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ESCOLA DE CIÊNCIAS
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DOUTORADO EM ZOOLOGIA

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ANÁLISE DE EVIDÊNCIA TOTAL DA TRIBO HARTTIINI SENSU ISBRÜCKER, COM UMA REVISÃO TAXONÔMICA DE STURISOMATICHTHYS ISBRÜCKER & NIJSSEN, 1979

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TESE DE DOUTORADO

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SUMÁRIO

A mis padres y hermana

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“Because I do believe that all the new societies which arise, at least in the Western world, will have technology as their cornerstone. It’s a pity, and it needn’t be, but it will be, because we are hooked. They won’t remember—or won’t choose to remember—the corner we had painted ourselves into. The dirty rivers, the hole in the ozone layer, the atomic bomb, the atmospheric pollution. All they’ll remember is that once upon a time they could keep warm at night without expending much effort to do it. I’m a Luddite on top of my other failings, you see. But this dream… it preys on me, Stu.”

Stephen King – The Stand

“Science is the first expression of punk, because it doesn't advance without challenging authority. It doesn't make progress without tearing down what was there before and building upon the structure. -- Ideologically, the pursuit of science is not that different from the ideology that goes into punk rock. The idea of challenging authority is consistent with what I have been taught as a scientist.”

Greg Graffin – Bad religion

“Coffee Mug, gonna clear away the haze
Liquid proof that I can win this race”

Descendents – Coffee Mug

Resumo

Uma análise de evidência total de Harttiini *sensu* Isbrücker é apresentada. Dez gêneros historicamente alocados na tribo foram incluídos: *Aposturisoma*, *Ctenilorícaria*, *Farlowella*, *Harttia*, *Harttiella*, *Lamontichthys*, *Metaloricaria*, *Pterosturisoma*, *Sturisoma* e *Sturisomatichthys*. O grupo interno inclui 78 táxons terminais mais 22 pertencentes ao grupo externo, que foram escolhidos de outras subfamílias de Loricariidae e gêneros de Loricariini. Sete marcadores moleculares foram incluídos, os mitocondriais Cytb, nd2, 12S e 16S, e os nucleares MyH6, RAG1 e RAG2. Além disso, 216 caracteres morfológicos são oferecidos, incluindo caracteres propostos por autores anteriores e caracteres novos propostos aqui, incluindo osteologia e morfologia externa. Uma análise de Máxima Parcimônia e uma análise de Inferência Bayesiana foram realizadas utilizando a matriz concatenada, composta por 6.839 caracteres. Foram encontradas trinta árvores mais parcimoniosas com um comprimento de 18.254 passos, índice de consistência (IC) de 0,37 e índice de retenção (RI) de 0,59, uma árvore consenso foi gerada, o qual resultou em Harttiini *sensu* Isbrücker como parafilêtico; o mesmo resultado foi obtido a partir da análise de Inferência Bayesiana. Harttiini inclui *Harttia*, *Harttiella* e *Ctenilorícaria.* Farlowellina é proposto ser elevado ao nível de tribo como Farlowellini, abrangendo *Farlowella*, *Lamontichthys*, *Pterosturisoma*, *Sturisoma* e *Sturisomatichthys*; *Aposturisoma* é aqui sugerido como sinônimo junior de *Farlowella*. *Metaloricaria* é atribuído a monotípico Metaloricariini. Por outro lado, Loricariini está aqui restrito a um grupo único sem uma divisão subtribal, ao contrário do que foi proposto em estudos anteriores. *Sturisoma* foi corroborado aqui ser estritamente cis-andino, enquanto *Sturisomatichthys* engloba, além das espécies válidas já incluídas no gênero, as espécies trans-andinas pertencentes a *Sturisoma sensu lato*. Foram reconhecidas duas espécies novas de *Sturisomatichthys* e uma nova espécie de *Sturisoma*. Uma nova classificação para Loricariinae é oferecida, bem como chaves de identificação para os gêneros de Harttiini e Farlowellini. Discussões sobre a taxonomia dos gêneros encontrados como válidaos sao oferecidas. Adicionalmente, uma revisão taxonômica de *Sturisomatichthys* é apresentada. Um total de 358 espécimes, incluindo ambos os espécimes tipo e não tipo de todas as espécies válidas foram examinados. Verificou-se que *Sturisomatichthys* abrange 12 espécies válidas: *Sturisomatichthys aureus, S. caquetae, S. citurensis, S. dariensis, S. festivus, S. frenatus, S. kneri, S. leightoni, S. panamensis, S. tamanae.* Além disso, duas novas espécies são descritas, *Sturisomatichthys* Baudó n.sp. do rio Baudó, no noroeste da Colômbia, pertencente à vertente Caribe do continente, e *Sturisomatichthys* San Juan n.sp. da bacia do rio San Juan, no oeste da Colômbia, na vertente do Pacífico. *Sturisomatichthys caquetae*, do rio Morelia, alto Amazonas, é transferida de *Sturisoma* e *S. leightoni* está distribuído, além da bacia Magdalena-Cauca, na bacia do rio Orinoco. Assim, descobriu-se que *Sturisomatichthys* é distribuído em drenagens trans e cis-andinas. Um neotipo é designado para *S. aureus*, do baixo rio Magdalena, localidade tipo da espécie. São fornecidos novos registros de localidades na região noroeste da América do Sul, bem como a redescrição e comentários taxonômicos de todas as espécies válidas. Mapas com a distribuição do gênero e uma chave de identificação das espécies são fornecidos.

Palavras chave: Cascudos, Inferência Bayesiana, Farlowellini, Máxima Parcimônia, Morfologia, Neotrópico, *Sturisomatichthys*, Colômbia, taxonomia, Noroeste da América do Sul.

Abstract

A total evidence analysis of the Harttiini *sensu* Isbrücker is presented. Ten genera historically included in the tribe are assumed as ingroup in the present analysis, which comprises: *Aposturisoma*, *Cteniloricaria*, *Farlowella*, *Harttia*, *Harttiella*, *Lamontichthys*, *Metaloricaria*, *Pterosturisoma*, *Sturisoma* and *Sturisomatichthys*. The ingroup encompasses 78 terminal taxa plus 22 belonging to the outgroup which were chosen from other subfamilies of the Loricariidae and genera of the Loricariini. Seven molecular markers were included for the phylogenetic analysis, the mitochondrial Cytb, nd2, 12S and 16S, and the nuclear MyH6, RAG1 and RAG2. Additionally, 216 morphological characters are included, which encompasses characters proposed by previous authors and new characters proposed herein including both osteology and external morphology. A Maximum Parsimony analysis and a Bayesian Inference analyses were carried out using the concatenated matrix which is comprised by 6,839 characters. Thirty most parsimonious trees were found with a length of 18.254 steps, consistency index (CI) of 0.37 and retention index (RI) of 0.59, a consensus tree was obtained and showed a paraphyletic Harttiini *sensu* Isbrücker; the same result was obtained from the Bayesian Inference analysis. Harttiini comprises *Harttia*, *Harttiella* and *Ctenilorícaria*. Farlowellina is elevated to the tribe rank as Farlowellini, encompassing *Farlowella*, *Lamontichthys*, *Pterosturisoma*, *Sturisoma* and *Sturisomatichthys*; *Aposturisoma* is here suggested as junior synonym of *Farlowella*. *Metaloricaria* is assigned to the monotypic Metaloricariini. On the other hand, the Loricariini is here restricted to a unique group without a subtribal division, contrary to what was proposed in previous studies. *Sturisoma* was corroborated here to be strictly cis-Andean, while *Sturisomatichthys* encompasses, besides the valid species already included in the genus, the trans-Andean species belonging to *Sturisoma sensu lato*. Two new species of the former and one new species of the latter were recognized. A new classification for the Loricariinae is offered, as well as for identification keys for the genera of both the Harttiini and the Farlowellini. Discussions regarding the taxonomy of the genera found to be valid are offered. Furthermore, a taxonomic revision of *Sturisomatichthys* is presented. A total of 358 specimens including both type an non-type specimens of all valid species were examined. *Sturisomatichthys* was found to encompass 12 valid species: *Sturisomatichthys aureus*, *S. caquetae*, *S. citurensis*, *S. dariensis*, *S. festivus*, *S. frenatus*, *S. kneri*, *S. leightoni*, *S. panamensis*, *S. tamanae*. In addition, two new species are described, *Sturisomatichthys* Baudó n.sp. from the Baudó River, in Northwestern Colombia, belonging to the Caribbean slope of the continent, and *Sturisomatichthys* San Juan n.sp. from the San Juan River basin in western Colombia, on the Pacific slope. *Sturisomatichthys caquetae*, from the Morelia River, upper Amazon, is transferred back from *Sturisoma* and *S. leightoni* is distributed, besides the Magdalena-Cauca basin, in the Orinoco basin; thus, *Sturisomatichthys* is discovered to be distributed in both trans- and cis-Andean drainages. A neotype is designated for *S. aureus* from the Lower Magdalena basin, type locality of the species. New records of localities in the Northwestern region of South America, as well as the redescription and taxonomic comments of all valid species, are provided. Maps with the distribution of the genus and a key of identification of the species are provided.

Key words: Armored catfishes, Bayesian Inference, Farlowellini, Maximum Parsimony, Morphology, Neotropics, *Sturisomatichthys*, Colombia, taxonomy, Northwestern South America.

