

Arieli Matheus Cherobim

Revisão Taxonômica de *Neoplecostomus franciscoensis* Langeani, 1990  
(Loricariidae: Neoplecostominae)

Dissertação apresentada como parte dos requisitos para obtenção do título de Mestre em Biologia Animal, junto ao Programa de Pós-Graduação em Biologia Animal, do Instituto de Biociências, Letras e Ciências Exatas da Universidade Estadual Paulista “Júlio de Mesquita Filho”, Câmpus de São José do Rio Preto.

Orientador: Prof. Dr. Francisco Langeani Neto

São José do Rio Preto

2016

Cherobim, Arieli Matheus.

Revisão taxonômica de *Neoplecostomus Franciscoensis* Langeani, 1990 (Loricariidae: Neoplecostominae) / Arieli Matheus Cherobim. -- São José do Rio Preto, 2016  
62 f. : il., tabs.

Orientador: Francisco Langeani Neto  
Dissertação (mestrado) – Universidade Estadual Paulista “Júlio de Mesquita Filho”, Instituto de Biociências, Letras e Ciências Exatas

1. Ecologia animal. 2. Peixe de água doce - Classificação.  
3. Cascudo (Peixe) 4. Rios – Brasil. I. Langeani Neto, Francisco.  
II. Universidade Estadual Paulista "Júlio de Mesquita Filho". Instituto de Biociências, Letras e Ciências Exatas. III. Título.

CDU – 597

Ficha catalográfica elaborada pela Biblioteca do IBILCE  
UNESP - Câmpus de São José do Rio Preto

## ERRATA

CHEROBIM, Arieli Matheus. **Revisão taxonômica de Neoplecostomus Franciscoensis Langeani, 1990 (Loricariidae: Neoplecostominae)**. 2016. 62 f. Dissertação (Mestrado em Biologia Animal)-Universidade Estadual Paulista “Júlio de Mesquita Filho”, Instituto de Biociências, Letras e Ciências Exatas, São José do Rio Preto, 2016.

<b>Folha</b>	<b>Linha</b>	<b>Onde se lê</b>	<b>Leia-se</b>
5	18	(FAPESP)	(FAPESP, Processo n. 2013/26865-8)

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São José do Rio Preto

25 de fevereiro de 2016

Dedico este trabalho aos meus pais, Valéria e Denilson,  
por todo o amor e apoio desde sempre.

## AGRADECIMENTOS

Cada etapa da nossa vida é compartilhada com várias pessoas. Algumas estavam presentes desde o começo. Outras conheci ao longo dessa caminhada. Graças a ajuda de cada uma delas este trabalho foi realizado. Não tenho palavras suficientes para expressar meu eterno agradecimento.

Primeiramente, agradeço ao meu orientador Prof. Dr. Francisco Langeani Neto. O trabalho fica muito mais agradável quando convivemos com uma pessoa como o Kiko: paciente, atencioso e que sempre está disposto a ensinar quando o assunto é peixes de água doce neotropicais. Muito obrigada por todas as oportunidades e também pelas risadas e conversas compartilhadas durante as coletas.

À Prof<sup>a</sup>. Dr<sup>a</sup>. Lilian Casatti, a quem admiro muito, pelas sugestões neste trabalho e por todo o apoio nos eventos e atividades dos alunos do Programa de Pós-Graduação em Biologia Animal.

Ao Prof. Dr. Fernando Rogério Carvalho, pelos ensinamentos, pelas sugestões, pelo convívio e pelas risadas. Foi um prazer conhecê-lo, pescador. O senhor ainda me deve uma coleta, não esqueci disso.

A todos os professores que participaram da minha formação profissional e pessoal durante esses anos no IBILCE, especialmente ao Prof. Dr. Classius de Oliveira, pelos anos de PET (Programa de Educação Tutorial), e a Prof<sup>a</sup>. Dr<sup>a</sup>. Eliane Gonçalves de Freitas por todo o auxílio nas questões burocráticas e apoio nas atividades dos alunos do Programa de Pós-Graduação em Biologia Animal.

Aos, Prof. Dr. Aléssio Datovo da Silva, Prof<sup>a</sup>. Dr<sup>a</sup>. Carla S. Pavanelli, Prof. Dr. Carlos A. S. Lucena, Prof. Dr. Cláudio Oliveira, Prof. Dr. Flávio A. Bockmann, Dr. Michel D. Gianeti, Dr. Osvaldo T. Oyakawa e Prof. Dr. Paulo A. Buckup pelo empréstimo de material e pela recepção nas coleções científicas. E ao Prof. Dr. Edson H. L. Pereira pelo envio de dados para a análise filogenética e pelas sugestões e conversas nos Encontros Brasileiros de Ictiologia em Maringá e Recife.

Aos meus companheiros de laboratório pela convivência, pela troca de experiências, pelos conselhos e pelos momentos de descontração. Aos sistematas: Alaina, desde sempre e para sempre; Fernanda, por toda a ajuda e bolinhos de chuva; Ana Cláudia, por compartilhar as alegrias e angústias; Breno, pela ajuda com os *Neoplecostomus* e Arturo, pelas paçocas e chocolates e pela ajuda na cozinha durante as coletas. Aos ecólogos: Mariana, Carolina, Jaquelini, Gabriel, Angélica, Camilo e Mônica, por toda a agitação e alegria da sala ao lado. E a nossa técnica, Rose, por todo o auxílio e pelas conversas sobre a vida enquanto organizávamos a coleção de tecidos de DNA.

À minha querida família: minha mãe Valéria, pelo exemplo de força e retidão; meu pai Denilson, pelo exemplo de honestidade e trabalho; e minha irmã Maraísa, pelas conversas secretas, pelas risadas, pelas brigas e toda aquela coisa de irmã. E aquela família que é a extensão da minha casa: meus avós, Ivoneti e Rubens; minhas tias, Marilei e Priscila, e meu priminho Arthur. A saudade é grande, mas o amor é infinitamente maior.

Ao meu grande amor e eterno companheiro, Gabriel, por estar ao meu lado em todas as horas, comemorando as alegrias e enxugando as lágrimas, mas principalmente por me fazer viver a vida de uma maneira mais leve, regada a sonhos e momentos especiais.

À Coordenação de Aperfeiçoamento de Pessoal de Nível Superior (CAPES) e à Fundação de Amparo à Pesquisa do Estado de São Paulo (FAPESP) pela bolsa concedida e pelo apoio financeiro para a realização deste trabalho.

E finalmente, à Deus, por iluminar meus caminhos.

## RESUMO

A diversidade em *Neoplecostomus* Eigenmann & Eigenmann, 1888 aumentou consideravelmente nos últimos anos. Na única revisão taxonômica disponível para o gênero, Langeani (1990) reconheceu apenas uma espécie para a bacia do alto rio Paraná, *N. paranensis*, e também uma única espécie para a drenagem do rio São Francisco, *N. franciscoensis*. Estudos posteriores revelaram a ocorrência de outras espécies no alto rio Paraná, totalizando oito espécies para a drenagem. Contudo, desde a descrição de *N. franciscoensis* há 25 anos, nenhuma análise foi realizada na bacia do rio São Francisco, a segunda maior drenagem a abrigar o gênero. Assim, o objetivo desse estudo foi revisar as populações de *Neoplecostomus* que ocorrem nesta bacia. Os resultados demonstram a ocorrência de duas espécies: *N. franciscoensis stricto sensu*, encontrada nos afluentes do rio das Velhas e *Neoplecostomus* sp. n., que ocorre em riachos de cabeceira do rio São Francisco no entorno da Serra da Canastra e afluentes do rio Paraopeba. *Neoplecostomus franciscoensis* apresenta *spinelet* ausente ou com disposição e tamanho variados (*vs. spinelet* sempre maior que a base do raio indiviso da nadadeira dorsal em *Neoplecostomus* sp. n.) e duas ou três placas maiores dispostas em linha, e acima delas várias placas menores entre o processo súpero-posterior do cleitro e a primeira placa grande da série lateral (*vs. uma placa grande entre o processo súpero-posterior do cleitro e a primeira placa grande da série lateral em Neoplecostomus* sp. n.). Além disso, em *N. franciscoensis* não há diferença no número de dentes entre machos e fêmeas (12-22 (15) dentes no pré-maxilar e 10-20 (12) dentes no dentário). Já em *Neoplecostomus* sp. n., as fêmeas apresentam maior número de dentes no pré-maxilar (17-34 (23) *vs.* 18-20 (20) nos machos) e no dentário (11-33 (15) *vs.* 13-19 (14) nos machos). Adicionalmente, *N. franciscoensis* apresenta a extremidade anterior do segundo basibrânquial maior que a extremidade posterior (*vs. extremidades sem qualquer diferença no desenvolvimento em Neoplecostomus* sp. n.) e processo lateral no primeiro pterigóforo da nadadeira anal ausente ou inconspícuo (*vs. processo lateral estreito em Neoplecostomus* sp. n.).

Palavras-chave: cascudos. *Neoplecostomus* sp. n.. rio das Velhas. rio Paraopeba. Serra da Canastra.



## ABSTRACT

The diversity in *Neoplecostomus* Eigenmann & Eigenmann, 1888 increased considerably last years. In the only taxonomic revision available for the genus, Langeani (1990) recognized only one species from the upper rio Paraná basin, *N. paranensis*, and also only one species from the rio São Francisco drainage, *N. franciscoensis*. Further studies revealed the occurrence of other species from the upper rio Paraná, totaling eight species from the drainage. However, since the description of *N. franciscoensis* 25 years ago, no analysis was performed in the rio São Francisco basin, the second largest drainage to harbor the genus. Thus, the aim of this study was to review the *Neoplecostomus* populations occurring in this basin. Results demonstrate the occurrence of two species: *N. franciscoensis stricto sensu*, from affluents of the rio das Velhas and *Neoplecostomus* sp. n., from headwater streams of the rio São Francisco surrounding Serra da Canastra National Park and affluents of the rio Paraopeba. *Neoplecostomus franciscoensis* present spinelet absent or with varied size and disposition (vs. spinelet always wider than dorsal-fin spine base in *Neoplecostomus* sp. n.) and two or three large plates arranged in line, and above them several small plates between the cleithrum humeral process and the first plate of the lateral series (vs. one large plate between the cleithrum humeral process and the first plate of the lateral series in *Neoplecostomus* sp. n.). Furthermore, in *N. franciscoensis* there is no difference in the number of teeth between males and females (12-22 (15) teeth in the premaxillary and 10-20 (12) teeth in the dentary). Already in *Neoplecostomus* sp. n., females present more number of teeth in the premaxillary (17-34 (23) vs. 18-20 (20) in males) and in the dentary (11-33 (15) vs. 13-19 (14) in the males). Additionally, *N. franciscoensis* present the anterior extremity of the second basibranchial greater than posterior extremity (vs. extremities without any difference in the development in *Neoplecostomus* sp. n.) and lateral process in the first anal-fin pterygiophore absent or inconspicuous (vs. narrow lateral process in *Neoplecostomus* sp.n.).

Keywords: cascudos. *Neoplecostomus* sp. n.. rio das Velhas. rio Paraopeba. Serra da Canastra.

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## 1 INTRODUÇÃO

A ictiofauna de água doce da região Neotropical é extremamente rica quando comparada com as demais regiões de água doce do planeta. Das 13.000 espécies conhecidas no mundo, cerca de 6.000 ocorrem nessa parte do globo (REIS *et al.*, 2003). Em termos comparativos de densidade específica, essa diversidade é ainda mais surpreendente, já que essas espécies ocorrem em menos de 0,01% dos habitats de água doce disponíveis (VARI & MALABARBA, 1998).

Os membros da ordem Siluriformes apresentam o corpo nu ou recoberto por placas ósseas, e também o primeiro raio das nadadeiras dorsal e peitoral modificado em espinho (NELSON, 2006). A ordem é reconhecida como o grupo mais diverso e amplamente distribuído dentro de Ostariophysi, com 39 famílias, 478 gêneros e 3680 espécies (ESCHMEYER, 2015; FERRARIS, 2007). Contudo, o conhecimento sobre a diversidade de Siluriformes na região Neotropical tem aumentado nos últimos anos. Segundo Ota *et al.* (2015), uma média de 24 espécies novas foram descritas por ano, entre janeiro de 1990 até agosto de 2014. Já durante um período de 232 anos, desde a publicação do *Systema Naturae* em 1758 até dezembro de 1989, a média cai para 6,3 espécies novas. Entretanto, apesar dos esforços empregados nos últimos 25 anos, cerca de 35% das espécies ainda estão por ser descritas.

Loricarioidea é o maior grupo monofilético de Siluriformes neotropicais, sendo constituído por seis famílias: Nematogeneyidae, Trichomycteridae, Callichthyidae, Scoloplacidae, Astroblepidae e Loricariidae. A principal sinapomorfia do grupo é a presença de odontódeos: estruturas idênticas aos dentes, mas que estão localizadas fora da cavidade oral (DE PINNA, 1998).

Loricariidae é a maior família de Siluriformes do mundo. Ferraris (2007) reconheceu 96 gêneros e 716 espécies, contudo dados de Eschmeyer (2015) apontam 916 espécies, sendo que 210 foram descritas ao longo dos últimos 10 anos. Além disso, Loricariidae é a família mais representativa quando se compara o número de Siluriformes descritos nos últimos vinte e cinco anos: 48% do total, correspondendo a 285 espécies (OTA *et al.*, 2015). Devido sua morfologia altamente especializada, é um dos grupos de Siluriformes mais bem caracterizados, sendo reconhecido desde as classificações mais antigas. A ampla variedade morfológica permite dividir o grupo em seis subfamílias: Delturinae, Hypoptopomatinae, Hypostominae, Lithogeninae, Loricariinae e Neoplecostominae (REIS *et al.*, 2006).

## 1.1 Aspectos Gerais sobre a Subfamília Neoplecostominae

Neoplecostominae foi criada por Regan em 1904 para alocar *Neoplecostomus granosus* (Valenciennes, 1840). Em 1945, Gosline manteve apenas o gênero *Neoplecostomus* na subfamília, mas em 1947 considerou o grupo mais abrangente, abrigando 12 gêneros (*Neoplecostomus*, *Upsilonodus*, *Hemipsilichthys*, *Pareiorhaphis*, *Pareiorhina*, *Kronichthys*, *Corymbophanes*, *Delturus*, *Rhinelepis*, *Canthopomus* (= *Pseudorinelepis*), *Pogonopoma* e *Pogonopomoides*). Isbruecker (1980) incluiu novamente apenas *Neoplecostomus* na subfamília, sendo os outros 11 gêneros considerados novamente pertencentes à Hypostominae. Schaefer (1987) chegou à mesma conclusão que Isbruecker, mas dos 12 gêneros estudados por Gosline em 1947 examinou apenas *Kronichthys*, *Corymbophanes*, *Pogonopomoides*, *Pseudorinelepis* e *Rhinelepis*.

O primeiro estudo molecular com ênfase em Hypostominae e Ancistrinae foi proposto por Montoya-Burgos *et al.* (1998). Os resultados foram parcialmente diferentes da classificação de Isbruecker (1980) e Schaefer (1987), considerando *Hemipsilichthys splendens*, *Hemipsilichthys* sp., *Isbrueckerichthys duseni*, *Kronichthys* e *Neoplecostomus* como membros de Neoplecostominae. Já Armbruster (2004) manteve no grupo *Hemipsilichthys* (exceto *H. gobio*), *Isbrueckerichthys*, *Kronichthys*, *Neoplecostomus* e *Pareiorhina*, até que fosse realizada uma análise envolvendo todos os gêneros de Neoplecostominae e Hypoptopomatinae.

A análise morfológica mais recente propõe Neoplecostominae formada por quatro gêneros: *Neoplecostomus*, *Isbrueckerichthys*, *Pareiorhaphis* e um gênero novo (PEREIRA, 2008). Este estudo recuperou *Neoplecostomus* como um grupo monofilético, suportado pelas seguintes sinapomorfias exclusivas: perfil dorsal do raio não ramificado da nadadeira peitoral com curvatura acentuada, lateropterígio com pequena expansão na porção distal e lábio inferior com papilas formando séries conspícuas e localizadas posteriormente ao dentário.

Já as análises moleculares demonstram uma composição diferente, incluindo em Neoplecostominae: *Neoplecostomus*, *Pareiorhaphis*, *Isbrueckerichthys*, *Pareiorhina*, *Pseudotocinclus* (CHIACHIO *et al.*, 2008) e adicionalmente *Kronichthys* (CRAMER *et al.*, 2007, 2011; ROXO *et al.*, 2012a). Ainda, propõem *Neoplecostomus* como não monofilético, com *N. ribeirensis* Langeani, 1990 mais relacionado à *Isbrueckerichthys* Derijst, 1996 (CRAMER *et al.*, 2011; ROXO *et al.*, 2012a; ROXO *et al.*, 2012b, ROXO *et al.*, 2014a).

