ARGYRIPNUS BROCKI, A NEW SPECIES OF STOMIATOID FISH FROM HAWAII, WITH OBSERVATIONS ON *A. EPHIPPIATUS* AND *A. IRIDESCENS*

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ABSTRACT

Argyripnus brocki is proposed as a new species, and new observations on *A. ephippiatus* from the Hawaiian Islands and *A. iridescens* from Australia are presented. *A. brocki* differs from *A. atlanticus*, *A. ephippiatus*, and *A. iridescens* in possessing fewer photophores in the VAV + anterior AC series, fewer photophores in the posterior AC series, fewer gill rakers, fewer vertebrae, and a greater interorbital distance. A single small specimen of *Argyripnus* from the Indian Ocean is tentatively assigned to *A. brocki*. Evidence is presented that *Argyripnus* is primarily an inhabitant of the near-bottom community. In Hawaii, *A. brocki* and *A. ephippiatus* exhibit nonoverlapping vertical distributions.

The stomiatoid genus *Argyripnus* is poorly known. At the time of Grey's (1961, 1964) treatments of the group, only 47 specimens of the three nominal species were available for study. Because *Argyripnus* was not present in the open-sea collections of the RV *Dana*, Bruun (according to Grey, 1964) had earlier suggested that members of this genus may live near the bottom. All but 3 of the previously reported 47 specimens have been taken with bottom-fishing gear. The holotype of *Argyripnus atlanticus* Maul 1952 was taken alive at the surface off Madeira, and two specimens were collected after being killed by a lava flow entering the sea from the island of Hawaii (Gosline et al., 1954; Grey, 1961). The later specimens are the only record of *A. atlanticus* from the Indo-Pacific region.

During recent bottom trawling surveys by the NMFS (National Marine Fisheries Service, formerly the Bureau of Commercial Fisheries) in the Hawaiian Islands, numerous individuals of *Argyripnus* were taken and provide additional evidence that the members of this genus are primarily demersal. The material consists of about 460 specimens of *Argyripnus ephippiatus* Gilbert and Cramer 1897 and about 145 specimens of a new species, *A. brocki*, proposed herein. Additional observations on *A. ephippiatus* and *A. iridescens* McCulloch 1926 are also presented. I did not find specimens of *A. atlanticus* in the new Hawaiian material, and taxonomic judgments relative to this species are based on data presented by Grey (1961, 1964).

METHODS

Most sampling was done with 12.5-m (headrope) shrimp trawls (ST) constructed of 38-mm mesh (stretched) webbing in the body and cod end. Limited sampling was also done with similarly constructed 7-m and 21.5-m shrimp trawls. A discussion of the sampling effort and ichthyological results of the surveys is given by Struhsaker (1973).

Measurements were made point to point and generally are as defined by Hubbs and Lagler (1958). Measurements and counts of paired structures are usually the average of both sides. The first and second anal fins are separated at the third photophore of the middle AC series. The last two dorsal and anal rays are counted as two.

Photophore terminology is that of Grey (1964), except that in this case I follow Ahlstrom and Moser (1969) in dividing the IV

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series into the IP (isthmal) and PV (abdominal) groups. All photophores, regardless of how rudimentary, were counted. There are two closely associated gill rakers at the angle of the first arch: The upper one is associated with the epibranchial and is included in the count for the upper limb, while the lower raker is included in the count for the lower limb. The pelvic rays of most specimens of *Argyripnus* I have examined are usually split and can only be counted accurately when submerged in fluid. Most vertebral counts were obtained from radiographs.

As an aid in the analysis of the morphometric characters, measurements obtained for the various body parts of all the specimens of *Argyripnus* I examined were plotted as functions of the standard length (SL) in both original units and as percent of SL.

ARGYRIPNUS BROCKI NEW SPECIES

(Figure 1)

Holotype.—U.S. National Museum (USNM) No. 207653, female, 81.5 mm SL, collected by the NMFS RV *Townsend Cromwell* at station TC-36-24 (*Townsend Cromwell* cruise 36, station 24); north edge Penguin Bank, Hawaiian Islands, lat. 21°09.7′N, long. 157°29.3′W (start of haul), 2235-0028 (local time), 4-5 May 1968, 183 m, 12.5-m shrimp trawl (ST).

Paratypes.—Four specimens (of 10 from station), USNM 207654, 46.5, 50, 52.5, and 56 mm SL, station TC-35-33, north edge Penguin Bank (lat. 12°09.7′N, long. 157°25.0′W) 1912-2052, 7 April 1968, 183 m, 12.5-m ST. One specimen, USNM 207655, 51.2 mm SL, station TC-35-34, north edge Penguin Bank (lat. 21°09.7′N, long. 157°25′W), 2225-2353, 7 April 1968, 183 m, 12.5-m ST. One specimen, USNM 207656, 54 mm SL, station TC-35-35, north edge Penguin Bank (lat. 21°09.7′N, long.157° 24.9′W), 0127-0307, 8 April 1968, 183 mm, 12.5-m ST. One specimen, USNM 207657, 84 mm SL, station TC-35-39, Kalohi Channel (lat. 20°59.3′ N, long. 157°03′W), 1902-2007, 8 April 1968, 274 m, 12.5-m ST. Four specimens (of 21, including holotype), USNM 207658, 64.5, 70.5, 83, and 91.5 mm SL, station TC-36-24, same data as for holotype. Four specimens (of 51) USNM 207659, 64, 65, 80, and 91 mm SL, station TC-36-26, north edge Penguin Bank (lat. 21°09.7′N, long. 157°29.7′W), 0336-0521, 5 May 1968, 183 m, 12.5-m ST. Two specimens, USNM 207660, 66.5 and 75 mm SL, station TC-40-2, north edge Penguin Bank (lat. 21°09.9′N, long. 157°24.1′W), 2144-2344, 6-7 November 1968, 183 m, 12.5-m ST. One specimen, USNM 207661, 77.5 mm SL, station TC-40-16, north edge Penguin Bank (lat. 21°09.8′N, long. 157° 24.5′W), 2021-2205, 8 November 1968, 179 m, 12.5-m ST. One specimen, USNM 207662, 70 mm SL, station TC-40-20, north edge Penguin Bank (lat. 21°09.8′N, long. 157°24.3′W), 2025-2222, 9 November 1968, 12.5-m ST.

