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BOARFISHES OF THE GENUS *ANTIGONIA* OF THE WESTERN ATLANTIC [1]

FREDERICK H. BERRY [2]

SYNOPSIS: The recently named boarfish *Antigonia combatia* Berry and Rathjen from the western Atlantic and the deeper-bodied *Antigonia capros* Lowe from the western Atlantic and the Indo-Pacific are described, illustrated, and compared with other nominal forms from the Indo-Pacific. Appreciable individual and geographic variation characterizes *Antigonia combatia* and apparently also exists in *Antigonia capros*. The boarfishes range in the western Atlantic from off southern Brazil to off the northern Atlantic coast of the United States, in water approximately 37 to 325 fathoms deep.

INTRODUCTION

The data developed on the biology and taxonomy of the genus *Antigonia* during an analysis of the relationships of *Antigonia combatia* Berry and Rathjen (1959) comprise the basis of this study.

Specimens of *Antigonia* previously were rare in most museum collections, but the recent work in the western North Atlantic by the U. S. Fish and Wildlife Service vessels OREGON, COMBAT, SILVER BAY, and THEODORE N. GILL has produced series of specimens that add appreciably to the knowledge of this group.

The boarfish genus *Antigonia* is known from tropical and subtropical waters of the Gulf of Mexico and the Caribbean Sea, the western and eastern Atlantic Ocean, the Indian Ocean, and the western Pacific eastward to Hawaii. It has not been reported from the eastern Pacific off the American continents. Specimens are usually taken in waters of about 37 to 325 fathoms, but the larvae apparently are near-surface pelagic forms. Of the 13 nominal species that have been ascribed to this genus or its synonyms, 5 appear to be valid species: *Antigonia capros* Lowe, *Hypsinotus rubescens* Günther, *Antigonia eos* Gilbert, *Antigonia malayanus* Weber, and *Antigonia combatia*. Four others are synonyms, *Caprophonus aurora* Müller and Troschel (= *A. capros*), *Antigonia steindachneri* Jordan and Fowler (= *A. capros*), *Antigonia fowleri* Franz (= *A. rubescens*), and *Anti-*

[1] Contribution No. 27 of the U. S. Fish and Wildlife Service Bureau of Commercial Fisheries Biological Laboratory, Brunswick, Georgia.

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gonia browni Fowler (= *A. capros*). Of the four remaining, the relationships of *Antigonia rubicunda* Ogilby and *Antigonia rhomboidea* McCulloch are uncertain, *Hypsinotus benhatatate* Bleeker is a *nomen nudum,* and *Antigonia mülleri* Klunzinger is of the family Zeidae.

Two species of boarfish occur in the western Atlantic: the deep-bodied *Antigonia capros,* with body depth generally greater than standard length, known also from eastern Atlantic and Indo-Pacific waters; and the recently described *Antigonia combatia,* a shallower-bodied species known only from the western Atlantic.

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Collection Abbreviations

ANSP—Academy of Natural Sciences of Philadelphia
BBL—Bears Bluff Laboratories
BMNH—British Museum (Natural History)
CNHM—Chicago Natural History Museum
CU—Cornell University
GCRL—Gulf Coast Research Laboratory
MCZ—Museum of Comparative Zoology
MMF—Museu Municipal do Funchal, Madeira
MNRJ—Museu Nacional (Rio de Janeiro)
NAFI—North Atlantic Fishery Investigations (U. S. Fish and Wildlife Service)

SAFI—South Atlantic Fishery Investigations (U. S. Fish and Wildlife Service)
SU—Stanford Natural History Museum
TU—Tulane University
UF—University of Florida
UMML—University of Miami Marine Laboratory
USNM—U. S. National Museum

Definitions and Methods

Standard length (S.L.)—from tip of snout to middle of end of caudal base (hypural bones). All body lengths given are standard length unless otherwise specified.

Total length (T.L.)—from tip of snout to vertical of longest caudal ray.

Body depth—from origin of pelvic spine to origin of 2nd dorsal spine.

Snout to 1st dorsal origin—from tip of snout to origin of 1st spine of dorsal fin.

Snout to pectoral—from tip of snout to origin of spine of pectoral fin.

Snout to pelvic—from tip of snout to origin of spine of pelvic fin.

Snout to 1st anal spine—from tip of snout to origin of 1st spine of anal fin.

Peduncle depth—vertical depth at end of caudal base.

Anal base length—from origin of 1st anal spine to origin of last anal softray.

Third dorsal spine length—from origin to tip of 3rd spine of dorsal fin.

First anal spine length—from origin to tip of 1st spine of anal fin.

Pectoral length—from origin of pectoral spine to tip of longest pectoral softray with fin in normal position against body.

Pelvic spine length—from origin to tip of pelvic spine.

Head length—greatest distance from tip of snout to fleshy margin of operculum.

Eye diameter—greatest horizontal diameter between circumorbitals.

Snout length—least distance from tip of snout to inner margin of anterior circumorbitals.

Upper jaw length—from anteriomedian tip of upper lip (premaxillary junction) to anterioventral angle of upper jaw (maxillary).

DORSAL FIN COUNTS—the fin consists of spines continuous with softrays.

ANAL FIN COUNTS—the fin consists of spines continuous with softrays.

BRANCHING OF DORSAL AND ANAL SOFTRAYS—frequently the terminal softray in the dorsal and anal fins is branched several times below the scaly sheath, and the next to last softray may be in close proximity to the last, making an accurate count difficult.

PECTORAL FIN COUNTS—the fin consists of a spine at the fin origin and softrays. Counts were made on both pectoral fins of each fish because slight bilateral variations exist.

PELVIC FIN COUNTS—the fin consists of a spine and branched softrays.

CAUDAL FIN COUNTS—the fin consists of 4 dorsal secondary rays, one unbranched and 5 branched dorsal principal rays, 5 branched and one unbranched ventral principal rays, and 3 ventral secondary rays. The principal rays originate on the hypural bones; the secondary rays do not. Counts of secondary rays were made on only a few specimens that were cleared and stained with alizarine.

BRANCHIOSTEGAL COUNTS—branchiostegal rays were counted on each side of only a few cleared and stained specimens.

GILLRAKER COUNTS—upper limb and lower limb gillrakers were counted on the first arch.

SCALE COUNTS—the number of diagonal scale rows from the junction of the operculum and shoulder girdle to the caudal base were counted. This count was begun at the operculum-shoulder girdle junction, progressing posteriorly to about the tip of the pectoral fin (in normal position against body); the last row as counted above was traced ventrally to a level with the straight part of the lateral line on the caudal peduncle, and the count was continued to the caudal base. Because of incomplete diagonal rows and intervening rows, the counts made are considered to have an accuracy of $\pm$ 1 scale. Counts of scales along the lateral line were not recorded because most of the scales along the curved portion of the lateral line do not have pores and do not cross the lateral line, but group about it dorsally and ventrally. In sample comparisons, from about 3 to 10 more scales were counted along the lateral line of a fish than were recorded for the scale row count.

KEY TO THE SPECIES OF *Antigonia* OF THE ATLANTIC OCEAN [3]

A. Dorsal spines 9 (rarely 10); dorsal softrays 26 to 30; anal softrays 23 to 28; pectoral rays I-12 (rarely I-11 or I-13); body depth from about 15 to 70 mm. S.L. 64 to 100% S.L., above 70 mm. S.L. 62 to 85% S.L.; pelvic spine length 12 to 23% S.L. ..... *Antigonia combatia* Berry and Rathjen

AA. Dorsal spines 8 (rarely 7 or 9); dorsal softrays 31 to 37; anal softrays 29 to 34; pectoral rays I-13 (rarely I-12 or I-14); body depth from about 15 to 70 mm. S.L. 120 to 136% S.L., above 70 mm. S.L. 98 to 127% S.L.; pelvic spine length 24 to 38% S.L. ..... *Antigonia capros* Lowe

Antigonia combatia Berry and Rathjen
(Figures 1, 3, 10)

Antigonia capros (*non* Lowe), Longley and Hildebrand, 1941, p. 147 (in part; Tortugas, Florida).—Springer and Bullis, 1956, p. 89 (in part; OREGON Sta. 32, 29°10′ N., 85°55′ W., Sta. 1026, 25°08′ N., 84°19′ W., and Sta. 1343, 22°59′ N., 79°17′ W.).

Antigonia browni (*non* Fowler); Fowler, 1952, p. 4 (off Boynton Beach, south of Sombrero Key Light, and southeast of Sand Key Light, Florida). —Briggs, 1958, p. 271 (in part; based on Fowler, 1952, p. 4; southern Florida).

SYNONYMY: It is probable that in their description of *A. capros* from Tortugas, Longley and Hildebrand (1941: 147) considered two specimens of *A. combatia*, USNM 171784 and USNM 116755, collected by W. H. Longley from south of Tortugas, Florida, and bearing the identity label of *A. capros*. The three paratypes of *A. combatia* that Fowler (1952: 4) identified as *A. browni* from off southern Florida are cataloged as ANSP 74840, ANSP 75409, and ANSP 75410.

DIAGNOSIS: [4] An *Antigonia* with dorsal spines 9 (rarely 10), dorsal softrays 29 (26 to 30), anal softrays 27 (23 to 28), pectoral I-12 (rarely I-11 or I-13), scale rows 53 (about 49 to 57), body depth 66.7 (100.8 to 62.4), third (longest) dorsal spine length 16.2 (30.2 to 16.2), first (longest) anal spine length 7.7 (16.2 to 7.7), pelvic spine length 12.4 (22.6 to 12.4), upper jaw length 9.0 (8.1 to 11.1).

DESCRIPTION: Counts and measurements are given in tables 1, 2, and 3. Body compressed and elevated. Greatest vertical body depth (from base of 2nd spine of dorsal fin to pelvic spine origin)

[3] Nominal species of Indo-Pacific distribution are not keyed because of their uncertain relationships. They are distinguished in the sections on relationships.

[4] The number after each character is the value recorded for the holotype. Numbers in parentheses following this are ranges in values of all specimens. Where the proportion decreases with growth, the larger extreme of the range is placed first. Body proportions are in percent of standard length (% S.L.). This procedure is followed in the Description.

66.7 (100.8-62.4), decreasing in proportion to S.L. with growth (fig. 4). Greatest body width (near lateral midline of body at cleithrum) 19.7 (value of holotype only). Snout to 1st dorsal spine 50.0 (69.4-50.0), decreasing in proportion to S.L. with growth. Snout to pectoral origin 38.0 (46.8-36.4), decreasing in proportion to S.L. with growth. Snout to pelvic origin 57.7 (73.5-54.9), decreasing in proportion to S.L. with growth. Snout to 1st anal spine 68.8 (84.5-66.7), decreasing in proportion to S.L. with growth. Caudal peduncle deeper than long, its depth at caudal base 12.0 (16.2-11.9), decreasing in proportion to S.L. with growth. Lateral line curving upward to below about 4th dorsal spine, then curving downward approximating the dorsal body contour posteriad to midline of body below the dorsal softrays, extending past the caudal base, and ending immediately anterior to the termination of the scaly covering of the caudal ray bases.

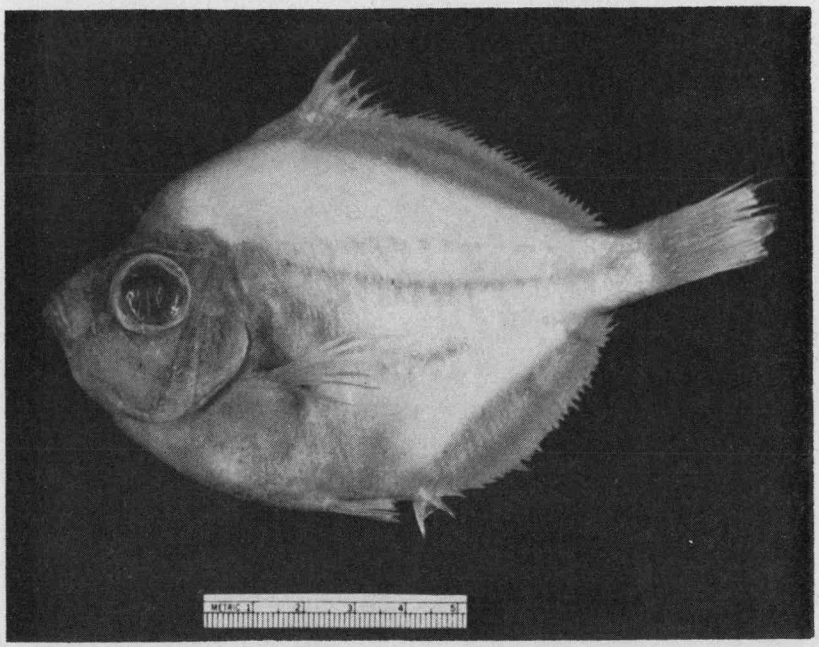

Figure 1. *Antigonia combatia,* holotype, USNM 159597, 117 mm. in standard length, COMBAT Sta. 259, 24°29′ N., 83°28′ W., southwest of Tortugas, Florida.

Head length 34.2 (43.4-34.2), decreasing in proportion to S.L. with growth. Profile changing with growth (fig. 3); an apex produced by upper end of supraoccipital crest with concavities between apex

and dorsal origin (fig. 3: F, K, P, Q) and between apex and snout (fig. 3: E, T, and others); these concavities varying with growth stage and individuals (fig. 3: B, J). Snout length 10.3 (12.5-9.9), decreasing only slightly in proportion to S.L. with growth. Cleft of mouth angular. Lower jaw slightly projecting. Upper jaw length (fig. 7) 9.0 (8.1-11.1), growing nearly in direct proportion to S.L. Eye diameter 13.2 (20.4-13.2), decreasing in proportion to S.L. with growth. Bony interorbital width 10.4 (value of holotype only). Denticulated ridges, about 12 to 15 in a definite pattern on head above eye, curving anteriad to posteriad. Denticulated ridges on snout below and in front of eye, on preopercle and subopercle.

Teeth small and conical in a narrow band in front and partially around the side of each jaw. No teeth on vomer, palatines, or tongue.

Gillrakers moderate, 5 (3-5) + 16 (14-16). Branchiostegals 6.

Dorsal spines 9 (9-10) (table 1). One specimen with 10 spines, cleared and stained, 65.5 mm. S.L., has 10th spine and 1st softray articulating with same interneural spine, while other stained specimens with 9 spines have separate interneural spines for the 9th spine and the 1st softray. One specimen with 9 spines has the 7th spine split to about three-fourths the distance from the tip, forming two points. Third spine the longest 16.2 (30.2-16.2), generally decreasing in proportion to S.L. with growth; 1st spine the shortest; 2nd spine the next to the shortest in length; and the 3rd through the last spine in a graduated series decreasing in length posteriad. First and second dorsal fins continuous, shallowly notched at connection.

