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Systematic Status of the Cichlid Fishes *Cichlasoma dorsatum*, *C. granadense* and *C. nigritum* Meek

JAIME VILLA

In his Synopsis of the Fishes of the Great Lakes of Nicaragua, Meek (1907) described 3 new cichlid fishes, *Cichlasoma dorsatum*, *C. granadense* and *C. nigritum*. The descriptions appeared after the two major revisions of the genus *Cichlasoma* (Pellegrin, 1904; Regan, 1905), which perhaps explains why they have since been ignored.

In his Supplement to the *Pisces* section of *Biologia Centrali-Americana*, Regan (1908) included these species on the basis of the published descriptions, and briefly noted similarities with other chichlids. Fowler (1923) compared *C. granadense* with his *C. bouchellei*. Except for the inclusion in a few faunal lists (e.g., Jordan *et al.*, 1930), the species have not been referred to again. In his review of the fishes of the great lakes of Nicaragua, Astorqui (1972a) excluded these species altogether. This was pointed out in a review of Astorqui's monograph (Villa, 1972), to which he replied that "*C. dorsatum*, *C. nigritum* and *C. granadense* were not included in any synonymy as it was impossible with the scarce data supplied by Meek" (Astorqui, 1972b).

Through the courtesy of Loren P. Woods, Field Museum of Natural History (FMNH), I examined the entire hypodigm of the 3 nominal species, consisting of 15 specimens in excellent condition. Comparative material was loaned by C. E. Dawson, Gulf Coast Research Laboratory (GCRL) and James E. Böhlke, Academy of Natural Sciences of Philadelphia (ANSP). P. H. Greenwood, British Museum of Natural History (BMNH) kindly provided data and illustrations of the types of *Cichlasoma citrinellum*, *C. erythraeum*, *C. labiatum*, *C. lobochilus* and *C. maculicauda*. William A. Bussing, Universidad de Costa Rica, Museo de Zoología (UCR) did the same for specimens of *C. maculicauda* from Nicaragua and Costa Rica. Specimens in my personal collection (JV) were examined but few of their data are presented herein as the collections were largely destroyed by the December, 1972 Nicaraguan earthquake.

Cichlasoma dorsatum

The species was based on 5 specimens from lakes Managua and Nicaragua. They have the general appearance of *Cichlasoma labiatum* and *C. citrinellum*. Meek (1907, key p. 118) separated *C. labiatum* and *C. lobochilus* from *C. granadense*, *C. citrinellum*, *C. dorsatum* and *C. erythraeum* on the basis of having "lips broad and thick, medianly produced into a long triangular flap," the latter group having "lips normal" or "lips very broad, slightly produced medianly." The types of *C. dorsatum* have broad and thick lips (Fig. 1); a large paratype (FMNH 5773) and a small one (FMNH 5972) have strong indication of such a "long triangular flap," although not fully developed; in 2 smaller paratypes (FMNH 5970) the flap is either apparently beginning or is absent, but the lips are broad and thick, as in

C. erythraeum (See Fig. 2B and Günther, 1869, Pl. 75, Fig. 2). This condition is clearly intermediate between *C. labiatum* and *C. citrinellum*.

The variation in the *Cichlasoma citrinellum-erythraeum-labiatum-lobochilus* complex, in color, body shape, lip and tooth development, etc., is overwhelming, and it is possible to recognize many different "species" by artificially combining several variables (Fig. 3). Astorqui (1972a), however, recognized only 2 species in the complex, an interpretation with which I tentatively concur. These are *Cichlasoma labiatum*, characterized by having broad, thick lips, and *C. citrinellum*, with lips of "normal" or reduced size. In addition, Astorqui found proportional differences, but when larger samples from different localities are studied, these tend to overlap (Tables 2, 4). It is questionable if both species are valid, but since it is usually possible to separate even small specimens (larger than 65 mm SL) on the basis of the lip condition (the development of which is ontogenetic and perhaps also sex-related), and since there seem to be certain behavioral differences between them (Barlow, *in litt.*) it seems premature to consider them identical.

On the basis of fin-ray counts, scales and gill rakers (Tables 1, 3), it is not possible to separate *C. dorsatum* from the nominal species *C. citrinellum*, *C. erythraeum*, *C. labiatum*, and *C. lobochilus*. Measurements and proportions (Tables 2, 4) of *C. dorsatum* generally overlap with those of the 3 above-mentioned species, although in some cases the mean values may be slightly different in the studied samples. I can find no differences, other than those due to age (size) and individual variation, to separate *C. dorsatum* from the nominal species cited above. Between *C. labiatum* and *C. citrinellum* (the 2 oldest names in the group) I would assign *C. dorsatum* to the synonymy of *C. labiatum* solely on the basis of having broad, thick lips. On the same basis, *C. erythraeum* may be considered synonymous with *C. labiatum*, although the latter's triangular skin flap and generally exuberant lip development are more modest in the type of *C. erythraeum*. Astorqui (1972a) considered *C. erythraeum* a synonym of *C. citrinellum*.

Fernández-Yépez (1969) made *C. lobochilum* (sic) the type of a new genus, *Curraichthys*, in which he also included *C. dorsatum*, *C. erythraeum* and *C. labiatum*. The content of this group is identical to Regan's (1905) "Section 10" of *Cichlasoma*, except for inclusion of the later-described *C. dorsatum*. Regan (1906, p. 17) noted that the five sections into which he arranged the Central American and Mexican species . . . "appear to be natural groups, but . . . are not sufficiently sharply defined to rank as subgenera." Since the description of *Curraichthys* is hardly diagnostic and since no justification is offered to raise a "section" to full generic rank, I see no reason for using a different generic name.