Additionally, specimens of *A. Brocki* not included in the type series were taken at the following stations during the surveys: TC-33-15 (1 specimen), Pailolo Channel (lat. 21°01.5′N,

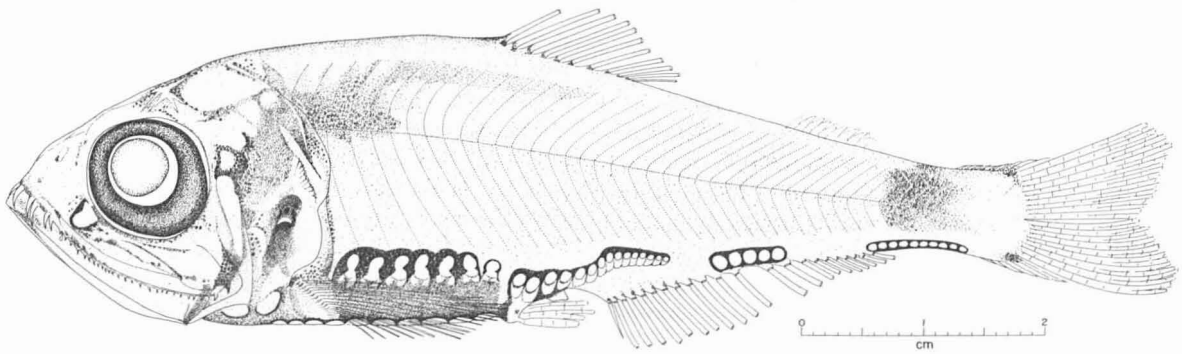

FIGURE 1.—Holotype of *Argyripnus brocki*, USNM 207653.

long. 156°45.9'W), 2028-2228, 31 October 1967, 248 m, 12.5-m ST. TC-33-25 (3), Kealaikahiki Channel (lat. 20°43.3'N, long. 156°48.6'W), 0150-0250, 4 November 1967, 224 m, 8-m ST. TC-33-37 (2), Kealaikahiki Channel (lat. 20° 41.7'N, long. 156°39.8'W), 1747-1836, 9 November 1967, 276 m, 8-m ST. TC-35-8 (1), northeast coast Hawaii Island (lat. 19°54'N, long. 155°03.1'W), 1804-1930, 29 March 1968, 280 m, 12.5-m ST. TC-35-36 (1), north edge Penguin Bank (lat. 21°10.2'N, long. 157°24.9'W), 0435-0625, 8 April 1968, 183 m, 12.5-m ST. TC-36-23 (22), north edge Penguin Bank (lat. 21°09.7'N, long. 157°25.2'W), 2019-2149, 4 March 1968, 183 m, 12.5-m ST. TC-36-35 (20), north edge Penguin Bank (lat. 21°09.7'N, long. 157°24.9'W), 0114-0245, 5 May 1968, 183 m, 12.5-m ST. TC-40-10 (7), north edge Penguin Bank (lat. 21°09.8'N, long. 157°24.4'W), 2021-2211, 7 November 1968, 181 m, 12.5-m ST. TC-40-26 (1), north edge Penguin Bank (lat. 21° 09.8'N, long. 157°24.2'W), 2023-2124, 10 November 1968, 183 m, 12.5-m ST. TC-40-61 (5), Pailolo Channel (lat. 21°02.1'N, long. 156° 44.4'W), 2026-2126, 18 November 1968, 238 m, 12.5-m ST. These specimens, and those taken at the same stations as specimens in the type series, are in the collections of the Southwest Fisheries Center, Honolulu Laboratory, National Marine Fisheries Service, NOAA.

Diagnosis

A. brocki is morphologically closest to *A. ephippiatus* and *A. iridescens*. These three species differ markedly from *A. atlanticus* in having fewer photophores in the VAV + anterior AC series and the posterior AC series. They usually have fewer gill rakers, pectoral rays, and vertebrae (Table 1). They have shorter snouts and longer upper jaws than *A. atlanticus*. The anal fins in *A. brocki*, *A. ephippiatus*, and *A. iridescens* originate below the posterior half of the dorsal fin bases, whereas the anal fin in *A. atlanticus* originates nearly below the origin of the dorsal fin.

Counts. — *A. brocki* exhibits clearcut differences from the three nominal species of this genus in having fewer photophores in the VAV + anterior AC series (17 or less in specimens 40 mm SL or longer, Figure 2, as compared with 18-28), fewer photophores in the posterior AC series (9-11 as compared with 12-18), fewer gill rakers (15-17 as compared with 18-26), and fewer vertebrae (41-43 as compared with 44-46).

