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A new species of cichlid fish, *Cichlasoma rhytisma* from the Río Sixaola drainage, Costa Rica

Myrna I. López S.
Escuela de Biología y Centro de Investigación en Ciencias del Mar y Limnología, Universidad de Costa Rica

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Abstract: A new cichlid fish, *Cichlasoma rhytisma* is described from the Río Sixaola basin on the Atlantic slope of Costa Rica. Its most distinctive characteristic is a dark lateral blotch bordered on each side by pale vertical bars. Series of blue-green dots and short vermiculations form horizontal lines along the flanks and create an irregular pattern around the eyes. The new species is compared in detail with the very similar *C. alfari*, with which it is syntopic.

Collections made during 1977 in the vicinity of Shiroles on the Atlantic versant of Costa Rica revealed an undescribed cichlid of the genus *Cichlasoma*. Additional material was obtained from one of the same tributaries in 1979. The new species was not abundant at any site and it was always sympatric with the similar and much commoner *Cichlasoma alfari*.

Whereas the widespread *C. alfari* can be separated from its allopatric cognate *C. diquis* (Bussing, 1974) on the basis of meristic differences, the sympatric and very similar *C. rhytisma* is distinguishable only by its color pattern and a combination of morphological differences.

MATERIAL AND METHODS

All counts and measurements follow the standard procedures defined by Hubbs and Lagler (1958).

The body measurements refer to standard length (SL) in millimeters (mm). All proportional measurements are expressed as times in SL or times in head length. Body proportions as thousands of SL appear in Table 1. The lateral series scale count is equivalent to Regan's "longitudinal series" as defined by Miller (1974).

The type material is listed in the following manner: catalog number, number of specimens in parentheses, size range in millimeters (mm) and locality.

Study materials are deposited at the Natural History Museum of Los Angeles County (LACM) and the Museo de Zoología, Universidad de Costa Rica (UCR).

Cichlasoma rhytisma, new species
Fig. 1

Holotype: LACM 42998-1, adult male, 121.4 mm SL, Costa Rica, Limón Province, Río Cocolis, a tributary of Río Sixaola, 3.5 km SE of Shiroles on road between Bratsí and Shiroles. Original collection number UCR 1299-10, 6 October 1979 collected by students of the Ichthyology course.

Paratypes: All specimens from Río Sixaola drainage LACM 42998-2, (4) 49.5-82.1 mm, same data as holotype; collections UCR 1299-10 (5) 45.6-98.5 mm, same data as holotype, UCR 1142-13 (1) 66.2 mm, 13 November 1977, creek 1.6 km SE of Shiroles on road between Bratsí and Shiroles, UCR 1144-4 (7) 32.4-135.0 mm, same locality as holotype, 13 November 1977.

Diagnosis: A moderately small species of *Cichlasoma;* as its close ally *C. alfari* (Bussing, 1967), it represents general characteristics of the *Amphilophus* (Regan's *Astatheros)* section of *Cichlasoma* (Regan, 1906-1908). The new species is distinguished by the presence of: 17 dorsal spines, 10-11 soft dorsal rays, 6 anal

TABLE 1

Meristics and body proportions in per mille of standard length of Cichlasoma alfari, *UCR 1144-5 (15) and* Cichlasoma rhytisma, *n. sp., UCR-1142-13 (1), UCR 1144-4 (7); UCR 1299-10 (10), LACM 42998-1 the holotype and LACM 42998-2*

	Cichlasoma alfari	*Cichlasoma rhytisma*
Dorsal spines	17	17
Dorsal rays	10-11	10
Anal spines	6	6
Anal rays	8-9	7-9
Pectoral rays	13-14	12-14
Pelvic rays	I,5	I,5
Caudal rays	16	16
Total gill rakers	13-15	12-14
Upper lat. line pores	19-23	17-21
Lower lat. line pores	8-14	9-14
Longitudinal scales	28-29	27-32
Lat. series scale count	30-33	29-33
Scales above lat. line	5-6	5-7
Scales below lat. line	11-12	12-13

