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**The emerald green tetra: a new restricted-range *Hyphessobrycon*  
(Characiformes: Characidae) from the upper rio Juruena, Chapada  
dos Parecis, Brazil**

Dourados

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**THOMAZ JEFREY SEREN**

**THE EMERALD GREEN TETRA: A NEW RESTRICTED-RANGE *HYPHESSOBRYCON*  
(CHARACIFORMES: CHARACIDAE) FROM THE UPPER RIO JURUENA, CHAPADA DOS  
PARECIS, BRAZIL**

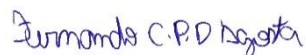
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**The emerald green tetra: a new restricted-range *Hyphessobrycon* (Characiformes: Characidae) from the upper rio Juruena, Chapada dos Parecis, Brazil**

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**Abstract**

A new species of *Hyphessobrycon* is described from the rio Mutum, a tributary of the Rio Juruena, Rio Tapajós basin, Brazil. The new taxon can be distinguished from its congeners by the presence of a well-defined and relatively narrow dark midlateral stripe on body, extending from head to the middle caudal-fin rays, presence of a humeral blotch, distal profile of the anal fin falcate in males, 13-16 branched anal-fin rays (vs. 17-26) and 11 or 12 horizontal scale rows around caudal peduncle. The new species shows polymorphism regarding the presence or absence of an adipose fin, which directly affects decisions on the systematic of characids. Thus, its generic allocation and its putatively phylogenetic relationship discussed.

**Resumo**

Uma espécie nova de *Hyphessobrycon* é descrita do rio Mutum, um afluente do rio Juruena, bacia do rio Tapajós, Brasil. O táxon novo pode ser distinguido de seus congêneres pela presença de uma faixa média-lateral escura bem definida e relativamente estreita no corpo, estendendo-se da cabeça aos raios médios da nadadeira caudal, presença de uma mancha umeral, 13-16 raios da nadadeira anal ramificada (vs. 17-26) e 11-12 séries horizontais de escamas ao redor do pedúnculo caudal. A nova espécie apresenta polimorfismo quanto à presença ou ausência de nadadeira adiposa, o

que afeta diretamente as decisões sobre a sistemática de caracídeos. Assim, sua alocação genérica e possíveis relações filogenéticas são discutidas.

**Keywords:** Adipose fin, Amazon, *Hyphessobrycon melanostichos*, Tapajós, Taxonomy.

## Running Head

The emerald green tetra: a new species of *Hyphessobrycon*

## Introduction

*Hyphessobrycon* Durbin, 1908 is one of the most species-rich genera of the Characidae, currently with more than 160 valid species (Marinho *et al.*, 2016; Carvalho *et al.*, 2017; Pastana *et al.*, 2017; Fricke *et al.*, 2021). It is distributed from southern Mexico to the rio de La Plata in Argentina, but most species occur in the Cis-Andean region, mainly in the Amazon basin, where it is the second most rich genus (Dagosta, de Pinna, 2019). Besides being diverse in the number of species, the group is also plenty in color and in body shape diversity. It ranges from the flame-colored Rosy-tetra group to the elegant *Hyphessobrycon loweae*-group, with elongate fins, or to the contrasting colored, dark banded species of *Hyphessobrycon vilmae*-group or *Hyphessobrycon peruvianus*-group.

A new species was collected during an expedition to the headwaters of the upper rio Juruena, rio Tapajós basin, at Chapada dos Parecis, Brazil. The new species is remarkable in coloration and has been exported by aquarists under the name *Hyphessobrycon melanostichos* Carvalho & Bertaco, 2006. It is popularly known as ‘emerald green tetra’. Additional specimens were recognized in the MZUSP collection and examined. The objective of the present work is to describe the new species and to evaluate its conservation status. Because the new taxon is polymorphic regarding the presence of adipose fin, we also discuss the application of this character in the systematic of characids.

## Materials and Methods

Counts and measurements follow Fink, Weitzman (1974), except for not including eye-dorsal fin origin measurement and for number of horizontal scale rows below lateral line, which are counted to the pelvic-fin insertion, not including the small scale at pelvic-fin insertion, and with the addition of head depth, measured at vertical through

the base of supraoccipital process. Standard length (SL) is given in millimeters (mm) and all other measurements are expressed as percentage of SL or of head length (HL) for subunits of head. In the description, counts are followed by their frequency of occurrence in parentheses, and an asterisk indicates the counts of the holotype. Number of maxillary tooth cusps, small dentary teeth, supraneurals, branchiostegal rays, gill rakers, vertebrae, unbranched anal-fin rays, and procurrent caudal-fin rays were obtained only from cleared and stained (CS) specimens prepared according to Taylor and Van Dyke (1985). Vertebrae of the Weberian apparatus are counted as four elements and the compound caudal centra (PU1+U1) as a single element. *Circuli* and *radii* counts were taken from scale row immediately above the lateral line. The sex of specimens was confirmed by dissection and direct examination of the gonads. Diet was checked in 20 individuals from the type-locality (22.3–35.0 mm SL). In the list of types and comparative material, catalog numbers are followed by the number of specimens in alcohol, their SL range, and if any, the number of CS specimens and their respective SL range. Institutional abbreviations follow Sabaj (2019). Type series was collected under IBAMA License 60634, 2017–2020.

## Results

### *Hyphessobrycon comodoro*, new species

(Figs. 1–2; Tab. 1)

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**Holotype.** MZUSP XXX, 29.55 mm SL. Brazil, Mato Grosso State, Municipality of Comodoro, lagoon at tributary of the rio Mutum, formed due to the construction of a road, tributary of rio Camararé, upper rio Juruena basin, rio Tapajós basin, 13°12'47.6"S 59°54'13.8"W, 567 elev., 19 Oct 2018, F. Dagosta, A. Ferreira & H. Lenza.

**Paratypes.** All from Brazil, Mato Grosso State, Municipality of Comodoro, rio Mutum drainage, upper rio Juruena basin. MZUSP 125215, 3 C&S, 211, 16.82–38.64 mm SL, UFPB 12086, 10, 24.05–31.23 mm SL, INPA 59651, 5, 26.18–31.13 mm SL, collected with holotype. MZUSP 115698, 22, 18.24–33.92 mm SL, rio Mutum at the Fazenda

Mutum, at the bridge of the road between Comodoro and Vilhena, 13°5'9.20"S, 59°53'33.80"W, 502 elev., 29 Aug 2013, O. Oyakawa, F. Dagosta, M. Marinho & P. Camelier. MZUSP 125217, 63, 13.93-32.05 mm SL, lagoon at tributary of the rio Mutum, formed due to the construction of a road, tributary of rio Camararé, upper rio Juruena basin, rio Tapajós basin, 13°13'23.2"S 59°54'41.8"W, 551 elev., 19 Oct 2018, F. Dagosta, A. Ferreira & H. Lenza. MZUSP 125221, 136, 14.33-29.74 mm SL, rio Mutum at the bridge of the road BR-364, 13°05'05.3"S, 59°53'30.7"W, 504 elev., 20 Oct 2018, F. Dagosta, A. Ferreira & H. Lenza.