Recentemente, Pereira *et al.* (2014) descreveram um novo gênero pertencente a Neoplecostominae: *Hirtella*. Assim, segundo as hipóteses morfológicas, a subfamília é composta atualmente por: *Neoplecostomus*, *Isbrueckerichthys*, *Kronichthys*, *Pareiorhaphis*, *Pareiorhina* e *Hirtella*.

## 1.2 Histórico da Taxonomia de *Neoplecostomus* Eigenmann & Eigenmann, 1888

*Neoplecostomus* foi descrito por Eigenmann & Eigenmann (1888) como subgênero de *Plecostomus* Gronow, 1792, mas no ano seguinte os mesmos autores o elevaram para nível genérico. Eigenmann & Eigenmann (1890) e Regan (1904) propuseram uma diagnose simples baseada na presença de um abdômen com pequenas placas granulares e também em outras características amplamente distribuídas em Loricariidae. Já Gosline (1947) desenvolveu uma descrição um pouco mais completa, mas sem destacar outras características diagnósticas. Posteriormente, estudos sobre morfologia comparada incluíram *Neoplecostomus*: Howes (1983) com a descrição de músculos craniais para Loricariidae e Schaefer (1987) com uma análise filogenética para as subfamílias de Loricariidae.

Langeani (1990), na única revisão taxonômica disponível para o gênero, reconheceu como válidas a espécie-tipo, *N. microps* (Steindachner, 1876), do rio Paraíba do Sul, e também *N. granosus* (Valenciennes, 1840) de Caiena (Guiana Francesa) e Rio de Janeiro. Contudo, apesar de reconhecer *N. granosus* como válida, o autor sugere que a localidade-tipo esteja incorreta, pois nenhum exemplar foi coletado posteriormente e apenas a série-tipo é conhecida.

No mesmo trabalho descreveu como espécies novas: *N. espiritosantensis* do Rio Jucu (braço sul), Domingos Martins-ES, e rio São Lourenço, afluente do Timbuí, Santa Teresa-ES, ambos na vertente oriental da Serra do Mar, *N. franciscoensis* encontrado em riachos de cabeceira do rio das Velhas e do rio Paraopeba, afluentes do rio São Francisco, Serra da Moeda, estado de Minas Gerais, *N. paranensis* pertencente a riachos de cabeceira da drenagem do alto rio Paraná e *N. ribeirensis* que ocorre em afluentes do rio Ribeira de Iguape no estado de São Paulo.

Alguns anos depois Bizerril (1995) descreveu *N. variipictus* coletado no rio Santo Antônio, tributário do rio Bengala, bacia do rio Paraíba do Sul, Nova Friburgo-RJ. Zawadzki *et al.* (2008) descreveram *N. corumba* encontrado no Córrego Gameleira, afluente do Rio Corumbá, bacia do rio Paranaíba, Corumbá-GO, *N. selenae* do

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Ribeirão das Batéias, afluente do rio Paranapanema, Ribeirão Grande-SP e *N. yapo* coletado no riacho Fortaleza (Fazenda Santo Amaro), afluente do rio Yapó, bacia do rio Tibagi, Tibagi-PR. Roxo *et al.* (2012c) descreveram mais três espécies: *N. bandeirante* do Rio Paraitinguinha, bacia do Rio Tietê, Salesópolis-SP, *N. botucatu* encontrado no córrego Águas de Madalena, tributário do rio Pardo, bacia do rio Paranapanema, Botucatu-SP e *N. langeanii* coletado nas drenagens do rio Muzambinho, bacia do rio Grande, Muzambinho-MG.

Os dois últimos trabalhos foram de Roxo *et al.* (2014b), descrevendo *N. doceensis* conhecido de 13 localidades: rio Gualaxo do Norte (1), rio Gualaxo do Sul (1), rio José Pedro (1), rio Piranga (1), rio Manhuaçu (3), rio Suaçuí Pequeno (1) e rio Xopotó (5), todos na bacia do rio Doce, Minas Gerais e de Andrade & Langeani (2014) descrevendo *N. jaguari* conhecido do ribeirão do Forja e do córrego Casca d'Antas, tributários do rio Jaguari, sub-bacia do rio Piracicaba-Capivari-Jundiáí, drenagem do rio Tietê, Extrema-MG e Camamducaia-MG.

Dessa forma, *Neoplecostomus* é composto por 15 espécies até o presente momento, sendo a maior diversidade encontrada na bacia do alto rio Paraná. *Neoplecostomus franciscoensis* não sofreu nenhuma análise desde sua descrição há 25 anos. Ao longo dos anos, material adicional foi coligido, ampliando a amostragem da bacia e evidenciando uma variação morfológica não detectada anteriormente. Assim, o objetivo deste trabalho foi reavaliar as populações de *Neoplecostomus* que ocorrem na bacia do rio São Francisco.



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## 2 CAPÍTULO 1

### **Redescription of *Neoplecostomus franciscoensis* Langeani, 1990 (Loricariidae: Neoplecostominae) and description of a new species from the rio São Francisco basin**

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(Manuscrito formatado para a revista Neotropical Ichthyology)

The diversity in *Neoplecostomus* increased considerably during the last years. At 1990, the only taxonomic revision available for the genus recognized only one species from the upper rio Paraná basin, *N. paranensis*, and also only one species from the rio São Francisco basin, *N. franciscoensis*. Further studies revealed the occurrence of more eight species from the upper rio Paraná basin, but no investigation was performed in the rio São Francisco drainage. Our results confirm the occurrence of *N. franciscoensis* from the rio das Velhas, and also demonstrate a new species from streams surrounding Serra da Canastra National Park and affluents of the rio Paraopeba. The new species always presents spinelet wider than dorsal-fin spine base and one large plate between the cleithrum humeral process and the first plate of the lateral series, differently what is proposed for *N. franciscoensis* in the original description. Furthermore, females of the new species present more number of teeth in the premaxillary (17-34 (23) vs. 18-20 (20) in males) and in the dentary (11-33 (15) vs. 13-19 (14) in males).

A diversidade em *Neoplecostomus* aumentou consideravelmente durante os últimos anos. Em 1990, a única revisão taxonômica disponível para o gênero reconheceu apenas uma espécie para a bacia do alto rio Paraná, *N. paranensis*, e também uma única espécie para a bacia do rio São Francisco, *N. franciscoensis*. Estudos adicionais revelaram a ocorrência de mais oito espécies na bacia do alto rio Paraná, mas nenhuma investigação foi realizada na drenagem do rio São Francisco. Nossos resultados confirmam a ocorrência de *N. franciscoensis* no rio das Velhas, e também demonstram uma espécie nova que ocorre em riachos no entorno da Serra da Canastra e em afluentes do rio Paraopeba. A espécie nova apresenta *spinelet* sempre maior que a base do raio indiviso da nadadeira dorsal e uma

placa grande entre o processo súpero-posterior do cleitro e a primeira placa grande da série lateral, diferentemente do que é proposto para *N. franciscoensis* em sua descrição original. Além disso, as fêmeas da espécie nova apresentam maior número de dentes no pré-maxilar (17-34 (23) vs. 18-20 (20) nos machos) e no dentário (11-33 (15) vs. 13-19 (14) nos machos).

**Keywords:** cascudos, *Neoplecostomus* sp. n., rio das Velhas, rio Paraopeba, Serra da Canastra.

**Running Head:** *Neoplecostomus* sp. n.

### Introduction

*Neoplecostomus* was described by Eigenmann & Eigenmann (1888) as a subgenus of the *Plecotomus* Gronow, 1792. One year later, the same authors raised *Neoplecostomus* to generic level. Eigenmann & Eigenmann (1890) and Regan (1904) diagnosed the genus as having an abdomen with small granular plates; other characteristics also proposed are widespread in Loricariidae: position of the adipose fin, body moderately elongate, eyes small, teeth bifid, dorsal originating above or a little behind the ventral, with I 7 rays, anal with I 5-6, pectoral with I 6, ventral with I 5, adipose fin present, caudal emarginate, vertebrae 5+8+18 and ribs slender. Gosline (1947) developed a more complete description, but without highlighting other diagnostic features. Posteriorly, studies dealing with comparative morphology included *Neoplecostomus*: Howes (1983) with a description of cranial muscle of loricarioid catfishes and Schaefer (1987) with a phylogenetic analysis of the loricariid subfamilies.

The genus was redescribed by Langeni (1990) who recognized two valid species: *Neoplecostomus microps* (Steindachner, 1876) from the rio Paraíba do Sul basin and *N. granosus* (Valenciennes, 1840) from Caiena (French Guiana) and Rio de Janeiro (type-locality probably incorrect). The same author described as new species: *N. espiritosantensis* from streams of the eastern slope of Serra do Mar, Espírito Santo State; *N. franciscoensis* from the rio das Velhas and rio Paraopeba, rio São Francisco basin; *N. paranensis* from the upper rio Paraná basin and *N. ribeirensis* from the rio Ribeira de Iguape basin. Later, Bizerril (1995) described another species from the rio Paraíba do Sul basin: *N. variipictus*. Thereafter, subsequent descriptions were focused in the upper rio Paraná basin: Zawadzki *et al.* (2008) proposed *N. corumba*, *N. selenae* e *N. yapo*, Roxo

*et al.* (2012a) reconized *N. bandeirante*, *N. botucatu* and *N. langeanii* and Andrade & Langeani (2014) described *N. jaguari*. Ultimately, Roxo *et al.* (2014a) described the first species from the rio Doce basin: *N. doceensis*.

Therefore, the diversity of the genus increased considerably in last years, mainly in the upper rio Paraná basin. Since the description of *N. franciscoensis*, numerous additional material was collected, revealing a greater morphological variation. Thus, the aim of this study was reevaluate the populations of *Neoplecostomus* from rio São Francisco basin.

## Material and Methods

Examined material came from: Coleção de Peixes do Departamento de Zoologia e Botânica, Universidade Estadual Paulista “Júlio de Mesquita Filho”, São José do Rio Preto-SP (DZSJRP), Laboratório de Biologia e Genética de Peixes, Universidade Estadual Paulista “Júlio de Mesquita Filho”, Botucatu-SP (LBP), Laboratório de Ictiologia de Ribeirão Preto, Universidade de São Paulo, Ribeirão Preto-SP (LIRP), Museu de Ciências e Tecnologia, Pontifícia Universidade Católica do Rio Grande do Sul, Porto Alegre-RS (MCP), Museu Nacional, Universidade Federal do Rio de Janeiro, Rio de Janeiro-RJ (MNRJ), Museu de Zoologia da Universidade de São Paulo, São Paulo-SP (MZUSP) and Núcleo de Pesquisas em Limnologia, Ictiologia e Aquicultura, Universidade Estadual de Maringá, Maringá-PR (Nupélia, NUP). In order to increase the number of specimens, we performed two collecting expeditions: one in the streams surrounding Serra da Canastra National Park and another in the rio Paraopeba, Serra da Moeda. A total of 266 specimens were analyzed.

Measurements were taken point to point with digital calipers to the nearest 0.1 mm, on the left side, following Langeani (1990), with modifications of Zawadzki *et al.* (2008). Juvenile specimens, smaller than 50.0 mm of SL, were not measured. Plate counts followed Langeani (1990) and Zawadzki *et al.* (2008), with additional counts of the lateral plate series, following Schaefer (1997). Plates just below the pterotic-supracleithrum, surrounded by a naked area, were not included in the counts of the lateral series. Plates were counted from the left side in alcohol and cleared and stained (c&s) specimens, prepared according to Taylor and Van Dyke (1985). Measurements were presented as percentages of standard length (SL), head length (HL) or other measurements (snout length/orbital diameter, interorbital length/orbital diameter, interorbital length/mandibullary width, predorsal length/first dorsal-fin ray length, caudal peduncle length/caudal peduncle depth, pelvic-fin length/caudal peduncle depth, lower caudal-fin

spine/caudal peduncle depth), and includes minimum, maximum, mean and standard deviation. Meristics presented as ranges with modes in parentheses. Vertebrae counts included five from the Weberian apparatus and one from the hypural plate. Osteological analysis followed Pereira (2008).

## Results

### *Neoplecostomus franciscoensis* Langeani, 1990

#### Fig. 1

*Neoplecostomus franciscoensis*. -Alves & Pompeu, 2005: 600 (apêndix A: MZUSP 73713). -Carvalho *et al.*, 2008: 338 (comparative material: MCP 34212). -Pereira, 2008: 21 (species included in phylogenetic analysis; MZUSP 37149, MZUSP 73713 and MCP 34212). -Cramer *et al.*, 2011: 48 (species included in phylogenetic analysis; MCP 42428). -Junqueira *et al.*, 2012: 421 (table 1); 422 (headwaters species). -Roxo *et al.*, 2012a: 18 (samples from LBP 6489, LBP 6493 and LBP 6537); 19 (table 3); 20 (comparative material). -Roxo *et al.*, 2012b: 2443 (species included in phylogenetic analysis; table S1: LBP 6537). -Roxo *et al.*, 2012c: 35 (species included in phylogenetic analysis; LBP 6537). -Costa e Silva, *et al.*, 2013: 74 (comparative material: LBP 6489). -Roxo *et al.*, 2014a: 125 (comparative material: MZUSP 38577 and LBP 6489). -Roxo *et al.*, 2014b: 9 (species included in phylogenetic analysis; table S1: LBP 6537).

**Diagnosis.** *Neoplecostomus franciscoensis* differs from most congeners by having two or three large plates, arranged in line, with several small plates above them, between the cleithrum humeral process and the first plate of the lateral series (except *N. ribeirensis*) (Fig. 2a) and spinelet absent or with varied size and disposition: narrower or wider than dorsal-fin spine base, only a very small plate on left or right side or divided into two pieces (*vs.* spinelet always wider than dorsal-fin spine base in most species, except *N. ribeirensis*) (Fig. 3). Besides, *N. franciscoensis* can be distinguished from *N. ribeirensis* by lacking a extra plate with a channel between the canal plate and ventral extremity of the preopercle (*vs.* present), from *N. paranensis* and *N. botucatu* by having well-developed adipose fin (*vs.* absent or poorly-developed), from *N. selenae* and *N. yapo* by lacking enlarged odontodes and distinct swollen skin along lateral margins of snout in mature males (*vs.* present), from *N. doceensis* by lacking enlarged fleshy folds between

dentaries (*vs.* present), from *Neoplecostomus* sp. n. “paraty” by having a dorsal color pattern without lighter areas with a central dark spot (*vs.* well-defined areas), and from *N. granosus* by having 29-35 (32) lateral-line plates (*vs.* 34-43 (unknown mode)), 7-10 (8) plates between adipose and caudal fin (*vs.* 10-13 (unknown mode)) and smaller occipital-dorsal distance (12.5-15.5% of SL *vs.* 18.0-22.0%). Finally, *Neoplecostomus franciscoensis* possesses the anterior portion of the second basibranchial greater than posterior portion (*vs.* extremities without any difference in *N. espiritosantensis*, *N. jaguari*, *N. microps*, *Neoplecostomus* sp. n. “paraty”, *N. ribeirensis*, *N. selenae*, *N. yapo* and *Neoplecostomus* sp. n.) (Fig. 4).

**Description.** Measurements and counts in Table 1. Body elongated and depressed. Greatest body width at cleithrum, narrowing to caudal peduncle. Dorsal body profile gently convex, elevating from snout tip to dorsal-fin origin and descending to first caudal-fin ray. Greatest body depth at dorsal-fin origin. Trunk and caudal peduncle dorsally rounded in cross section. Body ventrally flattened to anal-fin origin, flattened to slightly ascending to caudal fin. Dorsal body surface completely covered by dermal plates, except for naked area around dorsal-fin base. Snout tip with small naked area. Ventral head surface naked except by canal plate ahead of gill openings. Abdomen with conspicuous and small dermal platelets between insertions of pectoral and pelvic fins, forming thoracic shield (heptagonal- or hexagonal-shaped), surrounded by naked areas. Two or three large plates between the cleithrum humeral process and the first plate of the lateral series, arranged in line, with several small plates above them. Head wide and moderately depressed. Head and snout weakly rounded in dorsal view. Interorbital space slightly convex in frontal view. One median ridge from snout tip to area between nares, another one from naris to anterior margin of orbit. Snout convex in lateral profile. Eye moderately small (8.4-12.3% of HL), dorsolaterally placed. Iris operculum present. Lips well developed and rounded, covered by papillae. Lower lip not reaching pectoral girdle. Two or three irregular rows of papillae posterior to dentary teeth; papillae large, conspicuous and transversally flattened. Maxillary barbel short, coalesced with lower lip, and generally bifurcated in free portion (some specimens only with fold of skin instead). Teeth long, slender and bicuspid; mesial cusp longer than lateral. Dentary rami forming an angle of approximately 120°.

