THE AMERICAN ATHERINID FISHES OF THE GENUS *COLEOTROPIS*

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ABSTRACT: The atherinid fishes of the genus *Coleotropis* comprise two species, *C. starksi* (Meek and Hildebrand) and *C. blackburni* Schultz, which are found in shallow inshore waters of the eastern Pacific and western Atlantic oceans, respectively. A third species, *C. colecanos* Caldwell, recently described from Caribbean Costa Rica, is here synonymized with *C. blackburni*. The genus was included in the subfamily Menidiinae by Schultz (1948), who indicated that its closest relatives are the eastern Pacific genera *Eurystole* and *Nectarges*. The present paper describes the genus *Coleotropis* and its included forms, lists the morphological differences by which the species may be separated, and extends both the geographic ranges and ranges of morphometric variation of the two species.

INTRODUCTION

The genus *Coleotropis* was erected by Myers and Wade (1942: 136-138) to include a single species, *C. starksi,* which had been described by Meek and Hildebrand (1923: 267, pl. 20, fig. 2) from Panama Bay. Later, Schultz (1949: 108-109, fig. 15) and Caldwell (1962) described, respectively, *C. blackburni* and *C. colecanos,* cognate forms from the Caribbean. The last species was described from a single specimen and was said to differ from *C. blackburni* in having a more slender body and a longer and more slender caudal peduncle. Although the morphometric data given in the original description of *C. colecanos* appeared convincing, the absence of any meristic features different from those found in *C. blackburni,* together with the scarcity of specimens, cast some doubt as to the validity of the species.

During the summer of 1963, intensive field work by the senior author in the vicinity of Tortuguero, Costa Rica (the type locality of *C. colecanos*), resulted in the collection of over a hundred specimens of *Coleotropis*. This large series has permitted a reassessment of the two Atlantic species, as well as a more detailed comparison of the Atlantic and Pacific forms.

MATERIALS AND ACKNOWLEDGMENTS

The specimens examined during this study are from the following museum collections: Field Museum of Natural History (formerly Chicago Natural History Museum) (FMNH); Florida State Museum, University of Florida (UF); Los Angeles County Museum of Natural History (LACM); Museum of Comparative Zoology, Harvard University (MCZ); University of

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California, Los Angeles (UCLA); University of Puerto Rico, Institute of Marine Biology, Mayaguez (UPR); and the United States National Museum (USNM). We wish to thank the individuals in charge of these collections, other than our own, for making the specimens available. We also want to express our appreciation to Dr. Archie F. Carr, of the University of Florida, whose generous help and financial support has resulted in many valuable fish collections from the Tortuguero area; to Dr. C. Richard Robins, Institute of Marine Science, University of Miami, and Mr. Alejandro Ciardelli, Universidad de Cartagena, Cartagena, Colombia (formerly of the Institute of Marine Science, University of Miami), for information regarding the hydrography of the Rio Atrato and Gulf of Urabá (Darien); to Mrs. Mildred Eaddy, Florida State Plant Board, who took the photographs; to Mr. Paul Laessle, University of Florida, for the illustrations; and to the authorities of the United States Fish and Wildlife Service Biological Laboratory, Brunswick, Georgia, and particularly to Mr. Herbert Gordy, who is responsible for the radiographs used in this study.

METHODS

All counts and measurements included in this paper were taken by the senior author. These were made, using the standard methods described by Hubbs and Lagler (1958: 19-26), on the holotype and 21 topotypes of *Coleotropis colecanos* (ranging from 41.5 to 92 mm standard length) from Tortuguero, Costa Rica; on three paratypes and one non-type specimen of *C. blackburni* from Venezuela and Brazil, respectively; on six paratypes of *C. starksi* from Panama; and on 14 specimens of *C. starksi* from Costa Rica. Additional counts were made on a fourth paratype of *C. blackburni,* eleven other topotypes of *C. colecanos,* and ten other specimens of *C. starksi* from Costa Rica. Measurements are expressed in thousandths of standard length (shortened hereafter to SL); they were taken with precision dividers and were read to the nearest tenth of a millimeter. Scale counts for the circumferential and caudal-peduncle series are written to indicate the relative disposition of scales above and below the lateral line. Thus, a count expressed as 7-2-7=16 signifies seven scales above and seven scales below and between the lateral lines on each side of the body. The sum of these two counts, together with the lateral-line rows, represents the total count. Since the lateral line is incomplete and irregular, a lateral-scale count was obtained by counting the series from above the opercular opening to the caudal base. A frequency distribution expressed as (21) 23 to 25 (26) indicates that 90 percent of the counts fall between 23 and 25, with the extremes 21 and 26. The caudal fin-ray count is written so as to indicate the total number of caudal elements, as well as the number of main (long) caudal rays emanating from the superior and inferior hypurals. Thus, a count of 9+8=17 indicates nine dorsal and eight ventral main caudal rays. Vertebral counts are written so as to indicate the numbers of precaudal and caudal vertebrae, as well as the total number.

In this paper a complete description is presented under the account of the genus *Coleotropis;* no description appears in either of the species accounts. Characters distinguishing the two species are compared in the species diagnoses, and the rough breakdown of meristic counts also appears in these sections. The illustrations in Figures 2 through 5 were made from the specimens appearing in Figure 1.

Genus *Coleotropis* Myers and Wade

Menidia Bonaparte, 1836: 91 (type species, *Atherina menidia* Linnaeus, by absolute tautonomy).