#### FIGURE 1

**Diagnose.** The new species can be distinguished from all congeners, except *H. cachimbensis* Travassos, 1964, *H. cyanotaenia* Zarske & Géry 2006, *H. fernandezii* Fernández-Yépez, 1972, *H. melanostichos*, *H. nigricinctus* Zarske & Géry, 2004, *H. paucilepis* García-Alzate, Román-Valencia & Taphorn 2008, *H. petricolus* Ohara, Lima & Barros 2017, *H. piranga* Camelier, Dagosta & Marinho 2018, *H. psittacus* Dagosta, Marinho, Camelier & Lima 2016, *H. scholzei* Ahl, 1937, *H. sovichthys* Schultz, 1944, *H. stegemanni* Géry, 1961, *H. taphorni* García-Alzate, Román-Valencia & Ortega 2013, *H. tuyensis* García-Alzate, Román-Valencia & Taphorn 2008, and *H. vilmae* Géry 1966 by the presence of a well-defined and relatively narrow dark midlateral stripe on body, extending from head to the middle caudal-fin rays (vs. well-defined longitudinal stripe absent, or stripe wider than the orbit, or stripe starting approximately vertically through the origin of the dorsal fin or stripe blurred posteriorly). The new species is distinguished from the aforementioned species, except *H. cachimbensis*, *H. cyanotaenia*, *H. melanostichos*, *H. nigricinctus* and *H. petricolus*, by the possession of a humeral blotch (vs. humeral blotch absent). It is distinguished from *H. cachimbensis* and *H. cyanotaenia* by having the distal profile of the anal fin falcate in males (vs. approximately straight or convex) and from *H. cachimbensis*, *H. petricolus* and *H. nigricinctus* by having 13-16 branched anal-fin rays (vs. 17-26). It can be further distinguished from *H. cyanotaenia* by lacking concentration of black pigmentation on longest rays of dorsal, pelvic, and anal fins (vs. pigmentation present). It is readily distinguished from *H. melanostichos*, the most similar congener, by having 11 or 12 horizontal scale rows around caudal peduncle (vs. 14), fewer branched pelvic-fin rays (6 vs. 7), humeral blotch wider than deep, with pigmentation much more intense than the dark midlateral band, with well-defined edges (vs. humeral blotch deeper than wide,



with pigmentation similar to the dark midlateral band, without well-defined edges). Another useful character in distinguishing *Hyphessobrycon comodo* from *H. melanostichos* is the presence of 13-15, rarely 16 (only 3 of 30 specimens), branched anal-fin rays (vs. 16-18).

**Description.** Morphometric data presented in Table 1. Body compressed, moderately elongate. Greatest body depth at dorsal-fin origin. Dorsal profile of head convex from upper lip to vertical through posterior nostril; slightly convex from that point to base of supraoccipital spine. Dorsal profile of body convex along predorsal region, slightly convex along dorsal-fin base, straight from terminus of dorsal-fin base to adipose-fin origin, and slightly concave to straight from that point to origin of anteriormost dorsal procurrent caudal-fin ray. Ventral profile of head and body convex from tip of lower lip to pelvic-fin origin, slightly concave between latter point to anal-fin origin, somewhat straight to convex (see Sexual Dimorphism section) along anal-fin base, and concave from the terminus of anal fin to origin of anteriormost ventral procurrent caudal-fin ray.

TABLE 1

Jaws vertically aligned, mouth terminal. Premaxillary teeth in two distinct rows. Outer row with 2(1), 3(21) or 4(9) tri- to pentacuspoid teeth. Inner row with 5(31) pentacuspoid teeth. Posterior tip of maxilla at vertical through posterior half of second infraorbital. Maxilla with 1(2), 2(28) or 3(1) tri- to pentacuspoid teeth. Dentary with 5(31) larger pentacuspoid teeth followed by series of 5-7 diminutive conical teeth. Central median cusp in all teeth longer than lateral cusps. Branchiostegal rays four(4). Gill-rakers 5(3) or 6(1) in the lower and 9 (3) or 10 (1) in the upper branch.

Cycloid scales, with 5-7 radii from focus to posterior border, and conspicuous *circulii* anteriorly. Lateral line incomplete, with 6(1), 7(1), 8\*(26), 9(2), or 10(1) perforated scales, and 29\*(6), 30(16), or 31(7) total scales on longitudinal series. Longitudinal scale rows between dorsal-fin origin and lateral line 4(1) or 5\*(30). Longitudinal scale rows between lateral line and pelvic-fin origin 3\*(27) or 4(4). Scales along middorsal line between posterior tip of supraoccipital process and dorsal-fin origin 9\*(13), 10(11), or 11(7). Horizontal scale rows around caudal peduncle 11(6) or 12\*(25). Base of anteriormost anal-fin rays covered by series of 3 or 4 scales. Caudal fin not scaled.

Supraneurals 4(4). Dorsal-fin rays ii\*(29), iii(2), 7(1), 8(10), or 9\*(20). Base of last dorsal-fin ray at vertical anterior to anal fin. Pectoral-fin rays i\*(31), 9(16) or 10\*(15). Pelvic-fin rays i\*(31), 6\*(31). Adipose fin frequently present, of variable size, present in 27 specimens, absent in four specimens. Anal fin falcate, with iv(4), 13(3), 14\*(18), 15(7), or 16(3) branched rays. Principal caudal-fin rays i,9,8,i\*(27), i,8,8,i\*(1), i,10,8,i\*(1), i,9,7,i\*(1); caudal fin forked, lobes somewhat pointed, of similar size. Dorsal procurrent caudal-fin rays 10(2) or 11(2); ventral procurrent caudal-fin rays 9(4). Total vertebrae 32 (3) or 33(1): precaudal vertebrae 15(2) or 16(2) and caudal vertebrae 16(2) or 17(2).

**Color in alcohol.** Overall ground coloration of head and body beige (Fig. 1). Some specimens retaining guanine on opercular regions. Dorsal portion of head and dorsal midline of body dark. A reticulated pattern on first three to four horizontal scale rows, formed by concentration of chromatophores on posterior margin of scales. Snout, jaws and 1<sup>st</sup> and 2<sup>nd</sup> infraorbitals with concentration of dark chromatophores, 3<sup>rd</sup> and 4<sup>th</sup> infraorbitals with scattered dark pigmentation and 5<sup>th</sup> and 6<sup>th</sup> infraorbitals densely pigmented with dark chromatophores, continuing with dark midlateral stripe. Roughly inverted teardrop-shaped humeral blotch formed by two layers of pigmentation. Superficial layer darker and conspicuous, overlapping midlateral stripe and encompassing approximately four scales horizontally and one or two vertically. Subjacent layer with scattered pigmentation encompassing approximately three scales vertically and forming a ventral projection to the humeral spot with diffuse borders. Dark midlateral stripe on body, extending from upper half of posterior portion of eye to tip of middle caudal-fin rays. Abdominal region with few scattered chromatophores. Sparse dark chromatophores above anal fin, mainly near anal-fin base. Caudal-peduncle blotch absent. Adipose fin with scattered dark chromatophores. All fins with dark chromatophores scattered along edge of lepidotrichia. Dorsal and anal fins with dark pigmentation on interradial membranes. Some specimens with sparse dark pigmentation on pelvic-fin interradial membranes.

**Color in life.** Middorsal area olive green (Fig. 1C, 2); abdominal region silvery to yellow, with some specimens with orange pigmentation in the ventral portion. Upper portion of eye yellow to red, upper-posterior region dark pigmented. First and second infraorbitals, maxilla, lower jaw, gular area and preopercle with yellow pigmentation

and scattered orange chromatophores. Other infraorbitals mostly silver and with sparse orange chromatophores. Some specimens with lower portion of opercle lacking guanine, exposing red branchial filaments inside branchial chamber. Bright green midlateral stripe above and below the dark midlateral stripe, thicker at region above anal-fin base. All fins vivid orange to red coloration, more intense in caudal and anal fins. Adipose fin pale hyaline to pale yellow.