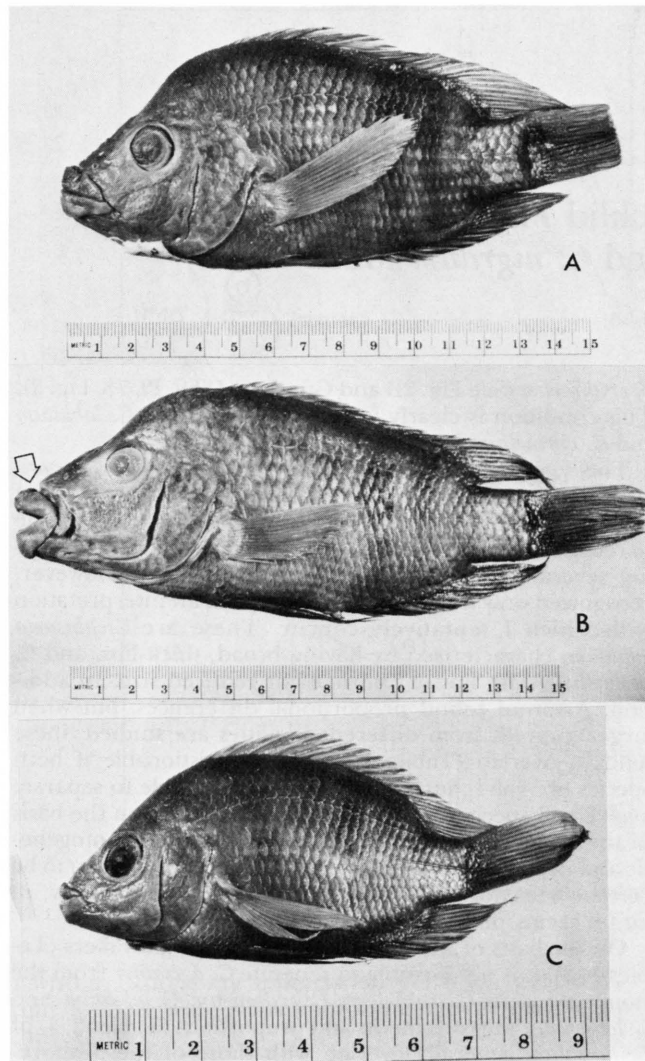


FIG. 1. Type specimens of *Cichlasoma dorsatum* Meek. (A) Holotype; note enlarged lips but triangular skin flap not well developed. (B) Paratype (FMNH 5971) with a shorter pectoral; the upper skin flap (arrow) is slightly developed but is bent posteriorly over premaxilla. (C) Small paratype (FMNH 5972) already showing enlarged lips and incipient skin flaps.

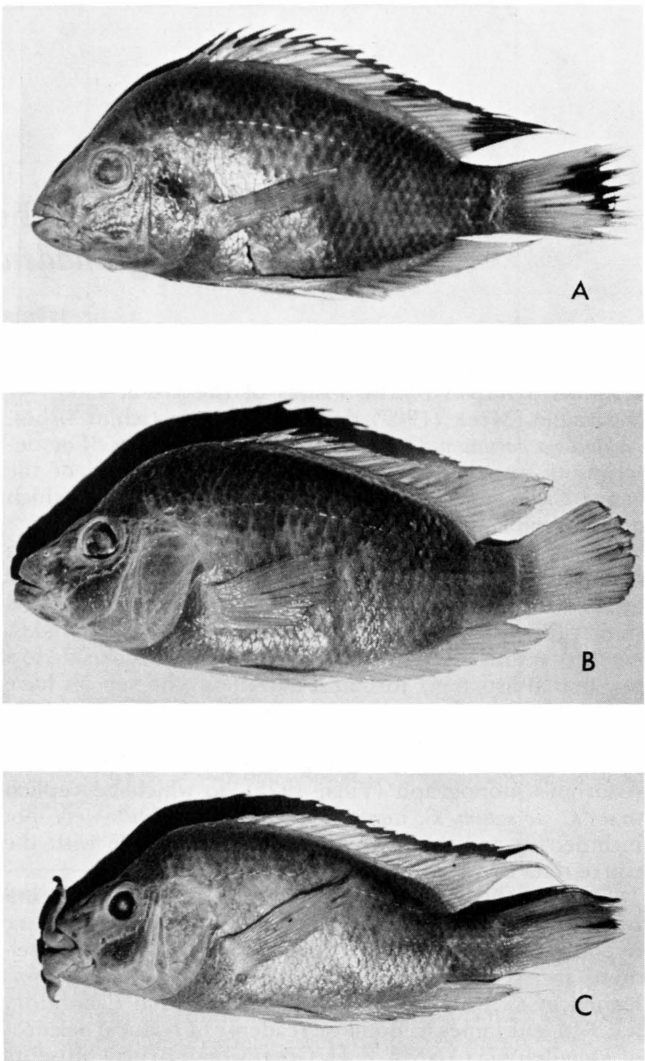


FIG. 2. Types of *Cichlasoma citrinellum* (A, syntype), *C. erythraeum* (B, holotype), and *C. labiatum* (C, syntype). The development of the lips in the type of *C. erythraeum* is intermediate between *C. citrinellum* and *C. labiatum*. The apparent size of the skin flaps in *C. labiatum* is enhanced by the shadow. From Kodachromes by G. Howes (no scales given).

TABLE 1. Meristic data for *Cichlasoma labiatum*, including the type specimens of *C. dorsatum*, *C. erythraeum* and *C. lobochilus*, and data from Astorqui (1972a). Means in parentheses; number of specimens examined enclosed in brackets.

Character	<i>C. dorsatum</i> [5] (Types)		<i>C. labiatum</i> [2] (Types)		<i>C. labiatum</i> [17] (Astorqui)	<i>C. erythraeum</i> [1] (Holotype)	<i>C. lobochilus</i> [1] (Holotype)
Dorsal spines	17		17		16-17	17	17
Dorsal soft rays	10-12	(11.0)	11		11-12	11	11
Anal spines	7		6-7	(6.5)	6-7	7	7
Anal soft rays	8-9	(8.6)	8-9	(8.5)	7-10	8	9
Pelvic rays	1,5		1,5		1,5	1,5	1,5
Pectoral rays	12-14	(13.0)	14		14-15	13	14
Caudal rays	16		15-16	(15.5)	---	18	16
Predorsal scales	14-18	(16.0)	12-14	(13.0)	---	14	14
Peduncle scales	16-17	(16.0)	16		---	18	17
Scales above lat. line	5.5-6.5	(6.0)	6		---	6	7
Scales in lat. line	31-35	(33.0)	32-34	(33.0)	30-34	34	33
Scales below lat. line	8.5-10.5	(9.5)	9-10	(9.5)	---	10	8
Gill rakers, lower limb	9-12	(10.6)	11		10-14	8	9
Gill rakers, upper limb	2-3	(2.8)	4		2-5	3	3

TABLE 2. Measurements and proportions for selected characters of *Cichlasoma labiatum*, including the type specimens of *C. dorsatum*, *C. erythraeum* and *C. lobochilus*, and data from Astorqui (1972a). Means in parentheses; number of specimens examined enclosed in brackets.

