

PONTIFÍCIA UNIVERSIDADE CATÓLICA DO RIO GRANDE DO SUL

FACULDADE DE BIOCÊNCIAS

PROGRAMA DE PÓS-GRADUAÇÃO EM ZOOLOGIA

**REVISÃO TAXONÔMICA DAS ESPÉCIES DE *Rineloricaria* (SILURIFORMES:  
LORICARIIDAE) DO PERU**

**Daniela Núñez Rodríguez**

**Orientador: Dr. Roberto E. Reis**

**DISSERTAÇÃO DE MESTRADO**

**PORTO ALEGRE - RS - BRASIL**

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En honor a esa fuerza y valentía que los hizo  
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iluminan.*



*Hombres  
Sobre hombros  
De otros hombres...*

*Hombres  
con hombros  
para otros hombres...*

*Hombros,  
hombres,  
hombros...*

*Torres.*

*Un día ya no habrán estrellas lejanas,  
Ni perdidos horizontes.*

***León Felipe***

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## Abstract

The genus *Rineloricaria* Bleeker (1862) currently comprises 65 valid species that are distributed from Panama in Central America to northern Argentina. Three *Rineloricaria* species are currently recorded from Peru: *Rineloricaria lanceolata*, with type locality in the district of "Xeberos" in the department of Loreto, *R. morrowi* and *R. wolfei* both species with type locality in the río Ucayali basin in the district Contamana. Peruvian *Rineloricaria* species are reviewed based on external morphology, osteological features and color pattern. Six species are recognized. The three species were validated and *Rineloricaria morrowi* and *R. wolfei* were redescribed. *Rineloricaria lanceolata* is differentiated by having irregular dark blotches on all fins and two parallel bands on dorsum of head, by having a higher number of post-rostral plates and the anterior ventral margin of pectoral girdle straight; its distribution mainly comprises río Madre de Dios, río Amazonas and río Ucayali basins and their tributaries. *Rineloricaria morrowi* is distinguished by having five longitudinal lateral plate series, a dark line along both sides on ventral area of caudal peduncle, a dark spot at anal-fin unbranched ray base and a dark band at the distal region of the caudal; its distribution is restricted to the río Amazonas basin and tributaries. *Rineloricaria wolfei*, has four longitudinal lateral plate series, triangular head profile and wide dark brown stripe covering the first half of the caudal fin, fifth ceratobranchial pharyngeal tooth plate wider with globular shape (*vs.* fifth ceratobranchial pharyngeal tooth plate narrow with triangular shape), a set of plates between insertions of pelvic fins anterior to the posterior complex irregularly arranged in more than one row (*vs.* arranged in one row). Additionally, three new species were described: *Rineloricaria* sp. "Loreto", distinguished by a strongly convex snout profile with naked snout tip area reduced to a narrow line and type locality at río Morona basin in Loreto State. *Rineloricaria* sp. "Madre de Dios" is differentiated from all congeners except from *R. fallax* by having a conspicuous dark brown spot on nuchal plate (*vs.* nuchal plate without dark brown spot); it differs from *R. fallax* by having four longitudinal lateral plate series (*vs.* five longitudinal lateral plate series), having type locality in the quebrada Wiratkentsa in Loreto State. *Rineloricaria* sp. "Pasco" is distinguished by having the naked area of snout tip as a globular protuberance and a narrow body, with type locality in Puerto Bermudez at Pasco State. Illustrations of species and osteological characters are presented. The diagnostic characters of the genus are discussed, as well as geographical distribution of *Rineloricaria* species occurring in Peru and its relationship with highly diverse areas in the Neotropics.

## Resumo

O gênero *Rineloricaria* Bleeker (1862) atualmente inclui 65 espécies válidas distribuídas desde o Panamá na América Central até o norte da Argentina. O Peru atualmente registra três espécies deste gênero: *Rineloricaria lanceolata*, com localidade tipo no distrito de “Xeberos” no departamento de Loreto, *R. morrowi* e *R. wolfei* ambas com localidade tipo na bacia do rio Ucayali no distrito de Contamana. As espécies de *Rineloricaria* que ocorrem no Peru foram revisadas com base em características morfológicas externas assim como também osteológicas e o padrão de colorido, sendo reconhecidas seis espécies. As três espécies registradas foram validadas e *Rineloricaria morrowi* e *R. wolfei* foram redescritas. *Rineloricaria lanceolata* é diferenciada por possuir manchas escuras irregulares em todas as nadadeiras e duas faixas paralelas na região dorsal da cabeça, um maior número de placas pós-rostrais e pela margem anterior do cleitro reta; sua distribuição compreende principalmente as bacias do rio Madre de Dios, rio Amazonas e rio Ucayali e seus tributários. *Rineloricaria morrowi* se diferencia de seus congêneres por ter cinco séries longitudinais de placas laterais e coloração ventral lateral do pedúnculo caudal, uma mancha escura na base do raio indiviso da nadadeira anal e uma banda escura na região distal da nadadeira caudal; sua distribuição está restrita a bacia do rio Amazonas e tributários. *Rineloricaria wolfei*, possui quatro séries longitudinais de placas laterais, perfil triangular da cabeça e uma barra marrom escura que cobre a primeira metade da nadadeira caudal, placas que se contatam com a margem anterior do complexo posterior de placas abdominais, entre a inserção das nadadeiras pélvicas, dispostas irregularmente ocupando mais de uma fileira (vs. placas organizadas em uma única fileira entre a inserção das nadadeiras pélvicas) e por possuir a placa dentígera ventral do quinto ceratobranquial expandida e com forma globular (vs. placa dentígera ventral do quinto ceratobranquial estreita e triangular). Adicionalmente foram descritas três novas espécies: *Rineloricaria* sp. “Loreto”, diferenciada pelo focinho fortemente convexo com região nua reduzida a uma linha e com localidade tipo na bacia do rio Morona no departamento de Loreto; *Rineloricaria* sp. “Madre de Dios” diferenciada de todos os seus congêneres exceto de *R. fallax* por possuir uma mancha marrom escura na placa nugal (vs. ausência de mancha na placa nugal) e com localidade tipo na quebrada Wiratkentsa no rio Maraón no departamento de Loreto; e *Rineloricaria* sp. “Pasco” diferenciada por possuir a ponta do focinho com região nua em forma de protuberância globular e corpo estreito, com localidade tipo na quebrada Ataz em Puerto Bermudez no departamento de Pasco. Ilustrações de todas as espécies e caracteres osteológicos analisados são apresentadas. Os caracteres diagnósticos do gênero são discutidos, como também a distribuição das espécies de *Rineloricaria* que ocorrem no Peru e sua relação com áreas de grande diversidade Neotropical.

## Apresentação

### **Taxonomia e diversidade: ordem Siluriformes e família Loricariidae**

Dentro da diversidade de peixes Neotropicais, a ordem Siluriformes esta representada por 37 famílias, 437 gêneros e 2735 espécies (Eschmeyer & Fong, 2014). Dentro desta classificação, a superfamília Loricarioidea, endêmica do Neotrópico, é o maior grupo de bagres neotropicais com uma filogenia bem estabelecida (Lundberg & Baskin, 1969; Schaefer & Lauder, 1986; Mo, 1991; de Pinna, 1992; Sullivan *et al.*, 2006) sendo Loricariidae o grupo mais derivado (Britto, 2003), com atualmente 869 espécies representa o grupo mais diverso entre todos os Siluriformes (Eschmeyer & Fong, 2014).

A divisão taxonômica de Loricarioidea inclui as famílias Astroblepidae, Callichthyidae, Loricariidae, Nematogenyidae, Scoloplacidae e Trichomycteridae (Lauder & Liem, 1983; Schaefer, 1987; de Pinna, 1998). A divisão taxonômica de Loricariidae proposta por Reis *et al.* (2006) inclui as subfamílias Delturinae, Hypoptopomatinae, Hypostominae, Lithogeneinae, Loricariinae e Neoplecostominae. O monofiletismo de Loricariinae (Bonaparte, 1831) foi testado utilizando caracteres morfológicos em Rapp Py-Daniel (1997) e Armbruster (2004) e dados moleculares em Montoya-Burgos (1998). A análise filogenética de Loricariinae mais recente proposta por Covain e Fisch-Muller (2007), aloca *Rineloricaria* como o grupo irmão de *Dasyloricaria*, e junto com *Spatuloricaria* e *Ixinandria* formam o grupo *Rineloricaria*.

### **Gênero *Rineloricaria***

*Rineloricaria* é um dos grupos de loricariídeos com maior riqueza. Incluindo atualmente 65 espécies, representa dentro da subfamília Loricariinae o grupo mais diverso e

sua distribuição compreende desde o sul da América Central até o norte da Argentina (Ferraris, 2003; Fichberg & Chamon, 2008; Ghazzi, 2008; Knaack, 2003; Rapp Py-Daniel & Fichberg, 2008; Rodriguez & Miquelarena, 2005; Rodriguez & Reis, 2008).

O gênero *Rineloricaria* foi originalmente descrito Bleeker em 1962, quem descreveu no mesmo ano outro gênero nomeado *Hemiloricaria*, sendo ambas as descrições pouco diferenciáveis. A sobreposição entre as descrições de *Hemiloricaria* e *Rineloricaria* tem levado a vários autores a alocar muitas das espécies de *Rineloricaria* dentro de *Hemiloricaria* (Isbrücker *et al.*, 2001; Ferraris, 2007; Rodriguez & Reis, 2008; Vera-Alcaraz, 2008).

Os caracteres diagnósticos de *Rineloricaria* incluem o entalhe pós-orbital, a presença de pequenas papilas arredondadas no lábio inferior, e 7 a 15 dentes bilobados e mais longos no dentário do que no pré-maxilar. O padrão de colorido é caracterizado por ter faixas de coloração escuras na superfície dorsal do corpo e não continuadas na região ventral (Rodriguez, 2003) ou pontos escuros irregularmente distribuídos. Ventralmente, a região abdominal do corpo está geralmente coberta de placas, incluindo uma placa pré-anal poligonal que usualmente faz contato com outras três placas anteriormente (Isbrücker & Nijssen, 1992).

O dimorfismo sexual se apresenta nos machos adultos pela presença de odontódeos nas margens laterais da cabeça, na área dorsal das nadadeiras peitorais e de forma variável na região pré-dorsal. As fêmeas são caracterizadas pela ausência desta característica (Fichberg & Chamon, 2008; Isbrücker & Nijssen, 1992; Rapp Py-Daniel & Cox-Fernandes, 2005).

A grande diversidade do gênero se reflete na taxonomia e filogenia não completamente resolvidas, embora o grupo tenha sido recuperado como monofilético nas filogenias propostas por Fichberg (2008) e por Costa (2013). Dentro da problemática taxonômica é discutida a validade de *Hemiloricaria*, entretanto, as duas filogenias propostas consideraram unicamente o gênero *Rineloricaria* como válido.

No Peru, as espécies de *Rineloricaria* são conhecidas comumente como “Shitari”, e pelo seu tamanho médio e seu colorido particular, estes peixes usualmente fazem parte de atividades de comércio de peixes ornamentais. A riqueza ictiológica no Peru é representada por 1864 espécies, sendo os Siluriformes o segundo grupo mais diverso depois dos Characiformes. Loricariidae por sua vez, inclui 125 espécies (Ortega *et al.*, 2012). Atualmente estão registradas três espécies de *Rineloricaria* que ocorrem no Peru: *Rineloricaria lanceolata* Günther (1868), *R. morrowi* Fowler, 1940 e *R. wolfei* Fowler, 1940. A distribuição geográfica destas espécies abrange as bacias hidrográficas do rio Amazonas, rio Inambari, rio Las Piedras, rio Madre de Dios, rio Tahuamanu, rio Tambopata e rio Tigre.

A descrição de *Rineloricaria lanceolata* Günther (1868) foi inicialmente como *Loricaria lanceolata* e baseada em um único exemplar. Tem como localidade tipo o distrito de “Xeberos” (provavelmente agora conhecido como Jeberos). É principalmente diferenciada pelo padrão de colorido escuro do corpo, duas faixas paralelas que atravessam as órbitas desde a ponta do focinho até a borda anterior da placa nugal e manchas irregulares em todas as nadadeiras (vs. coloração em faixas transversais marrom escuras com ou sem pontos marrom escuras entre as faixas). Entre as espécies que ocorrem no Peru, *R. lanceolata* se diferencia por possuir um maior número de placas pós-rostrais e pela



margem anterior do cleitro reta. Além do Peru, possui ampla distribuição, incluindo as bacias do rio Amazonas, Araguaia, Madeira, Paraná, Purus e Ucayali (Rodriguez & Miquelarena, 2002; Vera-Alcaraz *et al.*, 2012).

*Rineloricaria morrowi* difere de seus congêneres, exceto de *R. cacerensis* por possuir uma banda marrom escura nas margens laterais na região ventral do pedúnculo caudal. Se distingue de *R. cacerensis* por ter uma região nua estreita entre a série de placas médio-ventral e a série de placas abdominais laterais (*vs.* região nua ampla) e de *R. parva* por possuir unicamente o primeiro raio superior da nadadeira caudal como um filamento estendido (*vs.* primeiro raio superior e inferior como um filamento estendido) e cinco séries longitudinais de placas laterais (*vs.* quatro séries de placas). Entre as espécies peruanas, *R. morrowi* é distinguida de *R. lanceolata*, *Rineloricaria* sp. “Loreto”, *Rineloricaria* sp. “Madre de Dios”, *Rineloricaria* sp. “Pasco” e *R. wolfei* pela presença de cinco séries longitudinais de placas laterais (*vs.* quatro séries de placas laterais). Sua distribuição geográfica abrange as bacias do rio Nanay, rio Aucayacu e rio Ucayali.

*Rineloricaria wolfei* se distingue de todos os seus congêneres, exceto *R. phoxocephala* por possuir uma banda marrom escura na base da nadadeira caudal cobrindo a primeira metade da nadadeira caudal. Difere de *R. phoxocephala* por ter quatro séries de placas laterais, estando a série médio-dorsal ausente (*vs.* cinco séries de placas estando a série médio-dorsal presente). Entre as espécies peruanas, é diferenciada por ter as placas que se contatam com a margem anterior do complexo posterior de placas abdominais (entre a inserção das nadadeiras pélvicas) dispostas irregularmente ocupando mais de uma fileira (*vs.* placas organizadas em uma única fileira entre a inserção das nadadeiras pélvicas) e por possuir a placa dentígera ventral expandida e com forma globular (*vs.* placa dentígera

ventral estreita e triangular). Sua distribuição abrange o rio Juruá e rio Madeira, e nas bacias do Peru inclui o rio Aucayacu, rio Corrientes, rio Nanay e tributários do rio Ucayali.

Muitos dos exemplares depositados em coleções e com registro em bacias do Peru, estão identificados principalmente como *Rineloricaria lanceolata* e *R. morrowi* ou em sua maioria, não possuem informação do nome específico. Esta dissertação tem como objetivo conduzir uma revisão taxonômica das espécies de *Rineloricaria* que ocorrem nas bacias hidrográficas do Peru, fazendo uso de uma análise morfológica externa e osteológica, assim como também estabelecer as áreas de ocorrência das mesmas. Os resultados obtidos desta análise permitiram descrever três novas espécies e validar as espécies já descritas, incrementando os caracteres diagnósticos e descritivos.

Foram descritas três novas espécies: *Rineloricaria* sp. “Loreto” se diferencia de todos os seus congêneres por possuir a área nua da ponta do focinho reduzida a uma linha estreita não chegando ao primeiro poro do canal infraorbital (vs. área nua da ponta do focinho alongada, oval ou como uma protuberância globular podendo ou não chegar ou ultrapassar o primeiro poro do canal infraorbital). Entre as espécies que ocorrem no Peru, se diferencia por ter a margem anterior ventral do cleitro curva e a distância entre a inserção da nadadeira peitoral e o ponto mais alto do cleitro igual a um terço da distância total entre a inserção das nadadeiras peitorais (vs. margem anterior ventral do cleitro reta em *Rineloricaria* sp. “Pasco” e *R. lanceolata*; e a distância entre a inserção da nadadeira peitoral e o ponto mais alto do cleitro igual a metade da distância total entre a inserção das nadadeiras peitorais em *R. wolfei* e *Rineloricaria* sp. “Pasco”). *Rineloricaria* sp. “Loreto” se diferencia de *Rineloricaria* sp. “Madre de Dios” e *Rineloricaria* sp. “Pasco” por possuir o focinho convexo com cristas na região dorsal da cabeça desde a margem posterior da

órbita até a margem anterior da placa nugal (*vs.* ausência de cristas). Sua distribuição está restrita a os tributários da bacia do río Amazonas e río Marañón.

*Rineloricaria* sp. “Madre de Dios” se diferencia de todos os seus congêneres por ter uma mancha oval marrom escura na placa nugal (*vs.* ausência de mancha na placa nugal). Entre as espécies peruanas, se diferencia de *R. lanceolata*, *Rineloricaria* sp. “Loreto”, *Rineloricaria* sp. “Pasco” e *R. wolfei* por ter a margem anterior ventral do cleitro curva e a distância entre a inserção da nadadeira peitoral e o ponto mais alto do cleitro igual a um terço da distância total entre a inserção das nadadeiras peitorais (*vs.* margem anterior ventral do cleitro reta em *Rineloricaria* sp. “Pasco” e *R. lanceolata*; e a distância entre a inserção da nadadeira peitoral e o ponto mais alto do cleitro igual a metade da distância total entre a inserção das nadadeiras peitorais em *R. wolfei* e *Rineloricaria* sp. “Pasco”). Geográficamente encontra-se distribuída nas bacias do río Amazonas, río Nanay, río Ucayali e tributários.

*Rineloricaria* sp. “Pasco” se distingue de todos os seus congêneres exceto de *R. malabarbai* e *R. strigilata* por possuir a região nua da ponta do focinho como uma protuberância globular sem atingir o nível do primeiro poro do canal infraorbital (*vs.* região nua do focinho alongada ou oval podendo ou não atingir o primeiro poro do canal infraorbital). Se diferencia de *R. malabarbai* por ter o abdômen completamente coberto por placas e maior largura do corpo ao nível da inserção da nadadeira dorsal de (*vs.* região abdominal quase nua com apenas as series longitudinais de placas laterais presentes, e maior largura do corpo no nível do cleitro) e de *R. strigilata* pela coloração da superfície dorsal do corpo coberta com pontos marrom escuro dispostos entre as bandas de coloração (*vs.* superfície dorsal do corpo coberto com manchas vermiculares marrom escuras). Entre

as espécies peruanas, *Rineloricaria* sp. “Pasco” se diferencia também por ter a margem anterior ventral do cleitro reta e a distância entre a inserção da nadadeira peitoral e o ponto mais alto do cleitro igual a metade da distância total entre a inserção das nadadeiras peitorais (vs. margem anterior ventral do cleitro curva em *R. morrowi*, *Rineloricaria* sp. “Loreto”, *Rineloricaria* sp. “Madre de Dios” e *R. wolfei*; e a distância entre a inserção da nadadeira peitoral e o ponto mais alto do cleitro igual a um terço da distância total entre a inserção das nadadeiras peitorais em *R. lanceolata*, *R. morrowi* and *Rineloricaria* sp. “Loreto”). Sua distribuição ocupa principalmente río Palcazú, río Pachitea e tributários.

A estrutura do trabalho responde ao formato de artigo científico proposto pelo programa de Pós-Graduação em Zoologia da PUCRS. É constituído por um único capítulo e esta redigido de acordo as instruções fornecidas pela revista Neotropical Ichthyology, publicada pela Sociedade Brasileira de Ictiologia, para a qual este artigo será submetido após a aprovação da dissertação.

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## Taxonomic revision of the *Rineloricaria* species (Siluriformes: Loricariidae)

### from Peru

<sup>1</sup> Daniela L. Núñez

<sup>1</sup> Laboratório de Sistemática de Vertebrados, PUCRS, Av. Ipiranga, 6681, prédio 40.

90619-900 Porto Alegre, RS. E-mail: danunez.ro@gmail.com

### Abstract

The genus *Rineloricaria* Bleeker (1862) currently comprises 65 valid species that are distributed from Panama in Central America to northern Argentina. Three *Rineloricaria* species are currently recorded from Peru: *Rineloricaria lanceolata*, with type locality in the district of "Xeberos" in the department of Loreto, *R. morrowi* and *R. wolfei* both species with type locality in the río Ucayali basin in the district Contamana. Peruvian *Rineloricaria* species are reviewed based on external morphology, osteological features and color pattern. Six species are recognized. The three species were validated and *Rineloricaria morrowi* and *R. wolfei* were redescribed. *Rineloricaria lanceolata* is differentiated by having irregular dark blotches on all fins and two parallel bands on dorsum of head, by having a higher number of post-rostral plates and the anterior ventral margin of pectoral girdle straight; its distribution mainly comprises río Madre de Dios, río Amazonas and río Ucayali basins and their tributaries. *Rineloricaria morrowi* is distinguished by having five longitudinal lateral plate series, a dark line along both sides on ventral area of caudal peduncle, a dark spot at anal-fin unbranched ray base and a dark band at the distal region of the caudal; its distribution is restricted to the río Amazonas basin and tributaries. *Rineloricaria wolfei*, has four longitudinal lateral plate series, triangular head profile and wide dark brown stripe covering the first half of the caudal fin, fifth ceratobranchial pharyngeal tooth plate wider with globular shape (*vs.* fifth ceratobranchial pharyngeal tooth plate narrow with triangular shape), a set of plates between insertions of pelvic fins anterior to the posterior complex irregularly arranged in more than one row (*vs.* arranged in one row). Additionally, three new species were described: *Rineloricaria* sp. "Loreto", distinguished by a strongly convex snout profile with naked snout tip area reduced to a narrow line and type locality at río Morona basin in Loreto State. *Rineloricaria* sp. "Madre de Dios" is differentiated from all congeners except from *R. fallax* by having a conspicuous dark brown spot on nuchal plate (*vs.* nuchal plate without dark brown spot); it differs from *R. fallax* by having four longitudinal lateral plate series (*vs.* five longitudinal lateral plate series), having type locality in the quebrada Wiratkentsa in Loreto State. *Rineloricaria* sp. "Pasco" is distinguished by having the naked area of snout tip as a globular protuberance and a narrow body, with type locality in Puerto Bermudez at Pasco State. Illustrations of species and osteological characters are presented. The diagnostic characters of the genus are discussed, as well as geographical distribution of *Rineloricaria* species occurring in Peru and its relationship with highly diverse areas in the Neotropics.

## Resumo

O gênero *Rineloricaria* Bleeker (1862) atualmente inclui 65 espécies válidas distribuídas desde o Panamá na América Central até o norte da Argentina. O Peru atualmente registra três espécies deste gênero: *Rineloricaria lanceolata*, com localidade tipo no distrito de “Xeberos” no departamento de Loreto, *R. morrowi* e *R. wolfei* ambas com localidade tipo na bacia do rio Ucayali no distrito de Contamana. As espécies de *Rineloricaria* que ocorrem no Peru foram revisadas com base em características morfológicas externas assim como também osteológicas e o padrão de colorido, sendo reconhecidas seis espécies. As três espécies registradas foram validadas e *Rineloricaria morrowi* e *R. wolfei* foram redescritas. *Rineloricaria lanceolata* é diferenciada por possuir manchas escuras irregulares em todas as nadadeiras e duas faixas paralelas na região dorsal da cabeça, um maior número de placas pós-rostrais e pela margem anterior do cleitro reta; sua distribuição compreende principalmente as bacias do rio Madre de Dios, rio Amazonas e rio Ucayali e seus tributários. *Rineloricaria morrowi* se diferencia de seus congêneres por ter cinco séries longitudinais de placas laterais longitudinais e coloração ventral lateral do pedúnculo caudal, uma mancha escura na base do raio indiviso da nadadeira anal e uma banda escura na região distal da nadadeira caudal; sua distribuição está restrita a bacia do rio Amazonas e tributários. *Rineloricaria wolfei*, possui quatro séries longitudinais de placas laterais longitudinais, perfil triangular da cabeça e uma barra marrom escura que cobre a primeira metade da nadadeira caudal, placas que se contactam com a margem anterior do complexo posterior de placas abdominais, entre a inserção das nadadeiras pélvicas, dispostas irregularmente ocupando mais de uma fileira (vs. placas organizadas em uma única fileira entre a inserção das nadadeiras pélvicas) e por possuir a placa dentígera ventral do quinto ceratobranquial expandida e com forma globular (vs. placa dentígera ventral do quinto ceratobranquial estreita e triangular). Adicionalmente foram descritas três novas espécies: *Rineloricaria* sp. “Loreto”, diferenciada pelo focinho fortemente convexo com região nua reduzida a uma linha e com localidade tipo na bacia do rio Morona no departamento de Loreto; *Rineloricaria* sp. “Madre de Dios” diferenciada de todos os seus congêneres exceto de *R. fallax* por possuir uma mancha marrom escura na placa nugal (vs. ausência de mancha na placa nugal) e com localidade tipo na quebrada Wiratkentsa no rio Marañón no departamento de Loreto; e *Rineloricaria* sp. “Pasco” diferenciada por possuir a ponta do focinho com região nua em forma de protuberância globular e corpo estreito, com localidade tipo na quebrada Ataz em Puerto Bermudez no departamento de Pasco. Ilustrações de todas as espécies e caracteres osteológicos analisados são apresentadas. Os caracteres diagnósticos do gênero são discutidos, como também a distribuição das espécies de *Rineloricaria* que ocorrem no Peru e sua relação com áreas de grande diversidade Neotropical.

## Introduction

The Siluriformes, or catfishes, are represented by 5761 valid species worldwide, 2735 of which are distributed in the Neotropics, currently being classified in 37 families and 437 genera (Eschmeyer & Fong, 2014). Within the catfishes, the superfamily Loricarioidea Peyer, 1922 is endemic to the Neotropics and currently comprises the families Astroblepidae, Callichthyidae, Loricariidae, Nematogenyidae, Scoloplacidae and Trichomycteridae (Lauder & Liem, 1983; Schaefer, 1987; de Pinna, 1998). Phylogenetic studies have suggested that the family Loricariidae is the most derived among Siluriformes (Britto, 2003). This family, currently with 869 species, is the most diverse among all Siluriformes (Eschmeyer & Fong, 2014). The great richness of this group may be the result of several adaptations that involve aspects of morphology, feeding habits and behavior (Gerking, 1994; Delariva & Augustine, 2001), allowing the colonization of different freshwater habitats, including lotic rivers in the Andes, stuarine lentic systems and all different kinds of waters from Amazon system (Covain & Fisch-Muller, 2007).

The taxonomic subdivision of the Loricariidae currently comprises the subfamilies Delturinae, Hypoptopomatinae, Hypostominae, Lithogeneinae, Loricariinae and Neoplecostominae (Reis *et al.*, 2006). In 1979, Isbrücker proposed the subdivision of subfamily Loricariinae into four tribes: Acestridiini, Farlowellini, Harttiini and Loricariini. In the same publication, six subtribes were considered among the Loricariini: Hemiodontichthyina, Loricariina, Loricariichthyina, Planiloricariina, Reganellina and Rineloricariina, and within Harttiini two subtribes: Harttiina and Metaloricariina.