Measurements. — *A. brocki* differs from *A. ephippiatus* in possessing a smaller bony orbit, greater interorbital distance, and (in specimens longer than 70 mm SL) a greater distance from snout to anal fin origin. It differs from *A. atlanticus* in possessing a greater interorbital distance, longer snout, longer upper jaw (and accordingly, a longer premaxillary and maxillary), a greater body depth, longer dorsal fin base, and a greater snout to anal fin origin distance. It differs from *A. iridescens* in that it possesses a greater interorbital distance.

Description

Meristics. — The meristics for the 20 specimens in the type series are summarized below and in Table 1. Supplementary counts for certain characters were obtained from specimens not included in the type series. The number of specimens having a particular count is given in parentheses. Occasionally, only one side of bilaterally symmetrical structures could be counted.

Gill rakers on first arch (counts for the right upper and lower limbs given first): 4/4 + 11/11(1), 4/4 + 11/12(1), 4/4 + 12/12(12), 4/5 + 12/12(2), 4/4 + 12/3(2), 5/5 + 12/12(2). The four specimens with five gill rakers on the upper limb were small, being 41-56 mm SL. Pelvic rays: 7(19). Caudal rays (primary): 10 superior, 9 inferior (20). Branchiostegals: 7 + 3 = 10(20).

Only the combined VAV + anterior AC and the posterior AC series of photophores exhibit variation. ORB: 1/1(20). OP: 3/3(20). BR: 6/6(44). IV series — IP: 6/6(43), PV: 10/10 (43). OA: 7/7(44). Middle AC: 5/5(44). Posterior AC 9-11 (Table 1). There is no obvious relation between specimen size and numbers of posterior AC photophores. The number of photophores in the VAV + anterior AC series increases with size until the full complement

TABLE 1.—Summary of meristics of four species of *Argyripnus*. Frequency data are not available for *A. atlanticus* except one vertebral count (Grey, 1964).

Total gill rakers	15	15.5	16	16.5	17	17.5	18	18.5	19	19.5	20	20.5	21	21.5	22	23	24	25	26
A. brocki	1	1	12	4	2	—	—	—	—	—	—	—	—	—	—	—	—	—	—
A. ephippiatus	—	—	—	—	—	—	2	4	20	4	—	—	—	—	—	—	—	—	—
A. iridescens	—	—	—	—	—	—	—	—	—	—	—	1	6	1	1	—	—	—	—
A. atlanticus	—	—	—	—	—	—	—	—	—	—	—	—	—	—	+	+	+	+	+

Posterior AC photophores	9	9.5	10	10.5	11	11.5	12	12.5	13	13.5	14	15	16	17	18
A. brocki	1	2	26	5	7	—	—	—	—	—	—	—	—	—	—
A. ephippiatus	—	—	—	—	—	—	2	2	15	1	10	—	—	—	—
A. iridescens	—	—	—	—	—	—	5	—	2	—	1	—	—	—	—
A. atlanticus	—	—	—	—	—	—	—	—	—	—	—	—	+	+	+

Pectoral rays	13	13.5	14	14.5	15	15.5	16	16.5	17	18	19
A. brocki	1	—	9	5	18	—	2	—	—	—	—
A. ephippiatus	—	—	2	3	20	2	1	—	—	—	—
A. iridescens	—	—	—	—	—	—	3	1	5	—	—
A. atlanticus	—	—	—	—	—	—	—	—	+	+	+

Dorsal rays	10	11	12	13
A. brocki	1	21	8	—
A. ephippiatus	—	10	1	—
A. irridescens	—	1	6	2
A. atlanticus	—	+	+	—

First anal rays	10	11	12	13	14	15
A. brocki	1	18	11	—	—	—
A. ephippiatus	—	2	24	3	—	—
A. iridescens	—	—	—	1	6	—
A. atlanticus	—	—	—	+	+	+

Total anal rays	19	20	21	22	23	24	25
A. brocki	2	3	11	12	1	1	—
A. ephippiatus	—	—	1	7	16	5	—
A. iridescens	—	—	—	—	1	2	4
A. atlanticus	—	—	—	+	+	+	+

Second anal rays	8	9	10	11	12
A. brocki	1	4	20	4	1
A. ephippiatus	—	—	8	18	3
A. iridescens	—	—	3	4	—
A. atlanticus	—	+	—	—	—

Total vertebrae	41	42	43	44	45	46
A. brocki	5	17	1	—	—	—
A. ephippiatus	—	—	—	16	2	—
A. iridescens	—	—	—	—	12	5
A. atlanticus	—	—	—	—	—	1

of 14-17 photophores is attained in specimens longer than about 65 mm SL (Figure 2). Counts for specimens in which the two sides varied are given as the average of the two.

Vertebral counts were obtained from the 20 specimens in the type series and three cleared and stained specimens. Frequency of occurrence was as follows (including urostyle): 41 vertebrae (15 precaudal + 26 caudal), 5 specimens; 42 (15 + 27), 17 specimens; 43 (15 + 28), 1 specimen. Of the five specimens with 41 vertebrae, three exhibited double neural and/or haemal spines on the penultimate vertebra. Vertebral counts for *A. ephippiatus* and *A. iridescens* are given below. Only one vertebral count (46 total) is available for *A. atlanticus* (Grey, 1964).

