Morphometry and meristics of two species of *Ictalurus* (Siluriformes: Ictaluridae), native catfishes of Sierra Madre Occidental, Mexico

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ABSTRACT. Introduction: Morphotypes of native catfish of the genus *Ictalurus* (Siluriformes: Ictaluridae) are known to occur in allopatry in the northern Sierra Madre Occidental of Mexico, with only the Yaqui catfish (*Ictalurus pricei*) taxonomically described. Recent genetic analysis of these morphotypes has revealed the monophyly of the *I. pricei* complex, which indicates *Ictalurus* sp. from the Culiacán River and San Lorenzo River basins as its nearest genetic relative and recognizes as an evolutionarily significant unit the Culiacán River and San Lorenzo River morphotypes. **Objective:** To compare the meristic and morphometric characteristics of the catfish of the Culiacán River basin with its nearest genetic relative, the Yaqui catfish, in order to determine the presence of distinctive morphological characters that support genetic evidence previously reported for these morphotypes. **Methods:** Catfish specimens were collected during various field expeditions (1990-2012) to remote sites of the Sierra Madre Occidental and conducted in the Yaqui River and Culiacán River basins with the purpose of morphological comparison. Forty-five morphological characters (40 morphometric and five meristic) were examined in 76 adult specimens – 52 *Ictalurus* sp. and 24 *Ictalurus pricei*. Three groups were subject to a discriminant function analysis (DFA), including two *Ictalurus* sp. groups from the Humaya River and Tamazula River sub-basins, representing the Culiacán River basin, and one *I. pricei* group representing the Yaqui River basin. The standardized measurements and meristic data of the catfish morphotypes were compared by means of DFA. **Results:** The DFA revealed 12 characters to be significantly different (P < 0.01) among the groups compared. The morphological characters separating the *Ictalurus* sp. (Culiacán River basin) from the Yaqui catfish were associated with lower anal, pelvic and pectoral fin ray numbers, shorter head and predorsal lengths, shorter longest lateral barbel and longest dorsal ray lengths and a narrower premaxilar dentary plate; and finally longer distances in *Ictalurus* sp. for dorsal-fin origin to last anal-fin ray base and dorsal-fin origin to posterior end of the adipose fin base. The standardized coefficients for canonical variables 1 and 2 accounted for 85.6 % and 14.4 % of the total variation, respectively. **Conclusions:** The distinctive morphological characters of the *Ictalurus* sp. found in the Culiacán River basin, combined with the known mitochondrial evidence for this morphotype, identify it as an evolutionarily significant unit that requires description as a new species based on taxonomical protocols.

Key words: morphometrics, meristics, Río Culiacán catfish, evolutionarily significant unit, northwestern Mexico.

The family Ictaluridae, or North American catfish, contains 51 nominal species, of which 29 and 10 taxa belong to the genera *Noturus* and *Ictalurus*, respectively (Page et al., 2013). Several morphotypes of native *Ictalurus* catfish are present in the northern Sierra Madre Occidental (SMO), Mexico (Hendrickson, 1983; Varela-Romero, 2007; Varela-Romero, Hendrickson, Yepiz-Plascencia, Brooks & Neely, 2011). Of these, only the Yaqui catfish (*Ictalurus pricei*) from the Yaqui, Mayo, Sonora, Fuerte, and Casas Grandes river basins (Hendrickson, Minckley, Miller, Siebert & Minckley, 1980; Miller, Minckley, & Norris, 2005) has been formally described (Rutter, 1896; Miller et al., 2005).

The presence of native catfish in the northern SMO was first reported by Rutter (1896), who described a new species from the Yaqui River basin, *Villarius pricei* (currently known as *Ictalurus pricei*), based on specimens captured in the San Bernardino creek just south of the international border with Arizona, USA. Several authors (e.g. Hendrickson et al., 1980; Miller et al., 2005; Varela-Romero et al., 2011) have referred to the presence of at least one undescribed allopatric species of the genus *Ictalurus* inhabiting the drainages south of the Fuerte River basin. Recently, based on analysis of mitochondrial DNA of catfish from northwestern México, Ballesteros-Córdova et al. (2015) identified the monophyly of the Yaqui catfish (*Ictalurus pricei*) complex, including *Ictalurus* sp. from the allopatric populations of the Culiacán River and San Lorenzo River basins, as its nearest genetic relative.

In support of the recently presented genetic evidence supporting the recognition of the *Ictalurus* sp. from the Culiacán River basin as an evolutionarily significant unit (Ballesteros-Córdova et al., 2015), we postulate that this morphotype might represent a new species based on morphological characters that distinguish it from its nearest genetic relative, the Yaqui catfish, both of which present an allopatric distribution in the SMO.