	Juveniles		Adults		Juveniles		Adults	
Standard length (mm)	28.0	81.5	91.9	153.0	32.4	84.1	88.2	135.0
Head length	381	397	362	383	391	475	358	390
Eye width	92	139	71	90	102	167	80	108
Snout length	136	179	171	189	141	173	170	189
Maxillary length	105	136	130	140	112	136	117	133
Bony interorbital	96	108	99	115	96	120	103	122
Suborbital	71	103	101	118	68	99	98	126
Body depth	401	461	391	422	457	537	437	458
Peduncle depth	146	156	141	153	142	164	139	152
Peduncle lenght	132	155	146	163	125	144	128	156
Predorsal distance	435	450	415	444	417	543	405	448
Preanal distance	632	663	637	667	644	762	632	674
Prepectoral distance	394	655	371	408	409	494	378	493
Prepelvic distance	416	444	405	445	440	531	421	444
Dorsal-base length	586	600	544	595	572	620	580	626
Anal-base length	253	286	238	262	274	340	266	305
Caudal-base length	308	343	289	316	330	407	334	381
Length 7 th dorsal spine	117	146	90	114	132	176	106	141
Length last dorsal spine	138	159	109	133	144	191	115	170
Length pelvic fin	278	321	234	292	271	444	287	412
Length pectoral fin	266	294	226	272	300	389	285	307

spines, 7-9 anal soft rays, a large semiocellated black blotch on flank with anterior and posterior pale areas and a smaller blotch at upper caudal base.

C. rhytisma differs from each of the other Costa Rican members of the *Amphilophus* section in color pattern and a number of other characters, some of the most trenchant of which are mentioned below. *C. citrinellum* and *C. lyonsi* differ from the new form in lacking a frenum at the midline of the lower lip. *C. longimanus* and *C. rostratum* both have higher total gill raker counts (15-20 vs 12-14). *C. altifrons* has fewer dorsal fin spines (15-16 vs. 17) and fewer anal fin spines (4-5 vs 6) than *C. rhytisma*. *C. alfari* which is syntopic with *rhytisma* is also the most similar to it as is discussed below.

Description: Form and color pattern are shown in Figure 1. Meristic and proportional measurements are given below.

Body moderately deep, greatest depth (at origin of pelvic fins) in SL 1.9-2.3 times. Pre-dorsal contour rather straight from snout tip to just before dorsal origin, but slightly convex in juveniles. Caudal peduncle depth 6.1-7.2 times in SL; caudal peduncle length from end of anal fin base to middle of caudal base 6.4-8.1 times in SL.

Head length including opercular membrane 2.1-2.8 times in SL. Eyes rather small, horizontal orbit diameter 2.9-5.0 in head length. Interorbital space slightly convex, least width of bony interorbital 3.3-4.4 times in head length. Width of suborbital from posterior tip of maxillary to nearest point on fleshy margin of orbit 3.4-5.3 times in head length. Snout length 2.0-2.9 times in head length.

Mouth small, almost horizontal and well below level of ventral rim of orbit. Upper jaw moderately protractile, extends to vertical from a point between nostril and anterior rim of orbit. Fold of lower lip not continous, interrupted by frenum at midline. Teeth forming bands in both jaws. Teeth conical, those of outer row larger and decreasing regularly in size posteriorly. Outer series in upper jaw number 14 to 17 on each side; in lower jaw 19 to 24 on each side. Teeth of inner rows projecting above fleshy gums. Median teeth of outer row nearly round in cross section and becoming blunted with age. All teeth with brownish tips in young and adults.

Pharyngeal bones of one 88 mm specimen with slightly convex dentigerous portion. Each upper pharyngeal bone bearing oval patch of curved teeth. Lower pharyngeal plate triangular. Those teeth in the two median rows molariforms, heavy and oval in cross section. On both plates, anterior teeth largest, posterior teeth progressively smaller and laterally compressed. All pharyngeal teeth with brown tips.

Gill rakers of upper limb of first arch three; short, pointed and thick, its length twice the width of base. One thick and romboidad raker at angle of arch. Seven to ten bifid rakers on lower limb of first gill arch; these rakers truncate and divided in two halves of compressed "cauliflower" shape. Total gill rakers 12-14, usually 13.