Dorsal-fin ii,7; origin posterior to vertical passing through pelvic-fin origin. Nuchal plate not covered by skin. Dorsal-fin spinelet absent or with varied size and disposition:

narrower or wider than dorsal-fin spine base, only a very small plate on left or right side or divided into two pieces. Dorsal-fin locking mechanism absent. Dorsal-fin posterior margin slightly falcate, reaching or surpassing vertical through end of pelvic-fin rays when adpressed. Adipose fin present and well developed, preceded by none, one or two azygous plates. Pectoral-fin i,6; with depressed and inward curved unbranched ray, shorter than longest branched ray. Pectoral-fin posterior margin slightly falcate, reaching or nearly reaching half pelvic-fin length when adpressed. Pelvic-fin i,5; posterior margin nearly straight, reaching or nearly reaching anal-fin insertion when adpressed. Pelvic-fin unbranched ray ventrally flattened, with dermal flap on dorsal surface in males. Pectoral and pelvic-fin unbranched rays with odontodes on lateral and ventral portions. Anal-fin i,5; posterior margin nearly straight. Anal-fin unbranched ray with odontodes only ventrally. Caudal-fin i,7,7,i; bifurcate; lower lobe longer than upper. Vertebrae 31.

**Coloration.** Dorsal surface ground color yellowish with blotches light or dark brown. Head with straight yellowish line from snout tip to nare and one light area posterior to opercular area (more visible in juveniles). Dorsal color pattern of juveniles with four light areas: ahead, at middle and posterior to dorsal-fin base, and posterior to adipose-fin. Dorsal color pattern of adults dark or light brown; some specimens with spots along the body. Head ventral surface and body yellowish medially; light brown laterally from snout tip to ahead of anus; light brown from posteriorly to caudal peduncle. All fins with irregular dark brown areas; sometimes forming inconspicuous transverse stripes. Adipose fin with dark brown spine and hyaline membrane. Some specimens completely light brown; without stripes, just with four light areas at dorsal portion of the body (long preservation in alcohol).

**Sexual dimorphism.** As common for *Neoplecostomus* species, males with a dermal flap on anterior dorsal surface of the pelvic fin and a short urogenital papilla after anus.

**Geographic distribution.** *Neoplecostomus franciscoensis* is known from rio das Velhas drainage, affluent of the rio São Francisco, Minas Gerais State, Brazil (Fig. 5).

**Conservation status.** *Neoplecostomus franciscoensis* should be classified as Endangered (EN, B2abii) according to the International Union for Conservation of Nature (IUCN) categories and criteria (IUCN Standards and Petitions Subcommittee, 2014).

*Neoplecostomus franciscoensis* occurs in five locations (Fig. 5), restricted to the upper portion of the rio das Velhas (B2, a, Endangered), with an area of occupancy equal to 68 km<sup>2</sup> (B2, bii, Endangered).

**Examined material. Holotype.** MZUSP 38577, 68.1 mm SL, male, Brazil, Minas Gerais State, Nova Lima Municipality, rio São Francisco basin, rio das Velhas affluent, stream affluent of the Córrego Mutuca, right on the road Belo Horizonte-Nova Lima, km 20. **Paratypes.** MZUSP 37149, 39 of 40, 26.5-73.4 mm SL (16, 51.4-73.4 mm SL), 1c&s (not measured), Brazil, Minas Gerais State, Nova Lima Municipality, rio São Francisco basin, rio das Velhas affluent, stream affluent of the Córrego Mutuca, right on the road Belo Horizonte-Nova Lima, km 20. **Non-types.** All from Brazil, Minas Gerais State, rio São Francisco basin, rio das Velhas drainage. LBP 6489, 51, 37.0-60.2 mm SL (17, 50.2-60.2 mm SP), São Bartolomeu Municipality, rio das Velhas. LBP 6493, 14, 23.3-55.2 mm SL (2, 53.3-55.2 mm SL), Ouro Preto Municipality, rio das Velhas affluent. LBP 6537, 4, 38.4-53.8 mm SL (1, 53.8 mm SL), Brumadinho Municipality (probably incorrect), rio das Velhas affluent. MCP 42422, 39 of 41, 36.4-62.7 mm SL (14, 50.1-62.7 mm SL), Mariana Municipality, rio das Velhas, about 1,5 km northwest of São Bartolomeu. MCP 42428, 9 of 12, 34.0-56.9 mm SL (3, 51.0-56.9 mm SL), Mariana Municipality, rio das Velhas. MCP 34203, 2, 24.8-28.2 mm SL (not measured), Nova Lima Municipality, stream Caetezinho. MCP 34212, 15, 40.9-72.2 mm SL (8, 50.4-72.2 mm SL) (1c&s), Nova Lima Municipality, Cristais creek. MCP 46616, 5 of 6, 21.2-57.5 mm SL (2, 54.1-57.5 mm SL), Nova Lima Municipality, stream Mutuca. MNRJ 21418, 3, 51.2-60.3 mm SL (all measured), Ouro Preto Municipality, stream crossing MG-030, between Engenheiro Correia and Miguel Burnier, tributary of the rio Itabira. MZUSP 73713, 5, 49.2-60.6 mm SL (4, 54.6-60.6 mm SL), Ouro Preto Municipality, rio das Velhas. MZUSP 94561, 8, 40.2-69.7 mm SL, (6, 52.0-69.7 mm SL), Nova Lima Municipality, Macacos creek. MZUSP 109361, 3, 55.6-63.7 mm SL (all measured), Rio Acima Municipality, Prata creek. MZUSP 109366, 2, 43.2-47.2 mm SL (not measured), Rio Acima Municipality, Prata creek. MZUSP 109374, 3, 36.7-51.0 mm SL (1, 51.0 mm SL), Caeté Municipality, stream Maquiné, Prata creek affluent. MZUSP 109376, 3, 33.7-43.1 mm SL (not measured), Rio Acima Municipality, Prata creek. MZUSP 109387, 2, 48.9-58.1 mm SL (1, 58.1 mm SL), Caeté Municipality, stream Olhos d'Água, Prata creek affluent. MZUSP 109401, 1, 36.0 mm SL (not measured), Nova Lima Municipality, stream Tamanduá. MZUSP 109407, 2, 53.0-61.8 mm SL (all measured), Nova Lima

Municipality, stream Marumbé, Macacos creek affluent. MZUSP 109408, 3, 50.8-54.8 mm SL (all measured), Nova Lima Municipality, stream Penteado, Macacos creek affluent. MZUSP 109425, 2, 55.9-67.2 mm SL (all measured), Ouro Preto Municipality, Prata creek. MZUSP 109429, 2, 59.7-61.8 mm SL (all measured), Ouro Preto Municipality, stream das Almas affluent. MZUSP 109434, 1, 32.3 mm SL (not measured), Ouro Preto Municipality, stream of Almas affluent. NUP 6098, 14, 49.7-65.8 mm SL (10, 50.5-65.8 mm SL), Ouro Preto Municipality, rio das Velhas.

**Remarks.** The following lots, type specimens of *N. franciscoensis* are referred here to the new species proposed below. All from Brazil, Minas Gerais State, Moeda Municipality, rio São Francisco basin, rio Paraopeba affluent. MZUSP 37163, 2, 42.2-37.3 mm SL (not measured), creek affluent of the rio Paraopeba, Pedra Vermelha, km 10 of the BR-040, below the headwaters, 20°20'0.0"S 44°2'0.0"W, 8 Feb 1987, J. C. de Oliveira & O. T. Oyakawa. MZUSP 37171, 4, 40.7-38.1 mm SL (not measured), stream affluent of the rio Paraopeba, Água Limpa, km 3 of the BR-040, above the waterfalls, 20°20'0.0"S 44°2'0.0"W, 8 Feb 1987, J. C. de Oliveira & O. T. Oyakawa.

### *Neoplecostomus* sp. n., new species

#### Fig. 6

*Neoplecostomus franciscoensis*. -Langeani, 1990: 22 (type material: MZUSP 37163 and MZUSP 37171). -Casatti & Castro, 1998: 232 (table 1); 233 (ichthyofauna collected); 235 (image); 236 (feeding habit). -Roxo *et al.*, 2012d: 70 (collected with *Pareiorhina cepta*). -Andrade & Langeani, 2014: 680 (comparative material: DZSJRP 11451, DZSJRP 11458 and DZSJRP 11464). -Roxo *et al.*, 2014d: 125 (comparative material: MZUSP 107361). -Roa-Fuentes *et al.*, 2015: 170 (ecomorphological attributes); 178 (appendix 2: DZSJRP 11494).

**Holotype.** DZSJRP 20087, 67.2 mm SL, Moeda Municipality, stream at km 12, road from BR-040 to Moeda, 20°18'50"S 44°01'16"W, 24 Aug 2014, F. Langeani, A. M. Cherobim, B. N. Andrade & A. C. Rosa.

**Paratypes.** All from Brazil, Minas Gerais State, rio São Francisco basin, streams surrounding Serra da Canastra National Park. DZSJRP 11434, 1 c&s (54.8 mm SL,



female), São Roque de Minas Municipality, Grande stream, around Serra da Canastra National Park, Mr. Elmo property, 20°20'25"S 46°27'56"W, 19 Jun 2008, R. M. Romero & C. P. Ferreira. DZSJRP 11451, 1, 38.2 mm SL (not measured), São Roque de Minas Municipality, Grande stream, around Serra da Canastra National Park, Mr. Elmo property, 20°20'25"S 46°27'56"W, 9 Dec 2008, R. M. Romero & G. H. Baviera. DZSJRP 11458, 5, 41.0-64.6 mm SL (1, 64.6 mm SL), São Roque de Minas Municipality, Grande stream, around Serra da Canastra National Park, Mr. Elmo property, 20°20'25"S 46°27'56"W, 8 Feb 2009, R. M. Romero & G. H. Baviera. DZSJRP 11464, 3, 43.9-78.9 mm SL (1, 78.9 mm SL), 1 c&s (73.9 mm SL, female), São Roque de Minas Municipality, Grande stream, around Serra da Canastra National Park, Mr. Elmo property, 20°20'25"S 46°27'56"W, 25 Mar 2009, R. M. Romero & C. A. Roa-Fuentes. DZSJRP 11477, 2, 73.8 mm SL (one specimen with broken caudal peduncle), São Roque de Minas Municipality, Cerrado stream, around Serra da Canastra National Park, Mr. Joaquim Evaristo property, 20°20'00"S 46°28'31"W, 8 Aug 2008, R. M. Romero & A. R. Manzotti. DZSJRP 11494, 2, 45.6-72.3 mm SL (1, 72.3 mm SL), São Roque de Minas Municipality, Cerrado stream, around Serra da Canastra National Park, Mr. Joaquim Evaristo property, 20°20'00"S 46°28'31"W, 20°20'00"S 46°28'31"W, 9 Dec 2008, R. M. Romero & G. H. Baviera. DZSJRP 11605, 1, 12.3 mm SL (not measured), São Roque de Minas Municipality, stream Lavra, around Serra da Canastra National Park, Mr. Vitor property, upstream of the bridge, 20°18'36"S 46°25'59"W, 5 Nov 2009, R. M. Romero & G. H. Baviera. DZSJRP 11634, 1, 31.6 mm SL (not measured), São Roque de Minas Municipality, Luciano stream, around Serra da Canastra National Park, park entrance under bridge, 20°18'46"S 46°31'46"W, 7 Oct 2008, R. M. Romero & V. H. M. Prado. DZSJRP 11651, 1, 25.1 mm SL (not measured), São Roque de Minas Municipality, Luciano stream, around Serra da Canastra National Park, park entrance under bridge, 20°18'46"S 46°31'46"W, 24 Mar 2009, R. M. Romero & C. A. Roa-Fuentes. DZSJRP 20167, 1, 40.6 mm SL (not measured), São Roque de Minas Municipality, stream on the right, road from São Roque de Minas to São José do Barreiro, before Vargem Bonita, 20°19'19"S 46°23'27"W, 18 Nov 2014, F. Langeani, A. M. Cherobim & B. N. Andrade. DZSJRP 20173, 2, 30.9-45.1 mm SL (not measured), São José do Barreiro Municipality, Grande stream, road from Vargem Bonita to São José do Barreiro, in direction to Casca d'Anta, 20°20'10"S 46°27'47"W, 18 Nov 2014, F. Langeani, A. M. Cherobim & B. N. Andrade. DZSJRP 20183, 4, 34.1-61.8 mm SL (1, 61.8 mm SL), São José do Barreiro Municipality, rio São Francisco, road from Vargem Bonita to São José do Barreiro, 20°20'00"S

46°28'06"W, 18 Nov 2014, F. Langeani, A. M. Cherobim & B. N. Andrade. MZUSP 50749, 1, 102.6 mm de SL (measured), São Roque de Minas Municipality, rio São Francisco, Casca D'Anta farm, 20°30'00"S 46°50'00"W (incorrect coordinate), xii.1993-v.1995, L. Casatti, R. M. C. Castro & H. F. Santos. All from Brazil, Minas Gerais State, rio São Francisco basin, rio Paraopeba drainage. DZSJRP 20875, 3, 41.1-53.7 mm SL (2, 50.5-53.7 mm SL), 1 d&s (50.5 mm SL, female), Moeda Municipality, stream at km 12, road from BR-040 to Moeda, 20°18'50"S 44°01'16"W, 24 Aug 2014, F. Langeani, A. M. Cherobim, B. N. Andrade & A. C. Rosa. MCP 32530, 1, 72.9 mm SL (measured), Brumadinho Municipality, Arroio stream, rio Paraopeba affluent, 20°05'56"S 44°01'07"W, Luiz Fernando Salvador Jr. MZUSP 94532, 1, 80.6 mm SL (measured), Belo Vale Municipality (correct; Nova Lima is wrong), stream of Costas, Moinho waterfall, rio Paraopeba affluent, 20°23'09"S 44°06'23"W, 7 Jul 2007, Oyakawa, Baena e Loeb. MZUSP 107361, 7, 59.6-108.3 mm SL (all measured), Cristiano Otoni Municipality, waterfall at rio Paraopeba, coordinate not informed, 18 Feb 2004, Oliveira, Oyakawa & Togoro.

**Non-types.** All from Brazil, Minas Gerais State, Moeda Municipality, rio São Francisco basin, rio Paraopeba affluent. Paratypes of *N. franciscoensis*. MZUSP 37163, 2, 42.2-37.3 mm SL (not measured), creek affluent of the rio Paraopeba, Pedra Vermelha, km 10 of the BR-040, below the headwaters, 20°20'0.0"S 44°2'0.0"W, 8 Feb 1987, J. C. de Oliveira & O. T. Oyakawa. MZUSP 37171, 4, 40.7-38.1 mm SL (not measured), stream affluent of the rio Paraopeba, Água Limpa, km 3 of the BR-040, above the waterfalls, 20°20'0.0"S 44°2'0.0"W, 8 Feb 1987, J. C. de Oliveira & O. T. Oyakawa.

**Diagnosis.** *Neoplecostomus* sp. n. differs from all congeners by having females with more number of teeth in the premaxillary (17-34 (23) vs. 18-20 (20) in males) and dentary (11-33 (15) vs. 13-19 (14) in males) (Fig. 7). Besides, the new species can be distinguished from *N. franciscoensis* and *N. ribeirensis* by having one large plate between the cleithrum humeral process and the first plate of the lateral series (vs. two or three large plates, arranged in line, with several small plates above them) (Fig. 2b), and spinelet always wider than dorsal-fin spine base (vs. spinelet absent or with varied size and disposition in *N. franciscoensis*, and spinelet absent or narrower in *N. ribeirensis*). Also, the new species differs from *N. paranensis* and *N. botucatu* by having well-developed adipose fin (vs. absent or poorly-developed), from *N. ribeirensis* by lacking an extra plate with a channel

between the canal plate and ventral extremity of the preopercle (*vs.* present), from *N. selenae* and *N. yapo* by lacking enlarged odontodes and distinct swollen skin along lateral margins of snout in mature males (*vs.* present), from *N. doceensis* by lacking enlarged fleshy folds between dentaries (*vs.* present), from *Neoplecostomus* sp. n. “paraty” by having a dorsal color pattern without lighter areas with a central dark spot (*vs.* well-defined areas), and from *N. granosus* by having 28-32 (30) lateral-line plates (*vs.* 34-43 (unknown mode)), 3-5 (4) predorsal plates (*vs.* 6-8 (unknown mode)), 8-9 (8) plates between adipose and caudal fin (*vs.* 10-13 (unknown mode)) and smaller occipital-dorsal distance (11.0-13.5% of SL *vs.* 18.0-22.0%). Finally, *Neoplecostomus* sp. n. differs from most congeners, except *N. ribeirensis*, by having a narrow lateral process in the first anal-fin pterygiophore (*vs.* lateral process absent or inconspicuous in other species) (Fig. 8).