The number of teeth on the maxillary bone of *A. brocki* (as well as *A. ephippiatus* and *A. iridescens*) increases with growth, there being 15-16 teeth at a SL of about 50 mm and 22-30 at about 90 mm. Although *A. brocki*

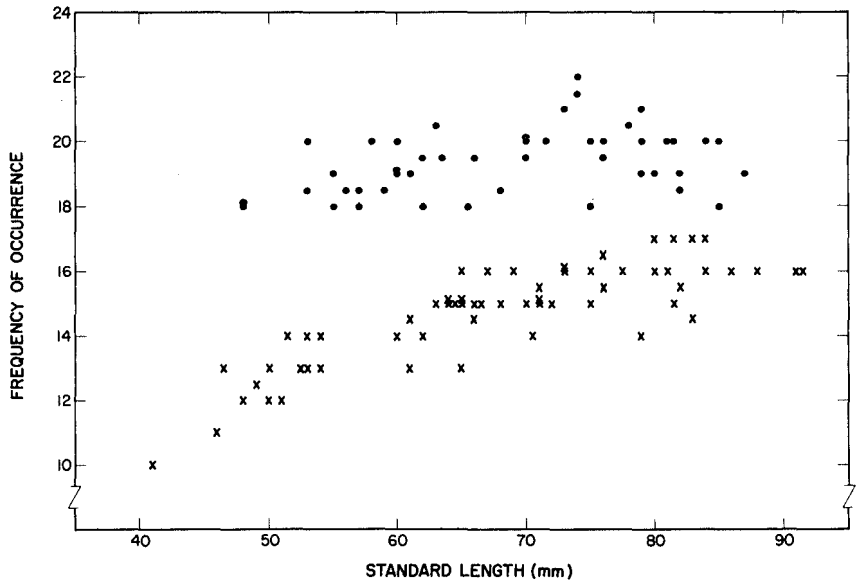

FIGURE 2.—Distribution of VAV + anterior AC photophores by standard length for 60 specimens of *Argyripnus brocki* (X) and 47 specimens of *A. ephippiatus* (dots).

exhibits a significant regression coefficient ($P < 0.001$) for this character, there is much variation ($r^2 = 0.503$) and considerable overlap with the other two species.

In addition to possessing diagnostically fewer VAV + anterior AC photophores, posterior photophores, gill rakers, and vertebrae, *A. brocki* exhibits further differences in numerical characters from the other three nominal species. The range in pectoral-ray numbers (13-16) for *A. brocki* although similar to *A. ephippiatus* (14-16) only slightly overlaps that of *A. iridescens* (16-17) and is less than that of *A. atlanticus* (17-19). The dorsal-ray counts are modally 11 for *A. brocki* and *A. ephippiatus*, while they are 12 for *A. iridescens*. The rays of the first anal fin of *A. brocki* (10-12) are fewer than for *A. iridescens* (13-14) and *A. atlanticus* (13-15), while they are modally one less than for *A. ephippiatus* (11-13). The number of rays in the second anal fin of *A. brocki* is modally one less than those of *A. ephippiatus*. Accordingly, *A. brocki* usually has one to two fewer total anal rays than *A. ephippiatus*.

Measurements. — The original measurements of the 20 specimens in the type series and their range as percent of SL are given in Table 2. Linear regressions were calculated and values for y-intercept, regression coefficient, and r^2 are also presented.

A. brocki does not differ greatly from the other species in most of the other body proportions not mentioned in the diagnosis. It does exhibit a strong tendency to be more deeply bodied than *A. ephippiatus*. Comparison with *A. iridescens* is difficult because only larger specimens are available for that species. The adipose fins of *Argyripnus* spp. exhibit considerable variation in the lengths of their bases and distances between their origins and the dorsal fins; much of this variation appears due to mechanical damage. In some specimens the adipose fin is completely missing.

The length-frequency distribution for 123 specimens of *A. brocki* is given in Figure 3. Females longer than 65-70 mm seem to be mature.

Color. — All three species examined have the same basic pigmentation pattern. The patch of black pigmentation on the upper portion of the body just behind the head is very seldom entire in specimens of *A. brocki* and *A. ephippiatus* because of chafing in the trawl, but it still appears that this patch is best developed in

TABLE 2.—*Argyripnus brocki*: Measurements (mm), ranges of proportions (percent SL), *y*-intercept (*a*), regression coefficient (*b*), and r^2 for the type series.

Standard length (mm)	46.5	50	51.2	52.5	54	56	64	64.5	65	66.5	70	70.5	75
Head length	14.5	16.6	16.0	16.0	16.5	16.5	19.0	20.6	20.6	20.0	21.0	21.8	21.5
Snout length	4.4	4.0	4.6	4.4	4.4	5.0	5.0	5.6	5.8	5.8	5.5	6.0	5.9
Orbit diameter	6.0	6.6	6.5	6.5	6.4	6.4	7.8	8.1	8.0	7.8	8.7	9.0	9.2
Interorbit width	3.8	4.0	4.2	3.8	3.8	4.2	5.0	5.2	5.0	5.2	5.2	5.9	5.4
Length of upper jaw	11.0	11.4	11.5	11.2	12.0	12.2	14.5	15.6	15.0	15.0	16.0	16.5	17.0
Length of premaxillary	5.0	5.8	5.0	5.5	5.5	6.0	6.5	6.5	7.0	7.6	7.8	7.0	7.5
Length of maxillary (toothed portion)	7.0	7.4	8.0	7.2	8.0	7.8	9.2	10.0	9.6	9.0	10.2	11.5	11.2
Greatest body depth	13.4	14.8	16.0	14.2	15.0	15.0	19.0	18.2	19.0	19.0	21.0	21.0	22.5
Least depth caudal peduncle	4.9	5.0	5.2	4.9	5.6	5.5	7.0	6.6	6.8	7.0	7.0	7.5	7.2
Length of pectoral fin	11.8	14.0	13.0	12.8	13.6	13.4	15.0	16.6	16.2	16.0	16.0	18.0	17.0
Length dorsal fin base	6.6	7.8	7.2	7.4	7.2	7.5	9.1	8.8	8.8	9.0	9.5	9.8	10.0
Length anal fin base	14.5	16.2	16.4	16.2	16.0	17.2	17.2	20.0	18.2	19.5	18.6	20.5	21.0
Length adipose fin base	5.0	5.2	4.0	—	—	4.0	—	5.8	4.4	—	3.6	—	—
Distance: dorsal to adipose	6.0	9.0	7.0	—	—	10.5	—	11.6	13.5	—	15.2	—	—
Snout to:													
Pectoral fin origin	13.2	14.8	15.5	15.0	15.0	16.0	19.0	19.0	19.0	19.4	20.0	20.4	22.0
Dorsal fin origin	22.0	24.0	24.5	25.5	25.0	26.0	31.5	31.0	32.0	31.0	32.8	34.4	35.0
Anal fin origin	26.0	28.0	28.6	28.8	29.5	31.0	35.0	38.0	36.5	39.0	40.0	40.5	46.0

