

Three new species of *Curimatopsis* (Characiformes: Curimatidae) from the Amazon basin

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Three new species of *Curimatopsis* are described from major tributaries of the Amazon basin. *Curimatopsis guaporensis* n. sp., from the Rio Madeira, belongs to the *Curimatopsis evelynae* clade and can be distinguished by the distinctive shape of the dark blotch on the caudal peduncle and by the position and shape of the nostrils. *Curimatopsis pallida* n. sp., from the Rio Negro, also related to *C. evelynae*, is distinguished from all congeners by the complete absence of pigmentation on the lateral surface of the caudal peduncle. *Curimatopsis jaci* n. sp., apparently endemic to the upper Rio Tapajós, belongs to the *Curimatopsis macrolepis* clade and differs from all congeners in details of body pigmentation. Meristic and morphometric features supplement diagnoses for the three new species. These species are hypothesized to belong to the two main clades of *Curimatopsis* on the basis of previous studies of osteology and external morphology and supplement a recent genetic study that revealed several cryptic and yet undescribed species within the genus. An updated identification key to the species of *Curimatopsis* is also provided.

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Key words: biodiversity; *Curimatopsis*; fresh water; Neotropics; South America; taxonomy.

INTRODUCTION

The Curimatidae is the fourth most speciose family among the Characiformes, following Characidae, Anostomidae and Alestidae, respectively (Eschmeyer & Fong, 2016). The family contains 109 valid species allocated in eight extant genera, largely within *Cyphocharax* Fowler 1906 and *Steindachnerina* Fowler 1906 (Vari, 2003; Eschmeyer *et al.*, 2016), being broadly distributed across southern Central America and most South American freshwater ecosystems on both sides of the Andes (Vari, 1989, 2003). Extensive taxonomic revisions anchored by morphological phylogenies based primarily on soft anatomy and osteology were conducted on each of the eight curimatid genera from 1982 to 1992 (see Vari, 2003 for summary). Even so, more recently several species, mainly of *Cyphocharax* and *Steindachnerina*, are still being described (Vari & Blackledge, 1996; Pavanelli & Britski, 1999; Vari & Chang, 2006; Lucinda & Vari, 2009; Netto-Ferreira & Vari, 2011; Vari *et al.*, 2012; Wosiacki

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& Miranda, 2013; Melo & Vari, 2014; Dutra *et al.*, 2016; Melo *et al.*, 2016a; Melo, 2017). Furthermore, reanalyses of the material collected throughout the Amazon basin have revealed that species previously thought to present intraspecific variation would, instead, represent undescribed ones (R. Vari, pers. comm.). This situation indubitably occurs in *Curimatopsis* Steindachner 1876 as previously suggested by Melo *et al.* (2016b).

Sister to all other curimatids, *Curimatopsis* is a small genus with only six relatively small-bodied species occurring throughout the Orinoco, Guianas, Amazonas and Paraguay Basins (Vari, 1982a, b). The species are classified in two main monophyletic groups (Vari, 1982a, 1989): the *Curimatopsis macrolepis* (Steindachner 1876) clade, being supported by three synapomorphies (Vari, 1989) and including *C. macrolepis*, *Curimatopsis microlepis* Eigenmann & Eigenmann 1889 and *Curimatopsis maculosa* Melo, Vari & Oliveira 2016. That clade is sister to the *Curimatopsis evelynae* Géry 1964 clade, including *C. evelynae*, *Curimatopsis cryptica* Vari 1982 and *Curimatopsis myersi* Vari 1982, being supported by five synapomorphies (Vari, 1989).

A recent study combining both molecular and morphological data (Melo *et al.*, 2016b) recognized three new, Amazonian species: one from the Rio Tapajós, recently described as *Curimatopsis maculosa* Melo, Vari & Oliveira 2016 (Melo *et al.*, 2016a), one from the Rio Madeira, which was hypothesized to be closer to *Curimatopsis myersi* Vari 1982 from the Rio Paraguay and another slender species from the Rio Negro, closer to *C. evelynae*. Remaining lineages were discussed as members of Amazonian cryptic species that were not morphologically distinguishable. Although barcoding papers have increased knowledge of Neotropical fish diversity (Rosso *et al.*, 2012; Pereira *et al.*, 2013; Castro Paz *et al.*, 2014), it is noteworthy that such studies generally propose the recognition of new taxa but fail to formally describe them (Carstens *et al.*, 2013). To address this concern, this paper provides formal descriptions for two species of *Curimatopsis* previously highlighted by Melo *et al.* (2016b) originating from the Rio Madeira and the Rio Negro, plus another new species apparently endemic to the upper Rio Tapajós discovered during the present study.

MATERIALS AND METHODS

Counts and measurements follow Vari (1982a, b) and Melo *et al.* (2016a). All measurements are linear distances taken point-to-point using digital callipers. In the description, the number of examined specimens with a particular count is indicated in parentheses and the values for the holotype are indicated by an asterisk (*). Vertebrae were counted in radiographed specimens with supplementary information derived from cleared and stained specimens (Taylor & van Dyke, 1985). Radiographs (rd) were obtained through X-ray equipment Faxitron LX60 DC12 at the Laboratório de Ictiologia de Ribeirão Preto, Universidade de São Paulo (LIRP-USP), Ribeirão Preto, Brazil. The fused first pre-ural and ural (PU1 + U1) is considered a single bone and the vertebrae associated with the Weberian apparatus are counted as four elements. Abbreviations in the text are head length (L_H) and standard length (L_S). Vouchers with incomplete geographic information received approximated coordinates from Google Maps (www.google.co.uk/maps). Institutional abbreviations follow Sabaj (2016): DZSJRP, Departamento de Zoologia e Botânica, Universidade Estadual Paulista, São José do Rio Preto; INPA, Instituto Nacional de Pesquisas da Amazônia, Manaus; LBP, Laboratório de Biologia e Genética de Peixes, Universidade Estadual Paulista, Botucatu; MZUSP, Museu de Zoologia da Universidade de São Paulo, São Paulo; ZUEC, Museu de Zoologia da Universidade Estadual de Campinas, Campinas.

