Real identity of the northern Colombian endemic sea catfish *Galeichthys bonillai* Miles, 1945 (Siluriformes: Ariidae)

by

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ABSTRACT. - *Notarius bonillai* (Miles, 1945) new combination is redescribed as a large-sized freshwater ariid species endemic to northern Colombia. *N. bonillai* is the sister species of the eastern tropical Pacific *N. cookei*, differing from it in body depth (20.0-20.5% SL in *N. bonillai vs* 17.3-17.9% SL in *N. cookei*), in having a less exposed and rugose head shield and 1.7% of mitochondrial sequence divergence (combined cytochrome *b* and ATP synthase 8/6 data set, with 1937 bp). It can be distinguished from other tropical western Atlantic ariid species by the presence of three pairs of barbels, one maxillary and two mandibulars; parieto-supraoccipital process broader at base than distally, 1.6 to 2.0 times longer than the width of its base; predorsal plate narrow and crescent-shaped; teeth on palate villiform, forming a U-shaped pattern of four closely adjacent patches, the lateral pair largest and subtriangular; and by the lack of a fleshy furrow between the nostrils, a longitudinal fleshy groove in the median depression of the head, and gill rakers on rear surfaces of the first two gill arches. The species seems to be restricted to freshwaters, living in the large Colombian rivers that run to the southern Caribbean. The name *Ariopsis bonillai* has been wrongly used for the New Granada sea catfish, a medium sized species common in brackish water estuaries and muddy shallow marine bottoms along the Colombian Caribbean.

RÉSUMÉ. - Identité réelle de *Galeichthys nobillai* Miles, 1945 (Siluriformes: Ariidae), poisson-chat marin endémique de la Colombie septentrionale.

Notarius bonillai (Miles, 1945) nouvelle combinaison est redécrite en tant que grande espèce dulçaquicole d'Ariidae, endémique de la partie nord de la Colombie. *N. bonillai* est l'espèce-sœur de *N. cookei*, du Pacifique Est tropical. Elle diffère par la hauteur du corps (20,0-20,5% SL chez *N. bonillai vs* 17,3-17,9% SL chez *N. cookei*), par le bouclier céphalique moins rugueux et moins exposé, et par une divergence de séquence mitochondriale de 1,7%. Elle se distingue des autres espèces d'Ariidae de l'Atlantique Ouest tropical par la présence de trois barbillons, un maxillaire et deux mandibulaires, un processus pariéto-supraoccipital plus large à la base que distalement et 1,6 à 2 fois plus long que sa largeur de base, une plaque prédorsale étroite en forme de croissant, des dents palatines villiformes réparties sur quatre plaques serrées disposées en U, la paire latérale étant plus large et subtriangulaire, par l'absence de sillon charnu entre les narines, d'une gorge longitudinale à la partie médiane de la tête, et de branchiospines à la surface postérieure des deux premiers arcs branchiaux. L'espèce semble être limitée aux eaux douces, vivant dans les grandes rivières colombiennes jusqu'au sud des Caraïbes. Le nom *Ariopsis bonillai*, petite espèce commune des eaux saumâtres d'estuaire et d'eaux marines troubles et peu profondes le long des Caraïbes colombiennes, a été faussement utilisé pour les poissons-chats marins de la Nouvelle-Grenade.

Key words. - Ariidae - *Notarius bonillai* - *Notarius cookei* - Northern Colombia - Endemic - Taxonomy - Molecular phylogeny.

In 1945, Miles described a single specimen of ariid catfish from Honda, a city over the Río Magdalena about 770 km away from the Caribbean Sea mouth of the river, naming it *Galeichthys bonillai* new species. He deposited the holotype in the Secretaría de Agricultura y Pesca of the Ministerio de Agricultura in Bogotá (Miles, 1947). However, after interviewing some Colombian officials, we conclude that this specimen is nowadays lost. Dahl (1971) partially misinterpreted Miles (1945, 1947) descriptions and stated that *G. bonillai* was a species living in the Río Magdalena, but also very abundant in the Ciénaga Grande de Santa Marta, the largest Caribbean brackish water lagoon. Later, Taylor and Menezes (1978) took the taxonomic confusion to its peak, using *Ariopsis bonillai* as the valid scientific name for the species living in the southern Caribbean estuaries and muddy shallow marine shores and coined for it the English common name of New Granada sea catfish. This decision was backed by several recent authors, such as Galvis (1984), Cervigón *et al*. (1992), Acero (2002, 2003), Acero and Betancur-R. (2002b), Acero *et al*. (2002), and Marceniuk and Ferraris (2003).