APRESENTAÇÃO

A presente tese está composta por dois artigos científicos, seguindo a formatação editorial da revista *Zoological Journal of the Linnean Society* para o Capitulo I, e da revista *Copeia* para o Capítulo II, para as quais o presente estudo será submetido. As normas de submissão das revistas são fornecidas no final do documento. A tese é composta por dois capítulos, redigidos em inglês e de acordo com as recomendações e exigências do Programa de Pós-graduação em Zoologia da Pontifícia Universidade Católica do Rio Grande do Sul. O Capitulo I apresenta uma análise filogenética de evidencia total da tribo Harttiini *sensu* Isbrücker, pertencente à subfamília Loricariinae, família Loricariidae. Os resultados foram obtidos a partir de um conjunto de dados combinados (6.839 caracteres), onde 216 caracteres são morfológicos e 6.623 caracteres são moleculares. Sete marcadores foram utilizados para a geração dos dados moleculares, quatro pertencentes ao genoma mitocondrial (12S, 16S, Cytb e nd2) e três ao genoma nuclear (RAG1, RAG2 e MyH6); dados dos marcadores 12S e 16S foram obtidos no Genbank de estudos prévios de Loricariinae. Tanto a análise de Máxima Parcimônia como a análise de Inferência Bayesiana corroboram a tribo Harttiini *sensu* Isbrücker como parafilética; quatro tribos são propostas aqui como parte de Loricariinae. A tribo Harttiini formada por *Harttia, Harttiella* e *Cteniloricaria*; a tribo Farlowellini compreendendo os gêneros *Farlowella, Lamontichthys, Pterosturisoma, Sturisoma* e *Sturisomatichthys*; Metaloricariini é monotípica, incluindo apenas *Metaloricaria*; e os restantes gêneros da subfamília, pertencendo a tribo Loricariini. Espécies trans-Andinas pertencentes à *Sturisoma sensu lato* foram descobertas como pertencentes à *Sturisomatichthys*. Chaves de identificação para os gêneros de Harttiini e Farlowellini são fornecidas. As diferenças quanto a relações genéricas quando comparados os resultados de Máxima Parcimônia e de Inferência Bayesiana são apresentadas e discutidas.

O Capítulo II apresenta uma revisão taxonômica de *Sturisomatichthys* Isbrücker & Nijssen, 1979, pertencente à subfamília Loricariinae, tribo Farlowellini. Um total de 358 espécimes, incluindo series tipo e espécimes não tipo, foram examinados, medidos, e dados merísticos foram tomados. Doze espécies são reconhecidas como validas: *Sturisomatichthys aureus, S. caquetae* (nova combinação), *S. citurensis, S. dariensis, S.*

festivus, *S. frenatus*, *S. kneri*, *S. leightoni*, *S. panamensis* e *S. tamanae*. Duas espécies não descritas foram encontradas e são aqui descritas, uma proveniente da bacia do rio San Juan no oeste da Colômbia, na vertente pacifica (*Sturisomatichthys* San Juan), e outra do rio Baudó, no Noroeste da Colômbia, pertencente a vertente do caribe (*Sturisomatichthys* Baudó). *Sturisomatichthys caquetae* é reconhecida como valida dentro do gênero, e é transferida de *Sturisoma* para *Sturisomatichthys*. O neótipo de *S. aureus* é designado, proveniente do baixo Magdalena na Colômbia, localidade tipo da espécie. Registros de *Sturisomatichthys leightoni* pertencentes à bacia do rio Orinoco foram encontrados e a distribuição da espécie é ampliada e discutida. *Sturisomatichthys* é aqui sugerido como não estritamente transandino, contrariamente ao que tem sido sugerido por autores prévios. Novos registros em localidades da região Noroeste de América do Sul, assim como a redescrição e comentários taxonômicos de todas as espécies, são também fornecidos. Um mapa de distribuição e uma chave de identificação das espécies são apresentados.

Classification

- Subfamily Loricariinae Bonaparte, 1831
  - Tribe Metaloricariini Isbrücker, 1980
    - *Metaloricaria* Isbrücker, 1975
  - Tribe Harttiini Boeseman, 1971
    - *Harttia* Steindachner, 1877
    - *Cteniloricaria* Isbrücker & Nijssen, 1979
    - *Harttiella* Boeseman, 1953
  - Tribe Loricariini Bonaparte, 1831
    - *Loricaria* Linnaeus, 1758
    - *Apistoloricaria* Isbrücker & Nijssen, 1976
    - *Brochiloricaria* Isbrücker & Nijssen, 1979
    - *Crossoloricaria* Isbrücker, 1979
    - *Dasyloricaria* Isbrücker & Nijssen, 1979
    - *Dentectus* Martín Salazar, Isbrücker & Nijssen, 1982
    - *Fonchiiloricaria* Rodriguez, Ortega & Covain, 2011
    - *Furcodontichthys* Rapp Py-Daniel, 1981
    - *Hemiloricaria* Bleeker, 1862
    - *Hemiodontichthys* Bleeker, 1862
    - *Limatulichthys* Isbrücker & Nijssen, 1979
    - *Loricariichthys* Bleeker, 1862
    - *Paraloricaria* Isbrücker, 1979
    - *Planiloricaria* Isbrücker, 1971
    - *Proloricaria* Isbrücker, 2001
    - *Pseudohemiodon* Bleeker, 1862
    - *Pseudoloricaria* Bleeker, 1862
    - *Pyxiloricaria* Isbrücker & Nijssen, 1984
    - *Reganella* Eigenmann, 1905
    - *Rhadinoloricaria* Isbrücker & Nijssen, 1974
    - *Ricola* Isbrücker & Nijssen, 1978
    - *Rineloricaria*, Bleeker, 1862
    - *Spatuloricaria* Schultz, 1944
  - Tribe Farlowellini Fowler, 1958
    - *Farlowella* Eigenmann & Eigenmann, 1889
    - *Aposturisoma* Isbrücker, Britski, Nijssen & Ortega, 1983 (new junior synonym of *Farlowella*)
    - *Lamontichthys* Miranda Ribeiro, 1939
    - *Pterosturisoma* Isbrücker & Nijssen, 1978
    - *Sturisoma* Swainson 1838
    - *Sturisomatichthys* Isbrücker & Nijssen, 1979

Total evidence analysis of the Harttiini *sensu* Isbrücker (Siluriformes: Loricariidae) with a new classification of the Loricariinae.

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Running title: Total evidence analysis of the Harttiini

Abstract

A total evidence analysis of the Harttiini *sensu* Isbrücker is presented. Ten genera are included in the phylogenetic analysis: *Aposturisoma*, *Ctenitoricaria*, *Farlowella*, *Harttia*, *Harttiella*, *Lamontichthys*, *Metaloricaria*, *Pterosturisoma*, *Sturisoma*, and *Sturisomatichthys*, further on relevant outgroups. The ingroup encompasses 78 terminal taxa plus 22 belonging to the outgroup which were chosen from other genera of the Loricariini and subfamilies of the Loricariidae. Seven molecular markers were included for the phylogenetic analysis, the mitochondrial Cytb, nd2, 12S and 16S, and the nuclear MyH6, RAG1 and RAG2. Additionally, 216 morphological characters were included in a total evidence phylogenetic analysis, which encompass characters proposed by previous authors and new characters proposed herein including both osteology and external morphology. A Maximum Parsimony analysis and a Bayesian Inference analysis were carried out using the concatenated data matrix which is comprised of 6,839 characters. Thirty most parsimonious trees were found with a length of 18.254 steps, consistency index (CI) of 0.37 and retention index (RI) of 0.59, which were summarized in a strict consensus tree showing a paraphyletic Harttiini *sensu* Isbrücker; the same result was obtained by the Bayesian Inference analysis. Harttiini comprises *Harttia*, *Harttiella* and *Ctenitoricaria*. Farlowellina is elevated to tribe rank as Farlowellini, encompassing *Farlowella*, *Lamontichthys*, *Pterosturisoma*, *Sturisoma*, and *Sturisomatichthys*. *Aposturisoma* is a junior synonym of *Farlowella*. *Metaloricaria* is assigned to the new and monotypic Metaloricariini. On the other hand, the Loricariini is here restricted to a unique group without subtribal division, contrary to what was proposed in previous studies. *Sturisoma* was corroborated as strictly cis-Andean, while *Sturisomatichthys* encompasses, besides the valid species already included in the genus, the trans-Andean species belonging to *Sturisoma sensu lato*. Two new species of the former and one new species of the latter were recognized and described. A new classification for the Loricariinae is offered, as well as identification keys for the genera of both the Harttiini and the Farlowellini. A discussion regarding the taxonomy of the valid genera is offered.

KEY WORDS: Armored catfishes – Bayesian Inference – *Farlowella* – Farlowellini – *Harttia* – Maximum Parsimony – Morphology – Neotropical – South America – *Sturisomatichthys*.

Introduction

Siluriformes and Loricariidae diversity

Neotropical fishes comprise one of the most diverse and numerous groups of vertebrates on earth. According to Eschmeyer & Fong (2017) there are currently 34,544 valid species of fishes, of which, 7,772 were described in the last 19 years. Only in the Neotropical region, according to Albert & Reis (2011), there are more than 5,600 species of fishes, with current estimates reaching to 9,000 species (Reis *et al*., 2016), which represents the majority of freshwater species in the world and around 10% of all known vertebrates (Vari & Malabarba 1998; Lundberg *et al*., 2000; Reis *et al*., 2003).

The order Siluriformes includes representatives in freshwater of almost all continents, except Australia, plus two marine families. Within the order are the commonly called armored and naked catfishes, the latter with some examples of groups of high commercial value in the Neotropics (i.e. *Pseudoplatystoma* Bleeker, 1862). Currently the order has 39 valid families (Eschmeyer & Fong, 2017), 19 of which are distributed along the main basins of South America, including Chile, where occur the Diplomystidae Eigenmann, 1890, considered the most basal group within this order (de Pinna, 1993, 1998; Sullivan *et al*., 2006).

One of the main components of the order Siluriformes is the family Loricariidae Rafinesque,1815, which currently comprises eight subfamilies: Delturinae Reis, Pereira & Armbruster, 2006; Rhinelepinae Lujan, Armbruster, Lovejoy & López-Fernández, 2015; Loricariinae Bonaparte, 1831; Hypoptopomatinae Eigenmann & Eigenmann, 1890; Neoplecostominae Regan, 1904; Otothyrinae Chiachio, Oliveira & Montoya-Burgos, 2008; Hypostominae Kner, 1853; and Lithogeninae Gosline, 1947 (Lujan *et al*., 2015). The Loricariidae belongs to the Loricarioidea, which constitutes a monophyletic clade formed by the Nematogenyidae Bleeker, 1862; Trichomycteridae Bleeker, 1858; Callichthyidae Bonaparte, 1838; Scoloplacidae Bailey & Baskin, 1976; Loricariidae; and Astroblepidae (Howes, 1983; Schaefer, 1990; de Pinna, 1998; Hardman, 2002; Sullivan *et al*., 2006). Several phylogenetic and taxonomic studies have been carried out dealing with the Loricariidae to elucidate their phylogenetic relationships, both interspecific and intergeneric, using both molecular and morphological evidence (e.g. Armbruster, 2004; Chiachio *et al*., 2008: Cramer *et al*., 2011; Lujan *et al*., 2015; Covain *et al*., 2016; Pereira & Reis, 2017). However, there are still inconsistencies in the number of subfamilies, diagnostic characters for each of the groups, and their composition. Loricariidae is a family of freshwater armored catfishes distributed through the main basins of South America, except in Chile and Patagonia. Species belonging to the family are recognized by having the body covered in ossified dermal plates, integumentary teeth known as odontodes (Garg *et al*., 2010), and a ventral oral disk that facilitates surface attachment and feeding (Geerinckx *et al*., 2011). Fishes belonging to the Loricariidae are commonly known as cascudos or acaris (Brazil), corronchos or cuchas (Colombia, Venezuela), carachamas (Peru) and viejas (Argentina, Uruguay).