Character (Proportions in thousandths of SL)	<i>C. dorsatum</i> [5] (Types)		<i>C. labiatum</i> [2] (Types)		<i>C. labiatum</i> [17] (Astorqui)		<i>C. labiatum</i> [13] L. Nicaragua (JV 7070)		<i>C. erythraeum</i> [1] (Holotype, L. Managua)	<i>C. lobochilus</i> [1] (Holotype, L. Managua)
Standard length (mm)	73.0–154	(116.16)	113.1–144.0	(128.50)	117–177	(139.0)	76–171	(111.30)	133.0	152.0
Predorsal length	445.48–481.65	(460.14)	392.36–439.43	(415.90)	429–449	(436)	414.81–492.06	(454.52)	364.66	342.11
Preanal length	665.42–684.93	(679.24)	677.08–776.30	(726.69)	658–719	(691)	612.40–710.52	(668.61)	668.42	664.47
Prepelvic length	451.29–472.60	(458.92)	429.85–514.59	(472.22)	435–486	(448)	409.35–493.05	(447.92)	388.72	452.95
Prepectoral length	417.43–431.50	(425.06)	418.75–498.67	(458.71)	-----	---	374.26–465.27	(424.35)	395.48	421.05
Body depth	418.83–500.00	(464.42)	430.56–475.69	(453.13)	429–469	(442)	392.59–475.00	(443.19)	511.27	467.11
Caudal peduncle, depth	146.10–171.23	(154.44)	152.78–165.34	(159.06)	135–156	(144)	133.33–160.91	(145.01)	145.86	151.31
length	136.36–157.53	(144.52)	132.64–160.92	(146.78)	-----	---	105.26–139.53	(125.18)	127.81	131.38
Head length	380.73–412.66	(399.08)	381.94–450.93	(416.44)	364–405	(383)	347.78–430.59	(377.45)	368.42	355.26
Head width	193.50–244.77	(213.13)	184.03–213.09	(198.56)	-----	---	127.90–213.74	(194.34)	185.71	190.79
Snout length	150.68–159.85	(151.11)	168.06–212.20	(190.13)	146–166	(154)	151.51–222.22	(176.74)	145.86	134.87
Orbital diameter	81.16–123.28	(106.38)	93.75–114.94	(104.35)	82–101	(88)	76.02–126.98	(94.92)	100.75	113.82
Interorbital width	120.12–148.62	(131.27)	123.61–140.58	(132.10)	107–148	(125)	116.66–187.50	(134.69)	121.05	113.82
Maxillary length	139.61–156.13	(150.03)	142.36–159.15	(150.76)	123–151	(137)	-----	---	124.81	121.71
Suborbital width	137.66–151.37	(144.44)	220.83–256.41	(238.62)	93–110	(100)	-----	---	195.73	205.95
Dorsal basal length	529.22–602.73	(571.48)	536.11–638.30	(587.24)	540–584	(561)	541.66–606.06	(569.46)	569.17	561.84
Anal basal length	253.24–273.97	(263.70)	246.53–283.82	(265.18)	237–271	(258)	251.46–287.50	(261.82)	278.19	278.29
Pectoral length	262.08–343.49	(318.55)	288.19–345.71	(316.95)	-----	---	-----	---	304.51	273.68
Pelvic length	293.68–369.86	(331.96)	-----	----	240–326	(291)	-----	----	284.96	----
Length of										
sixth dorsal spine	116.88–169.98	(147.54)	101.39–129.09	(115.24)	-----	---	-----	----	106.01	131.58
last dorsal spine	155.84–205.15	(174.48)	118.75–154.73	(136.74)	-----	---	-----	----	115.03	164.47
last anal spine	155.84–205.47	(182.81)	125.00–160.92	(142.96)	-----	---	-----	----	130.82	140.79