During a recent expedition of the senior author to the Golfo de Urabá, where the Río Atrato opens to the Caribbean, two specimens of a large sea catfish similar to the eastern Pacific *Notarius cookei* (Acero and Betancur-R, 2002a) were collected and many other observed. Additionally, G. Galvis purchased in Puerto Berrío (about 620 km from the Río Magdalena mouth) (G. Galvis, pers. comm., 2004) a specimen that proved to be conspecific to the Atrato material. After a detailed reading of the short original description

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of *Galeichthys bonillai* Miles, 1945, it is now clear that the proper name for this large freshwater species is *Notarius bonillai*. Therefore, the goal of this paper is clarify the taxonomic status of this freshwater ariid, endemic to northern Colombian, to designate a neotype for the species, and to discuss its systematic affinities according to the molecular phylogeny of *Notarius* presented in Betancur-R. and Acero (2004).

MATERIALS AND METHODS

Morphological data

Counts and measurements were made following Allen and Fischer (1978); all measurements were made as the shortest line between two points. Width of the parieto-supraoccipital process was measured at the base of the process, where it originates from the skull; its length was measured from the midpoint of the base to its distal end. Head depth was measured at the anterior end of the parieto-supraoccipital keel. SL is standard length, HL is head length, and TL is total length.

Molecular data

Sequences of the partial cytochrome *b* (cyt *b*, 1095 bp) and complete ATP synthase 8/6 (ATPase 8, 168 bp; ATPase 6, 684 bp; 10 bp overlapped) mitochondrial gene regions were obtained from a specimen of *N. bonillai* and a specimen of *N. cookei*. Molecular protocols are as in Betancur-R. and Acero (2004). The corrected distance with the Kimura-2-parameter (K2) model was calculated between both haplotypes in PAUPv.4.0b10 (Swofford, 2001).

The material of *N. bonillai* comes from northern Colombia and is deposited in the fish collections of the Museo de Historia Natural of the Instituto de Ciencias Naturales, Universidad Nacional de Colombia (ICN-MHN), Bogotá, Colombia, and of the Museo Colombiano de Historia Natural Marina, Instituto de Investigaciones Marinas y Costeras (INVEMAR-PEC), Santa Marta, Colombia. Tissues of part of the material examined are deposited in the tissue collections of the Smithsonian Tropical Research Institute (STRI), Panamá City, Panamá. Comparative material examined of *N. cookei* is listed in Acero and Betancur-R. (2002a) (data of UCR 314-3 not included). Comparative material of *N. cookei* deposited in the fish collection of the Smithsonian Tropical Research Institute (STRI) was also sequenced: STRI 5709 (stri 16750), collected in November 2002, Río Santa María, Herrera, Panamá (8°9'N, 80°33'W); cyt *b*, ATPase 8 and ATPase 6 sequences are available in GenBank, accession numbers AY582860, AY582862 and AY582864, respectively.

NOTARIUS BONILLAI (MILES, 1945) NEW COMBINATION

Cazon sea catfish, chivo cazón, mâchoiron cazón
(Figs 1-2)

Galeichthys bonillai Miles (1945): 454-456, fig. 4 and 4a; Miles (1947): 56.

G. bonillai (in part), Dahl (1971): 48-49.

Ariopsis bonillai (non Miles, 1945), Taylor and Menezes (1978); Galvis (1984): 67-84. Acero (2002): 836-839; Cervigón *et al*. (1992): 256; Acero and Betancur-R. (2002b): 10; Acero *et al*. (2002): 60-63; Acero (2003): 357.

Arius bonillai (non Miles, 1945), Acero (1996).

Hexanematichthys bonillai (non Miles, 1945), Marceniuk and Ferraris (2003): 451.

Notarius sp., Betancur-R. and Acero (2004).

Neotype

ICN-MHN 9873, female, 411 mm SL, collected by artisanal fishermen, 24 May 2004, Puerto Berrío (Antioquia) over the Río Magdalena, CO (74°24'W, 6°30'N); purchased by G. Galvis.