Members of the Loricariidae have differences in size when species of different subfamilies are compared. Representatives of Hypoptopomatinae (commonly known as "cascudinhos"), belonging for example to the genus *Hypoptopoma* Günther, 1868, can reach less than 30 mm in standard length (SL) even when they are adults (Schaefer, 1996). In contrast, species of the genus *Panaque* Eigenmann & Eigenmann, 1889 of the Hypostominae, can reach up to one meter (Lujan *et al*., 2017). Likewise, the dietary habits of the species belonging to Loricariidae have great differences, with species feeding on detritus and algae and small insects (a more generalized condition within the family), to species feeding on wood (i.e. *Panaque*, *Panaqolus* Isbrücker & Schraml 2001, in Isbrücker *et al*., 2001; Lujan *et al*., 2013, 2017).

The reproductive behavior of species of the Loricariidae, especially that of some genera of the subfamily Loricariinae (e.g. *Loricariichthys* Bleeker, 1862) is noteworthy. Several aspects can be observed such as dimorphic sexual characters present in males and that may indicate the sexual maturation of individuals. For instance, the development of odontodes in the lateral sides of the head, on the first ray of the fins (mainly pectoral and pelvic), thickening of pectoral spines and pre-maxillary teeth, filament extension on the leading rays (Isbrücker & Nijssen, 1992; Rapp Py-Daniel & Cox Fernandes, 2005) and, in some cases, different forms of the urogenital pore, mainly tubular forms (Rodriguez , 2003).

Currently, 958 valid species are included within Loricariidae (Eschmeyer & Fong, 2017). Species of Loricariidae are characterized by being benthic and usually attached to substrates, rocks or trunks. The individuals can be found in both fast- and slow-current environments, in small tributaries, and in main channels of the major river basins of South America. Studies related to the functionality of the jaws and their participation in terms of diversification of these groups are revealing (Schaefer & Lauder, 1986; Lujan & Armbruster, 2011a; Lujan et al., 2012). A peculiar characteristic of the members of this family is the disconnection and separation between both premaxillae and between both dentaries, which allows individuals to make independent movements of each of the structures when scraping detritus from rocks and trunks. Schaefer & Lauder (1986) studied the implications of the disconnection of these structures via Loricarioidea, and found that clades that are composed of individuals with this characteristic, which in turn have a greater biomechanical complexity, exhibit a greater morphological variability of associated structures, in comparison with groups presenting connection between said structures. On the other hand, Lujan & Armbruster (2011a) conducted a study similar to the one presented by Schaefer & Lauder (1986). Through a multivariate analysis, using measurements on each mandible, the authors found distributions of taxonomic groupings phylogenetically diagnosed in the mandibular morphospace that are consistent with an evolutionary and basal niche pattern that is related to multiple adaptive radiations within inclusive clades. Finally, Lujan *et al*. (2012), found that trophic division along elemental and nutritional gradients can provide an important mechanism of dietary segregation and evolutionary diversification between loricariids and perhaps other taxonomic groups detritivores and general herbivores. The authors proposed that the evolutionary patterns among the Loricariidae show a high degree of trophic niche conservatism, which indicates that the affiliation to the evolutionary lineage can be a strong predictor of how basal the consumers segregate along the trophic niche space.

Loricariinae and Harttiini systematic history

Loricariinae currently includes 239 valid species (Eschmeyer & Fong, 2017) classified in 31 genera (Covain *et al*., 2016), distributed from the La Plata basin in Argentina to the northern

Caribbean basins (Ferraris, 2003). The species of this subfamily are characterized by a long and depressed caudal peduncle and absence of adipose fin. They usually live in the substrate and show marked variations in the shape of their body due to the different colonized environments, from lotic to lentic systems, in organic or inorganic substrates such as rocks, trunks or soft substrate (Covain *et al*., 2008). The first genus described for the family Loricariidae was *Loricaria* Linnaeus, 1758 (located within the subfamily Loricariinae), being *L. cataphracta* Linnaeus, 1758 from the mouth of Marowijne River, near Galibi, Suriname, the type species. According to Isbrücker (1980), approximately 61% of the loricarids described after the description of *Loricaria* were included in that genus. Subsequently, many of these species were designated in new genera described mainly by Isbrücker and Isbrücker & Nijssen.

Regan (1904) produced the first monograph dealing entirely with the Loricariidae. Regarding the Loricariinae, the author diagnosed the subfamily by presenting vertebrae below the dorsal fin and above the anal fin with bifid neural spines; pharyngeal plates toothed; teeth on premaxilla and dentary in a single series; upper part of the body (namely dorsum) protected by bony scutes; caudal peduncle depressed, with dorsal and ventral series of longitudinal plates combined in a single series; coracoid not exposed; and no anterior rudimentary ray of ventral [fin]. Regan (1904) included the following as members of the Loricariinae: *Loricaria*, *Hemiodontichthys* Bleeker, 1862, *Oxyloricaria* (=*Sturisoma*) Bleeker, 1862, and *Farlowella* Eigenmann & Eigenmann, 1889. At that time, most of the species included in Loricariinae were described as *Loricaria* (see above). The main taxonomic statement Regan (1904) did regarding the Loricariinae was the diagnosis of *Oxyloricaria* comparing to *Loricaria*, based on the number of teeth (higher in *Oxyloricaria*), absence of a postorbital notch, and development of the rostrum in *Oxyloricaria*, and described new species in that genus. Nevertheless, shortly after that, Eigenmann (1910) proposed *Oxyloricaria* as a junior synonym of *Sturisoma*, and then transferred most *Oxyloricaria* species to the latter. Regan (1911) offered a second study regarding Loricariidae, but his results did not differ significantly from his first work (Regan, 1904) and maintained the same classification for the family.

Gosline (1947) based his study mainly on osteological characters to diagnose the different subfamilies recognized in that study. The author included within the Loricariidae the Astroblepinae (=Astroblepidae), Lithogeninae, Neoplecostominae, Plecostominae, Hypoptopomatinae, and Loricariinae. The latter diagnosed by teeth bifid in a single series in each jaw, sometimes rudimentary; gill rakers either little developed, normal, or resembling the gill filaments of such structures; pharyngeal plates with either villiform or molariform teeth; intestine with few coils; posterior portion of gas bladder absent; metapterigoyd large articulating with the cranium and autopalatine; interopercular area not evertible; vertebrae 30-37, as 10-13 (precaudal) and 18-25 (caudal); bifid hemal spines; cleithrum and coracoid interlocking along midventral line and not exposed; plates on dorsal, lateral, and ventral portions; three scutes between supraoccipital and pre-dorsal plate; pre-dorsal plate smaller or absent; anal fin originating under last, depressed dorsal ray; urogenital pore separated from anal fin by azygous plate and one or more pairs of lateral plates meeting along lateral line; caudal peduncle depressed; pectoral fin i,6 (i,5 in *Farlowella*); pelvic fin i,5 (sometimes i,4 in *Farlowella*); caudal fin usually 12 or 14 rays. Nevertheless, the author focused his study mainly on the Neoplecostominae and the Plecostominae, and did not offer an identification key for the Loricariinae genera, nor a classification for the subfamily. Gosline (1948) maintained the same classification.

Boeseman (1971) offered a study dealing strictly with the Loricariinae from Surinam. The author followed mostly the conclusion offered by Gosline (1948:95), in that Loricariinae shows some indication of being biphyletic, and it could be split into two apparently distinct groups based on gill raker structure, pharyngeal teeth development, number of teeth, and possibly the presence or absence of an orbital notch. Boeseman (1971) suggested that in some characters the scarce-toothed forms present a much wider range of variation within the group, comparable to that found in the whole series of the comb-toothed genera. The author suggested also an evolutionary line leading from a Neoplecostominae ancestor, continuing through *Harttiella* Boeseman, 1971, *Harttia* Steindachner, 1877, *Parasturisoma* (=*Sturisoma*) Miranda Ribeiro, 1911, and presumably *Sturisoma* Swainson, 1838, towards *Farlowella*, to reach its limits in the latter. Due to the restriction of this study to taxa distributed mainly (or exclusively) in rivers of Surinam, the author offered a diagnosis only for *Harttia*, *Harttiella*, *Sturisoma*, and *Farlowella*. In addition, described *Harttiella* giving a new combination for his species, *Harttiella crassicauda* (Boeseman, 1953). The genus was diagnosed by the characters given in the original description of *H. crassicauda*: naked abdomen, presence of pre-anal plates, number of scutes, caudal fin not emarginated, and more robust shape of the body, especially of the tail (Boeseman, 1953). Boeseman (1971) included a second species in *Harttiella*, *H. montebelloi* (currently *Rineloricaria steinbachi*), from Monte Bello, Tarija, Bolivia described by Fowler (1940) as *Canthopomus montebelloi*. Furthermore, the author suggested *Lamontichthys* Miranda Ribeiro, 1939 to be a junior synonym of *Parasturisoma* (=*Sturisoma*). Nevertheless, Isbrücker & Nijssen (1978a), based on the same characters proposed by Miranda Ribeiro (1939), revalidated *Lamontichthys*, and described a new species, *L. stibaros*. Boeseman (1971) proposed a new arrangement within the Loricariidae, suggesting the subfamily Harttiinae that included, according to the author, *Harttia*, *Sturisoma*, *Oxyloricaria* (=*Sturisoma*), *Farlowella*, *Acestridium* Haseman, 1911, *Parasturisoma* (=*Sturisoma*), *Lamontichthys*, and *Harttiella*. The author diagnosed the new subfamily by having numerous teeth (15-125) evidently increasing in number with age, not minute, bilobed, forming a comb; gill rakers little developed, filamentous; pharyngeal teeth small, villiform, or possibly lacking; no orbital notch; no adipose fin; usually strongly depressed body, in dorsal view varying from rather broad to extremely slender. Thus, the author suggested Loricariinae as a separate subfamily including the remaining genera of Loricariinae *sensu stricto* without a tribal division.