Anal spines 3 (3). One aberrant specimen, 66 mm. S.L., has elements of all 3 spines fused into one spine mass. First spine the longest 7.7 (16.2-7.7), generally decreasing in proportion to S.L. with growth; the 2nd and 3rd spines successively shorter. Third spine and 1st softray connected by a shallow notched membrane.

Dorsal softrays 29 (26 to 30). Anal softrays 27 (23 to 28) (table 2). In both fins the 2nd softray is the longest; the 1st softray is unbranched in smaller specimens and is slightly branched in some larger specimens, the last softray is frequently branched 6 or 7 times to the scaly sheath in specimens of all sizes, and the other softrays are moderately branched in specimens of all sizes (softrays broken in many specimens). Proximal portion of the softrays covered by a fleshy, scale-covered sheath. Anal fin base length 44.4 (55.2-40.7), decreasing in proportion to S.L. with growth.

Caudal fin subtruncate. Caudal principal rays 6 + 6 (in all specimens); the most dorsal ray and the most ventral ray are unbranched,

TABLE 1

RELATION OF NUMBER OF DORSAL SPINES TO NUMBERS OF PECTORAL SOFTRAYS FOR *Antigonia combatia* (179 SPECIMENS) AND *Antigonia capros* (103 SPECIMENS). PECTORAL SOFTRAY COUNTS ARE FROM BOTH SIDES OF EACH FISH, AND THE SINGLE SPINE ON EACH SIDE IS NOT INCLUDED IN THIS COUNT. NUMBER OF SPECIMENS WITH EACH COMBINATION IN PARENTHESES.

		PECTORAL SOFTRAYS (Spine of each fin excluded from count)				
		11 - 12	12 - 12	12 - 13	13 - 13	13 - 14
DORSAL SPINES	VII				capros (1)	
	VIII			capros (3)	capros (93)	capros (3)
	IX	combatia (1)	combatia (161)	combatia (11)	capros (3) combatia (3)	
	X		combatia (1)	combatia (1)	combatia (1)	

TABLE 2

RELATION OF NUMBERS OF DORSAL SOFTRAYS TO NUMBERS OF ANAL SOFTRAYS FOR 177 SPECIMENS OF *Antigonia combatia* (com) AND 97 SPECIMENS OF *Antigonia capros* (cap). NUMBERS ARE THE COUNTS OBTAINED FOR EACH COMBINATION.

ANAL SOFTRAYS	DORSAL SOFTRAYS											
	26	27	28	29	30	31	32	33	34	35	36	37
23	—	—	com	—	—	—	—	—	—	—	—	—
	—	—	1	—	—	—	—	—	—	—	—	—
24	—	com	com	—	—	—	—	—	—	—	—	—
	—	1	1	—	—	—	—	—	—	—	—	—
25	com	com	com	com	—	—	—	—	—	—	—	—
	2	11	12	2	—	—	—	—	—	—	—	—
26	com	com	com	com	com	—	—	—	—	—	—	—
	1	14	57	25	2	—	—	—	—	—	—	—
27	—	—	com	com	com	—	—	—	—	—	—	—
	—	—	10	32	5	—	—	—	—	—	—	—
28	—	—	—	—	com	—	—	—	—	—	—	—
	—	—	—	—	1	—	—	—	—	—	—	—
29	—	—	—	—	—	cap	—	cap	cap	—	—	—
	—	—	—	—	—	1	—	1	2	—	—	—
30	—	—	—	—	—	—	cap	cap	cap	—	—	—
	—	—	—	—	—	—	4	6	4	—	—	—
31	—	—	—	—	—	—	cap	cap	cap	—	—	—
	—	—	—	—	—	—	2	15	18	—	—	—
32	—	—	—	—	—	—	cap	cap	cap	cap	—	cap
	—	—	—	—	—	—	2	9	18	5	—	1
33	—	—	—	—	—	—	—	—	cap	cap	cap	—
	—	—	—	—	—	—	—	—	6	1	1	—
34	—	—	—	—	—	—	—	—	cap	—	—	—
	—	—	—	—	—	—	—	—	1	—	—	—

TABLE 3

RANGES OF MEASUREMENTS OF BODY AND FIN PARTS (IN PERCENT OF STANDARD LENGTH) FOR DESCRIBED SIZES OR SIZE RANGES OF *Antigonia combatia* AND *A. capros*

Species	Locality	No.	Standard Length	Body Depth	Snout to 1st Dorsal	Snout to Pectoral	Snout to Pelvic	Snout to 1st Anal	Peduncle Depth	Anal Base
Antigonia combatia	Atlantic & Gulf U. S.	18	100–118	63.6– 73.5	50.0–54.0	37.7–39.7	56.1–62.3	68.2–77.9	11.9–13.2	40.7–46.6
		11	79–99	66.7– 79.7	50.3–56.0	36.4–41.1	54.9–64.1	68.2–77.8	12.0–13.6	42.5–50.0
		1	62	87.1	57.3	40.3	66.1	75.8		51.6
		9	31–45.5	89.6–100.6	61.3–69.4	40.6–45.1	62.7–73.5	75.2–84.5	14.0–15.5	50.6–55.2
		2	23.5–26	92.3–100.8	63.5–68.5	45.0–46.8	69.2–70.2	82.7–83.0	15.8–16.2	49.6–52.3
	Cuba	1	100	85.0	57.0	42.0	66.0	76.5	14.0	48.0
	Honduras & Nicaragua	2	60.5–65	86.0– 90.8	56.7–60.0	41.3–41.5	63.6–66.9	75.2–78.5	13.8–14.0	51.2–54.3
		4	40.5–42	84.5– 91.6	60.0–62.7	40.5–41.0	61.9–66.7	72.6–76.5	13.6–15.4	49.4–50.6
	British Guiana	6	69–84.5	75.4– 85.1	51.4–56.3	39.7–41.5	61.9–63.8	71.0–75.2	12.6–13.5	46.8–51.1
		2	57–60	85.1– 89.2	55.3–56.7	40.8–41.2	63.2–66.7	74.2–75.8	13.5–13.7	50.9–53.3
	Surinam	32	61–83	62.4– 77.2	50.3–55.9	37.0–43.6	56.4–69.7	66.7–75.5	11.7–13.3	41.3–47.9
		9	51–59.5	78.2– 81.7	53.6–58.5	40.2–44.2	62.6–69.2	72.2–78.3	12.6–14.2	47.0–50.9
		2	39.2–44.5	87.6– 94.4	58.4–60.7	42.7–43.6	67.4–68.9	76.4–79.1	13.5–14.3	51.7–53.6
	Brazil	3	69–81	64.8– 73.8	50.6–52.3	37.7–39.7	55.6–57.6	67.9–70.9	11.9–12.5	42.1–43.5
		6	56–67.5	64.9– 75.2	51.1–54.6	38.8–42.7	57.3–65.0	67.2–74.4	12.1–13.0	42.0–44.7
		3	32–51.5	72.8– 92.2	51.5–62.8	38.8–44.4	59.2–68.8	68.9–75.6	13.6–14.7	44.7–51.3
Antigonia capros	Madeira	1	138	105.8	67.3	39.7	67.8	79.0	14.2	56.2
	Atlantic U. S.	3	109–127	105.5–122.2	60.9–67.6	37.4–39.8	71.5–78.7	79.7–88.4	13.8–15.3	55.9–63.9
		4	68.5–85	111.7–122.4	64.8–70.1	38.2–41.2	76.4–78.2	83.9–85.9	14.2–15.3	58.2–63.1
		5	50–65.5	118.7–134.3	66.7–77.2	40.4–42.0	78.1–82.9	85.1–91.1	13.6–15.8	63.6–66.7
		3	44.5–48	116.7–132.6	64.6–71.7	39.6–43.5	79.2–83.7	85.4–90.0	15.2–15.2	60.4–67.4
		1	26	129.2	75.0	44.2	81.9	86.5	16.9	69.2
	Gulf U. S.	19	110–134	98.3–108.7	59.6–65.0	37.4–40.9	69.3–74.8	76.4–83.5	13.9–15.8	52.5–61.0
		11	100–109	100.9–113.6	60.2–66.5	37.7–40.8	70.2–76.1	78.6–85.8	13.9–16.5	52.8–60.8
		16	69.5–97	108.5–126.6	62.7–71.2	36.2–41.3	71.2–79.1	78.0–87.1	14.0–16.2	57.1–65.5
		3	52–58.5	117.1–127.9	68.4–70.3	40.5–45.2	77.8–83.7	86.3–91.3	15.0–16.2	60.7–65.4
		8	39–47.5	125.3–136.0	70.5–76.7	40.9–43.0	80.9–85.4	88.2–92.7	12.8–16.1	65.3–69.8
		3	25.5–29	125.9–132.1	72.4–74.7	43.1–43.9	81.0–86.0	87.9–92.5	16.2–16.9	64.5–65.1
	Honduras & Nicaragua	1	131	103.8	62.2	38.2	72.1	76.6	14.9	57.3
		4	76–88.5	110.2–121.7	65.5–68.5	37.8–41.3	72.9–78.3	81.4–86.2	13.4–15.8	61.0–64.5
		6	38–59	120.3–131.2	69.5–74.1	42.4–46.1	79.7–86.0	85.9–92.0	14.1–14.6	
	Surinam	2	45.5–57.5	120.0–124.2	70.3–70.4	42.4–43.5	78.3–80.9	85.2–86.8	13.6–14.6	61.2–63.7
		2	88.5–89	106.8–110.1	62.7–63.7	39.3–39.8	72.0–75.3	79.1–82.2	14.6–14.7	58.4–58.8

TABLE 3—Continued

Species	Standard Length	3rd Dorsal Spine	1st Anal Spine	Pectoral Length	Pelvic Spine	Head Length	Eye Diameter	Snout Length	Upper Jaw Length
Antigonia combatia	100–118	16.2–22.1	7.7–11.1	28.5–33.3	12.4–15.5	34.2–38.2	13.2–16.0	9.9–11.6	8.3– 9.8
	79–99	18.4–23.8	8.2–12.7	30.3–33.3	13.2–17.8	35.4–38.8	14.3–16.0	10.0–11.8	9.0– 9.7
	62	28.4	13.7	34.2	19.2	37.9	15.5	11.0	8.9
	31–45.5	25.7–28.1	12.7–16.2	33.7–38.7	15.9–22.6	38.4–41.9	14.9–17.8	10.5–12.5	8.4– 9.1
	23.4–26	25.0–29.4	11.9–12.8	38.8–40.4	16.5–19.6	41.9–43.4	18.5–20.4	11.5–12.3	8.1–10.2
	100	24.5	12.5	32.3	17.5	39.0	16.4	11.7	9.9
	60.5–65	27.3–30.2	14.0–16.2	33.8–34.0	18.2–20.6	37.1–37.4	16.2–16.9	10.8–11.7	9.8–10.2
	40.5–42	23.3–28.9	13.6–14.8	35.7–38.3	18.8–20.5	37.8–39.8	15.9–19.8	10.8–11.9	8.4–10.5
	69–84.5	21.9–23.9	13.0	32.3–34.5	16.8–18.4	37.6–39.3	15.5–17.8	10.6–11.9	9.6–10.6
	57–60	24.6	12.3–13.5	36.3	17.7–20.0	39.5–40.0	15.0–16.0	11.0–11.4	9.1– 9.8
	61–83	17.2–23.1	8.9–11.8	30.1–36.2	14.1–18.2	36.8–40.9	15.4–18.9	9.9–12.3	9.2–11.1
	51–59.5	22.3–26.5	11.5–13.8	31.9–35.8	17.3–20.2	37.4–40.4	15.9–16.5	10.1–11.8	9.2–10.0
	39.2–44.5	25.8–28.1	13.5–13.8	34.2–36.7	18.0–20.4	40.4–41.6	15.7–16.6	11.5–12.1	8.9– 9.9
	69–81	17.3–19.9	8.3–10.3	31.5–33.1	14.5–14.9	36.7–38.0	14.9–15.9	10.9–11.4	9.7–10.3
	56–67.5	18.9–23.1	9.2–12.0	33.0–36.8	14.0–16.4	37.1–40.2	15.9–17.9	11.1–12.4	10.0–11.1
	32–51.5	22.2–26.1	12.6–14.7	35.0–36.0	17.1–18.9	36.9–40.9	16.5–17.5	10.5–12.0	9.3– 9.5
Antigonia capros	138	26.4		31.4	28.0	37.3	16.9	11.0	8.7
	109–127	27.3–30.0	15.2–18.5	31.3–34.7	26.0–27.0	33.9–38.0	13.4–14.8	9.4–11.7	7.4– 9.1
	68.5–85	29.6–38.2	14.6–20.4	33.3–35.0	24.1–31.2	35.8–38.2	15.3–16.1	8.9–11.1	8.9– 9.5
	50–65.5	33.3–44.5	17.4–21.6	36.0–40.2	29.8–35.3	36.6–40.2	15.8–18.8	8.9–11.6	8.2– 9.6
	44.5–48	33.3	16.3–19.8	35.4–38.0	27.1–31.2	35.4–40.4	15.4–17.4	9.6–10.1	8.1– 8.9
	26		15.4	41.5	27.7	42.3	16.5	8.8	7.7
	110–134	23.3–30.0	14.1–16.7	31.1–36.6	24.8–28.7	33.9–39.2	13.4–16.4	8.8–11.7	7.4– 9.7
	100–109	25.7–29.8	14.2–16.6	31.5–37.5	26.5–28.4	35.3–37.6	14.4–15.6	9.4–10.7	8.1–10.0
	69.5–97	28.9–37.1	15.4–18.5	33.3–35.9	26.0–33.1	35.1–37.4	14.0–16.3	9.0–11.2	8.6– 9.9
	52–58.5	35.0	13.9–19.8	36.2–40.4	30.8–35.1	37.8–38.5	16.2–18.3	10.5–10.9	8.1– 9.2
	39–47.5	35.5–43.0	16.8–20.9	35.8–40.0	32.6–37.2	36.4–40.7	15.9–17.9	9.8–11.6	7.3– 9.6
	25.5–29	33.2	15.5–17.6	38.6–39.2	30.2–30.6	37.9–41.2	17.0–17.3	9.8–10.7	7.5– 7.9
	131		16.0	34.4	26.0	35.1	13.7	10.5	8.8
	76–88.5	27.7–36.2	16.6–20.5	35.6–38.0	28.2–34.9	36.6–38.2	14.9–16.6	9.7–10.3	9.0– 9.9
	38–59	35.6–36.5	17.5–19.1	38.6–43.5	29.7–32.9	39.0–42.1	17.1–20.2	9.5–11.1	9.1–10.2
	45.5–57.5	38.3	18.3–18.7	37.4–39.6	36.0	37.9–44.0	17.6–19.1	9.9–10.3	8.8–10.4
	88.5–89	29.5–31.5		34.5–35.4	27.1–29.9	34.5–35.6	15.4–15.5	10.1–10.4	8.5– 9.0

others branched. Caudal secondary rays 4 + 3 (in seven cleared and stained specimens). Continuation of fleshy part of body extending posteriad over bases of caudal rays covered by about 5 vertical rows of scales.

