color description was made from 102 mm. Honaunau Bay male shortly after capture:

“light pinkish gray with broad dorso-lateral bright orange-red stripe becoming blackish red and narrower on snout; also a broad orange-red stripe midventrally extending forward on snout as red and blackish red. Snout yellowish, white dorsally and yellow between lateral and ventral blackish red stripes; tail nearly entirely red (red stripes close together); caudal fin red with a narrow white edge at sides, and a black area distally on 2 upper central interradi al membranes; dorsal colorless.”

In preservative the males apparently retain the color stripe along the head and trunk much better than do the females. The 125 mm. female from Kaneohe Bay (BPBM 7783) has a conspicuous blackish tip on the outer margin of the last five rays of the dorsal fin. Other specimens did not show this character.

DISCUSSION. Capture data and dive observation records indicate that specimens of *Dunckerocampus baldwini* are often found in pairs. In captivity longevity has been short, usually no more than 2 months. This compares with about three months longevity for the banded pipefish, *D. dactyliophorus*. In recent years this latter species has often been imported into the United States from the Philippines.

Cleaning activity by *Dunckerocampus baldwini* has been observed by Dr. Edith Chave. While diving at Milolii, Hawaii (August 4, 1970), in a cave at a depth of 75 feet, she watched an adult redstripe pipefish clean a cardinal fish, *Apogon evermanni*, then a moray eel, *Gymnothorax* species, and finally the pipefish attempted to clean Dr. Chave's wrist.

Only two other species of pipefishes are known to act as cleaners. Randall (1962) reported D. P. Wilson's observations at the Plymouth Aquarium of a John Dory being cleaned by the snake pipefish, *Entelurus aequoreus*. The junior author has also observed the flagtail pipefish, *Doryrhamphus melanopleura*, cleaning reef fishes, specifically a moray and a cardinal (Randall and Helfman, 1972).

In recognition of his study of Pacific fishes, the redstripe pipefish, *Dunckerocampus baldwini*, is named in honor of Wayne J. Baldwin who with the junior author collected the first specimens of this new species.

***Dunckerocampus dactyliophorus* (Bleeker) 1853.**

Banded Pipefish.

Syngnathus dactyliophorus Bleeker, Nat. Tijdschr. Nederl. Indie, vol. 4, p. 506, 1853 (type locality, Onrust Island, Djakarta [Batavia], Java).

Herald (1953, p. 252) studied geographic variability of meristic characters in a small series of *Dunckerocampus dactyliophorus*. He postulated sexual dimorphism in the trunk color ring pattern with females having a greater number than males. Tables 2 and 3 present data on the 62 specimens from 22 localities now available. Unfortunately, there does not appear to be any recognizable pattern that can be correlated with sex or area. It will be noted that the trunk ring count is remarkably constant at 16 with only one of 62 having a different count, i.e., 15. Size range for the 62 specimens was 41 to 159 mm. SL. The smallest mature male showing egg sockets on the brood patch area was 90 mm.

The banded pipefish has some interesting color ring variations. The typical

TABLE 2. *Geographic variation of Dunckerocampus dactyliophorus.*

	Trunk Rings			Tail Rings						Dorsal Fin Rays					
	15	16	17	18	19	20	21	22	23	20	21	22	23	24	25
Australs		2			2							2			
Marshalls		6			1	5				1	3	2			
Kapingamarangi		1			1					1					
Guam		1					1				1				
Ulithi		2			2							2			
Palaus	1	29		9	21						9	12	7	2	
Philippines		6			1	4	1						1	3	2
Solomons		2			1	1							1		1
Celebes		6		1	5							3	2		1
Java		1			1									1	
New Guinea		5			5								3	2	
Totals (62)	1	61		10	40	10	2			2	13	21	14	8	4

pattern shows about 5 rings on the snout (range 4–7), 1 over, under, and rarely through the eye, another around the opercle, 1 at the pectoral fins, then (table 3) 6–13 on the trunk, and 7–14 on the tail. The pattern for any given specimen is recorded as 5-1-1-1-7-9 = 24. The width of the individual color band is usually ½ to ¾ of an individual ring. However, the two Ulithi specimens (BPBM 8746) have remarkably narrow color bands; in width they are only equal to about ⅓ to ½ of a trunk or tail ring. Another extreme is shown by a 91 mm. specimen from Urukthapel in the Palaus (BPBM 7352); the color bands were very wide, 1 to 1¼ rings in width.