Shortly after that, Boeseman (1976) carried out another study dealing with the Loricariinae from Suriname. In that study, redescriptions of *Loricaria cataphracta*, *Loricaria maculata* (= *Loricariichthys maculatus*) Blotch, 1794, and *Loricaria* cf. *stewarti* (= *Rineloricaria stewarti*) Eigenmann, 1909 were offered, as well as the description of *Harttia nijsseni* (= *Metaloricaria nijsseni*). The author maintained his hypothesis of the Harttiinae and Loricariinae as different and separate lineages.

Posteriorly, Isbrücker (1980) divided Loricariinae into four tribes: Acestridiini Isbrücker, 1979, Farlowellini Fowler, 1958, Harttiini Boeseman, 1971, and Loricariini Bonaparte, 1831. The author did not follow Boeseman (1971,1976) in assuming Harttiinae as valid, and maintained Loricariinae as including the Harttiini, which in turn was divided in

Harttiina comprising *Harttia*, *Cteniloricaria*, *Lamontichthys*, *Pterosturisoma* Isbrücker & Nijssen 1978a, *Sturisomatichthys* Isbrücker & Nijssen 1979, in Isbrücker, 1979, and *Sturisoma*, and the Metaloricariina including *Metaloricaria* Isbrücker, 1975; the Farlowellini including only *Farlowella*; and the Acestridiini as monotypic comprising only *Acestridium*, which posteriorly was transferred to the Hypoptopomatinae (Nijssen & Isbrücker, 1987; Schaefer, 1991). In addition, Loricariini was divided into Rineloricariina encompassing *Ixinandria* (= *Rineloricaria*) Isbrücker & Nijssen, 1979, *Rineloricaria* Bleeker, 1862, *Dasyloricaria* Isbrücker & Nijssen, 1979, and *Spatuloricaria* Schultz, 1944; Loricariina, containing *Ricola* Isbrücker & Nijssen, 1978b, *Paraloricaria* Isbrücker, 1979, *Loricaria*, *Brochiloricaria* Isbrücker & Nijssen, 1979, *Crossoloricaria* Isbrücker, 1979, *Pseudohemiodon* Bleeker, 1862, and *Rhadinoloricaria* Isbrücker & Nijssen, 1974; Planiloricariina with *Planiloricaria* Isbrücker, 1971; Reganeliina with *Reganella* Eigenmann, 1905; Loricariichthyina comprehending *Limatulichthys* Isbrücker & Nijssen, 1979, *Pseudoloricaria* Bleeker, 1862, and *Loricariichthys*; and Hemiodontichthyina as monotypic including *Hemiodontichthys* Bleeker, 1862. The author did not offer diagnoses nor identification keys for the genera included. Nevertheless, Isbrücker (1981) maintaining the same classification mentioned above, and offered an identification key for the genera included in Loricariidae.

Rapp Py-Daniel (1997) presented the first morphology-based phylogenetic analysis aiming to include most of the diversity of the Loricariinae, including 192 characters from both osteology and external morphology. The author found the subfamily to be divided into two tribes, the Harttiini and the Loricariini. The former was proposed to be comprised by *Sturisomatichthys, Aposturisoma* Isbrücker, Britski, Nijssen & Ortega 1983, *Farlowella*, *Sturisoma, Harttia, Cteniloricaria* Isbrücker & Nijssen 1979 (assumed as synonym of *Harttia* by the author), and *Lamontichthys*; *Harttiella* and *Pterosturisoma* were not available for examination. Thus, Rapp Py-Daniel (1997) split the tribe into two subtribes: the Harttiina and the Farlowellina, the former comprising *Harttia* and *Lamontichthys*, and the remaining genera mentioned above in the latter. Even though the author offered no diagnosis or identification keys for the genera included, this study offered several diagnostic morphological characters to support that classification. The author mentioned the resemblance of *Aposturisoma* with external characteristics of *Farlowella*, but since not enough evidence was available, a synonymy of the genera was not formally proposed. That study is not published.

Retzer & Page (1997) carried out the only taxonomic revision regarding *Farlowella* published to date. Twenty-five valid species were recognized by the authors, which included six described in that study. An analysis of 34 morphometric characters were used to elucidate the phylogenetic relationships within the genus. Nineteen species were placed in six species groups that, according to the authors, were recognized as monophyletic, and six species as *incertae sedis* within the genus. The authors only included *Aposturisoma myriodon* as outgroup and taxon where trees were rooted, thus, relationships of *Farlowella* within Loricariinae were proposed. The authors offered an identification key for the species.

Sturisoma was included in a morphology-based phylogeny and taxonomic revision carried out by Ghazzi (2003). The author found the genus to be monophyletic by transferring the Trans-Andean species of *Sturisoma sensu lato* to her "'Trans' new genus". That author proposed a number of exclusive osteological synapomorphies for the genus, but that study is still unpublished. Eight valid species of *Sturisoma sensu lato,* plus five undescribed species were included. The author found a monophyletic *Sturisoma* including only Cis-Andean species, plus *S. kneri* (=*Sturisomatichthys kneri*) Ghazzi, 2005, distributed in the Maracaibo Lake basin. Ghazzi (2003) included three species of *Sturisomatichthys* in her phylogenetic analysis, *St. leightoni* (Regan, 1912), *St. citurensis* (Meek & Hildebrand, 1913) and *St. tamanae* (Regan, 1912). In her discussion, the author proposed a "'Trans' New Genus" to include undescribed species discovered in that study plus *St. panamensis* (Eigenmann & Eigenmann, 1889), *St. frenatus* (Boulenger, 1902), and *St. festivus* (Myers, 1942). That genus was proposed based on the supposed exclusive synapomorphy of lateral longitudinal stripes, on both sides of the body from the tip of the snout to the caudal peduncle. The only taxonomic revision of the genus to date is included in that study.

Covain & Fisch-Muller (2007) offered an update to the identification key of Isbrücker (1981). The authors found support from external morphological characters to keep only the tribes Harttiini and Loricariini, including the genus *Farlowella* (previously in the

Farlowellini) in Harttiini. The authors found differences mainly related to the number of rays in the caudal fin, number of teeth in the premaxilla and absence or presence of filamentous projections in the pectoral, ventral, and/or caudal leading rays, but did not maintain the division proposed by Isbrücker (1979, 1980, 1981).

Covain *et al*. (2008) offered a molecular-based phylogeny dealing with members of the Loricariinae. The authors included the partial 12S and 16S mitochondrial genes from 20 Loricariinae species representing 14 genera, and proposed the division of Loricariinae into two tribes, the Harttiini including only *Harttia*, and the Loricariini, divided in two subtribes, Loricariina and Sturisomina. Covain *et al*. (2008) assumed the Sturisomina containing *Farlowella, Lamontichthys, Sturisoma,* and *Sturisomatichthys,* as part of the Loricariini. In that study a paraphyletic *Farlowella*, with *F. platorynchus* as sister to *Sturisomatichthys*, and *F. oxyrryncha* as part of the *Sturisoma* clade, was suggested. Nevertheless, the paraphyletic state of *Farlowella* could be an artifact of few representatives of the genus, and/or few markers used for the inference of their relationships. The name Sturisomina was corrected by Covain *et al*. (2010) to Farlowellina, since the family-group name Farlowellini was already available for any lineage including its type genus, *Farlowella*. Thus, due to the Principle of Priority (ICZN, 1999) Sturisomina is an invalid and unavailable name. Rodriguez *et al*. (2011) in their description of the new genus and species *Fonchiiloricaria nanodon* included the same terminals and markers, plus the nuclear gene f-rtn4, as Covain *et al*. (2008), and found the same results as those authors plus the inclusion of *Fo*. *nanodon* within the Loricariini.

Fichberg (2008) offered a morphology-based phylogenetic analysis of *Rineloricaria*. The author included 36 of the 64 valid species belonging to the genus, using 181 characters. A monophyletic *Rineloricaria* was recovered with ten synapomorphies, one being exclusive. Fichberg (2008) presented a consensus tree from 72 most parsimonious trees, showing intraspecific relationships of *Rineloricaria*, including a polytomy comprising 11 species, plus seven clades comprehending 22 species with their relationships not fully resolved within the genus. Only relationships of *R. maquinensis* Reis & Cardoso 2001 (sister of the remaining *Rineloricaria*) and (*R. kronei* (Miranda Ribeiro 1911) + *R. daraha* Rapp Py-

Daniel & Fichberg 2008) (as sister of the remaining *Rineloricaria* except *R. maquinensis*) were resolved by the author. That study is not published.

Paixão & Toledo-Piza (2009) conducted a morphology-based phylogeny and taxonomic revision of *Lamontichthys*, suggesting the genus is monophyletic and includes six valid species (two of them described in that study). Intraspecific relationships of *Lamontichthys* were fully resolved and the authors offered several exclusive and non-exclusive synapomorphies, as well as an identification key of the species. Paixão & Toledo-Piza (2009) extensively compared *Lamontichthys* with *Pterosturisoma* due to the similarity of the members of both genera, first pointed out by Isbrücker & Nijssen (1978a) in the original description of the latter. Nevertheless, and according to Paixão & Toledo-Piza (2009:565), *Pterosturisoma* differs from *Lamontichthys* in the presence of six branched pectoral-fin rays (vs. seven in *Lamontichthys*), the more developed pores of the lateral line, the narrow dorsal region of the cleithrum (vs. wide), and the horizontal flattening of the predorsal plates. Even though in their analysis the position of *Pterosturisoma* was not fully resolved, the genus was recovered as valid and as a different lineage than *Lamontichthys*. Finally, in that study the presence of seven branched rays on pectoral fin was corroborated as diagnostic of the genus within Loricariinae (with exception of *R. daraha* with the same count, from which it can be distinguished by several other characters).