Pectoral fin bluntly pointed. Pectoral rays I-12 (rarely I-11 or I-13) (table 1). Length of pectoral spine decreasing in proportion to length of pectoral softrays with growth. First softray unbranched, others branched. Pectoral length 29.1 (40.4-28.5), decreasing in proportion to S.L. with growth. Third or fourth softray the longest. Inserted in advance of a vertical to 1st dorsal fin origin.

Pelvic fin pointed. Pelvic rays I-5 (in all specimens), 5th softray rudimentary in one small specimen, rays connected by a membrane, membrane connects 5th softray to body. Pelvic spine length 12.4 (22.6-12.4), decreasing in proportion to S.L. with growth (fig. 5). First softray the longest element of the fin. Inserted below 1st dorsal fin.

Scale rows 53 (about 49 to 57). Body completely scaled except for small bony area immediately above pectoral origin. Scales cover mandibles (exposed portion), cheeks, throat, opercle; few scales on interopercle and subopercle and on and above snout. Scale rows, usually single, extend along each (lateral) side of the spines of the dorsal, anal, pectoral, and pelvic fins, and on the softrays of the pelvic fin. Several scale rows extend distally on the membranes between the softrays of the pectoral and caudal fins.

Most body scales have on exposed portion an elevated ridge that is bent posteriorly, aligned dorsoventrally, and denticulated on the distal margin. Most body scales also have, arising from scale base and with same alignment as the longer ridge, about 2 to 20 flattened ridgelike structures bearing from 1 to 4 points or denticles (fig. 2). Scales immediately below the dorsal softrays and on lower portion of the peduncle tend to lack the smaller ridgelike structures, and the number of these structures apparently increases with growth. Scales on bones of head have ridges aligned dorsoventrally along central part of scale, those on body with ridges on posterior portion of scale. Group of scales posterior to horizontally curving denticulated ridges above the eye have a centrally located crescentic ridge. On most body scales circuli originate at base of the dorsoventral ridge and align with contour of anterior field of the scale. Radii occur on imbedded portion (fig. 2).

Pigmentation essentially faded out on preserved specimens. A light orange area at the dorsal and anal fin bases over the position of the interneurals and interhemals, and a narow orange stripe sloping from the operculum-shoulder girdle junction to the midline of the

body at the caudal peduncle are visible on many of the specimens in formalin. A Kodachrome slide (35 mm.) taken of several specimens immediately after capture at OREGON Sta. 2013 shows the dorsal aspects of the head and body to be reddish pink blending into pink on the sides and then into silver on the ventrolateral aspects.

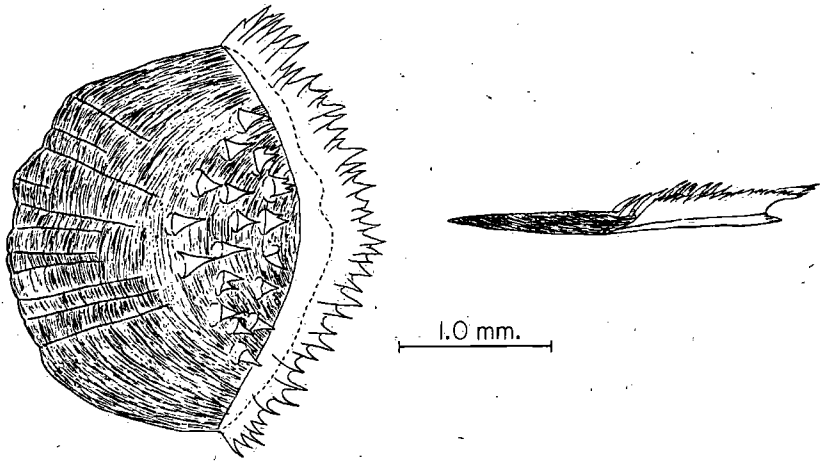

Figure 2. Top and side views of scale of holotype of *Antigonia combatia*, taken from below lateral line under second dorsal fin. Line of dashes on top view represents the posterior extension of the scale base, lying beneath the elevated dorsoventral ridge.

Gonads were developed in specimens from five collections. (1) Off Tortugas, Florida, COMBAT Sta. 259, 7 March 1957: 1 male (107 mm., with flacid testes that may have been partially spent); 2 females (111 and 117 mm., with well developed ovaries containing enlarged eggs). (2) West of Tortugas, Florida, OREGON Sta. 1026, 19 April 1954, 29 specimens: 2 with gonads not developed (38.5 and 39.5 mm.); 10 males (62 to 111 mm., mean size 91.2 mm.; smallest with slightly developed testes, others from 80 to 111 mm. with well developed testes); 17 females (79 to 118 mm., mean size 102.4 mm.; all with enlarged eggs in ovaries). (3) Off northern Cuba, OREGON Sta. 1343, 16 July 1955: 1 female (100 mm., with ovaries smaller than previously listed females and containing moderately developed eggs). (4) Off Surinam, OREGON Sta. 2013, 8 November 1957, of 107 specimens: 2 with gonads not developed (39.2 and 44.5 mm.); 58 males (51 to 75.5 mm., mean size 65.9 mm.; testes very enlarged in specimens larger than 65 mm.); 47 females (52 to 83 mm., mean size 68.8 mm.; specimens 55 mm. and smaller with small ovaries containing small eggs, specimens 55.5 mm. and larger with very large ovaries containing well developed eggs

and one of these appeared to be running-ripe). (5) Off Amazon River, OREGON Sta. 2066, 15 November 1957, 11 specimens: 2 with gonads not developed (37.5 and 51.5 mm.); 3 males with slightly developed testes (56, 58.5, and 64 mm.); 2 males with well developed testes (65.5 and 67.5 mm.); 4 females with well developed ovaries (66, 69, 75.5, and 81 mm.). Although Weber and de Beaufort (1929: 267) stated that males of *A. malayanus* had longer pelvic fins than the females, I found no such discrete differences attributable to sexual dimorphism in *A. combatia*. Of the specimens from OREGON Sta. 1026, the males tended to have shorter pelvic spines and a lesser body depth than the females, but the values were decidedly overlapping.

The smallest paratype, estimated at about 19 mm. S.L., from the stomach of a *Thunnus atlanticus* (Lesson), has the tail and peduncle and most of the fin rays missing. Its body depth (19.1 mm.), 1st anal spine length (2.4 mm.), pelvic spine length (3.4 mm.), and other body measurements identify it as continuous with the *A. combatia* series and as distinct from small *A. capros*. This specimen was identified as *A. capros* in Anderson and Gehringer (1957: 53).

DISTRIBUTION: *Antigonia combatia* is recorded from off Brazil (Amazon River), Surinam, British Guiana, Caribbean Nicaragua and Honduras, the Leeward Islands, northern Cuba, Florida, North Carolina, and Massachusetts (fig. 8).

DEVELOPMENT AND GEOGRAPHIC VARIATION: The possibility that the specimens designated as paratypes of *A. combatia* may comprise two or more species was considered. The variations in body proportions and estimated relative growth of specimens from different localities suggested this, and the future acquisition of an adequate size series of specimens from other localized areas of the western Atlantic may demonstrate the description of *A. combatia* to be based in part on a yet undescribed species. However, the differences encountered in this series of specimens more probably are attributable to individual and geographic intraspecific variation.

The more conspicuous changes during growth of *A. combatia* are a depression of the body outline (decrease in body depth), and a proportional decrease in the lengths of the dorsal spines (principally the 3rd), the anal spines (principally the 1st), and the spine of the pelvic fins (compare F through J of fig. 3).

Table 3 shows that all of the body parts measured increase in size or length more slowly than the standard length. Therefore these body parts are proportionally smaller on large fish than on small fish. The proportional decrease of body depth to standard length with growth is apparent in figure 4.

Although the data available and the size range of specimens are incomplete, comparisons between collections from off Brazil (Amazon River), Surinam, British Guiana, Nicaragua, Honduras, Cuba, and the United States coast in the Gulf of Mexico and the Atlantic—each of progressively more northern latitude—indicate that the southern populations reach comparable stages in their allometric or heterogonic growth at smaller body sizes than the northern populations.

Specimens from off British Guiana, from the Caribbean, and from the Gulf and Atlantic off the United States seem to be closely related in this differential development, for specimens of similar size have generally similar body proportions. This group differs most from the specimens from off Surinam and Brazil, with the Brazilian specimens showing the most extreme divergence. Geographic variation is manifest in several body proportions, as may be seen in the relation of body depth to standard length in figure 4. At smaller sizes, estimated between 15 and 30 mm. S.L., specimens from the different localities apparently are directly comparable, so that measurements of both depth and standard length of a small specimen from off Brazil might be expected to equal both these measurements for a specimen of the same size from off the United States. However, at sizes larger than 30 or 40 mm. S.L., geographic variation is apparent in comparison of specimens of similar length. The more southern, Brazilian specimens average the least body depth. The Surinam specimens average a lesser depth than those from more northern localities. Specimens from British Guiana to the United States apparently average a more closely comparable depth-length relation (an incomplete series of specimens limits this interpretation), and have greater depths than specimens from Surinam and Brazil. The 100-mm. Cuban specimen (fig. 3: O) has a greater depth than specimens of similar length from the United States, but is generally similar in depth and other body proportions and in body outline to some smaller specimens from more southern localities, as to the 65-mm. Honduran specimen (fig. 3: N). The 82.5-mm. specimen from off Surinam has a slightly different head and body profile and less body depth (62.4% S.L.) than all other specimens, and it may represent the ultimate stage in the development of body outline (fig. 3: J). The northern populations probably attain greater lengths than those to the south.

Assessment of the relative positions of the coordinates of the groups of specimens in figure 4 suggests that the relative increase of body depth to standard length is heterogonic, and that a complete series of specimens from any locality might be described adequately by a curvilinear regression or by rectilinear regressions interrupted by at

least two growth inflections. Other body parts or measurements—snout to 1st dorsal spine, snout to 1st anal spine, snout to pelvic, 1st anal spine length, and 3rd dorsal spine length—are similar to body depth, both in showing a geographic difference in relative growth and in having a heterogonic growth pattern.

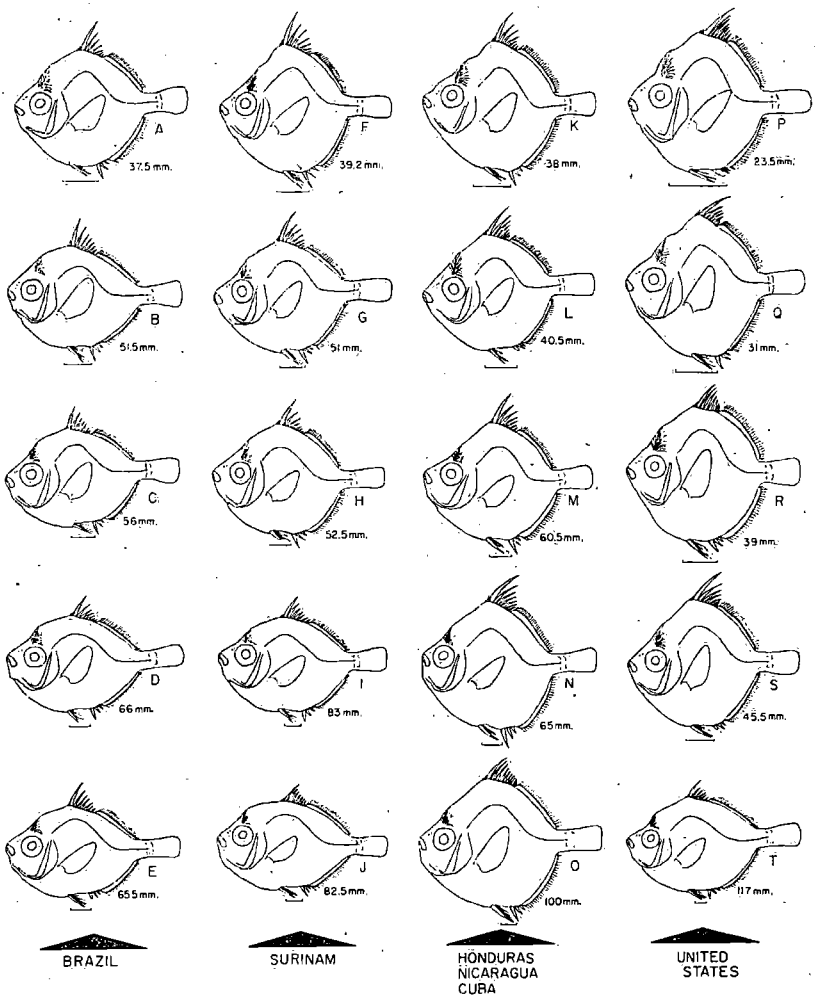

Figure 3. Body outlines of specimens of *Antigonia combatia* from five different areas, illustrating intraspecific changes occurring with growth and variation in outline, and interpopulation differences in degrees of development. Reference line under each outline represents 10 mm. Body length for each specimen is given in millimeters of standard length.

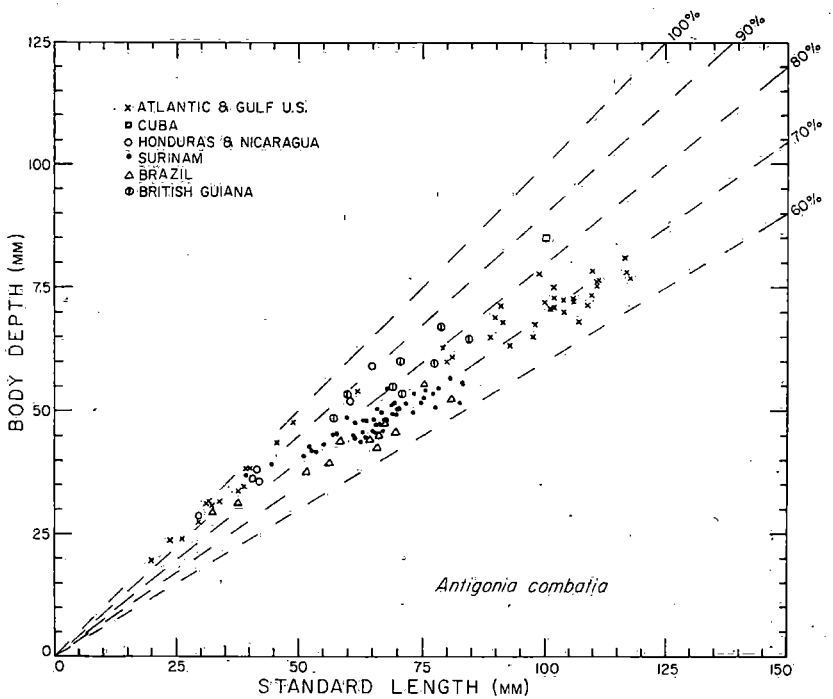

Figure 4. Relation of body depth to standard length for *Antigonia combatia* from five different areas. Reference lines of dashes represent proportional values; at "90%" body depth is 90% or nine-tenths of standard length.