RESULTS

CURIMATOPSIS GUAPORENSIS SP. NOV.

urn:lsid:zoobank.org:pub:CF451EFA-C8F0-4A8A-A865-2BAF9AACDF33 and
urn:lsid:zoobank.org:act:DEDEFEAB-BAB1-4EBF-B8E7-5BF3745B70D7 (Fig. 1
and Table I)

Curimatopsis sp. Madeira: Melo *et al.* (2016b): 653–655 (genetic lineage of *Curimatopsis*).

Holotype

MZUSP 121189 (24.0 mm L_S), Brazil, Mato Grosso, Vila Bela da Santíssima Trindade, Córrego da Várzea in the road MT-199, Parque Estadual Serra de Ricardo Franco, Rio Guaporé, Rio Madeira, Amazon basin; 14° 50' 18" S; 60° 04' 14" W; F. Langeani & P. P. U. Aquino, 26 March 2014 (Fig. 1).

Paratypes

All from Brazil, Rio Madeira, Amazon basin: DZSJRP 19418, (nine specimens, nine rd, 20.3–25.7 mm L_S), collected with holotype. LBP 22725 (four specimens, four rd, 19.9–24.7 mm L_S), collected with holotype. LBP 11062, (three specimens, tissues 50685–50687, 20.9–24.2 mm L_S), Rondônia, Porto Velho, Distrito de Abunã, Rio Abunã; 9° 39' 36.4" S; 65° 22' 19.7" W; C. Oliveira, M. Alexandrou, G. J. C. Silva & M. Taylor, 23 August 2010. LBP 11040, (two specimens, tissues 50620–50621, 22.8–25.0 mm L_S), Rondônia, Nova Mamoré, Rio Ribeirão; 10° 13' 54.4" S; 65° 16' 58.8" W; C. Oliveira, M. Alexandrou, G. J. C. Silva & M. Taylor, 22 August 2010.

Diagnosis

Curimatopsis guaporensis n. sp. is distinguished from the *C. macrolepis* clade (*C. macrolepis*, *C. maculosa*, *C. microlepis* and *C. jaci* n. sp.) by having the lower jaw as long as upper and not overlapping the upper jaw (v. lower jaw longer and overlapping the anterior portion of the upper jaw). Within the *C. evelynae* clade, *C. guaporensis* differs from *C. evelynae* and *C. pallida* n. sp. by having a pronounced, round dark blotch on the lateral surface of the caudal peduncle (v. dark mark on the caudal peduncle absent in *C. pallida* or, when present, faint horizontally elongate



FIG. 1. *Curimatopsis guaporensis*, holotype, MZUSP 121189, 24.0 mm standard length, Rio Guaporé, tributary of Rio Madeira, Amazon basin.

TABLE I. Morphometric data of *Curimatopsis guaporensis*; range includes holotype and paratypes

	Holotype	<i>n</i>	Range	Mean \pm s.d.
Standard length (L_S , mm)	24.0	19	20.3–25.7	–
Percentage of L_S				
Greatest body depth	32.5	19	30.1–34.5	32.4 \pm 1.1
Snout to dorsal-fin origin	47.9	19	47.7–55.7	51.0 \pm 2.0
Snout to pectoral-fin origin	30.0	19	29.9–35.6	32.1 \pm 1.7
Snout to pelvic-fin origin	54.2	19	54.0–61.9	56.1 \pm 1.9
Snout to anal-fin origin	76.7	19	75.3–83.9	78.2 \pm 2.0
Snout to anus	73.3	19	71.5–79.5	74.1 \pm 2.1
Dorsal-fin origin to hypural joint	52.5	19	50.1–56.1	53.5 \pm 1.5
Caudal-peduncle depth	13.3	19	11.9–16.5	13.9 \pm 1.2
Pectoral-fin length	13.3	19	11.3–21.3	16.3 \pm 2.5
Pelvic-fin length	19.2	19	17.2–25.4	21.4 \pm 2.1
Dorsal-fin length	27.5	19	26.9–34.3	31.2 \pm 2.1
Head length (L_H , mm)	29.2	19	28.9–36.7	31.4 \pm 1.9
Percentages of L_H				
Snout length	22.9	19	21.7–29.8	25.4 \pm 2.3
Orbital diameter	40.0	19	35.4–42.9	39.3 \pm 2.3
Postorbital length	35.7	19	35.7–44.3	40.1 \pm 2.5
Gape width	25.0	19	18.5–25.9	22.2 \pm 2.5
Interorbital width	35.7	19	31.3–39.9	35.6 \pm 2.5

n, number of individuals.

dark mark below the lateral line in *C. evelynae*). It is distinguished from *C. myersi* by having a round, dark blotch on the caudal peduncle not extending anteriorly to the vertical through the adipose-fin insertion (v. very intense dark blotch extending beyond the vertical through the adipose-fin insertion anteriorly) and by the relatively shallower body depth (30.1–34.5% of L_S v. 35–41% of L_S). *Curimatopsis guaporensis* can be distinguished from *C. cryptica* by the posterior nostril being rounded or slightly transversely elongate and separated from the anterior nostril by a distance equal to or greater than the anterior nostril diameter (v. posterior nostril crescent-shaped and separated by a distance less than the anterior nostril diameter).

Description

Morphometric data for *Curimatopsis guaporensis* are presented in Table I. Body moderately elongate, somewhat compressed. Dorsal profile of head slightly concave, particularly anteriorly. Dorsal profile of body slightly convex from tip of supraoccipital spine to end of dorsal-fin base; straight and posteriorly slanted at base of dorsal fin, straight or slightly convex from base of last dorsal-fin ray to adipose-fin origin and then concave to origin of anteriormost dorsal caudal-fin procurent ray. Dorsal surface of body with barely apparent median ridge anterior to dorsal-fin base and transversely rounded posterior to fin base. Ventral profile of head slightly convex to nearly straight from margin of lower lip to isthmus. Ventral profile of body smoothly convex from isthmus to pelvic-fin origin, convex from that point to rear of anal-fin base and then slightly concave to origin of anteriormost ventral caudal-fin procurent ray. Prepelvic

region smoothly flattened transversely, but without distinct longitudinal lateral keels. Postpelvic region of body transversely rounded.