Additional material

INVEMAR-PEC 5342 (stri x3613), male, 540 mm SL, collected by artisanal fishermen, Jun. 2003, Río Atrato, mouth El Roto, Golfo de Urabá, Antioquia, CO (76°58'W, 8°07'N); cyt *b*, ATPase 8 and ATPase 6 sequences are available in GenBank, accession numbers AY582861, AY582863 and AY582865, respectively. - ICN-MHN 8249 (stri x3617), male, 368 mm SL, INVEMAR-PEC 5344 (stri x3618),

Figure 1. - Lateral view of *Notarius bonillai* (ICN-MHN 8249, 368 mm SL) from the mouth of the Río Atrato, northern Colombia. *[Vue latérale de* Notarius bonillai *de l'embouchure de la rivière Atrato au nord de la Colombie.]*

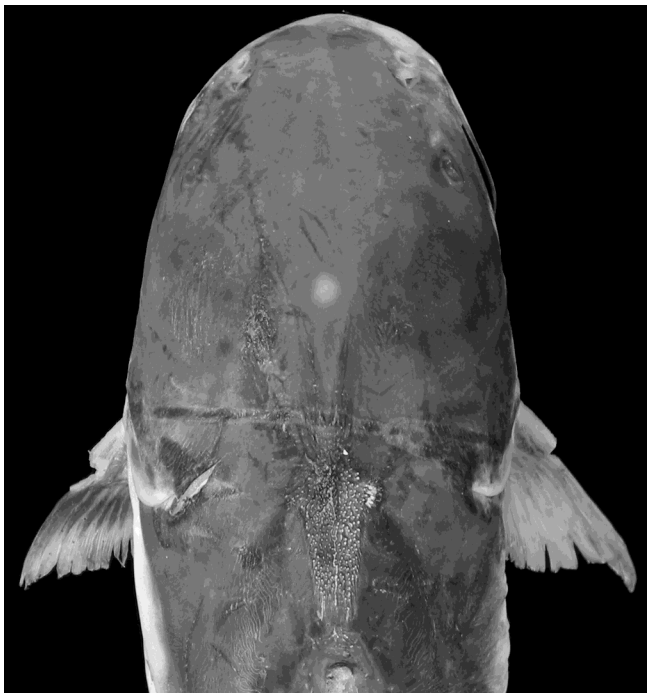

Figure 2. - Dorsal view of the head of *Notarius bonillai* (ICN-MHN 8249, 368 mm SL) from the mouth of the Río Atrato, northern Colombia. *[Vue dorsale de la tête de* Notarius bonillai *de l'em - bouchure de la rivière Atrato au nord de la Colombie.]*

female, 610 mm SL (only the head is deposited), Jan. 2004, Río Atrato, mouth El Roto, Golfo de Urabá, Antioquia, CO (76°58'W, 8°07'N).

Diagnosis

A western Atlantic species of *Notarius* characterized by having an elongated parieto-supraoccipital process, which is broader at base than distally, with its sides converging posteriorly to meet the predorsal plate, and 1.6 to 2.0 times longer than the width of its base. From the other Caribbean sea catfishes the species is also separated by having three pairs of barbels, a crescent-shaped predorsal plate, much shorter than the parieto-supraoccipital process, and by lacking a fleshy furrow between posterior nostrils, a fleshy groove in a median depression of the head, and gill rakers on rear surfaces of the first two gill arches. It differs from the eastern Pacific *N. cookei* by having a deeper body (body depth 20.0-20.5% SL in *N. bonillai vs* 17.3-17.9% SL in *N. cookei*). *Notarius bonillai* also reaches a larger size (at least to 84.5 cm) and has a less exposed and rugose head shield than *N. cookei* (maximum size 79 cm TL). Meristic and morphometric data of *Notarius bonillai* and *N. cookei* are summarized in table I.

Description

Body relatively robust, depth 4.9-5.0 in SL; width 4.3-4.7 in SL. Head relatively wide and flattened; length 3.1-3.6 in SL; width 4.0-4.5 in SL and 1.2-1.4 in HL; depth 5.6-6.4 in SL and 1.6-2.0 in HL. Snout overhangs, extending well forward to the mouth, length 3.2-4.0 in HL. Mouth broad, width of mouth 1.9-2.2 in HL; lips thick and fleshy, upper lip width 15.3-17.8 in HL; mandibular symphysis pointed. Maxillary barbels short and narrow, length 5.2-6.1 in SL, falling short or relatively far away of pectoral fin spines. Distance between anterior nostrils 3.0-3.4 in HL. Distance between posterior nostrils 3.1-3.6 in HL. Interorbital distance 2.1-2.5 in HL. Eye small, its diameter 10.1-12.1 in HL, 3.0-4.0 in distance between anterior nostrils, and 4.5-5.8 in interorbital distance. Postorbital length 1.5-1.7 in HL. Exposed head shield barely visible, relatively well covered by skin, slightly rugose, extending anteriorly but not quite reaching the eyes; a broad frontal depression present, but no groove. Parieto-supraoccipital process longer than wide, narrow and slightly keeled; width 7.0-7.2 in HL; length 3.6-4.3 in HL. Predorsal plate narrow and crescent-shaped. Mandibular band of teeth partially exposed when mouth closed; teeth pointed, fine, and strong. Palatine teeth in four patches, the inner pair smallest and separated medially. Gill rakers on first arch 4-5+9-10 (13-15); gill rakers on second arch 4-5+11-12. Predorsal fin length 2.5-2.8 in SL. Dorsal fin elements I,7; dorsal fin base 9.0-12.0 in SL. Distance between dorsal fin and adipose fin 3.7-4.2 in SL. Base of adipose fin 6.5-9.7 in SL, longer than base of dorsal fin; height of adipose 7.0-9.2 in SL. Pectoral fin elements I,10-13; pectoral-fin base 17.6-22.1 in SL; pectoral fin spine length 7.4-7.8 in SL. Anal fin rays 19-21; anal fin base 5.7-7.8 in SL. Caudal peduncle depth 15.9-17.7 in SL.