**Description.** Measurements and counts in Table 2. Body elongated and depressed. Greatest body width at cleithrum, narrowing to caudal peduncle. Dorsal body profile gently convex, elevating from snout tip to dorsal-fin origin and descending to first caudal-fin ray. Greatest body depth at dorsal-fin origin. Trunk and caudal peduncle dorsally rounded in cross section. Body ventrally flattened to anal-fin origin, flattened to slightly ascending to caudal fin. Dorsal body surface completely covered by dermal plates, except for naked area around dorsal-fin base. Snout tip with small naked area. Ventral head surface naked except by canal plate ahead of gill openings. Abdomen with conspicuous and small dermal platelets between insertions of pectoral and pelvic fins, forming thoracic shield (heptagonal- or hexagonal-shaped), surrounded by naked areas. One large plate between the cleithrum humeral process and the first plate of the lateral series; rarely with one small plate around the naked area. Only the right side of holotype with two large plates.

Head wide and moderately depressed. Head and snout weakly rounded in dorsal view. Interorbital space slightly convex in frontal view. One median ridge from snout tip to area between nares, another one from naris to anterior margin of orbit. Snout convex in lateral profile. Eye moderately small (7.5-13.2% of HL), dorsolaterally placed. Iris operculum present. Lips well developed and rounded, covered by papillae. Lower lip not reaching pectoral girdle. Two or three irregular rows of papillae posterior to dentary teeth; papillae large, conspicuous and transversally flattened. Maxillary barbel short, coalesced with lower lip, and generally bifurcated in free portion (some specimens only with fold of skin instead). Teeth long, slender and bicuspid; mesial cusp longer than lateral. Females teeth

thinner and delicate. Males teeth thicker and robust. Dentary rami forming an angle of approximately 120°.

Dorsal-fin ii,7; origin posterior to vertical passing through pelvic-fin origin. Nuchal plate not covered by skin. Dorsal-fin spinelet always present, half-moon shaped and wider than dorsal-fin first ray bas. Dorsal-fin locking mechanism absent. Dorsal-fin posterior margin slightly falcate, reaching or surpassing vertical through end of pelvic-fin rays when adpressed. Adipose fin present and well developed, preceded by none, one or two azygous plates. Pectoral-fin i,6; with depressed and inward curved unbranched ray, shorter than longest branched ray. Pectoral-fin posterior margin slightly falcate, reaching or nearly reaching half pelvic-fin length when adpressed. Pelvic-fin i,5; posterior margin nearly straight, reaching or nearly reaching anal-fin insertion when adpressed. Pelvic-fin unbranched ray ventrally flattened, with dermal flap on dorsal surface in males. Pectoral and pelvic-fin unbranched rays with odontodes on lateral and ventral portions. Anal-fin i,5; posterior margin nearly straight. Anal-fin unbranched ray with odontodes only ventrally. Caudal-fin i,7,7,i; bifurcate; lower lobe longer than upper. Vertebrae 31.

**Coloration.** Dorsal surface ground color yellowish with blotches light or dark brown. Head with straight yellowish line from snout tip to nare and one light area posterior to opercular area (more visible in juveniles). Dorsal color pattern of juveniles with four light areas: ahead, at middle and posterior to dorsal-fin base, and posterior to adipose-fin. Dorsal color pattern of adults dark or light brown with light areas not well defined. Head ventral surface and body yellowish medially; light brown laterally from snout tip to ahead of anus; light brown from posteriorly to the caudal peduncle. All fins with irregular dark brown areas; sometimes forming inconspicuous transverse stripes. Adipose fin with dark brown spine and hyaline membrane. Some specimens completely light brown (long preservation in alcohol).

**Sexual dimorphism.** Males with a dermal flap on the anterior dorsal surface of the pelvic fin and a short urogenital papilla after anus, as common for *Neoplecostomus* species.

**Geographic distribution.** *Neoplecostomus* sp. n. is known from headwater streams of rio São Francisco, surrounding Serra da Canastra National Park, and affluents of the rio Paraopeba, rio São Francisco basin, Minas Gerais State, Brazil (Fig. 5).

**Ecological notes.** The headwaters of the rio Paraopeba and also the rio das Velhas are located near the city of the Belo Horizonte. This region exhibits great economic development, being densely populated and industrialized. Thus, the streams are facing riparian deforestation, domestic and industrial pollution, construction of dams, gold-digging, overfishing and destruction of wetlands and oxbow lakes for agricultural projects, compromising the water quality and consequently the survival of fishes and other organisms (Alves & Pompeu, 2011; Godinho & Godinho, 2003). Besides, the new species also occurs around Serra da Canastra National Park, an area with land disputes, deforestation and fires, reinforcing the need of monitoring the species. We also suspect the occurrence of the new species inside Serra da Canastra National Park and other localities between Serra da Canastra and rio Paraopeba headwaters.

**Conservation status.** Current data suggest to classify *Neoplecostomus* sp. n. as Endangered (EN, B2abii) according to the International Union for Conservation of Nature (IUCN) categories and criteria (IUCN Standards and Petitions Subcommittee, 2014). *Neoplecostomus* sp. n. occurs in the headwaters of the rio São Francisco, near São Roque de Minas, and also in the rio Paraopeba, comprising three locations (Fig. 5) (B2, a, Endangered), with an area of occupancy equal to 32 km<sup>2</sup> (B2, bii, Endangered). However, there is a large, still unexploited, geographical area which could potentially harbor additional populations of the species. In consequence, we prefer classify the species as Data Deficient (DD) until more distribution data are available.

## Discussion

Comparing the populations of *Neoplecostomus* from the rio São Francisco basin, we observed a variation in some characteristics proposed in the original description of *N. franciscoensis*. Langeani (1990) recognized the spinelet as absent or with varied size and disposition, generally narrower than dorsal-fin spine base. In this study, we also observed a variation in *N. franciscoensis*: the spinelet may be absent, narrower or wider than dorsal-fin spine base, only a very small plate on left or right side, or divided into two pieces. However, analyzing a larger number of specimens, we do not find the narrower condition as the most frequent in *N. franciscoensis*. This condition is used by Langeani (1990) in the identification key to separate *N. franciscoensis* and *N. ribeirensis* from the other species of the genus. Here, we prefer to contemplate any spinelet variation in relation to *N. franciscoensis*, because restrict this character is not useful to identify the species. The

widespread condition in the genus *Neoplecostomus* is the spinelet always wider than dorsal-fin spine base, and was also reported to the new species from rio São Francisco basin.

Another diagnostic feature of *N. franciscoensis* is the plate arrangement between the cleithrum humeral process and the first plate of the lateral series: two or three large plates, arranged in line, with several small plates above them. In the new species we observed only one large plate surrounded by skin. Langeani (1990) recognized only the first condition for *N. franciscoensis*, while our analysis show a different pattern for *Neoplecostomus* populations from rio São Francisco. The first condition is shared only with *N. ribeirensis*, while the second is reported to all other *Neoplecostomus* species.

One distinctive feature present in the new species is the greater number of teeth in the females in the premaxillary (17-34 (23) vs. 18-20 (20) in males) and in the dentary (11-33 (15) vs. 13-19 (14) in males). A different number of teeth between males and females is also found in other two *Neoplecostomus* species: *N. jaguari* and *N. langeanii* (B. N. de Andrade e F. Langeani, pers. comm.). In *N. jaguari* females have 30-39 (31) premaxillary teeth (vs. 14-20 (18) in males) and 30-38 (31) dentary teeth (vs. 13-18 (14) in males), and teeth are thinner and delicate in females, and thicker and robust in males. In the new species, females may have thinner and delicate teeth when the number of teeth is close to the maximum (34). However, we also observed thicker and robust teeth in females, when the number is close to the minimum (17). In the case of *Neoplecostomus* sp. n. we do not consider this difference as a sexual dimorphism because the values of number of teeth between males and females overlap. Nevertheless, the recognition of intraspecific variability, related to sexual dimorphism or not, avoid error in taxonomic decisions, since one could consider it as a interspecific variability and interpret as different species (Rapp Py-Daniel & Cox Fernandes, 2005).

Junqueira *et al.* (2012) sampled rio das Velhas to investigate morphological diversity and collected *N. franciscoensis* only in the headwaters. The species was not captured in the upper, middle or lower course of the river, corroborating the hypothesis that *Neoplecostomus* species are restricted to headwaters regions. The currently known distribution of *Neoplecostomus* in the rio São Francisco basin is restricted to high lands at the Serra da Canastra National Park and Serra do Espinhaço South portion (Fig. 5). There is no record of *Neoplecostomus* in the high lands of the Serra do Espinhaço North portion, above Nova Lima Municipality. The lacking of ichthyofauna knowledge may be explain by difficult access to some areas, added to reduce interest in exploring headwaters

environment (Alves *et al.*, 2008). Or maybe, we do not find the genus in this region and probably might have a reason to explain why, but we do not have the answer now.

According to Roxo *et al.* (2012b), the ancestor of *N. franciscoensis* reached the São Francisco basin from the Interior Drainages at almost 10 Mya (mean). The species is closely related to a clade formed by *N. espiritosantensis* and *N. microps*, which occur in the littoral drainages. However, the results of Roxo *et al.* (2014b) demonstrate the ancestor of *N. franciscoensis* reaching the São Francisco from Coastal Drainages at 7.5 Mya (mean). Again, *N. franciscoensis* is closely related to the same littoral species, but more related to *N. espiritosantensis*, and both to *N. microps*. The addition of the new species to a biogeography analysis would help to clarify this issue, since several headwater capture events occurred between 15 and 28 million years ago among the rio São Francisco, rio Paraíba do Sul, rio Tietê and rio Ribeira de Iguape basins (Albert & Reis, 2011).

**Comparative material.** All from Brazil. *Epactionotus bilineatus*, DZSJRP 11358, 1 c&s, 32.9 mm SL, female, Rio Grande do Sul State, Maquiné Municipality, rio Maquiné. *Harttia kronei*, DZSJRP 3798, 1 c&s, unmeasured and undetermined sex, São Paulo State, Potirendaba Municipality, rio Tietê, Coqueiral creek. *Harttia novalimensis*, DZSJRP 11585, 1 c&s, 54.5 mm SL, female, Minas Gerais State, São Roque de Minas Municipality, stream Lavra, around Serra da Canastra National Park, Mr. Vitor property, upstream of the bridge. *Isbrueckerichthys cf. duseni*, DZSJRP 13670, 1 c&s, 48.3 mm SL, undetermined sex, São Paulo State, Tapiraí Municipality, rio Ribeira de Iguape basin, stream of Areias. *Kronichthys heilandi*, DZSJRP 12498, 1 c&s, 49.4 mm SL, female, Rio de Janeiro State, Tinguá Municipality, coastal drainage, stream at Fazenda Atlântica, 100 m from Tinguá downtown. *Kronichthys subterres*, DZSJRP 13620, 1 c&s, 56.6 mm SL, female, São Paulo State, Iporanga Municipality, rio Ribeira de Iguape basin, rio Iporanga, PETAR. *Neoplecostomus bandeirante*. All from São Paulo State, Salesópolis Municipality, upper rio Paraná basin, rio Tietê basin, rio Paraitinguinha. DZSJRP 14881, 2, 93.4-96.3 mm SL, paratypes of *Neoplecostomus bandeirante* Roxo, Oliveira & Zawadzki, 2012a. LBP 2861, 2 of 24, 75.4-81.7 mm SL, paratypes of *Neoplecostomus bandeirante* Roxo, Oliveira & Zawadzki, 2012a, 1 c&s (75.4 mm SL, male). MZUSP 110363, 1, 109.1 mm SL, holotype of *Neoplecostomus bandeirante* Roxo, Oliveira & Zawadzki, 2012a. *Neoplecostomus botucatu*. All from São Paulo State, Botucatu Municipality, upper rio Paraná basin, rio Paranapanema basin, rio Pardo affluent.

DZSJRP 14879, 6, 55.9-79.9 mm SL, paratypes of *Neoplecostomus botucatu* Roxo, Oliveira & Zawadzki, 2012a. LBP 7525, 2 of 21, 76.0-76.5 mm SL, paratypes of *Neoplecostomus botucatu* Roxo, Oliveira & Zawadzki, 2012a, 1 c&s (76.5 mm SL, immature female). MZUSP 110364, 1, 96.9 mm SL, holotype of *Neoplecostomus botucatu* Roxo, Oliveira & Zawadzki, 2012a. *Neoplecostomus corumba*. All from Goiás State, upper rio Paraná basin, rio Paranaíba basin, rio Corumbá affluent. DZSJRP 6713, 77.8 mm SL, holotype of *Neoplecostomus corumba* Zawadzki, Pavanelli & Langeani, 2008, Corumbaíba Municipality. DZSJRP 6193, 5, 43.9-73.7 mm SL, paratypes of *Neoplecostomus corumba* Zawadzki, Pavanelli & Langeani, 2008, Corumbaíba Municipality. DZSJRP 7003, 1 of 19, 1 c&s (58.1mm SL, female), Bela Vista de Goiás Municipality. *Neoplecostomus doceensis*. All from Minas Gerais State, rio doce basin. MZUSP 115486, 1, 100.9 mm SL, holotype of *Neoplecostomus doceensis* Roxo, Silva, Zawadzki & Oliveira, 2014, Ouro Preto Municipality, rio Gualaxo do Norte affluent. MZUSP 107368, 3 of 5, 56.0-77.6 mm SL, paratypes of *Neoplecostomus doceensis* Roxo, Silva, Zawadzki & Oliveira, 2014, rio Piranga, unknown locality. *Neoplecostomus espiritosantensis*. All from Espírito Santo State. MZUSP 38573, 1, 101.0 mm SL, holotype of *Neoplecostomus espiritosantensis* Langeani, 1990, Domingos Martins Municipality, rio Jucu. MZUSP 38574-75, 1 of 2, 94.3 mm SL, paratype of *Neoplecostomus espiritosantensis* Langeani, 1990, Domingos Martins Municipality, rio Jucu. MCP 27340, 3 of 5, 52.6-65.2 mm SL, 1 c&s (56.7 mm SL, male), Muniz Freire Municipality, Terra Corrida stream. *Neoplecostomus jaguari*. All from Minas Gerais State, Extrema Municipality, ribeirão do Forja. LIRP 2277, 89.1 mm SL, holotype of *Neoplecostomus jaguari* Andrade & Langeani, 2015. LIRP 2278, 3 of 83, 3 c&s (58.8 mm SL, female, 62.8-64.6 mm SL, males), paratypes of *Neoplecostomus jaguari* Andrade & Langeani, 2015. All from Minas Gerais State, Camanducaia Municipality. MZUSP 73240, 11, 29.6-77.4 mm SL, paratypes of *Neoplecostomus jaguari* Andrade & Langeani, 2015, road from Camanducaia to Monte Verde, about 18 km from Camanducaia, São Geraldo far, stream Casca d'Antas. MZUSP 73243, 11, 26.8-92.6 mm SL, paratypes of *Neoplecostomus jaguari* Andrade & Langeani, 2015, road from Camanducaia to Monte Verde, about 12 km from Camanducaia, Quilombo neighborhood. NUP 6586, 1, 71.5 mm SL, paratypes of *Neoplecostomus jaguari* Andrade & Langeani, 2015, road of Peregrinos, stream Casca d'Antas. *Neoplecostomus langeanii*. All from São Paulo State, Muzambinho Municipality, upper rio Paraná basin, rio Grande basin, rio Muzambinho affluent. DZSJRP 4880, 2, 70.1-70.3 mm SL, paratypes of *Neoplecostomus langeanii*