Provenzano (2011) carried out another morphology-based phylogenetic analysis of the Loricariinae including 90 characters. The author found a polytomy including *Harttia* (= *Cteniloricaria* according to the author), *Lamontichthys*, *Sturisoma*, and *Sturisomatichthys*. Moreover, a clade including species of *Harttia*, and clade formed by the species of *Farlowella*, with *Aposturisoma myriodon* as part of that clade as well. Even though Provenzano (2011) did not suggest any taxonomic rearrangements, the author suggested the Loricariinae to be divided into Loricariini, Harttiini, and Farlowellini, without mentioning the configuration of each tribe. That study is not published.

Thomas (2011) conducted a morphology-based phylogeny and taxonomic revision of *Loricaria*. The author diagnosed the genus based on two exclusive synapomorphies: lower lip surface covered with filiform papillae and absence of buccal papillae surrounding the dentary teeth. Based on a multivariate analyses of morphometric and meristic data in combination with qualitative assessment of external morphological characters, Thomas (2011) recognized 15 valid species, with an additional nine proposed as new species, plus several new synonymies within the genus. The phylogenetic analyses were based on 32 quantitative (morphometric and meristic) and 24 qualitative characters from external morphology, that were analyzed under equal weights and implied weighting criteria. *Loricaria* was found to be monophyletic, and according to the author, the genera *Brochiloricaria*, *Paraloricaria*, and *Ricola* should be placed as junior synonymies of *Loricaria*. That study is not published.

Paixão (2012) produced a thesis on a morphology-based phylogeny and taxonomic revision of *Loricariichthys*. The phylogenetic analysis consisted on 17 terminals belonging to the genus, with 84 characters, which resulted in 36 most parsimonious trees summarized in a strict consensus tree. The author proposed *Loricariichthys* as monophyletic based on five exclusive synapomorphies and as sister of *Hemiodontichthys*. Several synonymies within the genus were proposed, as well as the description of three new species. That study is not published.

Londoño-Burbano & Reis (2016) offered a study regarding the systematics of *Dasyloricaria*. The authors carried out a morphology-based phylogeny of the genus, and a taxonomic revision including all five species considered as valid up to that point. Three valid species, including a new species described in that study, were recognized, restricting the genus to be comprised by *D. filamentosa* (Steindachner, 1878), *D. latiura* (Eigenmann & Vance, in Eigenmann, 1912) and *D. paucisquama* Londoño-Burbano & Reis, 2016. *Dasyloricaria* was found to be monophyletic supported by 14 synapomorphies, being eight of them exclusive to the genus. Additionally, *Dasyloricaria* was suggested to be sister to *Spatuloricaria*, and Rineloricariina *sensu* Isbrücker as paraphyletic.

The most recent study regarding the Loricariinae is that of Covain *et al*. (2016), who carried out a molecular-based phylogeny of the subfamily in which almost the totality of genera belonging to the subfamily was included. The authors used three markers, two mitochondrial (12S and 16S) and one nuclear (f-rtn4), and 350 terminal taxa, which included most species of Loricariinae. The authors proposed the Loricariinae to be distributed into two sister tribes: Harttiini and Loricariini. The Harttiini, as classically defined (i.e. *sensu* Isbrücker), was found to be paraphyletic and it comprises *Harttia*, *Cteniloricaria*, and *Harttiella*. On the other hand, within the Loricariini, the authors proposed two subtribes, the Farlowellina and the Loricariina. Within the Farlowellina the authors included *Lamontichthys*, *Pterosturisoma*, *Farlowella*, *Aposturisoma* (as a possibly a synonym of *Farlowella*), *Sturisoma* (restricted to cis-Andean region), and *Sturisomatichthys* (including all trans-Andean *Sturisoma sensu lato*). Within Loricariina the authors included *Metaloricaria*, *Dasyloricaria*, and *Fonchiiloricaria*. As part of the Loricariina, Covain *et al*. (2016) proposed three different groups, the *Rineloricaria* group, the *Loricariichthys* group, and the *Loricaria-Pseudohemiodon* group (for configuration of each group the reader is referred to the reference). Moreover, the authors suggested *Loricaria*, *Crossoloricaria*, and *Apistoloricaria* Isbrücker & Nijssen, 1986 as paraphyletic; *Quiritixys* Isbrücker, in Isbrücker *et al*., 2001 as synonym of *Harttia*; East Andean members of *Crossoloricaria*, and *Apistoloricaria* as synonyms of *Rhadinoloricaria*; *Ixinandria*, *Hemiloricaria* Bleeker, 1862, *Fonchiiichthys*, and *Leliella* Isbrücker, in Isbrücker *et al*., 2001 as synonyms of *Rineloricaria*; and restricted *Crossoloricaria*, and *Sturisomatichthys* to their trans-Andean members, and *Sturisoma* to the cis-Andean species. Finally, the authors revalidated *Proloricaria* Isbrücker, in Isbrücker *et al*., 2001 as a monotypic genus from its synonym with *Loricaria*.

Through the studies mentioned, the configuration of the Harttiini has not been settled, and a profound study of intraspecific relationships of the genera historically included in Harttiini is needed. Moreover, the use of only morphological or molecular evidence could be one of the causes of the disparity regarding the classification of the tribe within Loricariinae. Thus, the objective of this study is to carry out a total evidence analysis of the Harttiini including all available morphological and molecular information and all genera historically allocated to it. Additionally, we aim to clarify intraspecific and intergeneric relationships of the tribe.

Material and Methods

Phylogenetic inference method

According to Hennig (1966), the objective of phylogenetic systematics is the study of degrees of phylogenetic relationship in a group of species and the illustration of such relationships in the form of phylogenetic trees, comprised by clades (namely monophyletic groups). There are, among others, two kinds of methods in Phylogenetic Systematics, those relying in character congruence (Cladistic parsimony) and those relying in probabilistic models (Maximum likelihood and Bayesian inference). Kluge & Grant (2006) explain that maximally parsimonious hypotheses are achieved by minimizing the patristic events in the topology with only background knowledge of descent with modification to explain these hypotheses by invoking the anti-superfluity principle. According to the authors, and following the anti-superfluity principle, the explanatory power of the method is maximized by minimizing the number of transformation events required to explain the character-states of the terminal taxa as hypotheses of homology, where the concept of homology is restricted to inherited traits shared by species. On the other hand, statistical approaches (Likelihood and Bayesian) require evolutionary models, an additional parameter that sums to the superfluity of the method. The phylogenetic method favored for the proposal of classification and interrelationships of the Harttiini and Farlowellini, is Maximum Parsimony. Nevertheless, a Bayesian Inference analysis was carried out and its results discussed and compared to those obtained through Maximum Parsimony.

As proposed by Kluge (1989), the analysis presented here follows a Total Evidence approach. A total evidence method relies in its ability to implement the scientific principle of severity of the test. Kluge (1997) explored cladistics in terms of Popperian testability and proposed that the subsequent hypothesis of a joint analysis of all available evidence is more severe than an analysis of partitioned evidence.

Ingroup Selection

The ingroup selected aimed to include the totality of the diversity of the Harttiini *sensu* Isbrücker. The tribe, following such proposal, comprises 10 genera: *Aposturisoma, Cteniloricaria*, *Farlowella*, *Harttia*, *Harttiella*, *Lamontichthys*, *Metaloricaria*, *Pterosturisoma*, *Sturisoma* and *Sturisomatichthys*.

The present study includes 75 of the 93 valid species distributed among the 10 genera (Eschmeyer *et al*. 2017; number of species/terminals in parenthesis): *Aposturisoma* (1), *Cteniloricaria* (2), *Farlowella* (23), *Harttia* (19), *Harttiella* (5), *Lamontichthys* (5), *Metaloricaria* (2), *Pterosturisoma* (1), *Sturisoma* (9, including one undescribed species) and *Sturisomatichthys* (11, including two undescribed species). A total of 78 ingroup terminals was analyzed.

Even though the aim of the study was to include all terminals with both, cleared and stained specimens (c&s) and tissues, terminals with only morphological data or DNA data, were included as well. This was accomplished in order to include as much of the diversity contained in the tribe and to propose the composition of the group, and its position within Loricariinae.

Outgroup Selection

Outgroup taxa are selected based on the possession of more inclusive synapomorphies shared with the ingroup (Nixon & Carpenter, 1993). Comparison between ingroup and outgroup helps delimitation of the character-states of the transformation series, and the optimization of these characters in the final topology determines the patristic and cladistic relationships (Vera-Alcaraz, 2013).

Outgroup taxa selection was based following studies dealing with phylogenetic analyses of Loricariidae, Loricariinae, and specific genera of the latter. *Hemipsilichthys gobio* (Lütken, 1874), the only species of Delturinae included, was selected as root for the trees.

Armbruster (2004, 2008), Lujan *et al*. (2015), and Covain *et al*. (2016) suggested Hypostominae as sister of Loricariinae, thus, three species belonging to the subfamily were included: *Ancistrus brevipinnis* (Regan, 1904), *Chaetostoma breve* Regan, 1904, and *Pterygoplichthys lituratus* (Kner, 1854). Three species belonging to the Hypoptopomatinae: *Acestridium scutatum* Reis & Lehmann, 2009, *Hisonotus laevior* Cope, 1894, and *Parotocinclus maculicauda* (Steindachner, 1877); and two of Neoplecostominae: *Neoplecostomus microps* (Steindachner, 1877) and *Pareiorhaphis calmoni* (Steindachner, 1907). Loricariinae has been historically divided into two tribes (Rapp Py-Daniel, 1997; Covain & Fisch-Muller, 2007; Covain *et al*., 2008, 2016; Lujan *et al*., 2015): Loricariini and Harttiini. Thus, 13 species of Loricariini were included as well: *Crossoloricaria* sp., *Dasyloricaria filamentosa*, *D. latiura*, *D. paucisquama*, *Hemiloricaria lanceolata* (Günther, 1868), *Hemiodontichthys acipenserinus* (Kner, 1853), *Limatulichthys griseus* (Eigenmann, 1909), *Loricaria* sp., *Loricariichthys anus* (Valenciennes, 1835), *L. platymetopon* Isbrücker & Nijssen, 1979, *Rineloricaria cadeae* (Hensel, 1868), *R. quadrensis* Reis, 1983, and *Spatuloricaria puganensis* (Pearson, 1937).