Colour in alcohol

Dark metallic blue to blackish on back, whitish below.

Size

The largest undeposited specimen examined was 7.7 kg and 84.5 cm TL. The species is the second largest ariid with Caribbean affinity.

Habitat and distribution

The species inhabits freshwaters and is known only from Atrato and Magdalena rivers, draining to the Colombian Caribbean. Since part of the material was collected in the mouth of the Río Atrato during the rainy season, it may also stand low salinities.

Remarks

Betancur-R. and Acero (2004), based on molecular grounds, established the limits of the genus *Notarius* Gill, which was resurrected by Marceniuk and Ferraris (2003) to include four neotropical species. Following Betancur-R. and Acero (2004) the genus comprises at least 14 species, equally distributed on each side of the Americas. Based on the combined cyt *b* and ATPase 8/6 data set, the K2 mitochon-

Table I. - Meristic and morphometric data on *Notarius bonillai* material, including the neotype and additional material, and interpreted from the original description (Miles, 1945) and on selected material of the type series of *N. cookei*. Neotype measurements are given in millimeters and the percents on the standard length appear between brackets. Measurements are given as a range; total length and standard length are expressed in millimeters; additional measurements are expressed as percents on the standard length. F: female; M: male(s). *[Données méristiques et morphométriques de* Notarius bonillai*, incluant le néotype et le matériel additionnel, et interprétations à partir de la description originale (Miles, 1945) et du matériel choisi de la série-type* N. cookei*. Les mesures du néotype sont en millimètres et les pourcentages de la longueur standard sont entre parenthèses. Les longueurs totales et standard sont en millimètres ; les mesures addition - nelles apparaissent en pourcentages de la longueur standard, F : femelle ; M : mâle(s).]*