MATERIAL AND METHODS

Study area: The study area includes the Culiacán River and Yaqui River basins in the SMO (Fig. 1), across the states of Durango, Sinaloa and Chihuahua. The Culiacán River basin provides drainage to a surface area of 19 150 km² in the states of Durango, Sinaloa and Chihuahua, along with the Humaya (11 363 km²) and Tamazula (3 657 km²) sub-basins. For the purposes of the present study, we considered the Humaya and Tamazula sub-basins as hydrological and physiographically different in their middle and upper sections, in which large artificial reservoirs (the Adolfo López Mateos and Sanalona reservoirs, respectively) have been built for agricultural irrigation in the Culiacán coastal valley. The hot sub-humid climate in the Culiacán River basin is characterized by rains in the summer and an annual average temperature of 12-24 °C and annual mean precipitation above 600 mm (Arriaga et al., 2000). The Yaqui River basin comprises an area of 71 452 km², providing drainage to the states of Sonora (74 %) and Chihuahua (21 %) in Mexico, and Arizona, in the USA (5 %) (Cruz-Medina & García-Páez, 2008), while its climate is controlled regionally by means of its latitudinal position, physical size, altitude, and distance to the sea. Most of the basin comprises extra-tropical drylands with a band of extra-tropical highlands that follow the SMO. The annual mean temperature along the coast and the basin inland is above 25 °C, while this is less than 15 °C in the plateau areas (Hendrickson et al., 1980).

Fish sampling: The catfish specimens were collected during various field expeditions (1990-2012) to remote sites in the SMO, in the states of Chihuahua, Sinaloa and Durango, with access to which made difficult and risky by the presence of drug traffickers (Fig. 1, Digital Appendix 1). Sampling was carried out in two sub-basins of the Culiacán River (the Humaya and Tamazula sub-basins) and one sub-basin of the Yaqui River (the Sirupa-Tutuaca sub-basin).

Specimens were captured using AC Smith-Root 15-B POW electrofishing equipment, hooks and lines, and cast nets. In the field, the recently captured specimens were photographed for the description of their live/fresh coloration, after which fin tissue clips of each specimen were taken and preserved in 95 % non-denatured ethanol. All the specimens were fixed in 10 % formalin, preserved in 70 % ethanol, and finally donated to the fish collections of the Universidad Autónoma de Baja California (UABC), the Universidad de Sonora (USON) and the Texas Natural History Collections (TNHC) at the University of Texas.

Morphological comparison: Fifty-two *Ictalurus* sp. specimens (Culiacán River basin, 66-215 mm standard length [SL]) and 24 *Ictalurus pricei* specimens (Yaqui River basin, 186-242 mm SL) were examined for morphometric and meristic comparison. The meristic analysis was based on the standardized method of Hubbs and Lagler (1958) for the dorsal, anal, caudal, pelvic and pectoral fin-ray counts. The

morphometric analysis comprised 40 somatic distances (Fig. 2A, Fig. 2B, Digital Appendix 2) following Hubbs and Lagler (1958), Bookstein et al. (1985), and Ruiz-Campos, Lozano-Vilano and García-Ramírez (2009). All linear measurements were made in millimeters (mm) along the left side of each specimen using a digital caliper (precision, 0.01 mm) connected to a PC.

A scatterplot was used to perform an exploratory analysis of the relationship between the standard length and each morphometric character (length and width measurements) of the examined specimens. This procedure enabled the detection of any aberrant or inconsistent data in the body measurements.

Considering that morphometric variation among individuals should be attributable to body shape differences and not the relative size of the fish, an allometric method (Elliott, Haskard and Koslow, 1995) was used to remove size-dependent variation in the morphometric characters and homogenize their variances (Jolicoeur, 1963).
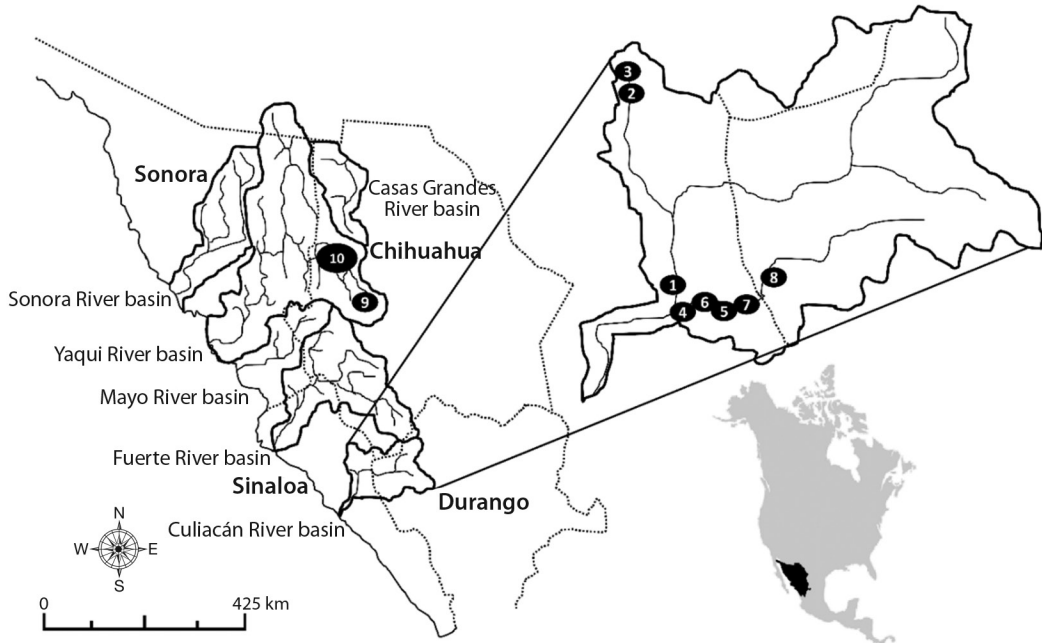

