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Description of a new species of *Astyanax* (Characiformes: Characidae) from the Rio Xingu basin, Pará, Brazil

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Trabalho de Conclusão de Curso apresentado, como requisito parcial para obtenção do grau de Bacharel em Ciências Biológicas, à Universidade Federal da Grande Dourados, Faculdade de Ciências Biológicas e Ambientais, Curso de Ciências Biológicas.

Orientador: Prof. Dr. Fernando Cesar Paiva Dagosta

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Trabalho de Conclusão de Curso aprovado pela Banca Examinadora como requisito parcial para obtenção do título de Bacharel em Ciências Biológicas, da Universidade Federal da Grande Dourados.
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Description of a new species of *Astyanax* (Characiformes: Characidae) endemic from the upper rio Xingu basin, southern Amazon, Brazil

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Abstract

A new species of *Astyanax* is described from the upper Rio Iriri, rio Xingu basin. The new species can be distinguished from all congeners by a unique combination of characters, including color pattern (*i.e.* presence of a dark longitudinal stripe with relatively constant width along the body, two vertically elongated diffuse humeral spots, concentration of dark pigments on the anterior portion of scales in the abdominal region), 40–43 lateral line scales, 1–2 pentacuspid maxillary teeth. *Astyanax* sp. n. presents sexual dimorphism, with males differing from females by having bony hooks on the anal fin rays. The description of another endemic species of Characidae in the southern Amazon reinforces that the region harbors a ichthyofaunistic diversity, while at the same time, it is still taxonomically poorly understood.

Keywords: Diversity, Ichthyology, Neotropical, Taxonomy.

Resumo

Uma nova espécie de *Astyanax* é descrita do alto rio Iriri, bacia do rio Xingu. A nova espécie pode ser distinguida de todos os congêneres por uma combinação única de caracteres, incluindo padrão de cor (ou seja, presença de uma faixa longitudinal escura com largura relativamente constante ao longo do corpo, duas manchas umerais difusas verticalmente alongadas, concentração de pigmentos escuros na porção anterior de escamas na região abdominal), 40–43 escamas na linha lateral, 1–2 dentes maxilares pentacúspides. *Astyanax* sp. n. apresenta dimorfismo sexual, sendo que os machos se diferenciam das fêmeas por possuírem ganchos ósseos nos raios da nadadeira anal. A descrição de outra espécie endêmica de Characidae no sul da Amazônia reforça que a região abriga uma diversidade ictiofaunística, ao mesmo tempo em que ainda é pouco

compreendida taxonomicamente.

Palavras-chave: Diversidade, Ictiologia, Neotropical, Taxonomia.

Introduction

The Humid Neotropics, encompassing the Amazon Rainforest, Atlantic Forest, and other tropical areas in Central and South America, are renowned for harboring significant biodiversity owing to their species richness and diversity. These areas host a wide array of organism groups (Antonelli *et al*., 2018). The freshwater habitats within the Neotropical region hold 20 — 5% of the world's entire fish diversity, currently comprising over 6,000 species, with estimates suggesting even higher numbers, between 8,000 and 9,000 (Reis *et al*., 2016; Albert *et al*., 2020).

The order Characiformes comprises approximately 284 genera, encompassing more than 2,300 species distributed across 24 families, occurring in Africa and in the Americas (Fricke *et al*., 2023). This order is defined based on various external morphological characteristics such as well-developed teeth; usually presenting an adipose fin; cycloid scales; short to moderately long anal fin; often curved lateral line, some times incomplete; upper maxilla typically non-protrusible; pharyngeal teeth usually present but not specialized as in Cypriniformes; absence of barbels; 3-5 branchiostegal rays; usually three postcleithra; ventral position of pelvic-fin insertion; among others (Nelson, 2016).