Later, Rapp Py-Daniel (1997), based on morphological characters, demonstrated the monophyly of Loricariinae and of two of the tribes proposed by Isbrücker (1979), Harttiini

and Loricariini. The monophyly of Loricariinae have also been tested by Montoya-Burgos *et al.* (1998) using molecular data, and by Armbruster (2000, 2004) and Reis *et al.*, (2006) using phenotypic characters. The phylogenetic analysis of the Loricariinae by Covain & Fisch-Muller (2007) divided the Loricariini into two major groups, the *Loricariichthys* group (*Furcodontichthys* ((*Limatulichthys*, *Pseudoloricaria*), (*Hemiodontichthys*, *Loricariichthys*))) and a second group subdivided into the Pseudohemiodon group (*Reganella*, (((*Dentectus*, *Planiloricaria*), (*Pyxiloricaria*, *Pseudohemiodon*)), (*Rhadinoloricaria*, (*Apistoricaria*, *Crossoloricaria*))), *Rineloricaria* group (*Spatuloricaria*, (*Dasylicaria*, *Rineloricaria*)) and *Loricaria* group ((*Loricaria*, (*Paraloricaria*, (*Brochiloricaria*, *Ricola*)))). However, the results of the *Rineloricaria* group and *Loricaria* group appears inconsistent with previous morphological studies, placing *Ixinandria* within the Hartiini, and *Spatuloricaria* within the *Rineloricaria* group instead within the *Loricaria* group.

The type species of the genus *Rineloricaria* was originally described as *Loricaria lima* by Kner in 1853. However, it wasn't until 1862 that Bleeker described *Rineloricaria* as a new genus, changing *Loricaria lima* to *Rineloricaria lima* and naming it as the type species. In the same year, Bleeker published another new genus description and named *Hemiloricaria* assigning *Hemiloricaria caracasensis* Bleeker, 1862 as type species. Later studies sustained the differences between *Rineloricaria* and *Hemiloricaria* by the presence of two crests on nuchal plate (*vs.* nuchal plate without crests), insertion of the dorsal fin posterior to the pelvic-fin origin (*vs.* insertion of dorsal fin anterior to the pelvic-fin origin), and a small pre-anal plate (*vs.* wider pre-anal plate; Rodriguez & Reis, 2008). However, despite the differences pointed above, the overlap between the descriptions of

*Hemiloricaria* and *Rineloricaria* had led several authors to consider some *Rineloricaria* species as part of *Hemiloricaria* (Isbrücker *et al.*, 2001; Ferraris, 2007; Vera-Alcaraz, 2008). Two recent phylogenetic studies recovered *Rineloricaria* as a monophyletic group, one based on 182 morphological characters using 36 species in the ingroup (Fichberg, 2008), and the other using molecular characters and 35 species of *Rineloricaria* (Costa, 2013). Although the relationships between the species of *Rineloricaria* have not been completely solved to date and most of the species remain as a polytomy, in both phylogenies *Hemiloricaria* was synonymized with *Rineloricaria*.

Peruvian ichthyological diversity includes 1864 species, where Siluriformes are represented by 393 species making it the second richest group after Characiformes. Within this group, the family Loricariidae is composed by 125 species arranged in 36 genera (Ortega *et al.*, 2012). Peru comprises many areas of high species richness, being the Amazonian plain the highest diverse area: Yavari River basin with 360 species, Peru-Ecuador Pastaza River basin with 312 species, Ampiyacu-Apayacu-middle Putumayo River Basins with 289 species, Madre de Dios River basin with 287 species, Napo River basin with 242 species, Tambopata-Candamo area with 232 species and Manu National Park with 210 species (Barthem *et al.*, 2003; Chang, 1998; Hidalgo & Olivera, 2004; Ortega, 1996; Ortega *et al.*, 2003; Willink *et al.*, 2005).

The diversity of *Rineloricaria* in Peruvian basins comprises three recognized species, *R. lanceolata* (Günther, 1868), *R. morrowi* Fowler, 1940, and *R. wolfei* Fowler, 1940, although some specimens were mistakenly identified as *Rineloricaria konopickyi* Steindachner, 1879, and registered in the checklist published by Ortega *et al.* (2012).

*Rineloricaria lanceolata* was first described by Günther (1868) in *Loricaria*, based on a single specimen with an apparently faded coloration. Posteriorly, Regan (1904) proposed *Rhineloricaria* (misspelled name introduced by Berg (1895)) as a subgenus of *Loricaria*, and described the coloration pattern based on the holotype and two additional specimens, as dorsal surface with two dark bands running through each side of snout and crossing the eye, dorsal fin blackish with a light area at base and at posterior half, pectoral, pelvic and anal fins blackish with light areas at base, and caudal fin dark at base and posterior half. Fowler (1940), using the correct spelling, raised *Rineloricaria* to the generic level and considered *R. lanceolata* within this genus. Isbrücker (1973), using specimens from Brazil, Bolivia, Ecuador and Guyana, redescribed the species and provided teeth illustration and sexual dimorphism differences. Most recently, Vera-Alcaraz *et al.* (2012) redescribed *Rineloricaria lanceolata* as part of a taxonomic review of the genus in the Paraguay River basin, and characterized it by having four longitudinal lateral plate series in longitudinal rows below the dorsal fin, dimorphic odontodes on the dorsum of head and predorsal region, and all fins with a broad dark band running parallel to fin rays. The type locality of *R. lanceolata* is at district "Xeberos" (probably the district now known as Jeberos, in the department of Loreto) and it is widely distributed across the Amazonas, Araguaia, Madeira, Paraguay, Parana, Purus and Ucayali River basins and tributaries (Rodriguez & Miquelarena, 2002; Vera-Alcaraz *et al.*, 2012).

Fowler (1940), in his publication "A collection of fishes obtained by Mr. William C. Morrow in the Ucayali River basin, Peru" three species of *Rineloricaria* were described, although *R. petleyi* was later established as a synonym of *Limatulichthys griseus* (Eigenmann, 1909). *Rineloricaria morrowi* and *R. wolfei* have the same type locality at

Contamana, in the Ucayali River basin. *Rineloricaria morrowi* was characterized by having the upper lip smooth and papillate, eight bifid teeth above and below, three predorsal scutes, two lateral keels, 30+1 lateral axial plates series, six dark brown bands on back, anal-fin membranes hyaline with a subterminal blotch and little spots, caudal fin with a hind border and base broadly blackish. At the same time, *R. wolfei* was described as having lower lip broad, eight bifid teeth above and ten bifid teeth below, 29+1 longitudinal lateral plate series, five dark brown bands on dorsal surface, dorsal and caudal fins very pale brown with some faint spots, a dark blotch at base of caudal and a smaller one close to the inner end of lower lobe.

In the present study a taxonomic review of *Rineloricaria* species occurring in Peruvian river basins is conducted, redescribing *R. morrowi* and *R. wolfei*, adding osteological characters to the description of *R. lanceolata*, and describing three new species. Illustrations and distributional maps are also provided.

## **Materials and Methods**

The specimens examined in this study belong to the following institutions: American Museum of Natural History, New York (AMNH), Academy of Natural Science of the Drexel University, Philadelphia (ANSP), Natural History Museum, London (BMNH), California Academy of Sciences, San Francisco (CAS), Field Museum of Natural History, Chicago (FMNH), Instituto Nacional de Pesquisas da Amazônia, Manaus (INPA), Museu de Ciência e Tecnologia da Pontifícia Universidade Católica do Rio Grande do Sul, Porto Alegre (MCP), Museo de Historia Natural de la Universidad Nacional Mayor de San Marcos, Lima (MUSM), Museu Nacional, Rio de Janeiro (MNRJ), Museu Paraense Emílio Goeldi, Belém (MPEG), Museu de Zoologia da Universidade de São Paulo, São Paulo



(MZUSP), National Museum of Natural History, Washington (USNM). Visits to foreign collections were made and non-type material was requested on loan when necessary.

Measurements were made to the nearest 0.1 mm with a Mitutoyo calliper, and counts were made under a stereomicroscope on the left side of specimens whenever possible. The morphometric characters used are those of Rodriguez (2003) and Rodriguez & Miquelarena (2008). Counts follow Rodriguez & Reis (2008) and nomenclature of longitudinal lateral plate series follows Schaefer (1997). Definition of anterior, median and posterior abdominal plate complexes follows Isbrücker & Nijssen (1979), who consider the anterior complex as the small polygonal plates on pectoral girdle, the median complex as the middle-sized polygonal plates between the lateral abdominal plate series and the posterior complex as the pre-anal plate and the three polygonal plates that contact it anteriorly.

Measurements and counts (Fig. 1), with the corresponding abbreviation in parenthesis, are described as follows: Standard length (SL), measured from the anterior margin of the snout to the base of central triangular plate at the origin of the caudal fin. Predorsal length (PdL), measured from the anterior margin of the snout to the posterior margin of nuchal plate. Postanal length (PaL), measured from base of last anal-fin ray to the base of triangular central plates at caudal-fin origin. Dorsal-fin spine length (DL), measured from the insertion to the tip of the spine. Anal-fin unbranched ray length (AL), measured from the insertion to the tip of the spine. Pectoral-fin spine length (PL), measured from the insertion to the tip of the spine. Ventral-fin ray length (VL), measured from the insertion to the tip of the first ventral-fin ray. Uppermost caudal-fin ray length (UL), measured from the insertion to the tip of the uppermost caudal-fin ray. Lowermost caudal-fin ray length (LL), measured from the insertion to the tip of the lowermost caudal-fin ray. Head length (HL),

measured from the anterior margin of snout to the posterior margin of the parieto-supraoccipital process. Pectoral-pelvic distance (PPD), measured from the insertion of pectoral-fin spine to the insertion of the first pelvic-fin ray. Pelvic-anal distance (PAD), measured from the insertion of first pelvic-fin ray to the insertion of first anal-fin ray. Cleitrowidth (CD), transverse width measured immediately above both pectoral-fin spine insertions. Body depth (BD), vertical distance between insertion of the dorsal-fin spine to the ventral surface. Caudal peduncle depth (PD), measured at the lowest depth of caudal peduncle. Snout length (SnL), measured from the snout tip to the anterior border of orbit. Head depth (HD), measured as the vertical distance between posterior margin of supraoccipital bone and the ventral surface of head. Interorbital width (IOW), measured at the least distance between orbits. Orbital diameter (OD), measured of the greater horizontal diameter of the bony orbit without considering the orbital notch. Maximum orbital diameter (MOD), measured of the greater horizontal diameter of the bony orbit considering the orbital notch. Rostral border length (RL), area covered by plates between the anterior margin of upper lip and the naked area of the snout tip. Snout naked area width, measure of the horizontal distance (parallel to premaxillary teeth) of the snout tip naked area. Snout naked area depth, measure of the vertical distance (orthogonal to premaxillary teeth) of the snout tip naked area. Body measurements are expressed as percents of standard length and cephalic measurements are expressed as percents of head length. Counts include: number of premaxillary teeth, number of dentary teeth, number of medial serial plates, number of mid-ventral serial plates, number of coalescent plates, number of abdominal lateral plates (right and left) and number of plates series.

The osteological analysis was conducted on clear and stained specimens (c&s) prepared based on the technique of Taylor & Van Dyke (1985). The structures analyzed were chosen based mostly in the phylogenetic analysis conducted by Fichberg (2008) as was the case of suspensorium (Fig. 18), pectoral girdle (Fig.19), branchial arch (Fig. 20) and pelvic girdle. In order to complete previous osteological characterization of the species of *Rineloricaria*, other osteological structures were add, such as: post-rostral plates (set of plates between infraorbital bones and rostral plates) (Fig.17), infraorbital sensory canal, neurocranium, supraorbital sensory canal, suspensorium (Fig. 18), pectoral girdle (Fig.19), caudal skeleton (Fig. 21) and longitudinal lateral plate series (Fig. 22-23). Despite caudal skeleton, pelvic girdle and neurocranium were analyzed, they were not included on species diagnosis and their descriptions, given that no substantial differences were found.

Nomenclature of the osteological structures follows Schaefer (1987). Abbreviations used for osteological structures are described as follow: Anguloarticular (aa), anterohyal (ah), basibranchial (bb), branchiostegal (br), ceratobranchial (cb), cleithrum (cl), scapulo-coracoid (s-co), dentary (d), dorsal plate series (dp), epibranchial (eb), epural (ep), ethmoidal plates (pet), fifth ceratobranchial pharyngeal tooth plate (5 ph-b), facial plates (pfa), frontal (f), hypobranchial (hb), hypohyal (hh), hyomandibula (hy), hypurals 1 to 5 (hyp 1-5), infraorbital canal (ioc), infraorbitals 1 through 6 (io1-io6), lateropterygium (lpt), metapterygoid (mpt), maxila (mx), median plate series (mp), mid-dorsal plate series (mdp), mid-ventral plate series (mvp), nasal (na), nuchal plate (np), opercle (op), pectoral-fin spine (pfs), pectoral-fin radials (pfr), posterior process of the coracoid (ppc), posterohyal (ph), posterolateral latero-sensory canal (pl), premaxilla (pmx), preopercle (pop), preopercular latero-sensory canal (popc), compound pterotic (cpt), quadrate (q), parieto-

supraoccipital (p-so), sphenotic (sp), suprapreopercle (spop) , urohyal (uh), ventral plate series (vp).

Comparative material from southern Colombia (upper río Nercua in Leticia State), northern Bolivia (río Curiraba in Beni State), and western Brazil (rio Jurua and rio Madeira basins in Acre and Amazonas State) were also examined. Geographic coordinates and localities were obtained from the ichthyological collections listed above and plotted using Google Earth. Distribution maps were then generated using the Quantum Gis software (QGIS 1.7.4).

Morphometric data was analyzed with the software Statistica ver. 8.0. (Statsoft, Inc., [www.statsoft.com](http://www.statsoft.com)). Discriminant Analysis (DA) was used to assess variation in 20 morphometric characters among species. This statistical model provides a reclassification of the specimens according to morphology and indicates if any individual shows morphological features that can include them into another group, under the assumption that the data are normally distributed. In order to standardized the variance, all measurements used were logarithmically transformed. The variables lowermost uppermost caudal-fin ray length (LL) and uppermost caudal-fin ray length (UL) were excluded from the analyses because they are frequently broken in many specimens.

## **Results**

### ***Rineloricaria lanceolata* (Günther, 1868)**

#### **Fig. 2-3, Tables 1-2**

*Loricaria lanceolata* Günther, 1868a: 477 [holotype: BMNH 1867.6.13.79; type locality: affluent of the Aipena River, tributary to the Huallaga River, Marañón River basin,

Jeberos, Departamento de Loreto, Peru]. - Günther, 1868b: 235, Fig. 3 [holotype description; illustrations]. -Miranda Ribeiro, 1911: 128, Fig. 70 [key of species; senior synonym of *Loricaria teffeana*].

*Loricaria Rhineloricaria* [sic] *lanceolata*.- Regan, 1904: 277 [listed; description; distribution upper Amazonas River; key of species;].

*Loricaria hoehnei* Miranda Ribeiro, 1912: 11 [holotype: MNRJ 650; type locality: drainage of the Taquari River, Paraguay River basin, Coxim, Estado de Mato Grosso do Sul, Brazil].

*Rineloricaria lanceolata*.- Fowler, 1954: 116, Fig. 720 [listed; upper Amazonas River basin in Ecuador, Peru, and Bolivia; illustration based on the Günther, 1868b].- Isbrücker, 1973: 75 [redescription; sexual dimorphism; dentition illustration].- Isbrücker & Nijssen, 1976: 120 [listed; holotype measurements; comparison with *Rineloricaria heteroptera*]. -Isbrücker, 1978: 87 [listed]. -Isbrücker & Nijssen, 1992: 29, figs. 34-35 [sexual dimorphism; illustrations]. -Chernoff *et al.*, 2001: 146 [listed].- Ferraris, 2003: 342 [listed].- Knaack, 2003: 57 [illustration]. -Vera & Castillo, 2006: 56 [listed]. - Ghazzi & Oyakawa, 2007: 90 [listed].- Vera-Alcaraz *et al.*, 2012[redescription; measurements; dimorphism; distribution Amazonas, Paraguay and Araguaia river basins].

*Rineloricaria hoehnei*. -Isbrücker & Nijssen, 1976: 112 [listed]. -Isbrücker, 1978: 87 [listed]. -Ferraris, 2003: 342 [listed].

*Hemiloricaria hoehnei*. -Isbrücker *et al.*, 2001: 23 [listed]. - Isbrücker, 2001: 27 [listed]. - Ferraris, 2007: 245 [listed].

*Hemiloricaria lanceolata*. -Isbrücker *et al.*, 2001: 23 [listed].- Isbrücker, 2001: 27 [listed]. - Rodriguez & Miquelarena, 2002: 159 [measurements; illustration].- López *et al.*, 2003: 45 [listed]. -Menni, 2004: 79, 95 [listed]. -Ferraris, 2007: 246 [listed].

**Material examined:**

**Holotype.** BNHM 1867.13.79, 83.4 mm SL, Peru, Loreto State, río Amazonas at tributary of the río Huallaga near Jeberos, 3°41'52"S 69°32'23"W.

**Non-types material:**

Cusco State: MUSM 13676, 1, 92.5 mm SL, La Convención, Echarate, San Martin, quebrada Natsiringari, 11°28'16"S 72°25'14"W. MUSM 26511, 1, 60.4 mm SL, Quispicanchi, Camanti, cuenca Araza, at río Araza confluent with Nushiniscato, 13°12'40"S 70°33'31"W. MUSM 32316, 6, 65.5- 98.5 mm SL. La Convención, Echarate, cuenca Bajo Urubamba, native community Miaria, 10°38'60"S 73°10'55"W. Huanuco State: MUSM 19316, 1, 78.7 mm SL, Pachitea, Inca port, río Zungaroyacu, 9°22'20"S 75°0'36"W. Madre de Dios State: MUSM 4858, 1, 95.9 mm SL, Manu, Alto Madre de Dios, quebrada Salvación. MUSM 9098, 2, 73.9-108.0 mm SL, Tambopata, Puerto Maldonado, road to Laberinto, km 13 quebrada "El recreo", 12°29'42"S 69°16'51"W. MUSM 9880, 2, 92.0- 109.3 mm SL, Tambopata, río Tambopata at lago Tres Chimbadas, 12°34'0"S 68°56'60"W. MUSM 15354, 1, 88.0 mm SL, Manu, Manu National Park, checkpoint and monitoring Pakitza, río Manu, río Panagua, 11°58'0"S 71°19'60"W. MUSM 20334, 4, 50.5-67.6 mm SL, Las Piedras, quebrada Mavila. MUSM 21331, 1, 56.6 mm SL, Tahuamanu, río Yaverija at quebrada Primavera, 11°0'35"S 69°33'26"W. MUSM 23424, 2, 56.1 mm SL, Manú, río Amiguillos, 12°29'42"S 69°16'51"W. MUSM 23586, 3, 93.9-104.9 mm SL, Tambopata, río Madre de Dios, E 21, 11° 8'16"S 73°2'55"W. MUSM

23709, 1, 109.0 mm SL, Manú, río Los Amigos at mouth of río Amiguillos, 12°22'16"S 70°22'14"W. MUSM 24255, 2, 57.7-68.9 mm SL, Tambopata, río Madre de Dios, quebrada Loboyoc, 12°27'8"S 69°7'42"W. MUSM 24660, 1, 62.9 mm SL, Tahuamanu, río Tahuamanu, 11°23'48"S 69°31'33"W. MUSM 24889, 1, 59.3 mm SL, Tahuamanu, río Tahuamanu, río Muymanu, 11°38'23"S 69°12'38"W. MUSM 25436, 1, 61.1 mm SL, Tambopata, Mazuko, río Inambari at quebrada Buenqueme, 12°47'20"S 70°7'37"W. MUSM 36953, 1, 87.9 mm SL, Tambopata, río Las Piedras, small tributary at 1 km upstream Cachuela Trigoso, 12°4'21"S 69°54'20"W. Loreto State: MUSM 34744, 1, 63.6 mm SL, Alto Amazonas, Morona, río Amazonas, río Marañón, río Morona at quebrada Wiratkentsa, 3°10'8"S 77°21'46"W. MUSM 37496, 1, 86.3 mm SL, río Macusari, 11°8'54"S 73°2'43"W. MUSM 41248, 1, 75.0 mm SL, Datem del Marañón, río Morona at quebrada Situche, 3°3'17"S 77°26'57"W. MUSM 41287, 1, 80.7 mm SL, Datem del Marañón, río Morona, 3°2'39"S 77°22'44"W. Pasco State: MUSM 30210, 1, 75.2 mm SL, Oxapampa, Bermudez port, San Francisco de Pichanaz, río Pichis at playa río Apuricayali, , 10°2'1"S 74°56'44"W. Puno State: MUSM 11188, 3, 92.0-97.1 mm SL, Sandia, Reserved Area Tambopata Candamo, río Candamo at quebrada Pacal, 13°17'11"S 69°30'14"W. MUSM 11607, 1, 108.3 mm SL, Sandia, Reserved Area Tambopata Candamo, cuenca Ebehuabaeji at quebrada PR2, 13°42'7"S 69°29'33" W. MUSM 30210, 1, 75.2 mm SL, Oxapampa, Bermudez port, San Francisco de Pichanaz, río Pichis at playa río Apuricayali, , 10°2'1"S 74°56'44"W. San Martin State: MUSM 8526, 1, 99.3 mm SL, río Pucayacu at km 6 road to Juanjuí, 6°34'43"S 76°15'27"W. MUSM 20356, 1, 75.3 mm SL, Bellavista, quebrada Potochico, 7°04'09"S 76°34'56"W. Ucayali State: MUSM 21028, 1, 72.7 mm SL, La Convención, Sepahua, cuenca del Bajo Urubamba, native community Miaria at quebrada Kumarillo, 13°18'32"S 72°7'48"W. MUSM 31500, 1, 74.7 mm SL, Atalaya,

Sepahua, cuenca Del Bajo Urubamba, native community Miaria at quebrada Kumarillo, 11°8'54"S 73°2'43"W. MUSM 33526, 1, 96.7 mm SL, Coronel Portillo, cuenca Ucayali, río Sesha at quebrada Blanca, 8°14'13"S 73°51'6"W. MUSM 33953, 1, 71.9 mm SL, Padre Abad, Huacamayo, Est. 4, 11°11'54"S 72°58'48"W. MUSM 35766, 3, 93.9-104.9 mm SL, Atalaya, Sepahua at quebrada Huayashi, E 21, 11°8'16"S 73° 2'55"W. **Bolivia:** Beni State: USNM 305547, 6, 59.0-108.0 mm SL, Ballivián, río Curiraba, 10 km NE El Porvenir Biological Station, 40 Air km San Borja, 14°55'12''S. 66°16'48.0"W. USNM 305556, 1, 86.2 mm SL, Ballivián, 3 km above mouth of río Curiraba, tributary arroyo Aguas Negras, 12 km N El Porvenir Biological Station, 40 Air km E San Borja, 14°55'12.0"S 66°16'48.0"W. USNM 305843, 1, 70.7 mm SL, Beni Biological Station, campamento Trapiche Pozo, approx 1 h road to La Pascana. **Colombia:** Amazonas State: USNM 341950, 1, 66.6 mm SL, Leticia, 1960. **Brazil:** Mato Grosso State: USNM 326425, 3, 61.7-72.9 mm SL, stream 13 km from Nova Olimpia, 5 km before Assari. 14°30'0.1"S 57°40'12.0"W. **Ecuador:** USNM 177246, 3, 86.3-96.0 mm SL.

**Diagnosis:** *Rineloricaria lanceolata* is distinguished from most of its congeners except *R. heteroptera* by having all fins covered by irregular dark brown to black blotches and two longitudinal dark brown to black bands running parallel crossing orbits from snout tip reaching anterior margin of nuchal plate (*vs.* absence of this coloration pattern).

*Rineloricaria lanceolata* can be distinguished from *R. heteroptera* by having abdomen surface dark brown (*vs.* abdomen surface pigmentation absent), orbital notch large and deep (*vs.* orbital notch narrow and shallow). It is also distinguished from *R. aequalicuspis*, *R. altipinnis*, *R. anhangupitan*, *R. anitae*, *R. baliola*, *R. cacerensis*, *R. capitonia*, *R. caracasensis*, *R. daraha*, *R. eigenmanni*, *R. fallax*, *R. formosa*, *R. hasemani*, *R. heteroptera*,



*R. isaaci*, *R. jaraguensis*, *R. jubata*, *R. konopickyi*, *R. kronei*, *R. latirostris*, *R. maacki*, *R. malabarbai*, *R. maquinensis*, *R. melini*, *R. microlepidogaster*, *R. osvaldoi*, *R. pentamaculata*, *R. phoxocephala*, *R. platyura*, *R. reisi*, *R. rupestris*, *R. steindachneri*, *R. stewarti*, *R. teffeana*, *R. tropeira*, and *R. zaina* by having four longitudinal series of plates being mid-dorsal series absent (vs. five longitudinal lateral plate series in longitudinal rows below the dorsal fin, the mid-dorsal series present and consisting in two to ten keeled plates situated below the dorsal series and beginning around insertion of the first dorsal-fin ray). It is also differentiated from *R. cadeae*, *R. castroi*, *R. catamarcensis*, *R. langei*, *R. lima*, *R. longicauda*, *R. misionera*, *R. nigricauda*, *R. pareiacantha*, *R. parva*, *R. quadrensis*, *R. sanga*, *R. setepovos*, *R. stellata*, *R. strigilata*, *R. uracantha* by having breeding male specimens with sexually dimorphic odontodes on the dorsum of the head and predorsal region (vs. sexually dimorphic odontodes absent on dorsum of the head and predorsal region). It is also differentiated from *R. aurata*, *R. cadeae*, *R. catamarcensis*, *R. felipponei*, *R. kronei*, *R. longicauda*, *R. misionera*, *R. osvaldoi*, *R. pareiacantha*, *R. phoxocephala*, *R. quadrensis*, *Rineloricaria* sp. "Loreto", *R. stellata*, *R. steindachneri*, *R. strigilata*, *R. teffeana*, *R. thrissoceps* and *R. zaina* by having profile of snout tip rounded in dorsal view (vs. dorsal profile of snout tip triangular). It is also distinguished from *R. anitae*, *R. anhaguapitan*, *R. castroi*, *R. daraha*, *R. reisi*, *Rineloricaria* sp. "Pasco", *R. stellata* and *R. zaina* by the presence of abdominal plates organized in three rows between lateral plates (vs. five rows or more). It is distinguished from *R. aurata*, *R. beni*, *R. felipponei*, *R. kronei*, *R. magdalенаe*, *R. sneiderni*, and *R. thrissoceps* by having all fins with a broad longitudinal dark band running parallel to the first rays (vs. fins irregularly spotted or with a transversal distal band).