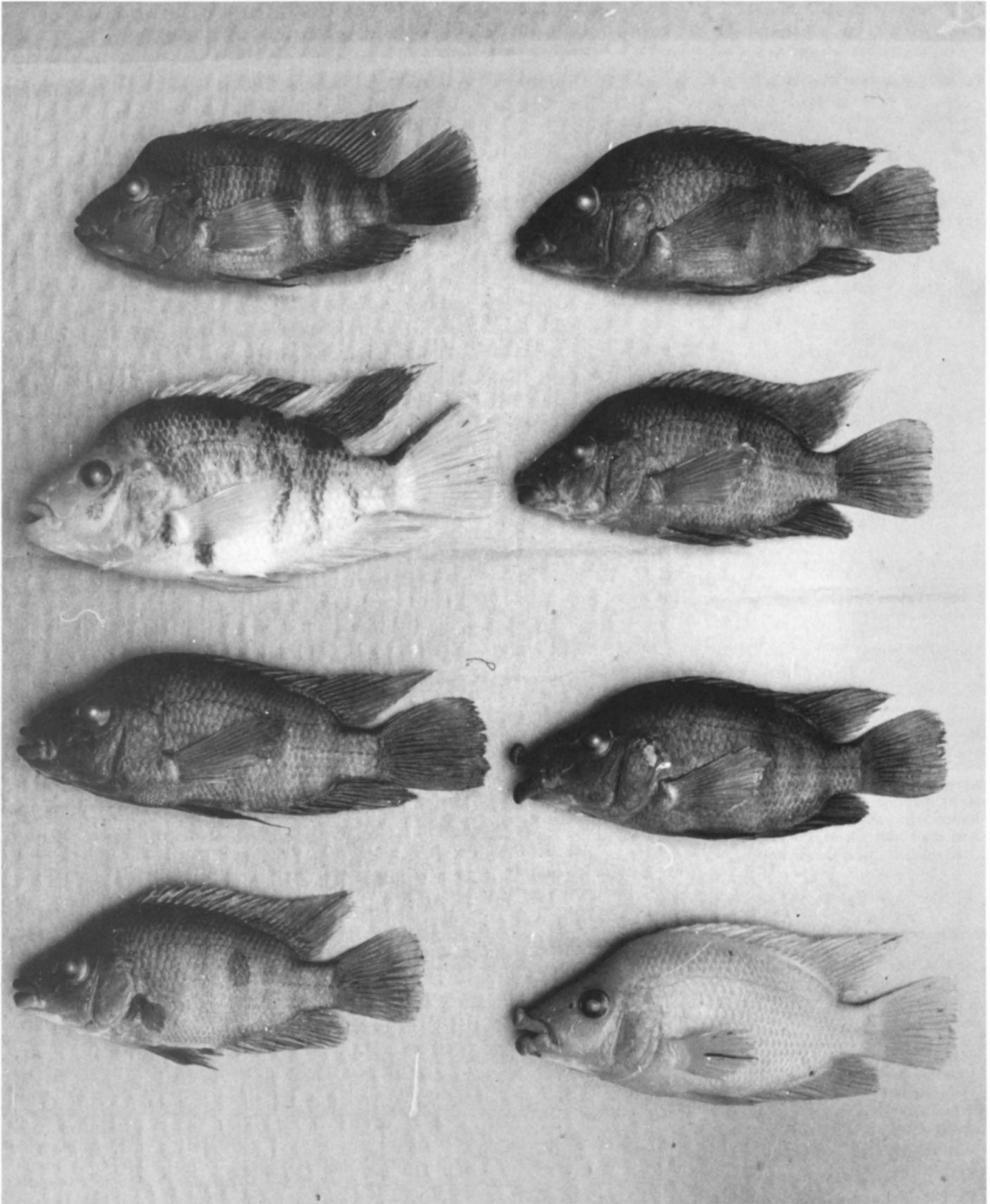


FIG. 3. Variability in color, body shape, pectoral and lip size in young *Cichlasoma citrinellum*-*C. labiatum* of about 130 mm SL, collected in the same station (Isletas de Granada, Lake Nicaragua). Note size of lips increasing toward the bottom of both columns. Collections like this one make it difficult to draw a line between *C. citrinellum* (above, left) and *C. labiatum* (below, right).

Cichlasoma granadense

Cichlasoma granadense was based on 9 specimens (apparently not 10 as stated by Meek, 1907) from lakes Managua, Nicaragua and associated *lagunas*. Eight of these specimens are identical with *C. citrinellum*; one of the 2 specimens in FMNH 5949 has somewhat broader lips with an incipient triangular flap, and the anteriormost teeth in both jaws are slightly larger than the adjoining ones. These characters are of *C. labiatum*.

According to Meek (1907) *C. granadense* (Fig. 4) differs from *C. citrinellum* in the lower dorsal fin (shorter spines) and shorter pectorals. Proportionally, the length of the last dorsal spine in *C. granadense* overlaps broadly with the types of *C. citrinellum* (Table 4). The range in variation in the sixth dorsal spine and of the pectoral fins in *C. granadense*

includes that in the types of *C. citrinellum* (Table 3). In most other characters examined, broad overlap is evident (Tables 3, 4).

Regan (1908) considered *C. granadense* "apparently intermediate between *C. citrinellum* and *C. erythraeum*." On the basis of available evidence, it seems better to consider *C. granadense* a synonym of *C. citrinellum*.

Fowler (1932) described *Cichlasoma bouchellei* and regarded it as "Related closely to *Cichlasoma granadense* Meek, and falling in the subgenus *Erythrichthus* Meek . . ." in spite of the fact that *C. bouchellei* has "lips moderately fleshy, lower not extending as a continuous fold across lower jaw" (Fowler 1923) and that all those species Meek (1907) included in *Erythrichthus* lack a frenum in their lower lip. Villa and Miller (1975) have shown that *C. bouchellei* is a junior synonym of *C. alfaroi* Meek.

TABLE 3. Meristic data for *Cichlasoma citrinellum*, including the types of *C. granadense*, and data from Astorqui (1972a). Means in parentheses; number of specimens examined enclosed in brackets.

Character	<i>C. granadense</i> [9] (Types)		<i>C. citrinellum</i> [2] (Types)		<i>C. citrinellum</i> [17] (Astorqui)		<i>C. citrinellum</i> [13] L. Nicaragua (JV 7070)	
Dorsal spines	16-17	(16.9)	16-17	(16.6)	16-17	(16.9)	17	
Dorsal soft rays	11-12	(11.6)	12		10-12	(11.8)	10-12	(10.7)
Anal spines	7		7		6-8	(7.0)	7	
Anal soft rays	8-9	(8.1)	8-9	(8.3)	8-9	(8.8)	6-8	(7.3)
Pelvic rays	1,5		1,5		1,5		1,5	
Pectoral rays	13-14	(13.3)	15		14-15	(14.5)	12-14	(12.6)
Caudal rays	14-16	(15.8)	16		---	---	13-15	(14.5)
Peduncle scales	16-18	(17.1)	17		---	---	---	---
Scales above lat. line	5.5-7	(6.3)	6		---	---	6	---
Scales in lat. line	27-36	(32.3)	31-34	(32.3)	30-34	(32.5)	30-34	(32.8)
Scales below lat. line	9.5-12	(10.8)	9		---	---	12-13	(12.3)
Gill rakers, lower limb	9-11	(10.2)	9-11	(10.0)	8-11	(9.5)	---	---
Gill rakers, upper limb	2-3	(2.3)	3-4	(3.7)	2-4	(3.2)	---	---

TABLE 4. Measurements and proportions for selected characters of *Cichlasoma citrinellum*, including the types of *C. granadense*, and data from Astorqui (1972a). Means in parentheses; number of specimens examined enclosed in brackets.