Head profile somewhat pointed anteriorly in lateral view. Lower jaw as long as upper and not overlapping the upper jaw, mouth terminal. Nostrils separated by distance equal or greater than anterior nostril diameter. Anterior nostrils circular to ovoid, posterior nostrils circular or slightly transversely elongate. Adipose eyelid well developed and extending posteriorly onto anterodorsal portion of opercle. Opening in larger individuals vertically-ovoid with eyelid overlapping anterior and posterior borders of pupil.

Lateral line longitudinal series with 27 (1), 28 (13), or 29* (4) scales from supraclithrum to hypural joint. Lateral line with three (3), four* (2), five (12), or six (2) pored scales; poring limited to anteriormost portion of series. Basal portions of caudal fin posterior to hypural joint one (1) or two* (17) scales. Longitudinal series of scales from dorsal-fin origin to pelvic-fin origin nine (1), 10* (6), or 11 (11) scales. Circumpeduncular scales 14 (1), 15 (3), or 16* (15).

Pectoral-fin rays ii, 10 (1), ii, 11 (2), i, 12* (1), ii, 12 (5), i, 13 (1) or ii, 13 (9). Pelvic-fin rays ii, 8 (6) or ii, 9* (13). Pectoral- and pelvic-fin profiles pointed. Tip of adpressed pelvic fin reaching anus and base of anteriormost anal-fin rays. Dorsal-fin rays ii, nine* (19) with first unbranched ray short. Dorsal fin pointed with distal margin straight and first and second branched rays longest, approximately twice length of ultimate ray. Anal-fin rays iii, seven* (13) or iii, eight (2), with first ray very short. Anal fin emarginate, anteriormost branched rays twice the length of ultimate ray. Tip of adpressed anal fin falling two or three scales short of point of origin of ventralmost procurent caudal-fin ray. Adipose fin well developed. Caudal fin forked with tips of lobes somewhat pointed. Total vertebrae 28 (5) or 29 (8); holotype not radiographed.

Colour in alcohol

Overall colour of specimens fixed in alcohol light brown; those fixed in formalin yellowish-tan, darker dorsally. Overall colour of larger specimens retaining guanine on scales silvery or silvery golden. Dusky surface colour darker on dorsal portion of head; head dusky dorsolaterally and light coloured ventrally. Dark chromatophores on postorbital region of head, upper lip, antorbital region and lateral surface of maxilla. Dorsal portions of head and body darkly pigmented. Ground colour of body more yellow ventrally. Faint dusky, posteriorly wider, midlateral stripe along body formed by dark chromatophores. Deep-lying dark band running from vertical through dorsal-fin origin to anterior margin of the dark blotch on the caudal peduncle. Dark, round spot covering posterior midlateral scales and borders of adjoining scale of longitudinal series and anteriormost portions of middle caudal-fin rays; dark blotch centred on caudal peduncle with dorsal and ventral portions of caudal peduncle covered by minuscule chromatophores. Middorsal region of body darker than adjoining areas with series of small, dark chromatophores ranging from tip of supraoccipital spine to adipose-fin origin. Portion of body dorsal to horizontal through pectoral-fin base with scattered dark chromatophores covering central and border portions of exposed region of scales; chromatophores more concentrated on anterior scales of that region; chromatophores forming a faint reticulate pattern along lateral surface of body. Body scales ventral to horizontal through pectoral-fin base and across abdomen lacking dark pigmentation. Dorsal and caudal fins somewhat dusky, with ray margins outlined by small, dark chromatophores. Dark pigmentation most pronounced distally on dorsal fin and caudal-fin

lobes. Anal, pectoral and pelvic fins hyaline overall, but with rays outlined by small, dark chromatophores. Adipose fin speckled with small, dark chromatophores (Fig. 1).

Sexual dimorphism

Male specimens of *Curimatopsis* usually demonstrate pronounced sexual dimorphism in the shape of the caudal peduncle and caudal-fin skeleton (Vari, 1982a). They are, however, relatively rare in samples (Vari, 1982a; Melo *et al.*, 2016a). This factor and the relatively limited sample size made it impossible to discover whether *C. guaporensis* demonstrates sexual dimorphism that is common among congeners.

Distribution

Curimatopsis guaporensis is known from middle portions of the Rio Guaporé and Rio Madeira, a right bank southern tributary to the Rio Amazonas, Mato Grosso and Rondônia, Brazil (Fig. 2).

Etymology

The specific epithet *guaporensis* is in reference to the Rio Guaporé, a tributary of the Rio Madeira and type locality of the new species.

CURIMATOPSIS PALLIDA SP. NOV.

urn:lsid:zoobank.org:act:47E049F7-4C68-4FBA-8B01-C2FE8BD18161 (Fig. 3 and Table II)

Curimatopsis evelynae. Vari (1982a): 23–26 (in part) (revision of *Curimatopsis*).

Curimatopsis sp. Negro, Melo *et al.* (2016b): 652–655 (genetic lineage of *Curimatopsis*).

Holotype

MZUSP 121192 (36.7 mm L_S), Brazil, Amazonas, Manaus, Igarapé at the right margin c. 20 km from mouth of Rio Cuieiras, Rio Negro; approx. 02° 41' 51.8" S; 60° 23' 57.6" W; Alpha Helix Expedition, 27 January 1977 (Fig. 3).

