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Krobia xinguensis, a new species of cichlid fish from the Xingu River drainage in Brazil (Teleostei: Cichlidae)

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Abstract

Krobia xinguensis is described from localities in the headwaters and in the lower part of the rio Xingu. It is distinguished from the other two species in the genus, *K. guianensis* and *K. itanyi*, primarily by deeper caudal peduncle, and details of the colour pattern, including contrasting interorbital stripes and a small dark spot anteriorly on each side of the lower jaw. *Krobia xinguensis* represents a considerable range extension of the genus from the Guianas and northern tributaries of the lower Amazon, into a major south bank Amazon tributary.

Key words: *Aequidens*, Amazon basin, endemism, taxonomy, Guiana shield, Brazilian shield

Introduction

Krobia was erected by Kullander & Nijssen (1989) to contain two species from the Atlantic drainages of the Guianas, previously classified in *Aequidens* Eigenmann & Bray, viz. *K. guianensis* (Regan) from the Essequibo drainage in Guyana, and *K. itanyi* (Puyo) from the Maroni drainage in Suriname and French Guiana. Kullander & Nijssen (1989) also signalled two undescribed species from French Guiana, and over time additional species have been reported also from the lower Amazon drainage. The presence of an undescribed species of *Krobia* in the Xingu river basin has already been published (Stawikowski & Werner, 1998). It was discovered in 1964 by Harald Schultz who sampled three specimens in the rio Batovi, a headwater of the rio Xingu in Mato Grosso. Later collections have accumulated coming from the same region and from the lower rio Xingu. The species is now also available in the ornamental fish trade (Stawikowski, 2007). The objective of this paper is to provide the long overdue formal description of this taxon.

Material and methods

Measurements and counts were taken as described by Kullander (1986). Specimen lengths are given as standard length (SL), measured from the tip of the upper jaw to the middle of the base of the caudal fin. Scales in a longitudinal row (E1 row scales) are counted in the row immediately dorsal to that containing the lower lateral line. Tooth shape terminology follows Barel *et al.* (1977). Colour marking terminology follows Kullander (1986); bar numbering follows Kullander (1983: fig. 4).Vertebral counts include the last half-centrum and were taken from X-radiographs made on Kodak X-omat V film using a Philips MG-105 low voltage X-ray unit. Morphometric data were managed and analysed using PASW Statistics 18 (SPSS, 2009), except that the principal component analysis (PCA) of measurements was made using a separate procedure for component shearing, partialling out multivariate size residues from the second and further components as described by Humphries *et al.* (1981). The PCA analysis was made with log-transformed measurement data to tenth of a millimetre in a covariance matrix, and without rotation. Pelvic-fin length was excluded from the PCA because of the sexual dimorphism in the relative length of the pelvic fin.

Specimens studied are deposited in the following institutions: BMNH, The Natural History Museum, London;

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INPA, Instituto Nacional de Pesquisas da Amazônia, Manaus; IRSNB, Institut royal des Sciences naturelles de Belgique, Bruxelles; NRM, Swedish Museum of Natural History, Stockholm; USNM, United States National Museum, Smithsonian Institution, Washington, D.C.

Tables of measurements were prepared for all species descriptions in Kullander & Nijssen (1989). Unfortunately, the book was printed without the tables. I therefore take the opportunity to present the measurement data for *K. guianensis* and *K. itanyi* here (Tables 1–2), as they are relevant for the comparison with *K. xinguensis.*

Comparative material. *Aequidens potaroensis*: NRM 33660, 2. Guyana, Mazaruni River, 16 May 1995. *Krobia itanyi*: NRM 30357, 5. Suriname, Manbari Val. 20 Apr 1967. Additional comparative material of *Krobia guianensis* and *K. itanyi* is that described by Kullander & Nijssen (1989).

TABLE 1. Standard length (in millimeters) and proportional measurements in percents of standard length of *Krobia guianensis*. SD, standard deviation. Regression line parameters, a (intercept), b (slope), and r (Pearson's correlation coefficient) are calculated from measurements expressed in millimeters.

	n	Min	Max	Mean	SD	a	b	r
Standard length (mm)	26	24.7	111.2	63.5	24.1			
Head length	26	32.9	37.4	34.5	1.2	1.337	0.321	0.998
Snout length	26	6.5	9.5	8.3	0.9	-1.006	0.102	0.993
Body depth	26	41.3	50.8	45.6	2.2	-2.463	0.501	0.997
Orbit diameter	26	11.4	16.4	13.4	1.6	1.907	0.099	0.990
Head width	26	18.3	21.0	19.5	0.7	-0.385	0.202	0.996
Interorbital width	26	9.3	15.0	11.7	1.4	-2.219	0.157	0.989
Preorbital depth	26	4.5	9.6	6.9	1.5	-2.182	0.109	0.996
Caudal peduncle depth	26	15.7	18.1	17.0	0.7	-0.553	0.180	0.996
Caudal peduncle length	26	9.3	13.0	11.8	0.9	-0.100	0.116	0.982
Pectoral-fin length	24	35.5	41.3	37.9	1.5	-0.701	0.391	0.993
Pelvic-fin length	25	28.3	49.9	37.3	5.0	-6.467	0.490	0.979
Last dorsal-fin spine length	26	16.8	19.7	18.4	0.9	0.394	0.177	0.993

TABLE 2. Standard length (in millimeters) and proportional measurements in percents of standard length of *Krobia itanyi*. SD, standard deviation. Regression line parameters, a (intercept), b (slope), and r (Pearson's correlation coefficient) are calculated from measurements expressed in millimeters.