The use of the term population in the above discussion refers to samples collected at designated separate localities. The specimens examined may be representatives of a continuous clinal population, but the sparsity of samples over the broad area considered fails to show any geographic centers of abundance or gaps in the species range. Hence, assigning subspecific designations to the collections from these discontinuous localities is not advisable.

RELATIONSHIPS: *Antigonia combatia* with dorsal softrays 30 or less and anal softrays 28 or less differs from *A. capros* Lowe (= *A. browni* Fowler = *Caprophonus aurora* Müller and Troschel = *A. steindachneri* Jordan and Fowler) and *A. eos* Gilbert in having fewer dorsal and anal softrays. *A. combatia* also differs from *A. capros* and *A. eos* in having a shallower depth of body and shorter 3rd dorsal, 1st anal, and pelvic spines.

Antigonia combatia is similar in numbers of dorsal and anal softrays to *A. rubescens* (Günther), *A. rubicunda* Ogilby, *A. malayanus*

Weber, *A. fowleri* Franz, and *A. rhomboidea* McCulloch. The five species are nominal forms of Indo-Pacific distribution and of uncertain relationships. Fraser-Brunner (1950) synonymized *A. mulleri* (questionably, possibly unidentifiable) and *A. malayanus* with *A. rubicunda;* and he synonymized *A. fowleri* and *A. rhomboidea* with *A. rubescens.* My examination of a larger series of specimens suggests modifications of his interpretations (discussed below). As the relationships of these

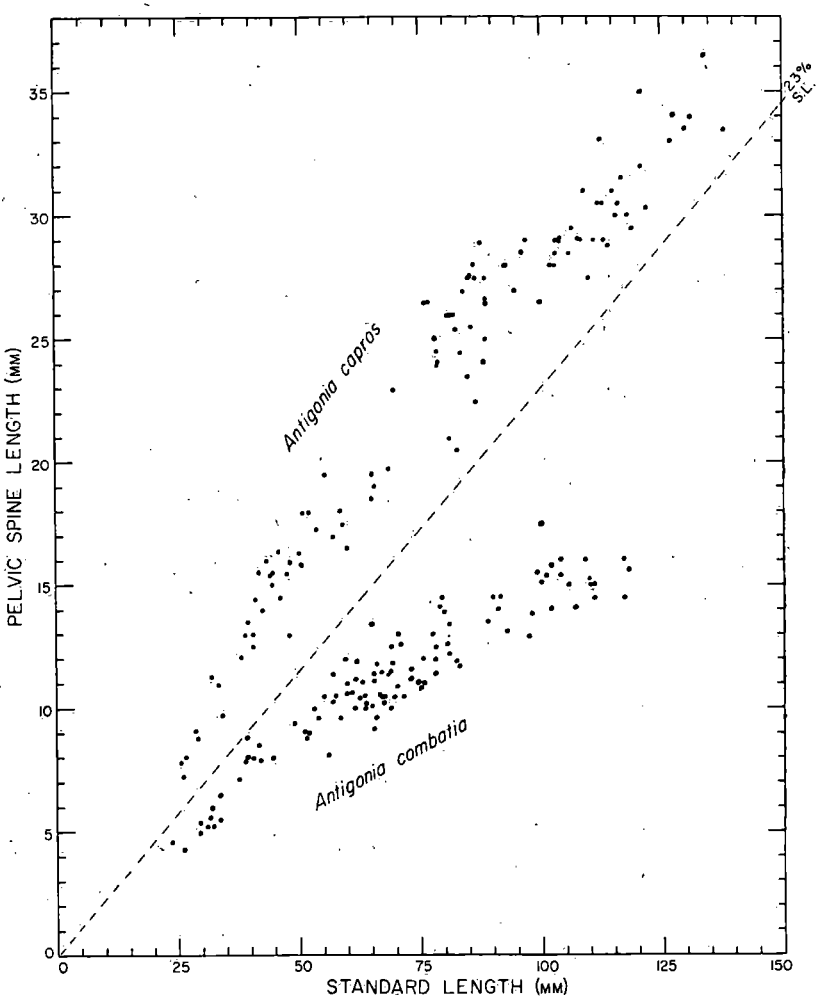

Figure 5. Relation of pelvic spine length to standard length for *Antigonia combatia* and *A. capros.* Reference line of dashes indicates values of pelvic spine length equivalent to 23% of standard length.

Indo-Pacific forms are not definite, it is best to distinguish *A. combatia* from the nominal species individually.

Antigonia rubescens was named *Hypsinotus* sp. by Temminck and Schlegel (1844: 84, pl. XLII, fig. 2) and described from a specimen about 4 inches in total length (which I estimate as about 80 mm. S.L.) from Japan, and the figure of the type is a natural size (1:1) reproduction. Compared to Temminck and Schlegel's figure of *A. rubescens*, *A. combatia* has a shallower body depth (107% S.L. in *A. rubescens*, 62.4 to 100.8% S.L. in all specimens of all sizes of *A. combatia*); a shorter 3rd dorsal spine (34% S.L. in *A. rubescens*, 16.2 to 30.2% S.L. in *A. combatia*); a shorter 1st anal spine (15.6% S.L. in *A. rubescens*, 7.7 to 14.8% S.L. in *A. combatia*); and a shorter pelvic spine (28% S.L. in *A. rubescens*, 12.4 to 22.6% S.L. in *A. combatia*).

The earliest redescription of *A. rubescens* was by Jordan and Fowler (1902: 523), and the larger specimen they illustrated appears to be conspecific (their fig. 2, USNM 50803, 119 mm. S.L.). However, their illustrated specimen has an open and extended mouth, and this probably prompted Fraser-Brunner (1950: 50) to describe *A. rubescens* as having, "Cleft of mouth small, nearly horizontal." The mouth is relatively small compared to certain specimens discussed below, but the cleft of the mouth is oblique and not nearly horizontal. Jordan and Fowler gave a scale count of "14-60-40" (the count of 60 apparently was made along the lateral line, as I counted approximately 58 and 61 scales along the lateral line for the two sides of the USNM specimen). This specimen has 44 and 45 scale rows, right and left sides, respectively, and the other 17 specimens I have identified as this species have about 38 to 47 scale rows. *A. combatia* differs from *A. rubescens* in having 49 to 57 scale rows.

A. combatia has a shorter pelvic spine than *A. rubescens* at comparable body sizes (from about 20 to 50 mm. S.L., 24 to 30% S.L. in *A. rubescens*, 14 to 23% S.L. in *A. combatia;* above 50 mm. S.L., 21 to 26% S.L. in *A. rubescens*, 12 to 20.9% S.L. in *A. combatia*). The 3rd dorsal spine of *A. combatia* averages a shorter length than that of *A. rubescens* (27 to 42% S.L. in *A. rubescens*, 16 to 30% S.L. in *A. combatia*); the 1st anal spine averages shorter (12.3 to 17.6% S.L. in *A. rubescens*, 7.7 to 16.2% S.L. in *A. combatia*); the pectoral fin above 50 mm. S.L. averages slightly longer (about 30 to 32% S.L. in *A. rubescens*, 28 to 36% S.L. in *A. combatia*). *A. combatia* has a shallower body depth at all comparable body lengths (84 to 106% S.L. in *A. rubescens*, 62 to 100.8% S.L. in *A. combatia*), a slightly shorter snout to 1st dorsal spine distance above 50 mm. S.L. (57 to 68%

S.L. in *A. rubescens*, 50 to 60% S.L. in *A. combatia*), and a longer upper jaw (8.0 to 9.5% S.L. in *A. rubescens*, 8.1 to 11.1% S.L. in *A. combatia*). The two species also show slight differences in profile (see figure 6). The figure of Temminck and Schlegel, or its outline, has been erroneously reproduced by Goode and Bean (1895, fig. 235), by Fowler (1936, fig. 381), and probably by Thompson (1943, fig. 524), to represent *A. capros*. Obviously the small first dorsal spine was omitted from Temminck and Schlegel's figure and its copies, and Boseman (1947: 84) stated that Burger's manuscript gave a count of 9 spines.

[Specimens of *A. rubescens* examined: USNM 50803 (1 specimen) 119 mm. S.L., Suruga Bay, Japan, ALBATROSS Sta. 3720, 13 May 1900, 34 fathoms. USNM 50804 (6) 40 to 79 mm. S.L., Totmi Bay, Japan, ALBATROSS. USNM 57588 (2) 77.5 and 79 mm. S.L., Yokohama, Japan. USNM 75465 (8) 26 to 60.5 mm. S.L., Mishai, Japan. USNM 135698 (2) 22 and 30 mm. S.L., Gulf of Tokyo, Japan, ALBATROSS, 26 October 1906.]

Antigonia fowleri was described by Franz (1910: 58) apparently because he believed specimens he examined from Japan and the illustration and description by Jordan and Fowler (1902: 523, fig. 2) of *A. rubescens* were specifically distinct from Temminck and Schlegel's (1884: 84, pl. XLII, fig. 2) figure and description. He did not indicate adequate separations of the two forms, and because I consider Jordan and Fowler's specimens to be conspecific with *A. rubescens*, I also include *A. fowleri* as a synonym. As *A. fowleri* was based in part on Jordan and Fowler's description, *A. combatia* is considered to differ from *A. fowleri* in the same respects as it does from *A. rubescens*.

Antigonia rhomboidea, described and illustrated by McCulloch (1915: 111, pl. XVIII, fig. 1) from Victoria, Australia, may be identical to *A. rubescens*. McCulloch's figure, apparently a natural size (1:1) reproduction of a fish 115 mm. in total length (about 90 mm. S.L.), is similar in outline and proportions of body parts to Jordan and Fowler's figure and specimen of *A. rubescens* (1902: 523, fig. 2, USNM 50803), and is intermediate in body depth between this figure and Temminck and Schlegel's figure. One objection to this proposed synonymy is in scale counts. McCulloch stated that his specimen had "About fifty-eight scales between the operculum and the hypural." This description seems to imply that McCulloch counted scale rows rather than scales along the lateral line, and as specimens I have identified as *A. rubescens* have about 38 to 47 scale rows, a difference exists. Using values given for *A. rhomboidea* by McCulloch, *A. combatia* has a lesser body depth (1.03 in S.L. in *A. rhomboidea*, .99 to 1.60 in S.L. in *A. combatia*) and a shorter pelvic spine (1.4 in head length in

A. rhomboidea, 1.75 to 2.78 in head length in *A. combatia*). Based on my measurements of McCulloch's figure of *A. rhomboidea, A. combatia* has a lesser body depth (105.6% S. L. in *A. rhomboidea,* 62.4 to 100.8% S. L. in *A. combatia*), a shorter 1st anal spine (17.3% S.L. in *A. rhomboidea,* 7.7 to 14.8% S.L. in *A. combatia*), a shorter pelvic spine (26.4% S.L. in *A. rhomboidea,* 12.4 to 22.6% S.L. in *A. combatia*), a lesser snout to 1st dorsal spine distance (72.8% S.L. in *A. rhomboidea,* 50.0 to 68.5% S.L. in *A. combatia*).

Antigonia rubicunda was described by Ogilby (1910: 103) from Queensland, Australia, and was redescribed and illustrated by McCulloch (1915: 113, pl. XVIII, fig. 2). I have not seen Ogilby's description, but McCulloch (*loc. cit.*) stated that in Ogilby's (1910) description of his two type specimens, 62 and 65 mm. T.L. (about 48.5 and 52 mm. S.L.), "Ogilby has wrongly counted the number of spines and rays of the fins, while some of the proportions given by him are also incorrect." Using values given for *A. rubicunda* by McCulloch, *A. combatia* has more scales (45 rows in *A. rubicunda,* 49 to 57 rows in *A. combatia*), a shorter 3rd dorsal spine (1.06 into head length in *A. rubicunda,* 1.23 to 2.12 into head length in *A. combatia*), and a shorter pelvic spine (1.2 into head length in *A. rubicunda,* 1.75 to 2.78 into head length in *A. combatia*). Based on my measurements taken from McCulloch's figure of *A. rubicunda, A. combatia* has a shorter 3rd dorsal spine (34.0% S.L. in *A. rubicunda,* 16.2 to 30.2% S.L. in *A. combatia*), and a shorter pelvic spine (27.8% S.L. in *A. rubicunda,* 12.4 to 22.6% S.L. in *A. combatia*).

[A. rubicunda and *A. rhomboidea* may be synonymous. The difference in scale counts given by McCulloch (45 for *A. rubicunda,* 58 for *A. rhomboidea*) suggests a specific difference, however, and McCulloch's figure of *A. rubicunda* shows the upper jaw to be longer than that in his figure of *A. rhomboidea.* Fraser-Brunner's (1950: 721) interpretation of this last character is questioned because he synonymized *A. malayanus* Weber with *A. rubicunda*—and I regard *A. malayanus,* with a long upper jaw and a nearly vertical cleft of mouth, to be distinct from any other nominal species. I have been unable to identify two small specimens (BMNH 1912.11.28.63) from the Kai Islands which Fraser-Brunner designated as *A. rubicunda.* I have examined one of the specimens (33.3 mm. S.L.), and data on the other (33 mm. S.L.) have been kindly furnished by G. Palmer of the British Museum. The 33.3-mm. specimen has a longer upper jaw (12.8% S.L. in the Kai Islands specimen, 8.1 to 11.1% S.L. in *A. combatia*) than was found in specimens of *A. combatia.]*

Antigonia malayanus was described and figured by Weber (1913: 299, fig. 69) from the Arafura Sea, and was redescribed by Weber and de Beaufort (1929: 267, fig. 71). I have examined a 64.5-mm. specimen of *A. malayanus* (CNHM 52432) labeled "Cotype, *Siboga*

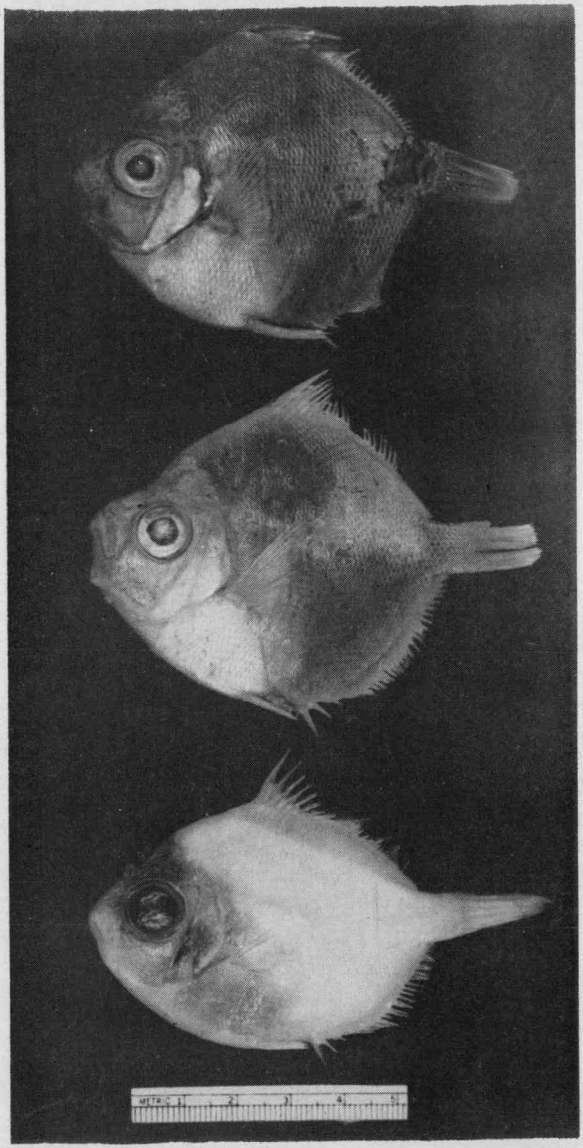

Figure 6. Top: *Antigonia rubescens*, 65.5 mm. S.L., USNM 50804. Middle: *Antigonia malayanus*, 67.5 mm. S.L., USNM 150996. Bottom: *Antigonia combatia*, 67.5 mm. S.L., SAFI, OREGON Sta. 2013.