**Sexual dimorphism.** Males with anal-fin base slightly convex (vs. somewhat straight in females). Dark midlateral stripe in males wider and blurred (vs. midlateral stripe relatively narrow and with more defined edges in females), a type of sexual dichromatism involving the larger concentration of melanophore-based pigments in males (Pastana *et al.*, 2017). Bony hooks on fins not present.

**Distribution.** The new species is so far only known from headwater of the rio Mutum, tributary of the rio Camararé, upper rio Juruena basin at Chapada dos Parecis, Mato Grosso State, Brazil (Fig. 3).

FIGURE 3

**Ecological notes.** Two collection sites of *Hyphessobrycon comodo* are lagoons of tributaries of the rio Mutum formed by the construction of roads (Fig. 4). In these habitats, the water is transparent, with maximum widths ranging 50-60 m and depth 0.3-2 m. The substrate is formed by sand, silt, and organic matter, with the presence of submerged aquatic macrophytes and large amounts of filamentous algae. The only other species collected syntopically was *Hoplerythrinus unitaeniatus* (Spix & Agassiz 1829), probably a predator of the new species. Streams that form the lagoons are small, 2–4 m wide and 0.5–2 m deep, with clear rapid waters and a bottom composed of sand and dead leaves. Local vegetation is composed of secondary forest locally known as “Capoeiras”. The other known locality lies at the rio Mutum itself, some meters downstream to the other two. At that point, the new species occurs syntopically with *Hyphessobrycon hexastichos* Bertaco & Carvalho, 2005 and *Hasemania nambiquara* Bertaco & Malabarba, 2007.

The diet was mainly composed of resources autochthonous (91.6% of the volume of food items), mainly vegetable fragments (57.7%) and aquatic insects (32.7%). The vegetable fragments were composed of aquatic macrophyte structures and aquatic insects (fragments of adults, larvae and pupae of Diptera and larvae of Trichoptera and Odonata).

Individuals analyzed were sampled in a region under anthropogenic pressure, which may influence the diet of fish species. Further, damming streams to road construction changes the taxonomic and functional of fish assemblages and limits the longitudinal dispersion (Brejão *et al.*, 2020). The transformation from lotic to lentic environments, with an increase in the width of the canopy-opening channel, creates pelagic and benthic areas that allow the proliferation of macrophytes and algae (Brejão *et al.*, 2020). Therefore, the biology of *H. comodo* still needs to be investigated in a natural environment.

FIGURE 4

**Etymology.** The name comodo is in reference to the Municipality of Comodoro, Mato Grosso State, where all the specimens were collected. A noun in apposition.

**Conservation status.** *Hyphessobrycon comodo* is endemic to Brazil and is a restricted-range species, a common pattern among endemic characids of the 'Chapada dos Parecis' biogeographic region (Dagosta *et al.*, 2020). Despite such biogeographic region was considered by those authors as one of the Endemic Amazonian Fish Areas (EAFAs), i.e. regions that should be considered as conservation priorities in the basin by presenting imminent threats and a low cover of protected areas, the new species is endemic to one of the most preserved river basins draining the Cerrado biome – the rio Mutum drainage. The new species is known by only three localities, but its EOO (Extent of occurrence) is likely underestimated since only the headwater of the rio Mutum basin was sampled. Most of the rio Mutum basin lies within the Nambikwara indigenous territory, where the new species is likely to occur. The new species has been exported in the aquarium trade and remains abundant in its collection sites, which, as far as we know, are the same as those used by the professional collectors. Therefore, this species is assessed as Least Concern (LC).

## Discussion

The adipose fin is variably developed in *Hyphessobrycon comodo*, with few specimens lacking it (4 out of 27). Among Characiformes, absence of adipose fin is relatively uncommon and occurs in species of different lineages of the order (Mirande, 2018; Mattox *et al.*, 2020). Among more than 6000 living Teleostei bearing adipose fin (Stewart *et al.*, 2014, 2019), Characiformes is the only order in which its developmental

pattern differs. In the Characiformes, the adipose fin develops *de novo*, i.e., the fin appears after the reduction of the median larval finfold, whereas in the other orders, it develops by the retention of the larval finfold between the dorsal and caudal fin (Fuiman, 1983; Bender, Moritz, 2013; Marinho, 2017; Stewart *et al.*, 2014, 2019).

Absence of adipose fin in Characiformes is more frequent among miniature to small-sized species and has long been related to miniaturization (Weitzman, Malabarba, 1999; Bührnheim *et al.*, 2008), although large species may also lack it (Mattox *et al.*, 2020). Its absence in miniature to small species is probable a consequence of truncation in their development during the evolution of small-body size, in which late-forming structures, such as the “*de novo*” formation of the adipose fin, are the first to be lost (Marinho, 2017). Besides, morphological variability of characters formed in late developmental stages is also associated with body-size reduction, resulting in intrapopulational variation of that structure (Hanken, Wake, 1993; Marinho *et al.*, 2021). Intraspecific variation regarding presence/absence of adipose fin has been documented for miniature to small characids, and are herein interpreted as a consequence of developmental truncation. Polymorphisms are not equivalent though. The frequency of the presence of adipose fin varies among species (Fig. 5), evidencing this is a very labile character for some taxa.

#### FIGURE 5

Polymorphism regarding presence of adipose fin directly affect decisions on the systematic of characiforms, especially the family Characidae. This is because its absence or presence is still widely used to diagnose genera and/or species in the family. For example, *Hasemania* Ellis, 1911, was originally defined as “like a *Hyphessobrycon*, but without an adipose” (Ellis, 1911), despite species of both genera present intraespecific variation in this character ( Fig. 5), evidencing the fragility of such definition. Therefore, the use of such labile character in systematics needs to be made with caution. Polymorphism in the presence of adipose fin in *Hyphessobrycon comodoro*, along with the still poorly known interspecific relationships of large polyphyletic genera within Stethaprionidae (see Mirande, 2018) raise questions on the allocation of the new species in *Hyphessobrycon*. The monophyletic nature of the genus has long been disputed (Weitzman, Fink, 1983; Weitzman, Palmer, 1997; Mirande *et al.*, 2010, 2018) and today, *Hyphessobrycon* is largely accepted as polyphyletic. However, some groups are likely monophyletic, such as the Rosy-tetra clade, the group

that encompasses the type-species. The evidence of monophyly of the Rosy tetras has long been proposed, based in the unique coloration pattern shared by its species (Weitzman, Palmer, 1977), and was confirmed in recent cladistic works (e.g. Mirande *et al.*, 2018). Unfortunately, only a restricted sample of *Hyphessobrycon* was included, not representing the actual diversity of the genus. As consequence, the composition and limits of *Hyphessobrycon* remain open to question. Despite generic allocation to be tentative, the new species can be distinguished from all remaining characids by the combination of a well-defined and relatively narrow dark midlateral stripe on body extending from the upper half of the posterior margin of the eye to the middle caudal-fin ray, orange fins, a total of 33-35 scales on the longitudinal series, in which only few of them are perforated.