Coleotropis Myers and Wade, 1942: 136-138 (type species, *Menidia starksi,* by monotypy).

Description: Compressed, rather elongate atherinid fishes with the air bladder not tapering to a point posteriorly and not extending into five or more haemal arches; air bladder and posterior end of body cavity falling well short of anal fin origin; anal fin elongate, with a single spine; a sheath of scales present at base of anal fin, this sheath consisting of either one or two rows of scales anteriorly; body scales cycloid, the posterior edge somewhat irregular; origin of anal fin anterior to origin of first dorsal fin, midway between caudal base and posterior margin of orbit; dorsal fin widely separated, the height of the spinous portion less than distance between the origins of the spinous and soft-rayed segments; first dorsal fin with III or IV flexible spines, the origin over base of fourth or fifth anal ray; caudal fin forked; pectoral fin high on body, falcate, as long as or slightly longer than head, its tip extending beyond ventral base; pelvic fins posterior in position, close together and inserted equidistant between upper angle of pectoral base and anal origin; pelvic fins completely joined by a membrane; several enlarged scales present between bases of pelvic fins, the largest sharply pointed and extending posteriorly more than halfway along lengths of fins; anus normal in position, situated a short distance in front of anal fin.

Premaxillaries protractile, the dermal covering separated by a deep fold from skin on head; premaxillaries broadly dilated posteriorly, the anterior part not separated by a notch from the posterior part; gape of mouth strongly curved, restricted at corners by a membrane between the jaws; rami of mandibles scarcely elevated; teeth well developed in both jaws, sharply pointed, and slightly curved, in two rows, the first row in upper jaw enlarged; lower jaw slightly included at tip of mouth when mouth is tightly closed.

Abdomen more or less strongly compressed; peritoneum brownish-black; lateral line present, but irregular and incomplete; silvery lateral band present, very well marked, and sharply delimited above and below, somewhat constricted at caudal peduncle, and bordered above with a dark line.

Sides of head and body scaled; scales large, 38 to 50 in lateral series; predorsal scales 18 to 28; body circumferential scales 9-2-11 or 10-2-10 to 11-2-11=22 to 24; caudal-peduncle circumferential scales usually 5-2-5=12

or 7-2-7=16 (depending on species), with intermediate counts often present; anal rays I,19 to I,32; dorsal rays II-I to IV-I,7 to 10; pectoral rays 12 to 14, usually 13; pelvic rays I,5; gill rakers 4 to 6+1+14 to 17 (range of total counts=20 to 23); vertebrae 14 or 15+25 to 27 (range of total counts=40 to 42); total caudal rays 34, the main rays 9+8=17.

Relationships: Although the genotype of *Coleotropis, C. starksi,* was originally described in the genus *Menidia,* the relationships of the two genera actually are not particularly close. Myers and Wade (1942: 136-138), in the description of *Coleotropis,* made the following comments regarding the affinities of their new genus: "In Jordan and Hubbs' (1919) key, *Coleotropis starksi* keys down to the *Thyrina* group (*Thyrina, Thyrinops,* and *Atherinella*). It differs from all of these in its much larger size, the more curved gape, the considerably larger mouth (the maxillary reaching to below the front part of the eye), and very sharply in the deep anal sheath. None of the *Melaniris* (=*Thyrina,* preoccupied) group appears to possess any anal sheath at all. It may be remarked that *Melaniris brasiliensis* possesses neither the pinched belly nor the posteriorly produced air-bladder of the other species of *Melaniris,*[3] and it is a much larger fish. In these three characters *brasiliensis* resembles *starksi,* and it is possible that there is a close relationship. *M. brasiliensis,* however, has no anal sheath and possesses the small mouth of the other species of *Melaniris.* We therefore do not at this time disturb its generic assignment."

Schultz (1948) regarded the degree to which the air bladder extends into the haemal arches of the caudal vertebrae as particularly significant in atherinid classification. Using this criterion, he placed *Coleotropis* in the subfamily Menidiinae, the members of which have the air bladder not tapering to a point posteriorly and not extending beyond the fifth haemal arch. Inasmuch as Schultz made no direct statements regarding the inter-relationships of the various genera (the characters of the different groups appearing only in the form of a key), one must assume that he intended the proximity to each other of the couplets in the key to be a direct indication of phylogenetic relationships. According to this, *Coleotropis* is most closely related to the eastern Pacific genera *Eurystole* and *Nectarges,* and somewhat more distantly allied to *Adenops, Membras,* and *Hubbesia.* All of these taxons are characterized by having the posterior tip of the air bladder falling well short of the anal-fin origin.

Ecology: All specimens of *Coleotropis blackburni* from Tortuguero, Costa Rica, were collected in the surge zone area, in water from one to 36 inches deep. None was ever taken in brackish or fresh water, and thus they were never found sympatrically with *Thyrinops chagresi* (Meek and Hildebrand), the other atherinid fish in the Tortuguero area.

[3]According to Schultz (1948), the genus *Melaniris* does *not* have a pronounced posterior extension of the air bladder. He also erected a new genus, *Xenomelaniris,* for the sole reception of *"M." brasiliensis.*

Data for the most recent collections of *C. starksi* (from Costa Rica) indicate that this species occurs in ecological situations very similar or identical to those in which *C. blackburni* is found.

Range: (See under species accounts).