Upper lateral line origin just above upper margin of gill opening, continuing almost parallel to dorsal profile and terminating below middle soft dorsal fin-rays; pored scales 17-21, usually 20. Lower lateral line beginning three scale rows below end of upper line and continuing to end of hypural plate; pored scales 9-14, usually 11, one or two pored scales on mid-caudal fin rays not included in count. Regan's longitudinal scale series 29-33, usually 31. Scales in longitudinal series from upper margin of gill opening to end of hypural complex 27-32, usually 29. Transverse scale rows between origin of dorsal fin and lateral line 5-7, usually 6. Transverse scale rows between origin of anal fin and lateral line 12-13, usually 12.

Dorsal fin origin above posterior margin of opercle; fin with XVII, 10 or 11 rays. Distance from tip of snout to origin of dorsal fin (predorsal distance) 1.8-2.5 times in SL. Length of dorsal fin base 1.5-1.7 times in SL. Dorsal fin spines increasing in length rapidly to about seventh to eighth, then more gradually to last (longest); length of seventh dorsal spine 5.7-9.5 times in SL; length of last dorsal spine 5.2-8.7 times in SL.

Anal fin usually VI, 8 rays, sometimes VI, 7 as VI, 9; preanal distance 1.3-1.6 times in SL. Length of anal fin base 2.9-3.8 times in SL. Soft part of dorsal and anal of both sexes usually produced into filaments, when laid back extending from anterior third to half, or more, of caudal fin.

Pectoral fin shorter than head, fin rays 12-14, usually 13. First (dorsal) two and last (ventral) two rays unbranched; first ray short