Standard length (mm)	77.5	80	[1]81.5	83	84	91	91.5	Range percent SL	*a*	*b*	r^2
Head length	24.0	23.6	25.4	27.0	25.0	28.0	28.2	28.7-33.2	0.44	0.301	0.970
Snout length	6.5	6.4	7.0	7.0	7.4	7.8	7.8	7.8- 9.5	0.19	0.082	0.948
Orbit diameter	8.9	9.0	10.0	10.6	9.6	11.0	10.4	11.3-13.2	0.85	0.109	0.948
Interorbit width	6.2	6.0	6.0	6.6	6.8	7.2	7.0	7.0- 8.4	-0.03	0.078	0.952
Length of upper jaw	19.0	18.0	19.0	20.0	20.0	22.0	21.5	21.3-24.5	-1.60	0.255	0.983
Length of premaxillary	8.0	7.0	7.9	8.1	8.0	9.0	8.8	8.8-11.6	1.33	0.082	0.897
Length of maxillary (tooth portion)	12.2	12.0	12.6	13.6	13.2	14.8	14.2	13.5-16.4	-1.57	0.17	0.964
Greatest body depth	23.0	23.5	23.0	27.0	26.0	27.5	27.0	26.8-32.5	-2.02	0.324	0.967
Least depth caudal peduncle	7.2	8.0	7.8	8.5	8.2	8.8	9.0	9.3-10.9	0.55	0.092	0.954
Length of pectoral fin	19.0	17.5	19.5	18.5	20.0	21.0	21.5	21.9-28.0	2.90	0.198	0.939
Length dorsal fin base	11.0	11.5	11.9	11.5	12.0	12.5	13.0	13.3-15.6	-0.04	0.140	0.973
Length anal fin base	23.4	22.0	23.0	23.2	23.0	25.0	25.0	26.6-32.4	4.15	0.228	0.947
Length adipose fin base	5.5	6.1	6.0	8.1	6.0	5.0	7.0	5.1-10.8	2.07	0.047	0.349
Distance: dorsal to adipose	14.5	15.0	15.0	13.5	15.0	16.6	19.0	12.9-21.7	6.94	0.114	0.205
Snout to:											
Pectoral fin origin	23.0	23.0	24.0	25.2	26.0	28.0	27.2	27.8-31.0	-1.58	0.317	0.989
Dorsal fin origin	38.0	39.5	40.8	42.0	41.0	45.0	45.0	46.3-50.6	-2.52	0.521	0.990
Anal fin origin	46.0	47.0	49.5	50.2	50.0	55.8	55.0	54.6-61.3	-6.52	0.677	0.992

[1] Holotype.

A. iridescens. The black patch on the caudal peduncle is best developed in *A. brocki*, less so in *A. ephippiatus*, and is weakest in *A. iridescens*. Some specimens of *A. iridescens* possess pigmentation on the distal portions of the dorsal rays, a condition not observed in the other two species. In fresh specimens of *A. brocki* and *A. ephippiatus*, the body musculature is translucent.

Etymology. — Named for the late Vernon E. Brock in recognition of his contributions to marine biology and his encouragement and support of my studies on Hawaiian bathyal fishes.

ARGYRIPNUS EPHIPPIATUS GILBERT AND CRAMER

Measurements and counts were obtained from the following material: 12 specimens (of 256), USNM 207663, 53-87 mm SL, station TC-33-29, Kealaikahiki Channel (lat. 20°35.0′ N, long. 156°50.9′W), 1915-2100, 4 November 1967, 412 m, 7-m ST. Three specimens (of 189) USNM 207664, 62-78 mm SL, station TC-33-30, Kealaikahiki Channel (lat. 20°34.1′N, long. 156°52.2′W), 0010-0210, 5 November 1967, 400 m, 7-m ST. *A. ephippiatus* was taken at eight