Among the Peruvian species, *R. lanceolata* is distinguished from *Rineloricaria* sp. “Loreto”, *R. morrowi*, *Rineloricaria* sp. “Madre de Dios”, *Rineloricaria* sp. “Pasco” and *R. wolfei* by having anterior ventral margin of pectoral girdle straight and distance between pectoral-fin insertion and the highest point of cleitro approximately equal to one third of the total distance between pectoral-fins insertion (Fig. 19) (vs. anterior ventral margin of pectoral girdle curved in *Rineloricaria* sp. “Loreto”, *R. morrowi*, *Rineloricaria* sp. “Madre de Dios” and *R. wolfei*; and distance between pectoral-fin insertion and the highest point of cleitro approximately equal to half of total distance between pectoral-fin insertion in *R. morrowi* and *Rineloricaria* sp. “Pasco”). It is also differentiated from *Rineloricaria* sp. “Loreto”, *R. morrowi*, *Rineloricaria* sp. “Madre de Dios” and *R. wolfei* by having a higher number (11-14) of post-rostral plates (Fig. 17) (vs. 4-5 post-rostral plates). It can be further differentiated from *Rineloricaria* sp. “Loreto” and *R. wolfei* by having dorsal profile of snout rounded (vs. dorsal profile of snout triangular). It differs from *Rineloricaria* sp. “Pasco” and *R. wolfei* by the presence of abdominal plates organized in three rows between lateral plates (vs. five rows or more). It is further distinguished from *R. morrowi* by the presence of four lateral longitudinal serial plates (vs. five lateral serial plates). It can be easily distinguished from *R. wolfei* by having a set of plates between insertions of pelvic fins anterior to the posterior complex arranged in a single row (vs. irregularly arranged in more than one row). It is differentiated from *Rineloricaria* sp. “Loreto” by having an elongated oval snout tip naked area (vs. snout tip completely covered by odontodes).

**Description:** See Vera-Alcaraz *et al.* (2012) for a recent redescription. Counts and measurements in Tables 1 and 2.

**Coloration in alcohol:** See Vera-Alcaraz *et al.* (2012) for a recent coloration description.

**Sexual dimorphism:** Males have straight, thin and hypertrophied odontodes on lateral margins of head arranged in numerous rows covering post-rostral plates and opercle. Pre-dorsal area covered by long odontodes vertically oriented arranged in numerous rows from anterior border of post orbital notch and not reaching the nuchal plate. Dorsal surface of pectoral-fin rays with long curved odontodes, arranged in numerous rows on unbranched pectoral-fin rays and in two to three rows on branched rays (*vs.* absence of these features in females).

**Distribution:** *Rineloricaria lanceolata* is widely distributed in western Peru, mainly in río Madre de Dios, río Las Piedras, río Manu and tributaries, in río Urubamba and tributaries of río Morona, río Pastaza and río Corrientes. It is also known from headwaters of río Huallaga and río Pachitea (tributary of río Ucayali) (Fig.3).

**Remarks:** The color pattern founded on ventral surface in specimens of *Rineloricaria lanceolata* that are distributed in Peruvian basins can present differences when compared with specimens from other regions on which the ventral coloration pattern is sometimes absent. Furthermore, specimens of *Rineloricaria heteroptera* that show sympatry on Amazon basin with *R. lanceolata*, can also present the ventral surface dark brown pigmented.

***Rineloricaria morrowi* Fowler, 1940**

**Figs. 4-5, Tables 3-4**

*Rineloricaria morrowi* Fowler, 1940: 244 [holotype: ANSP 68663, type locality: Ucayali River basin, Contamana, Peru]. *Rineloricaria morrowi*, -Böhlke 1984: 123 [type material listed from the Academy of Natural Sciences of Philadelphia]. - Isbrücker 1979:

112 [identification of collected material]; 117 [illustration of anterior portion of male body].- Isbrücker, 1980: 108 [listed].- Ortega & Vari, 1986: 18 [listed].- Burgess 1989:442 [listed]; 762 [illustration of lateral anterior portion of specimen].- Ferraris, 2003: 343 [listed, distribution Ucayali river basin, Peru].- Ortega *et al.*, 2012: 47 [listed].

*Hemiloricaria morrowi*.-Isbrücker *et al.* 2001: 23 [listed, new combination].- Isbrücker *et al.* 2001: 27 [listed]. - Ferraris 2007: 246 [listed, distribution Ucayali river basin, Peru].

**Material examined:**

**Holotype.** ANSP 68663, 143.4 mm SL, Peru, Loreto State, Contamana, río Ucayali.

**Non-type material:** All from Peru: Loreto State: ANSP 138929, 1, 77.0 mm SL, vicinity Iquitos, opposite naval base of río Nanay, backwater pools of cocha, 4 mi above río Amazonas, 3°43'44"S 73°17'28"W. ANSP 138930, 1, 83.9 mm SL, vicinity Iquitos, río Nanay just above cocha Morona ca. 9 left side above río Amazonas, 3°44'49"S 73°16'53"W. ANSP 165033, 4, 78.2-99.8 mm SL, río Ucayali, small stream ca. 70 km S of Iquitos near Jenaro Herrera, 4°55'11"S 73°41'37"W. ANSP 176139, 1, 69.1 mm SL, left bank of río Nanay at black water creek on downstream side of Nina Rumi, 3°46'04"S 73°19'46"W. ANSP 176140, 1, 58.6 mm SL, left bank of río Nanay at 0.5 mi below Santa Clara, 3°46'04"S 73°19'46"W. ANSP 176145, 1, 84.0 mm SL, right bank of sand clay beach of río Nanay, across and 0.25 mi below Minchana, 3°52'46"S 73°29'28"W. ANSP 178217, 2, 65.0-72.7 mm SL, caño Santa Rita, right bank tributary of río Nanay, 3.32 mi NW center of Iquitos, near village of Pampa Chica, 2°54'30"S 70°29'58"W. ANSP 180527, 3, 73.3-146.0 mm SL, río Amazonas, río Nanay at large sandy beach on downstream end of island, upstream from Santa Clara, SW of Iquitos, 3°47'14"S

73°21'4"W. ANSP 182347, 1, 63.8 mm SL, mouth of caño feeding laguna connected to río Nanay, about 2 hours upstream from Santa Clara, 3°42'01"S 73°15'1"W. MCP 37160, 1, 96.3 mm SL, Nauta, native community of Diamante Azul, 3°54'23"S 73°45'36"W. MCP 37162, 2, 164.5-172.5 mm SL, playa Agua Blanca, 3°50'0"S 73°40'0"W, 7 Apr 2004. MCP 43145, 3, 89.8-152.7 mm SL, Iquitos, quebrada Corrientillo at caserío Corrientillo, near the Iquitos airport, 3°49'57"S 73°21'43"W. MUSM 5445, 1, 113.9 mm SL, Requena, río Ucayali at quebrada Abrancillo in Jenaro Herrera, 4°55'07"S 73°41'55"W. MUSM 13117, 5, 99.3-111.4 mm SL, Maynas, río Nanay at cocha Anguilla in Santa Maria de Nanay, 3°55'09"S 73°39'17"W. MUSM 16378, 1, 75.0 mm SL, Tambopata, quebrada Jayave, km 127 PEM CUZ road, 12°47'10"S 69°58'45"W. MUSM 18271, 1, 115.8 mm SL, Nauta, at 15' from mouth of río Yanayacu, 4°31'09"S 74°5'48"W. MUSM 35011, 2, 69.1-81.4 mm SL, Maynas, río Nanay at Puerto Almendras, 3°45'07"S 73°16'56"W. MUSM 35013, 5, 109.8-120.4 mm SL, Maynas, río Nanay at Pampa Chica, 3°45'9"S 73°16'59"W. USNM 284829, 1, 74.3 mm SL, quebrada Corrientillo at Corrientillo, on road running west from Iquitos to río Nanay, 3°47'2"S 73°8'31"W. USNM 284845, 5, 59.0-180.0 mm SL, at caño entering río Nanay on northeast of Iquitos, 3°47'2"S 73°8'31"W.

**Diagnosis:** *Rineloricaria morrowi* is distinguished from most congeners, except *R. cacerensis* and *R. parva* by having a lateral dark brown band more visible ventrally on both sides along the posterior region of the body that begins at level of anal-fin origin, and by a conspicuous spot around the base of anal fin (*vs.* absence of this coloration pattern). It can be distinguished from *R. cacerensis* by having a narrow naked area covered by skin between mid-ventral series plate and lateral abdominal plates (*vs.* wide naked area) and from *R. parva* by having five longitudinal lateral plate series in longitudinal rows below the

dorsal fin (vs. four longitudinal lateral plate series below the dorsal fin), and upper unbranched caudal-fin ray extended as long filament (vs. upper and lower unbranched caudal-fin ray extended as long filaments). *Rineloricaria morrowi* also differs from most congeners except *R. baliola*, *R. hasemani*, *R. jubata* and *R. teffeana* by having a conspicuous dark transversal band at distal margin of caudal fin (vs. small spots on caudal-fin rays or lacking of any specific coloration pattern). It can be distinguished from *R. hasemani*, *R. jubata* and *R. teffeana* by having dorsal surface of body covered by small dark brown spots between transversal bands (vs. body surface without spots). It is further distinguished from *R. baliola*, *R. malabarbai* and *R. maquinensis* by having ventral area between pectoral and pelvic-fin insertion completely covered by plates (vs. ventral area between pectoral and pelvic-fin insertion partially covered by plates in *R. baliola* and *R. maquinensis* and completely naked in *R. malabarbai*). It is also differentiated from *R. aurata*, *R. cadeae*, *R. catamarcensis*, *R. felipponei*, *R. kronei*, *R. longicauda*, *R. misionera*, *R. osvaldoi*, *R. pareiacantha*, *R. phoxocephala*, *R. quadrensis*, *Rineloricaria* sp. “Loreto”, *R. stellata*, *R. steindachneri*, *R. strigilata*, *R. teffeana*, *R. thrissoceps* and *R. zaina* by having dorsal profile of snout tip rounded (vs. dorsal profile of snout tip triangular). *Rineloricaria morrowi* differs from *R. anhaguapitan*, *R. anitae*, *R. capitonia*, *R. castroi*, *R. daraha*, *R. hasemani*, *R. heteroptera*, *R. longicauda*, *R. osvaldoi*, *R. reisi*, *R. sanga*, *Rineloricaria* sp. “Pasco”, *R. stellata*, *R. tropeira* and *R. zaina* by having six transversal dark brown bands at dorsal body surface (vs. five dark brown bands). It differs from *R. beni*, *R. cadeae*, *R. catamarcensis*, *R. felipponei*, *R. longicauda*, *R. misionera*, *R. pareiacantha*, *R. quadrensis*, *Rineloricaria* sp. “Loreto”, *Rineloricaria* sp. “Madre de Dios”, *Rineloricaria* sp. “Pasco”, *R. strigilata* and *R. thrissoceps* by the presence of five longitudinal series of plates being mid-dorsal series present (vs. four series of plates, being mid-dorsal series

absent). It is also distinguished from *R. anitae*, *R. anhaguapitan*, *R. castroi*, *R. daraha*, *R. reisi*, *Rineloricaria* sp. “Pasco”, *R. stellata* and *R. zaina* by the presence of abdominal plates organized in three rows between lateral plates (vs. five rows or more).

Among the Peruvian species, *R. morrowi* is further distinguished from *R. lanceolata*, *Rineloricaria* sp. “Loreto”, *Rineloricaria* sp. “Madre de Dios”, *Rineloricaria* sp. “Pasco” and *R. wolfei* by the presence of five lateral longitudinal plate rows (Fig. 22 and Fig. 23, vs. four lateral serial plates). It is also distinguished from *R. lanceolata* and *Rineloricaria* sp. “Loreto” by having a lateral dark brown band more visible ventrally on both sides of the along the posterior region of the body that begins at level of anal-fin origin and a conspicuous spot around the base of anal fin (vs. ventral surface covered by irregular dark brown blotches in *R. lanceolata*; ventral surface of caudal peduncle dark brown to black in *Rineloricaria* sp. “Loreto”; ventral surface pale yellow in *Rineloricaria* sp. “Madre de Dios”, *Rineloricaria* sp. “Pasco” and *R. wolfei*). It can be further differentiated from *Rineloricaria* sp. “Loreto” and *R. wolfei* by having dorsal profile of snout rounded (vs. dorsal profile of snout triangular). It is differentiated from *Rineloricaria* sp. “Loreto” by having an elongated oval snout tip naked area (vs. snout tip completely covered by odontodes). It differs from *Rineloricaria* sp. “Pasco” and *R. wolfei* by the presence of abdominal plates organized in three rows between lateral plates (vs. five rows or more). It is also distinguished from *R. lanceolata*, *R. morrowi* and *Rineloricaria* sp. “Pasco” by having the anterior ventral margin of pectoral girdle curved and distance between pectoral-fin insertion and the highest point of cleitro approximately equal to one third of the total distance between pectoral-fins insertion (Fig. 19, vs. anterior ventral margin of pectoral girdle straight in *R. lanceolata* and *Rineloricaria* sp. “Pasco”; and distance between

pectoral-fin insertion and the highest point of cleitro approximately equal to half of total distance between pectoral-fin insertion in *R. morrowi* and *Rineloricaria* sp. “Pasco”). It can be easily distinguished from *R. wolfei* by having a set of plates between insertions of pelvic fins anterior to the posterior complex arranged in a single row (vs. irregularly arranged in more than one row).

**Description:** Counts and measurements in Table 3 and 4. Standard length of measured specimens 69.1-146.0 mm SL. Head and body depressed. Body width greatest at pectoral-fin insertion level gradually narrowing towards caudal fin. Body depth greatest at dorsal-fin insertion level. Dorsal profile of body from snout tip to nasal plate straight, from anterior border of frontal to posterior margin of parieto-supraoccipital straight, from anterior margin of predorsal plates to dorsal-fin insertion straight and slightly sloped from last dorsal-fin ray insertion to penultimate dorsal plate straight. Lateral line complete, median plate series bearing lateral sensory canal from compound pterotic to caudal fin. Five longitudinal lateral plate series, including dorsal, mid-dorsal, median, mid-ventral and ventral series. Median and mid-ventral series with rough, well developed keels. Coalesced plates starting on vertical line through most distal tip of dorsal-fin rays level. Ventral profile from snout tip to anal fin slightly convex, from anal-fin insertion to penultimate ventral plate straight. Snout tip rounded, with elongated oval naked area (without odontodes) not reaching first pore of infraorbital sensorial canal. Dorsal profile of head slightly rough, with carinae not very pronounced on parieto-supraoccipital, pre-dorsal plates. Lateral margins of head straight. Post-rostral plates arranged in more than one row. Anterior opening of supraorbital laterosensory canal at middle of posterior margin of nasal, not contacting infraorbital canal plates. Pore opening of first infraorbital ventrally exposed, second to sixth infraorbital pores



dorsally. Second infraorbital contacting pre-nasal plates, third infraorbital contacting margin of nostril, supraorbital and nasal, fourth infraorbital contacting supraorbital and orbital margin, fifth infraorbital contacting orbital margin and sixth infraorbital contacting sphenotic. Three pores on preopercle (Fig. 18) visible through post-rostral plates. Post orbital notch deep. Lower lip narrow, not reaching head margin, covered with homogeneous rounded papillae, narrow triangular fringes at margin. Maxillary barbels long, surpassing lower lip. Teeth bifid and larger in dentary than in premaxilla, with main cusp larger than lateral cusp, slender and pointed. Abdominal plates of anterior complex with plates irregularly arranged not reaching margin of lower lip, median complex longitudinally arranged in three series, posterior complex with preanal plate in contact anteriorly with set of plates arranged in one row between pelvic-fin insertions. Dorsal-fin origin slightly posterior to pelvic-fin origin. Dorsal-fin spinelet present but locking mechanism not functional. Pectoral-fin spine passing pelvic-fin origin. Pectoral girdle with anterior ventral margin of pectoral girdle strongly curved and distance between pectoral-fin insertion and the highest point of cleitro approximately equal to half of total distance between pectoral-fin insertion. Caudal fin emarginated with only upper unbranched-fin ray extended as long filament.

**Coloration in alcohol:** Dorsal surface of body light brown, covered with small dark brown dots more concentrated in snout; six dark brown transversal bars, first at base of dorsal-fin insertion, second at posterior margin of dorsal fin, third, fourth, fifth and sixth equidistantly distributed along caudal peduncle not reaching penultimate dorsal plate. Pores of sensory canals strongly dark brown to black pigmented, especially around infraorbital sensory canal pores. Dorsal surface of upper lip with two longitudinal, dark brown stripes. Pale yellow

ventrally, posterior area from anal-fin insertion to caudal-fin base, with one dark elongated line along sides of caudal peduncle and conspicuous dark brown spot around unbranched anal-fin rays insertion. All unbranched-fin rays with dark brown narrow stripes, and dark brown dots aligned through branched rays. Pectoral, dorsal, pelvic, and anal-fin membranes hyalines. Caudal-fin base with wide dark brown stripe at base and distal margin.

**Sexual dimorphism:** Males have straight and thin hypertrophied odontodes on the lateral margins of head arranged in numerous rows covering rostral plates and opercle. Pre-dorsal area covered by long odontodes vertically oriented arranged in two rows from anterior border of post orbital notch and almost reaching the nuchal plate. Males with long curved odontodes on dorsal surface of pectoral fin arranged in numerous rows on spine and unbranched fin rays and in two rows on branched fin rays, last two branched rays lacking odontodes.

**Distribution:** *Rineloricaria morrowi* is mainly distributed in Loreto State, in headwaters of río Nanay, río Aucayacu and the headwaters of río Ucayali in Peru. It is also known from río Inambari. This species is sympatric with *Rineloricaria* sp. “Madre de Dios” in the Madre de Dios River basin (Fig. 6).

**Remarks:** In the holotype, ventral coloration along the sides of caudal peduncle and the conspicuous dark brown spot around anal-fin insertion are missing. Also, the uppermost caudal-fin unbranched ray is broken.

***Rineloricaria wolfei* Fowler, 1940**

**Figs. 7-8, Tables 5, 6**

*Rhineloricaria wolfei* Fowler, 1940: 241 [holotype: ANSP 68660; type locality: Ucayali River basin, Contamana, Peru].

*Rineloricaria wolfei* Böhlke 1984: 126 [type material listed from the Academy of Natural Sciences of Philadelphia].- Isbrücker, 1980: 111 [listed].- Ortega & Vari, 1986: 18 [listed].- Ortega *et al.*, 2012: 47 [listed].- Burgess 1989:443 [listed].- Ferraris, 2003: 344 [listed, distribution Ucayali river basin, Peru].- Ortega *et al.*, 2012: 47 [listed].

*Hemiloricaria wolfei*.- Isbrücker *et al.* 2001: 23 [listed, new combination].- Isbrücker *et al.* 2001: 27 [listed]. - Ferraris 2007: 247 [listed, distribution Ucayali river basin, Peru].

**Material examined:**

**Holotype.** ANSP 68660, 121.2 mm SL, Peru, Loreto State, Contamana, río Ucayali.

**Non-types material: Peru:** Loreto State: ANSP 138942, 4, 76.2 - 102.1 mm SL, vicinity Iquitos, outlet of cocha Morona, right bank of río Nanay, ca. 9 mi above río Amazonas, 3°46'53"S 73°21'27"W. ANSP 176138, 1, 103.0 mm SL, río Nanay at mouth of creek on left bank of Nanay just above Puerto Almendras, 3°44'01"S 73°19'60"W. ANSP 179029, 4, 80.6-93.5 mm SL, río Amazonas, río Itaya at bridge on Iquitos-Nauta highway, approx. 25 miles SSW of Iquitos, 3°51'01"S 73°17'51"W. ANSP 182457, 1, 105.5 mm SL, río Amazonas, río Nanay, downstream half of large beach (left bank) at village of Pampa Chica, 4.54 km W of Iquitos, 3°45'09"S 73°17'01"W. ANSP 182605, 1, 113.1 mm SL, río Amazonas, río Nanay, large left bank beach upstream from mouth, North of Iquitos, 3°42'49"S 73°16'43"W. MCP 43853, 1, 86.3 mm SL, Maynas río Ucayali, tributary of río

Pacaya, Pacaya-Samiria National Reserve, 5°20'34"S 74°30'01"W. MUSM 17682, 1, 112.1 mm SL, Nauta, río Marañón at mouth of río Yanayacu, 4°38'39"S 73°47'09"W. MUSM 30994, 4, 57.0-76.0 mm SL, Andoas, río Corrientes, 2°33'45"S 76°11'12"W. MUSM 31216, 1, 127.2 mm SL, Andoas, río Corrientes, 2°41'06"S 76°02'50"W. MUSM 37278, 1, 148.9 mm SL, Maynas, río Momón, approx. 3 km of Punto Alegre community, 3°29'13"S 73°26'35"W. MUSM 38256, 4, 127.6-110.9 mm SL, río Corrientes, 2°41'18"S 76°02'32"W. MUSM 38315, 1, 74.0 mm SL, río Corrientes, 2°49'07"S 75°55'44"W. MUSM 42195, 1, 143.5 mm SL, Trompeteros, río Marañón, río Corrientes, 3°47'57"S 75°2'43"W. USNM 284878, 1, 89.3 mm SL, río Nanay, approx. 20 km upstream of mouth, main channel, side channels and side pools, 3°50'60"S 73°15'0"W. Ucayali: MUSM 42524, 4, 79.0-107.5 mm SL, Coronel Portillo, Iparía, Coco, Macaya, mouth of quebrada Macaya at left bank, 8°3'24"S 75°6'47"W. MUSM 42457, 1, 134.5 mm SL, Coronel Portillo, Iparia, Ramón Castilla, quebrada Macaya at left bank, 4°37'10"S 71°35'57"W. **Brasil:** Acre State: MCP 28826, 2, 81.4-124.3 mm SL, Bujari, Igarapé Marizinho, at BR 364, 86Km southwest of Sena Madureira, tributary of rio Atimari, 9°36'41"S 68°14'44"W. MCP 28832, 2, 94.4-166.1 mm SL, rio Branco, Iquiri, tributary of rio Ituxi, 10° 4'43"S 67°32'34.99"W.

**Diagnosis:** *Rineloricaria wolfei* is distinguished from most congeners, except *R. phoxocephala* by having wide dark brown stripe covering the first half of caudal fin. It can be distinguished from *R. aequalicuspis*, *R. altipinnis*, *R. ananguapitan*, *R. anitae*, *R. baliola*, *R. cacerensis*, *R. capitonia*, *R. caracasensis*, *R. daraha*, *R. eigenmanni*, *R. fallax*, *R. formosa*, *R. hasemani*, *R. heteroptera*, *R. isaaci*, *R. jaraguensis*, *R. jubata*, *R. konopickyi*, *R. kronei*, *R. latirostris*, *R. maacki*, *R. malabarbai*, *R. maquinensis*, *R. melini*, *R. microlepidogaster*, *R. morrowi*, *R. osvaldoi*, *R. pentamaculata*, *R. phoxocephala*, *R.*

*platyura*, *R. reisi*, *R. rupestris*, *Rineloricaria* sp. “Loreto”, *Rineloricaria* sp. “Madre de Dios”, *Rineloricaria* sp. “Pasco”, *R. steindachneri*, *R. stewarti*, *R. teffeana*, *R. tropeira*, and *R. zaina* by the presence of four longitudinal series of plates being mid-dorsal series absent (vs. five series of plates, being mid-dorsal series present). It is further distinguished from *R. anahuapitan*, *R. aurata*, *R. cacerensis*, *R. capitonia*, *R. castroi*, *R. formosa*, *R. heteroptera*, *R. hasemani*, *R. longicauda*, *R. osvaldoi*, *R. parva*, *R. sanga*, *Rineloricaria* sp. “Loreto”, *Rineloricaria* sp. “Madre de Dios”, *Rineloricaria* sp. “Pasco”, *R. stellata*, *R. tropeira* and *R. zaina* by having a set of plates between insertions of pelvic fins anterior to the posterior complex irregularly arranged (vs. arranged in single row). It is also distinguished from *R. aurata*, *R. cacerensis*, *R. capitonia*, *R. formosa*, *R. hasemani*, *R. heteroptera*, *R. longicauda*, *R. parva* and *R. phoxocephala* by the presence of abdominal plates organized in five rows between lateral plates (vs. three rows). It is also differentiated from *R. daraha*, *R. hasemani*, *R. heteroptera*, *R. osvaldoi*, *Rineloricaria* sp. “Madre de Dios”, *Rineloricaria* sp. “Pasco”, *R. stellata* and *R. zaina* by having dorsal profile of snout tip triangular and pointed (vs. dorsal profile of snout tip rounded). *Rineloricaria wolfei* differs from in *R. formosa*, *R. parva*, *R. setepovos* and *Rineloricaria* sp. “Pasco” by the coloration of dorsal surface, having five transversal dark brown bands (vs. six dark brown bands).

Among the Peruvian species, it is differentiated from *R. lanceolata*, *R. morrowi*, *Rineloricaria* sp. “Loreto”, *Rineloricaria* sp. “Madre de Dios” and *Rineloricaria* sp. “Pasco” by having fifth ceratobranchial pharyngeal tooth plate wider with globular shape (vs. fifth ceratobranchial pharyngeal tooth plate narrow with triangular shape), by having a set of plates between insertion of pelvic fins anterior to the posterior complex irregularly

arranged in more than one row (*vs.* arranged in one row). *R. wolfei* is further distinguishable from *R. morrowi*, *Rineloricaria* sp. “Madre de Dios” and *Rineloricaria* sp. “Pasco” by having a triangular snout tip profile (*vs.* rounded snout tip profile) and branchial arch with fifth ceratobranchial pharyngeal tooth plate having globular shape and narrow at extremes (Fig. 20, *vs.* branchial arch with fifth ceratobranchial pharyngeal tooth plate triangular). It is also distinguished from *R. lanceolata* and *Rineloricaria* sp. “Loreto” by having a ventral surface of body light brown (*vs.* ventral surface covered by irregular dark brown blotches in ventral surface of caudal peduncle dark brown to black in *R. lanceolata*). It is also differentiated from *R. lanceolata*, *R. morrowi* and *Rineloricaria* sp. “Pasco” by having the anterior ventral margin of pectoral girdle curved and distance between pectoral-fin insertion and the highest point of cleitro approximately equal to one third of the total distance between pectoral-fins insertion (Fig. 19, *vs.* anterior ventral margin of pectoral girdle straight in *R. lanceolata* and *Rineloricaria* sp. “Pasco”); and distance between pectoral-fin insertion and the highest point of cleitro approximately equal to half of total distance between pectoral-fin insertion in *R. morrowi* and *Rineloricaria* sp. “Pasco”).