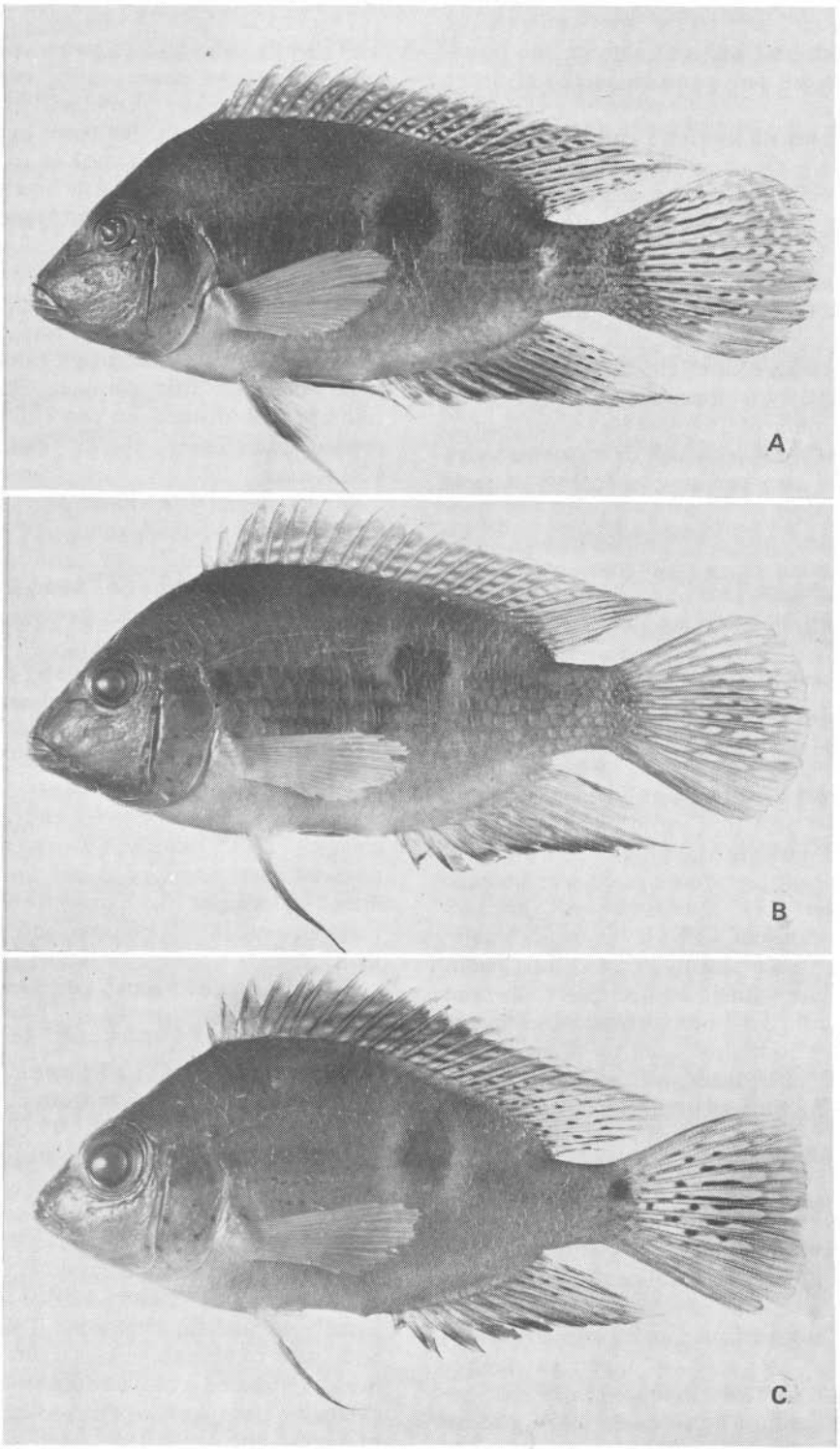

Fig. *Cichlasoma rhytisma*, n. sp. A. Holotype, LACM 42998-1, a male 121.4 mm from Río Shiroles, Atlantic versant, Costa Rica. B. Topotype, UCR 1299-10, female 98.5 mm. C. Topotype, UCR 1299-10, male 62.9 mm.

and closely affixed to second ray; all other rays branched. Distance from tip of snout to dorsal margin of pectoral fin base (prepectoral distance) 2.0-2.6 times in SL. Distal margin of pectoral fin rounded, extending to middle of midlateral spot. Length from dorsal margin of base to tip of distal margin of appressed fin 2.4-3.5 times in SL.

Pelvic fin rays I,5 in 18 specimens. Distance from tip of snout to anterior point of insertion of pelvic fin (prepelvic distance) 1.9-2.4 times in SL. First rays of pelvic fins (tips) of adults of both sexes enlarged as filaments which reach or pass base of last anal fin spine. Length of pelvic fin from insertion to tip of produced ray 2.3-3.7 times in SL.

Caudal fin rounded; number of branched rays 14 in 18 specimens. Length of middle caudal rays 2.5-3.0 in SL.

Color pattern of specimens in alcohol: The ground color is pale yellow and slightly paler ventrally (Fig. 1). The upper sides are crossed by four irregular dark areas. On juveniles these areas form four diffuse blotches just below the dorsal base, on some large individuals a plain brownish pattern nearly obscures the dorsal dark areas. Below the midline the dark pattern fades out. The venter is unmarked.

A black lateral blotch lies between the upper and lower lateral line series above or distal to the tip of the pectoral fin. This lateral blotch is bordered anteriorly and posteriorly by pale band-shaped areas that do not join dorsally nor ventrally.

A small round basicaudal blotch, smaller than the pupil, lies mostly above the lower lateral line. A smaller blotch lies at the end of dorsal fin base. On some adults a series of discontinous black blotches, or a solid black band connects eye to caudal peduncle.

The head is brown dorsally fading to pale tan below. Dots appear in an irregular pattern on the opercle and some at the border of the preopercle. Two well defined lines are present in adults below and anterior to the lower part of eyes; its length is about twice the pupil diameter. An interrupted dark line borders the postero-ventral margin of the eye.

The pectoral fins are clear or uniformly light yellow. Juveniles have clear pectoral fins. The pelvic fins of adults have melanophores along the first two elements, giving a dark appearance when the fin is retracted. The pelvic soft rays are pale.