Fig. 1. Collecting sites for *Ictalurus* sp. (1-8) and *I. pricei* (9, 10) in the Río Culiacán and Río Yaqui basins, respectively, in the Sierra Madre Occidental, Mexico. Numbers indicate the collecting sites as described in Digital Appendix 1.
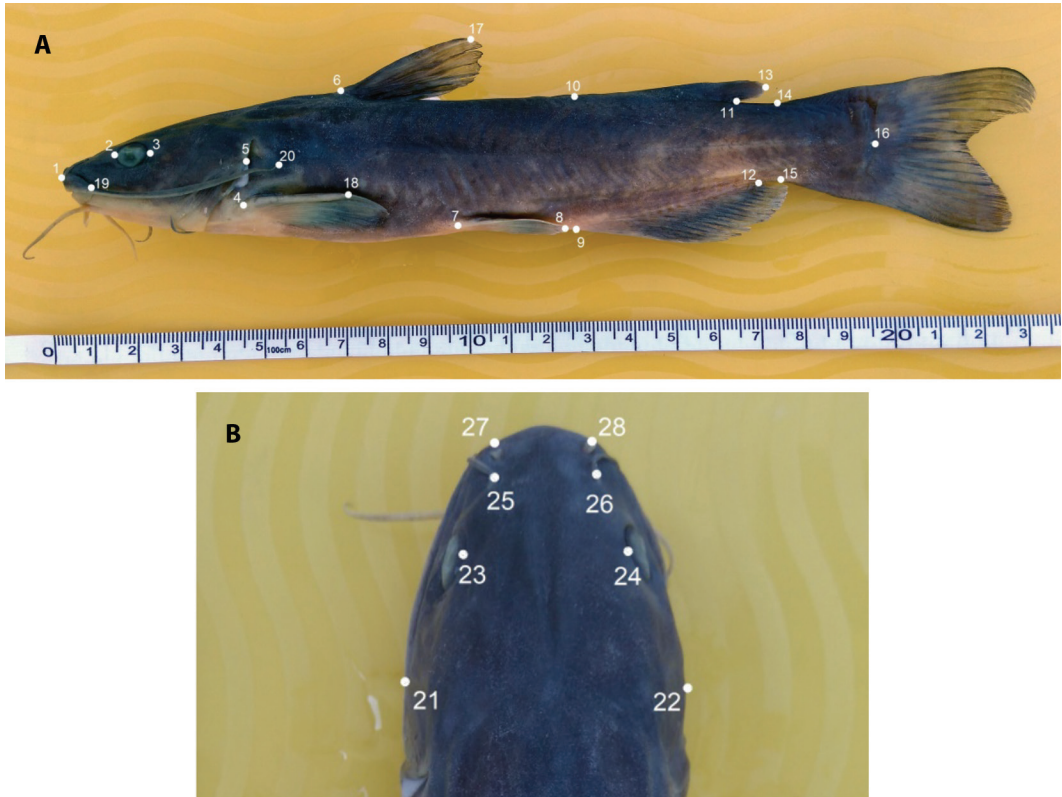
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Fig. 2. Morphometric landmarks in specimens of the genus *Ictalurus* from the Sierra Madre Occidental, Mexico. For a description of landmarks and distances in A and B see Digital Appendix 2.

This allometric method enabled the standardization of the morphometric data by means of the equation Ms = Mo (Ls/Lo)^b, where: Ms = standardized measurement; Mo = original length measurement of the character (mm); Ls = overall (arithmetic) mean standard length (mm) for all individuals from all populations examined; and, Lo = standard length (mm) of specimen. Parameter *b* was estimated for each character from the observed data using the non-linear equation, M = a L^b, where: M = the estimated measurement of the character; parameters *a* and *b* are the intercept and slope, respectively; and, L= standard length of the specimen (mm). Parameter *b* was estimated as the slope of the regression log Mo on log Lt, using all fish.