Dunckerocampus dactyliophorus ranges through the western and central Pacific. The type locality, Djakarta, is the westernmost point in the distributional pattern, and until recently the easternmost was 4300 miles away at Rongelap Atoll in the Marshall Islands. However, in 1971 the junior author diving at a depth of 185 feet collected two specimens at Rurutu (lat. 24° S.) in the Austral Islands. This extended the range westward for another 2700 miles and southward for 900 miles from the latitude of the Solomons (lat. 9° S.). The northernmost locality is Guam (lat. 12° N.).

Recently Dr. Eugenie Clark advised us that she has examined *Dunckerocampus dactyliophorus* from the Red Sea (Eilat, Gulf of Aqaba) which is some 8800 miles (by water) from Djakarta. This break in distribution is similar to that which occurs in *Corythoichthys flavofasciatus* with the subspecies of *C. f. flavofasciatus* in the Red Sea and *C. f. conspicillatus* many miles away in the Central Pacific (Herald, 1953, p. 275).

TABLE 3. *Geographic variation of Dunckerocampus dactyliophorus.*

	Trunk Color Bands								Tail Color Bands							
	6	7	8	9	10	11	12	13	7	8	9	10	11	12	13	
Australs	1	1							1		1					
Marshalls			3	1	2					1		2	2		1	
Kapingamarangi			1								1					
Guam		1								1						
Ulithi				1	1								1		1	
Palaus	4	15	6	4	1				5	14	9	2				
Philippines			1	2	2	1					1			3	2	
Solomons					2							2				
Celebes			1	2	2			1			3	2		1		
Java				1							1					
New Guinea		1		4							2	3				
Totals (62)	5	18	12	15	10	1	0	1	6	16	18	11	3	4	4	

The specific collection localities for *Dunckerocampus dactyliophorus* listed for the general areas of tables 2 and 3 are as follows: Marshall Islands: Rongelap, Bikini, and Eniwetok atolls; Palaus: Koror, Auluptagel, Babelthaup, Urukthapel, and Arakabesan islands; Solomons: New Georgia and Florida islands; Philippines: Cebu, Jolo, Pandanan Island, and Sibutu. Although the Philippine localities are all from the southern section, we have been advised by Mr. Earl Kennedy, who is the major Manila live fish jobber, that the species is fairly well distributed throughout the islands; most of his specimens come from Luzon (Batangas), Mindoro, and Palawan. Amboina is the only recorded locality from which we have not examined specimens.

THE PIPEFISH OF EASTER AND PITCAIRN ISLANDS

On the map of the world, Easter Island is a small dot in the eastern south Pacific some 2000 miles west of Caldera, Chile, and about 1100 miles east of Pitcairn, the nearest inhabited island. This isolated volcanic outcrop has a total area of 46 square miles, being about 14 miles long and 7 miles wide ($27^{\circ} 05' S.$ Lat. and $109^{\circ} 20' W.$ Long.). Although the island is internationally famed because of the giant stone statues, the published record of its ichthyological fauna and relationships is less well known (Randall, 1970). In recent years three field parties of biologists (1958, 1965, and 1969) have made collections at various sites around the island. All have used ichthyocides, and among them they have taken ten specimens from three localities of the first syngnathid to be collected in the area. In December 1971 the junior

author visited Pitcairn Island and was able to collect three additional specimens. The type series consists of 13 specimens: 5 males (69–85.5 mm. SL) and 8 females (67–95 mm. SL).