253, Max Weber," and a 67.5-mm. specimen (USNM 150996) from Talogo Light, Philippine Islands, that is identical to the cotype and to Weber's description and figure. These specimens have upper jaw lengths of 12.5% S.L. (CNHM) and 13.9% S.L. (USNM), which values are greater than those of any other described species of *Antigonia* (figs. 6 and 7). Both specimens have 8 dorsal spines, which is the count Weber (1913: 299) gave for 14 specimens of 76 to 90 mm. T.L. (about 59 to 70 mm. S.L.). *A. malayanus* is similar to *A. combatia* in having a relatively short pelvic spine. *A. combatia* is distinct from *A. malayanus* in having normally 9 dorsal spines, a shorter upper jaw, and in alignment of the lower jaw (less protruded and less vertically cleft in *A. combatia*) (fig. 7). Herre and Herald (1951: 332) recorded this species from Luzon, Philippines, but gave no confirming description.

Antigonia mulleri was described by Klunzinger (1880: 380, pl. V, fig. 3) from two specimens of about 35 mm. T.L. from New Zealand. In appearance and known characters, *A. mulleri* belongs to the family Zeidae rather than Caproidae. Fraser-Brunner (1950: 722) placed it in questionable synonymy with *A. rubicunda*, but noted that this was uncertain because the shallow body and large mouth of *A. mulleri* were "more like that of a Cyttid."

Antigonia benhatatate (Bleeker) is apparently a *nomen nudum*. The earliest record I have been able to find for the specific name is in Bleeker's 1876 Systema Percarum Revisum (p. 310), where, with no description or figure, he gives, "*Hypsinotus* Sch. (1842 ?) = *Antigonia* Lowe (1843) = *Caprophonus* M. Tr. Sp. typ. *Hypsinotus benhatatate* Blkr." Bleeker's other reference to this name (1879: 9) is also by name only.

HOLOTYPE: USNM 159597, 117 mm. in standard length; taken at Station 259 of the M/V COMBAT in a flat trawl, presumably from the bottom, in water about 185 fathoms deep, 24°29′N., 83°28′W., about 30 miles WSW of Loggerhead Key, Tortugas, Florida, 7 March 1957.

PARATYPES: USNM 159593 (1 specimen) 111 mm. S.L. (partially dessicated after original preservation), taken with the holotype. SAFI collection (1) 107 mm. S.L., taken with the holotype. MCZ 37604 (1) 49 mm. S.L., CAPT. BILL II Sta. 83, 39°59′N., 69°32′W., about 40 miles southward of Nantucket Island, Massachusetts, 16 July 1952, 87-90 fathoms. SAFI collection (1) 37.5 mm. S.L., COMBAT Sta. 370, 35°05′ N., 75°09′W., about 17 miles ESE of Cape Hatteras, North Carolina, 16 June 1957, 100 fathoms. ANSP 75410 (2) 31 and 33.5 mm. S.L., off Boynton Beach, Palm Beach County, Florida, by A. R. Thompson

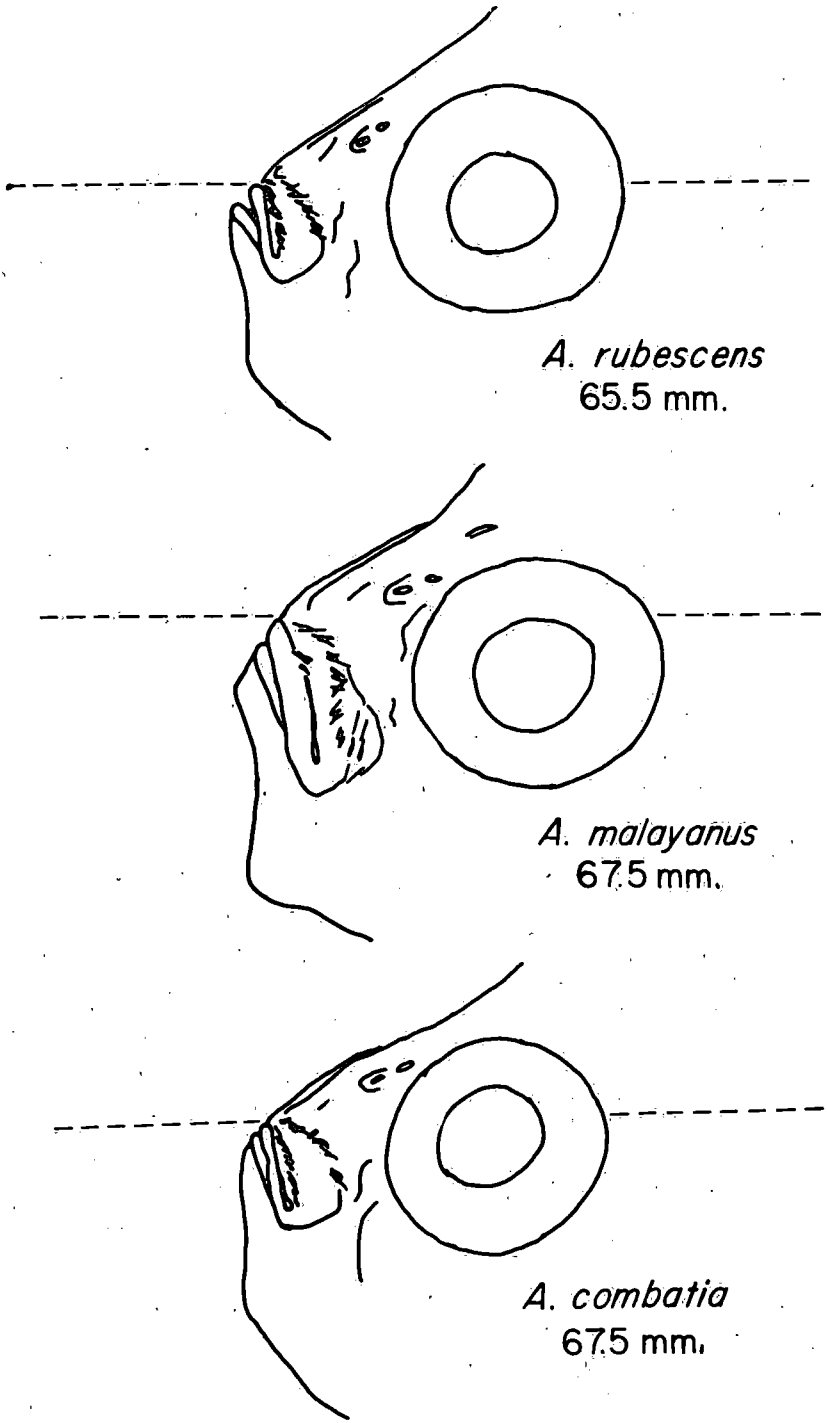

Figure 7. Diagramatic illustration, drawn to same scale, of the relative size and alignment of the upper jaw of the three specimens of figure 6. The lines of dashes align the tip of the upper lip with the center of the base of the caudal rays.

and McGintys, June 1952, 80 fathoms. MCZ 39534 (1) 29.5 mm. S.L., 18 miles east of Delray, Florida, 22 May 1948, 300-325 fathoms. SAFI collection (1) 23.5 mm. S.L., COMBAT Sta. 457, 25°16′N., 80°07′W., about 35 miles south of Miami, Florida, 26 July 1957, 65 fathoms. ANSP 74840 (1) 32 mm. S.L., south of Sombrero Light Key, Florida, by A. R. Thompson and McGintys on the TRITON, July 1952. ANSP 75409 (1) 26 mm. S.L., southeast of Sound Key Light, edge of Pourtales Plateau, Key West, Florida, 90 fathoms. USNM 116755 (1) 39 mm. S.L., Carnegie Inst. Act. No. 144662, Tortugas, Florida, by W. H. Longley. USNM 171784 (1) 45.5 mm. S.L., south of Tortugas, Florida, by W. H. Longley, 19 July 1932, 83-94 fathoms. SAFI collection (1) about 19 mm. S.L. (caudal peduncle missing), from stomach contents of *Thunnus atlanticus* (Lesson), caught surface trolling on THEODORE N. GILL Cruise 4, approximately 26°55′N., 78°55′W., southwest of Grand Bahama Island, 3 October 1953. CNHM 64461 (29) 38.5 to 118 mm. S.L., OREGON Sta. 1026, 25°08′N., 84°19′W., about 81 miles westnorthwest of Tortugas, Florida, 19 April 1954, 163 fathoms. GCRL collection (1) 31.5 mm. S.L., OREGON Sta. 32, 29°10′N., 85°55′W., about 43 miles southwest of Cape San Blas, Florida, 23 June 1950, 95 fathoms. CNHM 64382 (1) 100 mm. S.L., OREGON Sta. 1343, 22°59′N., 79°17′W., southeast of Cay Sal Bank and about 27 miles off the mainland of Cuba, 16 July 1955, 250 fathoms. USNM 159595 (6) about 36 to 65 mm. S.L., OREGON Sta. 1868, 16°36′N., 82°37′W., about 95 miles northeast of Laguna Caratasca, Honduras, 21 August 1957, 175 fathoms. USNM 159596 (2) 41.5 and 42 mm. S.L., OREGON Sta. 1902, 11°27′N., 83°11′W., about 35 miles east of southern coast of Nicaragua, 9 September 1957, 135 fathoms. SAFI (1) 29.5 mm. S.L., OREGON Sta. 2356, 17°33′N., 63°35′W., northwest of Saba Bank, Saba, Leeward Islands, 25 September 1958, 125-132 fathoms. CNHM 64461 (4) 70.5 to 84.5 mm. S.L., OREGON Sta. 1983, 09°53′N., 59°53′W., off British Guiana, 3 November 1957, 125 fathoms. CNHM 64462 (3) 57 to 71 mm. S.L., OREGON Sta. 1986, 09°39′N., 59°47′W., off British Guiana, 4 November 1957, 100 fathoms. CNHM 64463 (1) 60 mm. S.L., OREGON Sta. 1987, 09°36′N., 59°44′W., off British Guiana, 4 November 1957, 80 fathoms. USNM 159601 (75) 39.2 to 83 mm. S.L., OREGON Sta. 2013, 07°30′N., 54°16′W., about 95 miles north of the eastern coast of Surinam, 8 November 1957, 125 fathoms. SAFI collection (12, 7 cleared and stained) 53.5 to 71.5 mm. S.L., OREGON Sta. 2013 (data as above). BOC 3739 (2) 61.5 and 70 mm. S.L., OREGON Sta. 2013. CNHM 64448 (2) 52 and 73 mm. S.L., OREGON Sta. 2013. SU 51022 (2) 63 and 78 mm. S.L., OREGON Sta. 2013. UF 5243 (2) 57.5 and 77 mm. S.L., OREGON Sta. 2013. TU 18373 (2) 61 and 69 mm.

S.L., Oregon Sta. 2013. MCZ 39983 (2) 62.5 and 67.5 mm. S.L., Oregon Sta. 2013. CU 31615 (2) 63.5 and 66.5 mm. S.L., Oregon Sta. 2013. UMML 2554 (2) 67 and 74.5 mm. S.L., Oregon Sta. 2013. ANSP 82168 (2) 57 and 77.5 mm. S.L., Oregon Sta. 2013. MMF collection (2) 63.5 and 75 mm. S.L., Oregon Sta. 2013. BMNH 1958.6.20 (2) 66.5 and 75.5 mm. S.L., Oregon Sta. 2013. MNRJ 9.010 and 9.011 (2) 65 and 73 mm. S.L., Oregon Sta. 2013. CNHM 64464 (5) 61.5 to 69 mm. S.L., Oregon Sta. 2013. USNM 159598 (4) 37.5 to 66 mm. S.L., Oregon Sta. 2066, 02°40′N., 47°55′W., about 190 miles northeast of mouth of Amazon River, Brazil, 15 November 1957, 110 fathoms. SAFI collection (1, cleared and stained) 65.5 mm. S.L., Oregon Sta. 2066 (data as above). CNHM 64465 (6) 58.5 to 81 mm. S.L., Oregon Sta. 2066 (data as above). CNHM 64466 (1) 32 mm. S.L.,

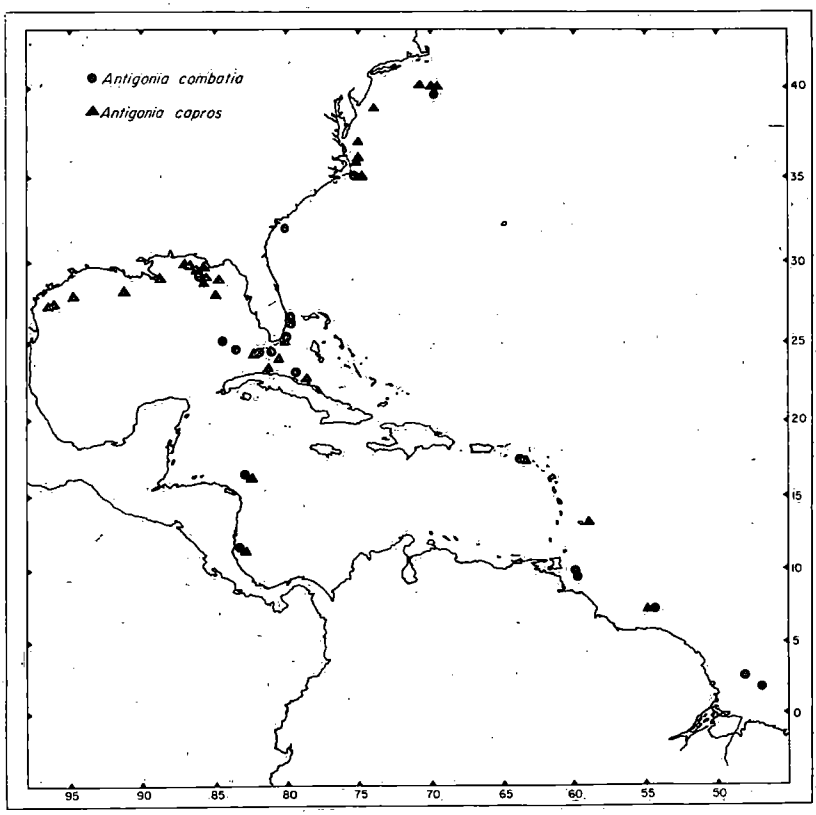

Figure 8. Distribution of *Antigonia combatia* and *A. capros* in the western Atlantic. Records of *A. capros* from Rio de Janeiro, Brazil (22°55′ S., 43°19′ W.), are not included.