Roxo, Oliveira & Zawadzki, 2012a. DZSJRP 14880, 2, 69.2-69.8 mm SL, paratypes of *Neoplecostomus langeanii* Roxo, Oliveira & Zawadzki, 2012a. DZSJRP 14882, 6 of 9, 46.0-55.3 mm SL, paratypes of *Neoplecostomus langeanii* Roxo, Oliveira & Zawadzki, 2012a. DZSJRP 14049, 13 of 15, 44.5-73.9 mm SL, 1 c&s (69.1 mm, male). LBP 5931, 3 of 19, 57.9-61.6 mm SL, paratypes of *Neoplecostomus langeanii* Roxo, Oliveira & Zawadzki, 2012a. LBP 5947, 9 of 35, 43.6-63.4 mm SL, paratypes of *Neoplecostomus langeanii* Roxo, Oliveira & Zawadzki, 2012a. MZUSP 110365, 1, 76.6 mm SL, holotype of *Neoplecostomus langeanii* Roxo, Oliveira & Zawadzki, 2012a. *Neoplecostomus microps*. All from São Paulo State, rio Paraíba do Sul basin. DZSJRP 2144, 17 of 23, 38.2-83.6 mm SL, 1 c&s (62.8 mm SL, immature female), Cunha Municipality, rio Jacuí-Mirim affluent. DZSJRP 2767, 1 c&s, (unmeasured, dissected), Campos Cunha Municipality, rio Jacuí-Mirim affluent. DZSJRP 2768, 1 c&s (unmeasured, dissected), unknown locality. DZSJRP 4267, 9, 25.2-53.6 mm SL, São Luís do Paraitinga Municipality, Ribeirão do Chapéu affluent. DZSJRP 4268, 1, 67.1 mm SL, Cunha Municipality, rio Paraitinga affluent. DZSJRP 4269, 5, 18.7-70.5 mm SL, Piquete Municipality, rio Piquete headwaters. DZSJRP 4270, 19, 19.2-78.1 mm SL, São Luís do Paraitinga Municipality, rio Paraibuna affluent. DZSJRP 12727, 2, 59.6-73.7 mm SL, Pindamonhangaba Municipality, rio Piracuama. DZSJRP 13902, 21, 16.3-62.3 mm SL, Silveiras Municipality, Ribeirão Bocaina affluent. DZSJRP 13908, 23, 30.7-79.4 mm SL, Silveiras Municipality, road Silveiras-Cunha, stream in the access on land to the neighborhood Colinas. DZSJRP 13913, 5, 42.7-93.1 mm SL, Cunha Municipality, stream on the royal road Parati-Cunha. DZSJRP 18710, 8, 27.6-83.9 mm SL, Pindamonhangaba Municipality, Ribeirão Grande affluent. DZSJRP 18715, 2, 67.2-67.5 mm SL, Pindamonhangaba Municipality, Ribeirão Grande affluent. DZSJRP 18721, 1, 34.1 mm SL (unmeasured), Pindamonhangaba Municipality, Ribeirão Grande affluent. DZSJRP 18736, 3, 63.3-80.1 mm SL, 1 c&s (63.3 mm SL, male), Cunha Municipality, stream on the royal road Parati-Cunha. DZSJRP 20417, 6, 61.9-88.1 mm SL, Bananal Municipality, Ribeirão das Cobras. DZSJRP 20421, 16, 40.6-86.6 mm SL, Bananal Municipality, stream after Bananal Ecological Station. MZUSP 22522, 1, 31.0 mm SL, Santa Branca Municipality, stream of Rogero. MZUSP 35496, 2, 56.9-52.3 mm SL, Monteiro Lobato Municipality, rio Buquira affluent. All from Rio de Janeiro State, rio Paraíba do Sul basin. DZSJRP 20342, 4, 17.9-78.3 mm SL, Itatiaia Municipality, Ribeirão Taquari, Itatiaia National Park, lower part. DZSJRP 20346, 5, 22.9-67.3 mm SL, Itatiaia Municipality, Ribeirão Tapera, Itatiaia National Park, lower part. DZSJRP 20353, 1, 66.6 mm SL,

Maringa Municipality, stream on the road Penedo-Maromba. DZSJRP 20355, 1, 76.6 mm SL, Visconde de Mauá Municipality, Marimbondo's river, road Penedo-Maromba. DZSJRP 20362, 8, 14.4-69.8 mm SL, Resende Municipality, Alambari river, road Penedo-Maromba. DZSJRP 20367, 7, 27.0-64.4 mm SL, Resende Municipality, Alambari river, road Penedo-Maromba. MZUSP 24870, 1 of 2, 51.2 mm SL, Petrópolis Municipality, rio of Petrópolis Municipality. *Neoplecostomus paranensis*. MZUSP 38822-824, 3, 33.3-90.5 mm SL, paratypes of *Neoplecostomus paranensis* Langeani, 1990, São Paulo State, Cajuru Municipality, upper rio Paraná basin, rio Cubatão. DZSJRP 8590, 10, 17.1-60.5 mm SL, 1 c&s (60.0 mm SL, male), Minas Gerais State, Fortaleza de Minas Municipality, upper rio Paraná basin, stream between São Sebastião do Paraíso and Passos. *Neoplecostomus ribeirensis*. All from São Paulo State, rio Ribeira de Iguape basin. MZUSP 35432, 14, 38.2-88.9 mm SL, paratypes of *Neoplecostomus ribeirensis* Langeani, 1990, 1 c&s (64.2 mm SL, undetermined sex), Miracatu Municipality, rio Bananal affluent. MZUSP 38576, 1, 86.5 mm SL, holotype of *Neoplecostomus ribeirensis* Langeani, 1990, rio Bananal affluent, km 7 of the road Biguá-Iguape (SP-222). DZSJRP 13696, 2, 62.5-73.4 mm SL, 1 c&s (62.5 mm SL, female), Ibiúna Municipality, rio Itaguapeva. *Neoplecostomus selenae*. All from São Paulo State, Ribeirão Grande Municipality, upper rio Paraná basin, rio Paranapanema affluent, ribeirão das Batéias. DZSJRP 7449, 4, 56.1-94.7 mm SL, paratypes of *Neoplecostomus selenae* Zawadzki, Pavanelli & Langeani, 2008, 1 c&s (56.3 mm SL, male). MZUSP 51873, 3, 51.6-65.3 mm SL, paratypes of *Neoplecostomus selenae* Zawadzki, Pavanelli & Langeani, 2008. MZUSP 52589, 4, 41.8-64.6 mm SL, paratypes of *Neoplecostomus selenae* Zawadzki, Pavanelli & Langeani, 2008. NUP 3572, 5, 47.4-82.1 mm SL, paratypes of *Neoplecostomus selenae* Zawadzki, Pavanelli & Langeani, 2008. *Neoplecostomus variipictus*. MNRJ 12806, 89.4 mm SL, holotype of *Neoplecostomus variipictus* Bizerril, 1995, Rio de Janeiro State, Nova Friburgo, rio Paraíba do Sul basin, upper rio Bengala. *Neoplecostomus yapo*. Paraná State, Tibagi Municipality, upper rio Paraná basin, rio Paranapanema basin, rio Tibagi, rio Yapó affluent. DZSJRP 6714, 95.6 mm SL, holotype of *Neoplecostomus yapo* Zawadzki, Pavanelli & Langeani, 2008. DZSJRP 6194, 6, 68.6-103.1 mm SL, paratypes of *Neoplecostomus yapo* Zawadzki, Pavanelli & Langeani, 2008, 1 c&s (69.8 mm SL, male). *Neoplecostomus* sp. n. paraty. All from Brazil, Rio de Janeiro State, Parati Municipality, coastal drainage. Rio Perequê-Açú basin: DZSJRP 12481, 7, 44.2-75.3 mm SL (3, 53.5-75.3 mm SL), 1 c&s (53.5 mm SL, female), stream on the road Parati-Cunha, near the Serra da Bocaina National Park. DZSJRP 13914, 6, 32.4-68.3 mm

SL (3, 55.7-68.3 mm SL), 1c&s (59.6 mm SL, male), stream on the road Parati-Cunha, Penha neighborhood, near the Serra da Bocaina National Park. DZSJRP 18726, 2, 59.3-75.1 mm SL (all measured), stream on the road Parati-Cunha, in front of the Cantina das Pedras Bar. DZSJRP 18733, 1, 35.8 mm SL (not measured), stream on the road Parati-Cunha, near the village. DZSJRP 20425, 2, 86.8-92.0 mm SL (all measured), rio Perequê-Açú, lateral access on the road Parati-Cunha, Serra da Bocaina National Park. DZSJRP 20429, 82.2 mm SL, male, stream on the road Parati-Cunha, Serra da Bocaina National Park. DZSJRP 20433, 29, 24.6-66.6 mm SL (12, 51.1-66.6 mm SL), rio Carrasquinho, road Parati-Cunha. MNRJ 24914, 3, 46.8-62.8 mm SL, (1, 62.8 mm SL), rio Carrasquinho, Penha neighborhood, 800 m upstream of Poço do Tarzan. MNRJ 41726, 5, 47.3-68.6 mm SL (4, 50.5-68.6 mm), 1 c&s (50.5 mm SL, female), rio Carrasquinho, road Parati-Cunha, downstream of Penha. MNRJ 41727, 12, 30.6-67.5 mm SL (7, 50.1-67.5 mm SL), 1c&s (52.0 mm SL, male), rio Carrasquinho, branch road Caminho do Ouro em Mãe da Água. MNRJ 44219, 4, 62.0-70.4 mm SL (all measured), Córrego do Sousa, second entrance in the road Caminho do Ouro, near km 9,5, right on the road Parati-Cunha. Rio Graúna basin: DZSJRP 20440, 2, 83.0-90.6 mm SL (all measured), stream on the right bank of rio Graúna, Graúna's village. Rio Corisco or Mateus Nunes basin: DZSJRP 20442, 22, 35.4-79.3 mm SL (8, 51.0-79.3 mm SL), tissue sample of 3 specimens, rio Corisco or Mateus Nunes. *Otocinclus affinis*, DZSJRP 7610, 1 c&s, 31.5 mm SL, undetermined sex, São Paulo State, Registro Municipality, artificial channel that flows into rio Jacupiranga, behind the rice field, Apta (Cedaval). *Pareiorhaphis hystrix*, DZSJRP 13714, 1 c&s, 49.8 mm SL, undetermined sex, Rio Grande do Sul State, rio Uruguai basin. *Parotocinclus jumbo*, MZUSP 69514, 1 c&s, unmeasured and undetermined sex, Paraíba State, rio Paraíba do Norte, 4 km from bridge at road PB-408. *Parotocinclus maculicauda*, DZSJRP 3137, 1 c&s, 35.7 mm SL, female, São Paulo State, Jacupiranga Municipality, rio Ribeira de Iguape affluent, rio Jacupiranga, under the bridge.

### Acknowledgments

We are grateful to Aléssio Datovo da Silva, Osvaldo Oyakawa and Michel D. Gianeti (MZUSP), Carla S. Pavanelli (Nupélia), Carlos A. S. Lucena (MCP), Cláudio Oliveira (LBP), Flávio A. Bockmann (LIRP) and Paulo A. Buckup (MNRJ) for the loan of specimens. We also thank Edson H. L. Pereira and Cláudio Zawadzki for valuable suggestions to the manuscript. This study was supported by Fundação de Amparo à

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Pesquisa do Estado de São Paulo (FAPESP, 2013/26865-8 to AMC; 2012/23224-9 to FL) and Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq, 131.179/2014-4 to AMC; 305.940/2011-0 to FL).

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## Captions

**Fig. 1.** Holotype of *Neoplecostomus franciscoensis*, MZUSP 38577, 68.1 mm SL, male, stream affluent of the Córrego Mutuca, right on the road Belo Horizonte-Nova Lima, km 20, rio das Velhas affluent, rio São Francisco basin, Minas Gerais State, Brazil.

**Fig. 2.** Detail of the plates between the cleithrum humeral process (cl) and the first plate of the lateral series (ls): two or three large plates, arranged in line, with several small plates above them in (a) *Neoplecostomus franciscoensis*, MCP 42422, 57.6 mm SL, female, and one large plate surrounded by skin in (b) *Neoplecostomus* sp. n., DZSJRP 20087, holotype, 67.2 mm SL, female. Pt-sc = compound pterotic. Scale bars = 1mm.

**Fig. 3.** Spinelet variation in *Neoplecostomus franciscoensis*: absent in (a) MZUSP 37149, 73.4 mm SL, male; narrower than dorsal-fin spine base in (b) MCP 42428, 47.1 mm SL, female; wider than dorsal-fin spine base in (c) MZUSP 37149, 54.1 mm SL, female; only a very small plate on right side in (d) MZUSP 37149, 63.9 mm SL, male; only a very small plate on left side in (e) MCP 34212, 45.7 mm SL, male; and spinelet divided into two pieces in (f) MZUSP 37149, 61.1 mm SL, female. Np = Nuchal plate and spi = spinelet. Scale bars = 1mm.

**Fig. 4.** Branchial skeleton in ventral view, showing the anterior portion of the second basibranchial (black arrow) greater than posterior portion in (a) *Neoplecostomus franciscoensis*, MCP 37149, unmeasured, and extremities without any difference in (b) *Neoplecostomus* sp. n., DZSJRP 20875, 50.5 mm SL, female. Scale bars = 1mm.

**Table 1.** Morphometric and meristic data of *Neoplecostomus franciscoensis*. H= holotype, n= number of specimens and SD = standard deviation.

**Fig. 5.** Geographic distribution of *Neoplecostomus franciscoensis* (yellow square) and *Neoplecostomus* sp. n. (red circle). Type locality indicated by black square (*Neoplecostomus franciscoensis*) and black circle (*Neoplecostomus* sp. n.). Symbols can represent more than one locality.

**Fig. 6.** Holotype of *Neoplecostomus* sp. n., DZSJRP 20087, 67.2 mm SL, female, stream at km 12, road from BR-040 to Moeda, rio Paraopeba affluent, rio São Francisco basin, Moeda, Minas Gerais, Brazil.

**Fig. 7.** Detail of the premaxillary and dentary teeth in a) *Neoplecostomus* sp. n., DZSJRP 20087, holotype, 67.2 mm SL, female, greater number of teeth in the premaxillary (17-34 (23)) and dentary (11-33 (15)), and b) *Neoplecostomus* sp. n., DZSJRP 11477, 73.8mm

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SL, male, smaller number of teeth in the premaxillary (18-20 (20)) and dentary (13-19 (14)).

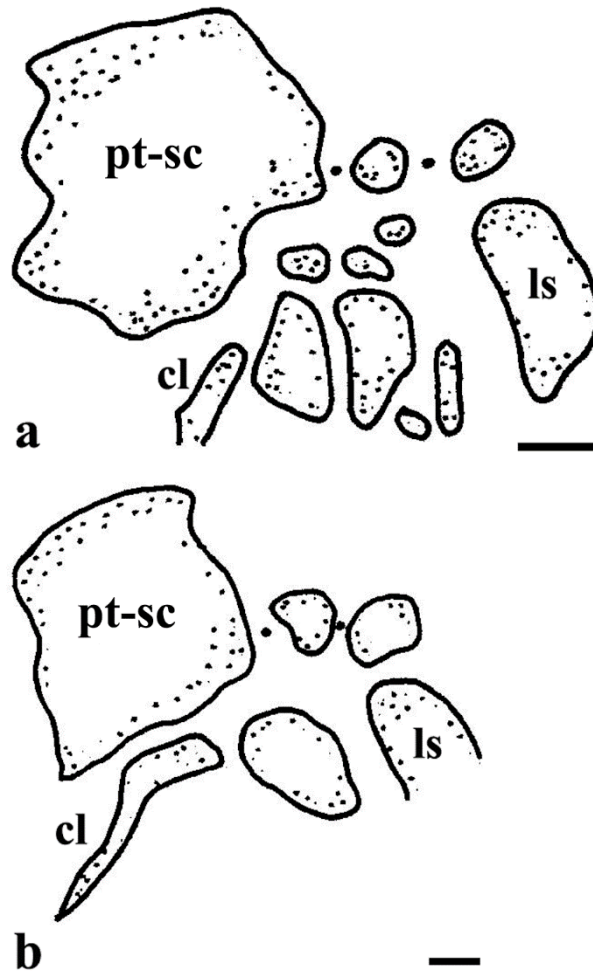
**Fig. 8.** First anal-fin pterygiophore in ventral view, showing the lateral process (black arrow) narrow in (a) *Neoplecostomus* sp. n., DZSJRP 20875, 50.5 mm SL, female and inconspicuous in (b) *Neoplecostomus franciscoensis*, MCP 34212, unmeasured. Scale bars = 1mm.

**Table 2.** Morphometric and meristic data of *Neoplecostomus* sp. n.. H= holotype, n= number of specimens and SD = standard deviation.