	Neotype	Additional material	Original description	*N. cookei*
Examined specimens	F	1F, 2M		1F, 2M, 1?
Dorsal fin elements	I,7	I,7	I,7	I,7
Pectoral fin elements	I,13	I,10-11		I,10-11
Pelvic fin elements	6	6		6
Anal fin elements	21	19-21	19	17-21
Gill rakers on first arch	4+10	4--5+10	4+9	4-5+8-10
Total gill rakers on 1st arch	14	14-15	13	12-15
Gill rakers on second arch	4+11	4-5+11-12		3-5+10-11
Total gill rakers on 2nd arch	15	15-17		13-16
Total length	485.0	440-750		415-530
Standard length	411.0	368-610	420	343-428
Body depth	82.0 (20.0)	20.4-20.5	equals body width	17.3-17.9
Body width	87.0 (21.2)	21.6-23.3		18.9-22.9
Head length	113.0 (27.5)	30.7-32.0	28.6	28.6-32.3
Head width	90.9 (22.1)	22.7-24.9		22.1-23.4
Head depth	70.5 (17.2)	15.6-17.8	19.2-22.9	15.8-16.8
Snout length	35.0 (8.5)	8.0-9.5	9.5	8.8-9.5
Mouth length	51.0 (12.4)	14.9-16.1		14.1-16.8
Upper lip width	72 (1.8)	1.7-2.0		1.6-2.6
Maxillary barbels	68.7 (16.7)	16.5-19.0		15.9-23.7
External mental barbels	52.7 (12.8)	11.1-14.3		13.3-15.9
Internal mental barbels	38.6 (9.4)	7.5-10.9		8.6-11.3
Anterior internarial distance	35.1 (8.5)	9.2-10.5		8.6-10.0
Posterior internarial distance	31.5 (7.7)	8.6-10.1		8.0-9.0
Interorbital distance	44.6 (10.9)	13.7-14.6	< 14.3	12.7-13.7
Eye diameter	9.5 (2.3)	2.5-3.0	2.6	2.5-3.1
Postorbital length	70.5 (17.2)	18.4-21.3		18.6-20.1
Width of supraoccipital/complex process	15.9 (3.9)	4.2-4.6		5.0-5.2
Length of supraoccipital process	31.7 (7.7)	7.2-8.3	twice its base	8.0-8.6
Predorsal fin length	145.0 (35.3)	36.7-40.2	37.0	37.6-43.9
Dorsal fin base	45.6 (11.1)	8.4-9.5		9.7-10.7
Dorsal fin spine height	52.2 (12.7)	-	< 14.3	14.5-14.9
Distance between dorsal and adipose fins	98.9 (24.1)	26.4-27.3		22.7-27.1
Preadipose fin length	285.0 (69.3)	69.3-73.5		72.0-76.4
Adipose fin base	63.1 (15.4)	10.3-12.7	half as long as the dorsal	9.5-12.5
Adipose fin height	57.3 (13.9)	10.9-14.3		-
Prepectoral fin length	104.0 (25.3)	23.9-26.9		24.8-27.8
Pectoral fin base	23.3 (5.7)	4.5-4.9		4.7-5.6
Pectoral fin spine length	55.7 (13.6)	12.8	< 14.3	15.4-16.8
Prepelvic fin length	205.0 (49.9)	54.9-57.8		52.7-60.3
Pelvic fin base	17.2 (4.2)	3.8-4.0		3.8-5.1
Pelvic fin length	62.0 (15.1)	13.2-13.3		13.9-20.0
Preanal fin length	269.0 (65.5)	70.7-73.7		72.6-75.9
Anal fin base	72.7 (17.7)	12.8-14.0	half as long as the dorsal	12.6-14.6
Anal fin height	74.1 (18.0)	17.2-18.1		12.4-18.0
Caudal peduncle depth	24.8 (6.0)	5.6-6.3	< 7.1	5.2-6.1

drial divergence value between two haplotypes of *N. bonillai* and *N. cookei* is 1.7%, corresponding to one of the smallest measured within the genus (Betancur-R., 2003). The data suggest that these two ariids are sister species and were separated relatively recently. Alternatively, it may be proposed that we are dealing with only one species including two populations. Nevertheless, given that such distances between other transisthmian sea catfish species pairs are also small, i.e. *Cathorops fuerthii* (Steindachner) and *Cathorops mapale* Betancur-R & Acero (2.2-2.8%), and *Ariopsis* sp. (New Granada sea catfish) and *A. seemanni* (Günther) (0.9%) (Betancur-R., 2003), we prefer to consider those two species of *Notarius* as valid. As it is clear from the phylogenetic tree of *Notarius* (Betancur-R. and Acero, 2004), this transisthmian species pair is closely related to *N. neogranatensis* (Colombian Caribbean) and *N. kessleri* (tropical eastern Pacific).

Miles (1945) deposited the holotype of his *Galeichthys bonillai* in a rather unusual place, an administrative office within a Ministery. This material may have got lost during the late 40s in the Bogotá riots or in any office move. Nowadays, at the beginning of the 21st century, nobody at the Ministerio de Agricultura in Bogotá knows the whereabouts of this material. Therefore, we designate herein the specimen purchased by G. Galvis at the Puerto Berrío market and deposited in the main Colombian fish collection as the neotype of *Notarius bonillai*. It should be remarked that in July 2004 the second author did a collecting trip to Puerto Berrío but no additional specimens were found. Moreover, fishermen commented that specimens of this species have become very scarce in the last years. This situation, added to a highly restricted distribution of this species, suggests its immediate inclusion in the red list of fish at least with the label of threatened.

An important consequence of the nomenclatural change presented herein is the lack of an appropriate name for the Colombian Caribbean species known as New Granada sea catfish (Acero, 2002, 2003; Acero *et al*., 2002). This population is genetically very close to the eastern Pacific species *Ariopsis seemanni* (Günther, 1864) (Betancur-R., 2003) and morphologically to the Middle American *Ariopsis assimilis* (Günther, 1864) (Acero, 2002). However, since no molecular information of *Ariopsis* material from Middle America is available and, thus, no full comparison can be done at this moment, we opt for the conservative move of calling provisionally the New Granada sea catfish *Ariopsis* sp. (aff. *assimilis*).

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