	n	Min	Max	Mean	SD	a	b	r
Standard length (mm)	25	23.5	100.8	73.7	18.6			
Head length	25	33.0	36.1	34.4	0.9	1.453	0.322	0.997
Snout length	25	6.0	11.3	8.8	1.0	-1.793	0.114	0.983
Body depth	25	40.0	45.3	43.7	1.2	-0.418	0.444	0.995
Orbit diameter	25	11.3	15.7	13.0	1.2	2.227	0.098	0.962
Head width	25	18.6	20.6	19.7	0.5	0.122	0.196	0.993
Interorbital width	25	9.4	14.2	12.6	1.1	-1.662	0.151	0.984
Preorbital depth	25	4.3	8.7	7.2	1.1	-2.140	0.104	0.984
Caudal peduncle depth	25	15.6	17.4	16.7	0.5	-0.198	0.170	0.995
Caudal peduncle length	25	10.3	12.8	12.0	0.7	-0.548	0.128	0.985
Pectoral-fin length	22	33.2	40.7	38.4	1.9	-2.017	0.414	0.990
Pelvic-fin length	25	28.5	48.5	39.6	4.5	-8.085	0.515	0.976
Last dorsal-fin spine length	25	16.2	19.7	18.5	1.0	-0.381	0.191	0.983

***Krobia xinguensis*, new species**
Figs. 1–9, Tables 3–4

Holotype. INPA 35653. Adult male, 74.4 mm SL. Brazil, State of Pará, Ilha de Babaquara, rio Xingu, 03°12’43’’S, 52°12’12’’W. 5 Oct 1990. L. Rapp Py-Daniel & J. Zuanon (Fig. 1).

FIGURE 1. *Krobia xinguensis*, INPA 35653. Holotype, adult male, 74.4 mm SL. Brazil, State of Pará, Ilha de Babaquara, rio Xingu.

FIGURE 2. *Krobia xinguensis*, IRSNB 979. Paratype, female, 60.5 mm SL. Brazil, State of Mato Grosso, small igarapé tributary to Lago Upavi, Kamaiurá village, Posto Leonardo Vilas-Boas.

Paratypes: All from Brazil, rio Xingu drainage. BMNH 1985.6.20:1223–1242pt. 1, 40.1 mm SL. Mato Grosso, córrego do Gato. 22 Apr 1968. R.H. Lowe-McConnell. — INPA 4219. 16, 35.3–77.2 mm SL; NRM 61781. 3, 45.5–84.6 mm SL. Collected with holotype. — IRSNB 877. 1, 67.7 mm SL. Mato Grosso, laguna at mar-

gin of rio Tuatuari upstream of Posto Leonardo Vilas-Boas. 12 Oct 1964. J.-P. Gosse & Léopold III. — IRSNB 878. 1, 47.1 mm SL. Mato Grosso, igarapé of Lago Yamarikumao, at Suiá village on rio Suiá-Missu. 3 Nov 1964. J.-P. Gosse & Léopold III. — IRSNB 879. 10, 38.6–60.5 mm SL. Mato Grosso, small igarapé tributary to Lago Upavi, Kamaiurá village, Posto Leonardo Vilas-Boas. 19 Oct 1964. J.-P. Gosse & Léopold III. — IRSNB 880. 1, 86.0 mm SL. Mato Grosso, laguna and inundated forest on right bank of rio Xingu upstream of Posto Diauarum. 15 Nov 1964. J.-P. Gosse & Léopold III. — USNM 235640. 2, 80.6–82.9 mm SL; USNM 329625. 1, 50.8 mm SL. Mato Grosso, small tributary of rio Batovi. Sep 1964. H. Schultz.

Non-types: NRM 60938–60939, 2, 65.8–76.1 mm SL. Aquarium specimens. E. Åhlander, 23 Jul 2010.

Diagnosis. Distinguished from other species of *Krobia* by slightly deeper caudal peduncle (17.6–19.6% SL, vs. 15.6–17.4 % in *K. itanyi*), dark lateral band reaching to end of dorsal-fin base (vs. ending well before in *K. itanyi*) (Figs. 1–2), two prominent dark interorbital stripes (vs. faint or obsolete in *K. itanyi*, absent in *K. guianensis*) (Fig. 3), slightly curved suborbital stripe (vs. straight); presence of dark brown spot anterolaterally on each side of the lower jaw (vs. absence).

Description. General aspect and colour pattern is illustrated in Figs. 1–3. Measurement data are summarised in Table 3. Sexes are very similar, with slightly shorter soft dorsal and soft anal fins, and pelvic fin in females.

TABLE 3. Standard length (in millimeters) and proportional measurements in percents of standard length of *Krobia xinguensis*. SD, standard deviation. Holotype (INPA 35653) data given separately (HT), as well as included in pooled data. Regression line parameters, a (intercept), b (slope), and r (Pearson's correlation coefficient) are calculated from measurements expressed in millimeters.