Paratypes

All from Brazil, Amazonas, Rio Negro basin: MZUSP 95267 (four specimens, 33.1–36.8 mm L_S), collected with holotype. LBP 4428 (one specimen, tissue 24309, 32.2 mm L_S), LBP 21105 (seven specimens, seven rd, tissues 24294–24295, 23.0–24.0 mm L_S), Barcelos, beach at the Rio Negro; 00° 55' 30" S; 62° 51' 51.4" W; C. Oliveira & C. S. Miranda, 20 November 2006. LBP 9164 (11 specimens, one tissue 24358, 22.8–31.0 mm L_S), Barcelos, Rio Negro, Igarapé Zalala; 00° 40' 03.1" S; 62° 58' 23.5" W; C. Oliveira & C. S. Miranda, 21 November 2006. LBP 18287 (17 specimens, tissues 74329–74333, 19.3–27.2 mm L_S), Santa Isabel do Rio Negro, Rio Negro, Igarapé Tibaha; 00° 26' 10" S; 64° 57' 05.8" W; C. Oliveira & M. I. Taylor, 16 August 2013.

Diagnosis

Curimatopsis pallida n. sp. is distinguished from all congeners by lacking a dark blotch of pigmentation over the caudal peduncle (v. the presence of a variably conspicuous dark blotch on the caudal peduncle or, at least, a faint dark blotch below

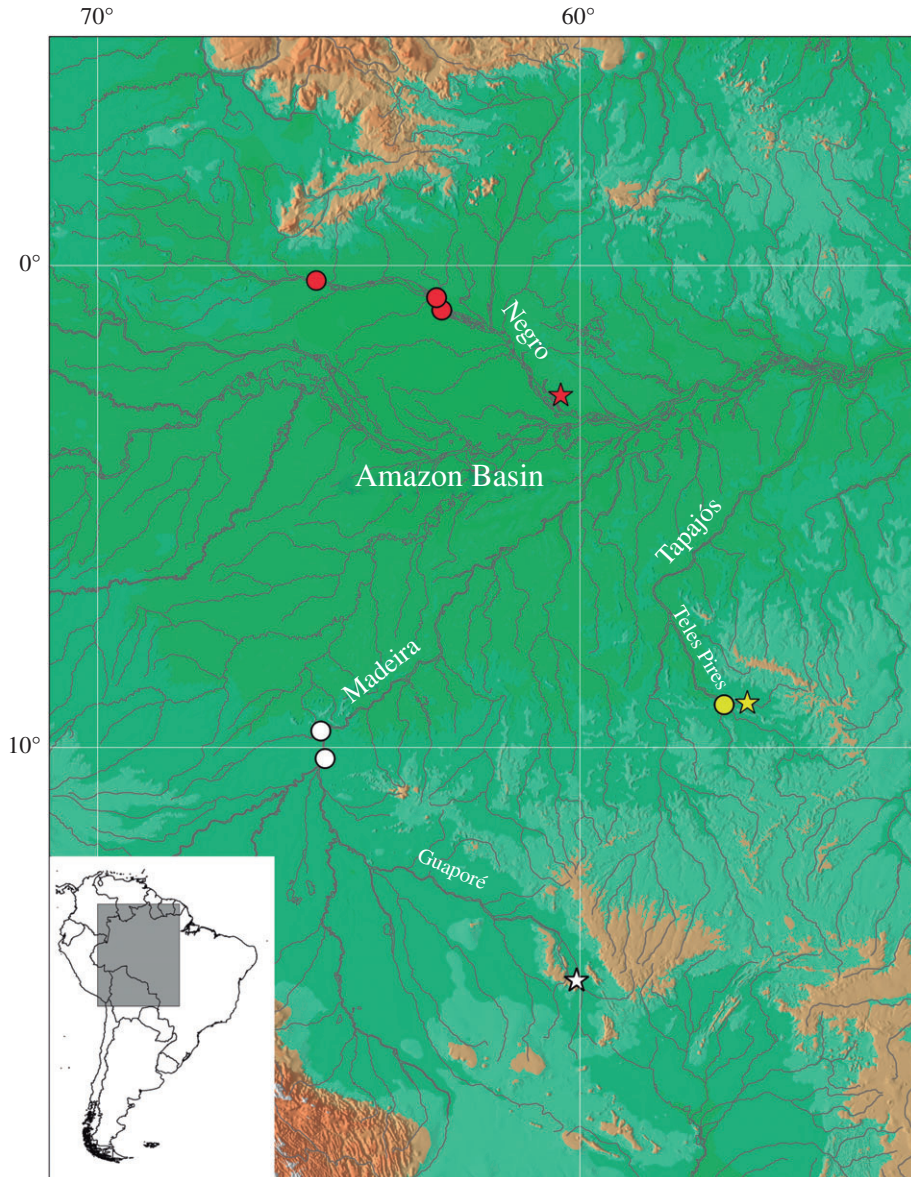


FIG. 2. Central Amazon basin showing collection sites of *Curimatopsis guaporensis* (○), *Curimatopsis pallida* (●) and *Curimatopsis jaci* (●). Stars represent holotype localities.

midline of caudal peduncle). *Curimatopsis pallida* also differs from *C. evelynae* by having a greater orbital diameter (36–43% v. 31–36% of L_H) and lesser interorbital width (30–39% v. 39–43% of L_H). It can be distinguished from *C. cryptica* by the posterior nostril being rounded or slightly transversely elongate (v. posterior nostril crescent-shaped) and the distance between the anterior and posterior nostrils equal to or greater than the anterior nostril diameter (v. distance between the nostrils less than



FIG. 3. *Curimatopsis pallida* (a) MZUSP 121192, holotype, female, 36.7 mm standard length (L_S) Igarapé at the right margin of Rio Cuieiras, tributary of Rio Negro basin and (b) MZUSP 95267, paratype, male, 33.1 mm L_S , same data as holotype.

the anterior nostril diameter). *Curimatopsis pallida* further differs from *C. myersi* by having a shallower body depth (25–31% v. 35–41% of L_S). *Curimatopsis pallida* further differs from the *C. macrolepis* clade (*C. macrolepis*, *C. maculosa*, *C. microlepis* and *C. jaci* n. sp.) by having the lower jaw shorter and not overlapping the upper jaw (v. lower jaw longer and overlapping the anterior portion of the upper jaw).