It is premature to infer a close evolutionary relationship between the new species with other characids, but morphological features indicate it is more closely related to species nowadays allocated in *Hyphessobrycon*. The new species share with *H. cachimbensis*, *H. cyanotaenia*, *H. melanostichos*, *H. nigrincinctus* and *H. petricolus* a similar coloration pattern, consisting of a conspicuous, relatively narrow dark midlateral stripe from head to middle caudal-fin ray and a humeral blotch. These species are endemic from the Brazilian Shield, except *H. nigrincinctus*, occurring in tributaries of the rio Madeira and rio Tapajós basins and *H. cachimbensis*, that is also recorded in the rio Iriri (upper rio Xingu basin). Among these species, *H. comodo* is particularly similar to *H. melanostichos*, sharing other coloration details such as the bright orange caudal fin in life, the dark midlateral stripe starting in the upper half of the posterior margin of the eye, with a green to bluish stripe above it and base of anal fin sexually dimorphic, convex in males. Besides very similar morphologically, *H. comodo* and *H. melanostichos* occur very close to each other in neighboring tributaries of the rio Camararé, Juruena river basin. They also share the fact of having a very restricted known distribution, with *H. melanostichos* so far known only from the rio Doze de Outubro and *H. comodo* from the Rio Mutum. Populations of *H. melanostichos* from shield tributaries of the rio Madeira basin (e.g. rio Cabixi, rio Machado) are probably new closely related species that are being studied (pers. obs. FCPD, MMFM).

The description of an additional new species already known worldwide in the aquarium trade reveals how scarce is the knowledge on the diversity of Neotropical freshwater fishes (Reis *et al.* 2016; Albert *et al.*, 2020). Despite being widely sampled

in the last decade, the Chapada dos Parecis still providing new and endemic taxa which reinforce the status of being a biogeographic region distinct from the rest of the Amazon basin (Dagosta, de Pinna, 2019; Dagosta *et al.*, 2020).

**Comparative material.** Material examined are the same listed in Dagosta *et al.* (2016), with the addition of *Hasemania nana*: Brazil, Minas Gerais, Lagoa Santa. MZUSP 38040, 173, 15.6-23.6 mm SL, Minas Gerais, rio São Francisco basin.

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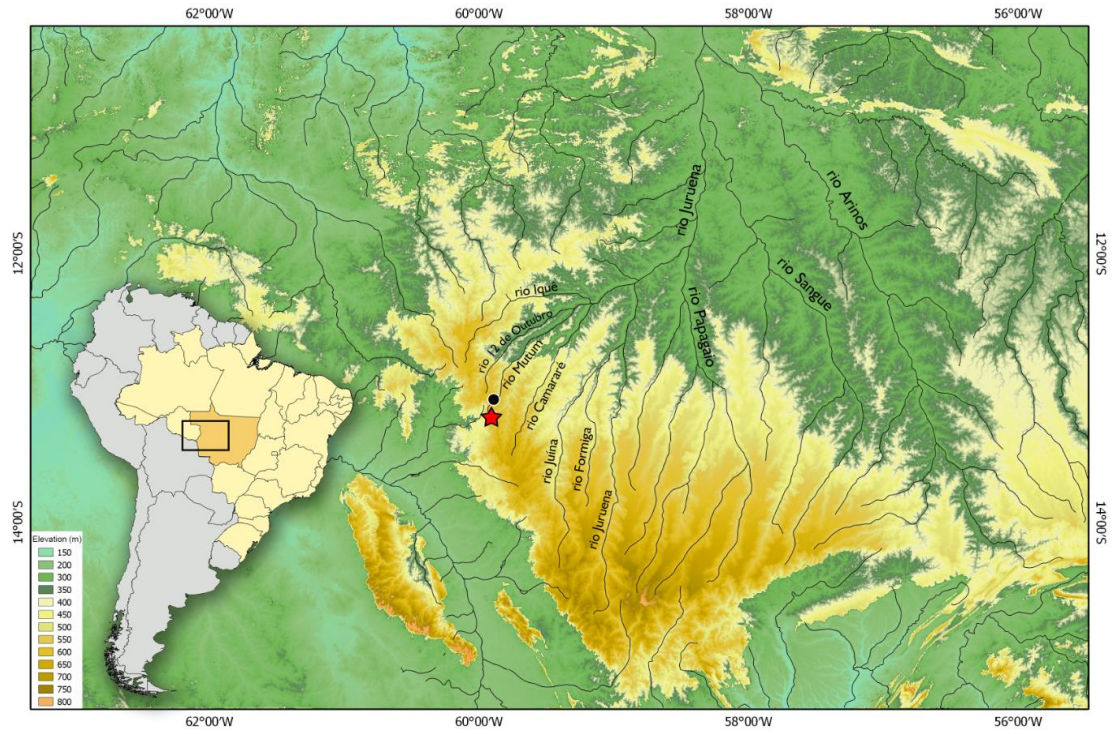
## Figure Captions



**Fig. 1.** *Hyphessobrycon comodoro*, new species, Brazil, Mato Grosso State, Municipality of Comodoro, rio Mutum, upper rio Juruena basin: **A.** Holotype, MZUSP XXXX, 29.55 mm SL, male; **B.** Paratype, MZUSP 125215, 25.29 mm SL, female; **C.** Aquarium specimen, not measured and preserved.



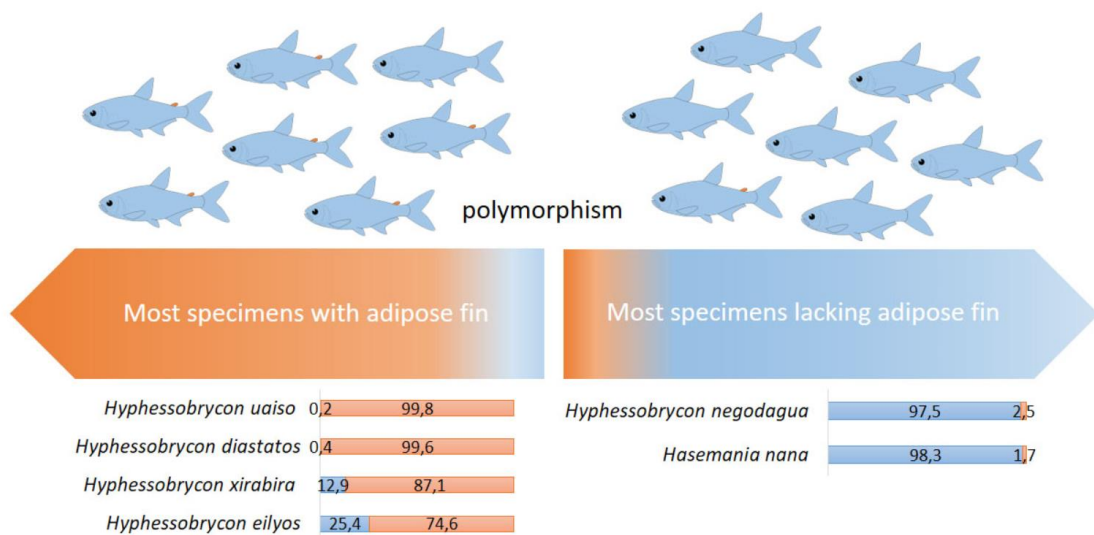
**Fig. 2.** Live coloration of *Hyphessobrycon comodoro*, Brazil, Mato Grosso State, Municipality of Comodoro, rio Mutum, upper rio Juruena basin: a) Holotype, MZUSP **XXX**, 29.55 mm SL, male; b) Paratype, MZUSP 125215, 27.38 mm SL, male lacking adipose fin; c) Paratype, MZUSP 125215, 29.75 mm SL, female.