	n	HT	Min	Max	Mean	SD	a	b	r
Standard length (mm)	22	74.4	38.6	84.6	59.2	14.2			
Head length	22	24.7	33.2	36.8	34.6	1.0	1.349	0.322	0.996
Snout length	22	5.3	6.3	9.2	7.6	0.7	-1.055	0.095	0.972
Body depth	22	37.1	45.2	53.3	48.6	2.4	-4.992	0.575	0.994
Orbit diameter	22	10.1	12.6	16.0	14.1	1.0	2.115	0.103	0.979
Head width	22	15.7	18.5	21.7	20.2	0.8	-1.024	0.220	0.991
Interorbital width	22	9.9	9.7	14.1	11.8	1.3	-2.444	0.162	0.970
Preorbital depth	22	5.0	4.2	7.6	6.0	1.1	-2.376	0.102	0.980
Caudal peduncle depth	22	14.1	17.6	19.6	18.9	0.6	-0.772	0.203	0.995
Caudal peduncle length	22	7.6	9.1	11.7	10.4	0.8	0.236	0.100	0.952
Pectoral-fin length	22	27.9	32.4	40.3	36.1	2.2	-3.188	0.417	0.980
Pelvic-fin length	22	29.3	29.3	44.4	35.7	3.5	-6.902	0.479	0.975
Last dorsal-fin spine length	22	14.4	16.5	21.6	18.9	1.2	-2.243	0.229	0.982

Body deep and high, ovoid in profile. Head and snout short. Head and anterior half of trunk broad; trunk above anal-fin base and caudal peduncle strongly compressed. Predorsal contour steep, curved above orbits; spinous dorsal-fin base straight or slightly curved, soft dorsal-fin base strongly recurved. Predorsal contour commonly slightly steeper than prepelvic contour which may be straight or slightly curved. Orbit large, diameter greater than snout length, greater part in anterior half of head and slightly removed from interorbital contour. Mouth small; jaws isognathous; maxilla reaching to or almost to vertical from anterior margin of orbit; lower jaw articulation below middle of orbit. Lips thin, lower lip fold broadly interrupted symphysially. Caudal peduncle notably short and deep, incorporating last half centrum or last halfcentrum and part or all of preceding vertebra.

Jaw teeth similar in upper and lower jaw. Outer row of mostly blunt-tipped unicuspid, subcaniniform, erect, straight or slightly recurved, fixed or slightly movable, slightly increasing in size from posterior to symphyseal; symphyseal teeth about 0.6 mm long in large specimens. Teeth in upper jaw left outer hemiseries 14–21, in lower jaw left outer hemiseries 14–20. Several (2–5, commonly 3) irregular rows of much smaller inner teeth in a band, short, slender, subcaniniform, slightly recumbent, straight or slightly recurved, slightly depressible, of about uniform size, or innermost slightly smaller.

FIGURE 3. Facial view of *Krobia xinguensis*, holotype, INPA 35653, 74.4 mm SL, to the left, to show transverse frontal stripes and, indicated by black arrows, anterolateral blotches on lower jaw close to lower lip; and *Krobia itanyi*, NRM 30357, 83.4 mm SL, to the right, showing considerably fainter transverse frontal stripes and absence of dark blotches on lower jaw.

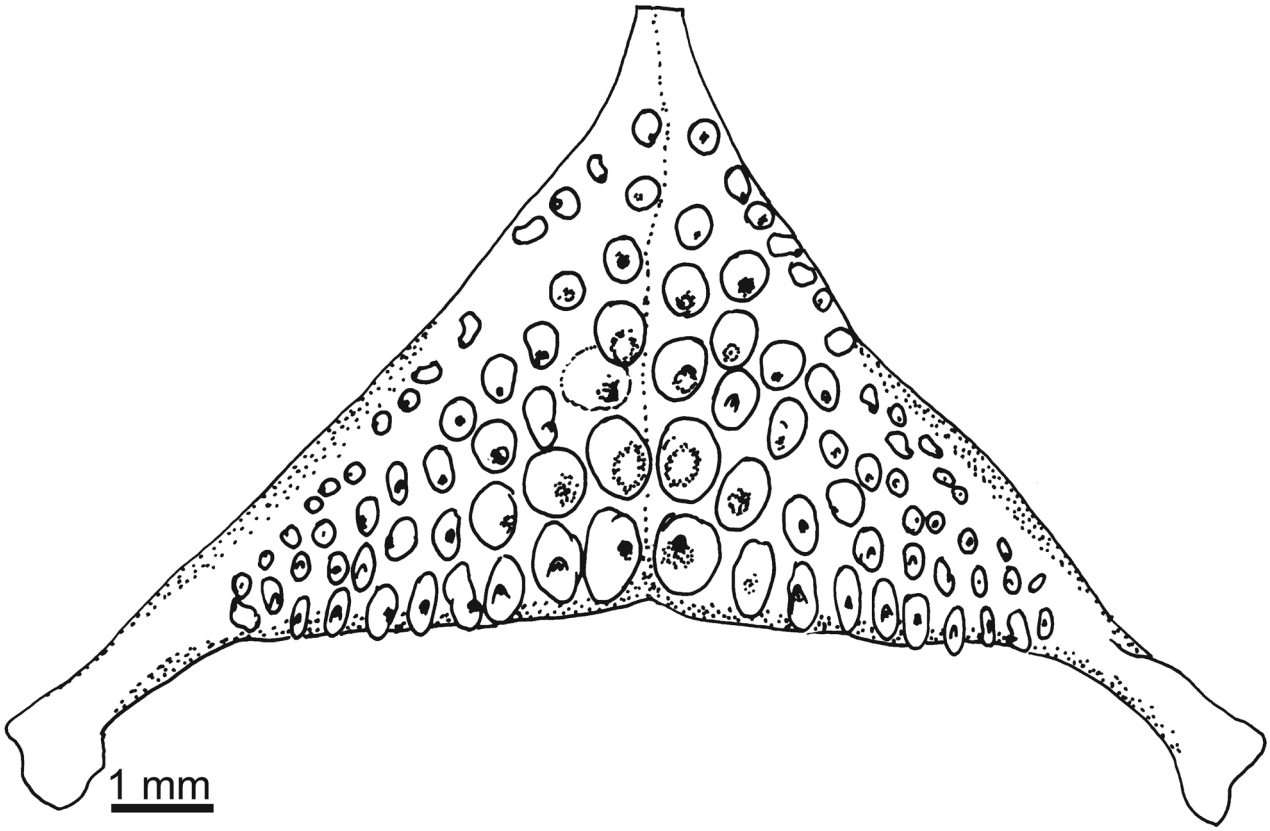

FIGURE 4. *Krobia xinguensis*. Occlusal view of lower pharyngeal toothplate, from NRM 61781, 72.6 mm SL.