Description

Morphometric data for *Curimatopsis pallida* are presented in Table II. Body very elongate. Dorsal profile of head straight or slightly convex. Dorsal profile of body slightly convex from tip of supraoccipital spine to end of dorsal-fin base; straight or gently concave from that point to adipose-fin origin and then slightly concave to origin of anteriormost dorsal caudal-fin procurent ray. Ventral profile of body gently curved from tip of lower jaw to pelvic-fin insertion; nearly straight from that point to anus. Ventral region of body anterior to pelvic-fin insertion smoothly flattened but without longitudinal lateral keels. Ventral portion posterior to pelvic-fin insertion transversely rounded. Ventral profile concave from anal-fin origin to rear of caudal peduncle.

Head profile anteriorly pointed overall from lateral view. Mouth terminal. Lower jaw shorter than upper and not overlapping tip of upper lip. Nostrils separated by distance equal or greater than anterior nostril diameter. Anterior and posterior nostrils circular to ovoid. Adipose eyelid well developed and extending posteriorly onto anterodorsal portion of opercle. Smaller specimens with central aperture in adipose eyelid round and approximately corresponding to limits of pupil. Opening in larger individuals vertically-ovoid with eyelid overlapping anterior and posterior borders of pupil.

TABLE II. Morphometric data of *Curimatopsis pallida*; range includes holotype and paratypes

	Holotype	<i>n</i>	Range	Mean \pm s.d.
Standard length (L_S , mm)	36.7	25	22.8–36.8	–
Percentages of L_S				
Greatest body depth	29.7	25	25.2–31.2	28.7 \pm 1.6
Snout to dorsal-fin origin	50.7	25	48.3–53.5	50.7 \pm 1.4
Snout to pectoral-fin origin	30.2	25	28.8–35.2	30.9 \pm 1.5
Snout to pelvic-fin origin	56.4	25	54.1–59.3	57.1 \pm 1.5
Snout to anal-fin origin	81.5	25	77.6–83.9	80.6 \pm 1.3
Snout to anus	76.8	25	73.1–80.5	76.2 \pm 1.7
Dorsal-fin origin to hypural joint	54.5	25	50.8–55.9	53.9 \pm 1.5
Caudal-peduncle depth	13.1	25	12.0–16.0	13.2 \pm 0.8
Pectoral-fin length	18.5	25	13.9–19.3	17.0 \pm 1.5
Pelvic-fin length	20.0	25	17.9–21.8	20.0 \pm 0.9
Dorsal-fin length	28.9	25	24.8–30.7	28.0 \pm 1.7
Head length (L_H , mm)	28.3	25	27.2–32.6	30.2 \pm 1.7
Percentages of L_H				
Snout length	26.9	25	22.0–29.3	25.6 \pm 1.8
Orbital diameter	36.5	25	35.6–42.6	38.7 \pm 1.7
Postorbital length	39.4	25	35.2–41.8	38.2 \pm 1.8
Gape width	26.9	25	20.5–29.8	24.1 \pm 2.3
Interorbital width	37.5	25	30.0–38.7	34.0 \pm 2.6

n, number of individuals.

Lateral line longitudinal series with 27 (4), 28* (17), or 29 (2) scales from supracleithrum to hypural joint. Lateral line with four (1), five (12), or six* (11) pored scales; poring limited to anteriormost portion of series. Basal portions of caudal fin posterior to hypural joint with one (1), two (16), or three* (6) scales. Scales in transverse series from dorsal-fin origin to pelvic-fin origin nine (3) or 10* (22). Circumpeduncular scales 16* (25).

Pectoral-fin rays ii, 12 (7), ii, 13 (6), i, 14* (2), ii, 14 (4), or ii, 15 (6). Pelvic-fin rays ii, eight (7) or ii, nine* (17). Pectoral- and pelvic-fin profiles pointed. Tip of adpressed pelvic fin almost reaching anus. Dorsal-fin rays ii, nine* (25) with first unbranched ray short. Dorsal fin pointed with distal margin straight. Anal-fin rays iii, seven* (25). Anal fin emarginate with first branched ray longest, being about three times length of ultimate ray. Tip of adpressed anal fin falling two or three scales short of point of origin of anteriormost ventral procurrent caudal-fin ray. Adipose fin well developed. Caudal fin forked with tips of lobes somewhat pointed in females. Total vertebrae 28 (1) or 29 (6); holotype not radiographed.

Colour in alcohol

Overall colour of specimens in alcohol pale; those fixed in formalin yellow or orange. Overall colour of larger specimens retaining guanine on scales silvery or silvery golden. Dusky surface colour darker on dorsal portion of head; head dusky dorsolaterally and light coloured ventrally. Dark chromatophores on postorbital region larger than those on snout. Middorsal region of body with series of small, dark chromatophores running from tip of supraoccipital spine to anterior border of adipose fin; chromatophores

darker than adjoining areas. Dorsal portion of body with scattered dark chromatophores covering large portions of exposed region of scales; chromatophores more concentrated on anterior scales of that region. Large specimens with a progressively greater concentration of small chromatophores running along flank from under dorsal fin to midlateral surface of caudal peduncle, but not forming a defined dark mark. Body scales ventral to horizontal through pectoral-fin base and across abdomen lacking dark pigmentation. Dorsal and caudal fins somewhat dusky, with ray margins outlined by small, dark chromatophores. Dark pigmentation most pronounced distally on dorsal fin and caudal-fin lobes. Anal, pectoral and pelvic fins hyaline overall, but with rays outlined by small, dark chromatophores. Adipose fin speckled with small, dark chromatophores (Fig. 3).

Sexual dimorphism

Curimatopsis pallida demonstrates pronounced sexual dimorphism in the shape of the caudal peduncle and caudal-fin skeleton (Fig. 3); caudal fin with lobes more evident in females; middle caudal-fin rays slightly elongate in males, as in *C. evelynae* (Vari, 1982a). Similar to other species (Vari, 1982a), adult male specimens of *C. pallida* present an enlargement of the penultimate principal ray of the caudal-fin lower lobe.