Character (Proportions in thousandths of SL)	<i>C. granadense</i> [9] (Types)		<i>C. citrinellum</i> [2] (Types)		<i>C. citrinellum</i> [17] (Astorqui)		<i>C. citrinellum</i> [13] L. Nicaragua (JV 7070)	
Standard length (mm)	79-121.6	(109.0)	130.0-142.2	(136.73)	127-169	(137)	69.0-146.0	(105.0)
Predorsal length	396.00-444.30	(430.52)	299.35-322.23	(311.27)	406-466	(429)	410.00-550.00	(448.98)
Preanal length	651.89-714.56	(682.95)	576.65-647.69	(612.98)	620-665	(644)	646.00-705.00	(669.00)
Prepelvic length	430.37-472.34	(451.79)	404.92-450.77	(428.82)	408-439	(422)	410.71-463.76	(429.43)
Prepectoral length	485.72-431.74	(415.07)	381.15-408.46	(396.49)	---	---	383.42-420.28	(405.84)
Body depth	452.17-506.26	(469.13)	467.65-478.46	(472.51)	394-514	(481)	424.24-480.76	(455.95)
Caudal peduncle, depth	143.91-165.55	(154.44)	137.83-144.62	(142.32)	138-155	(146)	134.14-157.14	(147.14)
length	111.01-143.54	(133.16)	119.23-133.77	(127.70)	---	---	115.38-134.61	(128.20)
Head length	365.95-400.94	(387.28)	355.84-364.43	(360.86)	353-380	(366)	355.61-384.61	(356.87)
Head width	208.51-232.09	(220.44)	184.95-195.95	(191.07)	---	---	211.00-243.90	(233.80)
Snout length	135.04-165.21	(150.34)	141.54-154.71	(146.95)	132-158	(146)	151.51-178.57	(162.90)
Orbital diameter	86.78-113.92	(99.36)	98.34-98.46	(98.41)	83-101	(92)	82.19-121.95	(97.29)
Interorbital width	123.40-150.94	(139.13)	132.13-143.46	(138.68)	134-166	(145)	120.87-164.28	(141.92)
Maxillary length	119.14-134.78	(128.63)	109.00-114.24	(112.36)	116-132	(124)	---	---
Suborbital width	126.58-159.11	(140.68)	170.18-183.08	(175.11)	79-105	(94)	97.56-126.31	(112.51)
Dorsal basal length	569.07-596.59	(524.19)	590.01-623.08	(608.26)	574-656	(619)	578.94-666.66	(609.33)
Anal basal length	255.14-279.60	(267.58)	291.54-300.07	(296.12)	264-322	(328)	263.73-330.35	(291.44)
Pectoral length	273.25-323.44	(296.43)	302.39-307.69	(305.79)	310-359	(338)	---	---
Pelvic length	275.49-349.05	(318.92)	---	---	282-352	(328)	---	---
Length of sixth dorsal spine	102.79-158.22	(130.54)	137.38-150.00	(142.67)	---	---	---	---
last dorsal spine	106.90-151.89	(133.94)	123.77-163.08	(143.82)	---	---	---	---
last anal spine	123.35-169.81	(149.59)	129.40-173.08	(152.40)	---	---	---	---

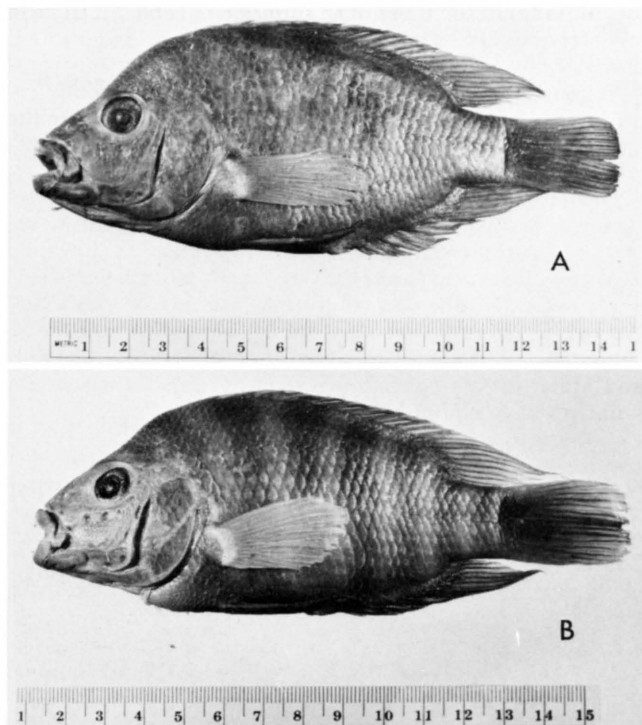


FIG. 4. Types of *Cichlasoma granadense* Meek. (A) Holotype; upper triangular skin flap is only apparent, caused by many years of remaining upside-down in a specimen jar. (B) Paratype (FMNH 5949) showing "normal" *C. citrinellum* lips.

Meek (1907) proposed the subgenus *Erythrictus* for *C. citrinellum* (type species), *C. granadense*, *C. dorsatum*, *C. erythraeum*, *C. labiatum* and *C. lobochilus*. Fernández-Yépez (1969) elevated *Erythrictus* to generic rank, transferred *C. lobochilus*, *C. dorsatum*, *C. erythraeum* and *C. labiatum* to his genus *Curraichthys* and included *C. margaritifera* in *Erythrictus*. His generic diagnosis for *Erythrictus* (none was given by Meek) is almost identical to that of *Curraichthys*, but *Erythrictus* is supposed to have a shorter pectoral and smaller and fewer teeth. Even if these supposed differences held (as the size of the pectoral does not), I do not consider them enough to justify the recognition of a separate genus, nor do they delimit a natural assemblage of species.

Although not immediately pertinent to this paper, the genus *Copora*, also proposed by Fernández-Yépez (1969), should be considered. *Copora* is based on *C. nicaraguense* (type species), *C. balteatum* and *C. alfaroi*. The first 2 species are probably synonymous (Miller, 1966; Astorqui, 1972a), and have long been placed in the "Theraps" section of *Cichlasoma*; *C. alfaroi* is a very different species, currently placed in the "Amphilophus" section. Thus *Copora* seems to represent an artificial grouping and, as such, should be considered (along with *Curraichthys* and *Erythrictus*) a junior synonym of *Cichlasoma*.¹

Cichlasoma nigrum

The description of *Cichlasoma nigrum* (Meek, 1907) was based on a single specimen (Fig. 5 A) measuring 104.5 mm

¹While this paper was in press López (1974) documented the identity of *C. balteatum* and *C. nicaraguense*. She also considers *Copora* as an invalid genus.