Coleotropis starksi (Meek and Hildebrand)
Figures 1A, 2A, 3A, 4A, 5A

Menidia starksi Meek and Hildebrand, 1923: 267-268, pl. XX, fig. 2 (original description; type locality, Taboga Island, Panama; holotype, 109 mm SL [incorrectly listed in original description as 235 mm SL], USNM 79732).

Coleotropis starksi, Myers and Wade, 1942: 136-138 (new generic name).

Specimens Examined (numbers in parentheses refer to number of specimens examined and size range in mm, respectively): FMNH 8308 (2 paratypes of *Menidia starksi,* 74-93.5), USNM 79733 (3 paratypes, 89-111), USNM 81747 (1 paratype, 111), all from Taboga Island, Panama; UCLA W 53-283 (26, 15-95), Isla de San Jose, Ensenada Playa Grande, Islas Perlas, Panama Bay, Panama; UCLA, W 54-168 (1, 43), Bahia Ballena, Golfo de

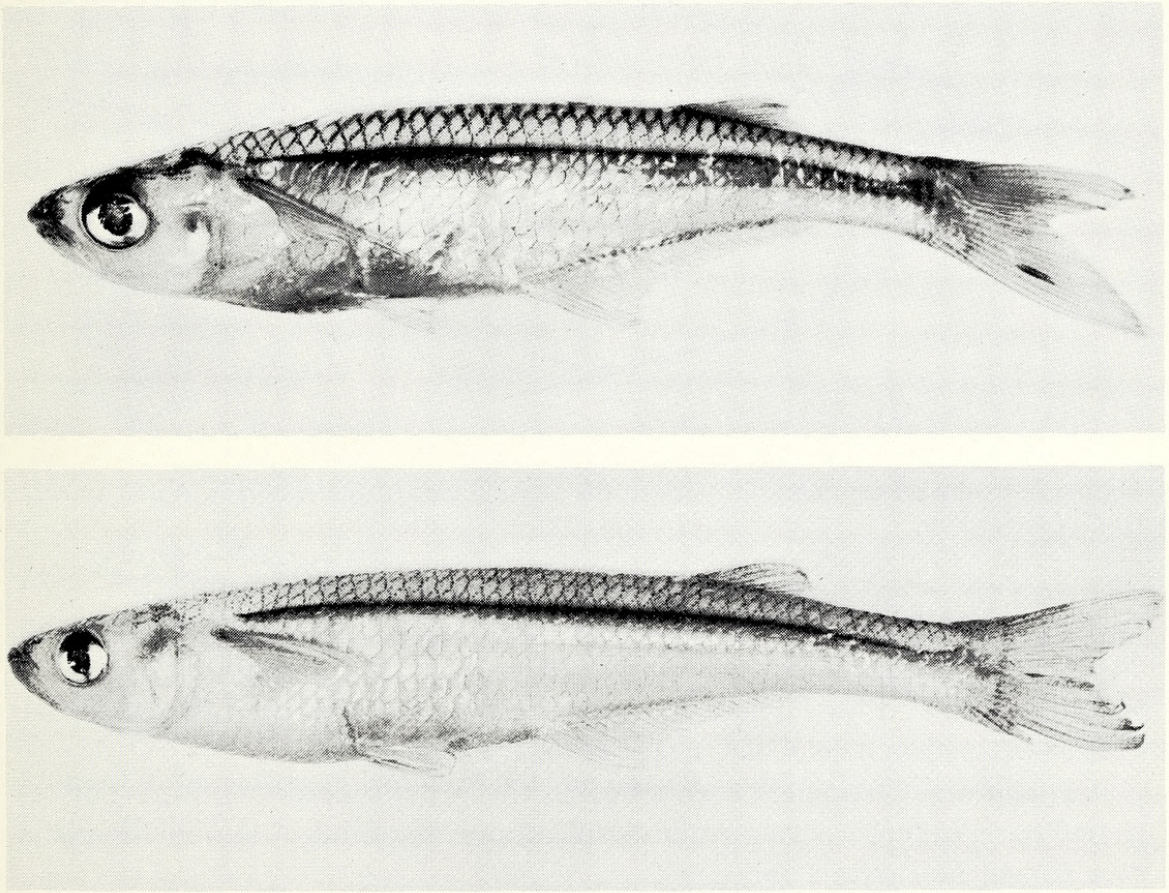

Figure 1. A: *Coleotropis starksi* (Meek and Hildebrand), LACM 6893-1, 90.5 mm SL, from Playa del Coco, near Sardinal, Costa Rica. B: *Coleotropis blackburni* Schultz, UF 11205, 90.5 mm SL, from Tortuguero, Costa Rica.