The Characidae is the most diverse family within the order, encompassing 1,256 valid species (Fricke *et al*., 2023). The interrelationships within the group remain complex (Lima *et al*., 2003), although more recent studies have provided resolution regarding the phylogenetic position of several of its lineages (Malabarba and Weitzman, 2003; Azevedo, 2010; Oliveira et al., 2011; Mirande, 2018). Species belonging to this family are found in virtually all freshwater environments and are distributed across the Americas, ranging from the Mexico-United States border to southern Argentina (Lucena, 1993).

Among the genera of Characidae, the genus Astyanax Baird & Girard 1854, is one of the richest in species diversity, with over 125 valid species (Dagosta & Marinho, 2022). In addition to its remarkable diversity, this genus includes species that are still relatively poorly understood. These fish are commonly encountered in neotropical river basins, often collected in ichthyofaunistic surveys. One of these Astyanax species was collected by us in the state of Pará, Altamira Municipality, Brazil, within the Serra do Cachimbo Biological Reserve (REBIO), situated in the upper Rio Xingu basin. The species was recognized as previously undescribed in scientific literature. In this study, our objective is to provide a description of this species.

Conserving the aquatic environments and fish of South America is an ongoing

and escalating challenge in the face of rapid human-induced changes over the years. The continuous loss of habitat due to land use changes, hydroelectric damming, water pollution, mining, urbanization, agricultural expansion, along with overfishing, is leading to rapid declines and the endangerment of many fish species in South America (Reis *et al*., 2016). To make conservation strategies more effective in preserving fish, there is a pressing need for more taxonomic and systematic experts in this field (Ota *et al*., 2015; Reis *et al*., 2016; Sidlauskas, Birindelli, 2018), so that knowledge of species distribution and delimitation can inform appropriate conservation decisions. Therefore, it is crucial to training new taxonomists with expertise in the identification of neotropical ichthyofauna. Another objective of this project was to provide fish taxonomy training to the student responsible for this work.

Material and Methods

Counts and measurements follow Fink, Weitzman (1974), except for the number of rows of horizontal scales below the lateral line, which are counted between the insertion of the pelvic fin. Standard length (SL) was given in mm, and all other measurements were expressed as a percentage of SL or head length (HL) for head subunits. In the description, the frequency of each count was accommodated between the parenthesis after the respective count. Counts of holotype were indicated by an asterisk. Small suspensory teeth, supraneurals, branchiostegal rays, gill rakers, vertebrae, unbranched anal-fin rays and procurrent rays were not counted as they will be analyzed in clean and stained (CS) specimens according to the protocol of Taylor, Van Dyke (1985). Unfortunately, the clean and stained of the specimens has not yet been possible due to the lack of reagents for the process. The sex of the specimens was confirmed by dissection. Institutional abbreviations followed SABAJ (2022)

Results

Astyanax sp. n., new species

(Figs. 1–3; Tab. 1)

Holotype. MZUSP XXXX, XXXX SL. Brazil, State of Pará, Municipality of Altamira, Stream below the waterfall, Provença Farm, at the Serra do Cachimbo Biological Reserve (REBIO), Rio Xingu basin , 09°08’19.8”S 54° 34’03.3”W, collected by F. Dagosta, M. Marinho, P. Camelier & M. Giovanetti.

Paratypes. MZUSP 119926, 21, XX–XX mm SL; MUBIO XXXX, XX, XX–XX mm SL; ZUEC XXXX, XX, XX–XX mm SL; all collected with the holotype.