**Description:** Counts and measurements in Tables 5 and 6. Standard length of measured specimens 57.0-148.8 mm SL. Head and body depressed. Body width greatest at pectoral-fin insertion, same body width from pectoral-fin origin to pelvic-fin origin with a rectangular shape and gradually narrowing from that point towards caudal fin. Body depth greatest at dorsal-fin insertion. Lateral line complete, median plate series bearing lateral sensory canal from compound pterotic to caudal fin. Four longitudinal lateral plate series, including dorsal, median, mid-ventral and ventral series. Median and mid-ventral series with rough well developed keels. Coalesced plates starting at posterior margin of anal-fin

rays. Dorsal profile of body from snout tip to nasal plate straight, from anterior border of frontal to posterior margin of supra-occipital slightly convex, from anterior margin of pre-dorsal plates to dorsal-fin insertion slightly convex, straight from base of dorsal-fin base to penultimate. Ventral profile from snout tip to pelvic-fin origin convex, from that point to penultimate ventral plate straight. In dorsal view, snout tip triangular with an elongated naked area not reaching first pore of infraorbital sensorial canal. Snout tip lateral profile straight. Head dorsal surface smooth. Post-rostral plates arranged in more than one row. Anterior opening of supraorbital laterosensory canal at middle of posterior region of nasal not contacting infraorbital canal. First infraorbital pore opening ventrally exposed, second to sixth infraorbital pores at dorsal surface. Second infraorbital contacting pre-nasal plates, third infraorbital contacting nostril margin, supraorbital bone and nasal, fourth infraorbital contacting supraorbital and orbital margin, fifth infraorbital contacting orbital margin and sixth infraorbital contacting sphenotic. Preopercular with three pores (Fig. 18) visible through post-rostral plates. Post orbital notch deep. Lower lip wide, almost reaching head border, with homogeneous small rounded papillae. Wide small triangular fringes at lower lip margin. Maxillary barbel long surpassing lower lip. Teeth bifid and larger in dentary than in premaxilla, with cusps almost same sized, main cusp with a rounded margin. Abdominal plates of anterior complex with plates irregularly arranged not reaching margin of lower lip, median complex longitudinally arranged in five series, posterior complex limited anteriorly by a set of plates irregularly arranged in more than one row between pelvic-fin insertion. Dorsal fin originating on vertical line through of pelvic-fin origin. Dorsal-fin spinelet present but locking mechanism not functional. Pectoral-fin spine reaching pelvic-fin origin. Pectoral girdle anterior ventral margin curved and distance between pectoral-fin insertion and highest point of cleitro approximately equal to one third

of the total distance between pectoral-fins insertion. Caudal fin emarginated with upper unbranched-fin ray extended as long filament and lower unbranched-fin ray slightly extended in some specimens, never longer than upper unbranched caudal-fin ray. Branchial arch with fifth ceratobranchial pharyngeal tooth plate having globular shape and narrow at extremes.

**Coloration in alcohol:** Dorsal surface of body light brown and five dark brown transversal bands, first one at insertion of first branched dorsal-fin ray, second at distal margin of dorsal fin, third starting at end of anal fin, fourth equidistantly separated from third and fifth, and fifth reaching anterior margin of antepenultimate dorsal plate. Pale yellow ventrally. Dorsal, pectoral and pelvic-fin membranes mostly hyaline. Spine and unbranched dorsal-fin rays with light brown narrow stripes. Caudal fin with a wide triangle dark brown band covering from base to first half of caudal-fin area.

**Sexual dimorphism:** Males have hypertrophied odontodes on lateral margins of head arranged in numerous rows covering from rostral plates to opercle. Dorsal surface of pectoral-fin rays in males with curved odontodes stronger than cephalic dimorphic odontodes and arranged in numerous rows on spine. Pectoral-fin branched rays with odontodes arranged in two to three rows.

**Distribution:** *Rineloricaria wolfei* is widely distributed in the western Amazon watershed, mainly in rio Juruá on western Amazonas State and rio Madeira River on southern Acre State in Brazil, comprising the ecoregions proposed by Abell *et al.* (2008) of Amazon lowlands and Guaporé-Itenez. Across Peruvians drainages, this species is distributed in the río Aucayacu, río Corrientes, río Nanay and tributaries of río Ucayali. This species shows a



sympatric distribution pattern with *R. lanceolata*, *R. morrowi*, *R. sp.* “Madre de Dios and *R. sp.* “Loreto” in Peruvian Amazon lowlands (Fig. 9).

**Remarks:** In the holotype, the dorsal, pectoral and caudal-fin rays are broken, and the coloration pattern at dorsal surface of body and first half of caudal fin has faded away.

***Rineloricaria sp.* “Madre de Dios”, new species**

**Fig. 10, Tables 7-8**

**Holotype.** MUSM 34745, 123.4 mm SL, Peru, Loreto State, Alto Amazonas, Morona, río Amazonas, río Marañón, río Morona at quebrada Wiratkentsa, 204 m asl, 3°10'08"S 77°21'46"W, 08 Dec 2010, D. Faustino.

**Paratypes. All from Peru: Loreto State:** MUSM 1316, 1, 167.0 mm SL, río Amazonas, Maynas, río Manití, 3°28'48"S 72°48'17"W, 2 Nov 1970, Ancieta, Landa & Wilhelm. MUSM 1586, 1, 93.7 mm SL, Iquitos, National Amazonian Peruvian University farm at quebrada Corrientillo, 2°46'06"S 70°5'48"W, 6 Jul 1984, H. Ortega. MUSM 36014, 5, 125.7-147.3 mm SL, Cuenca Nanay, río Nanay, quebrada sin nombre, 2°51'11"S 74°58'53"W, 24 Jan 2009, I. Sipión. USNM 284828, 1, 69.9 mm SL, approx. 20 km upstream of mouth of río Nanay, main channel, side channels and side pools, 3°48'55"S 73°23'27"W, 19 Aug 1986, R. Vari. **Madre de Dios State:** MUSM 2450, 1, 84.1 mm SL, Manu National Park, checkpoint and monitoring Pakitza, río Manu at quebrada Agua Clara, 17 Aug 1988, H. Ortega. MUSM 3741, 1, 72.7 mm SL, Manu, Manu National Park, checkpoint and monitoring Pakitza at aguajal Aguas Negras, 12°15'2"S 69°16'24"W, 22 Sep 1988, H. Ortega. MUSM 3865, 1, 84.0 mm SL, Manu, Manu National Park, checkpoint and monitoring Pakitza at quebrada Aguajal, 11°56'37"S 71°16'58"W. MUSM

4007, 2, 65.7-66.9 mm SL, Manu, Manu National Park, río Manu at quebrada Fortaleza, 12°16'04"S 70°51'01"W, 08 Sep 1989, H. Ortega. MUSM 4179, 1, 77.5 mm SL, Reserved Area Tambopata Candamo, isla Tambopata La Collpa at quebrada Grande, 12°36'17"S 69°10'59"W, 31 Aug 1992, F. Chang. MUSM 7724, 2, 53.5-65.1 mm SL, Tambopata, Reserved Area Tambopata Candamo, río Malinowski, 13°07'11"S 70°10'01"W, 11 Aug 1995, F. Chang. MUSM 9153, 1, 61.6 mm SL, Tambopata, Reserved Area Tambopata Candamo, left side of río Tambopata, 13°10'27"S 69°37'22"W, 25 Sep 1995, F. Chang. MUSM 10829, 1, 73.0 mm SL, río Madre de Dios at native community of Diamante, 12°10'06"S 69°56'08"W, 12 Feb 1992, H. Ortega. MUSM 11316, 3, 70.8-77.7 mm SL, Tambopata, Reserved Area Tambopata Candamo, río Tambopata, río Malinowski at quebrada José, 13°4'36"S 70°10'22"W, 12 Apr 1997, F. Chang. MUSM 11422, 2, 64.1-81.2 mm SL, Tambopata, Reserved Area Tambopata Candamo, río Malinowski at quebrada Venado, 13°3'45"S 70°9'18"W, 16 Apr 1997, F. Chang. MUSM 21168, 1, 63.3 mm SL, Tahuamanu, río Manuripeat quebrada Malecón, 12°6'47"S 69°7'3"W, 12 Jul 2003, H. Ortega. MUSM 21734, 1, 68.7 mm SL, Tambopata, cuenca Madre de Dios, aguajal Aguas Negras at pozo Santa Elena, 12°39'18"S 69°25'27"W, 17 Jan 2004, M. Hidalgo. MUSM 21787, 2, 61.4- 61.6 mm SL, Tambopata, río Madre de Dios, aguajal Aguas Negras at quebrada Pozo Santa Elena, 12°41'38"S 69°36'02"W, 19 Jan 2004, M. Hidalgo. **Puno State:** MUSM 3691, 2, 66.7-79.4 mm SL, Sandia, Reserved Area Tambopata Candamo at 500m left side of río Tambopata, 13°18'51"S 69°27'24"W, 26 Aug 1992, F. Chang. **Ucayali State:** MUSM 1652, 1, 64.2 mm SL, Pucallpa, Yarinacocha, 4°1'39"S 71°16'34"W, 9 Oct 1986, H. Ortega. MUSM 3626, 2, 91.9-93.0 mm SL, Coronel Portillo, Pucallpa, lago Imiria, 8°51'38"S 74°21'53"W, 16 Jul 1992, I. Samanez. MUSM 30430, 1, 95.2 mm SL, Coronel Portillo, Yarinacocha, Isla del Amor, 8°27'39"S 74°23'12"W, 16 Jun 1995, C.

Riofrio. **Bolivia: Beni State:** USNM 305583, 3, 56.0-73.4 mm SL, Ballivia province, río Matos below road crossing, 48 km east San Borja, 14°55'12"S 66°16'48"W, 2 Aug 1987, W. Santarnes, T. Munroe, J. Sarmiento, E. Forno & M. Brun.

**Diagnosis:** *Rineloricaria* sp. “Madre de Dios” is differentiated from all other congeners except from *R. fallax* by having a unique conspicuous dark brown oval spot at nuchal plate (vs. absence of this coloration feature). It is also distinguished from *R. aequalicuspis*, *R. altipinnis*, *R. anhangupitan*, *R. anitae*, *R. baliola*, *R. cacerensis*, *R. capitonia*, *R. caracasensis*, *R. daraha*, *R. eigenmanni*, *R. fallax*, *R. formosa*, *R. hasemani*, *R. heteroptera*, *R. isaaci*, *R. jaraguensis*, *R. jubata*, *R. konopickyi*, *R. kronei*, *R. latirostris*, *R. maacki*, *R. malabarbai*, *R. maquinensis*, *R. melini*, *R. microlepidogaster*, *R. morrowi*, *R. osvaldoi*, *R. pentamaculata*, *R. phoxocephala*, *R. platyura*, *R. reisi*, *R. rupestris*, *Rineloricaria* sp. “Loreto”, *Rineloricaria* sp. “Pasco”, *R. steindachneri*, *R. stewarti*, *R. teffeana*, *R. tropeira*, and *R. zaina* by the presence of four longitudinal series of plates being mid-dorsal series absent (vs. five series of plates, being mid-dorsal series present). It is also differentiated from *R. daraha*, *R. hasemani*, *R. heteroptera*, *R. osvaldoi*, *Rineloricaria* sp. “Pasco”, *R. stellata* and *R. zaina* by having dorsal profile of snout tip triangular and pointed (vs. dorsal profile of snout tip rounded). It is also distinguished from *R. anitae*, *R. anhangupitan*, *R. castroi*, *R. daraha*, *R. reisi*, *Rineloricaria* sp. “Pasco”, *R. stellate* and *R. zaina* by the presence of abdominal plates organized in three rows between lateral plates (vs. five rows or more). It is further distinguished from *R. baliola*, *R. daraha*, *R. malabarbai*, *R. microlepidogaster*, *R. reisi* and *R. setepovos* by having a set of plates anterior to the posterior complex and between pelvic-fin insertions arranged in a single row (vs. irregularly arranged in more than one row).

Among the Peruvian species, *Rineloricaria* sp. “Madre de Dios” differs from *R. lanceolata*, *R. morrowi*, *Rineloricaria* sp. “Loreto”, *Rineloricaria* sp. “Pasco” and *R. wolfei* by having cleitro width smaller than body width at dorsal-fin insertion level (vs. cleitro width similar to body width at dorsal-fin insertion level). It is differentiated from *R. lanceolata*, *R. morrowi* and *Rineloricaria* sp. “Pasco” by having a triangular snout tip profile (vs. rounded snout tip profile). It is also distinguished from *R. lanceolata*, *R. morrowi* and *Rineloricaria* sp. “Pasco” by having the pectoral girdle anterior ventral margin curved and distance between pectoral-fin insertion and the highest point of cleitro approximately equal to one third of the total distance between pectoral-fins insertion (Fig. 19; vs. anterior ventral margin of pectoral girdle straight in *R. lanceolata* and *Rineloricaria* sp. “Pasco”); distance between pectoral-fin insertion and the highest point of cleitro approximately equal to half of total distance between pectoral-fin insertion in *R. morrowi* and *Rineloricaria* sp. “Pasco”). It is also distinguished from *R. lanceolata* and *Rineloricaria* sp. “Loreto” by having a ventral surface of body light brown (vs. ventral surface covered by irregular dark brown blotches in *R. lanceolata* and ventral surface of caudal peduncle dark brown to black in *Rineloricaria* sp. “Loreto”). It is also differentiated from *R. morrowi* by the presence of four lateral longitudinal plate series lacking the mid-dorsal series (vs. five lateral serial plates and mid-dorsal series present). It is also distinguished from *R. wolfei* by having a set of plates between insertion of pelvic fins anterior to the posterior complex arranged in a single row (vs. set of plates between pelvic fin insertions irregularly arranged in more than one row).

**Description:** Counts and measurements in Tables 7 and 8. Standard length of measured specimens 51.1-167.0 mm SL. Head and body strongly depressed. Body width greatest at

level of dorsal-fin origin, body width gradually narrowing from that point towards caudal fin, body depth greatest at pelvic-fin insertion. Lateral line complete, median plate series bearing lateral sensory canal from compound pterotic to caudal fin. Four longitudinal lateral plate series, including dorsal, median, mid-ventral and ventral series. Median and mid-ventral series with rough well developed keels. Coalesced plates starting on vertical line through middle of anal fin. Body dorsal profile of body from snout tip to anterior margin of nasal straight, from posterior margin of post-orbital notch to dorsal-fin posterior tip convex, and from that point to penultimate dorsal plate straight. Snout tip triangular with elongated naked area not reaching first pore of infraorbital sensory canal. Ventral profile from snout tip to pectoral-fin origin straight, convex between pectoral and pelvic fin, straight from pelvic-fin origin to penultimate ventral plate. Dorsal profile of head slightly rough, with snout carinae not very pronounced, supraoccipital and pre-dorsal plates. Post-rostral plates arranged in more than one row parallel to snout external margin. Anterior opening of supraorbital latero-sensory canal at middle of posterior nasal margin not contacting with infraorbital canal plates. First infraorbital pore opening ventrally exposed, second to sixth infraorbital pores at dorsal surface. Second infraorbital contacting nasal, third infraorbital contacting nare and supraorbital bone, fourth and fifth infraorbital contacting orbital margin and sixth infraorbital in contact with sphenotic. Preopercular with three pores visible through post-rostral plates. Post orbital notch deep and short. Lower lip narrow, not surpassing snout lateral margin, covered by rounded papillae smaller at posterior margin, small triangular fringes at external margin, maxillary barbel long surpassing lower lip. Teeth bifid and larger in dentary than in premaxilla, dentary with main cusp with rounded margin and lateral cusp of premaxilla smaller. Abdominal plates of anterior complex with plates irregularly arranged not reaching lower lip, median complex

longitudinally arranged in three series, posterior complex limiting anteriorly with set of plates arranged in one row between pelvic-fins insertions. Dorsal fin originating on vertical line aligned with pelvic-fin origin. Dorsal-fin spinelet present with locking system not functional. Pectoral-fin spine not passing pelvic-fin origin. Pectoral girdle anterior ventral margin curved and distance between pectoral-fin insertion and highest point of cleitro approximately equal to one third of the total distance between pectoral-fins insertion. Caudal fin emarginated, upper unbranched-fin ray extended as long filament and lower unbranched caudal-fin ray never extended. Branchial arch with fifth ceratobranchial pharyngeal tooth plate having triangular shape slightly rounded at central margins.

**Coloration in alcohol:** Dorsal surface of body light brown, with a small oval dark brown spot on nuchal plate and six dark brown transversal bands, first to fifth wide and sixth irregular and narrow and incomplete, first band at base of third branched dorsal-fin insertion, second at distal margin of dorsal fin, third starting at end of anal fin, fourth and fifth equidistantly separated, and sixth at middle of antepenultimate dorsal plate. Pores of sensory canal dark brown pigmented. Rostral margin of snout with dark brown to black irregular spots. Dorsal surface of upper lip with two vertical parallel bands. Pectoral, dorsal, pelvic and caudal-fin rays with dark brown small stripes. Anal-fin branched rays with dark brown spots at posterior area. Pale yellow ventrally. Dorsal, pectoral and pelvic-fin membranes mostly hyaline. Dorsal-fin spine with dark brown narrow stripes and first branched ray with a dark brown spot at distal margin covering the membrane. Caudal-fin base with a triangle dark brown spot and a narrow dark brown stripe at distal margin.

**Sexual dimorphism:** Males have thin hypertrophied odontodes on lateral margins of head arranged in numerous rows covering pre-rostral plates and opercle. Dorsal surface of

pectoral-fin rays with stronger and curved odontodes arranged in numerous rows on spine, all branched rays with odontodes arranged in two to three rows except the last unbranched ray (*vs.* absence of these features in females).

**Distribution:** *Rineloricaria* sp. “Madre de Dios” is widely distributed in western Amazon watershed, comprising the ecoregions proposed by Abell *et al.* (2008) of Amazon lowlands, Ucayali-Urubamba and northwest of Marmoré-Madre de Dios. Across Peruvians drainages, this species is distributed in the río Amazonas, río Nanay and río Ucayali in northeastern Peru, río Ucayali and tributaries, and widely distributed in río Madre de Dios, río Las Piedras, río Manu and tributaries at southeastern Peru (Fig. 11).

***Rineloricaria* sp. “Pasco”, new species**

**Fig. 12, Tables 9, 10**

**Holotype.** MUSM 18947, 102.6 mm SL, female, Peru, Pasco State, Oxapampa, Puerto Bermudez at quebrada Ataz, 10°10'11"S 75°18'03"W, 09 Jul 2001, M. Hidalgo.

**Paratypes. All from Peru. Huanuco State:** MUSM 29964, 3, 60.9-65.6 mm SL, puerto Inca, codo del Pozuzo, río Palcazú, quebrada Charapa, 9°44'60"S 75°23'32"W, 22 May 2004, B. Rengifo. **Pasco State:** MUSM 18967, 1, 96.6 mm SL, Oxapampa, Puerto Bermudez, río Chivis, 10°39'08"S 75°06'53"W, 5 Jul 2001, Earthwatch. MUSM 19235, 2, 73.1-76.2 mm SL, Oxapampa, Puerto Bermudez at quebrada Esperanza, 10°12'12"S 74°57'20"W, 21 Jul 2001, H. Ortega. MUSM 19492, 4, 70.8-97.3 mm SL, Oxapampa, Puerto Bermudez, río Neguashi, 10°22'26"S 74°49'39"W, 4 Jul 2001, Earthwatch. MUSM 19496, 4, 71.2-90.6 mm SL, Oxapampa, Puerto Bermudez at km 8 quebrada, 10°20'13"S 74°59'17"W, 9 Jul 2001. MUSM 19531, 1, 119.4 mm SL, Oxapampa, Puerto Bermudez at

quebrada Cinco Reales, 10°13'41"S 74°55'52"W, 10 Jul 2001, H. Ortega. MUSM 20358, 2, 72.1-73.1 mm SL, Oxapampa, Puerto Bermudez at quebrada Esperanza, 10°34'14"S 75°23'10"W, 10 Aug 2002, M. Hidalgo. MUSM 20569, 1, 71.1 mm SL, Oxapampa, Puerto Bermudez at quebrada Ajas, 10°10'11"S 75°18'03" W, 9 Aug 2002, M. Hidalgo. MUSM 20636, 4, 75.6-105.7 mm SL, Oxapampa, Puerto Bermudez at quebrada La Raya, 10°14'38"S 74°58'46"W, 10 Aug 2002, M. Hidalgo. MUSM 20780, 1, 68.9 mm SL, Oxapampa, puerto Bermudez, left side of río Pichis, 10°09'56"S 74°54'38"W, 11 Aug 2002, M. Hidalgo. MUSM 26558, 2, 80.8-85.7 mm SL, Oxapampa, Pozuzo, río Santa Cruz at quebrada Azul, 10°26'19"S 75°2'45"W, 20 Oct 2005, E. Castro. MUSM 26562, 1, 72.5 mm SL, Oxapampa, río Santa Cruz, Yanahuanca, 10°02'22"S 75°34'15"W, 20 Oct 2005, E. Castro. MUSM 26578, 1, 58.8 mm SL, Oxapampa, Pozuzo, río Pozuzo, 9°54'58"S 75°14'52"W, 24 Oct 2005, E. Castro. MUSM 26597, 4, 6.0-78.8 mm SL, Oxapampa, Pozuzo, río Huancabamba, mouth of río Límite, 10°02'57"S 75°32'29"W, 22 Oct 2005, E. Castro. MUSM 29388, 1, 68.6 mm SL, Oxapampa, Iscozacín, right side of río Palcazú, 10°15'26"S 75°7'152"W, 19 Jun 2000, H. Ortega. **Ucayali State:** MUSM 10552, 1, 76.6 mm SL, Padre Abad, BNVH, quebrada 1, 8°46'23"S 75°29'37"W 3 Sep 199, F. Chang. MUSM 1587, 4, 68.8-74.1 mm SL, río Huacamayo, km 155 of Federico Basadre road, 9°0'12"S 75°29'0"W, 6 Oct 1984, H. Ortega. MUSM 15557, 1, 61.7 mm SL, Padre Abad, río Aguaytía, río Huacamayo, 9°0'12"S 75°29'01"W, 13 Sep 1979, H. Ortega.

**Diagnosis:** *Rineloricaria* sp. "Pasco" is distinguished from most congeners, except from *R. malabarbai*, *R. maquinensis* and *R. strigilata* by having naked area of snout tip as a globular protuberance not reaching most anterior pore of infraorbital canal (*vs.* naked area elongated without a globular protuberance). It can be distinguished from *R. malabarbai* and



*R. maquinensis* by having abdomen completely covered by plates and greater body width at dorsal-fin insertion level (vs. abdomen completely or partially naked with only abdominal lateral plates present, and greater body width at cleithrum). It differs from *R. strigilata* by having small light brown spots on dorsal surface (vs. conspicuous dark brown vermiculated spots on dorsal surface). *Rineloricaria* sp. “Pasco” is distinguished from *R. aequalicuspis*, *R. altipinnis*, *R. anhangupitan*, *R. anitae*, *R. baliola*, *R. cacerensis*, *R. capitonia*, *R. caracasensis*, *R. daraha*, *R. eigenmanni*, *R. fallax*, *R. formosa*, *R. hasemani*, *R. heteroptera*, *R. isaaci*, *R. jaraguensis*, *R. jubata*, *R. konopickyi*, *R. kronei*, *R. latirostris*, *R. maacki*, *R. malabarbai*, *R. maquinensis*, *R. melini*, *R. microlepidogaster*, *R. osvaldoi*, *R. pentamaculata*, *R. phoxocephala*, *R. platyura*, *R. reisi*, *R. rupestris*, *R. steindachneri*, *R. stewarti*, *R. teffeana*, *R. tropeira*, and *R. zaina* by the presence of four longitudinal series of plates being mid-dorsal series absent (vs. five series of plates, being mid-dorsal series present). It is also differentiated from *R. aurata*, *R. cadeae*, *R. catamarcensis*, *R. felipponei*, *R. kronei*, *R. longicauda*, *R. misionera*, *R. osvaldoi*, *R. pareiacantha*, *R. phoxocephala*, *R. quadrensis*, *Rineloricaria* sp. “Loreto”, *R. stellata*, *R. steindachneri*, *R. strigilata*, *R. teffeana*, *R. thrissoceps* and *R. zaina* by having dorsal profile of snout tip rounded (vs. dorsal profile of snout tip triangular). It is also distinguished from *R. aurata*, *R. cacerensis*, *R. capitonia*, *R. formosa*, *R. hasemani*, *R. heteroptera*, *R. longicauda*, *R. parva* and *R. phoxocephala*, *Rineloricaria* sp. “Loreto”, *Rineloricaria* sp. “Madre de Dios” by the presence of abdominal plates organized in five rows between lateral plates (vs. three rows). It is further distinguished from *R. baliola*, *R. daraha*, *R. malabarbai*, *R. microlepidogaster*, *R. reisi* and *R. setepovos* by having a set of plates between insertions of pelvic fins anterior to the posterior complex arranged in a single row (vs. irregularly arranged in more than one row).

Among Peruvian species, *Rineloricaria* sp. “Pasco” is distinguished from *R. lanceolata*, *R. morrowi*, *Rineloricaria* sp. “Loreto”, *Rineloricaria* sp. “Madre de Dios” and *R. wolfei* by having the pectoral girdle anterior ventral margin straight and distance between pectoral-fin insertion and the highest point of cleitro approximately equal to half of the total distance between pectoral-fins insertion (Fig. 19; vs. anterior ventral margin of pectoral girdle curved in *R. morrowi*, *Rineloricaria* sp. “Loreto”, *Rineloricaria* sp. “Madre de Dios” and *R. wolfei*; distance between pectoral-fin insertion and the highest point of cleitro approximately equal to one third of total distance between pectoral-fin insertion in *R. lanceolata*, *Rineloricaria* sp. “Loreto”, *Rineloricaria* sp. “Madre de Dios” and *R. wolfei*). It also differs from *Rineloricaria morrowi*, *Rineloricaria* sp. “Loreto” and *Rineloricaria* sp. “Madre de Dios” by the coloration of dorsal surface, having five transversal dark brown bands (vs. six dark brown bands). It differs from *R. morrowi*, *Rineloricaria* sp. “Loreto” and *Rineloricaria* sp. “Madre de Dios” by the presence of abdominal plates organized in five rows between lateral plates (vs. three rows). It is differentiated from *R. wolfei* and *Rineloricaria* sp. “Loreto” by having a rounded snout tip profile (vs. triangular snout tip profile). It is also differentiated from *R. morrowi* by the presence of four lateral longitudinal rows serial plates lacking the mid-dorsal series (vs. five lateral serial plates and mid-dorsal series present). It is differentiated from *R. wolfei* by having a set of plates between pelvic fin-insertions anterior to the posterior complex arranged in a single row (vs. irregularly arranged in more than one row).

**Description:** Counts and measurements in Tables 9 and 10. Standard length of measured specimens 58.8-119.4 mm SL. Head and body robust through posterior tip of anal-fin rays, strongly depressed from that point to caudal-fin origin. Body width greatest at level of

dorsal-fin origin, body depth greatest at pelvic-fin insertion. Lateral line complete, median plate series bearing lateral sensory canal from compound pterotic to caudal fin. Four longitudinal lateral plate series, including dorsal, median, mid-ventral and ventral series. Median and mid-ventral series with rough well developed keels. Coalesced plates starting posterior to level of anal-fin rays tip. Dorsal profile of body from snout tip to post-orbital notch straight, from that point to penultimate dorsal plate straight. Snout tip triangular with globular naked area projected as protuberance and not reaching first pore of infraorbital sensory canal. Ventral profile from snout tip to pectoral-fin origin straight, convex between pectoral and pelvic fins and straight from pelvic-fin origin to penultimate ventral plate. Dorsal profile of snout slightly rough, with carinae not very pronounced; predorsal surface smooth. Post-rostral plates arranged in more than one row parallel to snout external margin. Anterior opening of supraorbital laterosensory canal at middle of anterior nasal margin, not contacting with infraorbital sensory canal. Pore opening of first infraorbital ventrally exposed, second to sixth infraorbital pores at dorsal surface. Second infraorbital contacting pre-nasal plates, third infraorbital contacting nostril, fourth and fifth infraorbital contacting anterior orbital margin and sixth infraorbital contacting posterior orbital margin and sphenotic. Preopercular canal with two pores (Fig. 18) visible through post-rostral plates. Post-orbital notch deep and short. Lower lip narrow, not reaching head border, surface covered by homogeneous rounded papilla, small triangular barbels at external margin and maxillary barbel short, not surpassing lower lip posterior margin. Teeth bifid and larger in dentary than in premaxilla, main and lateral cusp same size and with rounded margin. Abdominal plates of anterior complex with plates irregularly arranged not reaching lower lip, median complex longitudinally arranged in five series, posterior complex limiting anteriorly with set of plates arranged in one row between pelvic-fins insertions. Dorsal fin

originating on vertical line aligned with pelvic-fin origin. Dorsal-fin spinelet present but without locking mechanism. Pectoral-fin spine not passing pelvic-fin origin. Anterior ventral margin of pectoral girdle straight and distance between pectoral-fin insertion and highest point of cleitro approximately equal to half of the total distance between pectoral-fins insertion. Upper caudal-fin unbranched ray extended as a filament and lower caudal-fin unbranched ray never extended. Branchial arch with fifth ceratobranchial pharyngeal tooth plate having a narrow triangular shape slightly rounded at central margins.