Acronyms of museums

The following institutions were visited to examine material and/or carry out extractions for DNA amplification or sent specimens on loan: ANSP (Academy of Natural Sciences, Philadelphia, USA); AUM (Auburn University Museum of Natural History, Auburn, USA); BMNH (British Museum of Natural History, London, UK); CAS (California Academy of Sciences, San Francisco USA); CIUA (Colección Ictiológica dela Universidad de Antioquia, Medellín, Colombia); FMNH (Field Museum of Natural History, Chicago, USA); ICNMHN (Instituto de Ciencias Naturales, Museo de Historia Natural de la Universidad Nacional, Bogotá D.C., Colombia); IUQ (Colección Ictiológica Universidad del Quindío, Armenia, Colombia); MCNG (Museo de Ciencias Naturales de Guanare, Guanare, Venezuela); MCP (Museu de Ciências e Tecnologia da Pontifícia Universidade Católica do Rio Grande do Sul, Porto Alegre, Brazil); MHNG (Museum d'Histoire Naturelle, Genève, Switzerland); MNRJ (Museu Nacional de Rio Janeiro, Rio de Janeiro, Brazil); MPEG (Museu Paraense Emilio Goeldi, Belém, Brazil); MUSM (Museo de la Universidad Nacional Mayor de San Marcos, Lima, Peru); MPUJ (Museo de Peces Universidad Javeriana, Bogotá D.C., Colombia); MZUSP (Museu de Zoologia, Universidade de São Paulo, São Paulo, Brazil); NRM (Naturhistoriska Riksmuseet, Stockholm, Sweden); RMNH (Nationaal Natuurhistorisch Museum, Leiden, Netherlands; including ZMA material); ROM (Royal Ontario Museum, Toronto, Canada); STRI (Smithsonian Tropical Research Institute, Panama City, Panama); UF (University of Florida, Museum of Natural History, Gainsville, USA); UFRGS (Departamento de

Zoologia, Instituto de Biociências, Universidade Federal do Rio Grande do Sul, Porto Alegre, Brazil); USNM (Smithsonian Institution National Museum of Natural History, Washington D.C., USA).

Morphological characters

Characters included here were mainly obtained from Rapp Py-Daniel (1997), Ghazzi (2003), Fichberg (2008), Paixão & Toledo-Piza (2009), and Provenzano (2011); additional characters were obtained from studies dealing with other members of the Loricariidae (i.e. Howes, 1983; Schaefer, 1987, 1991; Armbruster, 2004). All characters obtained from previous studies were maintained either as originally proposed or modified to suit the scope of this study and its composition regarding terminals included. New characters are proposed here as well. External morphology and coloration were studied based in alcohol preserved specimens. Bone and cartilage were studied based in double stained and cleared specimens according to Taylor & Van Dyke (1985). Osteological nomenclature follows Schaefer (1987) and Paixão & Toledo-Piza (2009). The software Mesquite 3.0.2 (Maddison & Maddison, 2011) was used for the construction of the character matrix. Innaplicable characters were codified as “-“, while missing data was codified as “?”.

Molecular characters

Covain *et al*. (2016) included almost the totality of Loricariinae genera in their molecular-based phylogeny of the subfamily. The authors included three molecular markers: the mitochondrial 12S and 16S, and the nuclear f-rtn4. Sequences of those markers are available in Genbank (see Table 1 here, and table 2 in Covain *et al*., 2016), and data from 12S and 16S was included here.

On the other hand, Lujan *et al*. (2015) carried out the most recent molecular-based analysis that encompasses members of the Loricariidae. The authors included primers from Li *et al*. (2007) and developed others specific for loricariids (Table 2). From that study, the genes and primers included were, one from the mitochondrial genome: Cytochrome b (Cytb); and three from the nuclear genome: Recombination activating gene 1 and 2 (RAG1 and RAG2), and the Myosin Heavy Chain 6 (MyH6). Finally, the NADH dehydrogenase 2 (nd2) from the mitochondrial genome, from Arroyave *et al*. (2013), which proved to be efficient for loricariids besides Characiform fishes, was also included.

Tissues were fixed in absolute ethanol and stored in freezer. Samples were obtained from museum specimens and voucher specimens were analyzed in order to include those samples as part of the study. See Table 1 for voucher numbers and collections in which they are deposited.

Total DNA extractions were obtained from muscle or fins samples using DNeasy Blood and Tissue kit (Qiagen), following the manufacturer protocol. Polymerase Chain Reaction (PCR) was used to amplify molecular fragments in a total reaction volume of 25ul: 2ul for mitochondrial markers and 4ul for nuclear markers of DNA template; 1.25ul of primer at 10uM (primers detailed in Table 2); 8ul (for mitochondrial markers) and 12.5ul (for nuclear markers) of PCR Master Mix 2X (Hotstartaq Master Mix Kit, Qiagen), and completed with nuclease-free water. A nested PCR protocol for the nuclear marker MyH6 was employed following Lujan *et al*. (2015; for annealing temperatures see Table 2); 1ul from the first PCR product was employed to carry out the second PCR, with half the volume for the remaining reagents of those listed above. Cycles of amplification were programmed following the conditions recommended by the Taq DNA polymerase manufacturer, plus protocols proposed by Sullivan *et al*. (2006), Li *et al*. (2007), Arroyave *et al*. (2013), Lujan *et al*. (2015) and those proposed here; annealing temperatures shown in Table 2.

A sample of 2ul of PCR product plus 2ul of BlueJuice (Invitrogen) diluted with nuclease-free water and mixed with 0.8ul of GelRed (Invitrogen) was loaded into agarose gel to run an electrophoresis. Successful DNA amplification was corroborated by visual observation in the electrophoresis gel of colored fragments using ultraviolet light box. Size fragments were compared with standard sizes of the Low DNA MassLadder (Invitrogen) to corroborate the correct length of the amplified fragment.

Functional Biosciences (USA) sequenced PCR products. Forward and reverse contigs were assembled and edited using the software Geneious 9.1, and checked by eye posteriorly to identify ambiguous portions of the sequences. Identity of vouchers of GenBank data of ingroup terminals, deposited from Covain *et al*. (2008, 2016), used in the phylogenetic analysis, were previously corroborated at MHNG; see Table 1 for vouchers of data from Genbank. Vouchers of Genbank data deposited by Lujan *et al*. (2015; see Table 1), belonging to *Lamontichthys stibaros*, were not verified.

Sequences of each gene were aligned using the MUSCLE algorithm (Edgar, 2004) with default parameters as implemented by the software Geneious 9.1. For coding genes (all except 12S and 16S), positions of the first, second and third codon were visualized using Mesquite 3.0.2 (Maddison & Maddison, 2011) and corroborated using Geneious 9.1 for posterior partitions. Models of molecular evolution for each gene and codon partition were calculated using the software PartitionFinder v1.1.1 (Lanfear *et al*., 2012). See Table 3 for the best model of each position of each gene.

Finally, the concatenation of both the morphological and molecular matrixes was achieved through the software SequenceMatrix 1.8 (Vaidya *et al*., 2011), and exported posteriorly as NEXUS and TNT files.

Tree searching methods

The computational techniques commonly used to find most parsimonious trees are Wagner trees and the branch swapping method of Tree Bisection and Reconnection (TBR). A strategy that makes the TBR algorithm more efficient is the use of multiple starting points when creating Wagner trees, this method is known as Multiple Random Addition Sequence (RAS). According to Goloboff (2002), large numbers of RAS + TBR generally work well in exploring islands for datasets of 50 to 150 taxa.

Two different methods were used here in order to analyze the final matrix. First, an analysis using Maximum Parsimony through the software TNT (Tree analysis using New technology, version 1.1; Goloboff *et al*., 2008), where gaps were treated as missing data and all characters treated with equal weights. Implementing the ratchet method, the following default search parameters were used: 0 Random seed, 100 Random addition sequences, stop perturbation phase when 12 substitutions or 99% of swap completed, perturbation phase with 25% up-weighting and 25% down-weighting probabilities allowing alternate equal weights, plus 400 iterations with 0 auto-constrained iterations. A strict consensus of the most parsimonious trees found was generated in order to summarize the phylogenetic hypotheses. Bremer support values were calculated through NONA from the suboptimal trees (Fig. 1).

Second, a Bayesian analysis was performed. Bayesian Inference (BI) was conducted in MrBayes v3.1.2 (Huelsenbeck & Ronquist, 2001; Ronquist & Huelsenbeck, 2003) via the CIPRES web portal (Miller *et al*., 2010). Mr. Bayes was programmed to run for 100 million generations, with two runs of four independent MCMC chains (three heated, one cold), sampling one tree every one thousand generation (Fig. 2). The first 4 million generations (25%) were discarded as burn-in.

Results

Character description

Morphological characters

Character descriptions are grouped by anatomical units.

Neurocranium

1. Anterior process of mesethmoid (cornua) **CI=0.11**. (Rapp-Py-Daniel, 1997, Ch.1; Ghazzi, 2003, Ch. 1; Fichberg, 2008, Ch. 1).

0. Present
1. Absent

When present, the cornua are at the tip of the mesethmoid (state 0). The structure is absent among members of the Farlowellini (state 1).

2. Ventral depression at anterior tip of mesethmoid **CI=0.16**. (Fichberg, 2008, Ch. 7; Paixão & Toledo-Piza, 2009, Ch. 1).

0. Absent
1. Present

Paixão & Toledo-Piza (2009) discussed that the ventral depression at anterior tip of mesethmoid was only present in *Lamontichthys filamentosus*, *L. llanero*, and *L. maracaibero*. Additionally, we observed here that depression in *Metaloricaria*, *Harttia carvalhoi*, *Harttiella longicauda*, *Crossoloricaria* sp. and *Limatulichthys griseus*. *Lamontichthys maracaibero* was not examined here.

3. Type of tegument cover ver the anterior portion of the snout around the tip of the mesethmoid **CI=0.05**. (Rapp Py-Daniel, 1997, Ch. 8; Fichberg, 2008, Ch. 5 and 6; Paixão & Toledo-Piza, 2009, Ch. 2).