Several years ago Dr. David K. Caldwell studied the Ramsey Parks 1958 series of 6 specimens at the Los Angeles County Museum of Natural History. He tentatively determined that they represented an undescribed species. This we are now able to verify, and we name this species in his honor.

Syngnathus caldwelli Herald and Randall, new species.

(Figure 3.)

HOLOTYPE. LACM 6560-3, 76 mm. standard length male with eggs in pouch. Anakena Cove, Easter Island; Ramsey Parks, Yacht *Chiriqui*; boulders and brown algae, rotenone to 4.6 m.; October 1, 1958.

PARATYPES. (5 from same collection as holotype): LACM 6560-41, 69 mm. male and 82 mm. female; CAS 24202: 71 mm. male and 65.5 mm. female; and USNM 203409, 79 mm. female. Another collection made at type locality 6½ years later—BC 65440, 84 mm. male (pouch empty); closed tidepools, depth ½ to 8 m., rotenone; Ian E. Efford and Jack A. Mathias, Jan. 15, 1964. Ten days later at nearby Vinapu on southwest side—BC 65449, 2 females 93 and 93.5 mm.; large boulders and rocks; depth 2–3 m., rotenone, also Efford and Mathias, Jan. 25, 1965. Finally, 10½ years after first collection—BPBM 6596, 95 mm. female (fig. 2); southwest coast between Hanga-Roa and Hanga-piko, inshore; depth 61 cm.; boulder bottom with brown algae; chemfish; J. E. Randall and G. R. Allen; January 26, 1969. BPBM 10856, 82 mm. male and 80 mm. female. Pitcairn Island, off "the Rope" 20 ft., large boulders with brown algae, sand and small rocks in low places; J. E. Randall, Dean B. Cannoy, Steve Christian, and Noggie Young; December 23, 1970. CAS 13922, 75 mm. female, same data as BPBM 10856.

DIAGNOSIS. Dorsal fin: 28–31; 7 specimens with 28 rays; 3 with 29; 2, 30; and 1, 31; pectoral 14–16; usually 14; anal 3; caudal 10; dorsal fin covering 6¾–7½ rings, i.e., ½–1 trunk ring and 6–6½ tail rings usually 1 + 6; trunk rings 16–17; tail rings 34–36; head-in-standard length 8.5–9.2; snout-in-head 2.2–2.6; head-in-dorsal fin base 1.06–1.15; dorsal fin base-in-head .87–.95. Lateral body ridges typical for genus *Syngnathus*: i.e., lateral trunk ridge interrupted at anal ring, then subcontinuous with lateral tail ridge (65.5 mm. female has the two ridges continuous on one side only). Brood pouch covering first 13–15 tail rings; eggs large, 1 mm. diameter, arranged in 3–4 single rows across pouch (holotype) or 2 rows wide and 2 rows deep (69 mm. male). Holotype egg count 88; for 69 mm. male: 19