FIGURE 1

Diagnose. The new species can be distinguished from all its congeners, except for *Astyanax novae, A. utiariti, A. argymarginatus, A. clavitaeniatus, A. goyacensis, A. siapae, A. unitaeniatus, A. saltor, A. rupununi*, by the presence of a dark midlateral stripe and two vertically elongated diffuse humeral spots. *Astyanax* sp. n. can be differentiated from *A. argyrimarginatus*, *A. clavitaeniatus*, *A. goyacensis*, *A. rupununi*, *A. siapae*, *A. unitaeniatus*, and *A. utiariti* by presenting a lateral stripe with relatively consistent width along the body (*vs*. lateral stripe distinctly narrower in anterior portion). Additionally, *Astyanax* sp. n. can be differentiated from *Astyanax goyacensis*, *A. novae*, and *A. utiariti* by having more lateral line scales (40–43 *vs*. 39 or fewer, one specimen of *Astyanax goyacensis* with 40 scales reported in the species redescription by Garutti & Langeani, 2009). and by having pentacuspid maxillary teeth (*vs*. absence of maxillary teeth in *A. novae* and *A. utiariti*; uni- or tricuspid teeth in *A. goyacensis*). It can be distinguished from *Astyanax saltor* by the presence of 1–2 maxillary teeth (*vs*. absence of maxillary teeth) and by having a concentration of dark chromatophoreon the anterior portion of scales in the abdominal region (*vs*. concentration of dark pigments on the posterior portion of scales in the abdominal region).

Description. Morphometric data are presented in Table 1. Body compressed and elongated, highest near dorsal-fin origin. Dorsal profile of head convex, extending from snout to vertical passing through midpoint of orbit. From this point to the supraoccipital tip either straight or slightly concave. From the supraoccipital tip to base of last dorsal-fin ray convex and from that point to adipose fin straight or slightly convex. Ventral profile of body, extending from head to anal-fin origin convex. Base of anal fin posteriorly dorsal-inclined and slightly convex or straight. Caudal peduncle is elongated with concave dorsal and ventral profiles.

TABLE 1

Two series of teeth in the premaxilla. Outer series with 4(14) to 5(1) tricuspidate teeth. Inner series with 5(15) pentacuspidate teeth, with the anterior ones larger than the posterior ones. Maxilla with, 1(8), to 2(6) pentacuspidate teeth. Dentary with 5 larger pentacuspidate teeth, decreasing in size from the third.

Cycloid scales. Complete lateral line with 40(1), 41(3), 42(9), 43(2) pored scales. Anal scales with 2(20), 11(22), 2(23). Scale rows between the origin of the dorsal fin and the lateral line 7(14) or 8(1). Scale rows between the origin of the pelvic fin and the lateral line 6(15). Pre-dorsal scales 11(11), 12(2), 13(2). Scales around the caudal

peduncle 14(15).

Coloration in alcohol. Pale beige background color (Fig. 1). Some specimens with guanine in the opercular region and on infraorbitals 3 and 4. Dorsal region of head and mid-dorsal body dark brown. Reticulated pigmentation pattern formed by chromatophore concentration around scales in the series just below the dark midlateral stripe, *i.e.*, between the 6th and 11th series of longitudinal scales. Concentration of dark pigments on the anterior portion of the scales forming a pattern of series of small dots. Such pattern occurs in the two scale series just below the lateral line, starting from the second scale after the opercle and extending to about the ninth scale. Snout, jaws, and infraorbitals 5 and 6 densely pigmented with dark chromatophores, with sparse pigments on infraorbitals 2, 3, and 4 and in the opercular region. A distinct dark humeral spot, horizontally elongated, with four scales in width and two scales deep, above the lateral line and above the midlateral stripe. Two diffuse humeral spots, vertically elongated, crossing the midlateral stripe. The first crosses the anterior portion of the vertically elongated humeral spot and the 3rd and 4th lateral line scales, with five scales deep. The second, in a more irregular, crossing the 7th, 8th, and 9th lateral line scales, with three scales in width and four scales deep. Diffuse vertical spots spaced two or three scales apart. Longitudinal dark stripe extending from the posterior opercular region to the end of the caudal median rays, approximately one scale in width and consistent along the body. Few pigments i the ventrolateral portion of the body, near and below the pectoral-fin origin and just above the pelvic-fin origin. Region above the anal-fin base with scattered pigmentation. Ventral portion of the caudal peduncle without pigment. Caudal peduncle spot absent. Adipose fin with concentrated dark pigmentation in the central region. Paired fins with less pigmentation, concentrated along the lepidotrichia. Unpaired fins with pigmentation along the margins of the lepidotrichia. Anal and dorsal fins with pigments along the interradial membranes. Greater pigment concentration at the distal portion of the anal-fin lepidotrichia and the proximal region of the dorsal fin.