**Coloration in alcohol:** Dorsal surface of body light brown, covered by small spots and five dark brown transversal bands, first band at base of first branched dorsal-fin insertion, second at tip of dorsal-fin rays, third, fourth equidistantly separated along caudal peduncle, and fifth reaching antepenultimate dorsal plate. Rostral margin of snout and snout naked area with dark brown to black irregular blotches. Dorsal surface of upper lip with two vertical parallel bands. All fin-rays with dark brown small stripes and hyaline membranes. Caudal fin with a conspicuous dark brown spot at base and at distal tip of upper lobe. Pale yellow ventrally. Dorsal-fin spine with dark brown narrow stripes and first branched ray with a dark brown spot at distal margin covering the membrane. Caudal-fin base with a triangle dark brown spot and a narrow dark brown stripe at distal margin.

**Sexual dimorphism:** Males have hypertrophied odontodes on the lateral margins of head arranged in numerous rows covering pre-rostral plates and opercle. Dorsal surface of pectoral-fin rays with curved odontodes stronger than head dimorphic odontodes and arranged in numerous rows on spine and in one row on unbranched-fin rays. Dorsal surface of body in males covered by long, thin, straight hypertrophied odontodes arranged in

numerous rows from posterior margin of nares through posterior margin of pre-dorsal plates and not reaching nuchal plate.

**Distribution:** *Rineloricaria* sp. “Pasco” is mainly distributed in río Palcazú, río Pachitea and tributaries. This species also occurs in tributaries of río Madre de Dios. *Rineloricaria* sp. “Pasco” is sympatric with *R. lanceolata* across its distribution (Fig. 13).

***Rineloricaria* sp. “Loreto”, new species**

**Fig. 14, Tables 11, 12**

**Holotype.** MUSM 41288, 85.8 mm SL, Sex, Peru, Loreto State, Datem del Marañón, Morona, río Morona at quebrada Uchpayacu, 3°02'39"S 77°22'44 W, 04 Oct 2011, J. Chuctaya.

**Paratype. Loreto State:** MUSM 28742, 1, 90.9 mm SL, Peru, Alto Amazonas, Andoas, río Corrientes at quebrada Carretera noroeste Kiviyacu, 16 May 2006, M. Gomez. MUSM 23182, 1, 53.5 mm SL, Alto Amazonas, Abanico del Pastaza, río Corrientes, río Platanoyacu at quebrada, 27 Oct 2004, S. Martinez. MUSM 41301, 2, 47.1-100.3 mm SL, Datem del Marañón, Morona, río Morona, 27 Oct 2004, S. Martinez.

**Diagnosis:** *Rineloricaria* sp. “Loreto” can be distinguished from all congeners by having the snout tip naked as a narrow line and almost completely covered by odontodes not reaching first pore of infraorbital sensory canal (*vs.* snout tip naked area elongated, oval or as globular protuberance sometimes reaching the first infraorbital pore). The new species is further distinguished from *R. aequalicuspis*, *R. altipinnis*, *R. anhangupitan*, *R. anitae*, *R. baliola*, *R. cacerensis*, *R. capitonia*, *R. caracasensis*, *R. daraha*, *R. eigenmanni*, *R. fallax*, *R. formosa*, *R. hasemani*, *R. heteroptera*, *R. isaaci*, *R. jaraguensis*, *R. jubata*, *R. konopickyi*,

*R. kronei*, *R. latirostris*, *R. maacki*, *R. malabarbai*, *R. maquinensis*, *R. melini*, *R. microlepidogaster*, *R. osvaldoi*, *R. pentamaculata*, *R. phoxocephala*, *R. platyura*, *R. reisi*, *R. rupestris*, *R. steindachneri*, *R. stewarti*, *R. teffeana*, *R. tropeira*, and *R. zaina* by the presence of four longitudinal series of plates being mid-dorsal series absent (vs. five series of plates, being mid-dorsal series present). It also differs from *R. anhaguapitan*, *R. anitae*, *R. aurata*, *R. beni*, *R. capitonia*, *R. daraha*, *R. heteroptera*, *R. longicauda*, *R. osvaldoi*, *R. parva*, *R. reisi*, *R. sanga*, *R. setepovos*, *Rineloricaria* sp. “Madre de Dios”, *Rineloricaria* sp. “Pasco”, *R. stellata*, *R. tropeira* and *R. zaina* by having lateral snout profile raised (vs. lateral snout profile not raised). It is also distinguished from *R. anitae*, *R. anhaguapitan*, *R. castroi*, *R. daraha*, *R. reisi*, *Rineloricaria* sp. “Pasco”, *R. stellata* and *R. zaina* by the presence of abdominal plates organized in three rows between lateral plates (vs. five rows or more). It is further distinguished from *R. baliola*, *R. daraha*, *R. malabarbai*, *R. microlepidogaster*, *R. reisi* and *R. setepovos* by having a set of plates between insertions of pelvic fins anterior to the posterior complex arranged in a single row (vs. irregularly arranged in more than one row). It is also differentiated from *R. daraha*, *R. hasemani*, *R. heteroptera*, *R. osvaldoi*, *R. stellata* and *R. zaina* by having dorsal profile of snout tip triangular and pointed (vs. dorsal profile of snout tip rounded). It is also differentiated from in *R. formosa*, *R. parva*, *R. setepovos*, *Rineloricaria* sp. “Pasco” by the coloration of dorsal surface, having six dark brown transversal bands, first and second wide and dark brown to black, third, fourth, fifth and sixth bands not easily distinguishable (vs. five wide dark brown bands).

Among Peruvian species, *Rineloricaria* sp. “Loreto” is distinguished by *R. lanceolata*, *R. morrowi*, *Rineloricaria* sp. “Madre de Dios”, *Rineloricaria* sp. “Pasco” and

*R. wolfei* by having snout profile convex and raised (vs. snout profile straight and not raised). It is further distinguished from *R. morrowi*, *Rineloricaria* sp. “Madre de Dios”, *Rineloricaria* sp. “Pasco” and *R. wolfei* by having a ventral surface of caudal peduncle dark brown (vs. ventral surface entirely light brown). Its further distinguished from *R. lanceolata*, *R. morrowi* and *Rineloricaria* sp. “Pasco” by having anterior ventral margin of pectoral girdle curved and distance between pectoral-fin insertion and the highest point of cleitro approximately equal to one third of the total distance between pectoral-fins insertion (Fig. 19; vs. anterior ventral margin of pectoral girdle straight in *Rineloricaria lanceolata* and *Rineloricaria* sp. “Pasco”; and distance between pectoral-fin insertion and the highest point of cleitro approximately equal to half of total distance between pectoral-fin insertion in *Rineloricaria* sp. “Pasco” and *R. lanceolata*). It differs from *Rineloricaria* sp. “Pasco” and *R. wolfei* by the presence of abdominal plates organized in three rows between lateral plates (vs. five rows or more). It is also distinguished from *R. lanceolata*, *R. morrowi*, *Rineloricaria* sp. “Madre de Dios” and *Rineloricaria* sp. “Pasco” by having a triangular snout tip profile (vs. rounded snout tip profile). *Rineloricaria* sp. “Loreto” can be distinguished from *R. morrowi* by the presence of four lateral longitudinal rows serial plates being mid-dorsal series absent (vs. five longitudinal lateral serial plates and mid-dorsal series present). It differs from *R. morrowi* by having a set of plates between insertion of pelvic fins anterior to the posterior complex arranged in a single row (vs. irregularly arranged in more than one row).

**Description:** Counts and measurements in Tables 11 and 12. Standard length of measured specimens 47.1-100.3 mm SL. Head and body strongly depressed. Body width greatest at middle of pectoral-pelvic area, body depth greatest at dorsal-fin origin. Lateral line

complete, median plate series bearing lateral sensory canal from compound pterotic to caudal fin. Four longitudinal lateral plate series, including dorsal, median, mid-ventral and ventral series. Median and mid-ventral series with rough well developed keels. Coalesced plates starting on vertical line through last posterior third of anal fin. Dorsal profile of body from snout tip to anterior margin of nasal concave, straight from orbital anterior margin to dorsal-fin insertion, and straight from that point to penultimate peduncle dorsal plate. Snout tip triangular complete covered by odontodes, snout naked area almost absent or reduced to a narrow line. Ventral profile straight from snout tip to pectoral-fin insertion, convex between pectoral and pelvic-fin insertions and straight from pelvic-fin insertion to penultimate peduncle ventral plate. Head dorsal surface rough, snout convex with pronounced carinae from orbital posterior margin to posterior margin of pre-dorsal plates. Post-rostral plates arranged in one row parallel to snout external margin. Anterior opening of supraorbital laterosensory canal at middle of anterior nasal area, not contacting infraorbital sensory canal. First infraorbital pore opening ventrally exposed, second to sixth infraorbital pores at dorsal surface. Second infraorbital contacting nasal, third infraorbital contacting nostril margin and suborbital, fourth infraorbital contacting suborbital and orbital anterior margin, fifth infraorbital contacting medial orbital margin and sixth infraorbital contacting posterior orbital margin and sphenotic. Preopercular canal with two pores (Fig. 18) visible through post-rostral plates. Post orbital notch deep and long. Lower lip narrow, not reaching head margin, surface covered by homogeneous rounded papilla, small narrow triangular fringes at external margin and maxillary barbel short, not surpassing lower lip posterior margin. Teeth bifid and larger in dentary than in premaxilla, main cusp margin rounded and larger than lateral cusp. Abdominal plates of anterior complex with plates irregularly arranged not reaching margin of lower lip, median complex



longitudinally arranged in three series, posterior complex limiting anteriorly with set of plates arranged in one row between pelvic-fin insertions. Dorsal fin originating on vertical line aligned with pelvic-fin origin. Dorsal-fin spinelet present but locking mechanism not functional. Pectoral-fin spine reaching pelvic-fin insertion and pelvic spine passing anal-fin insertion. Anterior ventral margin of pectoral girdle curved and distance between pectoral-fin insertion and highest point of cleitro approximately equal to one third of the total distance between pectoral-fins insertion. Caudal fin emarginated, upper unbranched ray extended as long filament and lower unbranched caudal-ray never extended. Branchial arch with fifth ceratobranchial pharyngeal tooth plate having triangular shape slightly rounded at central margins.

**Coloration in alcohol:** Dorsal surface of body dark brown, covered by small spots and six black transversal bands, first band at base of first branched dorsal-fin insertion, second at tip of dorsal-fin rays, and the others not very conspicuous and equidistantly separated along caudal peduncle. Rostral margin of snout and snout naked area with dark brown to black irregular blotches. Dorsal surface of upper lip with two vertical parallel bands. Ventral surface from posterior margin of upper lip to anal-fin origin light brown and dark brown from than point to caudal-fin. All fins with dark brown small stripes in each fin-rays and hyaline membranes. Dorsal-fin with a conspicuous dark brown blotch at distal margin of first two fin-rays. Caudal fin with a conspicuous dark brown triangular spot at base and a dark brown band at distal margin.

**Sexual dimorphism:** Only female specimens were examined.

**Distribution:** *Rineloricaria* sp. "Loreto" is restricted to the north region of Loreto State, distributed across the Amazon and Marañón tributaries including the río Morona, río

Corrientes, and some other streams nearby. *Rineloricaria* sp. “Loreto” is sympatric with *R. lanceolata* in its geographic range (Fig. 15).

**Remarks:** This species is mainly diagnosed by having a naked area at snout tip reduced to a narrow line not reaching the first infraorbital pore, one of the examined specimens presented the snout tip completely covered by odontodes, being the naked area at the snout tip naked area absent, reason why measures from this specimen were not considered in statistics analysis.

## Discussion

Bleeker (1862) described *Rineloricaria* and *Hemiloricaria* in the same year to accommodate *H. caracasensis*. Isbrücker (1980) considered both genera as synonyms, although in 2001 he named *Fonchiichthys* and *Leliella* as two new genera in order to place three species previously included within *Rineloricaria*: *Leliella heteroptera*, *Fonchiichthys rupestris* and *F. uracanthus*. Later, Ferraris (2003), considered *Fonchiichthys*, *Hemiloricaria* and *Leliella* as synonyms of *Rineloricaria*, but in 2007 he accepted part of classification proposed by Isbrücker (2001), considering only *Hemiloricaria* and *Fonchiichthys* as valid (Fichberg & Chamon, 2008).

Peruvian species of *Rineloricaria* (*R. lanceolata*, *R. morrowi* and *R. wolfei*) were considered by Ferraris (2007) within *Hemiloricaria*. However, the two phylogenies that corroborate *Rineloricaria* as monophyletic, Fichberg (2008) and Costa (2013), included *Hemiloricaria* species within *Rineloricaria*.

In an attempt to comply with Ferraris (2007) species list, Rodriguez & Reis (2008) proposed a species clustering using a geographic restriction based on external

morphological features and ecological features of *Rineloricaria* species from Laguna dos Patos in Rio Grande do Sul, Brazil. Thereby, *Hemiloricaria* was restricted to the upper Parana basin and costal Atlantic drainages, being characterized by having a narrow body, upper and sometimes lower unbranched caudal-fin elongated as a filament, abdominal area completely covered by plates, body surface dorsally covered by dark brown spots and sexual dimorphism expressed as hypertrophic odontodes on pre-dorsal area, lateral margins of head and dorsal surface of pectoral fin. *Rineloricaria* was restricted to rio Parana and tributaries, and from costal Uruguay drainages to northeastern Brazil, being diagnosed by having a wide body, upper caudal-fin ray not prolonged as a long filament in most species, abdomen not always fully covered by plates, body surface background color pattern uniform without dark brown spots between dark brown bands, and sexual dimorphism expressed as hypertrophied odontodes on lateral margin of head and dorsal surface of pectoral fin but never on predorsal area. As a result, two phenetic assemblages were proposed: the first group (named “sandy group”), were diagnosed by having a triangular snout profile and elongated naked area reaching first infraorbital pore; the second group (named “rocky group”), were diagnosed by having snout profile rounded, naked area with oval shape not reaching the first infraorbital pore.

However, as pointed by Fichberg (2008), this classification seems to work only with east costal species but do not fit with morphological variations of Amazonian species, in which we can observe a combination of those characters previously assigned by Rodriguez & Reis (2008) to *Hemiloricaria* (represented by 24 species) and *Rineloricaria* (with 20 species). Thus, Peruvian species that were examined, varied from having a naked elongated snout tip area not reaching pore of first infraorbital (in *Rineloricaria* sp. “Madre de Dios”,

*R. morrowi* and *R. wolfei*), naked snout tip area modify as a globular protuberance not reaching first pore of infraorbital sensory canal (in *Rineloricaria* sp. “Pasco”) or snout tip almost entire covered by odontodes being naked snout tip area reduced to a narrow line (in *Rineloricaria* sp. “Loreto”).

Among *Rineloricaria* species, sexual dimorphism was characterized by the having dimorphic odontodes in male specimens. However the arrangement (when present) of these structures on surface of pre-dorsal area is also a variable feature, but despite this variation it was possible to identify a pattern in the disposition and morphology of hypertrophied odontodes that allowed to enhance diagnoses of all Peruvian *Rineloricaria* species (except in *Rineloricaria* sp. “Loreto” of which only four females specimens were available). Thereby, *R. lanceolata* and *Rineloricaria* sp. “Pasco” were characterized by having numerous hypertrophied odontodes on pre-dorsal area irregularly arranged, on lateral margins of head and dorsal surface of pectoral-fin branched rays, but differ in number of hypertrophied odontodes on pectoral spine and unbranched-fin rays, being in *R. lanceolata* arranged in two to three rows and in *Rineloricaria* sp. “Pasco” in a single row on spine and unbranched pectoral-fin rays. *Rineloricaria morrowi* also have hypertrophied odontodes on the pre-dorsal area, differing from *R. lanceolata* and *Rineloricaria* sp. “Pasco” for being arranged in two rows from anterior border of post-orbital notch and not reaching the nuchal plate. On the other hand, *Rineloricaria* sp. “Madre de Dios and *R. wolfei* have dimorphic odontodes only on lateral margins of head and on dorsal surface of pectoral-fin rays.

Coloration pattern, although highly variable among Amazonian species and likewise sexual dimorphism, has been taken into account as an important diagnostic character to group together *Rineloricaria* species based on the number of dark brown bands on dorsal

body surface. Thus, Peruvian species are clustered into two groups, first by having five well distinguished dark brown bands grouping *R. morrowi*, *Rineloricaria* sp. “Madre de Dios” and *Rineloricaria* sp. “Pasco”, and second by having five dark brown bands very well distinguished and a blotch at end of caudal peduncle, but not easily differentiated as a band due to dark dorsal background body color *R. lanceolata* and *Rineloricaria* sp. “Loreto”.

In order to differentiate *R. lanceolata*, coloration is the main feature that distinguished this species from its congeners, except from *R. heteroptera* that differs from *R. lanceolata* by lacking abdominal pigmentation (*vs.* abdominal pigmentation always present as irregular blotches (Isbrücker & Nijssen, 1976), and its characterized by having irregular dark brown to black blotches on all fins and two longitudinal dark brown to black bands running parallel crossing orbits from snout tip and reaching the anterior margin of the nuchal plate. However specimens with this coloration pattern need to be further examined, given that the distribution of *R. lanceolata* encompasses a wide range of river basins including Amazonas and Araguaia basins (Isbrücker, 1973), rio Parana basin in Argentina (Rodriguez & Miquelarena, 2002) and río Paraguay basin (Vera-Alcaraz *et al.*, 2012), suggesting the idea of a species complex.

Although the holotype of *R. morrowi* was not well preserved, non-type specimens exhibit a characteristic coloration at posterior area from anal-fin insertion to caudal-fin base, as a dark elongated line along both sides of caudal peduncle and conspicuous dark brown spot around unbranched anal-fin rays insertion, caudal-fin base with dark brown, triangular spot and distal margin with wide dark brown stripe. However, as pointed out by Vera-Alcaraz *et al.* (2012), this coloration pattern is very similar in *R. melini*, *R. fallax*, *R. formosa*, *R. hasemani*, *R. jubata* and *R. teffeana* and also require a detailed review.

The osteological features that were included to enhance species diagnosis demonstrated to be consistent characters in order to differentiate *Rineloricaria* species. To reduce variation due to development and size, adult and juvenile specimens of all species were clear and stained. Results shown that higher number and small sized post-rostral plates (aproximattely from 11 to 17 plates) were found in *R. lanceolata* (Fig. 17; vs. aproximattely from 4 to 5 post-rostral plates in *R. morrowi*, *Rineloricaria* sp. “Loreto”, *Rineloricaria* sp. “Madre de Dios” and *R. wolfei*). A slightly curved anterior margin of the cleitro was found in *Rineloricaria* sp. “Loreto”, *Rineloricaria* sp. “Madre de Dios” and *R. wolfei* whereas it was strongly curved in *R. morrowi*; cleitro with a straight anterior margin was found in *R. lanceolata* and *Rineloricaria* sp. “Pasco”. However they differ in having distance between pectoral-fin insertion and the highest point of cleitro approximately equal to one third of the total distance between pectoral-fins insertion in *R. lanceolata* and distance between pectoral-fin insertion and the highest point of cleitro approximately equal to half of the total distance between pectoral-fins insertion in *Rineloricaria* sp. “Pasco” (Fig. 19).

Clear and stained specimens also allowed to identify the longitudinal lateral plate series that remain present in coalescent plates in Loricariini species (Fig. 22 and Fig. 23). Reis & Pereira (2000) defined coalesced plates as the number of plates in midventral plate series in which the two keels get close to each other. After examining clear and stained specimens of *Rineloricaria* and other Loricariini species (*Loricaria cataphracta* and *L. clavipinna*), it was possible to corroborate that coalesced plates started when the keels in median and mid-ventral series of lateral plates run parallel to each other and are only separated by the laterosensory canal, from approximately half of body to base of caudal fin.

Median and mid-ventral plate series possess a rough keel at middle of each plate and laterosensory canal passes through median plate series. Thus, contrasting with the assertions of Reis & Pereira (2000) that one of the series of plates (was not mentioned which one of them) probably disappears in the caudal peduncle and coalesced plates are formed only by the mid ventral plate series, it was found that the area below the keel in the median plate series and the area above the keel in the mid-ventral plate series, gradually reduce in size along caudal peduncle until the space between them adjust to the diameter of latero-sensory canal, but all plate series remain present.

According to Schaefer (1987), the preopercular sensory canal is reduced in trichomycterids, is present with three pores in challichthyids and with in two pores in loricariids (Reis, 1998). However, examination of suspensory and post-rostral plates, show that this feature is variable among *Rineloricaria* Peruvian species, on which the preopercle can have two pores (in *Rineloricaria* sp. "Pasco") and three pores (in *R. lanceolata*, *R. morrowi*, *R. wolfei*, *Rineloricaria* sp. "Loreto", *Rineloricaria* sp. "Madre de Dios"). This feature can also be examined in alcohol preserved specimens, being preopercular sensory canal pores dorsally located between post-rostral plates and opercle and occupying small areas only covered by skin (Fig. 18).

Another osteological feature that presented variation among *Rineloricaria* species is the contact of the anterior lateral margin of the nasal with the infraorbitals. In most *Rineloricaria* species, including all Peruvian species, the nasal bone is in contact with a infraorbital series, however in *R. longicauda* the nasal is separated from the infraorbital series by a naked space, and in *R. stellata* the nasal is separated from the infraorbital series by a small ethmoidal plate.

*Rineloricaria morrowi* and *R. wolfei* were described by Fowler, 1940 based only on the holotype. The type localities were poorly specified and holotypes of both species were collected in the same place, the río Ucayali basin at Contamana. However, since the original description, several specimens have been collected across Peruvian drainages, allowing the description of a more precise distribution. Accordingly, geographic distribution shows that *R. morrowi* occurs in headwaters of río Nanay (in this distribution some specimens were misidentified as *R. konopickyi*, the same were here identified as *R. morrowi*), río Aucayacu and the headwaters of río Ucayali in Peru and at río Inambari, which suggest that the distribution could be even wider. On the other hand, *R. wolfei* is widely distributed in the western Amazon watershed, in the río Juruá and río Madeira on southwestern Brazil and across Peruvians drainages, in río Aucayacu, río Corrientes, río Nanay and tributaries of río Ucayali.

Among the new species, two of them were well sampled allowing a more precise description of their distribution. *Rineloricaria* sp. “Madre de Dios” is the second most widely distributed Peruvian species after *R. lanceolata*, occurring in the río Amazonas, río Nanay, río Ucayali and tributaries, río Madre de Dios, río Las Piedras and río Manu and tributaries at southeastern Peru. *Rineloricaria* sp. “Pasco” is found in río Palcazú, río Pachitea and tributaries; however two specimens were also collected, one in a tributarie of río Madre de Dios and other in río Tahuamanu. *Rineloricaria* sp. “Loreto” is currently restricted to the Amazon and Marañón tributaries including the río Morona and río Corrientes, but this information is likely to be extended as more specimens are collected.

As stated by Fichberg (2008), there are 24 *Rineloricaria* species known from the Parana-Paraguay drainage system and 15 from the Amazon basin watershed (Fig. 16).



*Rineloricaria* species distributed in the Amazon basin (*R. fallax*, *R. formosa*, *R. heteroptera*, *R. daraha*, *R. phoxocephala*, *R. castroi*), including all Peruvian *Rineloricaria* species (*R. lanceolata*, *R. morrowi*, *Rineloricaria* sp. “Loreto”, *Rineloricaria* sp. “Madre de Dios”, *Rineloricaria* sp. “Pasco” and *R. wolfei*), they can be clustered by morphological features as greater body width at dorsal-fin insertion level, only upper unbranched caudal-fin ray extended as a filament and abdominal area completely covered by plates. By its turn, Araguaia (*R. osvaldoi*) and Parana-Paraguay *Rineloricaria* species (*R. hoehnei*, *R. parva*, *R. latirostris* and *R. pentamaculata*) can be distinguished by having greater body width at cleitro (except in *R. parva*), upper and sometimes lower unbranched caudal-fin ray extended as a filament and abdominal area not always completely covered by plates.

According with these results, we can assume now that diversity of *Rineloricaria* species in the Amazon basin must have been underestimated. Abell *et al.* (2008) designed a freshwater ecoregions map and delimited 426 ecoregions based on the distribution of freshwater fish species, in which ecoregions from 301 to 352 correspond to South America. According to this map, Peruvian *Rineloricaria* species distribution are linked to the most highly diverse ecoregions of the Amazon watershed, being ecoregions 316-Amazon Lowlands occupied by *Rineloricaria morrowi*, *Rineloricaria* sp. “Madre de Dios” and *Rineloricaria wolfei*; ecoregion 319-Guaporé-Itenez by *Rineloricaria wolfei*; and ecoregions 317-Ucayali-Urubamba and northwest of 318-Marmoré-Madre de Dios by *Rineloricaria* sp. “Madre de Dios”.

Results of the discriminant analysis show that the most important traits that define the peruvian *Rineloricaria* species are the naked area width at snout tip and rostral border length, having both measurements the higher Wilk’s Lambda value (0.0017 and 0.0016,

respectively) and tolerance value greater than 0.1, indicating that there was no collinearity problems among the two most discriminating morphometric variables. The discriminant analysis was applied twice, varying the number of species used on the analysis. The first analysis used six peruvian *Rineloricaria* species (Fig. 24) showing an overlap between *Rineloricaria* sp. “Loreto”, *R. morrowi* and *R. wolfei*, and in a second analysis due to this difference *R. lanceolata* and *Rineloricaria* sp. “Pasco” show morphological traits that differentiate them from the other species (as body width and body depth) this two species were excluded from the analysis, resulting in a less overlap, although *Rineloricaria* sp. “Loreto” still completely overlaps within *Rineloricaria* sp. “Madre de Dios”, which can be explained by the small number of specimens examined (Fig. 25).

Rapp Py-Daniel (1997) presented a hypothesis explaining relationships among the Loricariinae species, including 15 species of *Rineloricaria*, despite Loricariinae was demonstrated as monophyletic, *Rineloricaria* appeared as a paraphyletic group. Most recent phylogenies based on morphological and molecular characters encompassing most *Rineloricaria* species, have shown this group as monophyletic. Fichberg (2008) tested the monophyly of *Rineloricaria* using 36 species. Her results pointed 12 sinapomorphies sustaining the genus *Rineloricaria* as a monophyletic group, being the developed dorso-mesial process of fourth pharingobranchial the only exclusive sinapomorphy and the three plates usually contacting the anterior margin of pre-anal plate as a non exclusive sinapomorphy.