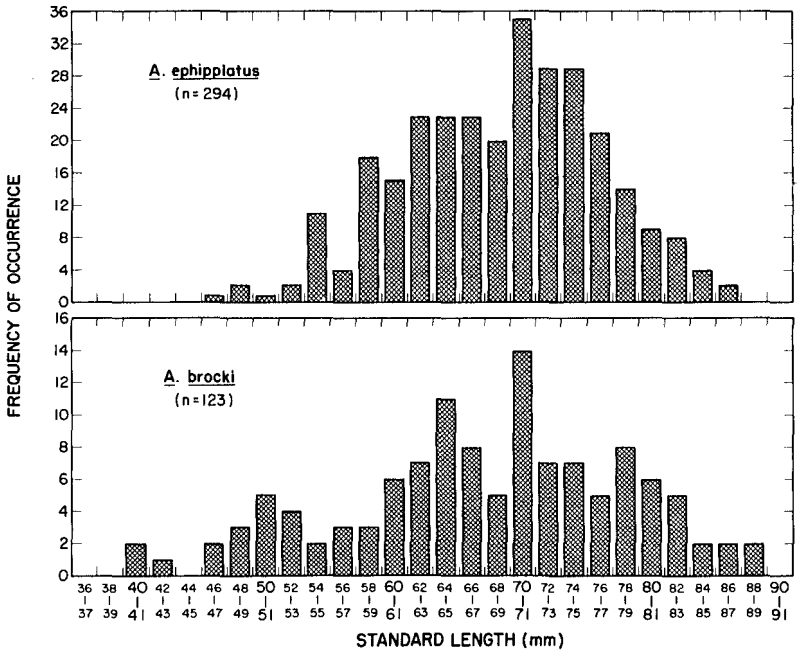

FIGURE 3.—Length-frequency distributions for 123 specimens of *Argyripnus brocki* and 294 specimens of *A. ephippiatus*.

additional stations (2-8 specimens per station), all in the 325- to 450-m depth range.

Measurements obtained from the 15 specimens are given in Table 3, while some of the counts (supplemented by randomly selected individuals from the same stations) are summarized in Table 1. The length-frequency distribution for 294 specimens is given in Figure 3. As in the case of *A. brocki*, *A. ephippiatus* females longer than 65-70 mm seem to be mature.

Gill rakers on the first arch: 5/5 + 13/13(2), 5/5 + 13/14(4), 5/5 + 14/14(20), 5/5 + 14/15(2), 6/5 + 14/14(2). Pelvic rays: 7(13). Caudal rays (primary): 10 superior and 9 inferior (9). Branchiostegals: 7 + 3 = 10(15). ORB: 1/1(15). OP: 3/3(15). BR: 6/6(15). IV series — IP: 6/6(12), PV: 10/10(12). OA: 7/7(15). Middle AC: 4/4(1), 5/5(28). Posterior AC: 12-14: (Table 1). There was no obvious relation between specimen size and number of posterior AC photophores. The number of VAV + anterior AC photophores (18-22) also increases with growth in *A. ephippiatus*, although the variation within the observed size range is not as pronounced as for *A. brocki*. The linear regression coefficient obtained for the photophore-SL relations for 47 specimens of *A. ephippiatus* (Figure 2) is significant ($P < 0.01$, but r^2 is only 0.145).

Total vertebrae for 18 specimens ranged from 44 to 45: 14 precaudal + 30 caudal, 2 specimens; 15 + 29, 14 specimens; 15 + 30, 2 specimens.

ARGYRIPNUS IRIDESCENS McCULLOCH

I have examined nine specimens of McCulloch's type series deposited in The Australian Museum. Each specimen is individually tagged, and the measurements I obtained from them are given in Table 4. Some of the counts are summarized in Table 2.

Gill rakers: 6/6 + 14/15(1), 6/6 + 15/15(6), 7/7 + 15/15(1), 6/6 + 15/16(1). Pelvic rays: 7(9). Caudal rays: 10 superior, 9 inferior (9). Branchiostegal rays: 7 + 3 = 10(9).

TABLE 3.—*Argyripnus ephippiatus*: Measurements (mm), range of proportions (percent SL), *y*-intercept (*a*), regression coefficient (*b*), and r^2 for 15 specimens.

Standard length (mm)	53	62	63	65.5	66	70	71.5	73	74	75	76	78	79	81.5	87	Range percent SL	*a*	*b*	r^2
Head length	17.4	20.6	22.0	21.0	20.0	20.4	24.0	22.0	22.2	24.4	23.5	24.0	27.0	24.0	27.0	29.1-34.9	3.57	0.266	0.787
Snout length	5.0	5.0	5.2	5.2	5.2	5.5	5.8	5.6	6.0	6.6	6.2	5.8	6.4	6.1	6.5	7.4- 9.4	1.29	0.055	0.761
Orbit diameter	7.6	9.0	9.3	9.4	9.0	9.6	10.2	10.0	10.0	10.2	10.7	11.0	11.6	11.5	12.0	13.5-14.8	0.70	0.131	0.945
Interorbit width	3.3	3.8	3.5	3.6	3.6	3.9	4.7	4.6	4.2	5.0	4.8	5.0	4.5	5.1	—	5.5- 6.7	-0.78	0.071	0.787
Length of upper jaw	12.8	15.2	15.8	15.5	15.9	16.8	17.0	16.8	16.8	18.1	17.5	17.6	18.6	19.0	21.0	22.6-25.1	1.74	0.212	0.945
Length of premaxillary	6.3	7.0	7.6	7.0	7.0	7.8	8.0	8.0	8.0	8.2	8.0	8.0	8.5	8.0	8.4	9.7-12.1	3.14	0.064	0.804
Length of maxillary (toothed portion)	8.0	10.1	10.2	10.0	10.9	11.0	11.5	11.0	10.8	11.2	11.2	12.2	12.5	13.0	14.0	14.6-16.5	0.03	0.156	0.907
Greatest body depth	14.6	17.8	18.0	17.0	17.8	20.0	20.0	20.0	19.5	20.0	20.0	21.0	22.6	21.6	25.2	26.0-28.9	-0.05	0.275	0.909
Least depth caudal peduncle	4.9	5.8	6.2	5.8	6.2	6.3	6.8	6.8	7.0	6.3	6.4	7.2	7.7	7.8	7.5	8.4- 9.8	0.63	0.083	0.828
Length of pectoral fin	13.0	14.5	16.2	16.5	17.0	18.0	17.2	18.0	17.8	17.0	18.5	17.0	19.6	19.0	21.0	21.8-25.8	2.58	0.206	0.845
Length dorsal fin base	—	7.8	7.5	8.4	8.0	9.5	8.4	9.0	9.0	10.0	9.2	10.0	10.0	11.0	—	11.7-13.6	-1.77	0.151	0.841
Length anal fin base	17.0	20.0	20.0	21.0	21.5	22.0	23.0	24.0	22.0	24.5	23.0	26.0	25.5	25.5	27.0	29.7-33.3	1.25	0.301	0.930
Length adipose fin base	—	—	—	—	—	—	6.2	—	—	—	—	8	—	—	—	8.7-10.3	—	—	—
Distance: dorsal to adipose	—	—	—	—	—	—	13.0	—	—	—	—	12	—	—	—	15.4-18.2	—	—	—
Snout to:																			
Pectoral fin origin	16.0	18.0	19.3	18.8	20.0	20.0	21.0	20.6	22.4	22.0	22.8	22.2	23.8	23.9	27.0	28.2-31.0	-0.63	0.305	0.945
Dorsal fin origin	24.5	29.0	29.0	29.6	30.0	32.2	33.5	33.0	35.5	36.0	34.5	36.0	38.8	37.5	41.5	45.2-49.1	-2.49	0.499	0.965
Anal fin origin	29.0	33.5	35.0	36.0	36.5	38.0	39.5	40.0	41.5	40.0	41.8	42.4	42.0	44.0	47.5	53.0-56.5	1.38	0.527	0.985