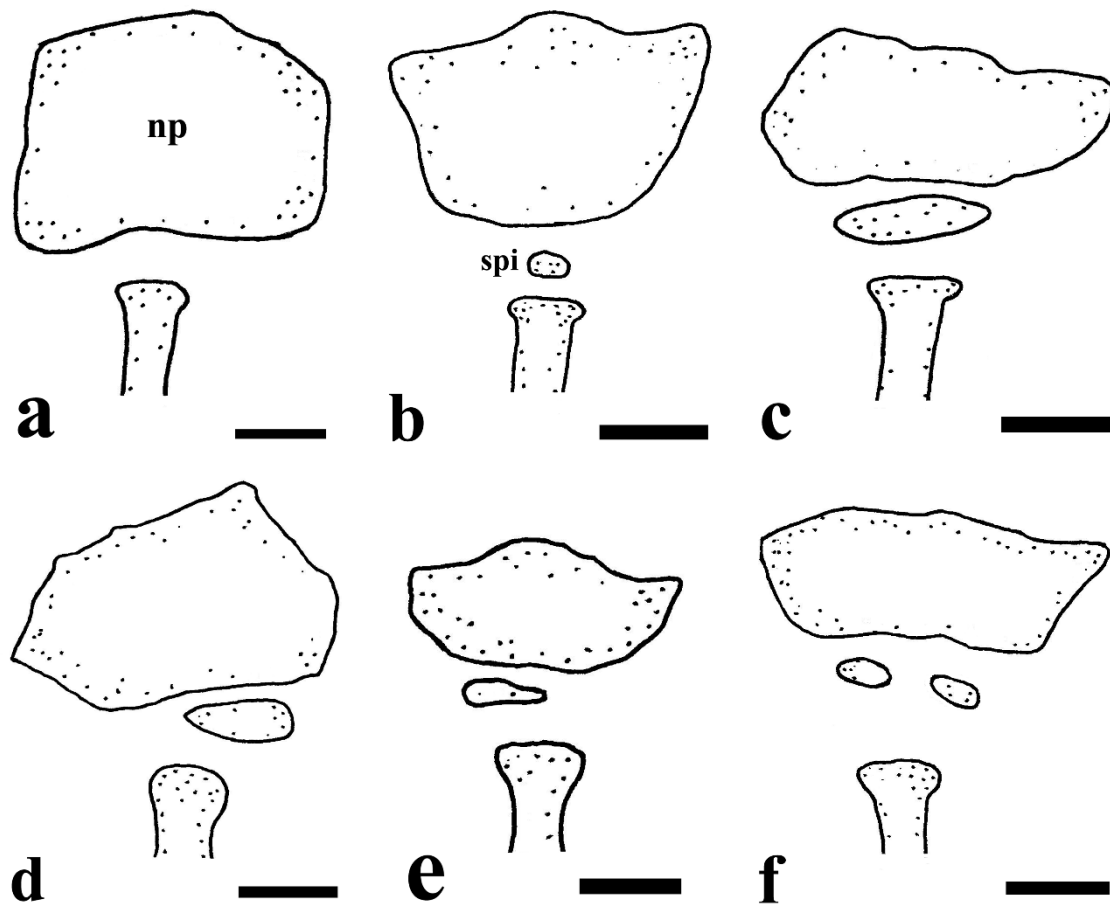




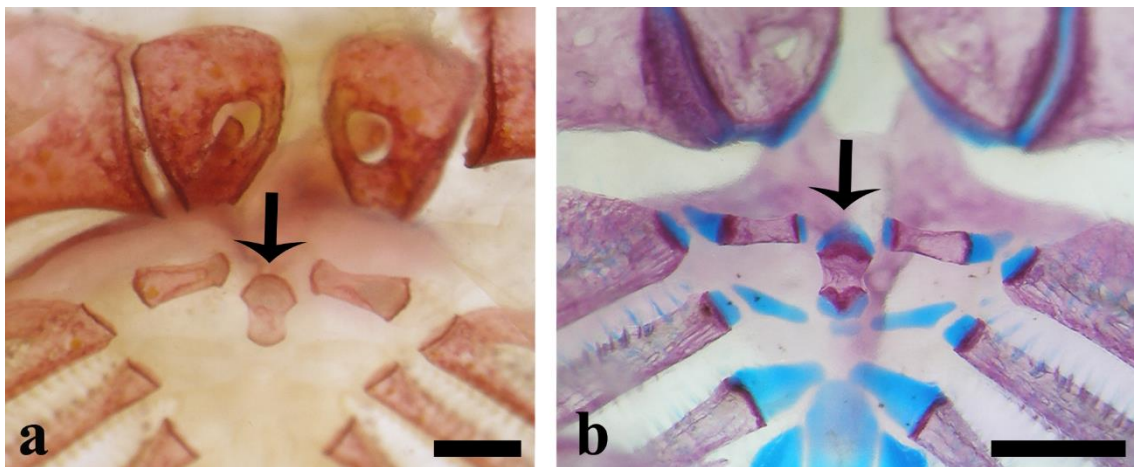
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**Fig. 2.** Detail of the plates between the cleithrum humeral process (cl) and the first plate of the lateral series (ls): two or three large plates, arranged in line, with several small plates above them in (a) *Neoplecostomus franciscoensis*, MCP 42422, 57.6 mm SL, female, and one large plate surrounded by skin in (b) *Neoplecostomus* sp. n., DZSJRP 20087, holotype, 67.2 mm SL, female. Pt-sc = compound pterotic. Scale bars = 1mm.



**Fig. 3.** Spinelet variation in *Neoplecostomus franciscoensis*: absent in (a) MZUSP 37149, 73.4 mm SL, male; narrower than dorsal-fin spine base in (b) MCP 42428, 47.1 mm SL, female; wider than dorsal-fin spine base in (c) MZUSP 37149, 54.1 mm SL, female; only a very small plate on right side in (d) MZUSP 37149, 63.9 mm SL, male; only a very small plate on left side in (e) MCP 34212, 45.7 mm SL, male; and spinelet divided into two pieces in (f) MZUSP 37149, 61.1 mm SL, female. Np = Nuchal plate and spi = spinelet. Scale bars = 1mm.



**Fig. 4.** Branchial skeleton in ventral view, showing the anterior portion of the second basibranchial (black arrow) greater than posterior portion in (a) *Neoplecostomus franciscoensis*, MCP 37149, unmeasured, and extremities without any difference in (b) *Neoplecostomus* sp. n., DZSJRP 20875, 50.5 mm SL, female. Scale bars = 1mm.

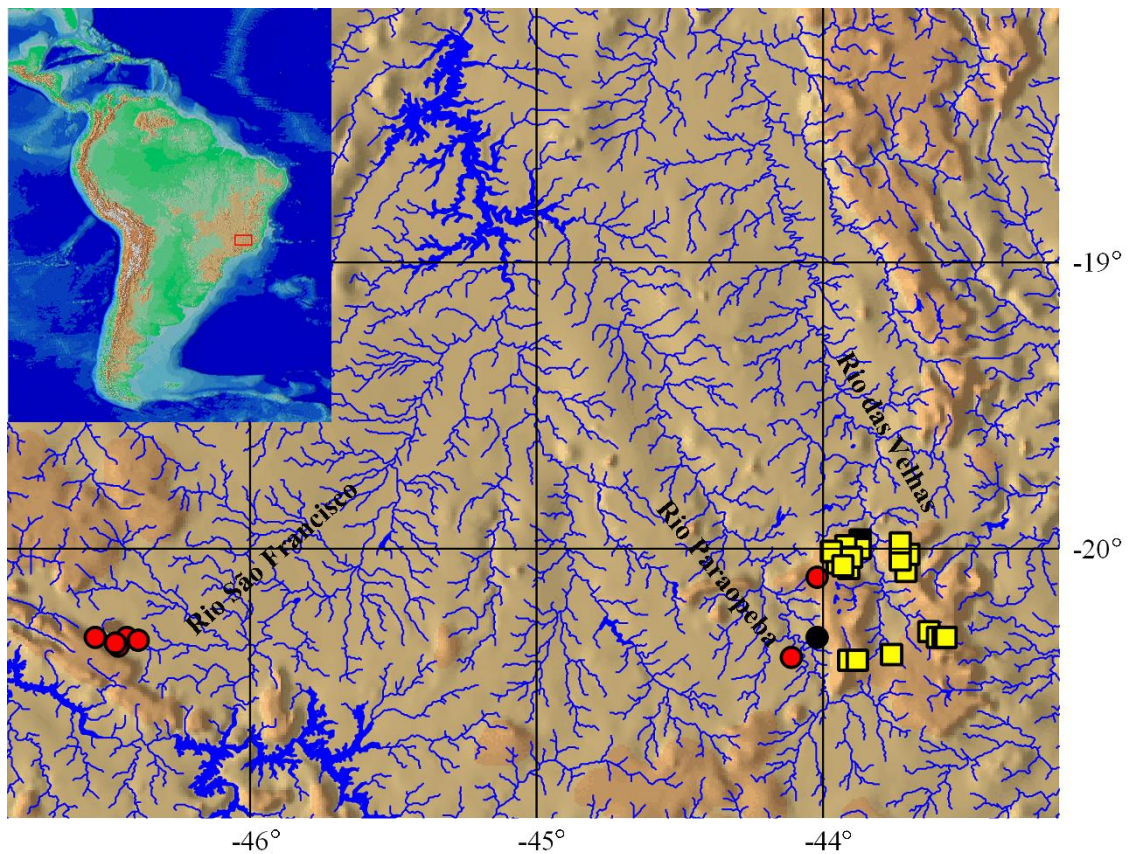
**Table 1.** Morphometric and meristic data of *Neoplecostomus franciscoensis*. H= holotype, n= number of specimens and SD = standard deviation.

	H	n	Range	Mean	SD
Standand length	68.1	100	50.1-73.5	56.9	5.3
Percents of standard length					
Predorsal length	45.1	100	42.5-48.0	45.3	1.0
Head length	32.5	100	29.9-34.3	32.3	0.9
Head width	25.2	100	23.8-27.3	25.7	0.9
Cleithral width	26.8	100	25.1-28.6	27.0	0.8
Occipital-dorsal distance	13.3	100	12.5-15.5	13.9	0.8
Thoracic length	15.0	100	12.1-17.7	14.8	1.2
Interdorsal length	19.1	100	18.0-24.4	21.1	1.3
Caudal peduncle length	30.2	100	27.4-33.0	30.0	1.1
Caudal peduncle depth	7.9	100	6.2-8.7	7.5	0.6
Body depth	14.0	100	13.1-18.7	16.2	1.2
Preanal length	64.3	100	61.2-67.6	64.3	1.3
Percents of head length					
Head width	77.4	100	73.1-86.0	79.4	2.6
Head depth	43.7	100	40.6-56.8	47.6	3.3
Snout length	61.2	100	57.0-63.6	61.1	1.3
Orbital diameter	9.2	100	8.4-12.3	10.3	0.7
Interorbital width	29.0	100	27.1-32.9	30.1	1.2
Mandibullary width	14.5	98	12.7-18.2	14.7	1.2
Other percents					
Snout length/Orbital diameter	15.0	100	13.3-20.0	16.8	1.3
Interorbital lenght/Orbital diameter	31.7	100	28.7-40.0	34.1	2.4
Interorbital lenght/Mandibullary width	50.1	98	39.2-66.3	49.0	4.8
Predorsal length/First dorsal ray length	45.6	99	37.8-49.9	45.3	2.4
Caudal peduncle length/ Caudal peduncle depth	26.1	100	21.0-31.2	25.1	2.1
Pelvic-fin length/ Caudal peduncle depth	31.5	100	25.9-39.1	32.3	3.0
Lower cd spine/ Caudal peduncle depth	29.3	100	23.6-37.9	30.0	2.9
Counts				Mode	

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Lateral-line plates	34	99	29-35	32	1.6
Predorsal plates	4	100	3-6	4	0.8
Plates of dorsal-fin base	6	100	5-7	6	0.7
Plates between dorsal and caudal fin	17	99	16-20	17	1.1
Plates between adipose and caudal fin	8	99	7-10	8	0.6
Plates between anal and caudal fin	12	99	11-15	12	0.8
Premaxillary teeth	15	100	12-22	15	2.3
Dentary teeth	12	99	10-20	12	2.3
Dorsal lateral plate series	28	99	28-33	29	1.4
Mid-dorsal lateral plate series	23	99	23-26	24	1.0
Mid-ventral lateral plate series	22	99	21-26	23	1.0
Ventral lateral plate series	23	99	22-26	24	0.8

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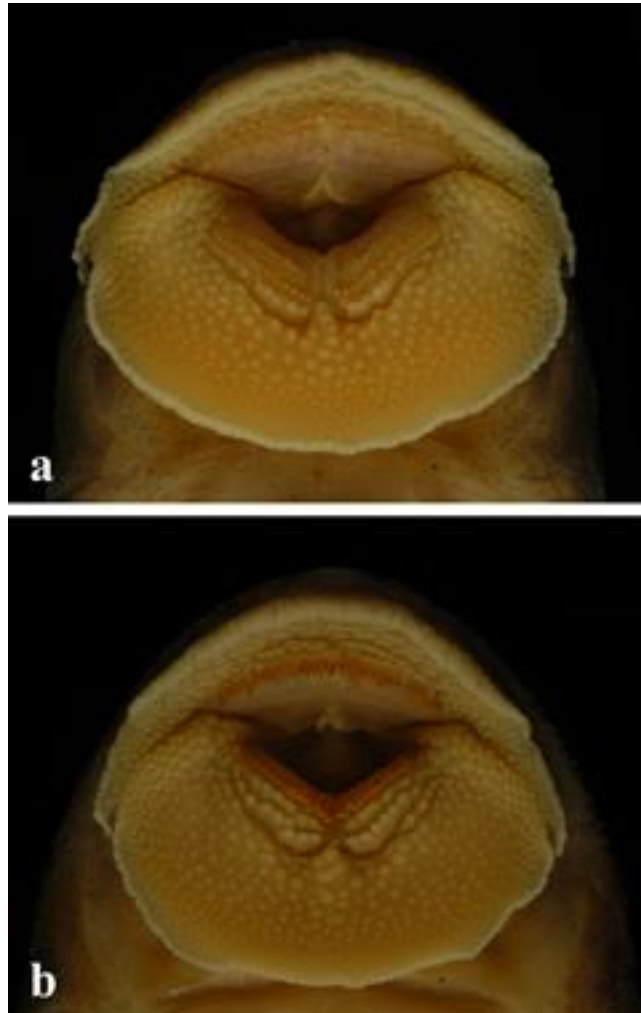


**Fig. 5.** Geographic distribution of *Neoplecostomus franciscoensis* (yellow square) and *Neoplecostomus* sp. n. (red circle). Type locality indicated by black square (*Neoplecostomus franciscoensis*) and black circle (*Neoplecostomus* sp. n.). Symbols can represent more than one locality.

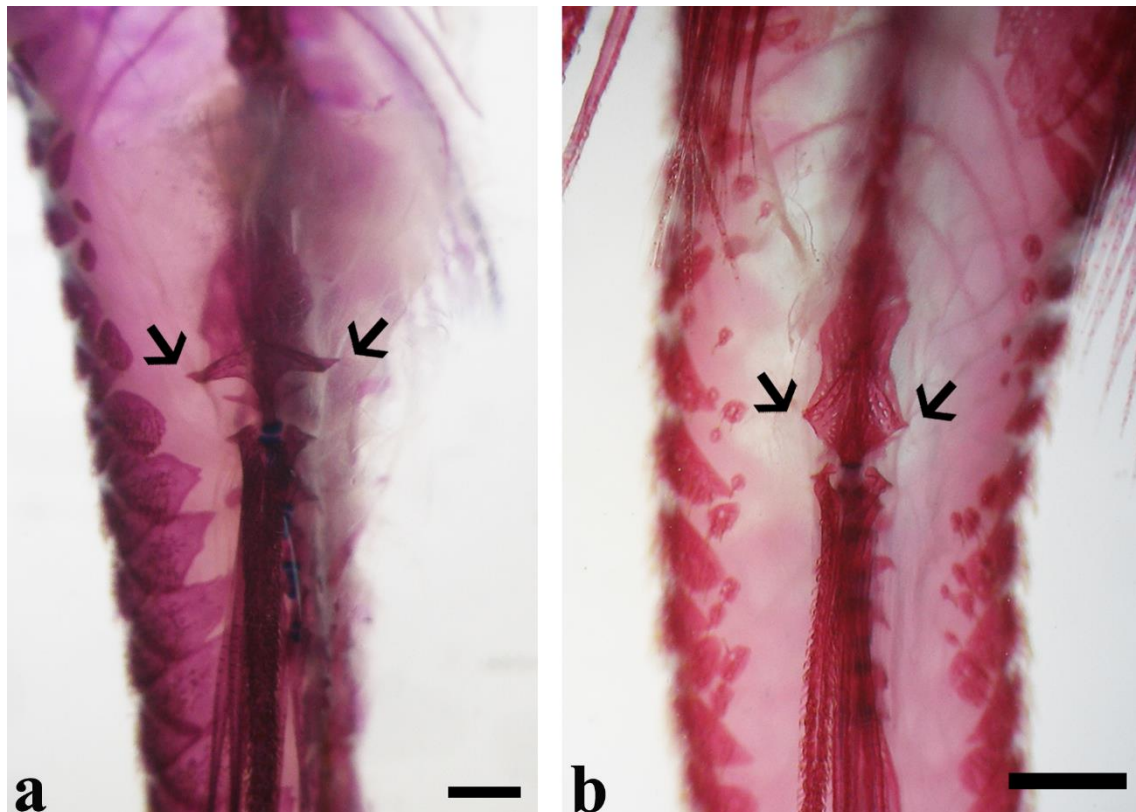


**Fig. 6.** Holotype of *Neoplecostomus* sp. n., DZSJRP 20087, 67.2 mm SL, female, stream at km 12, road from BR-040 to Moeda, rio Paraopeba affluent, rio São Francisco basin, Moeda, Minas Gerais, Brazil.