Lower pharyngeal tooth plate (Fig. 4) short and wide (length 75% of width of tooth plate). Dentigerous area length 56 % of width of dentigerous area. Teeth in posterior row 19, along midline 6 or 7. Marginal teeth compressed, central and posteromedian teeth coarser; anterior pair with retrorse major cusp, remainder bicuspid with antrorse pointed posterior cusp and lower anterior bulge, except central teeth considerably worn, some with rounded tip. Marginal teeth short, teeth gradually longer caudad and mediad. Gill rakers short, well spaced, exter-

nally on first gill arch one epibranchial, one in angle, and 4 (17), 5 (5), 6 (1) ceratobranchial. Ceratohyal with a distinct lateral furrow for the hyoid artery; anterior ceratohyal posteriorly with a short indentation in the dorsal margin, immediately lateral to a short elevation from the lateral face. Supraneurals 2 (15). Vertebrae 12+13 (14), 13+13 (1).

Scales in E1 row 22 (5), 23 (18). Scales cycloid on cheek and gill cover. Predorsal and prepelvic scales cycloid or with a few marginal cteni. Cheek scales in three rows. Preopercular scales absent. Flank scales with narrow marginal band of cteni. Predorsal scales about as large as flank scales. Prepelvic scales slightly smaller than flank scales. Two horizontal rows of scales passing between pectoral and pelvic fins. Predorsal squamation anteriorly with a scale on each side of coronalis pore, followed by midline row of usually seven scales with slightly convex, truncate, or slightly concave posterior margin. Scales flanking first dorsal-fin spine may overlap anterior to the spine, or a small midline scale may be present immediately anterior to first dorsal-fin spine, commonly concealed by larger predorsal midline scale. Circumpeduncular scale rows 16 (7 above, 7 below lateral lines). Lateral lines separated by two horizontal scale rows. Lateral line scales 14/6 (2), 14/7 (1), 14/8 (2), 15/5 (1), 15/6 (1), 15/7 (1), 15/8 (8), 15/9 (1), 16/7 (5), 16/8 (1). One or two scales continuing lower lateral line on caudal-fin base. One canal-bearing scale present basally on dorsal lobe in three specimens, positioned between rays D2-3 (1) or D3-4 (2); one or two canal-bearing scales present basally on ventral lobe in six specimens, between rays V3–4 (1) or V4–5 (5). Scales between upper lateral line and dorsal-fin base 3 anteriorly, 1 (occasionally 1.5) posteriorly. Usually 4–5 small scales along base of soft dorsal fin. Caudal fin with small scales proximally, covering approximately 1/3 of fin length.

Dorsal-fin rays XIV.8 (1), XIV.9 (14), XIV.10 (7), XIV.11 (1). First dorsal-fin spine short, spines increasing in length to fourth after which subequal in length, last two slightly longer. Soft dorsal fin pointed, fourth and fifth rays longest, reaching to middle or end of caudal fin. Anal-fin rays III.7 (1), III.8 (21). Soft anal fin similar to opposite dorsal fin, but reaching at most to 2/3 of caudal fin. Pectoral-fin rays 12 (6), 13 (16), 14 (1). Pectoral fin pointed, fourth ray longest, reaching to vertical from first or second anal-fin spine. Pelvic fin pointed, first ray longest, reaching to third anal fin spine or at most to base of third soft anal-fin ray. Caudal-fin rays ii.i7+8i.iii (2), iii.i7+7i.iii (12). Caudal fin rounded.

Colour pattern in preservative. Ground colour whitish, pale greyish or pale brownish yellow, depending on preservation. Seven faint vertical bars, as counted from the posteriormost rostrad: (1) Bar 1 across caudal peduncle, (2) Bar 2 between ends of dorsal- and anal-fin bases, (3) Bar 3 between dorsal and anal fins above middle of anal-fin base, (4) Bars 4+5 between dorsal and anal fins above spinous anal fin, (5) Bar 6 across side above posterior part of abdomen, (6) Bar 7 from dorsum down to middle of side, below dorsal-fin spines 3-4 usually indistinctly delimited, (7) Bar 8 a broad blotch around beginning of dorsal fin and top of head. Dark brown lateral band starting from posterior margin of orbit, forming elongate blotch where crossing Bar 7, and continued usually with constrictions between bars and expansions where crossing bars, ending at end of dorsal-fin base. Bar 6 including a dark brown or blackish blotch, approximately round, about 1½ scale deep and 3 scales long; incorporated in lateral band, but more prominent than rest of band. Dark brown suborbital stripe from lower margin of orbit, slightly curved across cheek, ending ventrally on preopercle. Suborbital stripe may be faded on middle producing dark blotch below orbit and another on preopercle. Dark brown preorbital stripe from anteroventral margin of orbit across tip of snout. Two dark brown bands between opposite side orbits. Lower jaw anterolaterally on each side with dark brown blotch close to lower lip (Fig. 3). Lower sides with indistinct pattern of parallel light and dark horizontal stripes formed by slightly darker overlapping parts of scales and lighter scale centres. Dorsal fin pale brownish, posterior interradial membranes lighter, with several rows of dark spots. Dorsal-fin lappets dark brown with hyaline distal margin. Anal fin pale brownish, posterior interradial membranes lighter, with several rows of dark spots. Caudal fin pale brownish or hyaline, with indistinct pattern of rows of small dark spots dorsally or across all of fin. Over most of base of dorsal lobe of caudal fin a round or vertically oval dark brown blotch, margined by narrow whitish ring. Pelvic fin only slightly pigmented, outer rays brownish.