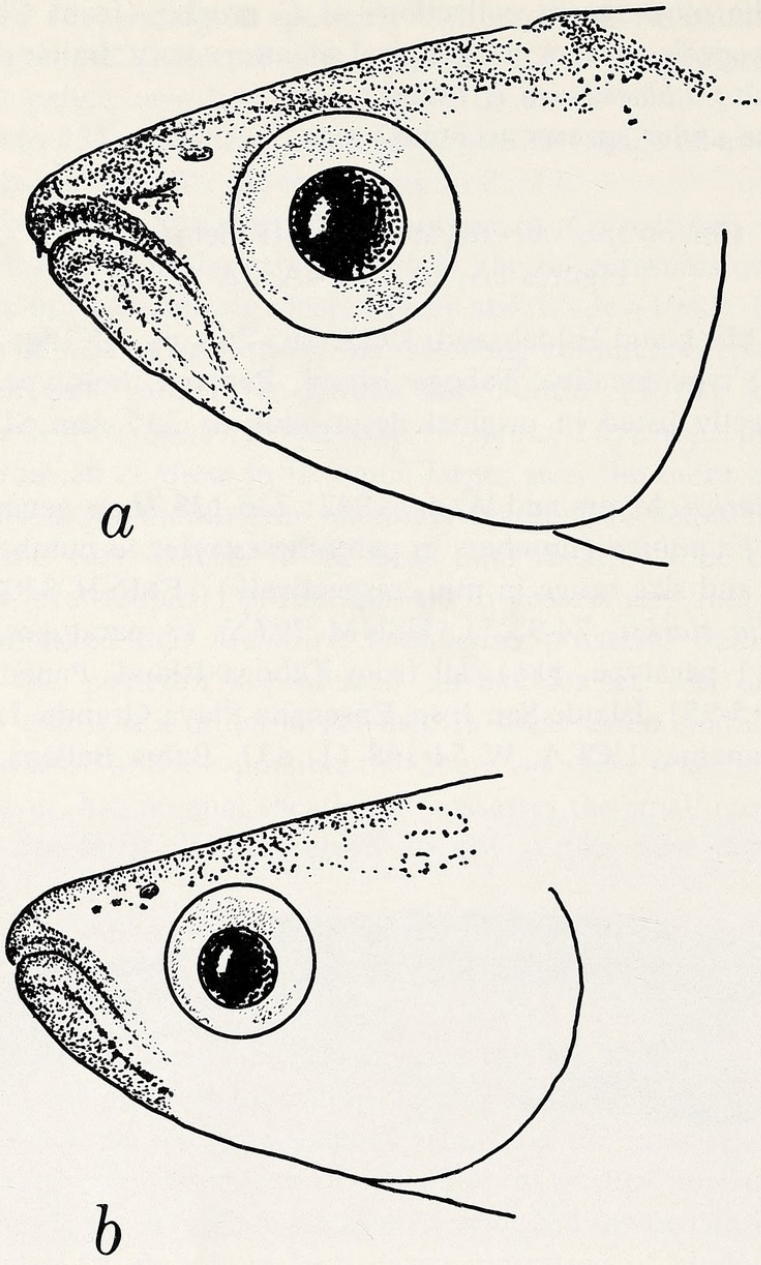

Figure 2. Comparison of mouth size in the two species of *Coleotropis.* A: *C. starksi.* B: *C. blackburni.*

Nicoya, Costa Rica; UCLA, W 54-172 (34, 31-99), UCLA, W 54-177 (24, 44-59), Isla Tortuga, Golfo de Nicoya, Costa Rica; LACM 6894-1 (2, 19-55), ½ mile south of Playa del Coco, near Sardinal, Costa Rica; LACM 6893-1 (22, 53-102), Playa del Coco, near Sardinal, Costa Rica.

Diagnosis: Characters mentioned in the generic description are not repeated here, except where greater clarification is required. Additional meristic data appear in Tables 1 through 5.

A species of *Coleotropis* that differs from its Atlantic cognate, *C. blackburni,* in having fewer predorsal scales (18 or 19 vs. 23 to 28); fewer lateral scales (37 to 39 vs. 43 to 50); fewer caudal-peduncle scales (usually 12 vs.

usually 16); fewer scales in circumferential series above and between lateral lines (9 vs. 10 or 11); a higher average anal fin-ray count (25 to 33 vs. 20 to 26); a larger mouth, the maxillary extending posteriorly to beneath anterior part of orbit (instead of extending just anterior to orbit) (Fig. 2A); an anal sheath with two scale rows anteriorly (instead of one) (Fig. 3A); a longer pectoral fin, which is slightly longer than head and extends to above tip of pelvic fin (instead of being shorter than head and extending about halfway along length of pelvic fin); the upper margin of silvery lateral stripe on third (rather than fourth) scale row below mid-dorsal scale row (Fig. 4A); pigmentation less extensive on lower jaw, covering less than half (instead of all) of jaw (Fig. 5A); teeth in both jaws larger and more widely spaced; a probable greater maximum body length (largest specimen [of 115] examined, 111 mm SL vs. 92 mm SL [124 specimens]).

Lateral scales 37 or 38 (39) (a count of 40 listed in original description); dorsal-fin rays (II) III (IV), (7) 8 (9); total anal elements (25) 26 to 29 (30 and 33); circumferential scales (9-2-9 or 8-2-11=20 or 21) 9-2-10 or 9-2-11=21 or 22 (9-2-12=23); caudal-peduncle scales 5-2-5=12; vertebrae (14+25=39) 15+25=40 (16+25=41).

Range: Recorded from the Gulf of Panama to northern Costa Rica. Further collecting undoubtedly will extend the range of this species.