Three groups were considered in the DFA, two *Ictalurus* sp. groups (Humaya and Tamazula river sub-basins) representing the Culiacán River basin, and one *I. pricei* group representing the Yaqui River basin. The standardized measurements and meristic data for the catfish groups studied were compared by means of a forward stepwise DFA using Statistica 6.0 (StatSoft, Inc., Tulsa, OK, 2002). A step-by-step discrimination model is built in this type of analysis, which, at each step, reviews all variables and identifies those which contribute most to the discrimination between groups.

The statistical significance of the discrimination among populations was determined using Wilk's lambda (λ), which oscillates from 0.0 (perfect discrimination power) to 1.0 (absence of discrimination power). The standardized coefficients of the canonical variables were determined in order to estimate the

contribution of each variable in each canonical function; therefore, the value of each coefficient indicates the power of the variables considered in the analysis to either separate or discriminate.

The standardized coefficients were plotted on a Cartesian coordinate system, where their position and orientation (vectors) indicated the degree of association between each variable and the groups (Pires-Da Silva, Imhoff, Giarola & Tormena, 2001). Finally, to illustrate the separations and relationships among the populations compared, we built tree diagrams based on the squared Mahalanobis distances of the morphological characters examined.

RESULTS

From the morphological comparison between *Ictalurus* sp. specimens from the Culiacán River basin (considering the Humaya and Tamazula river sub-basins separately) and *Ictalurus pricei* specimens from the Yaqui River basin, 27 of 45 the morphological variables examined entered into the forward stepwise DFA. The global Wilks lambda (λ) was 0.02701 (P < 0.0001), indicating a high degree of discrimination among the groups compared. The five most significant variables included body depth at origin of anal

fin (P < 0.001), number of pelvic rays (P < 0.001), distance from the orbit to the upper operculum opening (P < 0.001), number of pectoral rays (P < 0.01) and interorbital width (P < 0.05; Table 1).

Analysis of the standardized coefficients for canonical variables revealed that canonical roots 1 and 2 explained 85.6 and 14.4 % of the observed total variation, respectively (Table 2).

For Canonical Root 1, four variables exerted the major effects: body depth at origin of anal fin origin (Y = -1.08698); distance from orbit to the upper operculum opening (Y = -1.04841); number of anal rays (Y = -0.73818); and, number of pelvic rays (Y = -0.62839). For Canonical Root 2, two variables exerted the major effects, namely the length of dorsal and pectoral spines (Y = -1.05172 and 0.96372, respectively).

The highest squared Mahalanobis distance (59.10) was registered between the Humaya River sub-basin and the Yaqui River basin, while the lowest (15.76) was between the Humaya River and Tamazula River sub-basins. The Tamazula River sub-basin and the Yaqui River basin recorded a distance of 39.60. The tree diagram resulting from the squared Mahalanobis distances (Fig. 3A) indicates a high degree of discrimination between the *Ictalurus* sp. specimens from the Humaya River and

TABLE 1

Lambda values of Wilks (*p*) and tolerance for 10 somatic variables (P ≤ 0.05) in the forward stepwise discriminant function analysis for *Ictalurus* sp. of the Río Culiacán basin (Río Humaya and Río Tamazula sub-basins) and *I. pricei* of the Río Yaqui basin, in northwestern Mexico

Variable	Wilks	Partial	F-remove	P-level
Number of anal rays	0.032422	0.832940	4.713308	0.0136
Number of pectoral rays	0.033093	0.816069	5.296575	0.0084
Orbit to upper opercul opening	0.036523	0.739425	8.281441	0.0008
Dorsal spine length	0.032346	0.834901	4.647038	0.0144
Number of pelvic rays	0.036694	0.735977	8.43033	0.0007
Orbit length	0.032235	0.837783	4.550237	0.0156
Interorbital width	0.032578	0.828954	4.848997	0.0122
Body depth (at anal fin origin)	0.037003	0.729829	8.699308	0.0006
Pelvic fin origin to anal fin origin	0.031090	0.868643	3.553706	0.0365
Width of premaxillar dentary plate	0.030874	0.874715	3.365901	0.0430

Number of variables in the model: 27; Wilks Lambda: 0.02701; approx. F(54, 94) = 8.8519, P < 0.0001.