Coloration in life. Dorsal portion of body with an olive-yellow background color. Ventral region silvery. Upper part of the iris golden yellow, darker dorsally. Ventral portion of the eye clear, yet with scattered dark pigmentation. Reticle-like scale pattern beneath the olive-green midlateral stripe. Dark stripe horizontally crossing the eye. Infraorbitals, opercular series, and ventral head region with guanine. Dentary, upper maxilla, and dorsal head region olive-yellow. Ventro-lateral head portion

predominantly lighter. A clear iridescent light green longitudinal stripe is above the dark midlateral stripe, beginning after opercle and extending to caudal peduncle. All fins exhibit a yellowish coloration, except for pelvic fins and anterior portion of anal fin, which is orange. Some individuals display a more orange pigment on the distal portions of the anal and caudal fins (Fig. 2).

FIGURE 2

Sexual dimorphism. Males differ from females by possessing bony hooks on anal-fin rays, starting from the last unbranched ray and extending to the seventh branched ray. These hooks are situated along the posterior margin of the rays, 10 or 11 hooks by lepidotrichia. Each hook is arranged in an independent segment.

Distribution. The new species is currently known only from the rio Iriri, in the upper rio Xingu basin, within the Serra do Cachimbo Biological Reserve (REBIO), Pará State, Brazil (Figure 3).

FIGURE 3

Discussion

The new species belongs to the group of *Astyanax* species characterized by a dark longitudinal stripe and two vertically elongated humeral blotches (Garutti, 1999). The differentiation among species within this group relies on teeth characteristics, body color pattern, and the width of the dark lateral stripe.

According to Dagosta, Marinho (2022), although not implying homology, four types of dark lateral stripes can be recognized in *Astyanax*: 1) a stripe of various forms and pigmentation, beginning posteriorly to the anterior humeral blotch and never connected to it (*e.g.*, *A. bagual* Bertaco & Vigo, 2015, *A. eremus* Ingenito & Duboc, 2014); 2) a stripe starting immediately posterior to the humeral blotch and typically ending at the posterior extremity of the median rays of the caudal fin (*e.g.*, species typically attributed to the *Astyanax bimaculatus* group such as *A. argyrimrginatus* Garautti, 1999, *A. clavitaeniatus* Garutti, 2003, *A. novae* Eigenmann, 1911, *A. saltor* Travassos, 1960, *A. unitaeniatus* Garutti, 1998, and *A. utiaritti* Bertaco & Garutti, 2007); 3) a narrower stripe starting at the posterior margin of the operculum, becoming blurred posteriorly and not reaching the caudal extremity (*e.g.*, *Astyanax ajuricaba* = now *Jupiaba ajuricaba sensu?*); and 4) a stripe starting immediately posterior to the opercle (*e.g.*, *A. joavitori* and *A. nobre*). The stripe pattern of the new species resembles the condition described for the group 2 of the Dagosta, Marinho (2022).

Also without implying homology, differences in the width of the dark lateral stripe can be recognized among *Astyanax* species. Some species like *A. clavitaeniatus*, *Astyanax rupununni*, and *A. siapae* exhibit a club-shaped stripe, with the anterior portion much narrower than the posterior (Garutti, 2003). A more subtle pattern can be observed in *Astyanax argyrimrginatus*, *Astyanax goyacensis*, *Astyanax unitaeniatus*, and *Astyanax utiariti*, where the anterior part of the stripe is narrower than the posterior but not as abrupt as the group defined by Garutti (2003). *Astyanax saltor*, seemingly, has a relatively constant width of the lateral dark stripe along its length. This information can be deduced from the holotype illustration in the original species description (Travassos, 1960). It is not possible to confirm this data from the holotype as its coloration appears faded, giving the impression that the stripe varies in width along its length. In *Astyanax novae*, the width of the stripe remains relatively constant along the body, similar to the new taxon described here.