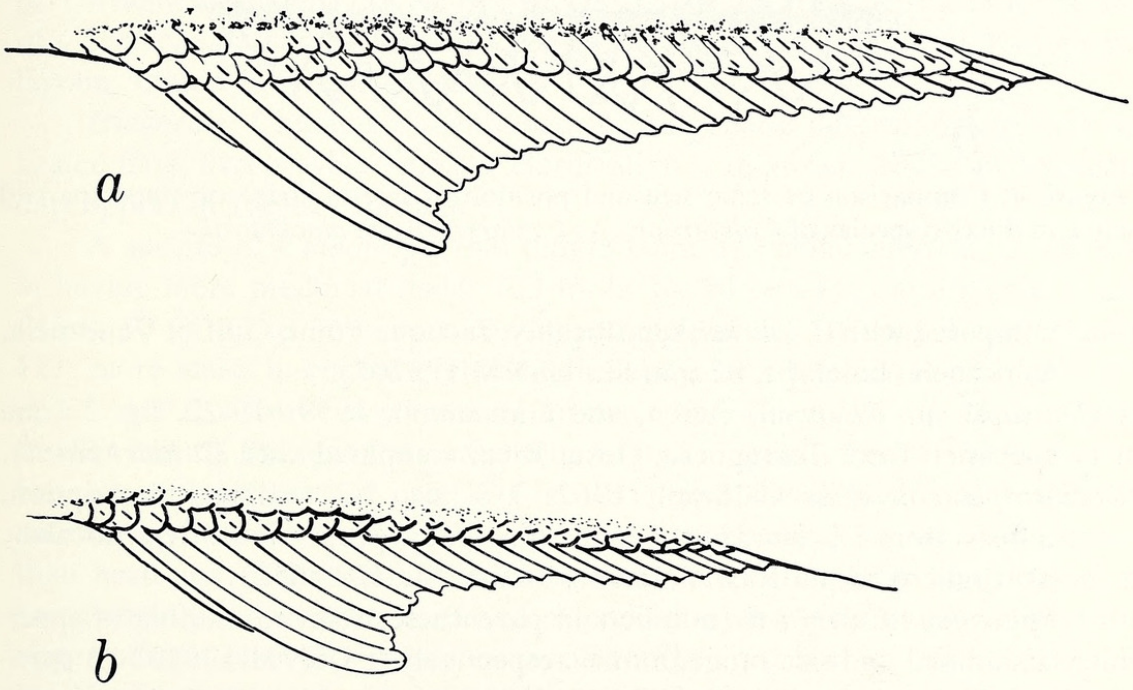

Figure 3. Comparison of anal sheaths in the two species of *Coleotropis*. A: *C. starksi*. B: *C. blackburni*.

Coleotropis blackburni Schultz
Figures 1B, 2B, 3B, 4B, 5B

Coleotropis blackburni Schultz, 1949: 108-109, fig. 15 (original description;

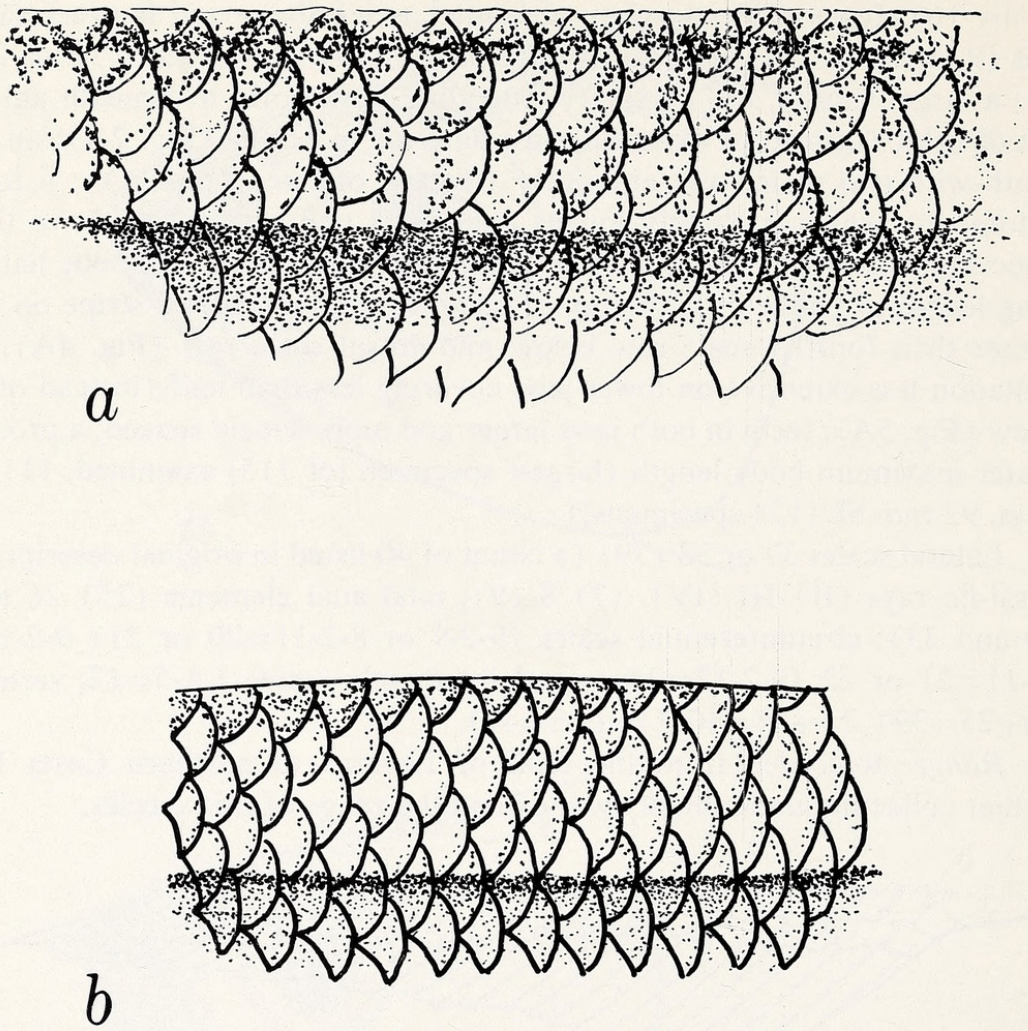

Figure 4. Comparison of scale size and position of lateral stripe on upper part of back in the two species of *Coleotropis*. A: *C. starksi*. B: *C. blackburni*.