**Fig. 3.** Distribution of *Hyphessobrycon comodoro* in the upper rio Mutum, rio Juruena basin, Brazil. Red star (type-locality), black dot (occurrence of other paratypes). Symbol can represent more than one collection event.



**Fig. 4.** Lagoon at the rio Mutum headwater due to the construction of a road, tributary of rio Camararé, upper rio Juruena basin, rio Tapajós basin, Comodoro, Mato Grosso, Brazil.



**Fig. 5.** Schematic draw showing the adipose fin variation in characids. Note that not all polymorphism are the same condition: some species have more specimens with developed adipose whereas other species have more specimens lacking that fin.

Numbers in graphic are percentages of specimens bearing adipose fin (orange) or lacking adipose fin (blue).

**Tab. 1.** Morphometric data of *Hyphessobrycon lenzai*. Range includes the holotype. SD = Standard deviation.

	Holotype	Range	Mean	SD
Standart length	29,06	20,7 - 35,0	27,9	
<b>Percents of Standard Length</b>				
Head length	29,06	27,1 - 32,0	29,1	1,1
Head heigth	27,8	23,8 - 28,2	26,5	1,1
Snout to anal-fin origin	70,0	66,8 - 72,4	69,8	1,6
Snout to dorsal-fin origin	54,2	53,7 - 57,3	55,7	1,0
Snout to pelvic-fin origin	52,8	49,5 - 54,1	52,4	1,3
Snout to pectoral-fin origin	28,5	27,4 - 31,5	29,0	1,1
Dorsal-fin base length	14,0	11,7 - 14,7	13,2	0,9
Anal-fin base length	22,2	19,4 - 24,2	21,8	1,3
Caudal-peduncule length	13,8	10,2 - 15,0	12,3	1,3
Caudal-peduncule depth	13,6	10,5 - 13,7	12,4	0,8
Depth at dorsal-fin origin	36,3	30,6 - 37,9	33,9	2,0
Dorsal-fin length	27,7	21,9 - 27,7	25,8	1,5
Anal-fin length	20,3	17,4 - 22,3	20,2	1,2
Pelvic-fin length	15,8	14,3 - 19,0	15,9	1,0
Pectoral-fin length	19,2	17,7 - 20,9	19,2	0,8
<b>Percents of head length</b>				
Snout length	20,6	20,6 - 25,9	23,4	1,5
Upper jaw length	41,1	40,5 - 49,1	44,7	2,3
Horizontal eye diameter	34,8	30,6 - 41,1	36,6	2,4
Interorbital width	26,2	25,3 - 36,6	28,4	2,6



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(May, 2020)

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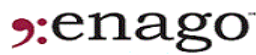
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Species, genera, and Latin terms (*et al.*, *in vitro*, *in vivo*, *vs.*, *i.e.*, *e.g.*) must be in italics. Cite scientific names according to the ICZN (<http://iczn.org/iczn/index.jsp>).

Authorship should be given at the first reference to a species or genus. Spelling, valid names and authorship of species must be checked in the Catalog of Fishes at <http://research.calacademy.org/research/ichthyology/catalog/fishcatmain.asp>. Latin terms presented between the generic and specific names (*cf.*, *aff.*, *etc.*) are not in italics (**e.g.**, *Hoplias aff. malabaricus*).

The genus name must always be fully spelled at its first appearance, at the beginning of a sentence and at least once in each figure and table caption(s). After first mention, the first letter of the genus name followed by the full species name may be used (**e.g.**, *H. aff. malabaricus*) as long as the abbreviation leaves no possibility of confusion with another generic name mentioned in the manuscript. In the case of possible confusion, the abbreviation can include more than the first letter to allow the differentiation of genera beginning with the same letter.

## TABLES

Tables must be numbered sequentially in Arabic numerals according to the order of citation in the text and be cited in the text using the following formats: Tab. 1, Tabs. 1–2, Tabs. 1, 4. Approximate locations where tables should be inserted must be indicated in upper case, along the right margin of the text, as in:

TABLE 1

**Note:** Use an **n-dash** for ranges (to automatically create n-dash in Word type "something – something" (*number-space-hyphen-space-number*)).

In table captions, the word Tab., its respective number and final period after the number should be in bold (**e.g., Tab. 1....**). End the caption in a period. Captions must be self-explicative. If genus names appear in a caption, spell out the name at least once. Tables must be constructed in cells using lines and columns. Do not format tables with "tab" or "space". Tables should not contain visible vertical lines or footnotes [contents of footnotes must be included in the caption].

List all captions at the end of the manuscript, in the following format. **E.g.:**

**Tab. 1.** Monthly variation of the gonadosomatic index in *Diapoma pyrrhopteryx* and *D. speculiferum*...

## FIGURES

Figures cannot be submitted as images inserted in Word files. Figures must be submitted as high quality individual files. For b&w figures, they must be saved in TIFF format, gray scale, 8.5 or 17.5 cm width, 600 dpi. Color figures must be in TIFF format, CMYK, 8.5 or 17.5 cm width and 300 dpi.

Composed figures must fit either the page (17.5 cm) or column width (8.5 cm). Text included in graphs and pictures must have a font size compatible with reductions to page or column width.

Figures must be numbered sequentially in Arabic numerals according to their order of citation in the text. Cite figures in the text using the following formats: Fig. 1, Figs. 1–2, Fig. 1A, Figs. 1A–B, Figs. 1A, C. Indicate the approximate locations where figures should be inserted in upper case, along the right margin of the text, as in:

FIGURE 1

**Note:** Use an **n-dash** for ranges (to automatically create n-dash in Word type "something – something" (*number-space-hyphen-space-number*)).

In each figure caption, the word Fig., its respective number and period are in bold (**e.g., Fig. 1....**). End each caption with a period. Captions must be self-explicative. If genus names appear in a caption, spell out the name at least once. Do not include symbols in the caption, but rather replace them with text (**e.g.,** black triangle) or include a legend in the figure itself.

Indicate figure subsections in upper case and bold letters in both in the figure and caption. Do not use parentheses after letters. Cite figures from other articles using the same formats as figures published in the present article, but do not capitalize them.

Illustrations must include either a scale or reference to the size of the item in the figure caption. List all captions at the end of the manuscript, in the following format. **E.g.:**

**Fig. 1.** Otoliths of representatives of Otophysi. **A.** *Brycon hilarii*; **B.** *B. orbignyanus*; **C.** *Pimelodus maculatus*; and **D.** *Sternopygus macrurus*. (Scale bars = 1 mm), lapillus (black triangle), asteriscus (white dot) and sagittal (red star), according to fig. 2 of Campana (2001).

## SUPPLEMENTARY FILES

Upload appendices, videos, datasets and other complementary materials as supplementary files. Provide the files formatted as you wish it appear, but in some format that allow edition. Videos must be in MP4 format. Identify these files in the text by a bolded letter **S** followed by sequential numbers in Arabic numerals. Indicate in the text that those will appear only in the online version (**e.g.,** as shown in the video **S1**, available only in the online version,...). List all captions at the end of the manuscript. **E.g.:**

**S1.** Video of variation of tides...

**S2.** Spreadsheet with catalog numbers of all voucher specimens collected in...

## PERSONAL COMMUNICATION

Personal communications should be included in the text of your document – cited in text only and not included in your reference list. Provide the full name, first and family name in

full, and initials of middle names when applicable, and year of the personal communication. **E.g.:**

The sample site had scarce riparian vegetation (Carlos A. R. Silva, 2018, pers. comm.).