Live coloration (Fig. 5). Considerable information on live colours of *Krobia xinguensis* is available from images in ornamental fish literature (e.g., Stawikowski, 2007). The major difference from preserved specimens consists in the rich orange to red or orange markings. Upper lip, lachrymal, part of cheek, anterior and posterior margins of opercle, and pectoral axilla red or orange. Bases of most flank scales marked with short red or orange vertical stripe.

FIGURE 5. *Krobia xinguensis*. Adult male in live coloration, NRM 60938, 76.1 mm SL; right side, reversed. Photograph by Erik Åhlander.

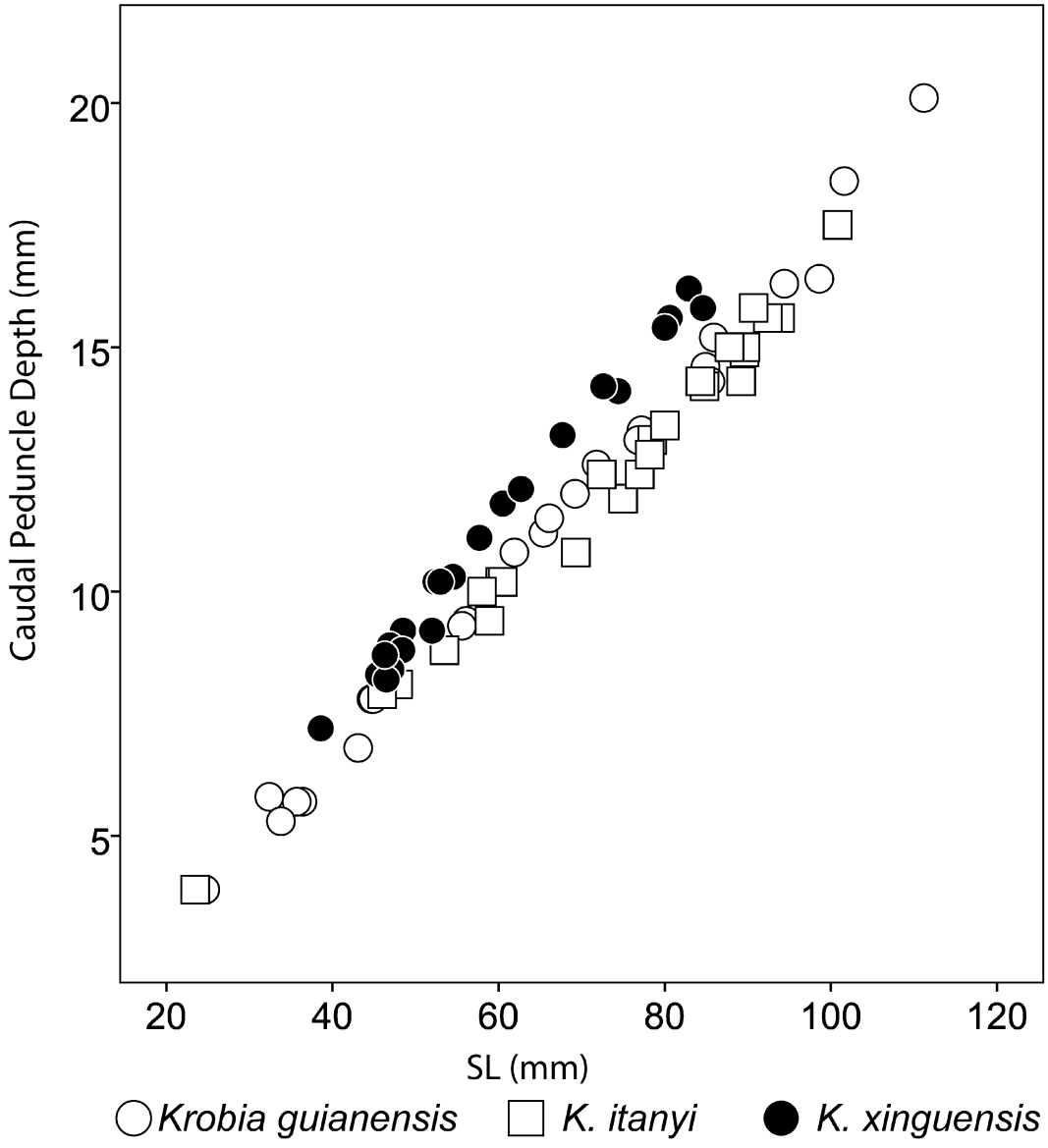

FIGURE 6. Comparative morphometrics of species of *Krobia*. Caudal peduncle depth plotted against Standard Length.