compared with *C. starksi*; type locality, Jacuque Point, Gulf of Venezuela, Venezuela; holotype, 82 mm SL, USNM 123205).

Coleotropis sp., Caldwell, Ogren, and Giovannoli, 1959: 19-22, fig. 2 (one specimen from Tortuguero, Costa Rica; compared with *C. blackburni*).

Coleotropis colecanos Caldwell, 1962: 1-8, fig. 1-2 (original description; differs from *C. blackburni* in certain body proportions; type locality, Tortuguero, Costa Rica; holotype, 76 mm SL, UF 5652).

Specimens Examined (numbers in parentheses refer to number of specimens examined and size range in mm, respectively): USNM 123207 (3 paratypes of *C. blackburni,* 45-64), MCZ 37293 (1 paratype of *C. blackburni,* 48), all from Point Macolla, Gulf of Venezuela, Venezuela; UPR 2490 (3, 35-65), Manzanilla, Isla Margarita, Venezuela; USNM 100830 (1, 72), Porto Inhauma, Brazil; UF 5652 (holotype of *C. colecanos,* 76), beach near Tortuguero, Limon Province, Costa Rica; UF 11205 (84 topotypes of *C. colecanos*, 19-90.5), LACM 8335 (10 topotypes of *C. colecanos,* 37-61.5), shore in front of turtle camp, ca. 2 mi. S of mouth of Tortuguero lagoon, Limon

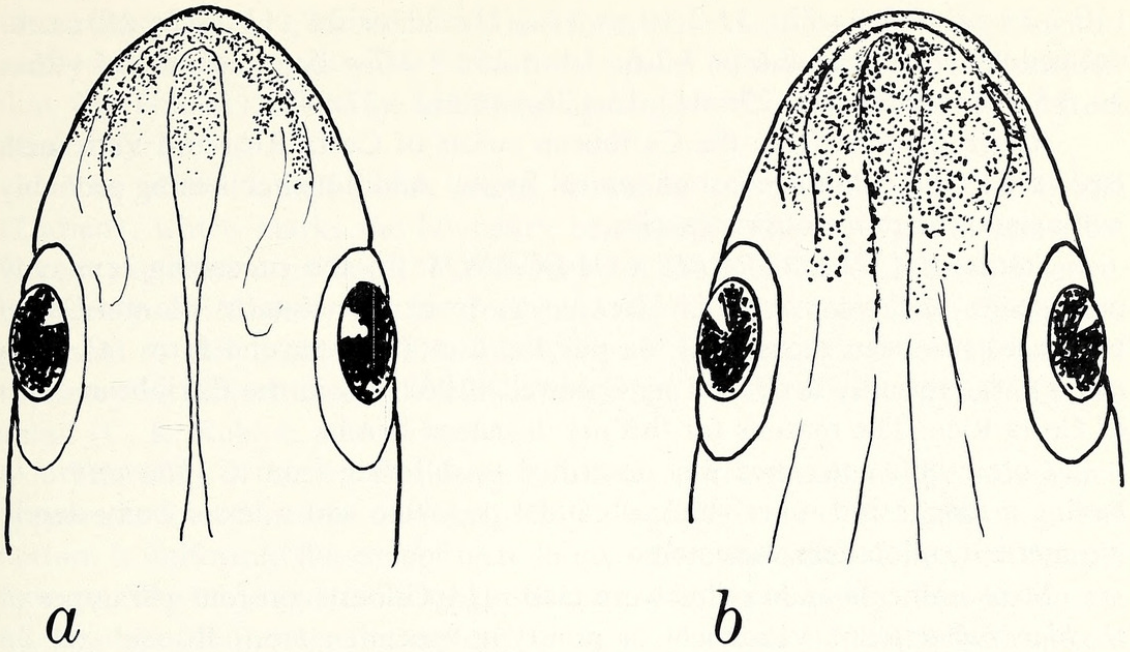

Figure 5. Comparison of pigmentation on underside of head in the two species of *Coleotropis.* A: *C. starksi.* B: *C. blackburni.*

Province, Costa Rica; UF 11254 (1 topotype of *C. colecanos*, 68.5), mouth of Tortuguero lagoon, Limon Province, Costa Rica; UF 11261 (23 topotypes of *C. colecanos*, 31-65), seaward side of sand spit, near mouth of Tortuguero lagoon, Limon Province, Costa Rica.

Diagnosis: Characters mentioned in the generic description are not repeated here, except where greater clarification is required. Additional meristic data appear in Tables 1 through 5.