Standardized coefficients for canonical variables resulting from the discriminant function analysis of morphological
data in *Ictalurus* sp. of the Río Culiacán basin (*n* = 52) and *I. pricei* of the Río Yaqui basin (*n* = 24),
in the Sierra Madre Occidental, Mexico

Variable	Root 1	Root 2
Number of anal rays	**-0.73818**	0.25144
Number of pectoral rays	-0.47715	-0.61656
Longest maxilar barbel length	-0.32428	-0.61145
Orbit to upper opercule opening	**-1.04841**	-0.25635
Length of caudal middle rays (from hypural plate)	0.33992	-0.26116
Dorsal spine length	-0.13743	**-1.05172**
Longest lateral barbel length	-0.05913	0.59828
Dorsal fin origin to pectoral fin origin	0.30900	-0.3084
Number of pelvic rays	**-0.62839**	0.58116
Orbital length	0.13826	-0.70431
Pectoral spine length	0.05883	**0.96372**
Longest nasal barbel length	0.23043	0.22421
Interorbital width	0.54342	-0.84529
Pectoral fin origin to pelvic fin origin	0.19634	-0.36921
Mouth width	-0.34814	0.58001
Body depth (at anal fin origin)	**-1.08698**	-0.31499
Head width (at opercules)	0.55541	-0.19311
Pelvic fin origin to anal fin origin	-0.5702	0.04686
Width of premaxilar dentary plate	-0.58649	-0.22642
Predorsal length	0.21914	0.53912
Caudal peduncle depth	0.48098	0.32647
Length of penultimate anal ray	-0.26833	-0.13646
Pelvic fin origin to posterior connection of adipose fin	0.49138	-0.19764
Snout width (at maxilla)	0.58904	0.06044
Anal fin base length	-0.42307	0.36902
Caudal peduncle length	-0.34173	0.41168
Adipose fin base to caudal fin	0.12610	-0.39151
Eigenval	11.56908	1.94604
Cum. Prop.	0.856010	1.00000

Variables exerting major contributions to the observed total variation are depicted in bold.

Tamazula River sub-basins (Culiacán River basin) and the *I. pricei* specimens from the Yaqui River basin. The *Ictalurus* sp. specimens from the two sub-basins of the Culiacán River revealed a high similarity level, with a value of 84.2 % (Fig. 3A).

The percentage of correct classification, by means of the DFA, of individuals in the examined groups was 98.7 %, indicating that almost all individuals across the different drainages were correctly classified into their respective groups (see scatterplots in Fig. 3B). Only one

individual from the Tamazula River population was classified incorrectly into the Humaya River population. In the scatterplot graph for roots 1 and 2 (Fig. 3B), the populations of the Humaya River and Tamazula River sub-basins appear as juxtaposed groups, while the population from the Yaqui River basin is widely separated from both populations of the sub-basins of the Culiacán River.