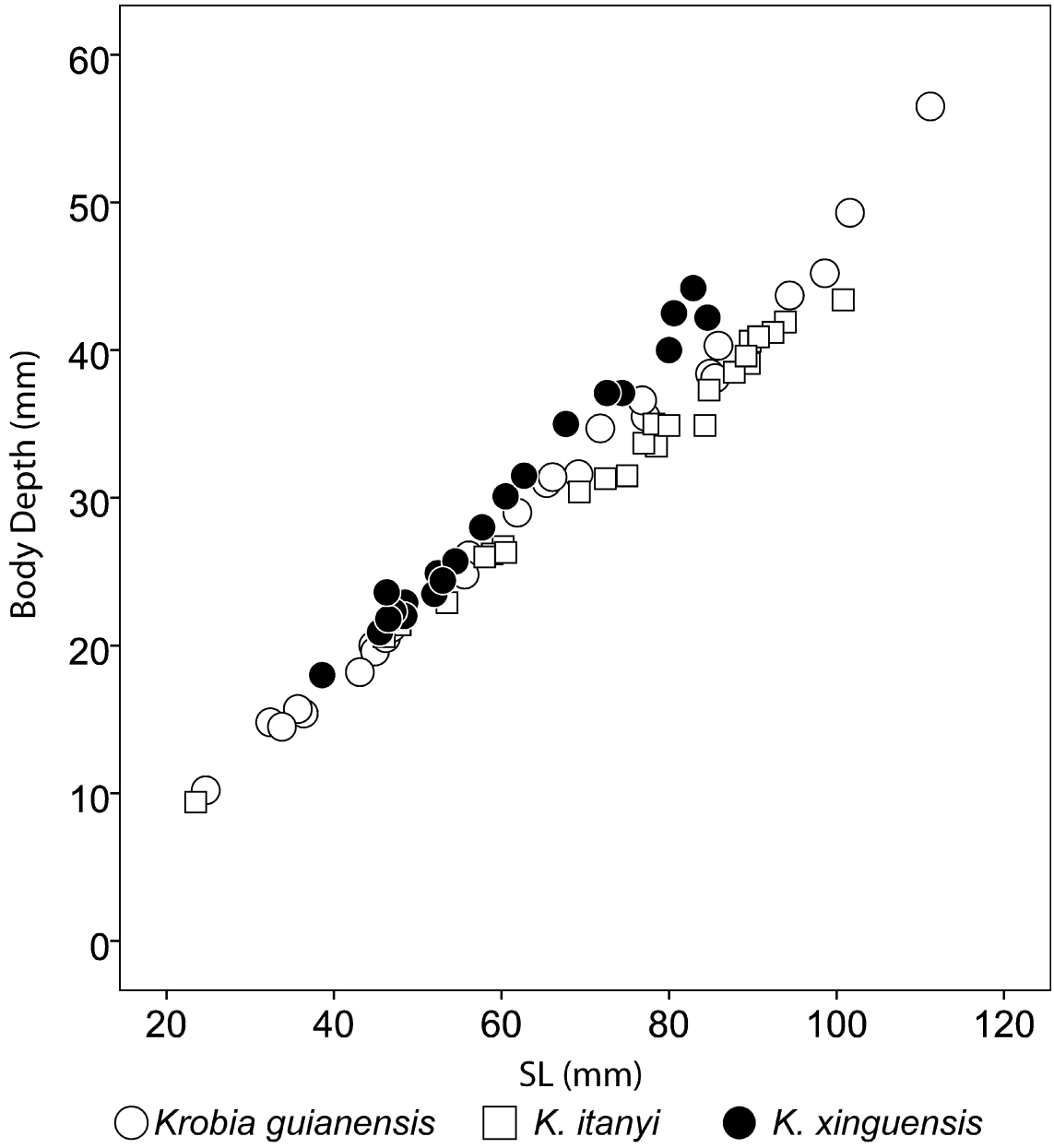

FIGURE 7. Comparative morphometrics of species of *Krobia*. Body depth plotted against Standard Length.

Comparative morphometrics. In a comparison with *Krobia guianensis* and *K. itanyi* (Tables 1–2), *K. xinguensis* is distinguished by proportionally deeper caudal peduncle (Fig. 6), and averaging slightly deeper body (Fig. 7), shorter snout, and shorter caudal peduncle (Tables 1–3). The principal component analysis separates *K. xinguensis* mainly by caudal peduncle distances and body depth (Table 4, Fig. 8).

Distribution. Known only from the Xingu river drainage, with several localities in headwaters in Mato Grosso and the type locality at the Ilha Babaquara, close to Altamira (Fig. 9). No detailed habitat information has been available for the samples included in the type series. Lowe-McConnell (1991) reported *Krobia xinguensis* as "Nov. gen. spec. cf. *Aequidens guianensis"* from the córrego do Gato in the Suiá-Missu drainage, a clear water habitat including a stream, a pool, and a small lake, with abundant vegetation and aquatic invertebrates. It is the type locality of *Crenicichla rosemariae* Kullander (1997). A small rocky stream at São Felix on the middle rio Xingu was figured by Stawikowski (2007) as habitat of *K. xinguensis*.

Etymology. The specific name *xinguensis* is an adjective referring to the river basin inhabited by the species.