A species of *Coleotropis* that differs from its Pacific cognate, *C. starksi,* in having more predorsal scales (23 to 28 vs. 18 or 19); more lateral scales (43 to 50 vs. 37 to 39); more caudal-peduncle scales (usually 16 vs. usually 12); more scales in circumferential series above and between lateral lines (10 or 11 vs. 9); a lower average anal fin-ray count (20 to 26 vs. 25 to 33); a smaller mouth, the maxillary extending to just in front of orbit (instead of to beneath anterior part of orbit) (Fig. 2B); anal sheath with one scale row anteriorly (instead of two) (Fig. 3B); a shorter pectoral fin, which is shorter than head and extends about halfway along length of pelvic fin (instead of being slightly longer than head and extending to above tip of pelvic fin); the upper margin of silvery lateral stripe on fourth (rather than third) scale row below mid-dorsal scale row (Fig. 4B); pigmentation more extensive on lower jaw, covering nearly all (instead of less than half) of jaw (Fig. 5B); teeth in both jaws smaller and more narrowly spaced; a probable smaller maximum body length (largest specimen [of 124] examined, 92 mm SL vs. 111 mm SL [115 specimens]).

Lateral scales (43) 44 to 49 (50); dorsal-fin rays III (IV), (7) 8 (9 or 10); total anal elements (20) 21 to 24 (25 or 26); circumferential scales

(10-2-10 or 11-2-9=22) 11-2-10 or 11-2-11=23 or 24 (11-2-12=25); caudal-peduncle scales (6-2-6 or 7-2-6=14 or 15) 7-2-7=16; vertebrae (14+26=40, 15+25=40, or 14+27=41) 15+26=41 (15+27=42).

Range: Known from the Caribbean coasts of Costa Rica and Venezuela eastward to the Atlantic coast of central Brazil. Additional collecting probably will extend the range of this species.

Status of COLEOTROPIS COLECANOS: In the preceding text only one species of *Coleotropis* (*C. blackburni*) from the western Atlantic-Caribbean area has been recognized, despite the fact that a second form (*C. colecanos*) was recently described by Caldwell (1962) from the Caribbean coast of Costa Rica. The reasons for this are discussed herein.

Coleotropis colecanos was described as differing from *C. blackburni* in having a longer and more shallow caudal peduncle and a lesser body depth. No meristic differences were noted.

Measurements and counts were made (by Gilbert) on four paratypes of *C. blackburni* from Venezuela, a non-type specimen from Brazil, and 25 topotypes of *C. colecanos*. In addition, the holotype of *C. colecanos* was recounted and remeasured. These data are summarized in Tables 1 through 5.

The new value obtained for the caudal peduncle depth of the holotype of *C. colecanos* agrees closely with the original (88 versus 84). The new value for the caudal-peduncle length is somewhat less than that given in the original description (205 versus 236). This undoubtedly is attributable to a slight difference in measuring technique. Nevertheless, this new value is greater than for all but seven (out of 38) of the topotypes measured, and is also higher than any of the values obtained for the four specimens from Venezuela and Brazil (Table 5). As can be seen from Table 5, the overall average for caudal-peduncle length is slightly higher for the topotypes of *C. colecanos* than for the paratypes and non-type specimen of *C. blackburni*. However, the fact that values obtained for *C. colecanos* completely encompass those for *C. blackburni* indicates that these differences are not meaningful. Since there apparently are no striking morphological differences by which *C. colecanos* and *C. blackburni* can be distinguished, we conclude that *C. colecanos* should henceforth be regarded as a synonym of *C. blackburni*.

Although the populations of *Coleotropis blackburni* from the extreme western Caribbean and from the southern Caribbean-western Atlantic apparently are indistinguishable, it should be noted that differences do exist between other elements of the inshore fish faunas occurring in these two areas. For example, in the southern and western Caribbean the sciaenid fish *Umbrina broussonnetii* is found only from western Colombia northward along the Central American coast, whereas the closely related *U. coroides* is confined almost exclusively to the South American coast. In the northern Caribbean these two species occur sympatrically (Gilbert, 1966). Another sciaenid, *Ophioscion costaricensis*, which is known from two specimens from the Tortuguero area, was said to differ from the closely related *O. brasiliensis*

(from the southern Caribbean and southwestern Atlantic) in having a significantly smaller eye and wider interorbital space (Caldwell, 1958). Examination (by Gilbert) of many additional specimens of *O. brasiliensis* confirms these differences.

The above faunal break seems to center around the Gulf of Urabá (Darien), which marks the boundary between South and Central America. Recent exploration by the *R/V Pillsbury* (of the Institute of Marine Science, University of Miami) in this area has resulted in ecological information pertinent to this problem. The following are preliminary observations, and thus may be subject to some modification when the data are analyzed in more detail (C. R. Robins, *pers. comm.*).

The Gulf of Urabá is a long, relatively narrow arm of the sea, which appears to be of nearly uniform depth throughout (ca. 20 fathoms). The bottom is uniformly flat except near shore, where the sides slope very sharply upward. The large quantities of silt that are carried in by the Rio Atrato are mostly deposited along the eastern shore of the Gulf or along the adjacent Caribbean coast of South America. This easterly flow is thought to be due to the Corollis effect and/or perhaps an eastward flowing oceanic countercurrent. The resultant ecological conditions favor such fishes as sciaenids and clupeids, most species of which characteristically inhabit shallow, turbid, inshore water where a silt bottom is present. In contrast, the western shore of the Gulf of Urabá, as well as much of the Caribbean coast of Panama, is largely silt-free, is characterized by extensive areas of small coral formations, and has a fish fauna that is basically an impoverished insular reef type. Such an area is poorly suited for most sciaenids and clupeids, and the species of these families collected to the east were not encountered here. Farther west one again finds ecological conditions similar to those on the coast of northern South America, and it is here that sciaenids and clupeids again appear. Thus, the distributional break noted for the sciaenid genera *Ophioscion* and *Umbrina* appears real, and might logically be expected in other groups of fishes.