Morphologically, the Culiacán River catfish differs from the Yaqui catfish by means of the following characters: a lower number of
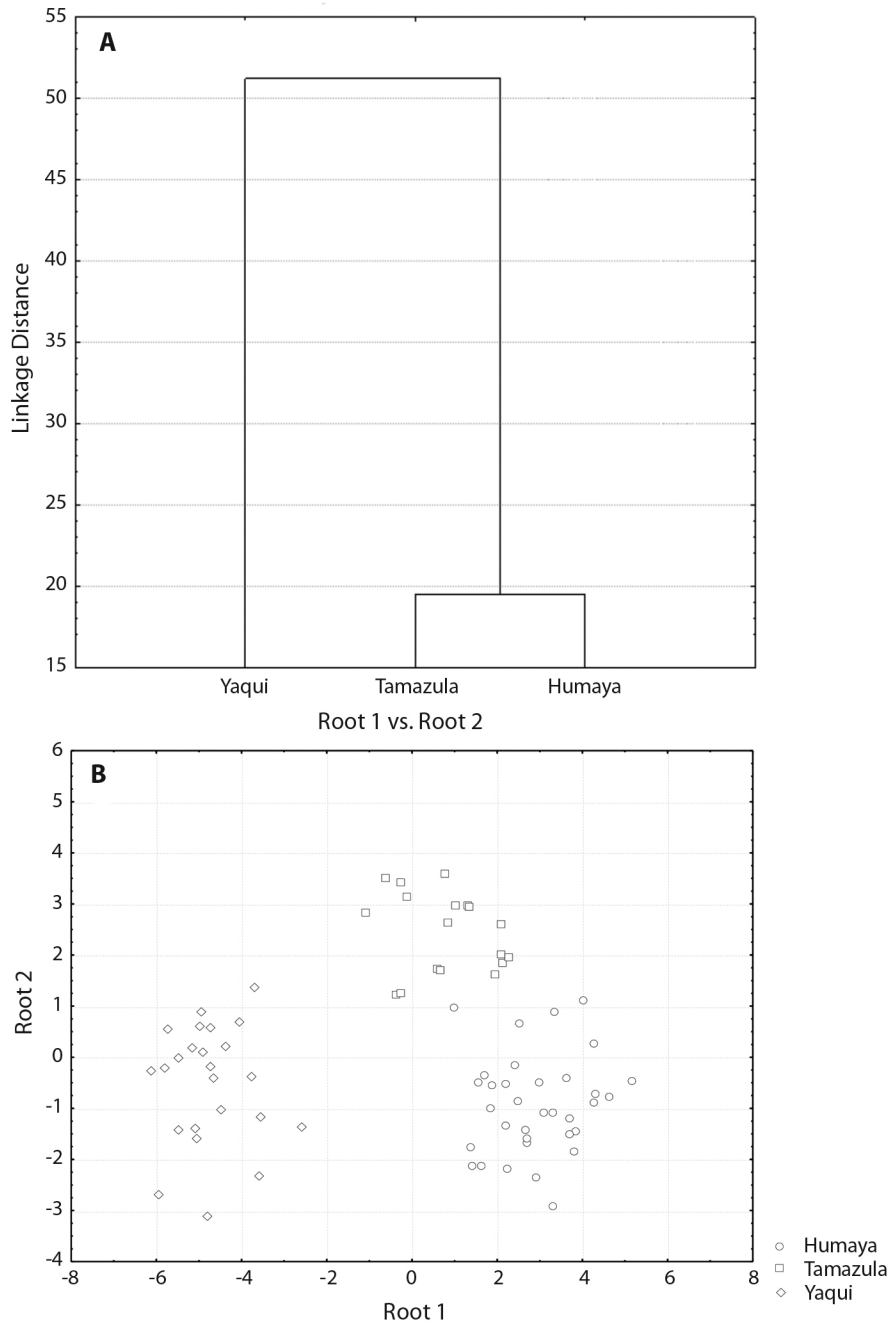
Fig. 3. (A) Tree diagram derived from the squared Mahalanobis' distances and **(B)** scatter plot of centroids for roots 1 and 2 in *Ictalurus* sp. from the Río Culiacán basin (Río Humaya and Río Tamazula sub-basins) and *I. pricei* from the Río Yaqui basin, in the Sierra Madre Occidental, Mexico.
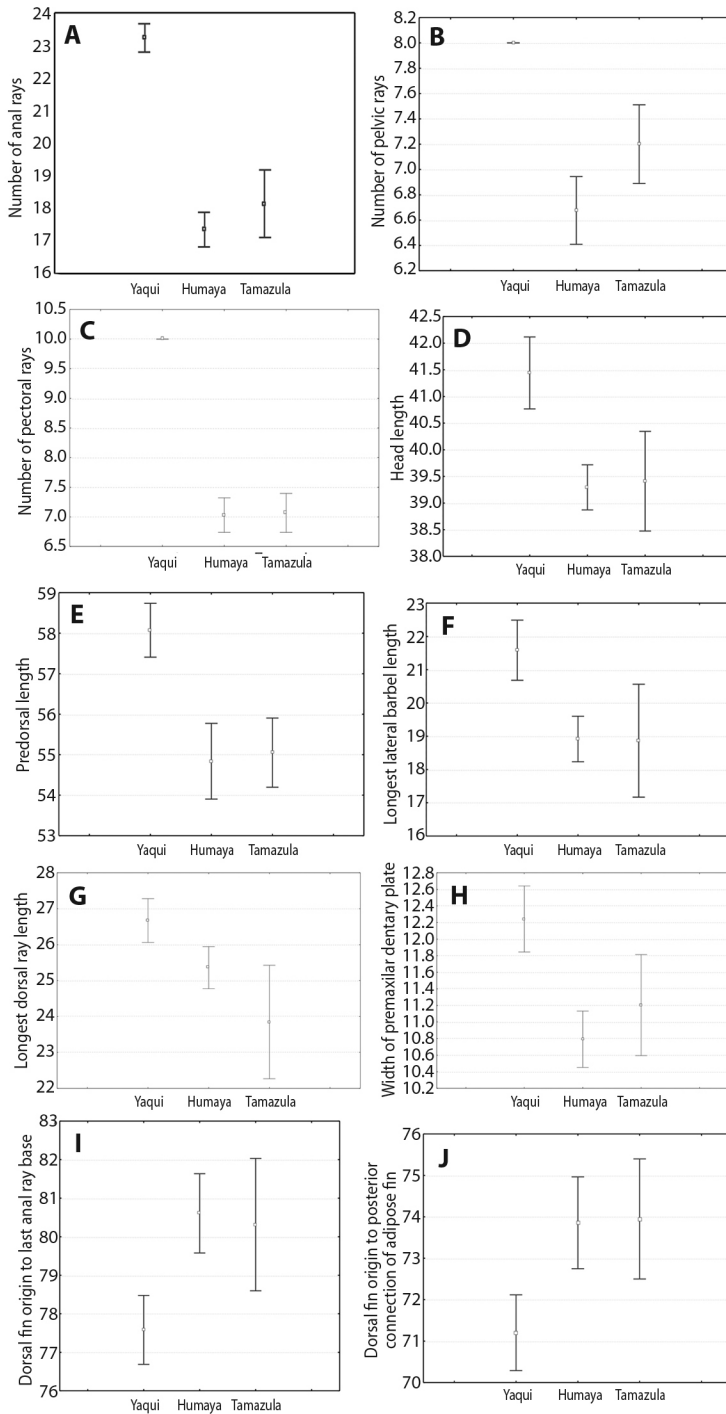
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Fig. 4. Mean and 95 % confidence interval of the 10 most significant morphological characters that separate *Ictalurus* sp. of the Río Culiacán basin (Río Humaya and Río Tamazula sub-basins) from *Ictalurus pricei* of the Río Yaqui basin, Sierra Madre Occidental, Mexico.