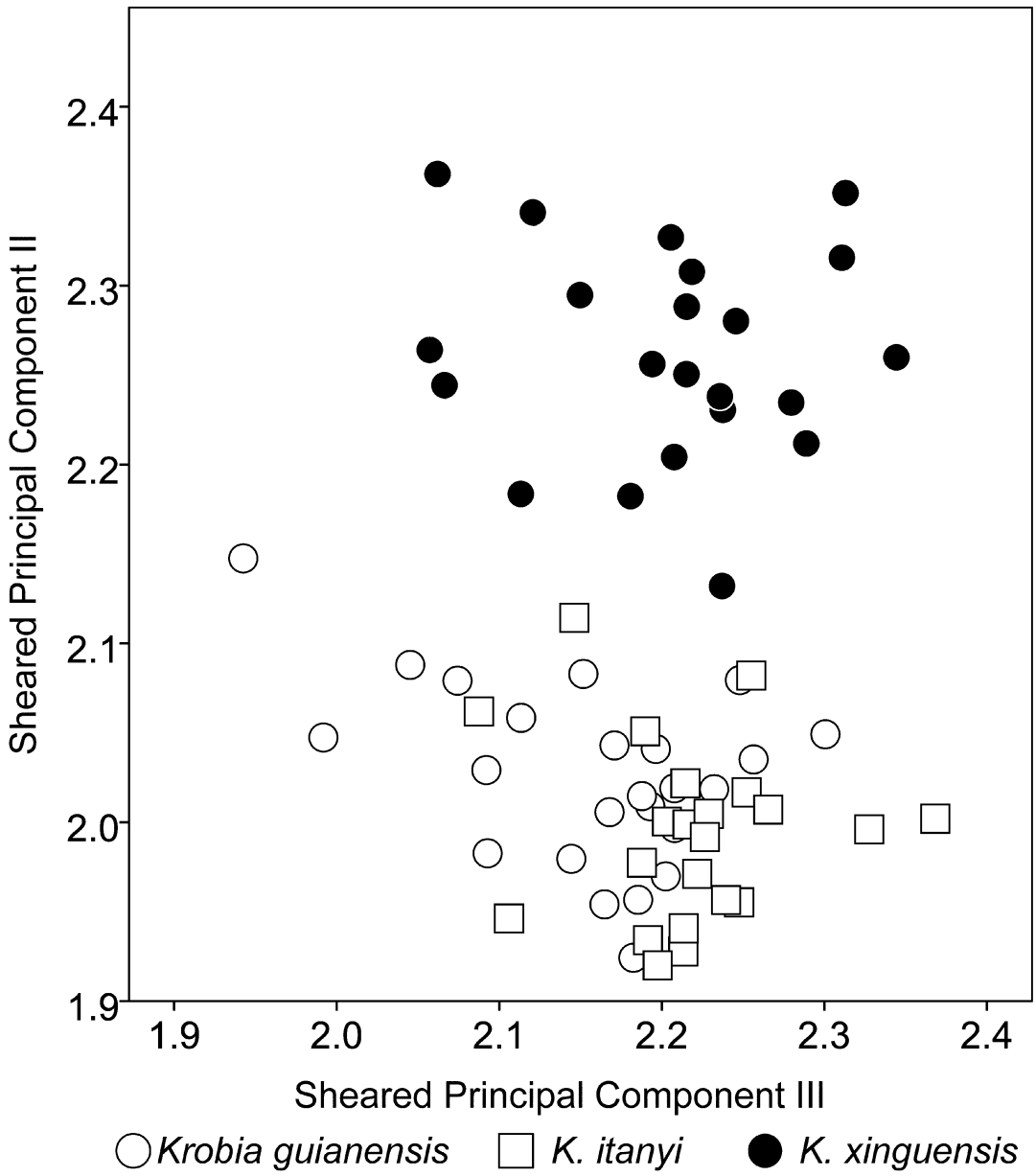

FIGURE 8. Comparative morphometrics of species of *Krobia*. Plot of scores of sheared principal component II against sheared principal component III, based on distance data.

Discussion

Krobia was diagnosed by Kullander & Nijssen (1989) by a set of characters in combination, including uniserial predorsal squamation, narrowly scaled or naked vertical fins, a dark lateral band composed of dark blotches and extending from the head to or toward the end of the base of the dorsal fin, lateral line scales dorsally on caudal fin between rays D3 and D4. The genus is similar to *Bujurquina* Kullander, *Tahuantinsuyoa* Kullander, and *Andinoacara* Musilová, Říčan & Novák in having ledges forming a furrow for the hyoid artery dorsally on the ceratohyal, and also shares with these genera the unusual colour pattern with a dorsad slanting lateral band. The hyoid furrow is comparatively shallow in *Krobia*, inclusive of *K. xinguensis* in which it agrees with the morphology in *K. guianensis* illustrated by Kullander & Nijssen (1989: fig. 89). Kullander & Nijssen (1989) also listed the absence of blue iridescent stripes on the sides of the head as a character of *Krobia*, but such stripes were later illustrated in a species of *Krobia* by Stawikowski & Werner (1998: 180). In Kullander's (1998) morphological phylogenetic analysis of

South American Cichlidae *Andinoacara*, *Bujurquina*, *Krobia*, and *Tahuantinsuyoa* come out as a monophyletic group. Species of *Krobia* are readily distinguished from the other genera in that group by the possession of a dark blotch positioned dorsally on the base of the caudal fin. In the molecular analyses of Musilová *et al.* (2008, 2009) and López-Fernández (2010), *Krobia* is rather basal to a clade composed of *Cichlasoma* Swainson and the catch-all genus *Aequidens.*

TABLE 4. Variable loadings on principal components 1–3 and sheared components 2–3 from pooled morphological dataset of *Krobia guianensis* (N=24), *K. itanyi* (N=22), and *K. xinguensis* (N= 22). Highest loadings in bold.