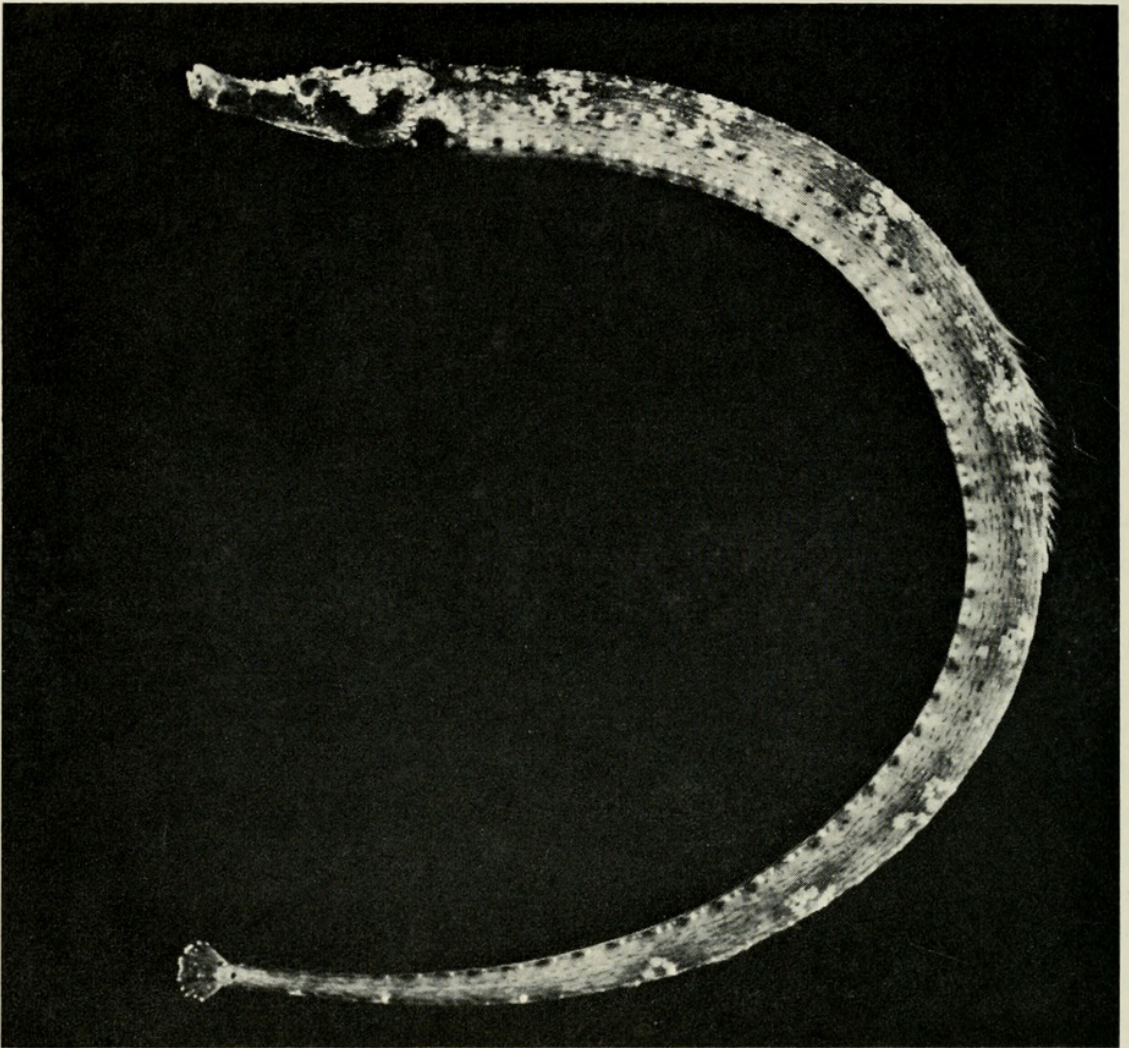


FIGURE 3. *Syngnathus caldwelli* Herald and Randall, Paratype; female 93 mm. SL (BPBM 6596); Easter Island between Hanga-Roa and Hanga-piko. Photograph by J. E. Randall.

and 21 eggs for dorsal rows and 14–14 for ventral rows or about 68 for total pouch count. Brood pouch folds almost in contact but without overlap or indentation, merely slightly thickened at free end of individual flap (modified Open Brood Pouch Closure: O-BPC). Color in preservative, brownish sometimes with many narrow dark lines running length of body. Eye may have dark band extending obliquely postero-ventrally over opercle. Dark spots sometimes present at juncture point between rings on inferior trunk ridge, and to lesser extent on lateral trunk ridge. Spots on Pitcairn pipefishes, larger and very pronounced; also with wide whitish areas on upper surface: about 4 on trunk and 7 on tail.