OREGON Sta. 2083, 01°49'N., 46°48'W., about 200 miles northeast of mouth of Amazon River, Brazil, 17 November 1958, 225 fathoms.

SPECIMEN EXAMINED: SAFI (1) 68.5 mm. S.L., OREGON Sta. 2291, 07°27'N., 54°27'W., about 80 miles northward of Paramaribo, Surinam, 9 September 1958, 120-135 fathoms.

Antigonia capros Lowe, 1843

(Figures 10 and 11)

Antigonia capros Lowe, 1843, p. 85 (Madeira).—Günther, 1887, p. 44 (in part; Madeira; Barbados).—Jordan, 1887, p. 577 (based on records of Lowe 1843 and Müller and Troschel 1849).—Goode and Bean, 1895, p. 229 (in part; based on records of Lowe 1843 from Madeira, Müller and Troschel 1849 from Barbados, and Günther 1887 from Barbados and Madeira; excluding fig. 235 which is *A. rubescens*).—Jordan and Evermann, 1896, p. 419 (in part; based on records of Lowe 1843 and Müller and Troschel 1849; excluding Pacific records).—Jordan and Evermann, 1898, p. 1665 (in part; based on records of Lowe 1843 from Madeira and Müller and Troschel 1849 from Barbados; excluding *A. mulleri* and *A. rubescens* from synonymy).—Miranda Ribeiro, 1903, p. 175 (Brasil).—? Osorio, 1909, p. 67 (Ilha de Santo Antao, Cape Verde Islands).—? Clark, 1913, p. 385 (Ascension Island).—Miranda Ribeiro, 1915 (Brasil).—Miranda Ribeiro, 1918, p. 76 (in part; synonymy; excluding *H. rubescens* and *A. mulleri*).—? Roule, 1919, p. 52 (southeast of Flores, Azores, 1360 meters; no description).—Jordan, Evermann, and Clark, 1930, p. 358 (based on records of Lowe 1843 and Müller and Troschel 1849).—? Firth, 1931, p. 162 (75 to 90 miles southeast of Cape Henry, Virginia, 28 to 50 fathoms; no description).—Fowler, 1936, p. 894 (in part; based on records of Lowe 1843, Clark 1913, and Roule 1919 from Madeira, Ascension, and Azores; excluding fig. 381 which is *A. rubescens*), ? p. 1306 (based on record of Osorio 1909 from Cape Verde Islands).—Cadenat, 1937, p. 491, fig. 36 (from seven stations off West Africa at Cape Verde Islands, Senegal, and French Guinea, between depths of 120 and 265 meters).—Longley and Hildebrand, 1941, p. 146 (in part; off Tortugas, Florida, 40 to 140 fathoms; probably also included specimens of *A. combatia*).—? Hildebrand, 1941, p. 228 (based on record of Firth 1931).—Howell Rivero, 1941, p. 344 (Matanzas, Cuba).—Fowler, 1941a, p. 169 (based on record of Miranda Ribeiro 1903 from Rio de Janeiro, Brazil).—Raney and Ross, 1947, p. 63 (off Block Island, Rhode Island, 53 fathoms).—? Maul in Noronha and Sarmento, 1948, p. 78 and 149 (Madeira; no description).—Fraser-Brunner, 1950, p. 722 (Madeira; Barbados).—Bigelow and Schroeder, 1953, p. 438, fig. 225 (south of Nantucket Lightship, off Massachusetts, 55 to 80 fathoms).—Springer and Bullis, 1956, p. 89 (in part; specimens examined and records verified for OREGON Stations 156, 273, 277, 278, 326, 602, 732, 864, 895, and 945; excluding records from OREGON Stations 32, 1026, and 1343 which are *A. combatia*).—? Salzen, 1957, p. 77 (Gold Coast, West Africa; no description).—Briggs, 1958, p. 271 (from Rhode Island to Rio de Janeiro and the northern Gulf of Mexico; compiled).

Caprophonus aurora Müller and Troschel, 1849, p. 28, pl. V, fig. 1 (Barbados).

Antigonia browni Fowler, 1934, p. 356, fig. 8 (about 50 miles southeast of Five-fathom Bank Light Ship, New Jersey); 1935, p. 9 (reference to Fowler 1934);

1937, p. 302, (Cape Henry, New Jersey); 1952, p. 119 (New Jersey; listed).—Briggs, 1958, p. 271 (in part; New Jersey; compiled).

? *Antigonia otwayi* (*nomen nudum*) Fowler, 1941b, p. 59 (*lapsus calami* ?; "Deep Boar Fish"; off New Jersey).

SYNONYMS AND REFERENCES: References are included only for the Atlantic Ocean. Identifications by name only, with no description or illustration that can be identified, are questioned because they may have included or have been composed of the previously undistinguished *A. combatia.*

DIAGNOSIS:[5] An *Antigonia* with dorsal spines 8 (rarely 7 or 9), dorsal softrays 31 to 37, anal softrays 29 to 34, pectoral I-13 (rarely I-12 or I-14), scale rows about 46 to 54, body depth 136.0 to 98.3, third (longest) dorsal spine length 44.5 to 23.3, first (longest) anal spine length 21.6 to 13.9, pelvic spine length 37.2 to 24.1, upper jaw length 10.2 to 7.3.

DESCRIPTION: Counts and measurements are given in tables 1, 2, and 3. Body compressed and elevated. Greatest vertical body depth 136.0 to 98.3, apparently increasing in proportion to S.L. with growth to about 50 or 60 mm. S.L. and decreasing in proportion to S.L. above this size (fig. 9; compare specimens in figs. 10 and 11). Snout to 1st dorsal spine 77.2 to 59.6, decreasing in proportion to S.L. with growth. Snout to pectoral origin 46.1 to 36.2, decreasing in proportion to S.L. with growth. Snout to pelvic origin 86.0 to 67.8, decreasing in proportion to S.L. with growth. Snout to 1st anal spine 92.7 to 76.4, decreasing in proportion to S.L. with growth. Caudal peduncle deeper than long, its depth at caudal base 16.9 to 12.8, tending to decrease in proportion to S.L. with growth. Lateral line as in *A. combatia.*

Head length 42.3 to 33.9, decreasing in proportion to S.L. with growth. Body outline becoming shallower with growth, but anteriodorsal profile remaining characteristic with slight concavities between snout and upper end of supraoccipital crest and between upper end of supraoccipital crest and dorsal fin origin. Snout length 8.8 to 11.7, increasing nearly in direct proportion to S.L. with growth. Cleft of mouth angular, and lower jaw slightly projecting. Upper jaw length 7.3 to 10.2, increasing nearly in direct proportion to S.L. with

[5] Only values for specimens from the Atlantic Ocean are given. The numbers after each character are the ranges in values for these specimens. Where the proportion decreases with growth, the larger extreme of the range is placed first. Body proportions are in percent of standard length. This procedure is followed in the Description.

growth. Eye diameter 20.2 to 13.4, decreasing in proportion to S.L. with growth. Denticulated ridges on head similar to *A. combatia.*

Teeth similar to *A. combatia.*

Gillrakers 5 to 6 + 13 to 16. Branchiostegals 6.

Dorsal spines 8 (rarely 7 or 9) (table 1). One specimen with 9 dorsal spines has the 5th spine split to about one-third of the distance from the tip forming two points and with the 9th spine appearing normal. X-ray of another specimen with 9 spines shows that the 9th spine abnormally has no interneural spine associated with it. Third spine the longest 44.5 to 23.3, decreasing in proportion to S.L. with growth. Spines in graduated length series and 1st and 2nd dorsal fins connected as in *A. combatia.*

Anal spines 3. First spine the longest 21.6 to 13.9, decreasing in proportion to S.L. with growth. Graduation of spines and connection to 1st anal softray as in *A. combatia.*

Dorsal softrays 31 to 37. Anal softrays 29 to 34 (table 2). A 128-mm. specimen has an abnormal anal fin consisting of only two spines and 26 softrays, with the first two softrays hardened and shortened like spines but possessing segment marks (the dorsal fin of this fish has 9 spines and 33 softrays). Approximate length of softrays, branching, and basal sheath as in *A. combatia.* Anal fin base length 69.8 to 52.5, decreasing in proportion to S.L. with growth.

Caudal fin subtruncate. Caudal principal rays 6 + 6 (in all specimens examined). Caudal secondary rays 4 + 3 (in two stained specimens). Branching of rays and scales on caudal as in *A. combatia.*

Pectoral fin bluntly pointed. Pectoral rays I-13 (rarely I-12 or I-14) (table 1). Pectoral length 43.5 to 31.1, decreasing in proportion to S.L. with growth. Relative growth of spine, branching and comparative length of rays, and insertion of pectoral as in *A. combatia.*

Pelvic fin pointed. Pelvic rays I-5 (in all specimens). Pelvic spine length 37.2 to 24.1, decreasing in proportion to S.L. with growth (fig. 5). Membranes connecting rays, comparative lengths of rays, and insertion as in *A. combatia.*

Scale rows about 46 to 54. Scalation of head, body, and fins, and structure of scales essentially similar to that of *A. combatia.*

Pigmentation essentially faded out on most preserved specimens; in these pigment is most prominent in dark interray membranes of the pelvic fins (pronounced on specimens up to about 70 mm. S.L., less so on largest specimens); slight dark pigment on interspinous membranes of dorsal fin in smaller specimens; a thin diagonal line extends perpendicular to and along the proximal ends of the interneural spines, another along proximal ends of interhemal spines, and

a third thin line along lateral midline of body (these of contrasting dark on specimens in alcohol, yellowish-orange on specimens in formalin). Three fresh specimens from the vicinity of Portsmouth, Virginia, were examined about 3 days after capture: the 116-mm. and 128-mm. specimens had dark red bodies and reddish fins; the 65.5-mm. specimen had a dark red bar extending through the eye, another from the spinous dorsal base to the pelvic insertions, and a broad bar-like mass of dark red pigment beginning at the middle of the soft-ray bases and diminishing in intensity onto the peduncle, with the snout and the interbar spaces colored silvery pink, the fins reddish, and the distal margin of the pelvics black. Two specimens from south of Martha's Vineyard, 44.5 and 61.5 mm. S.L., examined 15 days after capture and preservation in formalin, were similar in color to the 65.5-mm. specimen described above, but faded. Fowler (1934: 356) described similar bars from the holotype of *A. browni* as rose pink when fresh. Raney and Ross (1947: 63) described the body color of a 109-mm. specimen from Block Island Sound (CU 10454) as still pale red after 9 days in formalin.

Distribution: *Antigonia capros* is recorded from off the eastern coasts of North, Central, and South America, from the northern Bahamas, northern Cuba, the Leeward Islands, and the Barbados (fig. 8). The species in this area ranges from off southern Massachusetts to Rio de Janeiro, Brazil. Miranda Ribeiro (1903: 175 and 1915) reported *A. capros* from Brazilian waters. Antenor Leitao de Carvalho of the Universidade do Brasil informed me (personal communication) that the 75-mm. S.L. specimen reported by Miranda Ribeiro (1903 and 1915) and seven specimens of 85 and 150 mm. S.L. collected later from the same locality, around the Ihla Rasa in front of Guanabara Bay a few miles east of Rio de Janeiro, are in the Museu Nacional. Paul Kähsbauer, of Wien Naturhistorisches Museum, wrote (personal communication) that the 135-mm. T.L. specimen, reported by Miranda Ribeiro (1915), 112 mm. S.L., collected at Ilha Cava, Rio de Janeiro, Brazil, is in the Naturhistorisches Museum. The species occurs at Madeira and apparently off the western and eastern coasts of Africa, off India and Australia, in Indonesia and the Philippines, off Japan, and in the Hawaiian Islands. It has not been reported from the western coast of the American continents.

William C. Schroeder, Woods Hole Oceanographic Institution, generously furnished the following previously unreported records from off the northeastern United States: 40°00′ N., 69°50′ W., March 1954, 75 fathoms, (14 specimens) 61 to 116 mm. S.L., MCZ 38645.

39°59′ N., 69°35′ W., July 1952, 82-85 fathoms, (1) 34 mm. S.L., MCZ 37680. 38°26′N., 73°34′W., March 1954, 70 fathoms, (1) 88 mm. S.L., MCZ 38630. 37°51′ N., 74°09′ W., June 1953, 70-72 fathoms, (1) 42 mm. S.L., MCZ 38178.

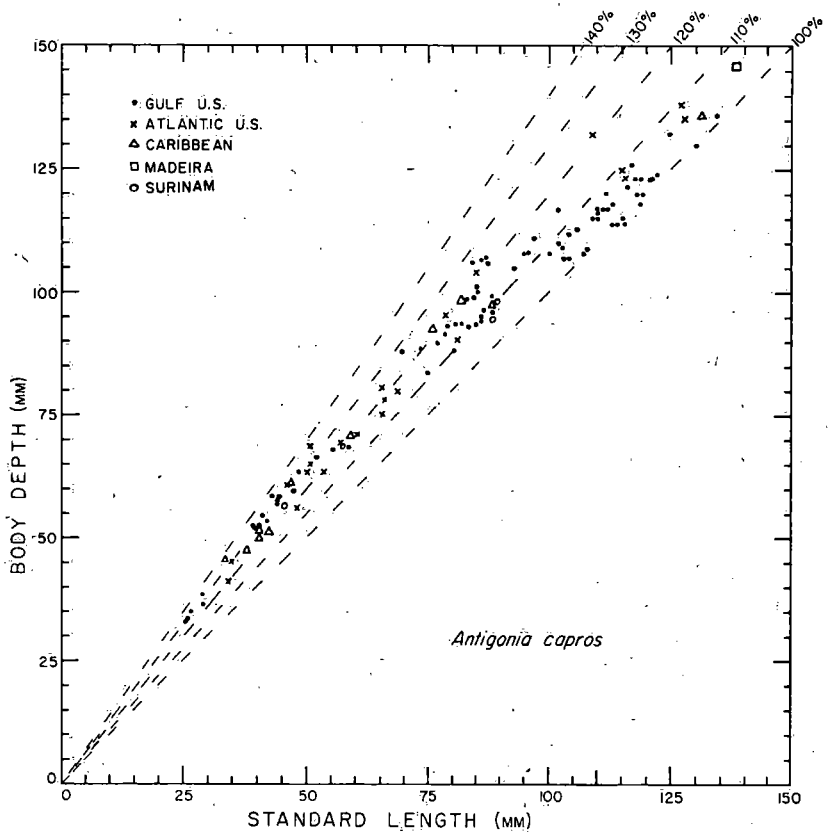

Figure 9. Relation of body depth to standard length for *Antigonia capros* from four different areas. Reference lines of dashes represent proportional (percentage) values; at "120%" body depth is 120% or twelve-tenths of standard length.