	PC I	PC II	Sheared PC II	PC III	Sheared PC III
SL	0.262	0.041	0.035	-0.002	-0.001
Head length	0.245	0.025	0.021	0.045	0.046
Snout length	0.336	-0.243	-0.249	**-0.516**	**-0.515**
Body depth	0.273	0.423	0.417	-0.129	-0.128
Orbital diameter	0.194	0.161	0.157	**0.436**	**0.436**
Head width	0.266	0.160	0.155	0.267	0.267
Interorbital width	0.333	0.045	0.039	0.293	0.294
Preorbital depth	0.409	-0.308	-0.315	-0.387	-0.385
Caudal-peduncle depth	0.262	**0.461**	**0.455**	-0.054	-0.053
Caudal-peduncle length	0.270	**-0.596**	**-0.601**	0.452	0.453
Pectoral-fin length	0.285	-0.090	-0.096	0.067	0.068
Last dorsal-fin spine length	0.273	0.191	0.186	-0.085	-0.084
Eigenvalue	1.4838	0.0164	N/A	0.0064	N/A
Cumulative variance %	97.6	98.7	N/A	99.1	N/A

Krobia xinguensis conforms to *Krobia* as diagnosed by Kullander & Nijssen (1989) by the shape of the ceratohyal bone, the uniserial predorsal squamation, the presence of a few scales on the base of the soft dorsal fin, the slanting lateral band, and the distinct ocellus on the caudal-fin base. It agrees with other *Krobia* in meristics as summarized by Kullander & Nijssen (1989: 148). It is readily distinguished from all other species of *Krobia*, described and undescribed, by details of the colour pattern, the more rounded body, and, particularly, the short and deep caudal peduncle. *Krobia xinguensis* is marginally more deep-bodied that *K. guianensis*, but distinctly deeper than *K. itanyi* at larger sizes (Fig. 7).

In the molecular and morphological phylophenetic analyses of cichlasomatin cichlids of Musilová *et al.* (2008, 2009) *K. xinguensis* (as *Krobia* sp. Xingu) appears in various positions in a clade that also includes *Aequidens potaroensis* Eigenmann, *K. cf. guianensis*, and *Krobia* sp. from the Oyapock river drainage. Musilová *et al.* (2008, 2009) consequently referred *A. potaroensis* and *A. paloemeuensis* Kullander & Nijssen to *Krobia*. In López-Fernández *et al.* (2010) molecular phylogenetic analysis *K. xinguensis* (as *Krobia* sp. Xingu orange spot) came out as sister taxon to *A. potaroensis*, but no species of *Krobia* sensu stricto was included. *Aequidens potaroensis* and *A. paloemeuensis* are two species from the northern Guiana shield somewhat similar to *Krobia*, in particular in the prominent suborbital stripe in adults. It appears from the supporting material of Musilová *et al*. (2009: Appendix S3) that *K. xinguensis* was not included in their morphological analysis, in which *A. potaroensis* and *A. paloemeuensis* are scored with 49 unknown and one inapplicable out of 96 characters. Kullander & Nijssen (1989: 147) compared the two species with *Krobia*, pointing to the naked vertical fins, reduced number of vertical bars, and lateral band running to the caudal fin as characters shared with *Aequidens*. The predorsal scale pattern is uniserial in *A. paloemeuensis* but in *A. potaroensis* it is triserial as in other species of *Aequidens.* Characters listed as shared with *Krobia* were the lower vertebral count (12+13 vs. usually 13+13 in *Aequidens*); presence of facial stripes; the wide suborbital stripe retained in adults, and E1 scale count 23 (vs. 24 or more in most *Aequidens*). The hyoid furrow for the hyoid artery, present in *Krobia*, but absent in *Aequidens*, is absent in both *A. paloemeuensis* and *A. potaroensis*. Further morphological analyses may provide support for an alternative generic classification of these

two species but inclusion of *A. potaroensis* and *A. paloemeuensis* in the catch-all genus *Aequidens* best reflects current knowledge.

Species of *Krobia* have been reported primarily from the Guianas, including *K. guianensis* in the Essequibo basin, *K. itanyi* in the Maroni basin (Kullander & Nijssen, 1989), and undescribed species from French Guiana (Keith *et al.*, 2000). I have also examined specimens from the rio Jari, a northern tributary of the rio Amazonas and from the rio Araguari which drains into the mouth of the Amazon. Stawikowski & Werner (1998) reported and figured *Krobia* from the rio Paru, also a north bank Amazon tributary.

The presence of a species of *Krobia* in a southern tributary of the Amazon is interesting in the light of a limited number of genera with representatives on the Guiana and Brazilian shields only, but absent from other parts of the Amazon basin as well as the rest of South America. Although *Krobia* has species in all adjacent drainages in the Guianas, the Araguari and the Jari, the southern Amazonian representation in the Xingu is opposite the Jari, and the distribution of this genus is questionably disjunct. It may represent continuous eastern South American drainages from before the reversal of the main Amazon River 11–7 Ma (Wesselingh & Hoorn, 2011). Among cichlids, a similar, but mirrored distribution is observed in *Retroculus* with several species in southern Amazon tributaries, and only one species in the Araguari and Oyapock rivers in the southern Guianas.

FIGURE 9. Collecting sites of *Krobia xinguensis*.

Krobia xinguensis is available from the ornamental fish trade, where it is handled as *Krobia* "Red cheek" or similar expressions, emphasizing the red markings on the head and anterior side in living specimens (pers. obs.; NRM 60938–60939).

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