DESCRIPTION. Median snout ridge smooth, extending forward from inter-orbital area for about half snout length. Superior ocular ridge extends

posteriorly for distance equal to eye width but is absent anteriorly. Eye very large, in diameter about equal to $2\frac{1}{2}$ of snout length. Nuchal plates bilobed, indistinct. Upper and lower pectoral ridge plates evident but not pronounced; opercular ridge extends over $\frac{1}{2}$ to $\frac{3}{4}$ length of opercle. Body ridges evident, smooth, and not strongly pronounced. Lateral flanges of brood pouch slightly developed.

FIELD NOTES. The junior author and G. R. Allen collected the most recent Easter Island paratype and also made color and black and white photographs at the time of capture. From field notes the near-living color of *Syngnathus caldwelli* from Easter Island is:

"light brown with row of red dots along anterior lateral ridge and full length of ventral flange; a small red spot at front and at rear of dorsal fin; ventral part of body light yellowish with a midventral row of red dots along trunk; large irregular light gray blotches on back and upper side; a dark brown band running from snout through lower half of eye where it broadens on lower opercle and continues as a broad zone on chest; caudal fin yellowish with brown rays; dorsal fin clear."

Any distinctive marks on the 1958 specimens have been largely lost following preservation. The two 1965 specimens from Vinapu are the only ones to show clearly the narrow lines on the body, about 12 on the top of the trunk and approximately 10 on the trunk sides. The 1965 Anakena specimen is very dark and its markings are suggestive of the 1969 specimen whose near-life colors are described above.

COMPARISONS. In the Indo-Pacific from Africa to the Americas there are about 34 members of the genus *Syngnathus*, excluding *Corythoichthys* and *Bombonia*. None of these approach *Syngnathus caldwelli* in their numerical or other characteristics. The nearest relative is probably *Syngnathus balli* of Hawaii. However, the latter is a smaller species (58 mm.) with fewer tail rings (32 vs. 35–36) and fewer dorsal fin rays (21–23 vs. 28–31).

***Syngnathus banneri* Herald and Randall, new species.**

(Figure 4.)

HOLOTYPE. BPBM 8695, 39 mm. SL (40 mm. TL) undet. sex; Ryukyu Islands, Ishigaki; reef about $\frac{1}{2}$ mile off harbor of Ishigaki City; depth 20–35 feet; chemfish ichthyocide; J. E. Randall and A. H. Banner, May 22, 1968.

PARATYPE. CAS 14375, 26.5 mm. SL (27.3 mm. TL) immature; Marshall Islands, Eniwetok Atoll, lagoon off Eniwetok Island; 25 feet, coral and rubble patch; quinaldine; J. E. Randall, March 31, 1972.

DIAGNOSIS. Dorsal fin rays 16–18 located on a total of $3\frac{1}{2}$ –4 rings ($\frac{1}{4}$ –1 trunk and $3\frac{1}{4}$ tail rings); pectoral 11; anal 2; caudal 10. Trunk rings

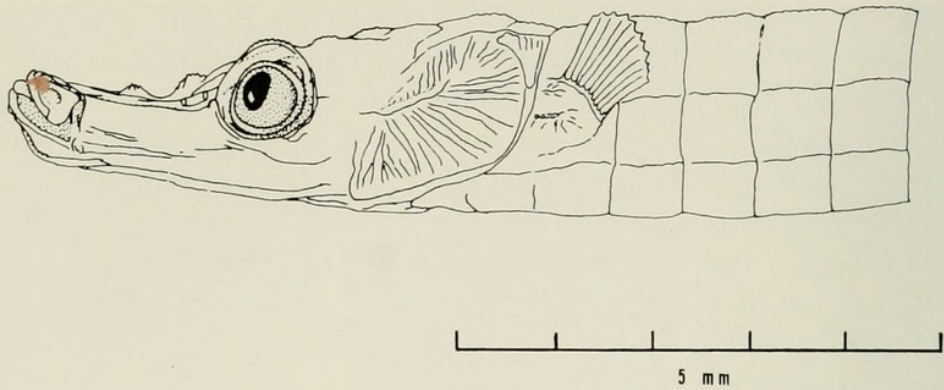


FIGURE 4. *Syngnathus banneri* Herald and Randall, Holotype; imm. 39 mm. SL (BPBM 8695); reef near Ishigaki City, Ryukyus. Drawing by L. Sabre.