The description of an endemic species belonging to the Characidae family, situated in the southern Amazon region, serves as additional evidence pointing to the presence of rich ichthyofaunistic diversity in this area. This finding reinforces the fact that the vast geographic expanse of the Amazon harbors a great variety of fish species, many of which remain unknown to science. Simultaneously, this discovery underscores the taxonomic knowledge gap of the region, highlighting that, despite advances in research and the identification of new species, much remains to be learned about the intricate aquatic biodiversity present in the Amazon. Therefore, the description of this endemic Characidae species not only enriches our understanding of regional aquatic fauna but also emphasizes the ongoing need for investigating and preserving Amazonian aquatic environments.

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Figure Captions

FIGURE 1. *Astyanax* sp. n., Brazil, Pará, Municipality of Altamira, Stream below the waterfall, Provença Farm, in the Reserva Biologica in Serra do Cachimbo(REBIO), Iriri Rio, upper Xingu Rio basin.

FIGURE 2. Live coloration of *Astyanax* sp. n., MZUSP XXXXX; Brazil, Pará, Municipality of Altamira, Stream below the waterfall, Provença Farm, in the Serra do Cachimbo in , Reserva Biologica (REBIO), upper Xingu Rio basin.

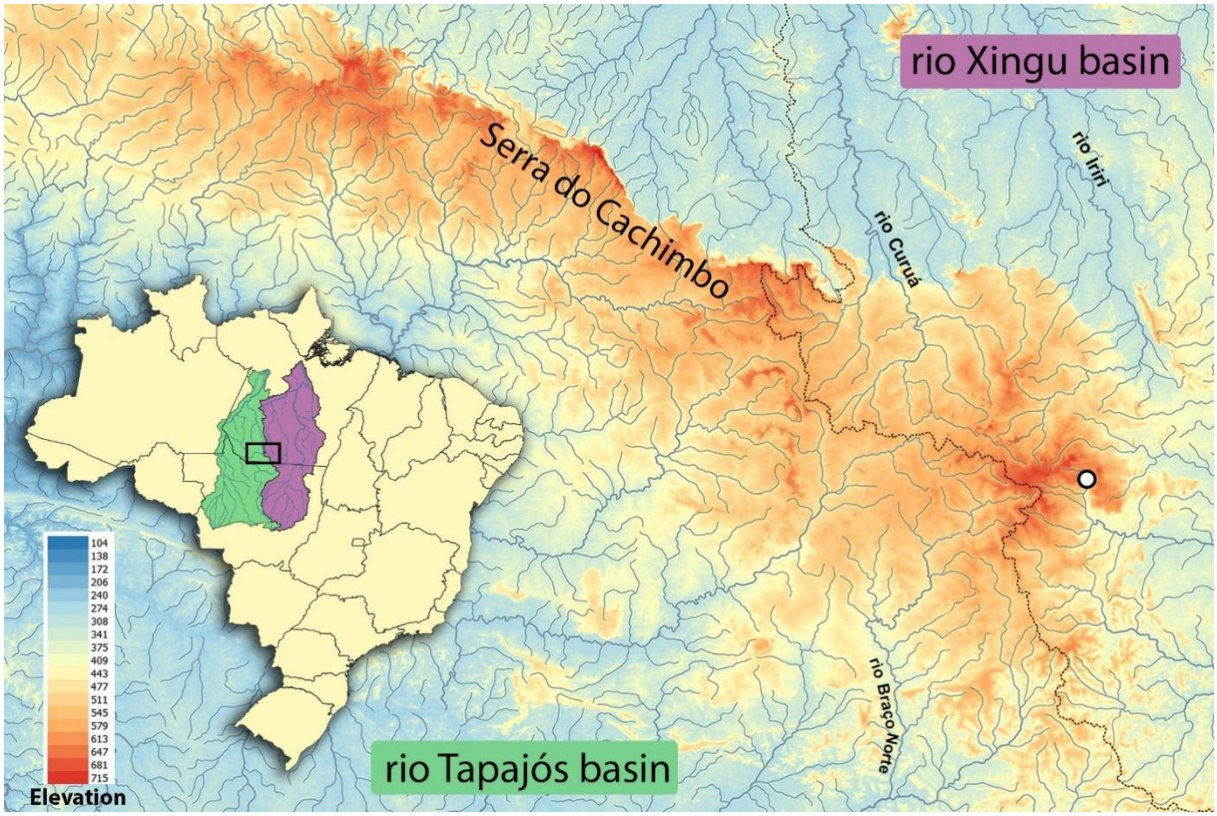

FIGURE 3. Distribution of *Astyanax* sp. n. from rio Iriri, rio Xingu basin, Brazil. White dot (type locality).

TABLE 1. Morphometric data of *Astyanax* sp. n., SD = Standard Deviation**.**

Measurements	Range	Mean	SD
Standard length	43.0—90.0	74.5	0.7
Head length	26.9—29.0	27.5	0.7
Snout to anal-fin origin	67.1—70.0	68.0	0.9
Snout to dorsal-fin origin	52.2—55.7	52.6	1.1
Snout to pelvic-fin origin	47.7—50.9	49.3	0.9
Snout to pectoral-fin origin	27.1—29.2	28.0	0.6
Dorsal-fin base length	13.2—16.0	14.4	0.7
Anal-fin base length	22.9—26.6	25.8	1.1
Caudal-peduncle length	8.3—9.6	8.9	0.4
Caudal-peduncle depth	11.4—12.6	11.9	0.4
Depth at dorsal-fin origin	31.7—36.9	33.5	1.6
Dorsal-fin length	23.2—27.2	25.2	1.3
Anal-fin length	16.7—19.9	17.5	0.8
Pelvic-fin length	15.4—18.4	16.4	1.0