Distribution

Curimatopsis pallida is known from blackwater tributaries to the Rio Negro, throughout the drainage (Fig. 2).

Etymology

From the Latin *pallida*, meaning pale, in allusion to the complete absence of a dark blotch of pigmentation over the caudal peduncle. An adjective.

CURIMATOPSIS JACI SP. NOV.

urn:lsid:zoobank.org:act:D7697834-79 DC-4102-9318-217863B44678 (Fig. 4 and Table III)

Holotype

MZUSP 121197 (28.1 mm L_S), Brazil, Pará, Jacareacanga, Amazon basin, Rio Tapajós, Rio Teles Pires, Rio São Benedito, Rio Cristalino, upriver Thaimaçu lodge; 09° 04' 46" S; 56° 31' 51" W; A. C. Zeinad, 27 February 2008 (Fig. 4).

Paratypes

All from Brazil, Pará, Jacareacanga, Amazon basin, Rio Tapajós, Rio Teles Pires, Rio São Benedito: LBP 22726 (one specimen, female, one rd, 31.2 mm L_S), collected with holotype. MZUSP 118861 (four specimens, four rd, females, 28.3–31.3 mm L_S), collected with holotype. MZUSP 116668 (one specimen, male, 32.8 mm L_S), near mouth of Rio São Benedito; 09° 07' 00" S; 57° 00' 35.7" W; W. M. Ohara, 12 January 2015. ZUEC 14192, (three specimens, one male 35.6 mm L_S , two females 42.3–46.2 mm L_S); 09° 07' 56" S; 56° 58' 13" W; D. M. F. Nunes, F. Normando *et al.*, 14 May 2015.



FIG. 4. *Curimatopsis jaci* (a) MZUSP 121197, holotype, female, 28.1 mm standard length (L_S) Rio Cristalino, tributary of Rio São Benedito, tributary of Rio Teles Pires, Tapajós basin and (b) MZUSP 116668, paratype, male, 32.8 mm L_S , Rio São Benedito, tributary of Rio Teles Pires, Tapajós basin.

Diagnosis

Curimatopsis jaci n. sp. belongs to the *C. macrolepis* clade (*C. macrolepis*, *C. maculosa* and *C. microlepis*) and can be diagnosed from species of the *C. evelynae* clade by having the lower jaw longer than and overlapping anterior portion of upper jaw (v. lower jaw shorter than and not overlapping anterior portion of upper jaw). Within the *C. macrolepis* clade, *C. jaci* can be distinguished from *C. macrolepis* by the presence of a distinctly marked reticulate pattern on the flanks of females (v. body with regular concentration of pigmentation without a distinctive reticulate pattern); it differs from *C. microlepis* by having relatively larger and fewer scales in the longitudinal series from supracleithrum to hypural joint (28–29 v. 57–63), fewer pored scales (4–5 v. 10–12) and a dark, round to ovoid blotch on the lateral surface of the caudal peduncle (v. dark blotch absent); *C. jaci* differs from *C. maculosa* by having a round to vertically ovoid dark blotch overlapping nearly the entire lateral surface of the caudal peduncle (v. a small, posteriorly pointed spot overlapping the posteriormost midlateral scales).

Description

Morphometric data for *Curimatopsis jaci* are presented in Table III. Body moderately elongate. Dorsal profile of head convex from snout tip to dorsal-fin origin, then slightly convex to end of dorsal-fin base. Straight from that point to adipose-fin origin and then slightly concave to origin of anteriormost dorsal caudal-fin procurrent ray. Ventral profile of head slightly convex to nearly straight from margin of lower jaw to isthmus. Ventral profile of body slightly convex from isthmus to pelvic-fin origin, convex from

TABLE III. Morphometric data of *Curimatopsis jaci*; range includes holotype and all paratypes

	Holotype	<i>n</i>	Range	Mean \pm s.d.
Standard length (L_S , mm)	28.1	10	28.1–46.2	–
Percentages of L_S				
Greatest body depth	36.7	10	30.3–37.4	34.4 \pm 2.7
Snout to dorsal-fin origin	55.9	10	50.0–56.5	53.5 \pm 2.0
Snout to pectoral-fin origin	36.7	10	30.3–37.5	35.2 \pm 2.0
Snout to pelvic-fin origin	60.5	10	56.5–62.5	59.3 \pm 1.8
Snout to anal-fin origin	82.6	10	77.6–84.4	81.1 \pm 2.0
Snout to anus	77.6	10	73.7–79.5	76.1 \pm 1.8
Dorsal-fin origin to hypural joint	50.9	10	48.4–55.1	52.5 \pm 1.9
Caudal-peduncle depth	13.9	10	12.1–16.2	14.2 \pm 1.3
Pectoral-fin length	17.8	10	16.2–20.7	17.8 \pm 1.4
Pelvic-fin length	19.6	10	18.0–20.2	19.4 \pm 0.9
Dorsal-fin length	29.2	10	27.2–31.4	29.2 \pm 1.3
Head length	34.9	10	30.7–35.7	34.2 \pm 1.6
Head length (L_H , mm)				
Snout length	28.6	10	25.2–29.5	27.8 \pm 1.6
Orbital diameter	34.7	10	33.6–38.7	36.1 \pm 1.4
Postorbital length	42.9	10	42.2–47.7	44.3 \pm 1.9
Gape width	26.5	10	23.0–29.4	26.1 \pm 2.3
Interorbital width	38.8	10	34.4–41.3	38.0 \pm 1.9

n, number of individuals.

that point to rear of anal-fin base and then concave to origin of anteriormost ventral caudal-fin procurrent ray. Prepelvic region smoothly flattened transversely.

Head profile anteriorly pointed overall in lateral view. Mouth terminal. Lower jaw extending further anteriorly than and overlapping the anterior portion of upper jaw. Nostrils separated by distance equal or greater than anterior nostril diameter. Anterior and posterior nostrils circular to ovoid. Adipose eyelid well developed and extending posteriorly onto anterodorsal portion of opercle. Smaller specimens with central aperture in adipose eyelid round and approximately corresponding to limits of pupil. Opening in larger individuals vertically-ovoid with eyelid overlapping anterior and posterior borders of pupil.