15; tail rings 27. Head-in-standard length 7.3–7.8; snout-in-head 2.5–3.2; dorsal fin base-in-head 1.7–1.8. Body ridge pattern typical of *Syngnathus*, i.e., lateral trunk ridge discontinuous with lateral tail ridge at end of anal ring; inferior trunk and tail ridges continuous and superior trunk and tail ridges discontinuous at end of dorsal fin. Brood pouch unknown.

DESCRIPTION. Holotype median snout ridge with two triangular flanges just anterior to nostrils; orbital ridge markedly extended dorsally; preopercular ridges present but not accentuated. Opercular ridge extending over one-half (paratype three-quarters) of opercle. Superior and inferior pectoral cover plate ridges sharply pronounced. Trunk and tail ridges slightly raised and indented between individual rings so that ridges have moderately scalloped profile. Paratype ridges for the most part less accentuated than holotype. Holotype color light tan with exception of dark brown spot pattern on anterior trunk; beginning behind pectoral, 6 spots on lower trunk ridge and 5 on lateral trunk ridge on left side; spots on right side less distinct; on dorsal surface 9 dark brown bars, one-half ring in width: 3 extending between superior trunk ridges and 6 between superior tail ridges. Paratype color whitish with dark area on lower sides of gill cover extending underneath pectoral fins.

DISCUSSION. *Syngnathus banneri* is a remarkable species for it has the lowest dorsal fin count of any member of the genus (16–18 as compared with a normal range of about 19–45), and with this is combined a very low tail ring count of 27. When egg-bearing males are available for examination, this species will probably prove to be a member of the subgenus *Microsyngnathus* Herald 1953. These are small Syngnathine pipefishes usually less than 100 mm. in length that have overlapping brood pouch closures (O-BPC).

Named '*banneri*' in honor of Dr. A. H. Banner whose welcome field efforts resulted in the capture of the holotype of this species.

Minyichthys Herald and Randall, new subgenus
of **Micrognathus** Duncker 1915

TYPE SPECIES. *Micrognathus brachyrhinus* Herald 1953.

DIAGNOSIS. Differentiated from other members of *Micrognathus* by increased number of trunk rings (19–21 rather than 13–17), very short snout, and small size (mature at less than 50 mm.). Named *Minyichthys*, small fish, from the Greek “miny” meaning small.

DISCUSSION. Pipefishes of the genus *Micrognathus* have the lateral trunk ridge continuous with the inferior tail ridge and the lateral tail ridge is present. The tail brood pouch has everted type closure in which the outer lip of one flap is turned back upon itself, and the other flap overlaps it (Herald, 1959). There are three subgenera: (1) *Anarchopterus* Hubbs 1935, characterized by smooth body ridges and absence of the anal fin, has two species limited to the Gulf of Mexico and Caribbean; (2) *Minyichthys*, defined above, has two Pacific species; and (3) the type subgenus *Micrognathus* with its typical sharp body ridges, has two Atlantic American species and nine Pacific species.

Micrognathus (Minyichthys) myersi Herald and Randall, new species.
(Figures 5 and 6.)

HOLOTYPE. CAS 13918, 42.5 mm. SL mature male (43.5 mm. TL); Guam, NW. Cocos Island, outside of reef, 70–100 feet depth; rotenone; June 30, 1969; J. E. Randall, *et al.*

PARATYPE. BPBM 8759, 41 mm. SL female (43 mm. TL); Guam; south of Uruno Point, about 10 mi. NE. of Agana; depth 60–90 feet; reef edge adjacent to sand; June 27, 1968; J. E. Randall and H. Kami.