Pectoral-fin length	20.4—22.7	20.9	0.8
Percentages of the head			
Snout length	26.1—28.6	25.5	0.8
Upper jaw length	40.6—44.8	43.5	1.4

Horizontal eye diameter	27.3—37.0	29.2	2.7
Interorbital width	36.4—41.2	39.1	1.4

Neotropical Ichthyology

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Ethical statement

As recommended by the Brazilian Council of Animal Experimentation Control, we ask you to provide the protocol numbers authorizing the research by the Animal Ethics Committees of your institution and the permit numbers or collection licenses authorizing field research.

E.g.: Experiments were approved by the Ethical Committee for Animal Use in Experiments of the Instituto Nacional de Pesquisas da Amazônia (CEUA number ###/year ###) and Collection Licenses of SISBIO number ####.

If your work did not require such permissions, state this explicitly. For manuscripts from countries other than Brazil, please provide the documentation required in the respective country.

Science Communication

NI has now a Science Communication Editor, which will be in charge of preparing press releases, social media posts and other promotional material for selected articles. If you prefer to produce such material yourself, please produce materials such as a cartoon, text, video, infographic or any other material during the peer-review period. It will be asked to you, in case of acceptance of your article, to be displayed on NI's website or other medias. Otherwise, I would like you authorize the journal to do it for you, if pertinent.

Author contributions and competing interests

This information is required at the time of article submission. Ensure that all authors and co-authors are aware and agree, as they will be included in the publication.

FORMATTING RULES

Please, be sure you have carefully read all the items below

FILE AND PAGE SETUP
Manuscript files must be in the DOC, DOCX or RTF formats. Do not lock or protect the file. Formats such as XLS, XLSX or PDF will NOT be accepted.

The document file cannot include headers, footers, or footnotes (except page number). Do not format text in multiple columns. Although no page limit is imposed, manuscripts should always be as concise as possible.