The median fins are dusky. The spinous dorsal fin also has rows of pale or clear spots. Black spots typically cover the soft dorsal. The distal margin of the dorsal fin is clear. The anal fin is covered distally with clear spots and proximally with rectangular dark spots. The interradial membranes of the caudal fin are dark on the proximal half and covered distally by rows of clear spots.

Coloration in life: This description is based on a live female 101 mm collected at the type locality. Color brown with rows of blue dots on sides and similar spots and vermiculations on head. Dark brown above; rows of dark blue spots on all scales, forming longitudinal rows, those blue spots especially prominent behind opercle. Lateral blotch black with anterior and posterior vertical pale areas. Head below solid blue, or with blue horizontal line in smaller and larger specimens; isthmus rose colored (violet). Iris brown or yellowish.

Pectoral fins yellowish. Filaments of first pelvic fin ray brown with some blue, other rays clear or yellowish.

Median fins vary with sex. Dorsal fin of females: reddish brown with pale blue specks on the anterior three-fourths; filamentous tips of each spine and ray red, submarginally clear; last few rays yellowish or brown (on larger females). Dorsal fins on males: reddish brown with pale blue specks on anterior three fourths and dark specks on posterior half; margin red; last few soft rays yellowish over brown (on largest males).

Anal fin of females: yellowish brown, with blue vermiculations, last few rays more yellowish. Anal fin on males: yellowish brown, last few rays more yellowish (on larger specimen), with dark specks.

Caudal fin on females: Reddish brown or maroon with some clear areas. Caudal fin on males: maroon with clear areas and black specks. On both sexes a yellowish central area.

Comparison with *C. alfari:* The new species is closest to *C. alfari* and presents characteristics typical of Regan's *Astatheros* (now *Amphilophus*) section of *Cichlasoma* (Jordan and Clark, 1930). Principal morphologic and color differences between these two species are as follows:

C.rhytisma

1. Tip of pectoral fin reaches to or past base of second anal fin spine.
2. Maximum body depth 1.9-2.3 times in SL.
3. Pores in upper lateral line 17-21.
4. An indistinct lateral band seldom present on anterior flank.
5. Females without a large black blotch on dorsal fin.

C. alfari

1. Pectoral shorter, not reaching base of first anal spine.
2. Maximum body depth 2.2-2.6 times in SL.
3. Pores in upper lateral line 19-23.
4. A discontinuous black band between eye and caudal base.
5. Females with black blotch, often containing white spots between 8th and 12th dorsal spines.

In addition to these differences which apply to specimens of *C. alfari* from its entire range, the Sixaola population of *alfari* is distinctive from *alfari* of other hydrographic systems as well as from *rhytisma.* The Sixaola population of *alfari* is unique in that the males have black spots on nearly every scale, scattered above, but tend to form rows below the lateral band; females may display a few black spots on the last fourth of the body.

Etymology: The specific name is derived from the Greek *rhytisma* and refers to the large, semi-ocellated spot or patch on the flanks. It is used as a noun in apposition.

Geographic distribution: The new species was collected in tributaries of the Río Sixaola, on the Atlantic versant of eastern Costa Rica. *C. rhytisma* is associated with sand and rocky bottoms and with clear water of low to high current velocity. It was collected between 40 to 60 m elevation.

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RESUMEN

Se describe un nuevo pez cíclido de Costa Rica, *Cichlasoma rhytisma* de la cuenca del Río Sixaola, Vertiente Atlántica. Una mancha oscura en los costados rodeada por dos bandas verticales claras constituye el carácter más distintivo de este pez. Series de puntos o banditas vermiculares de color azul verdoso forman líneas horizontales en los costados; este patrón de coloración se presenta también en la cabeza bordeando el ojo y con una distribución menos regular que en los costados.

Se compara esta nueva especie con su congénere más cercano, *C. alfari,* con quien se encuentra simpátrica.

Aunque sólo se ha colectado en el Río Cocolis y en una quebrada cercana, ambos tributarios pequeños del Río Sixaola, se supone que esta nueva especie habita en toda la cuenca del Río Sixaola.

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