DIAGNOSIS. Dorsal fin rays 29–31 covering 9–10½ rings, i.e., 2½–3 trunk rings and 6½–7½ tail rings; trunk rings 19, tail rings 40–41; pectoral 11–12; anal 2, caudal 8; head-in-standard length 7.2–8.92; snout-in-head 2.36–2.7; dorsal fin base-in-head .75–.93; pectoral base-in-pectoral length 1.6. Lateral ridge pattern typical of *Micrognathus*, i.e., median trunk ridge continuous with inferior tail ridge; lateral tail ridge extended forward onto 2 trunk rings (holotype) or 2½ (paratype); superior trunk and superior tail ridges interrupted at posterior edge of dorsal fin. Distinctive spike on dorso-median snout ridge just ahead of nostrils. Brood pouch covering first 13 tail rings with embryos to 10th ring; 7 large embryo sockets; pouch protecting plates slightly developed with pouch closure of everted type (E-BPC). Mouth extremely vertical.

DESCRIPTION. With exception of internasal spike, all head and body ridges faint. Orbital ridge mildly accentuated with pronounced spine on anterior border (holotype) or moderate (paratype). Opercular ridge extending

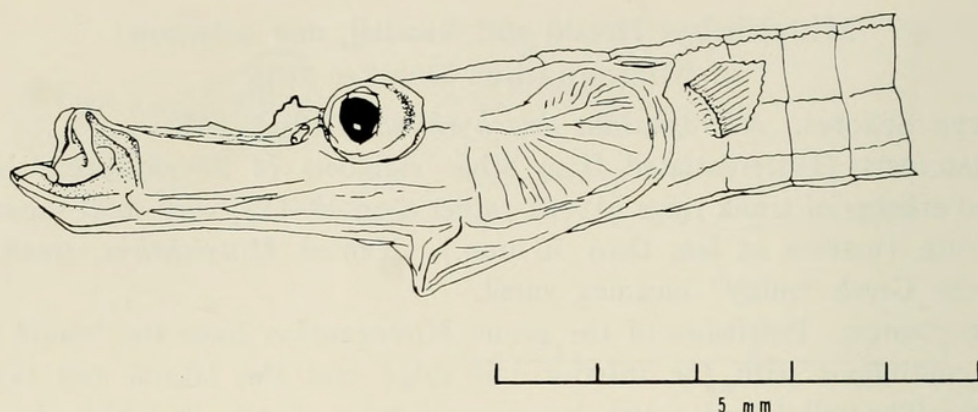


FIGURE 5. *Micrognathus myersi* Herald and Randall, Holotype; male 42.5 mm. SL (CAS 13918); NW. Cocos Island, Guam. Drawing by L. Sabre.

over half of opercle. Pectoral cover plate with faint superior and inferior ridges. Trunk and tail ridges with indentation between rings, and ridges with finely toothed edge. Base of dorsal fin resting in slight 'V.' Color light tan: holotype with indication of 4 pigment streaks extending downward from opercle and dark area on side of snout just anterior to eye. Paratype with indication of color bands formed by occasional dark spots: 7 bands or bars on trunk and 17 on tail.

DISCUSSION. Although the two type specimens are almost the same size, the holotype snout length is much greater than that of the paratype, with snout-in-head values being 2.36 and 2.7. If the other characters were not so similar, one would be tempted to consider them as closely related but separate species.