Text should be aligned to the left (except if otherwise mentioned), not fully justified, not indented by tab or space and not underlined. Do not hyphenate words at line breaks (though hyphens can be used in compound constructions, such as dorsal-fin rays, as appropriate).

All text must be Times New Roman font size 12, with 1.5 line spacing. Do not number lines. The font "symbol" can be used to represent the following characters: χ μ θ ω ε ρ τ Ψ υ ι ο π α σ δ Φ γ η φ κ λ ∋ ϖ β ν ≅ Θ Ω Σ Δ Φ. Spell out numbers from one to nine, except those that refer to numerical values, scale counts, and when referencing figures and tables. Also, spell out numbers that begin a sentence.

Abbreviations used in the text must be listed under Material and Methods; except for those in common use (***e.g.***, min, km, mm, kg, m, sec, h, ml, L, g). For measurements, use the metric system.

LANGUAGE

Text must be submitted in English. Avoid clichés, slang, and colloquial words or expressions such as "In the present study". If none of the authors are native English speakers, we recommend that you contract with a professional language editing and copyediting services or have the manuscript read by a native English speaking colleague prior to submission. Authors are free to choose any certified service, but Neotropical Ichthyology authors receive a discount from these two companies.

MANUSCRIPT FILE

TITLE

New taxa names should not appear in the title or abstract. Center the title and present it in boldface, without quotation marks, with sentence-style capitalization, and with subordinate taxa separated by ":". Titles must reflect the contents of the paper and use scientific names rather than vernacular names. Do not provide taxonomic authorship in the title. ***E.g.:***

A new species of loricariid catfish from the rio Ribeira de Iguape basin, Brazil (Ostariophysi: Siluriformes)

AUTHORS

As the submitting author will be responsible for completing information at submission, it is mandatory that all authors have reviewed, discussed, and agreed with the contents of the manuscript and the order of authorship prior to submission. All co-authors must have contributed substantially to all article steps.
Capitalize only the initial letters of authors' names. Do not abbreviate first name of authors and separate the names of the last two authors by "and". We encourage presenting the full middle names of the authors, except when the number of authors is more than four. In case of authors from different institutions, use superscript numerals to identify each one in regular font (not italics). Superscript numerals can also be used to identify multiple addresses for each individual author. For Hispanic surnames, insert a hyphen between the paternal and the maternal surname if the author wishes to be cited with both. ***E.g.:***

Heraldo Antônio Britski1, Naércio Aquino de Menezes1, Hernán Ortega2 and John Lundberg3

AUTHORS ADDRESSES

Full mailing addresses and a valid email of all authors must be provided, including institution name, ZIP codes, cities (no comma between ZIP and city), states and countries. For Brazilian and American states, use standard abbreviations preceded by comma, and always present the country name in English. Footnotes should not be used. List emails as part of the institutional address. When there is more than one author at a given institution, insert initials of each author name before their respective email address. Provide ORCIDs of all the authors and coauthors in the main text and of the submission author in the system. If any author is not registered yet, one must register in http://orcid.org/. Indicate the corresponding author by adding (corresponding author) after the ORCID. Do not use period. ***E.g.***:

[1] Seção de Peixes, Museu de Zoologia da Universidade de São Paulo, Av. Nazaré, 481, Ipiranga, 04263-000 São Paulo, SP, Brazil. (HAB) heraldo@usp.br, ORCID http://orcid.org/0000-0002-5593-9651 (corresponding author), (NAM) naercio@usp.br, ORCID https://orcid.org/0000-0002-9634-6051
[2]Departamento de Ictiología, Museo de Historia Natural, Universidad Nacional Mayor de San Marcos, Av. Arenales 1256, Apartado, 14-0434 Lima, Peru. hortega.musm@gmail.com, ORCID http://orcid.org/0000-0002-4396-2598
[3]Department of Ichthyology, The Academy of Natural Sciences of Drexel University, 1900 Benjamin Franklin Parkway, 19103-1195 Philadelphia, PA, USA. mhs58@drexel.edu, ORCID https://orcid.org/0000-0002-5671-9933