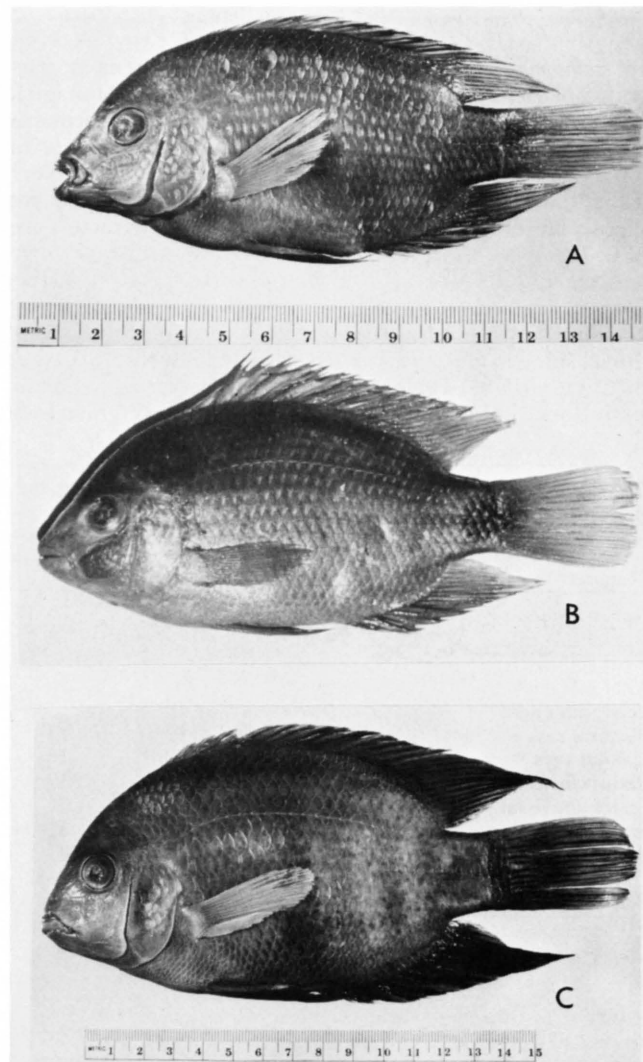


FIG. 5. *Cichlasoma maculicauda* Regan. (A) Holotype of *C. nigrum*; (B) Syntype of *C. maculicauda* (Lake Izabal, Guatemala, from a Kodachrome by G. Howes). (C) *C. maculicauda* (GCRL V70-5422) from Nicaragua.

SL (FMNH 5979) collected in Lake Nicaragua (Granada). The description is accurate save for minor details, and need not be repeated here. Although Meek considered *C. nigrum* similar to *C. rostratum* and *C. longimanus*, the teeth of the latter species (Fig. 6) are conical, while those of *C. nigrum*, although distally conical, have a posterior lobe at their base, the lobes being better defined in the front teeth. The shape of the teeth is like that of *C. maculicauda*, *C. coryphaenoides*, *C. festivum*, and probably others.

Regan (1908) considered *C. nigrum* "apparently very similar to *C. maculicauda*, but the coloration plain dark olivaceous, without a dark spot on the caudal peduncle." Comparison of the types of *C. nigrum* and *C. maculicauda* (Figs. 5 A, B), and specimens of the latter species from various localities of Nicaragua and Costa Rica (Table 5) shows no significant differences in the number of scales, fin-rays and gill rakers. In addition, body proportions of these nominal species (Table 6) are quite similar, especially in view of the small sample at hand and the wide geographic range.

SYSTEMATIC STATUS OF THREE CICHLIDS

TABLE 5. Meristic data for various populations of *Cichlasoma maculicauda*, including the holotype of *Cichlasoma nigrinum* and data from Astorqui (1972a). Means in parentheses; number of specimens examined enclosed in brackets.

Character	<i>C. nigrinum</i> [1] (Holotype)		<i>C. maculicauda</i> [2] (Syntypes)		<i>C. maculicauda</i> [10]		<i>C. maculicauda</i> [3]	
	Lake Nicaragua		Lake Izabal (Guat.)		Nicaragua*		Costa Rica*	
Dorsal spines	17		17		16-17	(16.8)	16-17	(16.6)
Dorsal soft rays	12		13		11-13	(11.9)	12-13	(12.3)
Anal spines	6		6		6-7	(6.1)	6	
Anal soft rays	9		9-10	(9.5)	8-9	(8.7)	9	
Pelvic rays	1.5		1.5		1.5		1.5	
Pectoral rays	12-13**	(12.5)	13-15	(14.0)	12-14	(13.3)	14-15	(14.6)
Caudal rays	16		16		15-16	(16.8)	16-18	(16.3)
Peduncle scales	18		21		20-21	(20.2)	20	
Scales above lat. line	5.5		6		5.5-6.5	(6.2)	6	
Scales in lat. line	35		34		32-36	(33.1)	32-34	(32.7)
Scales below lat. line	8.5		11		9.5-12	(11.5)	12-13	(12.7)
Gill rakers, lower limb	7		7-8	(7.5)	7-8	(7.9)	7-8	(7.3)
Gill rakers, upper limb	2		3		1-3	(2.3)	2	

*See "specimens examined" for detailed localities and museum numbers. **Counts taken on both sides of same specimen.

The type of *C. nigrinum* was dark, which apparently masked the caudal blotch that supposedly distinguishes it from *C. maculicauda*. The type is now somewhat faded, but a caudal blotch can barely be discerned. At any rate, *C. maculicauda* occasionally lacks the caudal blotch (W. A. Bussing, *in litt.*), and is known from Lake Nicaragua; the measurements and proportions given by Astorqui (1972a; see also Table 6) compare favorably with the type of *C. nigrinum*. Thus, *C. nigrinum* is here considered a synonym of *C. maculicauda*.

DISCUSSION

Study of the type specimens of *Cichlasoma dorsatum*, *C. granadense* and *C. nigrinum*, along with that of moderate-sized samples of other species of Nicaraguan cichlids, indicates that they are synonyms of *C. labiatum*, *C. citrinellum* and *C. maculicauda*, respectively. Regan (1908) recognized *C. dorsatum*, noting that it differs from *C. erythraeum* in the longer pectoral. Both were based on few specimens, and their characters are generally within the range of variation of the types and other Nicaraguan specimens of *C. labiatum*. The same holds true for *C. lobochilus*, although some characters of the holotype do not fit as neatly those of *C. labiatum*. However, considering the remarkable variation and the small sample, this is not surprising, nor does it seem critical, because the meristic data compare favorably.

Astorqui (1972a) correctly considered *C. erythraeum* as an invalid species, but his assigning it to the synonymy of *C. citrinellum* instead of that of *C. labiatum* (as considered here), was apparently based on Günther's (1869) description and not on examination of the type. His placement of *C. lobochilus* in the synonymy of *C. labiatum* has the same basis, but it appears to be correct. Villa (1971) tentatively placed *C. dorsatum* with *C. citrinellum*. This was apparently incorrect, unless one considers *C. labiatum* and *C. citrinellum* to be synonymous.