Short snouts are the mark of the subgenus *Minyichthys* as is shown even better by the two known specimens of the genotype *M. (Minyichthys) brachyrhinus* (snout-in-head 3.17). A comparison between the two species of *Minyichthys* follows:

	<i>M. (M.) brachyrhinus</i>	<i>M. (M.) myersi</i>
Dorsal fin rays	23-25	29-31
Rings covered by dorsal	$1\frac{1}{2} - 1\frac{3}{4} + 5\frac{3}{4} - 6\frac{1}{2} = 7\frac{1}{4} - 8\frac{1}{4}$	$2\frac{1}{2} - 3 + 6\frac{1}{2} - 7\frac{1}{2} = 9 - 10\frac{1}{2}$
Trunk rings	19-21	19
Tail rings	37-39	40-41
Snout-in-head	3.17-3.18	2.3-2.7
Max. known size	31 mm.	42.5 mm.
Distribution	Oahu; Ticao I. Philippines	Guam

This new species is named in honor of Stanford faculty member Dr. George Myers (retired) who has been the major professor for many of today's ichthyologists.

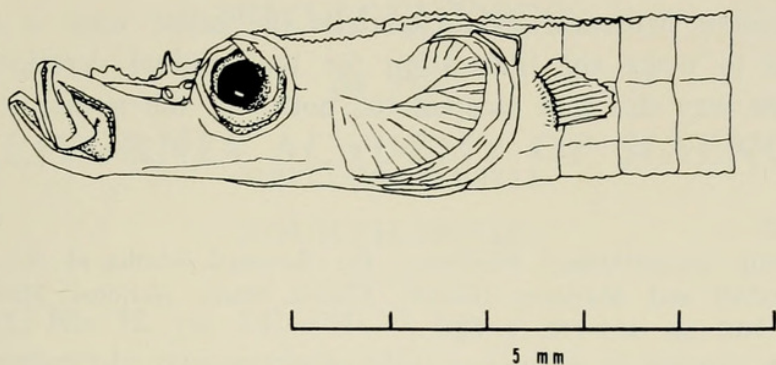


FIGURE 6. *Micrognathus myersi* Herald and Randall, Paratype; female 41 mm. SL (BPBM 7579); south of Uruno Point, Guam. Drawing by L. Sabre.

COMMENTS ON OTHER *MICROGNATHUS*

Since the senior author's *Micrognathus* study of 1953, there have been two additional new species, one in the Atlantic and one in the Pacific. In 1964 Gilbert Whitley described *Micrognathus boothae* from Australia's Lord Howe Island (off New South Wales). This species is closely related to *M. brocki* discovered at Bikini Atoll in the Marshall Islands, about 2570 miles north of Lord Howe. The two species differ mainly in the shorter snout of *M. boothae* along with its 42 rather than 37 tail rings. Three specimens are known for the two species: the female holotypes of each plus a second specimen of *M. brocki* captured by the junior author in 1968 at Ishigaki in the Ryukyu Islands. This 82 mm. female (BPBM 8755; 20–70 feet) represents a westward range extension of about 2800 miles. When more material is available of both species, it is possible that the two may prove identical.

In April and May 1971 the junior author collected four heavily-banded specimens of *Micrognathus edmonsoni* in the Marquesas. Three were taken at Nuka Hiva at a depth of 70 feet (BPBM 10857, 71 and 70 mm. SL, and CAS 13977, 62 mm.) and one was captured at 115 feet in Vaitahu Bay at Tahuata (BPBM 11936, 72 mm. SL). This is startling because previously this species had been considered a rare Hawaiian endemic. Although it was described more than 42 years ago (1930) only 7 other specimens are known from 3 localities on Oahu and Maui. This new locality extends the range about 2500 miles southward from the Hawaiian archipelago. It is entirely possible that this species is one of the deeper water syngnathids, and thus has escaped collections made by non-diving ichthyologists.

Another problem deals with a pipefish originally described as *Ichthyocampus annulatus* Macleay 1878. The two type specimens are actually *Micrognathus brevirostris* as shown by reexamination in 1971 by Dr. John R. Paxton

at the Australian Museum. Unfortunately the artist used a specimen of *Yozia* species to make the illustration for the original description, and in some unknown way this fact escaped the notice of the author.

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