Development and Geographic Variation: Within the size range of specimens examined, all the body parts measured except body depth increase with growth at a slower rate than the standard length (table 3). Body depth (fig. 9) increases faster than standard length to about 50 or 60 mm. S.L., and above this size increases more slowly than standard length (a 6.2-mm. S.L. larval specimen, identified as *A. capros*, has a body depth of 83.9% S.L.). The snout and upper jaw

apparently grow at a constant rate with respect to standard length, but the other body parts measured do not—these apparently having a curvilinear or inflected rectilinear growth pattern in relation to standard length.

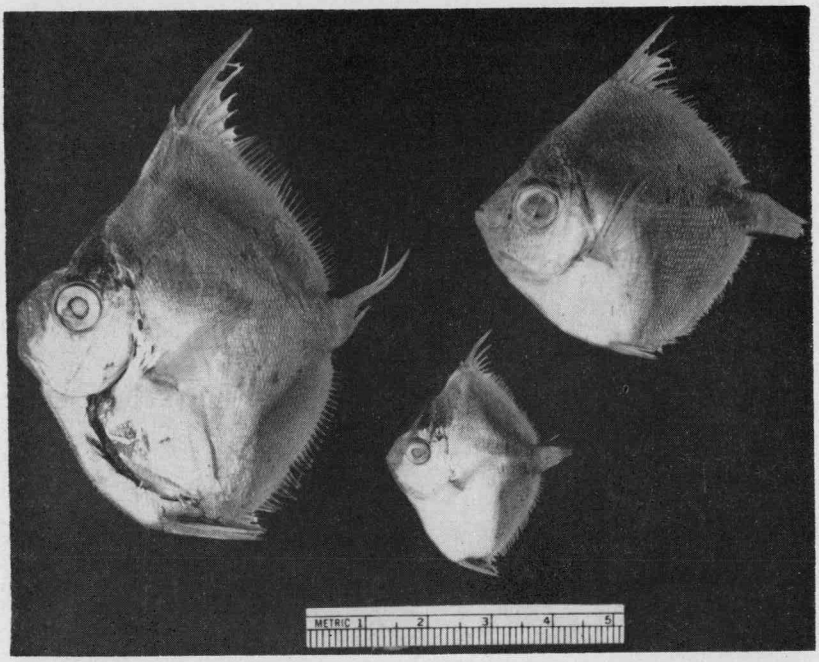

Figure 10. Left and lower right: *Antigonia capros*, 52 and 25.5 mm. S.L. Upper right: *Antigonia combatia*, 45.5 mm. S.L. Taken together south of Tortugas, Florida, 19 July 1932, USNM 116755 and 171784.

Geographic variation in development, as was postulated for *A. combatia*, is suggested by comparisons of larger specimens (109 to 128 mm. S.L.) from off the northeastern United States with specimens of similar size from the Gulf of Mexico and of the two largest Surinam specimens (88.5 and 89 mm. S.L.) with Gulf of Mexico specimens. The larger northeastern U. S. specimens average greater measurements and the Surinam specimens average smaller measurements of body depth (fig. 9), 3rd dorsal spine length, 1st anal spine length, pelvic spine length, and snout to pelvic and snout to 1st anal spine distances than do similar sized Gulf of Mexico specimens. Similar comparisons of smaller specimens do not appear to manifest this phenomenon, so that if geographic variation does occur, it may not be apparent at smaller body sizes (generally at less than 80 or 100

mm. S.L.). The few specimens from the Caribbean do not appear to differ greatly from specimens from the other areas.

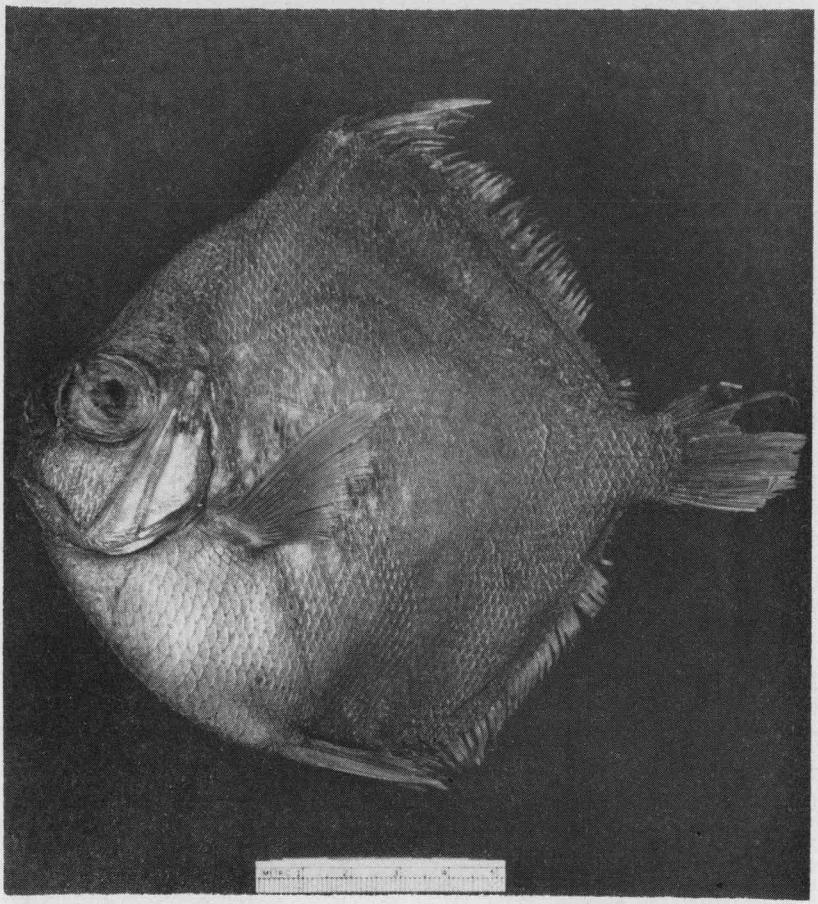

Figure 11. *Antigonia capros*, 130 mm. S.L., OREGON Sta. 273, 29°09′ N., 88°59′ W., Gulf of Mexico, USNM 158636. Depth equals standard length.

The single specimen examined from the Eastern Atlantic, 138 mm. S.L., BMNH 1864.8.24.3, from Madeira, collected by Johnson, reported as *A. capros* by Günther (1887: 44), is the largest Atlantic specimen I have examined. Its ratios of body depth, snout to pelvic and snout to 1st anal spine distances, and 3rd dorsal spine length to standard length are comparable to those of slightly smaller specimens from the Western Atlantic off the northeastern United States, but its ratio of eye diameter to standard length is slightly greater.

Five specimens from the Indo-Pacific I have examined are referable, on the basis of the number of dorsal and anal softrays, dorsal spines, and general depth of body, to *Antigonia capros*. One specimen, 155 mm. S.L., TU 10776, from the Honolulu market, Hawaii, is the largest *Antigonia* I have examined, but it appears to be identical in all respects to Atlantic *A. capros*; its body depth is 102.6% S.L. The second specimen, 128 mm. S.L., USNM 51036, from Hilo, Hawaiian Islands, identified as the synonymous *A. steindachneri* by Jordan and Evermann (1905: 361, No. 03702), has a body depth of 113.3% S.L., greater than that of the 5 specimens examined of Atlantic *A. capros* of comparable length (127-138 mm. S.L.), but this may be attributable to geographic or individual variation. The third specimen, 89 mm. S.L., BMNH 1921.3.1.30, identified as *A. capros* by Fraser-Brunner (1950: 722), compared to Atlantic specimens of *A. capros* has a slightly different body outline, a straighter and thinner 3rd dorsal spine and 1st anal spine, the pelvic fins inserted more posteriorly, a shorter upper jaw (6.7% S.L.), and a slightly shorter pelvic spine (23.8% S.L.). The fourt specimen, 52 mm. S.L., BMNH 1871. 7.20.145, from Manado, Celebes, identified as *A. browni* by Fraser-Brunner (1950: 722), compared to Atlantic specimens of *A. capros* has the profile formed by the bases of the dorsal and anal softrays almost straight rather than convex, 3rd dorsal and 1st anal spines straighter and thinner, and a slightly shorter pelvic spine (25.0% S.L.). The fifth specimen, 42.5 mm. S.L., BMNH 1879.5.14.340, from the Kai Islands, Banda Sea, identified as *A. capros* by Fraser-Brunner (1950: 722), compared to Atlantic specimens of *A. capros* has a body depth (109.4% S.L.), less than that of all *A. capros* specimens examined of about this size, and it has a slightly shorter pelvic spine (23.5% S.L.). This specimen might be referred to *A. eos* except that it has only 8 dorsal spines, and even this reservation is uncertain. Broken dorsal and anal spines of the three smallest specimens limit taxonomic assessment. The Hawaiian specimens agree with Atlantic specimens of *A. capros*—the others differ in certain respects.

RELATIONSHIPS: *Antigonia capros* Lowe, 1843, from Madeira, is accepted *prima facie* as the scientific name applicable to the specimens so identified from the Atlantic Ocean. Lowe (1843: 85) had no illustration and gave no mention of the deposition of his type, but his listing of "D. 8 + 34; A. 3 + 33" excludes *A. combatia* from consideration. He referred to his specimen as a "little fish," but in view of the poetic phrases embellishing his descriptions and of the interposition of the description of *A. capros* among the descriptions of speci-

mens of other species "five-eighths of an inch less than three feet" and "thirteen inches and a quarter long" the actual length of his specimen of *A. capros* cannot be determined.

Caprophonus aurora Müller and Troschel, 1849, from Barbados, Lesser Antilles, is identical to *A. capros*. Müller and Troschel (1849: 28) gave counts of D. VIII-34, A. III-32. Their figure (pl. V, fig. 1) is apparently a natural size reproduction (1:1) of their type specimen, which they described as being about 6 inches in total length. The standard length and the depth of the figure (and presumably of the type specimen) are both about 120 mm.

Antigonia browni Fowler, 1934, was described from a specimen taken about 50 miles southeast of Five-fathom Bank Light Ship, off New Jersey. Examination of the type specimen (51 mm. S.L., 65.5 mm. T.L., ANSP 60173) and comparison of its characters with the relatively large series of *A. capros* justifies my synonymization of *A. browni* with *A. capros*. *A. browni* is actually a growth stage of *A. capros*. The specimens from the western Atlantic that I have identified as *A. capros* collectively demonstrate the growth changes connecting these two forms. Hildebrand in Longley and Hildebrand (1941: 147) and Raney and Ross (1947: 63) expressed doubt on the distinctness of the two forms. Fowler's original suggestions of the distinctness of *A. browni* were based mainly on growth differences and what is probably attributable to geographic variation between his small specimen (51 mm. S.L.) from off New Jersey and the larger *Caprophonus aurora* of Müller and Troschel from Barbados (about 120 mm. S.L.). Fowler (1934: 358) referred to differences in color of *A. browni* and *C. aurora*—Hildebrand (1941: 147) suggested that these differences were due to preservation; I concur with Hildebrand and add that the prominent pigmentation on the pelvics and of vertical body bars or bands on small specimens apparently tends to moderate and disappear with growth. Fowler contrasted the convex caudal fin of *A. browni* with the emarginate caudal of Müller and Troschel's illustration of *C. aurora* and Lowe's description of a truncate tail for *A. capros* —I have examined specimens with caudal fins that are rounded on their dorsal and ventral edges to an almost convex shape, others that appear nearly truncate, and some that are slightly broken or worn to appear emarginate, and therefore describe the caudal fin shape as subtruncate. The differences in contour ascribed by Fowler to occur between *A. browni* and *C. aurora* are illustrated as size differences in comparison of figures 9, 10, and 11. Fowler inferred that *A. browni*

had a longer pectoral fin than *A. aurora*—the decrease in the proportional length of the pectoral (in % S.L.) is evident from table 3.

Fraser-Brunner (1950: 722) identified two small specimens in the British Museum (Natural History) from Manado (Celebes) as *A. browni*, and reported that these were the specimens identified as *Hypsinotus rubescens* by Meyer (1885: 18). Fraser-Brunner (1950) distinguished *A. browni* from *A. capros* as: *A. browni* with 3rd dorsal spine longer than head, shorter in *A. capros*; and *A. browni* with depth of body much greater than standard length, depth equal to standard length or but little greater in *A. capros*. In initial consideration of Fraser-Brunner's treatment, three of the five Pacific specimens that I have examined that are meristically and morphometrically similar to *A. capros* have certain differences, discussed above, that suggest that some of the Indo-Pacific forms referred to *A. capros* may be specifically different from the Atlantic *A. capros*. I have examined a 52-mm. S.L. specimen (BMNH 1871.11.28.63) identified as *A. browni* by Fraser-Brunner, and information of the other specimen so identified has been kindly furnished by G. Palmer of the British Museum. Palmer (personal communication) described the second specimen as about 58 mm. S.L., but with part of the head missing and therefore difficult to measure. The end of the 3rd dorsal spine is missing from the 52-mm. specimen. Despite this, table 3 shows that while the 3rd dorsal spine and the head length decrease in proportion to the standard length with growth, the 3rd dorsal spine decreases faster than the head and, consequently, the 3rd dorsal spine will be shorter in proportion to the head in large specimens than it is in small specimens. I consider the differences in depth and 3rd dorsal spine length suggested by Fraser-Brunner to result from growth changes.

Antigonia steindachneri, described by Jordan and Fowler (1902: 522) from specimens from the Hawaiian Islands, has since been relegated by most authors to the synonymy of *A. capros*. In their proposal to split the Atlantic and Pacific forms of *A. capros* taxonomically, Jordan and Fowler (*op. cit.*) were very brief in their distinction, saying, "The two species [*A. capros* and *A. steindachneri*] are closely related, but apparently distinct." A 128-mm. specimen from the Hawaiian Islands, identified as *A. steindachneri* by Jordon and Evermann (1905: 361) and discussed above, appears to be identical to Atlantic specimens of *A. capros*.