anal (Fig. 4A), pelvic (Fig. 4B) and pectoral fin rays (Fig. 4C); smaller dimensions for head length (Fig. 4D) and predorsal length (Fig. 4E); shorter longest lateral barbel length (Fig. 4F); shorter longest dorsal ray length (Fig. 4G); narrower premaxilar dentary plate (Fig. 4H); larger distance from dorsal fin origin to last anal ray base (Fig. 4I); larger distance from dorsal fin origin to posterior end of the adipose fin base (Fig. 4J); and, finally, the tips of caudal fin lobes are rounded (Fig. 5A, Fig. 5B) while those of the Yaqui catfish are pointed (Fig. 5C).

The body coloration of fresh catfish specimens from the stream El Rodeo, a tributary of the Tamazula River sub-basin (Culiacán River basin), collected on 19 February 2011 (Fig. 5A), is dark gray on the head and dorsum, while the medium gray to yellowish brown observed on the sides contrasts with the shiny white observed on the belly. Fresh catfish

Fig. 5. Life coloration of native catfishes of the genus *Ictalurus* from the Sierra Madre Occidental, Mexico. (**A**) *Ictalurus* sp., Arroyo El Rodeo [Río Tamazula sub-basin], Durango; (**B**) *Ictalurus* sp., Arroyo Surutato [Río Humaya sub-basin], Sinaloa; and (**C**) *Ictalurus pricei*, Río Fuerte basin, Sinaloa. Photographs by S. Sánchez-Gonzáles (**A** and **B**) and A. Varela-Romero (**C**).

specimens from the stream Surutato, a tributary of the Humaya River sub-basin (Culiacán River basin), captured on 29 February 2012 (Fig. 5B), presented the following: a dark blue gray coloration on the head and dorsum which contrasts with the clear blue gray observed on the sides; small black spots are dispersed along the sides of the body and are more conspicuous on small individuals; white mental barbels contrast with the dark gray coloration of the maxillary barbels; and, all fins are dark gray. The fresh coloration of *Ictalurus pricei* (Fig. 5C) was clear brown on the head, dorsum and sides, while all fins had a clear gray tonality, and the caudal fin had a black edge.

DISCUSSION

The Mexican highlands are considered a focus of biodiversity in North America (Ramamoorthy, Bye, Lot, & Fa, 1993; Bye, 1995), containing highly endemic flora and fauna as a result of the strong role played by divergence and speciation (MacCormak, Peterson, Bonaccorso, & Smith, 2008; Schönhuth et al., 2011). In the historical context of the SMO, the geographic isolation among hydrological drainages has facilitated reproductive isolation and morphological divergence, resulting in the formation of unique phenotypes (*sensu* Worsham, Julius, Nice, Diaz, & Huffman, 2017).

The geographical isolation of the Culiacán River catfish and its consequent differentiation (Varela-Romero et al., 2011) could be related to various orographic events and episodic aridity during the Miocene which, combined with pluvial cycles in the Pleistocene, resulted in the separation of the different hydrological drainages in the SMO (Schönhuth, Doadrio, & Mayden, 2006; Schönhuth et al., 2011, 2014; Smith et al., 2002). This tectonic-climatic event has been also proposed as the main causal factor of the speciation of other fish genera in the SMO, such as *Gila* (Schönhuth et al., 2014), *Codoma* (Schönhuth, Lozano-Vilano, Perdices, Espinosa, & Mayden, 2015) and *Catostomus* (Ruiz-Campos, Sánchez-Gonzáles, Mayden, & Varela-Romero et al., 2016).

Recently, molecular evidence based on cytochrome b (Varela-Romero, 2007; Varela-Romero, Ballesteros-Córdova, Ruiz-Campos, Sánchez-Gonzáles, & Brooks, in press), the cytochrome oxidase subunit 1 (Castañeda-Rivera, Grijalva-Chon, Gutiérrez-Millán, Ruiz-Campos, & Varela-Romero et al., 2014) and the sequencing of four geographical mitogenome haplotypes of Yaqui catfish and Sinaloan catfish (Culiacán River and San Lorenzo River basins) has placed the geographical haplotypes of *I. pricei* within a clade of specific identity. This identity is close to Sinaloan catfish haplotypes, thus supporting the hypothesis that Sinaloan catfish are a distinct evolutionary unit (Ballesteros-Córdova et al., 2015).