TABLE 1

Predorsal scale counts in the two species of *Coleotropis*

	18	19	20	21	22	23	24	25	26	27	28	No.	x
C. starksi	15	13										28	18.5
*C. blackburni***							2	3				5	24.6
*C. blackburni****						2	3*	4	8	13	3	33	26.1

*Value for holotype of *C. colecanos*

**Non-topotypes of *C. colecanos*

***Topotypes of *C. colecanos*

TABLE 2

Lateral scale counts in the two species of *Coleotropis*

	37	38	39	40	41	42	43	44	45	46	47	48	49	50	No.	x
C. starksi	9	17	2												28	37.8
*C. blackburni***								3	2						5	44.4
*C. blackburni****							1	7	3	8*	4	5	3	2	33	46.3

*Value for holotype of *C. colecanos*

**Non-topotypes of *C. colecanos*

***Topotypes of *C. colecanos*

TABLE 3

Anal ray counts in the two species of *Coleotropis*****

	20	21	22	23	24	25	26	27	28	29	30	31	32	33	No.	x
C. starksi						1	8	4	9	6	1			1	30	27.7
*C. blackburni***			2	2											4	22.5
*C. blackburni****	2	3	5*	13	7	1	2								33	22.9

*Value for holotype of *C. colecanos*

**Non-topotypes of *C. colecanos*

***Topotypes of *C. colecanos*

****Includes the single anal spine plus the remaining soft elements

TABLE 4

Total vertebrae counts in the two species of *Coleotropis*

	39	40	41	42	No.	x
C. starksi	1	9	1		11	40.0
*C. blackburni**		1	3		4	40.8
*C. blackburni***		4	14	1	19	40.8

*Non-topotypes of *C. colecanos*

**Topotypes of *C. colecanos*

TABLE 5

Comparison of proportional measurements (expressed in thousandths of standard length) in the species of *Coleotropis*

	C. starksi	*C. starksi*	*C. blackburni**	*C. blackburni**	*C. blackburni***	*C. blackburni***	*C. blackburni****
Size range in mm	56.7-64.5	67.5-111	54-64	72	41.5-63	65-92	74
No. of specimens	6	14	3	1	18****	3	1
Body depth	183-205 (193.0)	196-230 (215.6)	200-207 (203.3)	167	163-189 (176.8)	172-194 (181.3)	169
Caudal-peduncle depth	81-87 (84.0)	83-101 (92.1)	102-103 (102.3)	103	92-104 (97.0)	87-93 (90.7)	88
Caudal-peduncle length	155-175 (165.5)	135-178 (156.9)	173-191 (182.0)	188	169-224 (195.6)	178-192 (185.0)	205
Head depth	162-174 (169.2)	158-180 (166.5)	142-163 (152.7)	136	139-159 (144.8)	132-147 (139.7)	138
Head width	118-131 (126.5)	114-143 (126.1)	104-116 (108.7)	97	102-124 (111.2)	99-104 (102.3)	104
Head length	243-251 (246.7)	221-258 (238.1)	213-220 (216.7)	213	198-239 (215.1)	208-213 (211.0)	213
Length of lower jaw	98-113 (107.5)	94-114 (104.4)	81-96 (89.7)	76	76-93 (83.1)	76-85 (80.0)	78
Snout length	62-75 (67.0)	68-82 (75.1)	66-67 (66.3)	63	60-92 (64.7)	58-70 (63.0)	68

TABLE 5 (CONT.)

Post-orbital length	84-96 (89.4)	81-96 (88.4)	88-92 (89.7)	88	84-92 (87.0)	83-93 (88.3)	88
Orbital diameter	79-95 (87.5)	68-86 (76.8)	64-69 (66.7)	63	65-76 (70.4)	57 (57.0)	59
Interorbital width	72-79 (75.8)	77-87 (81.5)	69-78 (74.7)	67	67-78 (72.0)	65-73 (68.3)	65
Snout to 1st dorsal origin	524-561 (541.7)	536-611 (585.4)	550-594 (569.3)	553	532-609 (548.9)	539-570 (553.6)	547
Snout to pelvic insertion	344-380 (357.7)	350-405 (380.3)	344-363 (356.6)	351	337-380 (351.1)	348-376 (359.0)	362
Snout to anal origin	495-529 (510.0)	503-566 (539.9)	488-523 (507.3)	521	470-552 (498.6)	494-540 (514.0)	507
1st dorsal origin to 2nd dorsal origin	126-154 (134.7)	117-149 (132.0)	118-141 (126.7)	160	130-163 (144.5)	139-160 (150.7)	132
Anal fin length	357-405 (384.8)	336-407 (369.4)	308-341 (322.3)	326	326-380 (343.9)	302-349 (329.0)	320

*Non-topotypes of *C. colecanos*

**Topotypes of *C. colecanos*

***Holotype of *C. colecanos*

****Caudal-peduncle length was measured for 35 topotypes under 65 mm SL

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