These results did not corroborate some of the results found by Rapp Py-Daniel (1997) who found *R. lima* as the most plesiomorphic taxon. In contradiction, Fichberg (2008) found *R. maquiensis* as the most basal taxon among *Rineloricaria* species and *R.*

*daraha* as the sister group of *R. kronei* instead of *R. heteroptera*. Relationships with other genera show *Ixinandria steinbachi* as the sister group of all *Rineloricaria* species (Fichberg, 2008).

Despite *Rineloricaria* was validated as monophyletic, the results obtained by Fichberg (2008) using only morphological characters, show 11 species of *Rineloricaria* (including *R. lanceolata*) grouped in a polytomy. The inclusion of the new *Rineloricaria* species, as well as the new osteological and morphological characters proposed that were described in this paper and used in species diagnosis allows a more precise identification and could also help to clarify the unresolved relationships between the species in the genus.

From a total of 65 *Rineloricaria* species, only three of them (*R. lima*, *R. thrissoceps* and *R. wolfei*) are contemplated by the IUCN. Among the Peruvian species, *Rineloricaria wolfei* has been assessed in the Red List & Criteria 2013 (Reis & Lima, 2009), as Least Concern, taking into account the lack of any known major widespread threats and the large geographical distribution (information probably based on previous studies as checklists and original descriptions). Ecological traits characterized this species as demersal and frequently occupying medium sized rivers with muddy bottoms. However, the IUCN also highlights the need of a major knowledge on the taxonomy and ecology of this species, given that most of this information belongs to the genus description in general (Reis & Lima, 2009).

Given the present state of knowledge of the Peruvian ichthyofauna, and despite the fact that many inventories have been made at the main River basins, there is still a lack of information in areas of difficult access like headwaters of Yanachaga-Chemillén and Cordillera Azul National Park, lower Putumayo River basin, Amazon drainages between

Ecuador and Peru, Santiago-Comainas Reserved Zone, Alto Mayo River Basin and the rivers from Reserved Area Alto Purus (Ortega *et al.*, 2012). Thereby, a more detailed exploration of areas with difficult access will allow to understand a possible increment of the genus diversity and it also becomes very likely to clarify the still patchy geographic distribution of Peruvian *Rineloricaria* species.

Thus, the still patchy geographic distribution of most *Rineloricaria* species in Peru its very likely to be better understood, as well as a possible genus diversity increment, if a more detailed exploration of areas with difficult access in the future will be made.

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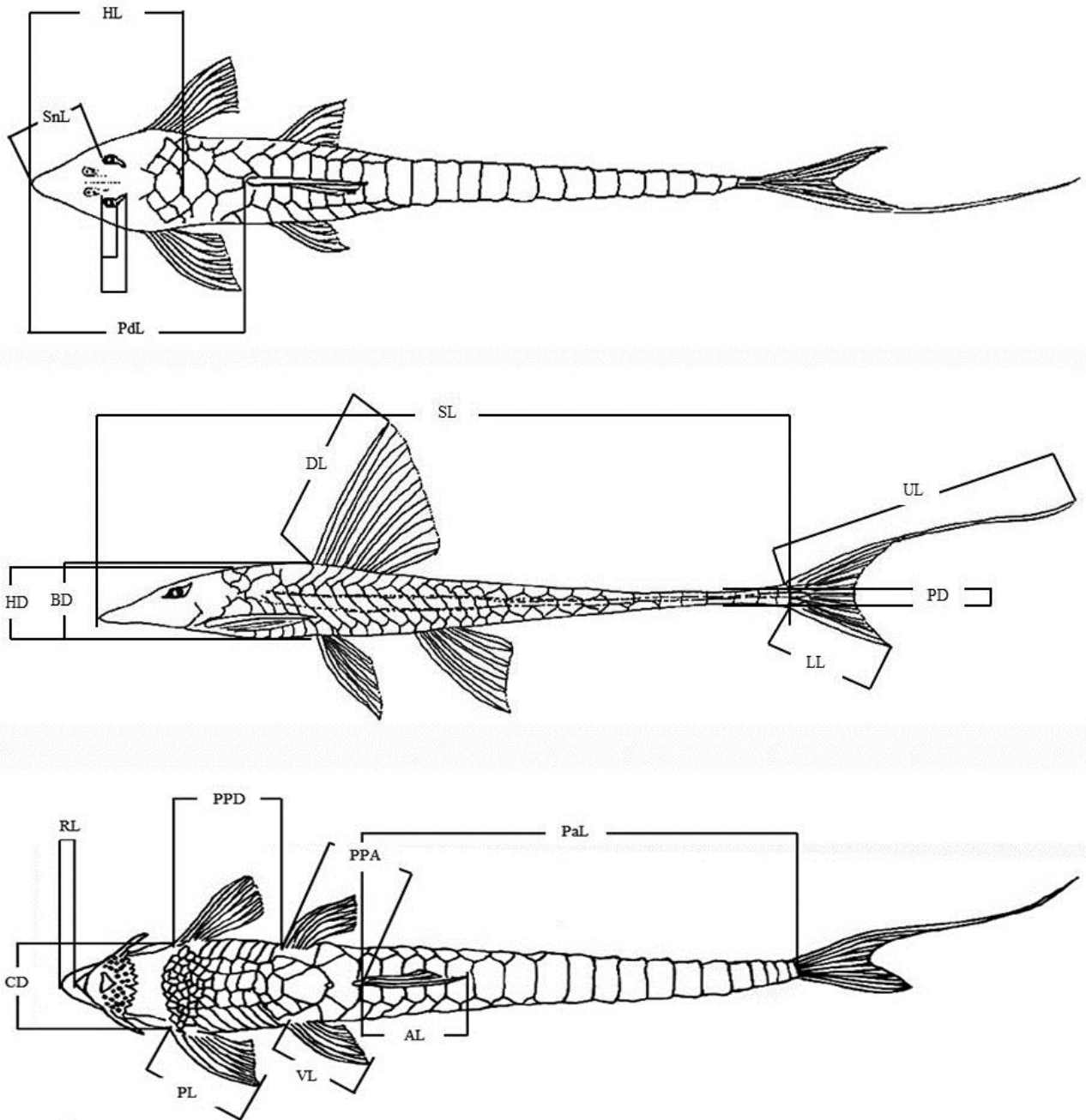
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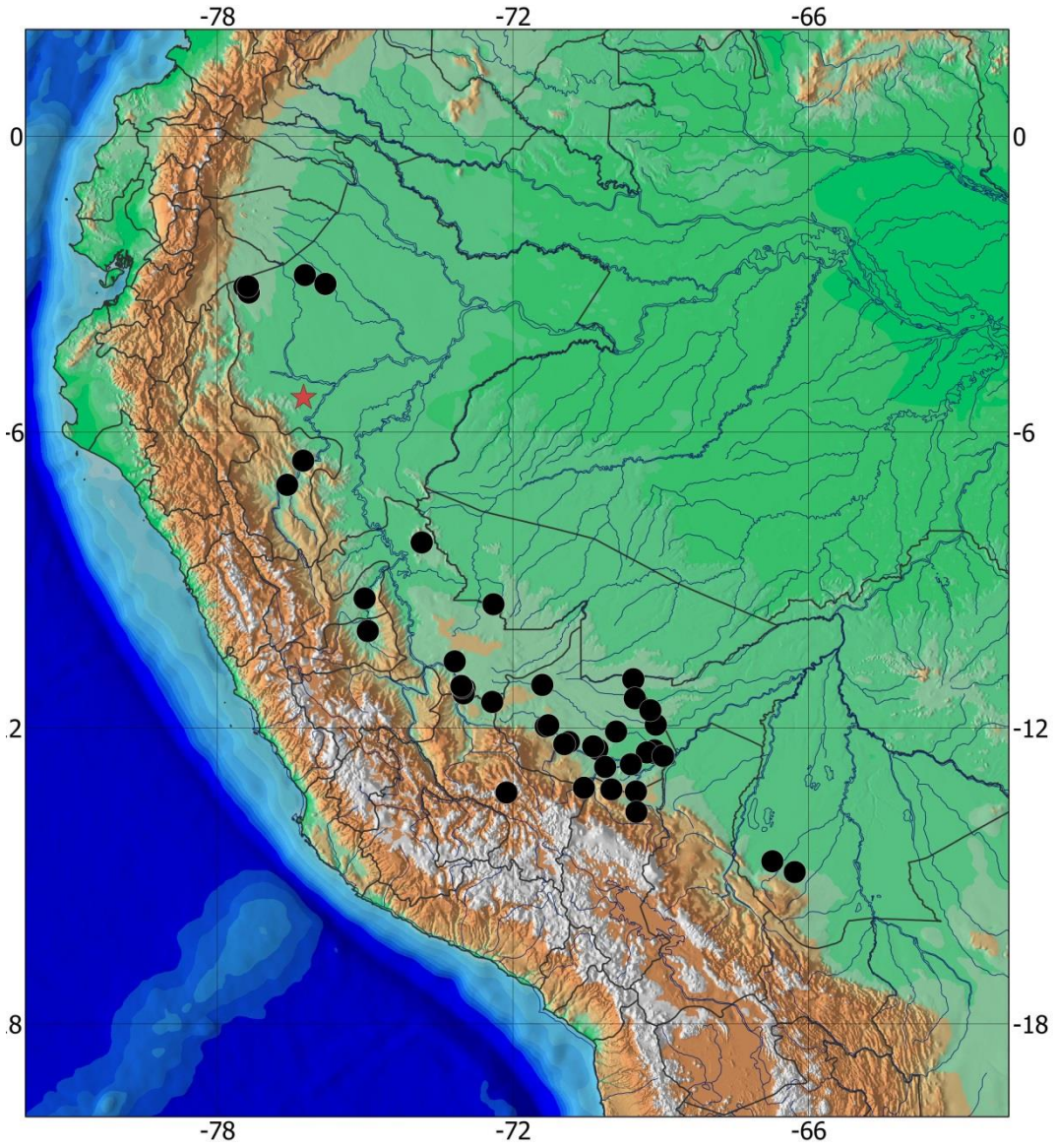


**Fig.1** Measurements used in this study. Illustration based on Fowler (1940) with modifications. Abbreviations used are: Standard length (SL), Predorsal length (PdL), Postanal length (PaL), Dorsal-fin spine length (DL), Anal-fin spine length (AL), Pectoral-fin spine length (PL), Ventral-fin ray length (VL), Uppermost caudal-fin ray length (UL), Lowermost caudal-fin ray length (LL), Head length (HL), Pectoral-pelvic distance (PPD), Pelvic-anal distance (PAD), Cleitro width (CD), Body depth (BD), Caudal peduncle depth (PD), Snout length (SnL), Head depth (HD), Interorbital width (IOW), Rostral border length (RL).



**Fig. 2** Dorsal, lateral, and ventral views of *Rineloricaria lanceolata*, ANSP 180656, 85.7 mm SL, female, Peru, Loreto State, provincia Maynas.





**Fig. 3** Geographic distribution of *Rineloricaria lanceolata*. Star indicates type-locality.

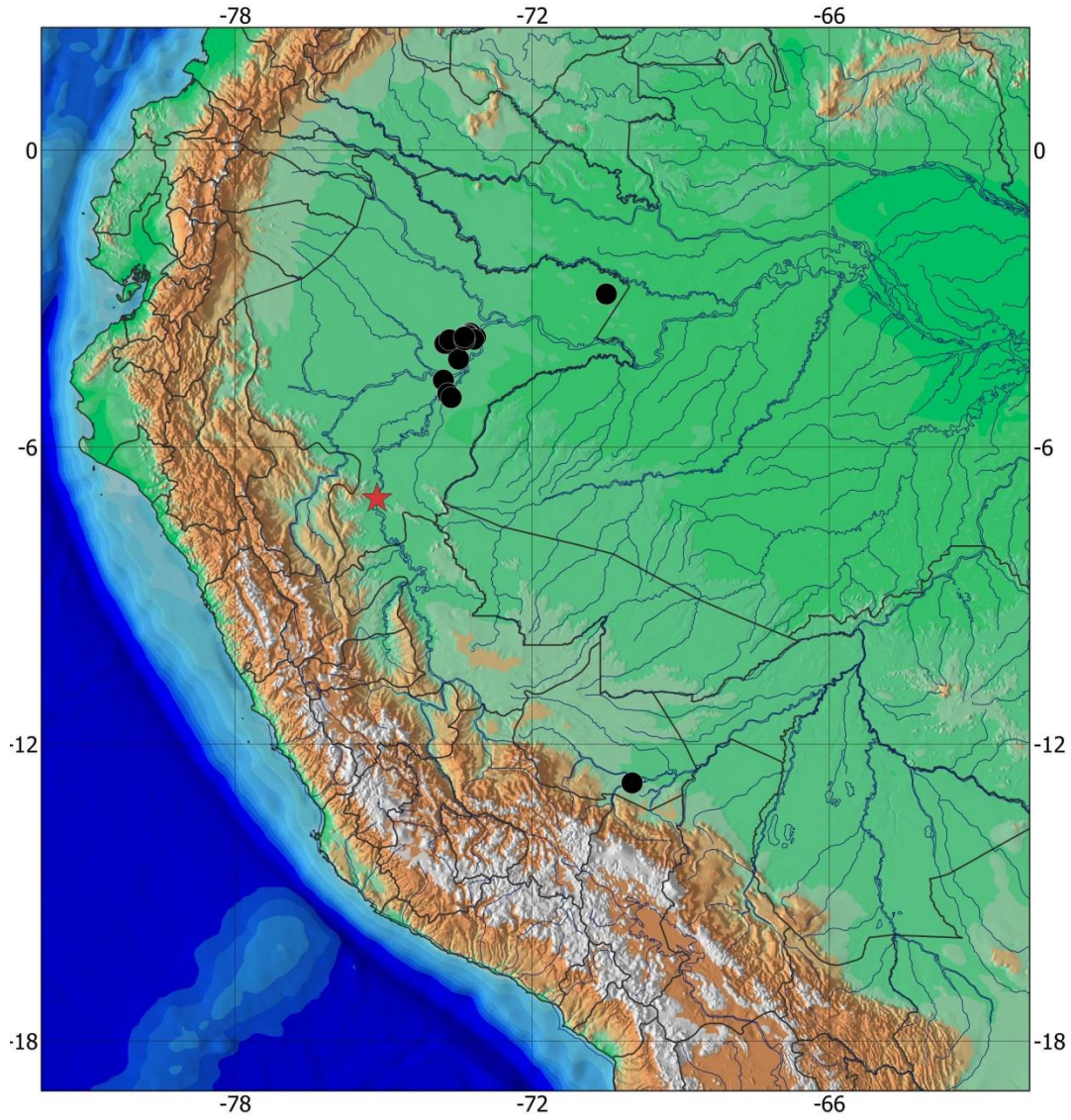


**Fig. 4** Dorsal, lateral, and ventral views of *Rineloricaria morrowi*, ANSP 68663, holotype, 143.4 mm SL, female, Peru, Loreto State, Ucayali River basin near Contamana.



**Fig. 5** Dorsal, lateral, and ventral views of *Rineloricaria morrowi*, MUSM 13117, 111.4 mm SL, female, Peru, Loreto State, Maynas, río Nanay at cocha Anguilla in Santa Maria de Nanay, 3°55'9"S 73°39'17"W.





**Fig. 6** Geographic distribution of *Rineloricaria morrowi*. Star indicates type-locality.

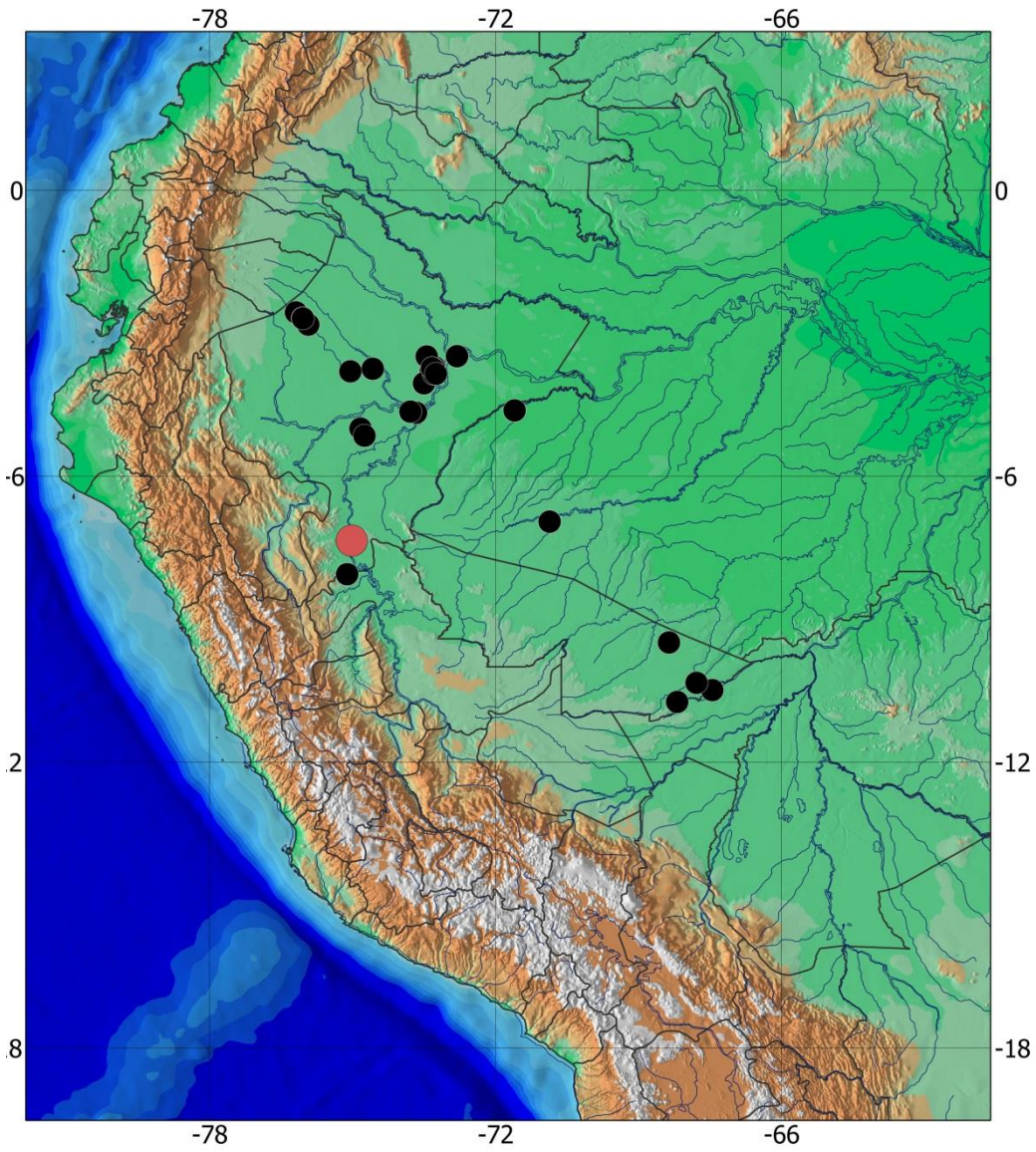


**Fig. 7** Dorsal, lateral, and ventral views of *Rineloricaria wolfei* ANSP 68660, holotype, 143.4 mm SL, female, Peru, Loreto State, Ucayali River basin near Contamana.



**Fig. 8** Dorsal, lateral, and ventral views of *Rineloricaria wolfei*, MUSM 17682, 112.1 mm SL, female, Peru, Loreto State, Nauta, río Marañón at mouth of río Yanayacu, 4°38'39"S 73°47'9"W.



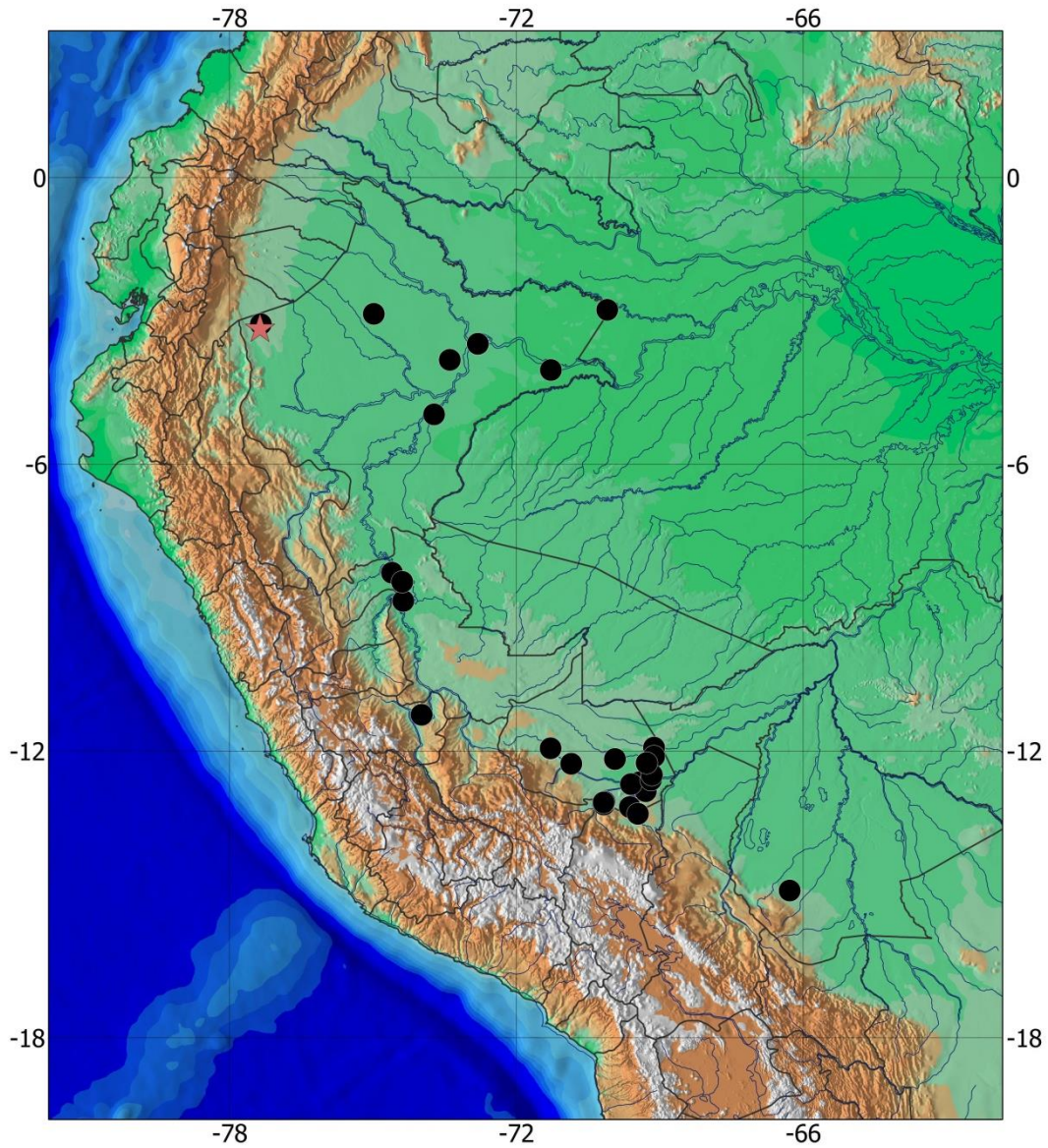


**Fig. 9** Geographic distribution of *Rineloricaria wolfei*. Star indicates type-locality.



**Fig. 10** Dorsal, lateral, and ventral views of *Rineloricaria* sp. “Madre de Dios”, MUSM 34745, holotype, 123.4 mm SL, female, Peru, Loreto State, Alto Amazonas, Morona, río Amazonas, río Marañón, río Morona at quebrada Wiratkentsa, 204 m, 3°10'8"S 77°21'46"W.

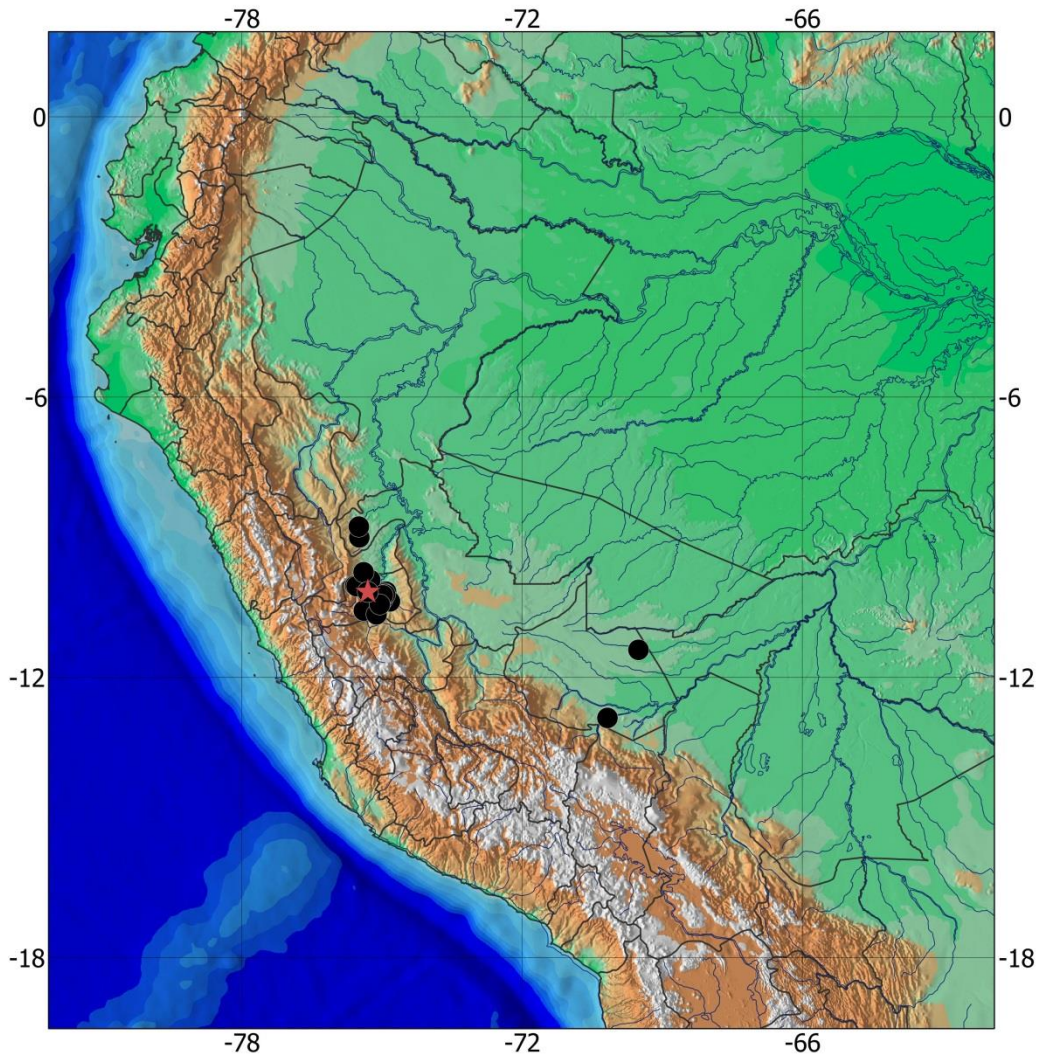




**Fig. 11** Geographic distribution of *Rineloricaria* sp. "Madre de Dios". Star indicates type-locality.



**Fig. 12** Dorsal, lateral, and ventral views of *Rineloricaria* sp. “Pasco”, MUSM 18947, holotype, 80.3 mm SL, female, Pasco State, Oxapampa, Puerto Bermudez at quebrada Ataz, 10°10'11"S 75°18'03"W.