**Fig. 7.** Detail of the premaxillary and dentary teeth in a) *Neoplecostomus* sp. n., DZSJRP 20087, holotype, 67.2 mm SL, female, greater number of teeth in the premaxillary (17-34 (23)) and dentary (11-33 (15)), and b) *Neoplecostomus* sp. n., DZSJRP 11477, 73.8mm SL, male, smaller number of teeth in the premaxillary (18-20 (20)) and dentary (13-19 (14)).



**Fig. 8.** First anal-fin pterygiophore in ventral view, showing the lateral process (black arrow) narrow in (a) *Neoplecostomus* sp. n., DZSJRP 20875, 50.5 mm SL, female and inconspicuous in (b) *Neoplecostomus franciscoensis*, MCP 34212, unmeasured. Scale bars = 1mm.

**Table 2.** Morphometric and meristic data of *Neoplecostomus* sp. n.. H= holotype, n= number of specimens and SD = standard deviation.

	H	n	Range	Mean	SD
Standand length	67.2	20	50.5-108.3	73.3	16.8
Percents of standard length					
Predorsal length	44.7	19	42.2-45.2	43.5	0.9
Head length	32.8	19	30.2-33.6	31.7	0.9
Head width	26.1	19	24.1-26.8	25.4	0.9
Cleithral width	26.6	19	25.0-28.2	26.6	0.8
Occipital-dorsal distance	13.0	19	11.0-13.5	12.4	0.7
Thoracic length	14.9	19	14.9-17.7	16.2	0.8
Interdorsal length	20.2	19	18.4-21.3	19.8	0.8
Caudal peduncle length	27.7	19	27.7-31.7	29.4	1.2
Caudal peduncle depth	6.6	19	6.6-9.2	7.7	0.7
Body depth	15.3	19	13.4-18.4	16.4	1.3
Preanal length	65.8	19	62.1-65.8	63.7	1.2
Percents of head length					
Head width	79.4	19	72.9-86.5	80.3	3.6
Head depth	43.9	19	40.6-52.8	48.2	3.6
Snout length	64.2	19	61.7-66.8	64.6	1.3
Orbital diameter	10.0	19	7.5-13.2	9.5	1.2
Interorbital width	30.9	19	27.8-32.1	30.3	1.0
Mandibullary width	20.0	19	13.3-20.0	16.3	2.2
Other percents					
Snout length/Orbital diameter	15.6	19	11.4-16.6	14.4	1.6
Interorbital length/Orbital diameter	32.3	19	23.4-35.5	30.7	3.5
Interorbital length/Mandibullary width	64.6	19	43.4-65.0	53.9	7.1
Predorsal length/First dorsal ray length	43.6	19	40.5-48.7	44.6	2.1
Caudal peduncle length/ Caudal peduncle depth	23.7	19	23.4-31.8	26.4	2.4
Pelvic-fin length/ Caudal peduncle depth	27.9	19	27.9-36.4	32.1	3.0
Lower cd spine/ Caudal peduncle depth	24.6	19	24.6-35.9	29.4	3.7
Counts				Mode	

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Lateral-line plates	29	20	28-32	30	1.0
Predorsal plates	4	20	3-5	4	0.6
Plates of dorsal-fin base	5	20	5-6	5	0.5
Plates between dorsal and caudal fin	17	20	17-18	17	0.5
Plates between adipose and caudal fin	8	20	8-9	8	0.5
Plates between anal and caudal fin	13	20	11-13	12	0.6
Premaxillary teeth (M)	-	9	18-20	20	1.0
Dentary teeth (M)	-	9	13-19	14	1.9
Premaxillary teeth (F)	34	11	17-34	23	5.8
Dentary teeth (F)	32	11	11-33	15	7.4
Dorsal lateral plate series	28	20	27-31	28	1.1
Mid-dorsal lateral plate series	26	20	23-27	23	1.2
Mid-ventral lateral plate series	23	20	21-24	23	0.8
Ventral lateral plate series	25	20	23-25	24	0.7

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## ANEXO A – Análise Filogenética

Ao longo deste estudo também realizamos uma análise filogenética com a finalidade de investigar o posicionamento de *N. franciscoensis* e *Neoplecostomus* sp. n. em relação às demais espécies do gênero.

### Material e Métodos

Os caracteres são aqueles descritos por Pereira (2008). Todas as espécies de *Neoplecostomus* foram removidas da matriz original, restando apenas os demais gêneros. A essa matriz resultante foram acrescentados os seguintes táxons: *N. espiritosantensis* (MCP 27340), *N. franciscoensis* (MZUSP 37149 e MCP 34212), *N. microps* (DZSJRP 2144, DZSJRP 2767 e DZSJRP 2768), *N. paranensis* (DZSJRP 8590), *N. ribeirensis* (MZUSP 35432), *Neoplecostomus* sp. n. “paraty” (DZSJRP 13914) e *Neoplecostomus* sp. n. (DZSJRP 11434, DZSJRP 11464 e DZSJRP 20087). A codificação dos caracteres realizada neste estudo está disponível na Tabela 3.

Os dados foram analisados utilizando o *software* TNT versão 1.1. O método utilizado foi a análise por parcimônia e todos os caracteres receberam o mesmo peso. A análise utilizou a busca tradicional (*Traditional Search*) e o algoritmo TBR (*Tree Bisection Reconnection*), com retenção máxima de 10.000 árvores e salvando as primeiras 1000 árvores por replicação. Após a busca as árvores foram colapsadas.

A busca também foi realizada com *New Technology Search*, utilizando-se *ratchet* com 200 iterações e *drift* com 50 iterações, adição randômica de táxons e 1.000 réplicas. O resultado obtido foi o mesmo da busca tradicional por TBR.

### Resultados

A análise filogenética resultou em 6 árvores igualmente parcimoniosas com 2156 passos, índice de consistência de 0,222 e índice de retenção de 0,670. Já o cladograma de consenso estrito apresentou índice de consistência de 0,215 e índice de retenção de 0,656 (Figura 9).

O resultado demonstra que *N. franciscoensis* e *Neoplecostomus* sp. n. fazem parte de uma politomia. *Neoplecostomus franciscoensis* é sustentado pelas seguintes autapomorfias: placa nasal com nítido formato em L (característica 11: 1→2), processo

ventral no esfenótico ausente/inconspícuo ou curto (característica 17: 1 → 0, 2), raio branquiostégio 2 longo (característica 25: 0 → 1), ossificação interopercular sesamóide grande (característica 31: 2 → 1), expansão dorsomesial do infrafaringo-branquial 3 presente (característica 68: 0 → 1), extremidades anterior do basibrânquial maior que a extremidade posterior (característica 74: 0 → 1), costelas posteriores a costela do centro vertebral seis se articulam diretamente nas vértebras (característica 163: 1 → 0), placas pós-dorsais ímpares ausentes (característica 178: 1 → 2), expansão ventral no basipterígio é maior que a dorsal (característica 209: 2 → 3), processo látero-ventral do basipterígio ausente (característica 216: 2 → 0), sulco na margem posterior da placa hipural extremamente reduzido (característica 247: 1 → 0) e um conjunto de placas diminutas posteriores ao pterótico-composto estão presentes (característica 268: 0 → 1). Já para *Neoplecostomus* sp. n. as autapomorfias são as seguintes: placa faríngea superior apresenta uma expansão anterior nitidamente mais estreita que a região posterior da placa (característica 62: 2 → 1), placa faríngea superior com formato de “gota” (característica 63: 0 → 2), expansões látero-dorsais no basipterígio assimétricas, com a expansão ventral maior que a dorsal (característica 209: 2 → 3) e processo lateral no primeiro pterigióforo da nadadeira anal estreito (característica 241: 0 → 2).

## Conclusões

Os resultados corroboram a hipótese inicial de que há mais de uma espécie de *Neoplecostomus* na bacia do rio São Francisco: *N. franciscoensis* Langeani, 1990 e *Neoplecostomus* sp. n.. A análise filogenética não demonstra resultados conclusivos sobre o relacionamento das duas espécies, mas aponta autapomorfias para cada uma delas.

**Tabela 3.** Matriz de dados com 303 caracteres e 7 táxons incluídos na análise filogenética (Caracteres 1 a 60).

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
<i>N. paranensis</i>	0	1	0	1	0	3	1	1	1	2	1	1	1	1	0
<i>N. microps</i>	0	1	0	1	0	3	1	1	1	2	1	1	1	1	0
<i>Neoplecostomus</i> “paraty”	0	1	0	1	0	3	1	1	1	2	1	1	1	1	0
<i>N. franciscoensis</i>	0	0 e 1	0	1	0	3	1	1	1	2	2	1	1	1	0
<i>Neoplecostomus</i> sp. n.	0	1	0	1	0	3	1	1	1	2	1	1	1	1	0
<i>N. espiritosantensis</i>	0	1	0	1	0	3	1	1	1	2	1	1	1	1	0
<i>N. ribeirensis</i>	0	1	0	1	0	3	1	1	1	2	1	1	1	1	0
	<b>16</b>	<b>17</b>	<b>18</b>	<b>19</b>	<b>20</b>	<b>21</b>	<b>22</b>	<b>23</b>	<b>24</b>	<b>25</b>	<b>26</b>	<b>27</b>	<b>28</b>	<b>29</b>	<b>30</b>
<i>N. paranensis</i>	0	1	1	2	1	1	1	0	0	0	0	1	1	1	1
<i>N. microps</i>	0	0 e 1	2	2	1	1	1	0	0	0 e 1	0	1	1	1	1
<i>Neoplecostomus</i> “paraty”	0	0	2	2	1	1	1	0	0	1	0	1	1	1	1
<i>N. franciscoensis</i>	0	0 e 2	2	2	0 e 1	1	1	0	0	1	0	1	1	1	1
<i>Neoplecostomus</i> sp. n.	0	1	2	2	0 e 1	1	1	0	0	0	0	1	1	1	1
<i>N. espiritosantensis</i>	0	1	2	2	0 e 1	1	1	0	0	0	0	1	1	1	2
<i>N. ribeirensis</i>	0	1	2	2	0	1	1	0	1	0	0	1	1	1	1
	<b>31</b>	<b>32</b>	<b>33</b>	<b>34</b>	<b>35</b>	<b>36</b>	<b>37</b>	<b>38</b>	<b>39</b>	<b>40</b>	<b>41</b>	<b>42</b>	<b>43</b>	<b>44</b>	<b>45</b>
<i>N. paranensis</i>	2	1	1	2	1	0	1	0	1	0	0	0	1	1	0
<i>N. microps</i>	2	1	1	2	1	2	1 e 2	0 e 1	1	0	0 e 1	0	1	1	0
<i>Neoplecostomus</i> “paraty”	1	1	1	2	1	2	2	0	1	0	1	0	0	1	0
<i>N. franciscoensis</i>	1	1	1	2	0 e 1	1 e 2	2 e 3	1	1	0	0 e 1	0	1	1	0
<i>Neoplecostomus</i> sp. n.	1 e 2	1	1	2	1	2	2	1	1	0	0 e 1	0	0 e 1	1	0
<i>N. espiritosantensis</i>	0	1	1	2	1	2	2	1	1	0	1	0	0	1	0
<i>N. ribeirensis</i>	2	1	1	2	0	2	2	1	1	0	0	0	0	1	0
	<b>46</b>	<b>47</b>	<b>48</b>	<b>49</b>	<b>50</b>	<b>51</b>	<b>52</b>	<b>53</b>	<b>54</b>	<b>55</b>	<b>56</b>	<b>57</b>	<b>58</b>	<b>59</b>	<b>60</b>
<i>N. paranensis</i>	2	1	1	0	1	0	1	0	0	1	0	0	1	1	1
<i>N. microps</i>	2	2	1	0	0 e 1	0	1 e 2	0	0	1	0 e 1	0	1 e 2	2	1
<i>Neoplecostomus</i> “paraty”	2	3	1	0	0	0	1	0	0	1	1	0	1	2	1
<i>N. franciscoensis</i>	2	2	1	0	0	0	1	0	0	1	0 e 1	0	1 e 2	1 e 2	1
<i>Neoplecostomus</i> sp. n.	2 e 3	2	1	0	0 e 1	0	1	0	0	1	0 e 1	0	1 e 2	1	1
<i>N. espiritosantensis</i>	2	2	0	0	0	0	2	0	0	1	0	0	1	1	1
<i>N. ribeirensis</i>	2	3	1	0	0	0	2	0	0	1	0	0	1	0	1

**Tabela 3 (continuação).** Matriz de dados com 303 caracteres e 7 táxons terminais utilizados na análise filogenética (Caracteres 61 a 120).

	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75
<i>N. paranensis</i>	2	2	0	0	1	1	1	0	1	1	1	0	1	1	2
<i>N. microps</i>	2	2	0	0	0 e 1	1	1	0	1	1	1	0	1	0 e 1	2
<i>Neoplecostomus</i> “paraty”	2	2	0	0	0	1	1	0	1	1	1	0	1	0	2
<i>N. franciscoensis</i>	2	2	0	0 e 1	1	1	1	1	1	1	1	0	1	1	2
<i>Neoplecostomus</i> sp. n.	2	1	2	0 e 1	1	1	1	0 e 1	1	1	1	0	1	0	1 e 2
<i>N. espiritosantensis</i>	2	2	0	0	1	1	1	1	1	1	1	0	1	0	2
<i>N. ribeirensis</i>	2	2	0	0	1	1	1	0	1	1	1	0	1	0	2
	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90
<i>N. paranensis</i>	0	1	0	1	1	1	0	0	0	0	0	1	0	0	1
<i>N. microps</i>	0 e 1	1	0	1	2	1	0	0	0	0	0 e 1	1 e 2	0	0	0
<i>Neoplecostomus</i> “paraty”	1	1	0	1	2	1	0	0	0	0	1	1	0	0	0
<i>N. franciscoensis</i>	0	1	0	1	1 e 2	1	0	0	0	0	0 e 1	1	0	0	0
<i>Neoplecostomus</i> sp. n.	0	1	0	1	1	1	0	0	0	0	0	1 e 2	0	0	0
<i>N. espiritosantensis</i>	1	1	0	1	2	1	0	0	0	0	0	1	0	0	1
<i>N. ribeirensis</i>	?	1	0	1	1	1	0	0	0	0	1	2	0	0	0
	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105
<i>N. paranensis</i>	1	1	2	0	1	1	0	0	1	1	1	0	0	0	0
<i>N. microps</i>	1	1	2	0	0 e 1	1	0	0	1	1	1	0	0	0	0
<i>Neoplecostomus</i> “paraty”	1	1	2	0	0	1	0	0	1	1	1	0	0	0	0
<i>N. franciscoensis</i>	1	1	2	0	0	1	0	0	1	1	1	0	0	0	0
<i>Neoplecostomus</i> sp. n.	1	1	2	0	0	1	0	0	0 e 1	1	1	0	0	0	0 e 1
<i>N. espiritosantensis</i>	1	1	2	0	1	1	0	0	1	1	1	0	0	0	1
<i>N. ribeirensis</i>	1	1	?	0	?	1	0	0	0	1	1	0	0	0	1
	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120
<i>N. paranensis</i>	0	1	2	2	1	1	2	0	2	1	2	1	1	0	0
<i>N. microps</i>	0	0, 1 e 2	2	2	1	0	0	0	0	0 e 1	2	1	1	0	0 e 1
<i>Neoplecostomus</i> “paraty”	0	1	2	2	1	0	0	0	0	0	2	1	1	0	1
<i>N. franciscoensis</i>	0	2	2	2	1	1	2	0	1	0 e 1	2	1	1	0	0 e 1
<i>Neoplecostomus</i> sp. n.	0	1 e 2	2	2	1	1	2	0	1	0 e 1	2	1	1	0 e 1	0 e 1
<i>N. espiritosantensis</i>	0	2	2	2	1	0	0	0	0	0	2	1	1	1	0
<i>N. ribeirensis</i>	0	2	2	2	?	1	2	?	1	0	2	1	1	1	1

**Tabela 3 (continuação).** Matriz de dados com 303 caracteres e 7 táxons terminais utilizados na análise filogenética (Caracteres 121 a 180).