The discriminant function analysis applied, in the present study, on *Ictalurus* sp. from the Culiacán River basin (Humaya and Tamazula sub-basins) and *I. pricei* from the Yaqui River basin enabled the identification of a set of diagnostic morphological characters that can be used to distinguish them. The Culiacán River catfish (both sub-basins) is distinguished from the Yaqui River catfish by: its smaller average size (140 mm SL vs. 212 mm SL); lower number of anal ($\leq$ 19 vs. $\geq$ 23), pelvic ($\leq$ 7 vs. 8), and pectoral (7 vs. 10) fin rays; smaller dimensions for head length, predorsal length, longest lateral barbel length, longest dorsal ray length and premaxilar dentary plate width; and, finally, larger distances in *Ictalurus* sp. (Culiacán River basin) from dorsal fin origin to last anal ray base, and dorsal fin origin to posterior end of the adipose fin base.

The morphological characters described above support the hypothesis of the present study, which stipulates that the *Ictalurus* sp. of the Culiacán River basin (Humaya and Tamazula sub-basins) represents a different form to the nominal species *Ictalurus pricei* of the Yaqui River basin, as already confirmed by genetic analysis undertaken using mitochondrial DNA (Ballesteros-Córdova et al., 2015; Castañeda-Rivera et al., 2014; Varela-Romero, 2007; Varela-Romero et al., 2011; Varela-Romero, et al., in press). In this context, the *Ictalurus* sp. inhabiting the Culiacán River

basin represents an evolutionarily significant unit (Wiley, 1981) that should be described in the taxonomic standards for future legal protection by the Mexican government (Hendrickson et al., 2003). Currently, the native catfish populations of the Culiacán River basin face several threats from anthropogenic activities, such as the alteration of their habitat by mining, the diversion or impoundment of flows, or the potential introduction of exotic catfish (*Ictalurus punctatus*), all of which affect the population distribution and abundance of this native taxon.

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RESUMEN

Morfometría y merística de dos especies de *Ictalurus* (Siluriformes: Ictaluridae), bagres nativos de la Sierra Madre Occidental, México. Introducción: Morfotipos de bagres nativos del género *Ictalurus* (Siluriformes: Ictaluridae) se distribuyen de manera alopátrica en el norte de la Sierra Madre Occidental, de los cuales solo el bagre Yaqui (*Ictalurus pricei*) ha sido taxonómicamente descrito. Análisis genéticos recientes de esos morfotipos han revelado la monofilia del complejo *I. pricei*, que incluyó a *Ictalurus* sp. de las cuencas de los ríos Culiacán y San Lorenzo como su pariente genético más cercano, además del reconocimiento de los morfotipos de los ríos Culiacán and San Lorenzo como una unidad evolutivamente significativa. **Objetivo:** Comparar características merísticas y morfométricas del bagre de la cuenca del río Culiacán con su pariente genético más cercano, el bagre Yaqui, con el propósito de determinar la presencia de caracteres morfológicos distintivos en apoyo a evidencia genética previamente reportada para esos morfotipos. **Métodos:** Especímenes de bagres fueron recolectados durante varias expediciones de campo (1990-2012) en sitios remotos de la Sierra Madre Occidental en las cuencas de los ríos Yaqui y Culiacán para comparación morfológica. Cuarenta y cinco caracteres morfológicos (40 morfométricos y cinco merísticos) fueron examinados en 76 especímenes adultos (52 de *Ictalurus* sp. y 24 de *Ictalurus pricei*). Medidas corporales estandarizadas y datos merísticos de los morfotipos de bagres estudiados fueron comparados por medio de un análisis de función discriminante (AFD). **Resultados:** El AFD arrojó 12 caracteres significativamente diferentes (P < 0.01) entre los grupos comparados. Los caracteres morfológicos que distinguen al bagre del río Culiacán del bagre Yaqui, estuvieron asociados con un menor número de radios anales, pélvicos y pectorales, así como dimensiones más pequeñas para la longitud de la cabeza, longitud predorsal, longitud de la barbilla lateral más larga, longitud del radio dorsal más largo y una menor anchura de la placa dentaria premaxilar; y finalmente, dimensiones mayores en *Ictalurus* sp. (cuenca del río Culiacán) para distancias como origen de aleta dorsal a la base del último radio anal y origen de aleta dorsal a conexión posterior de aleta adiposa. Los coeficientes estandarizados para las variables canónicas 1 y 2 explicaron el 85.6 y 14.4 % de la variación total, respectivamente. **Conclusiones:** Los caracteres morfológicos distintivos de *Ictalurus* sp. de la cuenca del r**ío Culiacán**, en combinación con la evidencia mitocondrial conocida para este mismo morfotipo, permite reconocerlo como una unidad evolutivamente significativa y que requiere ser descrita como una especie nueva bajo los protocolos taxonómicos.

Palabras clave: morfometría, merística, bagre del río Culiacán, unidad evolutivamente significativa, noroeste de México.

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