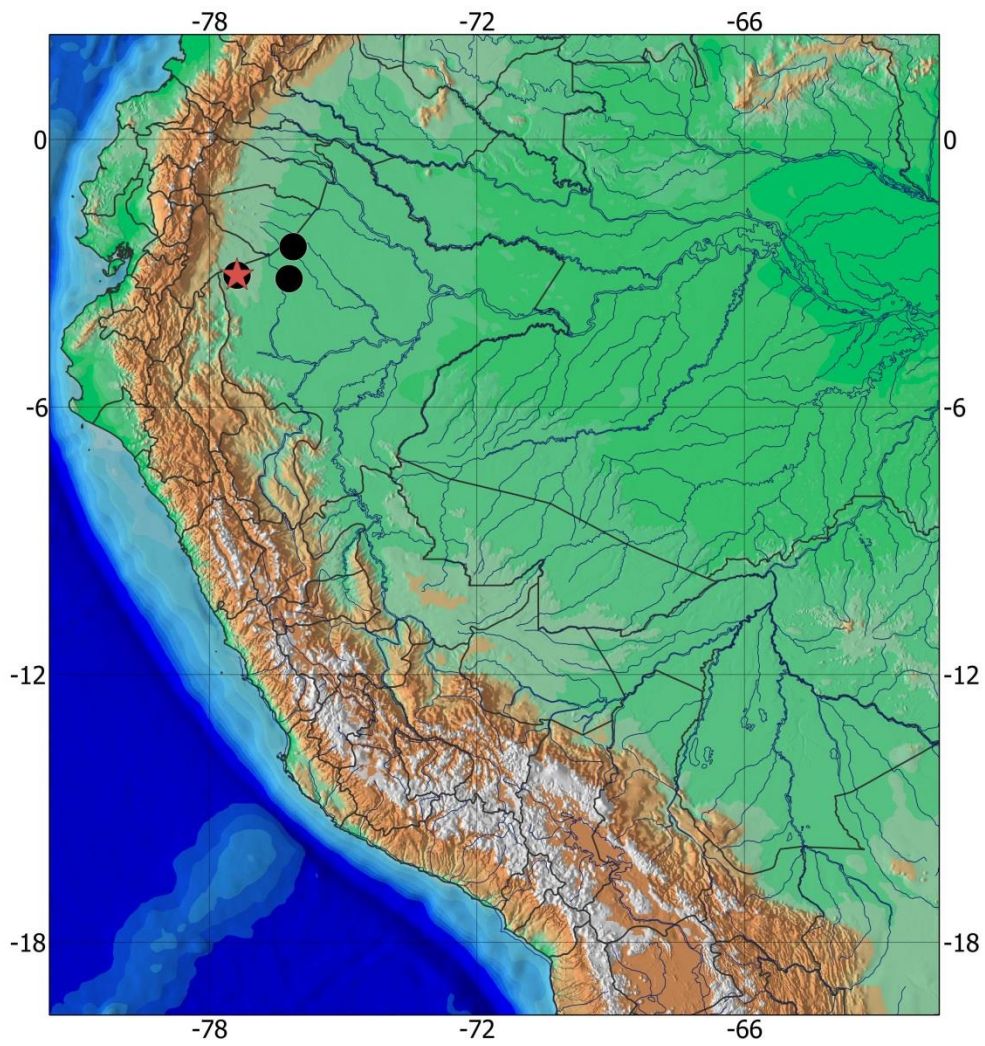


**Fig. 13.** Geographic distribution of *Rineloricaria* sp. “Pasco”. Star indicates type-locality.





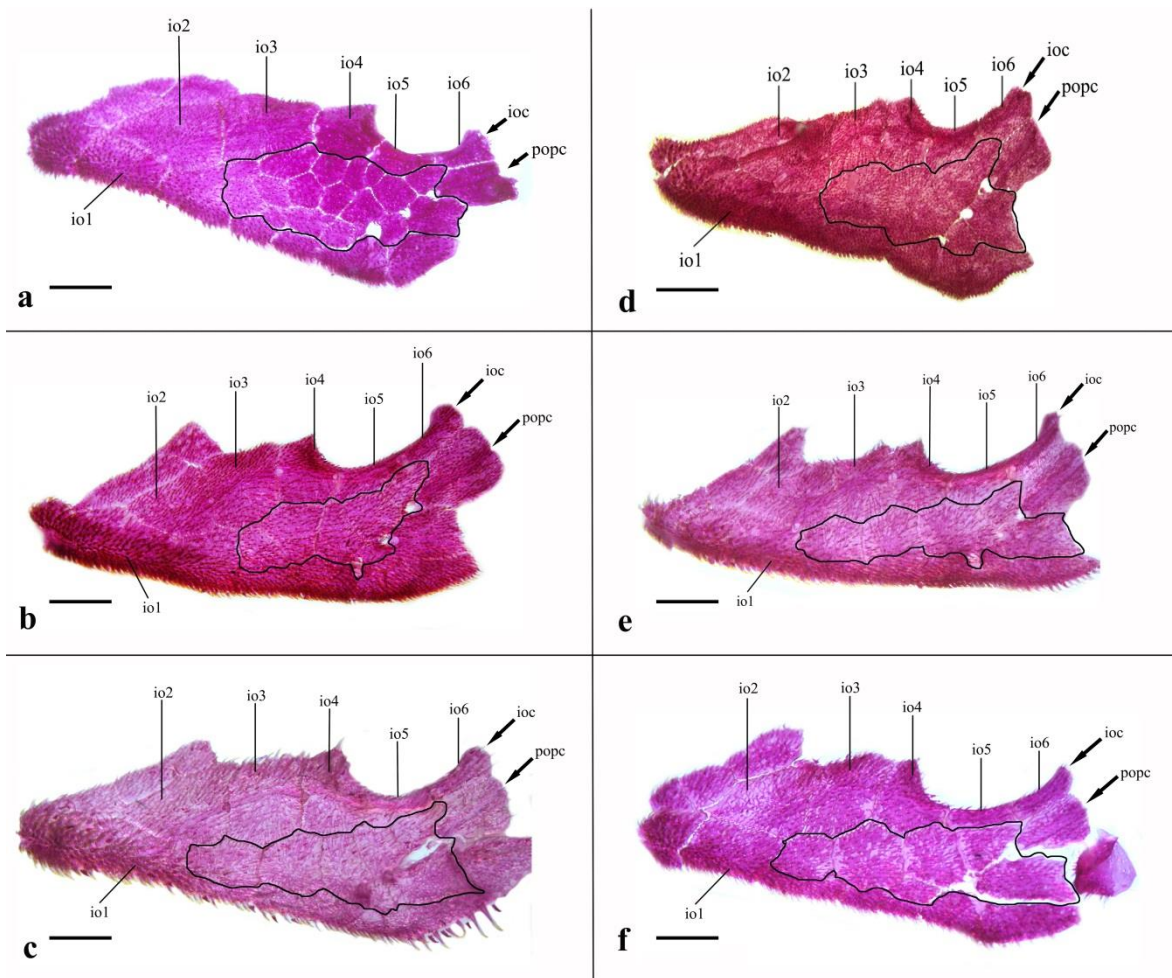
**Fig. 14** Dorsal, lateral, and ventral views of *Rineloricaria* sp. “Loreto”, MUSM 41288, holotype, 85.8 mm SL, female, Peru, Loreto State, Datem del Marañón, Morona, río Morona at quebrada Uchpayacu, 3°02'39"S 77°22'44 W.



**Fig. 15.** Geographic distribution of *Rineloricaria* sp. "Loreto". Star indicates type-locality.

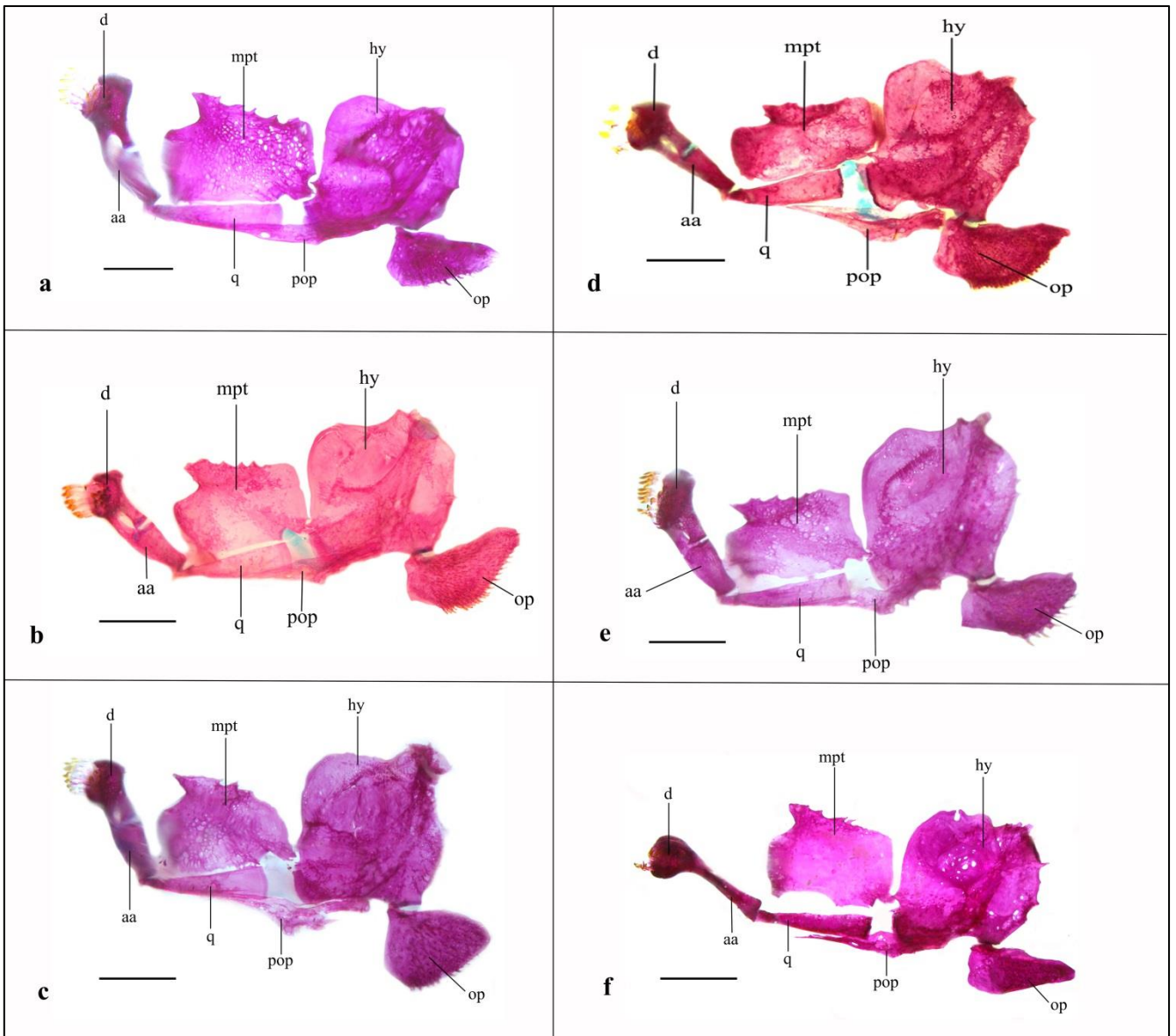


**Fig. 16.** Major drainage basins where *Rineloricaria* species are distributed (adapted from Lundberg *et al.* 1998; Fichberg, 2008).



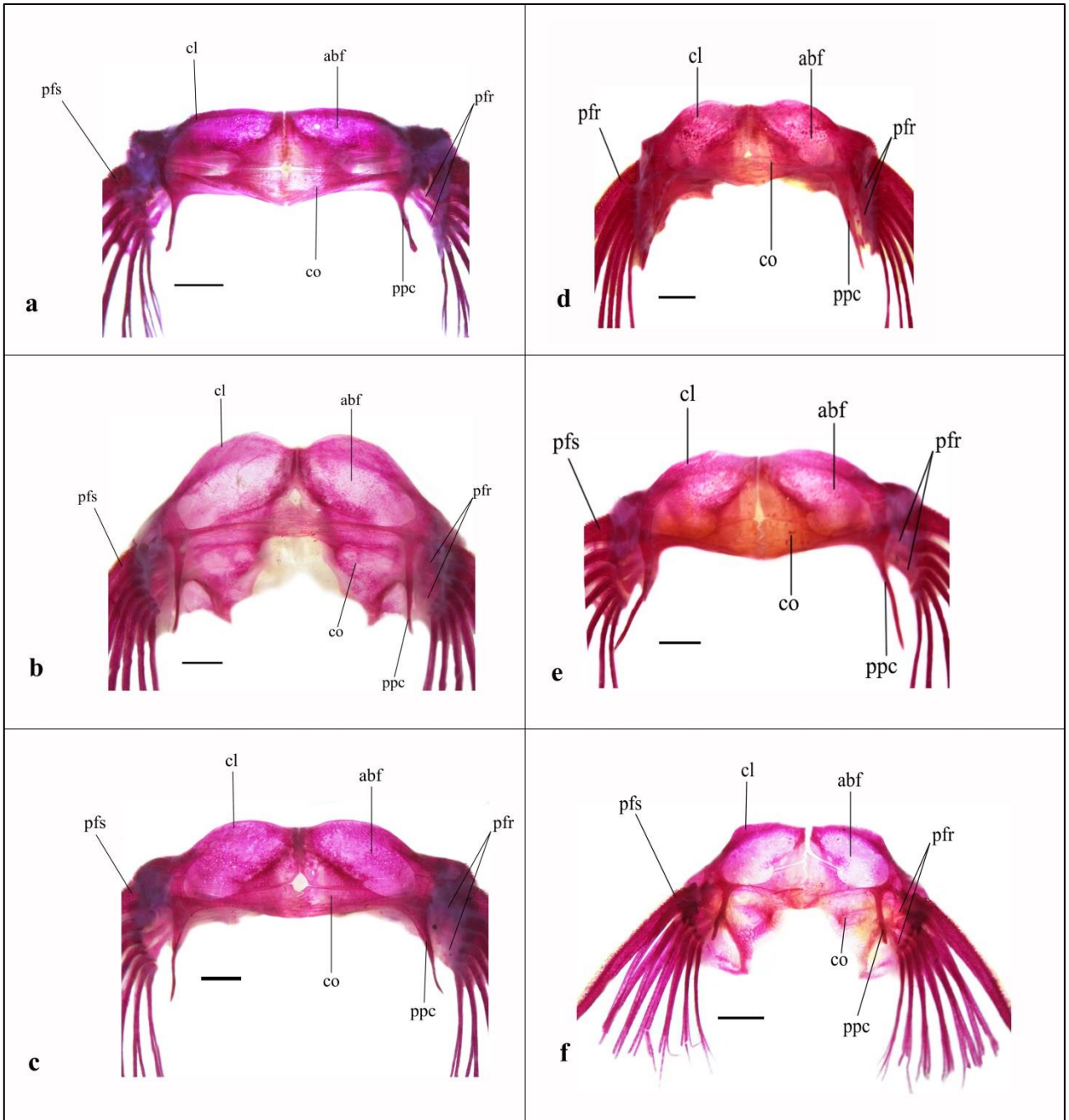
**Fig.17.** Post-rostral plates (countoured area) of *Rineloricaria* species: a) *Rineloricaria lanceolata* MUSM 35766; b) *Rinelo/ricaria morrowi* MUSM 35013; c) *Rineloricaria wolfei* MUSM 38256; d) *Rineloricaria* sp. “Loreto” MUSM 41301; e) *Rineloricaria* sp. “Madre de Dios” MUSM 10027; f) *Rineloricaria* sp. “Pasco” MUSM 19496. Lateral view, anterior towards left. Scale bar = 2 mm.



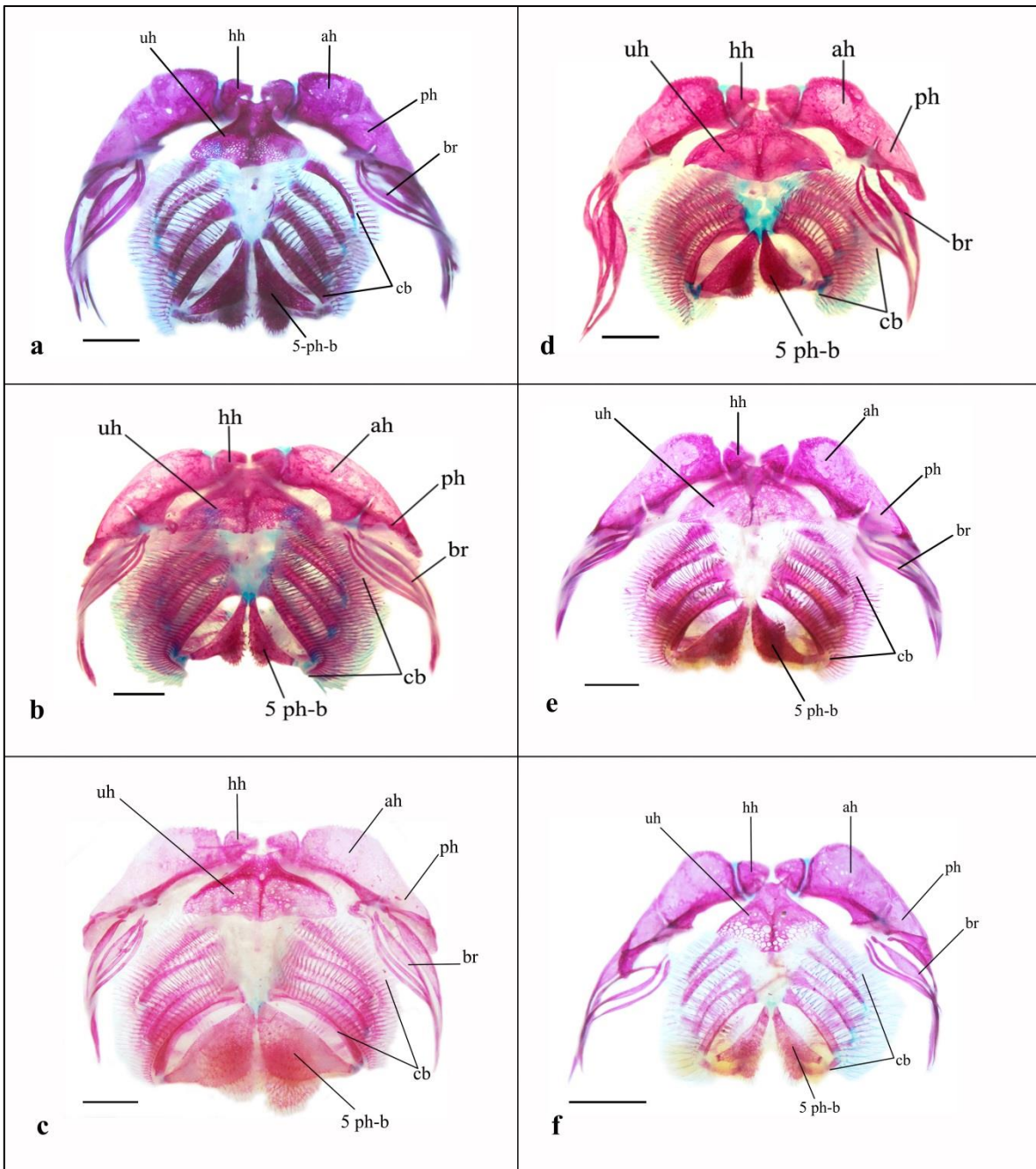


**Fig.18.** Suspensory and lower jaw of *Rineloricaria* species: a) *Rineloricaria lanceolata* MUSM 35766; b) *Rineloricaria morrowi* MUSM 35013; c) *Rineloricaria wolfei* MUSM 42524; d) *Rineloricaria* sp. “Loreto” MUSM; e) 41301 *Rineloricaria* sp. “Madre de Dios” MUSM 10027; f) *Rineloricaria* sp. “Pasco” MUSM 20636. Lateral view, anterior towards left. Scale bar = 2 mm.

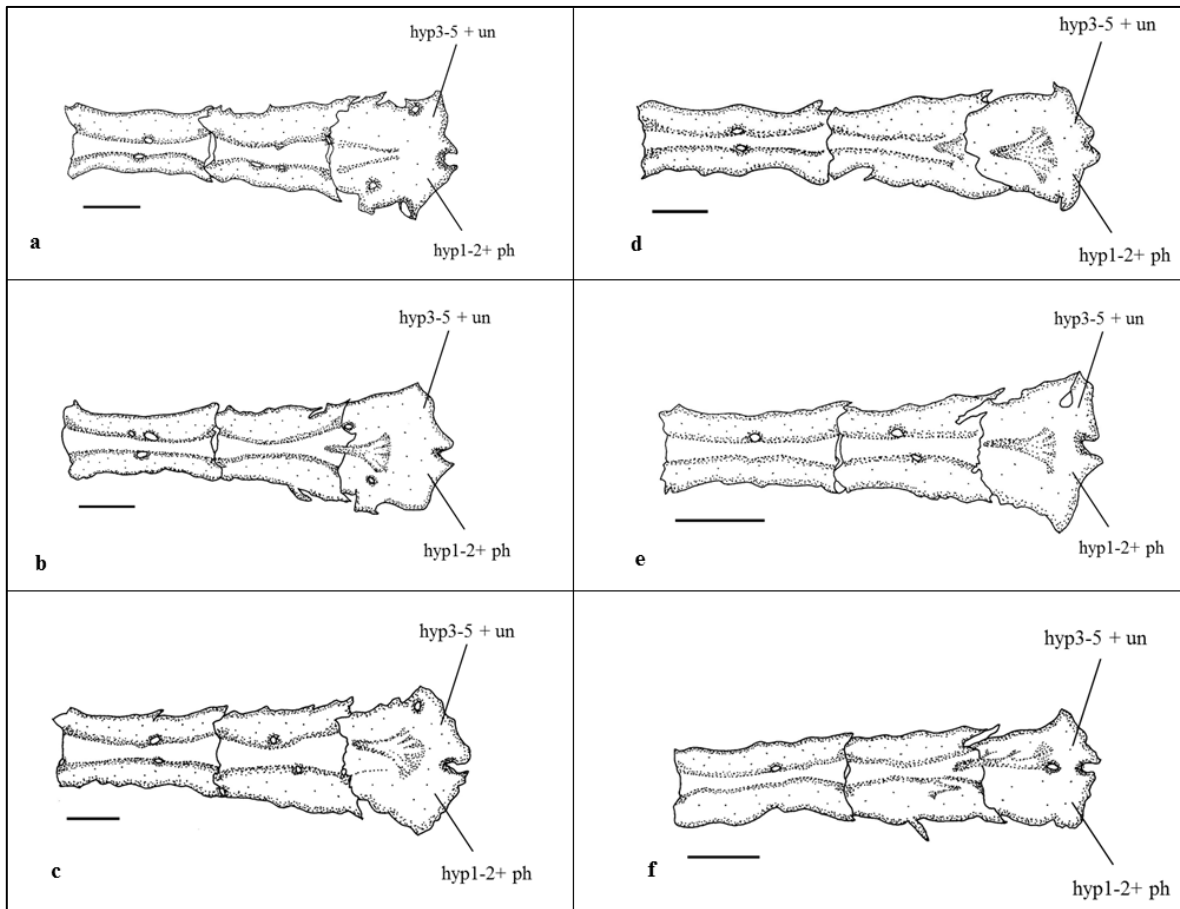




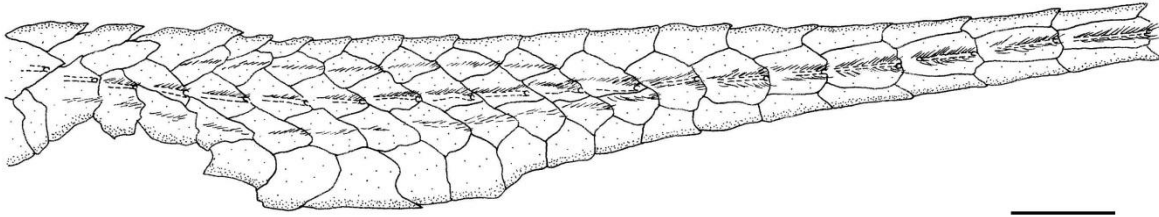
**Fig.19.** Pectoral girdle of *Rineloricaria* species: a) *Rineloricaria lanceolata* MUSM 11188; b) *Rineloricaria morrowi* MUSM 35013; c) *Rineloricaria wolfei* MUSM 42524; d) *Rineloricaria* sp. “Loreto” MUSM 41301; e) *Rineloricaria* sp. “Madre de Dios” MUSM 10027; f) *Rineloricaria* sp. “Pasco” MUSM 19496. Ventral view, anterior towards up. Scale bar = 2 mm.



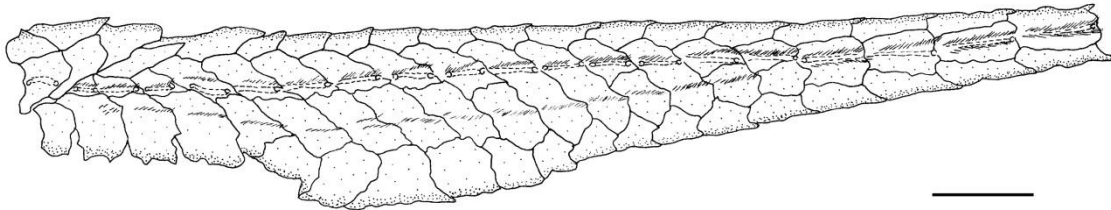
**Fig. 20.** Branchial arch of *Rineloricaria* species: a) *Rineloricaria lanceolata* MUSM 35766; b) *Rineloricaria morrowi* MUSM 35013; c) *Rineloricaria wolfei* MUSM 38256; d) *Rineloricaria* sp. "Loreto" MUSM 41301; e) *Rineloricaria* sp. "Madre de Dios" MUSM 10027; f) *Rineloricaria* sp. "Pasco" MUSM 19496. Ventral view, anterior towards up. Scale bar = 2 mm.