Lateral line longitudinal series with 28* (8) or 29 (2) scales from supracleithrum to hypural joint. Lateral line with four (5) or five* (5) pored scales; poring limited to anteriormost portion of series. Scales on basal portions of caudal fin posterior to hypural joint two (3) or three* (7). Longitudinal series of scales from dorsal-fin origin to pelvic-fin origin 11* (9) or 12 (1). Circumpeduncular scales 16* (10).

Pectoral-fin rays ii, 13 (1), ii, 14 (4) or ii, 15* (5). Pelvic-fin rays i, eight* (1) or ii, eight (9). Pectoral and pelvic-fin profiles pointed. Tip of adpressed pelvic fin reaching anus. Dorsal-fin rays ii, nine* (10) with first unbranched ray short. Dorsal fin pointed with distal margin straight, anteriormost rays more than twice the length of ultimate rays in females, more than once in males. Anal-fin rays iii, seven* (10). Anal fin emarginate with first branched ray longest, being about twice the length of ultimate ray. Tip of adpressed anal fin falling two or three scales short of point of origin of anteriormost ventral caudal-fin procurrent ray. Caudal fin forked with tip of lobes somewhat

pointed in females. Caudal fin scaled only at base. Adipose fin well developed. Total vertebrae 29* (7).

Colour in alcohol

Specimens yellow overall. Dusky surface colour darker on dorsal portion of head with scattered chromatophores on opercle and upper jaw. Dark chromatophores on postorbital region of head slightly larger than those on snout other than in area posterior of orbit overlapped by adipose eyelid. Body darker dorsally with scales outlined by small chromatophores. Pigmentation less pronounced ventral to lateral midline of body. A progressively widening lateral stripe running from supracleithrum to midlateral surface of caudal peduncle; stripe well-marked in males and diffuse in females. Round blotch on rear of caudal peduncle terminating at base of caudal peduncle in females; blotch continuous with stripe on middle caudal-fin rays in males. Dark pigmentation expanding vertically at the posterior portion of caudal peduncle in some females. Body with scattered dark chromatophores covering large portions of exposed region of scales forming a typical reticulate pattern, more so in females. Body scales ventral to horizontal through pectoral-fin base and across abdomen lacking dusky colour in males. Median fins with chromatophores delineating fin rays. Dark pigmentation most pronounced distally on dorsal fin and caudal-fin lobes. Anal, pectoral and pelvic fins hyaline overall, but with rays outlined by small, dark chromatophores. Adipose fin spotted with small, dark chromatophores, distal border more pigmented (Fig. 4).

Sexual dimorphism

Curimatopsis jaci demonstrates sexual dimorphism in the shape of the caudal peduncle and caudal-fin skeleton (Fig. 4); caudal fin with lobes more evident in females; middle caudal-fin rays slightly elongate in the male. Similar to other species of *Curimatopsis* (Vari, 1982a), adult males of *C. jaci* presents an enlargement of the penultimate principal ray of the caudal-fin lower lobe.

Distribution

Curimatopsis jaci is known from the Rio São Benedito and its tributary (Rio Cristalino), Tapajós Basin (Fig. 2).

Etymology

The specific epithet *jaci*, from the Tupi *Yacy*, is in allusion to the lunar goddess Jaci, one of the most adored divinities of nature for indigenous people, including in Amazonia. The name also honours the first author's mother, Maria Jaci Petrini de Melo, who always encouraged him to study fishes. A noun in apposition.

KEY TO THE SPECIES OF *CURIMATOPSIS*

Modified from Vari (1982a, 1992)

1. Lower jaw longer than upper and overlapping anterior portion of upper lip; dorsal profile of head nearly straight to tip of upper jaw 2
 - Lower jaw not longer than upper and not overlapping the anterior portion of the upper lip; dorsal profile of head convex 5

2. 57–63 scales on lateral line longitudinal series from supracleithrum to hypural joint; 12–13 pored lateral-line scales; approximately 25 longitudinal series of scales from dorsal-fin origin to pelvic-fin origin (Amazon basin) *C. microlepis*
 24–30 scales on lateral line longitudinal series from supracleithrum to hypural joint; three to five pored lateral-line scales; nine to 13 longitudinal series of scales from dorsal-fin origin to pelvic-fin origin 3
3. Small, posteriorly pointed dark spot overlapping posteriormost midlateral scales (middle and lower Rio Tapajós) *C. maculosa*
 Large, round to ovoid dark blotch covering nearly the entire lateral surface of the caudal peduncle 4
4. Reticulate pattern of pigmentation over the body in females (Rio Teles Pires, upper Rio Tapajós) *C. jaci*
 Regular concentration of pigmentation over the body without a reticulate pattern (Amazon and Orinoco basins) *C. macrolepis*
5. Posterior nostril crescent-shaped; distance between anterior and posterior nostrils of each side of head less than anterior nostril diameter (Amazon basin and Guianas) *C. cryptica*
 Posterior nostril rounded or slightly transversely elongate; distance between anterior and posterior nostrils of each side of head equal to or greater than anterior nostril diameter .. 6
6. Blotch of dark pigmentation on midlateral surface of caudal peduncle very intense, sometimes extending to anterior of vertical through anterior of insertion of adipose fin, large proportion of blotch located above midlateral line 7
 Blotch of dark pigmentation on midlateral surface of caudal peduncle absent or moderately intense to faint, typically extending anteriorly only about one-half distance from hypural joint to vertical through anterior of insertion of adipose fin and centred below midlateral line 8
7. Blotch of dark pigmentation extending to anterior of vertical through anteriormost adipose fin; relative body depth 35–41% of L_S (Paraguay basin) *C. myersi*
 Blotch of dark pigmentation restricted to midlateral surface of caudal peduncle and not extending anterior to vertical through anterior of insertion of adipose fin; relative body depth 30–34.5% of L_S (Rio Madeira) *C. guaporensis*
8. Presence of a dark blotch on midlateral surface of caudal peduncle moderately intense to faint, centred below midlateral line; orbital diameter 31–36% of L_H ; interorbital width 39–43% of L_H (Amazon and Orinoco basins) *C. evelynae*
 Complete absence of a dark blotch on midlateral surface of caudal peduncle; orbital diameter 36–43% of L_H ; interorbital width 30–39% of L_H (Rio Negro) *C. pallida*

DISCUSSION

The results presented here reveal that both *C. guaporensis* and *C. pallida* belong to the *C. evelynae* clade (*sensu* Vari, 1982a), which agrees with the molecular hypothesis that also suggests *C. guaporensis* is more closely related to *C. myersi* (Melo *et al.*, 2016b).