0. Naked skin (Fig. 3A,B)
1. Plates (Fig. 3C)

4. Mesethmoid ventral process next to mesethmoid disk **CI=0.37**.

0. Absent
1. Ill-developed, united to mesethmoid disk
2. Well-developed, united to mesethmoid disk
3. Well-developed, separated from mesethmoid disk

The mesethmoid possesses an anterior disk, which is present in members of the Loricariinae showing different degrees of development and a variety of shapes (see Character 5). A mesethmoid ventral process next to that disk was observed among members of the Farlowellini (Fig. 4B). In Harttiini and Loricariini, that structure is absent (state 0). An ill-developed process, united to the mesethmoid disk occurs in *Pterosturisoma*, *Sturisomatichthys aureus*, *S. dariensis*, *S. frenatus*, *S. panamensis*, *Sturisomatichthys* Baudó, *Sturisomatichthys* San Juan, *Sturisoma lyra*, *St. guentheri*, *St. monopelte*, *St. nigrirostrum*, *St. robustum*, *St. tenuirostre*, *Sturisoma* Madre de Dios, (state 1). A well-developed process, united to the mesethmoid disk was found to be an exclusive synapomorphy for *Farlowella*, except *F. myriodon* (state 2; Fig. 4A). Finally, a well-developed process, separated from the mesethmoid disk is present in *S. citurensis*, *S. leightoni*, and *S. tamanae* (state 3).

5. Mesethmoid ventral disk shape **CI=0.38**. (Fichberg, 2008, Ch. 4; Paixão & Toledo-Piza, 2009, Ch. 3; Provenzano, 2011, Ch. 2; modified).

0. Broad disk with a dorsal fenestra (Fig. 4A)
1. Robust, circular in lateral view, without fenestra (Fig. 4B)
2. Thin, circular lamina
3. Thin, triangular lamina
4. Thin, square lamina
5. Thin lamina without format

6. Position of ventral mesethmoid disk **CI=0.20**. (Ghazzi, 2003, Ch. 3; Paixão & Toledo-Piza, 2009, Ch. 4; Provenzano, 2011, Ch. 3; modified).

0. Terminal
1. Sub terminal (Fig. 4B)
2. Posterior (Fig. 4A)

7. Ventrolateral crest of mesethmoid **CI=0.11**. (Rapp Py-Daniel, 1997, Ch. 7; Ghazzi, 2003, Ch. 6; modified).

0. Narrow lamina
1. Short, easily observed on the margin of the proximal portion
2. Well-developed on the posterior margin
3. Well-developed along the entire mesethmoid

Among the Harttiini and Farlowellini, the development is variable (state 2). The crest is more developed among the Loricariini members (state 3).

8. Lateral process of sphenotic **CI=0.13**. (Armbruster, 2004, Ch. 116; Fichberg, 2008, Ch. 28; Paixão & Toledo-Piza, 2009, Ch. 8; modified).

0. Short
1. Reduced or absent
2. Thin and long
3. Broad and long

The sphenotic contributes to the posterior border of the orbital rim. Its contribution can vary depending on the presence or absence of its process, as well as on its degree of development. The type of process of the sphenotic is useful to diagnose the species of *Sturisoma*.

9. Orbital notch **CI=1.00**. (Paixão & Toledo-Piza, 2009, Ch. 9).

0. Absent (Fig. 3)
1. Present

The absence of orbital notch was found to be a synapomorphy for both the Harttiini and Farlowellini.

10. Sphenotic width (its largest extension) **CI=0.20**. (Rapp Py-Daniel, 1997, Ch. 14; Ghazzi, 2003, Ch. 12; modified).

0. Reduced, less than half the frontal length
1. Large, approximately more than half the frontal length

Within the Harttiini, *Ctenilorircaria platystoma* and *Harttia* species presented a sphenotic less than half the length of the frontal (state 0), which is an exclusive synapomorphy for the general mentioned above.

11. Sutures of anterior process of vomer **CI=0.13**. (Rapp Py-Daniel, 1997, Ch. 9; Ghazzi, 2003, Ch. 8; modified).

0. Short, interdigitated sutures
1. Long, interdigitated sutures
2. Absent

Short sutures (state 0) is the general condition for the Harttiini, while for the Loricariini and Farlowellini the vomer sutures are variable.

12. Lateral ethmoid contact with metapterygoid **CI=0.20**. (Howes, 1983; Schaefer, 1987, Ch. 1; 1991, Ch. 4; Rapp Py-Daniel, 1997, Ch. 10 and 11; Ghazzi, 2003, Ch. 9; Fichberg, 2008, Ch. 10; Paixão & Toledo-Piza, 2009, Ch. 7; Provenzano, 2011, Ch. 8; modified).

0. Broad suture, in contact along entire lateral border of lateral ethmoid
1. Contact only through anterior and posterior tips
2. Contact only through anterior tip only
3. Contact only through posterior tip only
4. Contact absent

Within Loricariinae, a broad suture, in contact along the entire lateral border of the lateral ethmoid is the general condition for the Loricariini.

13. Laterodorsal process of lateral ethmoid **CI=0.26**. (Schaefer, 1991, Ch. 6; Rapp Py-Daniel, 1997, Ch. 12; Ghazzi, 2003, Ch. 11; Fichberg, 2008, Ch. 13; modified).

0. Well-developed folds
1. Pointed
2. Expanded
3. Strut-like
4. Absent

14. Posteroventral border of lateral ethmoid **CI=0.09**. (Rapp Py-Daniel, 1997, Ch. 13; Fichberg, 2008, Ch. 14; modified).

0. Broad, next to anterior border of orbit rim
1. Ill-developed, do not contribute to border of orbital rim
2. Well-developed, contribute to border of orbital rim

15. Nasal bone length **CI=0.33**. (Fichberg, 2008, Ch. 57).

0. Longer than broad
1. Short, broader than long

The general condition observed among the Harttiini, Farlowellini, and Loricariini is a nasal bone longer than broad (state 0; Fig. 3A,C). The only exception observed within the Loricariinae was *Farlowella myriodon* and *Loricariichthys* (state 1; Fig. 3B).

16. Nasal bone shape **CI=0.04**. (Rapp Py-Daniel, 1997, Ch. 171; Fichberg, 2008, Ch. 56; modified)

0. Rectangular, borders straight or slightly curved (Fig. 3A)
1. Approximately rectangular, with lateral extension at anterior distal portion (Fig. 3C)

17. Lateral lamina of orbitosphenoid **CI=0.07**.

0. Reduced, do not participate extensively of lateral border of orbital rim, dorsally oriented

1. Next to lateral border of orbital rim, do not contribute extensively, laterally oriented

The orbitosphenoid has lateral expanded laminae, which sometimes contribute to the border of the orbital rim. In Harttiini and *Farlowella* the lateral laminae are reduced, not participating extensively of the lateral border of the orbital rim, and are dorsally oriented (state 0). The not contribution to the orbital rim (state 1) was variable among the other groups.

18. Participation of frontal in dorsal border of orbital rim **CI=0.14**. (Rapp Py-Daniel, 1997, Ch. 15; Fichberg, 2008, Ch. 17; Provenzano, 2011, Ch. 30; modified).

0. Without participation
1. Reduced participation, tip of frontal contacting border of orbital rim (Fig. 3B)
2. Contributes 1/3 of dorsal border of orbital rim
3. Extensive participation, covering half or slightly more than half of dorsal border of orbital rim (Fig. 3A,C)
4. Contributes to almost entire dorsal border of orbital rim

The participation of the frontal in the dorsal border of the orbital rim is quite variable. In the Harttiini, an extensive participation, covering half or slightly more than half of the dorsal border of the orbital rim, is a non-exclusive synapomorphy within Loricariinae. In addition, a contribution to almost the entire dorsal border of the orbital rim is exclusive of Loricariini.

19. Basioccipital connection to exoccipital **CI=0.09**. (Rapp Py-Daniel, 1997, Ch. 18; Ghazzi, 2003, Ch. 18; Fichberg, 2008, Ch. 22; modified).

0. Basioccipital not sutured to transcapular ligament, exoccipital between both structures
1. Basioccipital sutured to transcapular ligament, exoccipital excluded

20. Basioccipital lateral processes **CI=0.08**. (Rapp Py-Daniel, 1997, Ch. 21; Fichberg, 2008, Ch. 26; Provenzano, 2011, Ch. 19; modified).

0. Absent
1. Small, shorter than height of basioccipital, not ventrally expanded
2. Big, laterally expanded

21. Exoccipital ventral lamina **CI=0.13**. (Provenzano, 2011, Ch. 21; modified).

0. Thick lamina, shortly expanded ventrally, not in contact with transcapular ligament
1. Thin lamina, expanded ventrally, partially in contact with transcapular ligament
2. Thin lamina, expanded ventrally, in contact with transcapular ligament along its entire length
3. Absent

22. Exoccipital in ventral view **CI=0.09**. (Fichberg, 2008, Ch. 24).

0. Quadrangular, expanded
1. Rectangular, narrow

23. Exoccipital fenestra between ventral lamina and transcapular ligament **CI=0.07**.

0. Present
1. Absent

As stated above, the exoccipital have a ventral lamina that either contacts or not the transcapular ligament. In most Loricariidae examined here, a small fenestra between those two structures is present (state 0).

24. Suture between basioccipital and transcapular ligament **CI=0.10**. (Rapp Py-Daniel, 1997, Ch. 18; Ghazzi, 2003, Ch. 18; Fichberg, 2008, Ch. 22; Paixão & Toledo-Piza, 2009, Ch. 38).

0. Absent
1. Present

25. Ventral expansion of transcapular ligament **CI=0.07**. (Fichberg, 2008, Ch. 23).

0. Ventrally and posteriorly expanded (Fig. 5A)
1. Only ventrally expanded (Fig. 5B)

As stated by Fichberg (2008) the ossified transcapular ligament is a synapomorphy for Siluriformes. Additionally, within Loricariidae different types of expansion are observed that could be related to the type of pectoral girdle of each species.

26. Angle of lamina formed by lateral process of basioccipital connection to ventral lamina of compound pterotic **CI=0.13**. (Ghazzi, 2003, Ch. 20; modified).

0. Parallel to transverse angle of body
1. Anteriorly oriented
2. Posteriorly oriented

In *Harttia* a lamina parallel to the transverse direction of the body (state 0) is the usual condition. Nevertheless, it does not represent an exclusive synapomorphy for the genus as that state is also present in *Harttiella*, *Lamontichthys*, *Pterosturisoma* and *Sturisomatichthys* .