Antigonia eos, described by Gilbert (1905: 621, pl. 80, fig. 1) from specimens taken at six ALBATROSS stations in the Hawaiian Islands, is currently known only from Gilbert's holotype and paratypes. I

have examined the holotype (65.5 mm. S.L., USNM 51593) and seven paratypes (24.5 to 59 mm. S.L., USNM 51686) and consider them specifically distinct from *A. capros*, but I have not been able to separate the two species completely by morphological characters. *A. eos* differs from *A. capros* in normally having one more dorsal spine (9 spines in all specimens reported by Gilbert and confirmed in the USNM types; 9 spines present in only 3 of 103 specimens of *A. capros* examined). *A. eos* averages one less pectoral softray than *A. capros* (one spine and 12 softrays counted on both sides of the USNM types, Gilbert did not distinguish the spine and gave a count of "P. 13."; 100 specimens of *A. capros* had a spine and 13 or 14 softrays, only three specimens had 12 softrays and these three had 13 softrays on the alternate side). *A. eos* apparently averages a lesser body depth than *A. capros* at sizes larger than about 50 mm. S.L., but the species may be indistinguishable by this character at smaller sizes (four types of *A. eos* of 57 to 65.5 mm. have body depths of 100.8 to 98.5% S.L.; interpretation on figure 9 of the coordinates of *A. capros* indicates body depths of 115 to 133% S.L. for this species within the above size range). Meager evidence suggests that *A. eos* has a longer 3rd dorsal spine than *A. capros*, but distinguishing the species on this basis is quantitatively impossible at present. Although Gilbert gave the length of the 3rd dorsal spine as 45 percent of the standard length, he mentioned that the tip was injured, his type illustration (pl. 80, fig. 1) represents the posterior third of this spine by a contrasting dotted line, and the length of the broken spine remaining on the holotype is only about 13% S.L. The 3rd dorsal spine of all the USNM paratypes is broken, and at least the terminal halves of the spines must be missing. Gilbert described differences in the shape and structure of the scales of *A. eos* and *A. steindachneri* (= *A. capros*), but these described differences might be attributable to intraspecific variation or variation with growth. The dorsal and anal softrays of the USNM types are: D. 33, A. 31 (1 specimen); D. 32, A. 30 (2); D. 31, A. 30 (4); and D. 31, A. 29 (1).

SPECIMENS EXAMINED: MCZ 38181 (1) 51 mm. S.L., CAPT. BILL II Sta. 221, 40°04′N., 70°34′W., about 77 miles south of Martha's Vineyard, Massachusetts, 29 July 1953, 70-75 fathoms. NAFI collection (2 specimens) 44.5 and 61.5 mm. S.L., approximately 40°03′N., 70°38′W., about 80 miles south of Martha's Vineyard, Massachusetts, by the DORTHY AND BETTY II, 11 March 1958, 75 fathoms. MCZ 37194 (4) 34.5 to 66 mm. S.L., EUGENE H, 40°00′N., 69°50′W., about 75 miles south of Nantucket Island, Massachusetts, 25 March 1951, 76

fathoms. CU 10454 (1) 109 mm. S.L., 58 miles south-half-east of Block Island, Rhode Island, by Wm. F. Royce on NEW DAWN, 12 March 1946, 53 fathoms. ANSP 60173 (1) 51 mm. S.L., 50 miles southeast Five Fathom Bank, New Jersey, March 1934. ANSP 72098 (1) 127 mm. S.L., 40 miles southeast of Ventnor, New Jersey, by C. B. Atkinson, 1945. USNM 127410 (2) 78.5 and 85 mm. S.L., Cape Henry, Virginia, SERIANO II, 6 April 1931, 50-60 fathoms. USNM 120992 (2) 46 and 57 mm. S.L., 80 miles southeast of Cape Henry, Virginia, by H. H. Iltis, SEA ROAMER, 11 February 1944, 100 to 150 fathoms. SAFI collection (3) 65.5 to 128 mm. S.L., landed at Portsmouth, Virginia, about 15 April 1958 (presumably taken from the Portsmouth area at about this date, but definite data lacking; trucked into Lewis Crab Co., Brunswick, Georgia). SAFI collection (5, 2 cleared and stained) 48 to 115 mm. S.L., COMBAT Sta. 370, 35°05′N., 75°09′W., about 20 miles ESE of Cape Hatteras Bight, North Carolina, 6 June 1957, 100 fathoms. CNHM 64377 (1) 50 mm. S.L., COMBAT Sta. 384, 34°54′N., 75°25′W., about 20 miles ESE of Cape Hatteras Bight, North Carolina, 17 June 1957, 75 fathoms. BBL (1) 35 mm. S.L., southeast of North Edisto River sea buoy off South Carolina by T-19 (about 50 miles southeast of Edisto Island), 25 February 1958, 37 fathoms. SAFI collection (1) 26 mm. S.L., COMBAT Sta. 457, 25°16′N., 80°07′W., about 16 miles east of Key Largo, Florida, 26 July 1957, 65 fathoms. MCZ 39435, Harvard-Havana Expedition ATLANTIS Sta. 3393, 22°36′N., 78°19′W., about 6 miles northeast of Cayo Coco, Cuba, 27 April 1939, 210 fathoms. MCZ 37156, Harvard-Havana Expedition ATLANTIS Sta. 3480, 23°10′N., 81°28′W., off Matansas, Cuba, 11 May 1939, 200 fathoms. GCRL (1) 73.5 mm. S.L., OREGON Sta. 1349, 24°03′N., 80°30′W., northeast of Cay Sal Bank, Florida Straits, 18 July 1955, 150 fathoms. USNM 116754 (2) 25.5 and 52 mm. S.L., south of Tortugas, Florida, by W. H. Longley, 19 July 1932, 83-94 fathoms. USNM 92055 (1) 55.5 mm. S.L., south of Tortugas, Florida, by Longley, 18 August 1931. TU 12967 (3) 40 to 79 mm. S.L., OREGON Sta. 895, 28°47′N., 85°19′W., about 53 miles south of Cape San Blas, Florida, 7 March 1954, 64 fathoms. USNM 163521 (5) 43 to 87 mm. S.L., OREGON Sta. 920, 28°00′N., 84°54′W., west of Tampa, Florida, 11 March 1954, 80 fathoms. UF collection (2) 84 and 87.5 mm. S.L., OREGON Sta. 920 (data as above). USNM 159599 (3) 83.5 to 88.5 mm. S.L., SILVER BAY Sta. 154, 28°58′N., 84°44′W., about 44 miles south of Apalachicola Bay, Florida, 22 August 1957, 76-81 fathoms. CNHM 45566 (1) 26.5 mm. S.L., OREGON Sta. 732, 28°50.8′N., 85°28′W., about 50 miles south of Cape San Blas, Florida, 17 December 1952, 57

fathoms. CNHM 46569 (6) 39 to 100 mm. S.L., OREGON Sta. 277, 28°48′N., 85°40′W., about 56 miles south of Cape San Blas, Florida, 23 February 1951, 104 fathoms. USNM 158519 (4) 104 to 134 mm. S.L., OREGON Sta. 278, 29°49′N., 85°45′W., off Cape San Blas, Florida, 24 February 1951, 112 fathoms. USNM 155670 (1) 44 mm. S.L., PELICAN Sta. 154-2, 29°08.5′N., 85°47′W., about 39 miles southwest of Cape San Blas, Florida, 10 March 1939, 70 fathoms. UF 3551 (2) 103 and 116 mm. S.L., OREGON Sta. 864, 29°19′N., 86°04′W., about 43 miles southwest of Cape San Blas, Florida, 31 October 1953, 82 fathoms. TU 12979 (3) 80.5 to 119 mm. S.L., OREGON Sta. 864 (data as above). GCRL collection (1) 58.5 mm. S.L., OREGON Sta. 603, 29°33.5′N., 86°13.2′W., about 40 miles west of Cape San Blas, Florida, 12 July 1952, 60 fathoms. TU 6071 (10) 77 to 125 mm. S.L., OREGON Sta. 602, 29°31.5′N., 86°21.4′W., about 54 miles south of Destin, Florida, 12 July 1952, 80 fathoms. USNM 155659 (1) 29 mm. S.L., PELICAN Sta. 143-4, 29°44.5′N., 86°34.5′W., south of Panama City, Florida, 5 March 1939, 65 fathoms. UF collection (2) 47.5 and 69.5 mm. S.L., OREGON Sta. 945, 29°48′N., 86°37′W., about 36 miles south of Ft. Walton, Florida, 21 March 1954, 67 fathoms. TU 12809 (1) 118 mm. S.L., OREGON Sta. 326, 29°57′N., 86°57.5′W., about 31 miles south of Pensacola, Florida, 30 April 1951, 82 fathoms. TU 2032 (1) 79 mm. S.L., OREGON Sta. 326 (data as above). USNM 158636 (17) 85 to 130 mm. S.L., OREGON Sta. 273, 29°09′N., 88°59′W., about 4 miles off Pass a Loutre, Louisiana, 18 February 1951, 110 fathoms. CNHM 46571 (6) 86 to 121 mm. S.L., OREGON Sta. 273 (data as above). USNM 159594 (1) 86 mm. S.L., SILVER BAY Sta. 179, 28°06′N., 91°09′ W., about 60 miles south of Terrebonne Bay, Louisiana, 21 September 1957, 75-100 fathoms. GCRL collection (2) 107 and 108 mm. S.L., OREGON Sta. 1514, 27°50′N., 94°45′W., about 70 miles off Freeport, Texas, 9 May 1956, 130 fathoms. CNHM 46570 (1) 39.5 mm. S.L., OREGON Sta. 156, 27°22′N., 96°08′W., about 56 miles southeast of Aransas Pass, Texas, 27 November 1950, 103 fathoms. CNHM 45215 (2) 41 and 44.5 mm. S.L., 27°20′N., 96°20′W., about 53 miles southeast of Aransas Pass, Texas, by J. L. Baughman, July 1952, 100 fathoms. SAFI (1) 33.8 mm. S.L., OREGON Sta. 2356, 17°33′N., 63°35′W., northwest of Saba Bank, Saba, Leeward Islands, 25 September 1958, 125-132 fathoms. CNHM 64378 (4) 38 to 46.5 mm. S.L., OREGON Sta. 1867, 16°38′N., 82°43′W., about 95 miles northeast of Laguna Caratasca, Honduras, 21 August 1957, 140 fathoms. CNHM 64380 (1) 88.5 mm. S.L., OREGON Sta. 1869, 16°38′N., 82°34′W., about 95 miles northeast of Laguna Caratasca, Honduras, 21 August 1957, 205-210 fathoms.

CNHM 46379 (1) 59 mm. S.L., OREGON Sta. 1868, 16°36'N., 82°37'W., about 70 miles north of Laguna Caratasca, Honduras, 21 August 1957, 175 fathoms. USNM 159600 (4) 76 to 131 mm. S.L., OREGON Sta. 1868 (data as above). CNHM 64381 (1) 40.5 mm. S.L., OREGON Sta. 1902, 11°27'N., 83°11'W., about 28 miles east of Monkey Point, Nicaragua, 9 September 1957, 135 fathoms. SAFI (2) 88.5 and 89 mm. S.L., OREGON Sta. 2291, 07°27'N., 54°27'W., about 80 miles northward of Paramaribo, Surinam, 9 September 1958, 120-135 fathoms. SAFI (2) 45.5 and 57.5 mm. S.L., OREGON Sta. 2289, 07°25'N., 54°35'W., about 80 miles northward of Paramaribo, Surinam, 8 September 1958, 75-80 fathoms.

REMARKS

The boarfishes apparently live in areas of continental and insular shelves and slopes. Most of the specimens examined were taken in bottom trawls where water depths ranged from about 37 to 325 fathoms, and published depth records are generally within this range. This does not justify, however, the assumption that they live at the depths at which the trawl hauls were made. Their laterally compressed bodies do not suggest a sea floor existence, and their stomachs contain mainly invertebrate plankton types that occur in epipelagic waters.

Antigonia combatia and *A. capros* exist sympatrically in the western North Atlantic. They were taken together in six of the collections examined. Their combined range has been demonstrated to extend from off southern Brazil to off the northern Atlantic coast of the United States. While *A. combatia* has been taken only from this area, *A. capros* also occurs in the eastern Atlantic. *A. capros* has been reported from the western Pacific and Indian Oceans, but comparison of Atlantic specimens with an adequate size range series of Indo-Pacific forms may prove that two or more similar species exist.

Larval specimens identified as *Antigonia* species (they will be described elsewhere) were taken on several cruises of the M/V THEODORE N. GILL for the South Atlantic Fishery Investigations in near-surface waters of the Gulf Stream off the Atlantic coast of the southeastern United States. This indicates that the boarfishes have an offshore pelagic larval stage and therefore are subject to geographic dispersion by current systems. The title of a publication (Uchida, 1936) I have not seen seems to substantiate this hypothesis.

In describing *Antigonia capros*, Lowe (1843: 85) proposed the family name *Caproidae*. Müller and Troschel (1849: 63) placed their synonymous *Caprophonus aurora* in the family Scomberoidei. Günther

(1860: 63), apparently prior to his recognition of Lowe's publication, placed *Hypsinotus* (= *Antigonia*) in the family Squamipinnes. Bleeker (1876: 310) apparently did not consider the relationship of *Capros* and, having an incorrect date of Temminck and Schlegel's description of *Hypsinotus* (1844), used the family name Hypsinotoidei. McCulloch (1929) also did not record the relationship of *Capros* and, incorrectly (under present nomenclatorial rules) considering *Antigonia* and *Hypsinotus* to be homonyms of prior-named genera, initiated the family name of Caprophonidae. Jordan and Fowler (1902: 521) stated, "We use the name *Antigoniidae* in preference to *Capridae*, as *Capridae*, derived from *Capra*, is applied to the family of Goats. *Caproidae* used by Gill seems hardly admissible." Recent authors have variously used Caproidae or Antigoniidae. I follow Lowe (*loc. cit.*), Berg (1947: 468), and others in recording *Antigonia* Lowe and *Capros* Lacepede in the family Caproidae. The phylogenetic relationships of the family are so uncertain, despite the early work of Starks (1902) and Regan (1910), that among other conflicting opinions Tortonese (1943-48: 13) gave evidence for placing Caproidae in the Zeiformes, while Matsubara (1955: 928) recorded the family (as Antigoniidae) in Percida: Chaetodontina.

Capros aper Lacepede differs generically from species of *Antigonia* in the way the nasal bones are fused (joined across the front of the snout with the posterior extensions of the premaxillaries extending posteriodorsally under the nasals in *Capros*, a recess between the nasals containing the posterior extensions of the premaxillaries exposed along the dorsal profile of the snout in *Antigonia*), in the external sculpture of the head above the eye (no distinct pattern of ridges in *Capros*, a distinct pattern of 12 or more curved and serrated ridges in *Antigonia*), in the structure of the scales (with numerous conical spines on exposed portion in *Capros*, with elevated and frequently denticulated ridges and frequently bearing flattened spines on the exposed portion in *Antigonia*), and in several proportions and meristics. I have not been able to locate the deep-bodied, protractile-mouthed fish from the stomach of a chiasmodont taken off Puerto Rico that Erdman (1956: 339) suggested might be a young *Capros aper*. Dannevig (1917: 8) listed as *Capros aper* a specimen of 6 mm. total length from 49°24′ N., 58°55′ W., in the Laborador Sea, but this record was not described or illustrated and is not convincing. The substantiated range of *Capros aper* is the Mediterranean Sea and the eastern North Atlantic Ocean.

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