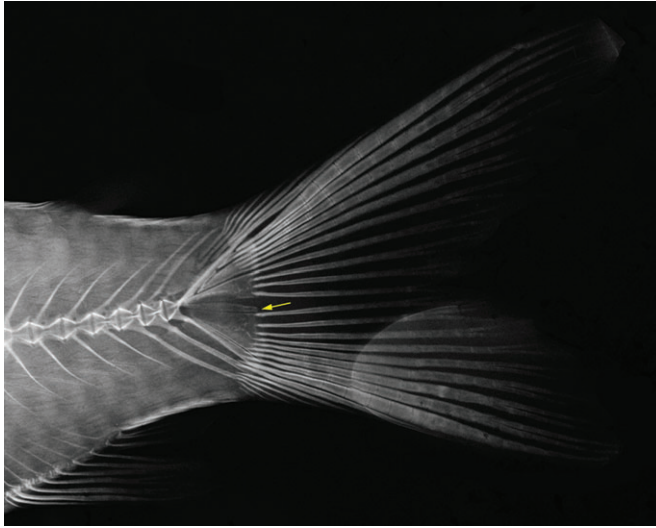


FIG. 5. Caudal skeleton of *Curimatopsis jaci* MZUSP 121197, holotype, showing the separation of the first and second hypurals (◀▶), which confirms the position of the species in the *Curimatopsis macrolepis* clade.

Interestingly, both *C. guaporensis* and *C. myersi* share the presence of a very intense blotch of pigmentation over the caudal peduncle extending anteriorly and occur in the Madeira and Paraguay River basins. Biogeographic studies suggest that similarities in fish composition between the Madeira and Paraguay River basins result primarily from ancient southward migration–dispersion of taxa (Carvalho & Albert, 2011).

As mentioned in its diagnosis, *C. pallida* is unique among congeners by having a colourless caudal peduncle. Nevertheless, the colour might be very faint in members of the sympatric species *C. evelynae* from the Rio Negro. In fact, many specimens of *C. pallida* are commonly encountered within mixed lots of *C. evelynae* and occasionally with *C. cryptica* and *C. macrolepis*. Indeed, Vari (1982a) considered both features (absence and presence of pigmentation concentrated below lateral line) as intraspecific variation within *C. evelynae*. Such morphological understanding was recently supported by a genetic study (Melo *et al.*, 2016b), which showed that the colourless lineage corresponded to an undescribed species, herein described as *C. pallida*.

Curimatopsis jaci is here proposed as a member of the *C. macrolepis* clade. The species shares with members of this clade the expansion of the posterior portion of the head and the upturned mouth with a prolongation of the lower jaw overlapping the upper jaw. In addition, the first and second hypurals of *C. jaci* are not fused into a single element and the third hypural has no contact with the autogenous plate of hypurals 1 + 2 (Fig. 5); these characteristics further corroborate the placement of the new species into the *C. macrolepis* clade. Since only *C. maculosa* (Melo *et al.*, 2016a) has been described since 1982, it is very likely that other new species will be discovered and described within the large geographic range of the genus.

ADDITIONAL SPECIMENS EXAMINED

Curimatopsis cryptica, all from Brazil. MZUSP 15974 (two paratypes, 26.2–29.6 mm L_S), Amazonas, Rio Negro, Igarapé Anapichi; MZUSP 15976 (two paratypes,

34.5–34.6 mm L_S) Pará, Santarém, Rio Tapajós; LBP 15195 (eight specimens, 23.8–28.9 mm L_S) Roraima, Rio Takutu. *Curimatopsis evelynae*, all from Brazil, Amazonas, LBP 4454 (15 specimens, 17.6–30.0 mm L_S) Barcelos, Rio Negro; LBP 14900 (three specimens, 21.3–21.5 mm L_S) Barcelos, Rio Negro. *Curimatopsis macrolepis*, LBP 4087 (25 specimens, 30.0–37.4 mm L_S) Brazil, Acre, Mâncio Lima, Rio Juruá; LBP 4489 (11 specimens, 22.8–46.5 mm L_S) Brazil, Amazonas, Barcelos, Rio Negro; LBP 12064, (three specimens, 24.1–30.9 mm L_S) Brazil, Amazonas, Humaitá, Rio Madeira; LBP 12426, (two specimens, 32.1–33.2 mm L_S) Peru, Maynas, San Juan Bautista, Río Nanay. *Curimatopsis maculosa*, all from Brazil, Pará, Monte Cristo, Rio Tapajós, MZUSP 118659 (holotype, 24.6 mm L_S); MZUSP 25412 (23 specimens, 18.0–26.3 mm L_S). *Curimatopsis microlepis*, INPA 41825 (one specimen, 75.7 mm L_S) Brazil, Amazonas, Tapauá, Rio Purus. *Curimatopsis myersi*, MZUSP 20659 (one paratype, 36.6 mm L_S) Paraguay, Departamento San Pedro, Paraguay basin, río Aguaray-Guazu system San Pedro; LBP 14006 (13 specimens, 19.1–24.4 mm L_S) Brazil, Mato Grosso, Poconé, Rio Paraguay.

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