Counts for the ORB, OP, BR, IP, and PV series are as for other species of *Argyripnus*. VAV + anterior AC: 19.5(2), 20(7). Middle AC: 5(9). Posterior AC 12-14 (Table 1).

Total vertebrae for 17 specimens (radiographs obtained for 8 unexamined specimens) ranged from 45 to 46: 15 precaudal + 30 caudal, 12 specimens (including holotype); 15 + 31, 3 specimens; 16 + 30, 2 specimens.

McCulloch (1926) stated that *A. iridescens* was so similar to *A. ephippiatus* that he separated the two species with hesitation. The new counts presented here for the two species indicate that they should continue to be recognized.

ARGYRIPNUS SPP.

I have examined the following three specimens of *Argyripnus:* (1) 51 mm SL, USNM 207984. RV *Anton Bruun* cruise 9, station 422, Indian Ocean, lat. 6°51′N, long. 39°54′E, 19 November 1964, 100 m, midwater trawl. (2) 64 mm SL, SIO 69-19-10 (Scripps Institution of Oceanography Circe Expedition, Celebes Sea), lat. 06°00′N, long. 122°36′E, 21 April 1968, midwater trawl. (3) USNM 135402, 78 mm SL. This is the same Philippine specimen treated by Grey (1961).

Measurements obtained on selected body parts are given in Table 4. Counts that were obtained on characters that show variation in other species of *Argyripnus* are as follows (values given are for the respective specimen number). VAV + anterior AC photophores: 15, 16, 18. Posterior AC photophores: 10, 11, 12. Gill rakers: 4/4 + 11/11, 4/4 + 12/12, 2/4 + 9/12. There is no indication that the right gill arch has been damaged on the third specimen, but the higher count is taken to be "correct." Pectoral rays: 15, 17, 15. Dorsal rays: ca. 13, 12, 10. First anal rays: ca. 11, 13, 11. Second anal rays: ca. 9, 10, not available.

TABLE 4.—Measurements (mm) of nine *Argyripnus iridescens*, one *A. brocki* from the Indian Ocean (USNM 207984), and two specimens of undetermined species of *Argyripnus* (last two columns).

Specimen number	IA1347	IA1346	E4369	IA1345	E6586	E6584	IA1344	IA1349	IA1348	Range percent SL	USNM 207984	SIO 69-19-10	USNM 135402
Standard length (mm)	83.5	85	98	98	98.5	101	104	108	112	—	51	64	78
Head length	26.0	26.0	28.0	31.0	29.5	30.5	32.0	32.3	34.0	28.6-31.6	16.5	19.7	27.0
Snout length	7.0	6.6	7.5	7.0	7.6	8.0	8.0	8.2	9.5	7.1- 8.5	4.4	5.2	7.0
Orbit diameter	10.0	11.0	12.0	11.6	12.4	12.2	13.0	12.8	14.0	11.8-12.9	6.9	7.8	11.8
Interorbit width	5.4	5.2	5.9	6.0	6.0	6.0	6.8	7.0	7.0	5.9- 6.5	3.2	4.1	5.8
Length of upper jaw	18.6	18.0	21.8	21.0	21.5	23.0	23.0	23.6	25.0	21.2-22.8	12.5	15.0	19.0
Length of premaxillary	8.0	8.0	9.0	8.5	7.8	10.0	9.8	9.4	9.5	7.9- 9.9	6.0	5.8	9.0
Length of maxillary (toothed portion)	12.6	12.6	14.5	14.9	15.0	15.0	16.0	16.2	17.0	14. -15.4	8.0	11.0	13.0
Greatest body depth	21.5	23.0	27.5	27.0	26.0	30.0	30.0	31.9	32.5	25.7-29.5	15.0	18.0	22.0
Least depth caudal peduncle	7.8	8.0	9.0	8.1	8.8	—	9.2	9.6	10.0	8.3- 9.4	5.0	6.1	7.4
Length of pectoral fin	20.0	21.0	23.0	23.0	22.5	23.0	24.0	24.5	26.5	22.8-24.7	12.0	—	17.0
Length dorsal fin base	11.3	11.0	12.2	13.0	13.0	13.0	13.0	15.0	14.2	12.4-13 9	9.0	9.0	12.0
Length anal fin base	27.7	27.0	29.5	32.0	31.0	31.0	30.0	35.0	37.0	28.8-33.2	15.0	20.0	26.0
Length adipose fin base	4.2	7.0	6.2	6.0	9.0	9.0	8.0	6.8	5.5	4.9- 9.1	—	—	—
Distance: dorsal to adipose	14.6	14.0	18.0	15.0	17.0	18.0	19.0	17.0	18.0	15.3-18.4	—	—	—
Snout to:													
Pectoral fin origin	23.0	23.0	29.0	29.0	27.5	29.5	28.5	30.0	32.2	27.1-29.6	15.0	19.2	25.0
Dorsal fin origin	40.0	41.0	48.0	48.0	48.5	50.0	52.0	51.0	55.0	47.2-50.0	23.5	29.0	39.0
Anal fin origin	46.5	47.0	55.0	57.0	56.0	57.0	61.0	61.0	64.0	55.3-58.7	27.0	—	45.0