**Note:** It is recommended you get permission from the source/author of your personal communication.

## REFERENCES

### **Ensure that all citations in the text and the References coincide before submitting a manuscript.**

References must be cited in the following formats in the text: Eigenmann (1915, 1921) or (Eigenmann, 1915, 1921; Fowler, 1945, 1948; Carvalho, 2001) or Eigenmann, Norris (1918) or, for more than two coauthors, Eigenmann *et al.* (1910a,b), always in chronological order and then in alphabetical order in case of more than one author cited. Do not include undergraduate monographs, conference papers, abstracts or technical reports. Include Masters Thesis or Ph.D. dissertations only if extremely necessary. Do not format references with "tab" or "space" and present references in rigorous alphabetical order. In case of authors with surnames with prepositions, in Portuguese do not include the preposition (**e.g.**, Carlos Alberto da Silva = Silva CA), in Spanish do not include "de" (**e.g.**, María de Rueda = Rueda M), but include "Del" (**e.g.**, Angel Del Río = Del Río A), except for authors who usually self cite differently. Ignore prepositions for the purpose of alphabetization, as in the following example:

**E.g.** of sequence    De Carli F  
                          Devincenzi GJ  
                          Eigenmann CH  
                          Maldonado-Ocampo J  
                          De Pinna MCC  
                          Del Río A  
                          Rueda M  
                          Silva CA

**Note:** In case of self-citations using a convention other than those exemplified, please cite using your usual convention and, in the cover letter, mention your intention to maintain and standardize that usage in all your self-citations in this and other journals.

**For more than six authors you can use *et al.* from the seventh in all categories of references, or list all the authors. Choose one pattern and follow it consistently for all references.**

For authors using reference management software, Vancouver is the style closest to NI's but the citations must be as described above. For users of the **Mendeley** manager, which is free, the Neotropical Ichthyology style for citations and references is available. To insert it in your Mendeley, login the software > view > citation styles > get more styles > paste the link <https://csl.mendeley.com/styles/78754841/neotropical-ichthyology>. For more information see: <https://www.elsevier.com/solutions/mendeley/support>.

**Note:** Do not forget to put the scientific names of references in italics in **Mendeley** before importing the reference. To do this, use the HTML <i> tags at the beginning of the word and </i> at the end. **E.g.:**

Reproductive biology of two species of <i>Mugil</i>: <i>M. curema</i> and <i>M. liza</i> =  
Reproductive biology of two species of *Mugil*: *M. curema* and *M. liza*.

Example formats are listed below.



## Book

Baumgartner G, Pavanelli CS, Baumgartner D, Bifi AG, Debona T, Frana VA. Peixes do baixo rio Iguaçú. Maringá: EDUEM; 2012.

## Edited book

Reis RE, Kullander SO, Ferraris CJ, Jr., editors. Check list of the freshwater fishes of South and Central America. Porto Alegre: Edipucrs; 2003.

## Chapter in a book

Pires T, Ohara W. Gasteropelecidae. In: Queiroz L, Torrente-Vilara G, Ohara W, Pires T, Zuanon J, Doria C, editors. Peixes do rio Madeira. São Paulo: Diaeto Latin America Documentary; 2013. p.206–11.

**Note:** You must present only **two** digits for last page if the previous digits coincide with the previous digits of the first page, separated by an **n-dash** (to automatically create n-dash in Word type "something – something" (*number-space-hyphen-space-number*)).

## Journal Articles

Journal titles may be abbreviated according to the style used in the sites: [https://images.webofknowledge.com/images/help/WOS/R\\_abrvjt.html](https://images.webofknowledge.com/images/help/WOS/R_abrvjt.html), <http://cassi.cas.org/search.jsp>, <http://www.ncbi.nlm.nih.gov/nlmcatalog/journals>, or others.

In case you do not find the journal name in the above links, provide the full name of the journal and highlight it in yellow. **DO NOT USE POINTS IN JOURNAL ABBREVIATIONS.**

Ota RR, Deprá GC, da Graça WJ, Pavanelli CS. Peixes da planície de inundação do alto rio Paraná e áreas adjacentes: Revised, annotated and updated. Neotrop Ichthyol. 2018; 16(2):e170094. <http://dx.doi.org/10.1590/1982-0224-20170094>

**Note:** You must provide only the e-location if there are no page numbers.

Sawakuchi AO, Hartmann GA, Sawakuchi HO, Pupim FN, Bertassoli DJ, Parra M, *et al.* The Volta Grande do Xingu: Reconstruction of past environments and forecasting of future scenarios of a unique Amazonian fluvial landscape. Sci Drill. 2015; 20:21–32. <https://doi.org/10.5194/sd-20-21-2015>

**Note:** You can use *et al.* for articles with more than six authors, and the page numbers separated by an **n-dash** (to automatically create n-dash in Word type "something – something" (*number-space-hyphen-space-number*)).

Abudayah WH, Mathis A. Predator recognition learning in rainbow darters *Etheostoma caeruleum*: specific learning and neophobia. J Fish Biol. 2016; 89(3):1612–23. <https://doi.org/10.1111/jfb.13061>

**Note:** You must present only **two** digits for last page if the previous digits coincide with the previous digits of the first page, separated by an **n-dash** (to automatically create n-dash in Word type "something – something" (*number-space-hyphen-space-number*)).

Koike Y, Koya Y. Viable periods of fertilizability of eggs and sperm of Japanese medaka, *Oryzias latipes*. Japan J Ichthyol. 2014; 61(1):9–14. Available from: [https://www.jstage.jst.go.jp/article/jji/61/1/61\\_9/pdf](https://www.jstage.jst.go.jp/article/jji/61/1/61_9/pdf)

**Note:** You must provide the issue number, and can present the URL of online articles without DOI number, preceded by Available from:..

## Journal article – in press

Birindelli JL, Britski HA, Provenzano F. New species of *Leporinus* (Characiformes: Anostomidae) from the highlands of the Guiana Shield in Venezuela. *Neotrop Ichthyol.* Forthcoming 2019.

**Note:** You must cite only if the paper is about to be published.

## Reports and other Government Publications

Eayrs S. A Guide to bycatch reduction in Tropical shrimp-trawl fisheries [Internet]. Rome; 2007. Available from: [www.fao.org/docrep/015/a1008e/a1008e.pdf](http://www.fao.org/docrep/015/a1008e/a1008e.pdf)

International Commission on Zoological Nomenclature (ICZN). International code of zoological nomenclature. 4th ed. London: International trust for zoological nomenclature Natural History Museum [Internet]. London; 1999. Available from: <https://www.iczn.org/the-code/the-international-code-of-zoological-nomenclature/>

International Union for Conservation of Nature (IUCN). Standards and petitions subcommittee. Guidelines for using the IUCN Red List categories and criteria. Version 13 [Internet]. Gland; 2017. Available from: <http://cmsdocs.s3.amazonaws.com/RedListGuidelines.pdf>

## Thesis

Oliveira AG. Predizendo impactos das mudanças climáticas sobre a diversidade funcional de peixes de água doce: um panorama "down under". [PhD Thesis]. Maringá: Universidade Estadual de Maringá; 2018. Available from: <http://nou-rau.uem.br/nou-rau/document/?code=vtls000228862>

**Note:** You must provide a hyperlink when available.

Figueiredo PICC. Decifrando a relação evolutiva entre *Gymnogeophagus labiatus* (Hensel, 1870) e *Gymnogeophagus lacustris* Reis & Malabarba 1988 (Cichlidae: Geophagini). [Master Dissertation]. Porto Alegre: Universidade Federal do Rio Grande do Sul; 2018.