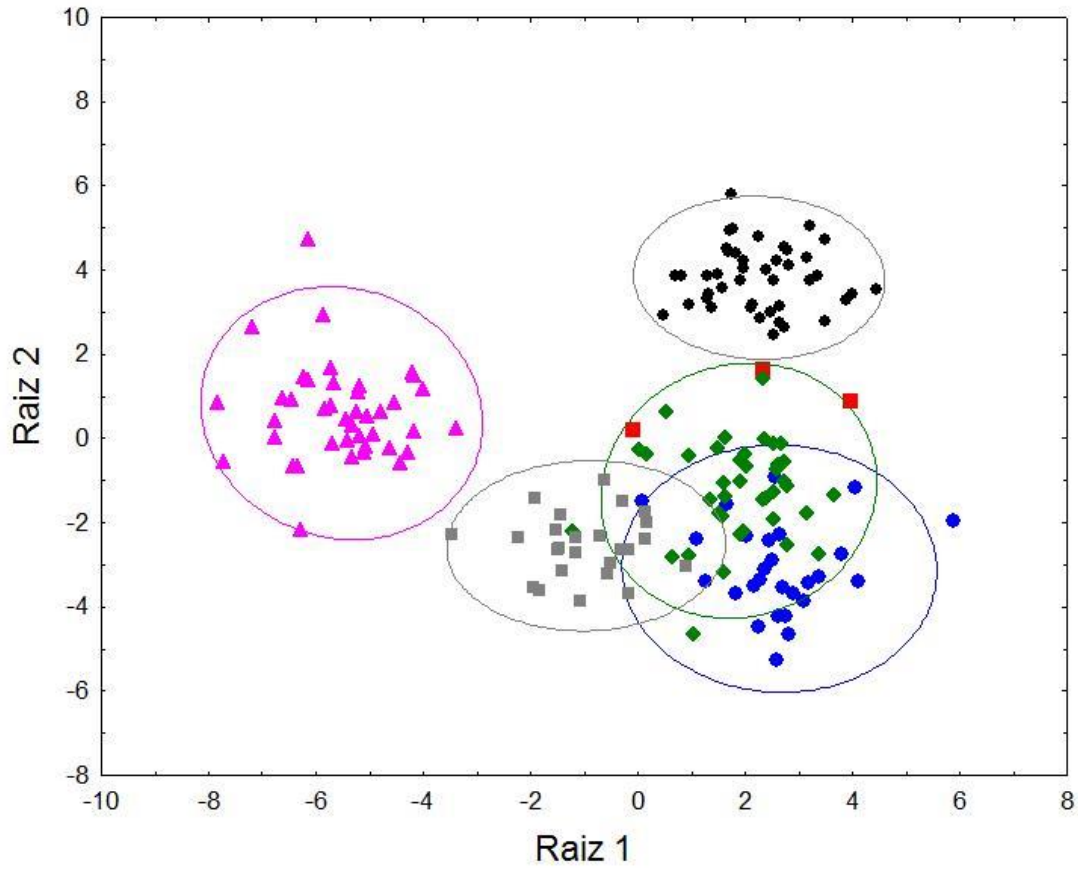
**Fig. 21** Caudal skeleton of *Rineloricaria* species: a) *Rineloricaria lanceolata* MUSM 11188, b) *Rineloricaria morrowi* MUSM 35013, c) *Rineloricaria wolfei* MUSM 42524, d) *Rineloricaria* sp. “Madre de Dios” MUSM 10027, e) *Rineloricaria* sp. “Pasco” MUSM 19496, f) *Rineloricaria* sp. “Loreto” MUSM 41301. Lateral view, anterior towards left. Scale bar = 1 mm.



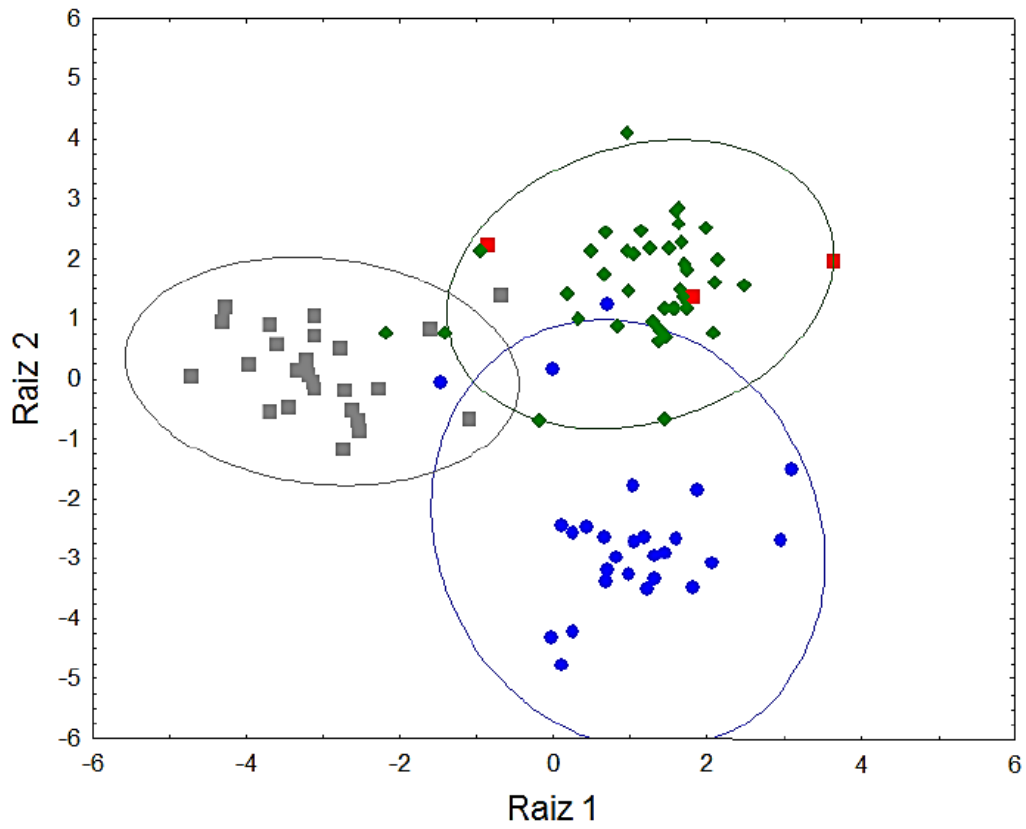
**Fig. 22.** Longitudinal lateral plate series of *Rineloricaria morrowi* MUSM 35013. Lateral view of left side, anterior towards left. Scale bar = 0.5 mm.



**Fig. 23.** Longitudinal lateral plate series of *Rineloricaria wolfei* MUSM 42524. Lateral view of left side, anterior towards left. Scale bar = 0.5 mm.



**Fig. 24.** Discriminant Analysis of six species of *Rineloricaria*. Pink triangles: *R. lanceolata*; blue dots: *R. morrow*; gray square: *R. wolfei*; red square: *Rineloricaria* sp. “Loreto”; green rhombus: *Rineloricaria* sp. “Madre de Dios”; black dots: *Rineloricaria* sp. “Pasco”.



**Fig. 25** Discriminant Analysis of four species of *Rineloricaria*. Blue dots: *R. morrowi*, gray square: *R. wolfei*, red square: *Rineloricaria* sp. “Loreto”, green rhombus: *Rineloricaria* sp. “Madre de Dios”.

**Table 1.** Morphometric data of *Rineloricaria lanceolata*. Values are given as percents of standard length or head length. H = holotype, n = number of specimens, and SD = standard deviation.

	H	n	Low	High	Mean	SD
Standard length (mm)	83.4	48	55.3	109.0	81.2	
Percent of standard length						
Head length	17.0	48	16.7	28.5	25.2	1.7
Predorsal length	25.7	48	26.9	34.2	31.6	1.2
Postanal length	44.3	48	32.0	55.2	51.7	3.2
Pelvic-anal distance	12.9	48	12.0	15.7	13.9	0.8
Pectoral-pelvic distance	10.0	48	12.6	25.9	15.3	2.4
Dorsal-fin spine length		47	20.3	28.4	24.2	1.8
Pectoral-fin unbranched ray length	13.6	48	13.3	25.7	17.8	1.8
Ventral-fin unbranched ray length	13.1	48	14.2	19.2	17.0	1.2
Anal-fin unbranched ray length		47	17.9	22.9	20.5	1.2
Uppermost caudal-fin ray length		11	66.5	91.8	75.9	8.4
Lowermost caudal-fin ray length		38	15.0	57.7	20.0	7.3
Caudal-peduncle depth	1.2	48	0.9	1.7	1.4	0.1
Body depth	8.1	48	8.2	14.5	10.0	1.1
Cleithro width	11.6	48	13.9	17.2	15.2	0.7
Percent of head length						
Head depth	6.5	44	27.2	41.6	34.5	3.6
Snout length	9.4	48	34.6	55.5	44.8	2.8
Orbital diameter	2.5	48	8.6	14.7	11.5	1.3
Interorbital distance	4.4	48	19.2	27.6	24.2	1.4
Maximum orbital diameter	3.2	48	11.1	18.5	15.0	1.6
Rostral border length	0.4	46	1.0	4.4	2.9	0.7
Snout naked area width	1.6	48	2.2	13.6	10.8	2.1
Snout naked area depth	0.4	48	0.7	7.0	3.4	1.3

**Table 2.** Meristic data of *Rineloricaria lanceolata*. H = holotype, n = number of specimens.

Counts	H	n	Low	High	Mode
Premaxillary teeth	7	47	4	9	6
Dentary teeth	8	48	5	8	6
Number of medial serial plates	14	48	14	32	28
Number of mid-ventral serial plates	15	48	15	32	30
Number of coalesced plates	16	48	12	16	15
Number of right pectoral-pelvic lateral plates	10	48	7	11	9
Number of left pectoral-pelvic lateral plates	9	48	8	11	9
Number of plates series	4	48	4	4	4

**Table 3.** Morphometric data of *Rineloricaria morrowi*. Values are given as percents of standard length or head length. H = holotype, n = number of specimens, and SD = standard deviation.

	H	n	Low	High	Mean	SD
Standard length (mm)	143.4	17	69.1	146.0	98.7	
Percent of standard length						
Head length	22.4	17	18.8	26.7	22.8	1.7
Predorsal length	28.9	17	27.1	33.4	28.6	1.5
Postanal length	55.4	17	49.9	58.2	55.6	2.0
Pelvic-anal distance	15.6	17	12.9	15.9	14.6	0.9
Pectoral-pelvic distance	12.9	17	11.7	16.3	13.0	1.4
Dorsal-fin spine length	19.5	17	12.7	26.2	23.0	3.3
Pectoral-fin unbranched ray length	17.6	17	16.4	19.5	18.0	0.9
Ventral-fin unbranched ray length	18.4	17	15.0	20.5	17.5	1.3
Anal-fin unbranched ray length	18.4	17	13.4	20.1	18.4	1.6
Uppermost caudal-fin ray length	0.0	8	25.4	62.4	45.0	13.6
Lowermost caudal-fin ray length	15.2	15	12.8	16.7	15.1	1.0
Caudal-peduncle depth	1.4	17	1.1	1.5	1.3	0.1
Body depth	9.3	17	5.4	20.7	9.3	3.2
Cleithro width	14.7	17	13.9	19.1	15.1	1.5
Percent of head length						
Head depth	35.4	17	29.6	40.2	34.6	3.3
Snout length	40.6	17	36.0	47.6	40.1	2.9
Orbital diameter	13.6	17	11.2	17.2	14.6	1.4
Interorbital distance	14.8	17	14.8	20.8	17.2	1.8
Maximum orbital diameter	20.5	17	18.0	24.7	20.6	1.8
Rostral border length	3.6	17	2.9	5.3	3.9	0.7
Snout naked area width	14.9	17	11.8	21.1	15.9	2.0
Snout naked area depth	2.9	17	1.4	5.6	3.9	0.9

**Table 4.** Meristic data of *Rineloricaria morrowi*. H = holotype, n = number of specimens.

Counts	H	n	Low	High	Mode
Premaxillary teeth	8	17	4	10	7
Dentary teeth	7	17	5	12	7
Number of medial serial plates	29	17	13	29	28
Number of mid-ventral serial plates	31	17	15	31	31
Number of coalesced plates	15	17	12	16	15
Number of right pectoral-pelvic lateral plates	7	17	6	9	8
Number of left pectoral-pelvic lateral plates	7	17	5	10	9
Number of plates series	5	17	5	5	5



**Table 5.** Morphometric data of *Rineloricaria wolfei*. Values are given as percents of standard length or head length. H = holotype, n = number of specimens, and SD = standard deviation.

	H	n	Low	High	Mean	SD
Standard length (mm)	121.2	39	57.0	148.9	104.9	
Percent of standard length						
Head length	24.4	39	22.4	33.6	25.4	1.8
Predorsal length	31.0	39	25.2	38.7	30.4	1.8
Postanal length	52.9	39	49.5	61.9	52.8	2.1
Pelvic-anal distance	15.1	39	12.6	18.3	14.6	1.0
Pectoral-pelvic distance	17.5	39	13.8	21.1	16.2	1.4
Dorsal-fin spine length	19.8	39	19.8	26.3	23.7	1.4
Pectoral-fin unbranched ray length	17.4	39	14.9	20.4	18.0	1.1
Ventral-fin unbranched ray length	16.5	39	13.1	20.8	16.5	1.1
Anal-fin unbranched ray length	17.9	39	16.2	27.0	18.5	1.8
Uppermost caudal-fin ray length		8	50.4	108.3	85.6	18.6
Lowermost caudal-fin ray length		30	9.0	18.1	15.0	2.0
Caudal-peduncle depth	1.2	39	1.0	1.7	1.2	0.1
Body depth	10.0	39	7.6	12.9	9.8	1.0
Cleitrowidth	15.4	39	14.1	18.6	15.2	0.8
Percent of head length						
Head depth	24.4	37	29.0	44.0	36.1	3.9
Snout length	41.7	39	35.9	51.6	40.3	3.1
Orbital diameter	51.6	39	11.5	17.4	14.1	1.4
Interorbital distance	17.4	39	16.3	22.7	18.8	1.5
Maximum orbital diameter	22.7	39	14.7	24.7	18.3	1.9
Rostral border length	24.7	39	3.2	6.5	5.1	0.8
Snout naked area width	6.3	39	1.5	13.8	9.3	3.0
Snout naked area depth	12.5	39	1.1	12.7	3.5	3.2

**Table 6.** Meristic data of *Rineloricaria wolfei*. H = holotype, n = number of specimens.

Counts	H	n	Low	High	Mode
Premaxillary teeth	7	39	5	10	8
Dentary teeth	9	39	6	12	9
Number of medial serial plates	28	39	26	29	28
Number of mid-ventral serial plates	30	39	28	31	30
Number of coalesced plates	14	39	11	16	13
Number of right pectoral-pelvic lateral plates	8	38	8	11	9
Number of left pectoral-pelvic lateral plates	9	38	7	12	10
Number of plates series	4	39	4	4	4

**Table 7.** Morphometric data of *Rineloricaria* sp. “Madre de Dios”. Values are given as percents of standard length or head length. H = holotype, n = number of specimens, and SD= standard deviation.

	H	n	Low	High	Mean	SD
Standard length (mm)	123.4	45	51.1	167.0	82.6	
Percent of standard length						
Head length	18.7	45	18.7	26.4	23.5	1.6
Predorsal length	31.9	45	28.3	34.4	30.7	1.5
Postanal length	52.4	45	48.4	58.5	53.3	2.1
Pelvic-anal distance	15.3	45	12.3	17.5	14.4	1.1
Pectoral-pelvic distance	17.7	45	10.6	18.9	15.6	1.7
Dorsal-fin spine length	20.2	45	15.9	23.4	20.2	1.3
Pectoral-fin unbranched ray length	15.8	45	13.9	18.0	16.0	0.8
Ventral-fin unbranched ray length	13.8	45	13.0	17.6	14.5	0.8
Anal-fin unbranched ray length	15.5	45	13.9	19.2	16.5	1.0
Uppermost caudal-fin ray length		13	24.4	74.8	44.9	17.9
Lowermost caudal-fin ray length	13.0	38	10.6	17.2	13.5	1.3
Caudal-peduncle depth	1.2	45	0.9	1.7	1.3	0.2
Body depth	9.5	45	7.0	11.7	8.8	1.1
Cleitrowidth	14.4	45	13.2	17.3	14.4	0.9
Percent of head length						
Head depth	48.1	45	25.3	48.1	33.8	5.4
Snout length	45.7	44	34.8	45.7	39.1	2.1
Orbital diameter	16.1	45	11.2	18.5	14.4	1.3
Interorbital distance	19.5	45	15.7	26.2	20.7	2.1
Maximum orbital diameter	22.7	45	16.7	24.6	19.9	1.6
Rostral border length	3.6	45	1.3	5.8	3.8	1.0
Snout naked area width	14.5	43	10.5	20.8	15.4	3.0
Snout naked area depth	2.6	45	0.9	6.2	3.4	1.2

**Table 8.** Meristic data of *Rineloricaria* sp. “Madre de Dios”. H = holotype, n = number of specimens.

Counts	H	n	Low	High	Mode
Premaxillary teeth	9	45	5	10	7
Dentary teeth	8	45	5	12	7
Number of medial serial plates	13	45	13	29	28
Number of mid-ventral serial plates	15	45	15	36	30
Number of coalesced plates	15	45	12	22	15
Number of right pectoral-pelvic lateral plates	6	45	5	10	7
Number of left pectoral-pelvic lateral plates	6	45	5	11	9
Number of plates series	4	45	4	4	4

**Table 9.** Morphometric data of *Rineloricaria* sp. “Pasco”. Values are given as percents of standard length or head length. H = holotype, n = number of specimens, and SD= standard deviation.

	H	n	Low	High	Mean	SD
Standard length (mm)	102.6	46	58.8	119.4	77.1	
Percent of standard length						
Head length	25.5	46	19.9	27.9	24.9	1.6
Predorsal length	33.7	46	20.5	34.8	32.1	2.8
Postanal length	48.1	46	39.3	52.8	49.6	2.1
Pelvic-anal distance	15.2	46	12.9	16.8	15.3	0.7
Pectoral-pelvic distance	18.1	46	13.7	18.8	16.7	1.2
Dorsal-fin spine length	18.9	46	14.6	21.8	19.3	1.4
Pectoral-fin unbranched ray length	15.0	46	12.6	18.9	15.9	1.2
Ventral-fin unbranched ray length	14.0	46	12.4	19.0	14.6	1.2
Anal-fin unbranched ray length	14.5	46	11.9	27.9	15.9	2.3
Uppermost caudal-fin ray length	12.5	15	13.0	53.3	37.9	11.6
Lowermost caudal-fin ray length		43	11.1	17.0	13.7	1.4
Caudal-peduncle depth	1.6	46	1.2	1.7	1.5	0.1
Body depth	10.2	46	7.4	11.0	9.2	0.7
Cleitrowidth	13.8	46	11.8	15.6	13.9	0.9
Percent of head length						
Head depth	38.6	42	27.0	39.2	33.8	2.6
Snout length	39.6	44	34.7	47.1	40.7	1.9
Orbital diameter	13.6	46	12.1	17.3	14.4	1.2
Interorbital distance	17.8	46	16.4	22.2	19.1	1.4
Maximum orbital diameter	19.8	46	16.8	24.5	19.1	1.5
Rostral border length	1.8	46	1.4	3.9	2.4	0.6
Snout naked area width	14.0	46	11.9	18.3	14.0	1.5
Snout naked area depth	6.8	46	3.6	8.5	6.3	0.9

**Table 8.** Meristic data of *Rineloricaria* sp. “Pasco”. H = holotype, n = number of specimens.

Counts	H	n	Low	High	Mode
Premaxillary teeth	9	45	6	12	8
Dentary teeth	11	46	5	11	9
Number of medial serial plates	27	46	14	28	27
Number of mid-ventral serial plates	29	46	16	30	29
Number of coalesced plates	12	46	8	14	11
Number of right pectoral-pelvic lateral plates	9	46	5	10	8
Number of left pectoral-pelvic lateral plates	9	46	5	10	8
Number of plates series	4	46	4	4	4

**Table 11.** Morphometric data of *Rineloricaria* sp. “Loreto”. Values are given as percents of standard length or head length. H = holotype, n = number of specimens, and SD= standard deviation.

	H	n	Low	High	Mean	SD
Standard length (mm)	85.8	5	47.1	100.3	75.5	
Percent of standard length						
Head length	20.4	5	16.6	25.3	21.7	3.5
Predorsal length	30.9	5	30.0	32.8	31.7	1.2
Postanal length	54.3	5	51.0	54.3	52.7	1.3
Pelvic-anal distance	13.1	5	13.1	14.4	13.5	0.6
Pectoral-pelvic distance	17.1	5	15.6	17.8	16.6	0.9
Dorsal-fin spine length	18.7	4	8.9	19.8	16.8	5.3
Pectoral-fin unbranched ray length	17.7	5	15.9	17.7	16.7	0.7
Ventral-fin unbranched ray length	14.4	5	13.6	14.7	14.3	0.4
Anal-fin unbranched ray length	15.7	5	14.5	16.6	15.6	1.0
Uppermost caudal-fin ray length		4	12.6	42.4	26.5	12.4
Lowermost caudal-fin ray length	12.8	4	10.9	13.7	12.6	1.2
Caudal-peduncle depth	1.3	5	1.2	1.5	1.4	0.1
Body depth	9.6	5	9.0	9.6	9.3	0.2
Cleitrowidth	13.6	5	13.1	14.8	13.8	0.7
Percent of head length						
Head depth	42.9	5	37.1	56.7	43.0	8.0
Snout length	47.7	5	38.2	60.3	46.2	8.7
Orbital diameter	12.0	5	10.3	21.6	14.2	4.4
Interorbital distance	20.7	5	15.8	28.9	21.4	5.3
Maximum orbital diameter	18.3	5	15.1	27.6	19.6	4.8
Rostral border length	6.8	5	5.3	7.8	6.4	1.0
Snout naked area width	10.7	4	10.5	24.8	14.5	6.9
Snout naked area depth	2.8	4	1.0	4.3	2.9	1.4

**Table 12.** Meristic data of *Rineloricaria* sp. “Loreto”. H = holotype, n = number of specimens.

Counts	H	n	Low	High	Mode
Premaxillary teeth	10	5	8	12	9
Dentary teeth	10	5	9	11	11
Number of medial serial plates	13	5	12	15	12
Number of mid-ventral serial plates	16	5	14	16	15
Number of coalesced plates	15	5	13	15	14
Number of right pectoral-pelvic lateral plates	6	5	5	6	6
Number of left pectoral-pelvic lateral plates	6	5	5	6	6
Number of plates series	4	5	4	4	4

## **Comparative material.**

*Loricaria cataphracta*: 3 (1 C&S), MCP 41395, Rio Piranhas, near to foz of rio São Domingos, affluent of rio Araguaia, Piranhas, Goiás, Brazil, 16°33'6.00"S 51°49'52.00"W.

*Loricaria clavipinna*: 5 (1 C&S) MCP 45735, Quebrada Pinto Yaco near to mouth of rio Purus, Ucayali, Peru, 10° 1'36.00"S 70°55'26.00"W. *Rineloricaria cadeae*: 16 (1 C&S),

MCP 20043, Arroio Feitoria, Sapiranga, Rio Grande do Sul, Brasil, 29°32'59.71"S 51° 1'1.73"W. *Rineloricaria longicauda*: 11 (1 C&S ), MCP 38283, Arroio affluent of arroio

Arambaré near to Carvalho de Freitas, 35 Km of Pedro Osório, bridge Linha do Trem., Pedro Osório, Rio Grande do Sul, Brasil, 6°17'20.02"S 48°28'25.97"W.

*Rineloricaria microlepidogaster*: 19 (1C&S), MCP 25741, Arroio da Gringa ca 12km N da UHE Dona Francisca, Ibarama, Rio Grande do Sul, Brasil, 29°22'30.14"S 53°13'56.13"W.

*Rineloricaria quadrensis*: 4 (1 C&S), MCP 9548, Lagoa dos Quadros, Fish-farming of Agriculture Secretary Station, Osório, Rio Grande do Sul, Brasil, 29°23'60.00"S

51°55'0.00"W. *Rineloricaria stellata*: 6 (C&S), MCP 37191, Arroio Pedras, affluent of rio Ijuí (left margin), 16 de Novembro, Rio Grande do Sul, Brasil, 28°12'12.04"S 54°

4'28.31"W. *Rineloricaria strigilata*: 7 (1 C&S), MCP 19524, Rio Taquari in Arroio do Meio, Arroio do Meio, Rio Grande do Sul, Brasil, 29°24'0.31"S 51°55'0.12"W.

## Conclusões Gerais

Este trabalho procura contribuir para esclarecer parte da problemática que tem gerado a grande diversidade *Rineloricaria*, especialmente devido à grande variação morfológica que apresentam as suas espécies. No Peru, embora tenha sido comprovada a grande riqueza ictiológica, principalmente na região Amazônica, a diversidade de espécies de *Rineloricaria* era subestimada a três espécies: *R. lanceolata*, *R. morrowi* e *R. wolfei*, sendo conhecidas unicamente pela descrição original e com localidade tipo pouco detalhada. No presente estudo estas espécies são validadas e são adicionalmente descritas três novas espécies, providenciando diagnoses baseadas em um maior numero de caracteres morfológicos externos e osteológicos, como também uma distribuição geográfica mais detalhada limitando áreas de ocorrência.

Embora *Rineloricaria lanceolata* tenha sido recentemente redescrita e sua identificação esteja baseada principalmente no padrão de colorido, a análise osteológica mostrou características próprias da espécie que podem ajudar a elucidar a existência de um possível complexo de espécies, como um maior numero de placas pos-rostrais e o perfil reto da margem anterior do cleitro.

A redescrição de *Rineloricaria morrowi* e *R. wolfei* possibilitou a identificação correta dos exemplares, o que levou a estabelecer as áreas de ocorrência correspondentes, estando *R. morrowi* distribuída principalmente na bacia do rio Amazonas e tributários, e *R. wolfei* mais amplamente distribuído, ocupando as bacias do rio Amazonas, Juruá, Madre de Dios, Purus, Ucayali e seus tributários. Os caracteres mais informativos para suas diagnoses são baseados no número de series de placas (cinco series de placas em *R. morrowi* e quatro em *R. wolfei*) e padrão de colorido (cinco faixas marrom escuro na superfície dorsal, canais

sensoriais pigmentados, faixas escuras aos laterais do pedúnculo caudal e base da nadadeira anal e nadadeira caudal com uma faixa escura na região distal em *R. morrowi* e padrão de colorido com cinco faixas marrom escuro na superfície dorsal de *R. wolfei*). Entre os caracteres osteológicos diagnósticos, *R. wolfei* apresentou a placa dentígera ventral expandida em forma globular (*vs.* placa dentígera ventral triangular e estreita nas outras espécies examinadas) e *R. morrowi* o perfil posterior do esqueleto caudal irregular (*vs.* perfil posterior do esqueleto caudal reto).

*Rineloricaria* sp. “Madre de Dios” foi claramente diferenciada de seus congêneres por possuir uma mancha oval escura na placa nugal, comprimento do focinho e da cabeça muito menor. Sua distribuição abrange principalmente a bacia do rio Madre de Dios e tributários.

*Rineloricaria* sp. “Pasco” se diferencia da maioria de seus congêneres (exceto *R. malabarbai* e *R. strigilata*) e especificamente de todas as espécies que ocorrem no Peru, por possuir a região nua do focinho como uma protuberância globular sem atingir ao primeiro poro do canal sensorial infraorbital (*vs.* região nua do focinho alongada, oval ou como uma linha estreita) e a margem anterior do cleitro reta ultrapassando a inserção da nadadeira peitoral (*vs.* margem anterior do cleitro convexa em *R. morrowi*, *Rineloricaria* sp. “Loreto”, *Rineloricaria* sp. “Madre de Dios” e *R. wolfei*; margem anterior do cleitro reta e não ultrapassando o nível da inserção da nadadeira peitoral em *R. lanceolta*). Geograficamente abrange a bacia do rio Palcazú, rio Pachitea e tributários.

Finalmente, *Rineloricaria* “Loreto” se distingue de seus congêneres por possuir a região nua da ponta focinho reduzida a uma linha estreita (*vs.* região nua alongada, oval ou

em forma de protuberância), o perfil do focinho convexo e cristas na região dorsal da cabeça. Sua distribuição abrange as bacias do rio Amazonas, rio Marañón e tributários.