Vertebrae: 42 (15 precaudal + 27 caudal), 44 (15 + 29), 44 (15 + 29).

I tentatively assign the 51-mm specimen from the Indian Ocean to *A. brocki*. The specimen shares in common with the Hawaiian type series 19 of 23 morphological and meristic characters, including the four diagnostic counts (VAV + anterior AC photophores, posterior AC photophores, gill rakers, and vertebrae). It does not agree with the range of interorbital measurements obtained from the type series (a diagnostic character), but this may be due to geographical variation or distortion of the small specimen. Thus, the distribution of *A. brocki* may extend from Hawaii to the Indian Ocean.

Although the remaining two specimens certainly do not represent *A. atlanticus*, I cannot definitely assign them to a species because, to varying extents, they share characters with *A. brocki*, *A. ephippiatus*, and *A. iridescens*. For example, the Philippine specimen exhibits 10 body proportions similar to both *A. ephippiatus* and *A. brocki*, 3 proportions characteristic of *A. ephippiatus*, and 3 proportions characteristic of *A. brocki*. With regard to counts, there are two characters common to both *A. ephippiatus* and *A. brocki*, one common to *A. ephippiatus*, two common to *A. brocki*, and one shared by both *A. ephippiatus* and *A. iridescens*.

While this report was in press I had the opportunity to examine an approximately 60-mm SL specimen of an undetermined species of *Argyripnus* taken from the stomach of a specimen of *Etelis* captured at a depth of 280 m outside of "Grand Récif," New Caledonia. The specimen is in poor condition and only the vertebrae and gill rakers may be counted with certainty. The total vertebral count of 42 (14 + 28) places this specimen within the range of vertebral counts for *A. brocki*. However, the only *Argyripnus* specimens I have examined that possess 14 precaudal vertebrae are two individuals representing *A. ephippiatus* (all other specimens have 15 or 16 precaudal vertebrae). The gill raker count of 3 + 10 = 13 (for both sides) is two less than the lowest count obtained for *A. brocki* (which has the lowest gill raker counts of the four species treated here). The stomach of the New Caledonia *Argyripnus* specimen contains an undetermined myctophid. I thank P. Fourmanoir and Robert K. Johnson for making this specimen available for study.

ECOLOGY

The capture of large numbers of *Argyripnus* in bottom-fishing gear strongly indicates that the genus is essentially a member of the near-bottom (demersal, engybenthic) bathyal ichthyofauna. In the case of the Hawaiian specimens reported here, it seems improbable that such large numbers of *Argyripnus* would be taken during the short periods of time that the bottom-fishing trawls are effectively sampling the midwater environment. This premise is argued for by the absence of the genus in the numerous midwater trawl stations occupied by NMFS and the University of Hawaii (Thomas A. Clarke, pers. comm.) within a few miles of the Hawaiian Islands. Additionally, if the species were pelagic and being captured during the setting and hauling of the trawl, then they would be expected to be present in all the deeper hauls, including those exceeding the apparent optimal depths of the two species as indicated by the data presented here. The two specimens taken in the Indian Ocean and the Celebes Sea by midwater trawls are most likely individuals that have been displaced from the bathyal environment. If the young of this genus are pelagic like other stomiatoids, it should not be surprising to occasionally encounter a small specimen offshore. However, the possibility of established breeding populations of the genus in the oceanic realm cannot be ruled out at present.

A. brocki and *A. ephippiatus* were never taken in the same trawl haul. The capture records show that the vertical distributions of the two species do not overlap: *A. brocki* was taken at 17 stations in depths of 180-280 m, while *A. ephippiatus* appeared at 10 stations in depths of 325-450 m. This must be one of the few examples of sympatric congeneric bathyal fish species not exhibiting some degree of overlap in their vertical distributions.

A. brocki and *A. ephippiatus* were never taken between dusk and dawn. Possibly this species undergoes diel vertical migrations over the sea bottom as has been hypothesized for several other species of Hawaiian bathyal fishes (Struhsaker, 1973). Because of the relatively small numbers of specimens taken, however, the effect of net avoidance during daylight hours cannot be discounted at present.

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