## Webpages

Fricke R, Eschmeyer WN, Van der Laan R. Eschmeyer's catalog of fishes: genera, species, references [Internet]. San Francisco: California Academy of Science; 2019. Available from: <http://researcharchive.calacademy.org/research/ichthyology/catalog/fishcatmain.asp>

## Taxonomic style instructions

This summary provides information specific to taxonomic manuscripts. For large taxonomic revisions and reviews, see additional recommendations below. Items with \* are required, others are recommended whenever applicable. Taxon accounts should be in alphabetical order. For original descriptions, the words "**new genus**" or "**new species**" should appear after the name of the new genus or species, preceded by a comma. The designation also must to appear in the caption of the holotype's figure, in the case of a new species. For species mentioned in the Diagnosis section but for which no comparative material was examined, please formally cite their original descriptions and provide the full references.

**Note:** Prior to submitting a description of a new taxon, please register new nomenclatural act(s) and the paper (as unpublished manuscript) at URL: <http://zoobank.org/> and provide both the pub and the nomenclatural act codes just below the new taxon name. **E.g.:**

urn:lsid:zoobank.org:**pub**:XX9XX9XX-X1X2-99XX-9X19-9XXX0XX99X12

urn:lsid:zoobank.org:**act**:XX9XX9XX-X1X2-99XX-9X19-9XXX0XX99X12

**Note:** The pub number is only one for each manuscript, but, in case of more than one nomenclatural act, provide all the numbers.

**Note:** After publication, you must update the ZooBank article status from unpublished to published. This must be done by the author who made the initial registration.

### **Generic accounts**

Order of presentation:

**Genus Author, year (or new genus; do not abbreviate) (bolded and centered)**

urn:lsid:zoobank.org:act:XX9XX9XX-X1X2-99XX-9X19-9XXX0XX99X12  
(in case of new genus only) (centered)

**Synonymy.**

**Type species.\***

**Diagnosis.\***

**Description.\***

**Etymology.** for new genus only\*

**Remarks.**

**Key to species.**

Comments on the above:

### **Synonymy**

Provide a complete synonymy listing all validly published names that have been applied to the genus, including all references in systematic treatments or identification guides that can help link the present concept of the genus to past concepts. The senior synonym is usually the correct and valid name. If applicable, include invalid names and mistakes in identity with suitable annotation to indicate their nature. For each name listed, include minimally: the original form of the name; the author and date of publication; reference and page number; basic information on the genus in the paper cited (modified from Wiley EO, Lieberman BS. *Phylogenetics: theory and practice of Phylogenetic Systematics*. 2nd edition. Hoboken: Wiley-Blackwell; 2011). Provide full references of all listed sources as part of the References section. If applicable, discuss the synonymy and cite relevant literature in the Remarks section. **E.g.:**

*Parodon Valenciennes*, 1849

*Parodon Valenciennes*, in Cuvier, *Valenciennes*, 1849:50 (original description; type-species by original designation and monotypy: *Parodon suborbitalis Valenciennes*). —Günther, 1864:31

(redescription). —Eigenmann, 1912:274 (diagnosis). —, Miles, 1943:251 (diagnosis in key). —Schultz, 1944:288 (diagnosis in key). —Campos, 1945:440 (diagnosis). —Miles, 1947:132 (diagnosis). —Travassos, 1955:4 (synonymic list). —Böhlke, 1958:83 (comments). —Ringuelet *et al.*, 1967:180 (diagnosis in key). —Roberts, 1974b:433 (osteology). —Godoy, 1975:451 (diagnosis in key). —Géry, 1977:202 (diagnosis in key). —Britski *et al.*, 1988:26 (diagnosis in key).

*Nematoparodon* Fowler, 1943:226 (original description; type-species by original designation and monotypy: *Parodon apolinari* Myers).

**Note:** Precede each quotation with an **m-dash** (Type an m-dash using **Shift-Option-hyphen** on a Mac. In Windows, use **ALT + 0151**).

### **Type-species**

For proposed new genera, the original name of the proposed type-species, followed by author and year of publication (or new species) is sufficient. For previously proposed generic names, the following additional information is required (in this order): Nature of type designation (**e.g.**, original designation, monotypy, absolute tautonymy, etc). Whether the type-species was not designated in the original publication, the author, year and page of the subsequent designation should be cited (**e.g.**, Type by subsequent designation by Jordan, 1919: 45).

### **Diagnosis**

Diagnosis should NOT be written in telegraphic style (for purposes of clarity). A generic diagnosis should preferably list the unique synapomorphies of the genus, followed by homoplastic derived characters and/or other useful distinguishing characteristics.

### **Description**

In telegraphic style (*i.e.*, no verbs nor articles).

### **Etymology**

For new names, state the gender, even though it may be obvious from the construction. Do not give an etymology for preexisting names. If it is necessary to discuss the etymology of an old name (for example, to justify an interpretation of its gender), include that in the Remarks section.

### **Key to species**

If a key for identification of species is provided and it was not mentioned in the title, add "dichotomous key" or "identification key" as a keyword.

### **Specific accounts**

Order of presentation:

***Species* Author, Year (or new species - do not abbreviate)  
(bolded and centered)**

urn:lsid:zoobank.org:act:XX9XX9XX-X1X2-99XX-9X19-9XXX0XX99X12  
(in case of new species only)  
(centered)

**Synonymy.**

**Holotype.\*** for new species only; include full collection data (see details, below)

**Paratype(s).** for new species only; include full collection data (see details, below)

**Non-types.** for new species only; include reduced collection data (see details, below) (Justification for separating non-types from types should be provided in the Material and Methods section)

**Diagnosis.\*** see below for instruction on how to prepare a species diagnosis

**Description.\***

**Coloration in alcohol.\***

**Coloration in life.**

**Sexual dimorphism.**

**Geographical distribution.\***

**Ecological notes.**

**Etymology.** for new species only\*

**Conservation status.** for new species only\*

**Remarks.**

**Material examined.** for accounts of previously named species

Comments on the above:

**Synonymy**

Provide a complete synonymy listing all validly published names that have been applied to the species, including all references in systematic treatments or identification guides that can help link the present concept of the species to past concepts. The senior synonym is usually the correct and valid name. If applicable, include invalid names and mistakes in identity with suitable annotation to indicate their nature. For each name listed, include minimally: the original form of the name; the author and date of publication; reference and page number; country or basin and basic information on the species in the paper cited (modified from Wiley EO, Lieberman BS. *Phylogenetics: theory and practice of Phylogenetic Systematics*. 2nd edition. Hoboken: Wiley-Blackwell; 2011). Provide full references of all listed sources as part of the References section. If applicable, discuss the synonymy and cite relevant literature in the Remarks section. **E.g.:**

*Parodon caliensis* Boulenger, 1895

*Parodon caliensis* Boulenger, 1895:480 (original description; type-locality: near Cali, Colombia). —Eigenmann, 1922(reprint 1976):109 (*partim*; Paila, río Cauca basin; diagnosis in key). —Miles, 1943:47 (río Cauca; redescription). —Miles, 1947:132 (río Magdalena; meristics). —Roberts, 1974b:416 (osteology; osteological illustrations). —Roberts, 1975:269 (dentition).