The meristic and morphometric data on *C. labiatum* (including *C. dorsatum*, *C. erythraeum* and *C. lobochilus*) and of *C. citrinellum* (including *C. granadense*) generally show broad areas of overlap, and seem to indicate that only one species is involved. However, *C. labiatum* differs from *C. citrinellum* in having broad, fleshy lips, often with an anterior triangular flap directed dorsally and a greater development of the anteriormost teeth. Even in small specimens the lip development is noticeable, although it is most conspicuous in

ripe adults. At this point it is not possible to determine whether these characters are indicative of 2 different species or if only one dimorphic or polymorphic species is involved. Since the "classical" or morphological approach has not adequately solved this problem, it may be necessary to resort to karyotypical, behavioral, and hybridizational methods, to determine if more than one natural assemblage is involved. The submergence in *C. labiatum* of *C. dorsatum*, *C. erythraeum* and *C. lobochilus* seems justified at this time, as does consideration of *C. dorsatum* as a junior synonym of *C. citrinellum*.

In a previous paper, Villa (1971) tentatively placed *Cichlasoma nigrinum* in the synonymy of *C. longimanus*. Examination of the holotype of the former species, however, makes this contention untenable, and indicates that *C. nigrinum* is a junior synonym of *C. maculicauda*. Regan (1908) considered these nominal species as "apparently closely related" but refrained from uniting them on the basis of color differences. These, however, do not appear to justify the separation.²

SPECIMENS EXAMINED

The following specimens have been examined by me or for me. One asterisk (*) denotes specimens examined by K. E. Banister; two (**), by W. A. Bussing. Number in parentheses after museum number indicates the number of specimens in that collection.

Cichlasoma citrinellum Günther, 1864. Syntypes: BMNH 1864-1-26:201-3* (3), Lake Nicaragua. Holotype and paratypes of *C. granadense* Meek, 1907: FMNH 5948 (2), Lake Managua; 5949 (2, one is *C. labiatum*), Laguna San Francisco; 5950 (1), Laguna Genizaro (Jenicero); 5951 (1), Lake Nicaragua; JV 7070 (deposited at UCR and the University of Kansas, Lawrence) (13), Lake Nicaragua: Isletas de Granada.

²George W. Barlow (*in litt.*) notes that "I have seen *C. maculicauda* in Lake Nicaragua that bore the typical coloration of that species: pale blue with a black vertical bar on the body, elongated black spot before the tail, and an orange throat. I have observed breeding in nature and in the laboratory. Both sexes, but especially the female, become nearly black (the more so ventrally) with a greenish wash (the eye becomes pale green). The type of *nigrinum* may have been a breeding female, as its small size suggests."

TABLE 6. Measurements and proportions for selected characters of various populations of *Cichlasoma maculicauda*, including the holotype of *Cichlasoma nigrum* and data from Astorqui (1972a). Means in parentheses; number of specimens examined enclosed in brackets.

Character (Proportions in thousandths of SL)	<i>C. nigrum</i> [1] (Holotype) Lake Nicaragua	<i>C. maculicauda</i> [2] (Syntypes) L. Izabal (Guat.)	<i>C. maculicauda</i> [10] Nicaragua*	<i>C. maculicauda</i> [2] (Astorqui 1972a) Lake Nicaragua	<i>C. maculicauda</i> [3] Costa Rica*
Standard Length (mm)	104.5	101.7–114.0 (107.85)	40.0–150.0 (62.86)	31.0–148.5 (89)	101.3–193.5 (139.93)
Predorsal length	435.40	299.90–315.79 (308.75)	410.00–457.06 (433.79)	430–484 (457)	422.22–448.17 (438.40)
Preanal length	708.13	649.12–673.55 (661.34)	623.33–734.07 (682.91)	680–710 (690)	692.00–710.76 (699.28)
Prepelvic length	730.62	381.58–388.40 (384.96)	363.33–476.70 (430.87)	418–452 (435)	407.23–420.53 (414.59)
Prepectoral length	375.11	358.90–367.54 (363.22)	348.57–422.54 (386.83)	----- --	317.82–345.60 (332.69)
Body depth	497.60	378.56–516.67 (447.62)	512.60–552.26 (537.75)	500–548 (524)	528.13–560.72 (549.62)
Caudal peduncle, depth	167.46	147.49–166.67 (157.08)	148.00–184.21 (169.18)	168–177 (172)	157.94–178.40 (170.17)
length	133.97	128.81–147.37 (138.09)	126.76–152.35 (135.94)	----- --	96.80–134.36 (121.47)
Head length	349.28	329.40–333.33 (331.37)	330.00–385.92 (364.08)	356–386 (371)	319.32–356.00 (341.94)
Head width	186.80	158.31–167.54 (162.93)	----- --	----- --	198.40–203.61 (201.00)
Snout length	143.54	117.99–130.70 (124.35)	120.00–146.78 (127.06)	129–141 (135)	147.80–156.00 (151.28)
Orbital diameter	95.69	83.33–88.50 (85.92)	87.33–142.86 (114.76)	94–135 (114)	73.90–94.76 (83.69)
Interorbital width	133.97	117.99–121.05 (119.52)	127.76–138.50 (124.76)	129–141 (135)	125.06–129.60 (127.33)
Maxillary length	95.69	93.41–99.12 (96.27)	85.87–112.68 (101.20)	97–108 (102)	96.12–98.71 (97.74)
Suborbital width	133.97	166.67–167.16 (166.92)	73.24–89.33 (76.11)	65–94 (79)	82.92–94.05 (89.39)
Dorsal basal length	598.08	609.64–609.65 (609.65)	587.50–637.33 (610.03)	580–613 (596)	587.34–645.99 (621.12)
Anal basal length	253.88	250.00–268.44 (259.22)	256.58–310.08 (295.32)	274–280 (277)	270.48–305.42 (291.70)
Pectoral length	287.08	194.74–240.90 (217.80)	266.67–310.08 (297.27)	----- --	267.70–300.80 (286.90)
Pelvic length	339.71	----- ----	----- ----	322–357 (339)	----- ----
Length of					
sixth dorsal spine	157.89	132.74–135.96 (134.35)	150.00–199.45 (183.54)	----- --	118.86–143.13 (130.26)
last dorsal spine	200.95	151.75–173.06 (162.41)	161.90–203.95 (184.86)	----- --	157.62–169.79 (165.14)
last anal spine	239.23	171.05–178.96 (175.01)	188.89–226.67 (207.85)	----- --	149.87–185.60 (171.05)

*See "Specimens examined" for detailed localities and museum numbers.