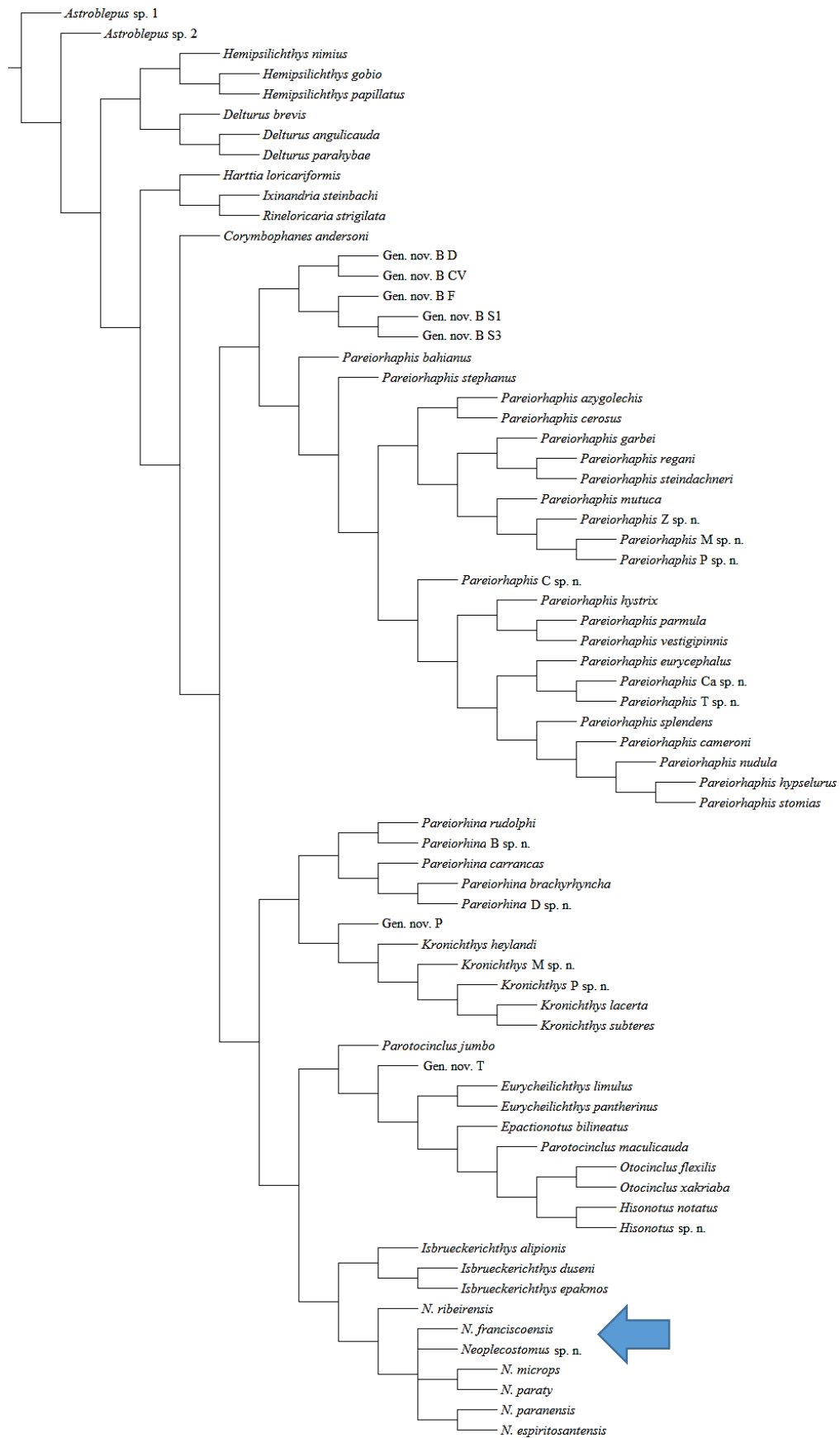
	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135
<i>N. paranensis</i>	0	1	1	0	0	1	0	2	0	1	0	2	1	1	1
<i>N. microps</i>	0	1	1	0	0	1	0	2	0	1	0	2	1	1	1
<i>Neoplecostomus</i> “paraty”	0	1	1	0	0	1	0	2	0	1	0	2	1	1	1
<i>N. franciscoensis</i>	0	1	1	0	0	?	0	2	0	1	0	2	1	1	1
<i>Neoplecostomus</i> sp. n.	0	1	1	0	0	?	0	2	0	1	0	2	1	1	1
<i>N. espiritosantensis</i>	0	1	1	0	0	1	0	2	0	1	0	2	1	1	1
<i>N. ribeirensis</i>	0	1	1	0	0	1	0	2	0	1	0	2	1	1	1
	<b>136</b>	<b>137</b>	<b>138</b>	<b>139</b>	<b>140</b>	<b>141</b>	<b>142</b>	<b>143</b>	<b>144</b>	<b>145</b>	<b>146</b>	<b>147</b>	<b>148</b>	<b>149</b>	<b>150</b>
<i>N. paranensis</i>	1	0	1	1	1	1	1	1	0	0	0	1	0	0	1
<i>N. microps</i>	1	0	0	1	1	1	1	1	1	1	1 e 2	1	0	0	1
<i>Neoplecostomus</i> “paraty”	1	0	1	1	1	1	1	1	0	1	1	1	0	0	1
<i>N. franciscoensis</i>	1	0	1	1	1	0	1	1	0	1	1	1	0	0	1
<i>Neoplecostomus</i> sp. n.	1	0	1	1	?	0 e 1	1	1	0	0 e 1	0 e 1	1	0	0	1
<i>N. espiritosantensis</i>	1	0	1	1	1	1	1	1	0	1	0	1	0	0	1
<i>N. ribeirensis</i>	1	0	1	1	1	0	1	1	1	1	0	1	0	0	1
	<b>151</b>	<b>152</b>	<b>153</b>	<b>154</b>	<b>155</b>	<b>156</b>	<b>157</b>	<b>158</b>	<b>159</b>	<b>160</b>	<b>161</b>	<b>162</b>	<b>163</b>	<b>164</b>	<b>165</b>
<i>N. paranensis</i>	0	1	1	2	2	0	0	2	1	2	1	1	1	0	0
<i>N. microps</i>	0	1	1	2	2	0	0	2	1	2	1	1	1	0	0
<i>Neoplecostomus</i> “paraty”	0	1	1	2	2	0	0	2	1	2	1	1	1	0	0
<i>N. franciscoensis</i>	0	1	1	2	2	0	0	2	1	1 e 2	1	0 e 1	0	0	0
<i>Neoplecostomus</i> sp. n.	0	1	1	2	2	0	0	2	1	1 e 2	1	0 e 1	0 e 1	0	0
<i>N. espiritosantensis</i>	0	1	1	1	2	0	0	2	1	2	1	1	1	0	0
<i>N. ribeirensis</i>	0	1	1	2	2	0	0	2	1	1	1	1	0	0	0
	<b>166</b>	<b>167</b>	<b>168</b>	<b>169</b>	<b>170</b>	<b>171</b>	<b>172</b>	<b>173</b>	<b>174</b>	<b>175</b>	<b>176</b>	<b>177</b>	<b>178</b>	<b>179</b>	<b>180</b>
<i>N. paranensis</i>	1	1	1	1	2	2	0	1	0	1	0	0	1	0	1
<i>N. microps</i>	1	1	1	1	2	2	0	1	0	1	0	0	1	0	1
<i>Neoplecostomus</i> “paraty”	1	1	1	1	2	2	0	1	0	1	0	0	1	0	1
<i>N. franciscoensis</i>	1	1	1	1	2	2	0	1	0	1 e 2	0	0	2	0	1
<i>Neoplecostomus</i> sp. n.	1	1	1	1	2	2	0 e 1	1	0	1	0	0	1	0	1
<i>N. espiritosantensis</i>	1	1	1	1	2	2	0	1	0	2	0	0	1	0	1
<i>N. ribeirensis</i>	1	1	1	1	2	2	0	?	?	1	0	0	1	0	1

**Tabela 3 (continuação).** Matriz de dados com 303 caracteres e 7 táxons terminais utilizados na análise filogenética (Caracteres 181 a 240).

	181	182	183	184	185	186	187	188	189	190	191	192	193	194	195
<i>N. paranensis</i>	1	1	1	0	0	1	0	1	1	0	2	1	1	0	0
<i>N. microps</i>	1	1	1	0	0	1	0	1	1	0	2	1	1	0	0
<i>Neoplecostomus</i> “paraty”	1	1	1	0	0	1	0	1	1	0	2	1	1	0	0
<i>N. franciscoensis</i>	1	1	1	0	0	1	0	1	1	0	2	0 e 1	1	0	0
<i>Neoplecostomus</i> sp. n.	1	1	0 e 1	0	0	1	0	1	1	0	2	1	1	0	0
<i>N. espiritosantensis</i>	1	1	1	0	0	1	0	1	1	0	2	1	1	0	0
<i>N. ribeirensis</i>	1	1	1	0	0	1	0	1	1	0	2	1	1	0	0
	196	197	198	199	200	201	202	203	204	205	206	207	208	209	210
<i>N. paranensis</i>	0	2	1	0	2	1	0	0	1	1	1	2	1	2	0
<i>N. microps</i>	0	2	1	0	2	1	0	0	1	1	0 e 1	2	1	2	0
<i>Neoplecostomus</i> “paraty”	0	2	1	0	2	1	0	0	1	1	1	2	1	2	0
<i>N. franciscoensis</i>	0	2	1	0	2	1	0	0	0	1	0	2	1	3	0
<i>Neoplecostomus</i> sp. n.	0	2	1	0	2	1	0	0	0 e 1	1	0	2	1	3	0
<i>N. espiritosantensis</i>	0	2	1	0	2	1	0	0	1	1	0	2	1	2	0
<i>N. ribeirensis</i>	0	2	1	0	2	1	0	0	0	1	0	2	0	2	0
	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225
<i>N. paranensis</i>	0	0	1	0	1	2	2	2	0	1	0	1	2	1	2
<i>N. microps</i>	0	0	1	0 e 1	1	2	2	2	0	1	0	1	2	1	2
<i>Neoplecostomus</i> “paraty”	0	0	1	0	1	2	2	2	0	1	0	1	2	1	2
<i>N. franciscoensis</i>	0	0	1	0	1	0	2	2	0	1	0	1	2	1	1 e 2
<i>Neoplecostomus</i> sp. n.	0	0	1	0	1	0 e 2	2	1 e 2	0	1	0	1	2	1	2
<i>N. espiritosantensis</i>	0	0	1	1	1	0	2	2	0	1	0	1	2	1	2
<i>N. ribeirensis</i>	0	0	1	1	1	2	2	1	0	1	1	1	1	1	1
	226	227	228	229	230	231	232	233	234	235	236	237	238	239	240
<i>N. paranensis</i>	0	1	2	1	0	?	0	1	0	1	0	1	1	0	1
<i>N. microps</i>	0	1	2	1	0	1	0	1	0	1	0	1	1	0	1
<i>Neoplecostomus</i> “paraty”	0	1	2	1	0	?	0	1	0	1	0	0	1	0	1
<i>N. franciscoensis</i>	0	1	2	1	0	1	0	1	0	1	0	1	1	0	1
<i>Neoplecostomus</i> sp. n.	0	1	2	1	0	1	0	1	0	1	0	1	1	0	1
<i>N. espiritosantensis</i>	0	1	2	1	0	1	0	1	0	1	0	1	1	0	1
<i>N. ribeirensis</i>	0	1	2	1	0	1	0	1	0	1	0	0	1	0	?

**Tabela 3 (continuação).** Matriz de dados com 303 caracteres e 7 táxons terminais utilizados na análise filogenética (Caracteres 240 a 303).

	241	242	243	244	245	246	247	248	249	250	251	252	253	254	255	256
<i>N. paranensis</i>	0	1	1	1	0	0	1	2	0	0	1	1	0	0	0	0
		1	1	1	0	0	1	2	0	0	1 e 2	1 e 2	0	0	0	0
<i>N. microps</i>	0	1	1	1	0	0	1	2	0	0	2	1	0	0	0	0
<i>Neoplecostomus</i> “paraty”	0	1	1	1	0	0	0	2	0	0	2	1	0	0	0	0
<i>N. franciscoensis</i>	0	1	1	1 e 2	0	0	1	2 e 3	0	0	2	1	0	0	0	0
<i>Neoplecostomus</i> sp. n.	2	1	1	1	0	0	1	2	0	0	1	1	0	0	0	0
<i>N. espiritosantensis</i>	0	1	1	1	0	0	0	2	0	0	2	2	0	0	0	0
<i>N. ribeirensis</i>	2															
	<b>257</b>	<b>258</b>	<b>259</b>	<b>260</b>	<b>261</b>	<b>262</b>	<b>263</b>	<b>264</b>	<b>265</b>	<b>266</b>	<b>267</b>	<b>268</b>	<b>269</b>	<b>270</b>	<b>270</b>	<b>271</b>
<i>N. paranensis</i>	0	0	1	0	1	1	0	0	1	?	0	?	2	2	2	2
<i>N. microps</i>	0	0	1	0	1	1	0	0	0	2	0	0 e 1	2	2	2	2
<i>Neoplecostomus</i> “paraty”	0	0	1	0	1	1	0	0	0	2	0	0	2	2	2	2
<i>N. franciscoensis</i>	0	0	1	0	1	1	0	0	0	3	0	1	2	2	2	2
<i>Neoplecostomus</i> sp. n.	0	0	1	0	1	1	0	0	0 e 1	2 e 3	0	0 e 1	2	2	2	2
<i>N. espiritosantensis</i>	0	0	1	0	1	1	0	0	0	3	0	0	?	2	2	2
<i>N. ribeirensis</i>	0	0	1	0	1	1	0	0	0	?	0	?	2	2	2	2
	<b>272</b>	<b>273</b>	<b>274</b>	<b>275</b>	<b>276</b>	<b>277</b>	<b>278</b>	<b>279</b>	<b>280</b>	<b>281</b>	<b>282</b>	<b>283</b>	<b>284</b>	<b>285</b>	<b>286</b>	<b>287</b>
<i>N. paranensis</i>	0	0	1	2	1	0	1	0	0	0	0	0	1	1	0	0
<i>N. microps</i>	0	0	1	2	1	0	1	0	0	0	0	0	1	1	0	0
<i>Neoplecostomus</i> “paraty”	0	0	1	2	1	0	1	0	0	0	0	0	1	1	0	0
<i>N. franciscoensis</i>	0	0	1	2	1	0	1	0	0	0	0	0	1	1	0	0
<i>Neoplecostomus</i> sp. n.	0	0	1	2	1	0	1	0	0	0	0	0	1	1	0	0
<i>N. espiritosantensis</i>	0	0	1	2	1	0	1	0	0	0	0	0	1	1	0	0
<i>N. ribeirensis</i>	0	0	1	2	1	0	1	0	0	0	0	0	1	1	0	0
	<b>288</b>	<b>289</b>	<b>290</b>	<b>291</b>	<b>292</b>	<b>293</b>	<b>294</b>	<b>295</b>	<b>296</b>	<b>297</b>	<b>298</b>	<b>299</b>	<b>300</b>	<b>301</b>	<b>302</b>	<b>303</b>
<i>N. paranensis</i>	1	1	0	1	1	0	0	2	0	0	1	1	1	0	1	0
<i>N. microps</i>	1	1	0	1	1	0	0	2	0	0	1	1	1	0	1	0
<i>Neoplecostomus</i> “paraty”	1	1	0	1	1	0	0	2	0	0	1	1	1	0	1	0
<i>N. franciscoensis</i>	1	1	0	1	1	0	0	2	0	0	1	1	1	0	1	0
<i>Neoplecostomus</i> sp. n.	1	1	0 e 1	1	1	0	0 e 1	1 e 2	0 e 1	0	1	1	1	0	1	0
<i>N. espiritosantensis</i>	1	1	0	1	1	0	0	1	0	0	1	1	1	0	1	0
<i>N. ribeirensis</i>	1	1	0	1	1	0	0	2	0	0	1	1	1	0	1	0



**Figura 9.** Cladograma de consenso estrito da análise filogenética de Neoplecostominae. A seta indica o posicionamento de *N. franciscoensis* e *Neoplecostomus* sp. n.



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São José do Rio Preto, 23/03/2016

*Caroli Matheus Oberlin*

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Assinatura do autor