TEXT

The body of text may employ named heading and subheadings, which cannot be lettered or numbered. All sections are left justified, except the primary headings, which should appear centered in small caps and bold font. Employ the following heading, in the cited order:

Abstract

Abstracts must appear as a single paragraph with fewer than 200 words in English. Do not include new taxa names, authorship or references. Do not indent. Remember that this is the first piece of your article that will be viewed by each potential reader. Include information showing the importance and relevance of your article to encourage the reader to read your entire paper.

Resumo or **Resumen**

Provide a concise (maximum 200 words) and accurate Portuguese or Spanish translation of the English abstract.

Keywords, Palavras-chave ou Palabras clave

Provide up to five capitalized keywords in English, in alphabetic order and separated by commas. Do not use words already contained in the title, nor Neotropical (which appears in the name of the journal). If the article provides an identification key, include that as keyword in the English and translated lists. According to the language you provide the Resumo or Resumen, choose present Palavras-chave or Palabras clave. The order of them also is arranged alphabetically, and then the sequence of the words might differ from those in English. ***E.g.***:

Keywords: Conservation, Identification key, Ostariophysi, Taxonomy
Palavras-chave: Chave de identificação, Conservação, Ostariophysi, Taxonomia **OR**
Palabras clave: Clave de identificación, Conservación, Ostariophysi, Taxonomía

Running Head

Provide a suggested running head of up to 50 characters. It must concisely reflect the content of the article. Do not include vernacular names or species authorship here. ***E.g.***:

New *Astyanax* species from the rio Ribeira de Iguape

Introduction

Provide taxonomic authorship in the first appearance of species names in the text. See Nomenclature Section below for further instructions.

Material and Methods

If two heading levels are used, follow this format:

Sampling sites. Collections were carried out in…
Statistical analyses. Data were analyzed…
In case of listing Examined Material, provide a list of institutional acronyms in Material and Methods section OR a reference to a published paper with a list of acronyms in Material and Methods. Also, reference(s) for species identification and classification used must be provided.

Results

Do not unite Results and Discussion as a unique section.

Discussion

Do not provide a separate Conclusion section. However, we encourage highlighting conclusions as the last paragraph(s) of the Discussion.

Acknowledgments

Acknowledgments are optional but encouraged. If included, they must be concise and include both first and last names of persons. If you wish to provide the institutions of people thanked, use abbreviate names for institutions, which the full name has been provided in the Material and Methods. Names of sponsor institutions should be listed in their original spelling and not translated to English. Collections permit numbers and approvals of ethics committees can be listed here OR in the Material and Methods section.

References

See detailed rules bellow.

VOUCHER SPECIMENS
Voucher specimens of all species examined must be deposited in a recognized scientific research collection, even in studies focusing on a single well-known species. A list of catalog numbers of voucher specimen(s) must be furnished in all manuscripts.

GENETIC SEQUENCES
Authors must deposit genetic sequence data used for phylogenetic or other analyses in a public online depositary, and include a Table or Appendix in their manuscript with the following information: museum acronym and catalog number; online depository name (*e.g.* BOLD, GenBank); depository accession number (it is appropriate to use "pending" prior to acceptance of a manuscript, but following acceptance of a manuscript, these numbers must be made available as a condition for final publication); the marker gene/locus (e.g. CO1, cytB, RAG2).

NOMENCLATURE
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 al 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 tags at the beginning of the word and at the end. ***E.g.:***

Reproductive biology of two species of Mugil: M. curema and M. liza **=**
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 Iguaçu. 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: Dialeto 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, 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

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

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 depositary 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 depositary accession number. Studies that include multiple sequences for phylogenetic or other analyses should list these along with the depositary 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, 21º11'35"S 49º07'22"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 Rio, Parana Rio, Paraguay Rio) 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.