*Parodon saliensis* [sic]. —Roberts, 1975:269 (dentition).

*Parodon Parodon caliensis*. —Géry, 1977:203 (diagnosis in key).

**Note:** Precede each quotation with an **m-dash** (Type an m-dash using **Shift-Option-hyphen** on a Mac. In Windows, use **ALT + 0151**).

## Type-material

For new species, list types separately from other comparative material examined. Indicate when you have cleared and stained (c&s) specimens or genetic sequences in some online depository. Type specimens for which common barcoding sequences are available (**e.g.** COI, Cytb, 12S, 16S) at an online depository should be indicated clearly either in a table or in the text of the Holotype or Paratype(s) sections. In either case the following should be included: The museum acronym and lot number, the maker gene/locus (**e.g.** COI), the name of the depository (**e.g.** GenBank), and the depository accession number. Studies that include multiple sequences for phylogenetic or other analyses should list these along with the depository name and accession number in a table or supplementary document (see GENETIC SEQUENCES in Author Instructions). It is acceptable for authors to indicate sequences in online depositories as "pending", but following acceptance of a manuscript, these numbers must be made available as a condition for final publication. **E.g.:**

Group paratypes by country or basin, in alphanumeric order of museum acronym and catalog numbers inside each group. Include full collection data, in the following order:

Museum acronym and catalog number, number of specimens (except for holotype), size range separated by an **n-dash** (to automatically create n-dash in Word type "something – something" (*number-space-hyphen-space-number*)), number and size range of measured specimens, if different (in parentheses along with size range) locality (country, state, municipality, locality, basin, coordinates), date of collection [in dd, Month (3 letter abbreviation) and yyyy], and collector(s). **E.g.:**

Paratypes. LIRP 5640, 25, 38.5–90.3 mm SL (12, 75.0–90.3 mm SL), Brazil, São Paulo, Município de Marapoama, rio Tietê basin, ribeirão Cubatão at road between Marapoama and Elisiário, 21°11'35"S 49°07'22"W, 10 Feb 2003, A. L. A. Melo.

**Note:** Except in cases where no actively-curated scientific research collection exists, Holotypes must be deposited in collections in the country of origin of the species. When a species occurs in multiple countries, the holotype must be deposited in the country of the type-locality, with paratypes distributed among countries in which the species occurs. Even in cases of species endemic to one country, we encourage dissemination of paratypes.

## Diagnosis

Do NOT write the diagnosis in telegraphic style (for purposes of clarity). A species diagnosis is typically a paragraph constructed of full sentences that list the most important traits that allow the reader to unequivocally identify the species. Ideally, the diagnosis includes one or more features that are unique to the species, preferably autapomorphic characters. If unique features were not discovered, the next best option is a differential diagnosis, within which a series of direct comparisons are made among species and the alternative character states specified by contrasts are stated explicitly (using "vs." followed by the condition found in the species, or group of species, being compared, for each diagnostic feature). Diagnoses that consist only of a combination of characters (*i.e.*, traits listed sequentially

which, when considered together, distinguish the species from congeners) should be avoided.

**Note:** In the event of listing species in the diagnosis without associated comparative material, please formally cite their original descriptions and provide full references.

### **Description**

Write the description section in telegraphic style (*i.e.*, without verbs and articles). Treat bilaterally paired structures in the singular (**e.g.**, pelvic fin short, not pelvic fins short). Compound adjectives that include a noun should be connected by a hyphen (**e.g.**, pectoral-fin spine, NOT pectoral fin spine). Fin-ray formulae should be reported with unbranched rays in lower case Roman numerals, spines in upper case Roman, and branched rays in Arabic numerals. Transitions between different types of rays should be indicated by a comma (,) and not a plus sign (+), or dash (-). We treat the catfish spinelet as a spine, so dorsal fin counts that include a spinelet should be reported as II,6 (or whatever the branched ray count is). **E.g.:**

iii,7 or II,9. Not iii-7 or iii+7 (no spaces should be inserted after the comma).

**Note:** Do not include space between numerals and % (**e.g.**, 25%, not 25 %).

### **Coloration**

Write this section in telegraphic style (*i.e.*, without verbs or articles). This section may be divided into Coloration in alcohol and Coloration in life.

### **Geographic distribution**

Geographic descriptors must NOT be translated and should be capitalized or not according to the standard usage in the language in question. English usage typically uses capitals (**e.g.**, Amazon River, Parana River, Paraguay River) while Portuguese and Spanish do not (**e.g.**, rio Solimões, río Magdalena, rio Paraná, río Parana, río Paraguay, rio Paraguai). When referring to a municipality or geopolitical region that includes the names of a water body, capitalize the entity as a proper noun in all languages (**e.g.**, Municipality of Arroio dos Ratos, State of Rio Grande do Sul).

### **Etymology**

For new names, state the usage (adjective, noun, patronym, etc.), even though it may be obvious from the construction. For more information, see article 31 of the online International Code of Zoological Nomenclature (<https://www.iczn.org/the-code/the-international-code-of-zoological-nomenclature/the-code-online/>). Do not provide an etymology for preexisting names, unless the etymology is necessary to justify the spelling. In such cases, include this information in the Remarks Section and not as a separate heading.

### **Conservation status**

Please consider providing the conservation status, at least for new species, based on the IUCN criteria and categories. **E.g.:**

**Conservation status.** Provide information on the conservation status assessment and finalize with... According to the International Union for Conservation of Nature (IUCN) categories and criteria (IUCN Standards and Petitions Subcommittee, 2017 [or later]), *Genus species* can be classified as Category (category abbreviation).

**Note:** In such case, provide the full reference in the References.

### **Material examined**

Provide only taxa, museum acronym, catalog number, number of specimens and size range.

Indicate any types by: (Holo- Syn-, etc.) type of *Genus species* Author, date. For lectotypes or neotypes, also cite the source of designation.

Specimen lots should be arranged taxonomically, and then by country or basin (in bold), in alphanumeric order of museum acronym and catalog numbers inside each group proposed. **E.g.:**

*Auchenipterichthys coracoideus*: **Peru**: CAS 220574, 2, 104.0–107.0 mm SL, syntypes of *Trachycorystes coracoideus* Eigenmann, Allen, 1942).

**Note:** Deviation from this order is permissible only if an alternate arrangement shortens the text. If another arrangement is chosen, its use must be explained and justified in the Material and Methods section.

List material of non-focal species as **Comparative material examined**, using the same rules of arrangement stated above.

### **Large taxonomic revisions and reviews**

Before presenting the taxonomic accounts, provide a table at the beginning, cited early, that lists all the species included in the revision that are new and those that are being redescribed. Taxon accounts can be arranged in two ways: presenting the new species descriptions first (in alphabetic order) and then the redescribed species (in alphabetic order), OR reporting all the species in alphabetic order without separating new and redescribed ones. In either case, mentioning the words **new genus** or **new species** after the name of each new taxon presented, preceded by a comma. The chosen order of presentation should focus on brevity and comprehensibility.

### **Further information**

Contact the Editor at [neoichth@nupelia.uem.br](mailto:neoichth@nupelia.uem.br).