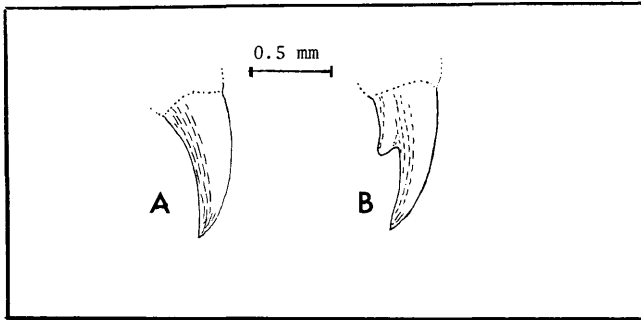


FIG. 6. Upper front teeth of *Cichlasoma longimanus* and of the *C. labiatum* group (A), and of *C. maculicauda* and the holotype of *C. nigratum* (B). The posterior lobe, worn down in older specimens, is just above the mouth epithelium and is often difficult to discern without extraction of the tooth.

Cichlasoma labiatum Günther, 1864. Syntypes: BMNH 1867-9-23: 7-8* (2), lakes Managua and Nicaragua. Holotype of *Heros lobochilus* Günther, 1868: BMNH 1865-7-20:36* (1), Lake Managua. Holotype of *Heros erythraeus* Günther, 1869: BMNH 1865-7-20:33* (1), Lake Managua. A paratype of *C. granadense* Meek, 1907: FMNH 5949 (1 of 2 specimens), Laguna San Francisco. Holotype and paratypes of *C. dorsatum* Meek, 1907: FMNH 5970-71 (3), Lake Managua; 5972 (1), Laguna Genizaro; 5973 (1), Lake Nicaragua; JV 7070 (13), Lake Nicaragua: Isletas de Granada.

Cichlasoma maculicauda Regan, 1905. Syntypes: BMNH 1864-1-16:56-9* (2), Guatemala: Lake Izabal (Yzabal). Holotype of *C. nigratum* Meek, 1907: FMNH 5979 (1), Lake Nicaragua: Granada; UCR 260-1** (1) Costa Rica: Prov. Limón, Laguna de Tortuguero; UCR 605-2** (1), Costa Rica: Prov. Limón: Cahuita, Río Perezoso; UCR 457-8** (2), Nicaragua: Depto. de Zelaya: Río Yaoya, 13.6 km E Siuna; GCRL V70-5423 (1), Nicaragua: Chihuahua Creek (Depto. de Zelaya?); GCRL VFO-5426 (1), Nicaragua: Río Tisla; GCRL V70-5427 (6), Nicaragua: Río Mahogany; GCRL V70-5422, (2), Nicaragua: Deadmans Creek.

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SUMMARY

Study of the type material indicates that *Cichlasoma dorsatum* Meek is a synonym of *C. labiatum* Günther, a species which also includes *C. erythraeum* Günther and *C. lobochilus* Günther. *Cichlasoma granadense* Meek is a synonym of *C. citrinellum* Günther. Although *C. labiatum* and *C. citrinellum*

cannot be sharply distinguished by their morphology alone, it seems premature to consider them identical. *Cichlasoma nigratum* Meek is a synonym of *C. maculicauda* Regan. The genera *Curraichthys*, *Erythrarchthys* and *Copora* are considered synonyms of *Cichlasoma*.

RESUMEN

El estudio de los caracteres morfológicos del material típico indica que *C. dorsatum* Meek es sinónimo de *C. labiatum* Günther, especie que también incluye a *C. erythraeum* Günther y a *C. lobochilus* Günther. *Cichlasoma granadense* Meek es sinónimo de *C. citrinellum* Günther. Aunque no se encontraron caracteres morfológicos que consistentemente separen a *C. citrinellum* de *C. labiatum*, parece prematuro considerar idénticas ambas especies. *Cichlasoma nigratum* Meek es sinónimo de *C. maculicauda* Regan. Los géneros *Curraichthys*, *Erythrarchthys* y *Copora* son considerados sinónimos de *Cichlasoma*.

LITERATURE CITED

- ASTORQUI, I. 1972a. Peces de la cuenca de los grandes lagos de Nicaragua. Rev. Biol. Trop. 19:7-57 (Vol. 19 dated 1971).
 ASTORQUI, I. 1972b. Aclaración sobre un libro de peces. La Prensa, July 16, 1972, Managua.
 FERNÁNDEZ-YÉPEZ, A. 1969. Contribución al conocimiento de los cichlidos. Evencias, No. 22 (no pagination).
 FOWLER, H. W. 1923. Fishes from Nicaragua. Proc. Acad. Nat. Sci. Philadelphia 75:23-32.
 GÜNTHER, A. 1864. Report of a collection of fishes made by Messrs. Dow, Godman and Salvin in Guatemala. Proc. Zool. Soc. London 1864:114-154.
 GÜNTHER, A. 1869. An account of the fishes of the states of Central America based on collections made by Capt. J. M. Dow, F. Godman, Esq. and O. Salvin, Esq. Trans. Zool. Soc. London 6:377-494.
 JORDAN, D. S., B. W. EVERMANN AND H. W. CLARK. 1930. Checklist of the fishes and fishlike vertebrates of North and Middle America north of the northern boundary of Venezuela and Colombia. Appendix 10, Rept. U. S. Comm. Fish., 1928.
 LÓPEZ, M. I. 1974. Variación, coloración y estado sistemático del pez Centroamericano *Cichlasoma nicaraguense* (Cichlidae). Rev. Biol. Trop. 22:161-185.
 MEEK, S. E. 1907. Synopsis of the fishes of the great lakes of Nicaragua. Field Columb. Mus. Pub. 121, Zool. Ser. 7(4):97-132.
 MILLER, R. R. 1966. Geographical distribution of Central American freshwater fishes. Copeia 1966:773-802.
 PELLEGRIN, C. 1904. Contribution a l'etude anatomique, biologique et taxonomique des poissons de la famille des cichlides. Mem. Soc. Zool. France 16:40-400.
 REGAN, C. T. 1905. A revision of the fishes of the American cichlid genus *Cichlosoma* and of the allied genera. Ann. Mag. Nat. Hist., Ser. 7, 16:60-77, 225-243, 316-340, 433-445.
 REGAN, C. T. 1906-1908. Pisces. In: Biología Centrali-Americana 8:1-203.
 VILLA, J. 1971. Sinopsis de los Peces de Nicaragua, 3rd. Ed. Universidad Nacional Autónoma de Nicaragua, Managua. (Mimeo.)
 VILLA, J. 1972. Peces de nuestros lagos. La Prensa, 9 July, 1972, Managua.
 VILLA, J. and R. R. MILLER. 1975. Identity of the Central American cichlid fish *Cichlasoma bouchellei* Fowler. Copeia 1975 (4): in press.