27. Anterior process of prootic in contact with hyomandibula **CI=0.50**.

0. Absent
1. Present

The prootic is located between the orbitosphenoid (anteriorly), the exoccipital posteriorly, and the compound pterotic laterally. This structure can either have (state 1), or not (state 0) a process. Additionally, the process can be in contact with the hyomandibula. In *Harttia*, *Harttiella*, *Ctenilloricaria*, *Lamontichthys*, *Pterosturisoma*, *Sturisoma lyra*, and Loricariini, the process is absent, while in *Sturisomatichthys*, *Farlowella*, and the remaining *Sturisoma* species, the process is present.

28. Contribution of compound pterotic to articulation of hyomandibula with cranium **CI=0.22**. (Schaefer, 1997, Ch. 4; Rapp Py-Daniel, 1997, Ch. 44; Ghazzi, 2003, Ch. 36; Armbruster, 2004, Ch. 34; Fichberg, 2008, Ch. 65; Paixão & Toledo-Piza, 2009, Ch. 30; modified).

0. Extense, same length as prootic
1. Reduced, shorter than prootic
2. Reduced or absent, articulation almost exclusively with prootic

29. Perforations on compound pterotic **CI=0.05**. (Rapp Py-Daniel, 1997, Ch. 20).

0. Small
1. Large (Fig. 3)

SENSORY CANALS

30. Infraorbital canal **CI=0.13**. (Rapp Py-Daniel, 1997, Ch. 168; Fichberg, 2008, Ch. 53).

0. Less than six pores
1. Six pores
2. More than six pores

31. Passage of preopercular canal through infraorbitals **CI=0.15**. (Rapp Py-Daniel, 1997, Ch. 163; Ghazzi, 2003, Ch. 119).

0. None
1. Passing through interorbital five
2. Passing through interorbital six

32. Preopercle shape **CI=0.37**. (Rapp Py-Daniel, 1997, Ch. 50; Ghazzi, 2003, Ch. 41; modified).

0. Broad, height greater than that of quadrate (Fig. 6A,B,C,F)
1. Same height as quadrate, with thin projection passing through quadrate (Fig. 6D,E)
2. Same height as quadrate, without anterior projection
3. Height smaller than that of quadrate, thin and reduced lamina

The preopercle appears as part of the suspensory, and it is attached to the quadrate and the hyomandibula (Fig. 6). As discussed below, this structure can be seen externally by means of an opening between the snout plates (see character 35). The shape of the preopercle is variable, and in *Harttia*, *Harttiella*, *Lamontichthys*, and *Farlowella myriodon* the preopercle is broad, with its height greater than that of the quadrate (state 0). While a preopercle with the same height as the quadrate, with a thin projection passing through the quadrate (state 1) was found among *Cteniloricaria*, *Sturisoma*, *Sturisomatichthys*, and the remaining *Farlowella*. States 2 and 3 were observed to be present among members of the Loricariini.

33. Preopercle ventral process **CI=0.50**. (Rapp Py-Daniel, Ch. 53; Ghazzi, 2003, Ch. 43; Paixão & Toledo-Piza, 2009, Ch. 32).

0. Absent

1. Present

Rapp Py-Daniel (1997) discussed the presence of a process in the preopercle as a synapomorphy for the Harttiini (her Figures 16A and B; Fig. 6); the author included the genera: *Sturisomatichthys*, *Farlowella*, *Aposturisoma* (= *Farlowella*), *Sturisoma* (her Farlowellina) and *Harttia*, *Ctenіloricaria*, *Lamontichthys*, *Harttiella* and *Pterosturisoma* (her Harttiina) as members of the Harttiini. We found here that, in fact, that is a synapomorphy for those genera within the Loricariinae, but is not useful to distinguish the Harttiini from the Farlowellini (classification proposed here).

34. Preopercle canal shape **CI=0.13**. (Rapp Py-Daniel, Ch. 54; Ghazzi, 2003, Ch. 120).

0. Straight with two exits
1. Curved but not branched, two exits
2. Curved and branched, three exits
3. Straight with three exits, branched
4. Absent

35. Preopercle exposed surface **CI=0.10**. (Rapp Py Daniel, 1997, Ch. 51; Ghazzi, 2003, Ch. 42; Paixão & Toledo-Piza, 2009, Ch. 33; modified).

0. Absent, bearing odontodes
1. Small, 1/3 or less size of second infraorbital
2. Big, half or equal size of second infraorbital

36. Preopercle connection to dermal plates **CI=0.27**. (Rapp Py Daniel, 1997, Ch. 52; modified).

0. Loosely connected to dermal plates
1. Contact via dorsal ridge of preopercle
2. Preopercle strongly sutured to dermal plates
3. No contact

37. Position of canal-bearing cheek plate on head **CI=0.40**. (Schaefer, 1988; Ghazzi, 2003, Ch. 117; Paixão & Toledo-Piza, 2009, Ch. 34; modified).

0. Lateral
1. Ventrolateral

2. Ventral (Fig. 7)

Schaefer (1988) described the canal-bearing cheek plate as being an element of the loricariids, which appears to be homologous with a dermal cheek plate, rather than the interopercle (Schaefer, 1988: 90). The author goes on and states that, in loricariids, the second of two preopercle canal exits passes into and forms a canal in what appears to be a dermal cheek plate (Schaefer, 1988: 84, Fig. 3c and 4).
It was found that the ventral position (state 2; Fig. 7) of the plate is an exclusive synapomorphy of the Harttiini and the Farlowellini, except for *Sturisomatichthys citurensis* and *S. tamanae* that have a ventrolateral plate (state 1).

38. Canal-bearing cheek plate ventral process **CI=0.20**.

0. Absent
1. Short and broad
2. Long and broad
3. Long and thin

The canal-bearing cheek plate can have a ventral process with different formats. The absence of the process (state 0) was observed on some *Sturisoma*, *Sturisomatichthys*, and *Farlowella* species. For *Harttia*, *Ctenilorciaria*, and *Pterosturisoma*, as for the remaining *Sturisoma* and *Sturisomatichthys* species, and *Farlowella platorynchus*, either a short, broad process (state 1) or a long and broad process (state 2) was observed. A long and thin process (state 3) was found to be an exclusive synapomorphy for *Harttiella* (Fig. 7).

39. Orientation of canal on canal-bearing cheek plate **CI=0.22**. (Schafer, 1988; Rapp Py-Daniel, 1997, Ch. 161; Fichberg, 2008, Ch. 47; Paixão & Toledo-Piza, 2009, Ch. 35; modified).

0. From posterolateral to anterolateral portion
1. From dorsal to ventral border
2. From median anterior portion of plate, to posterodorsal end of plate

40. Last infraorbital canal **CI=0.14**. (Ghazzi, 2003, Ch. 121).

0. One exit, dorsally oriented

1. Two exits, ventrolateral and dorsal

The generalized condition within Loricariinae observed was that of one dorsally oriented exit (state 0). Nevertheless, canal with two exits, laterodorsal and dorsal (state 1) was observed on *Sturisoma lyra*, *S. guentheri*, *S. robustum*, *Sturisomatichthys kneri*, *Farlowella reticulata*, *F. vittata*, and *Hemiloricaria lanceolata*.

41. Point of bifurcation of infraorbital and supraorbital canals **CI=0.12**. (Arratia & Gayet, 1995; Rapp Py-Daniel, 1997, Ch. 166).

0. On sphenotic
1. At border between sphenotic and compound pterotic

For the Harttiini, except for *Cteniloricaria platystoma,* the condition observed was the bifurcation of the infraorbital and supraorbital canal on the sphenotic (state 0). In *Sturisomatichthys*, *Farlowella* except *F. myriodon*, and the Loricariini except *Loricaria* sp., the bifurcation occurs at the border between the sphenotic and the compound pterotic (state 1). For the remainder taxa, both states were variable across taxa.

42. Plate between infraorbitals 2 and 3 **UNINFORMATIVE** (Paixão & Toledo-Piza, 2009, Ch. 37).

0. Absent
1. Present

As stated by Paixão & Toledo-Piza (2009) a plate between infraorbitals 2 and 3 (state 1) is present on both *Lamontichthys avacanoeiro* and *L. parakana*. Additionally, that state was also found here to be present on *Spatuloricaria puganensis*, *Limatulichthys griseus, Hemiloricaria lanceolata* and *Rineloricaria quadrensis*. The absence of such plate (state 0) was observed in the remainder taxa.

43. Parieltal branch of supraorbital canal length **CI=0.11**. (Rapp Py-Daniel, 1997, Ch. 173).

0. Short, reaching only half of sphenotic
1. Long, more than half of sphenotic

44. Parietal branch terminal exit **CI=0.14**. (Rapp Py-Daniel, 1997, Ch. 174).

0. Ending on frontal
1. Ending on frontal/supraoccipital border
2. Ending on frontal/sphenotic border
3. Ending on supraoccipital
4. Ending on sphenotic

45. Parietal branch shape **CI=0.18**. (Rapp Py-Daniel, 1997, Ch. 172; Fichberg, 2008, 58).

0. Straight
1. Curved, once
2. Sinuous, twice

46. Length of lateral line **CI=0.08**. (Schaefer, 1991, Ch. 45; Rapp Py-Daniel, 1997, Ch. 138; Ghazzi, 203, Ch. 98).

0. Truncated, ending one to four plates before supracaudal plates
1. Complete, last canal on last plate of caudal peduncle, but not entering supracaudal plates
2. Extended, lateral line ending on supracaudal plates

MAXILLA AND DENTARY

47. Length of posterior process of palatine **CI=0.09**. (Paixão & Toledo-Piza, 2009, Ch. 18; modified).

0. Long, extending beyond anterior condyle of lateral ethmoid
1. Short, not extending beyond anterior condyle of lateral ethmoid
2. Absent

The palatine is connected anteriorly through a cartilaginous plug to the maxillar bone (Fig. 8). Within Harttiini, *Harttiella* possesses a long posterior process, extending beyond the anterior condyle of the lateral ethmoid (state 0; Fig. 8A), for the same occurring in some Farlowellini and Loricariini. *Cteniloricaria* and *Harttia* possess a short posterior process, not extending beyond the anterior condyle of the lateral ethmoid (state 1; Fig. 8B), although it is not an exclusive synapomorphy for any of the genera. An absence of such process (state 2) was observed on some Loricariini, as well as representatives of taxa outside the Loricariinae.

48. Lateral flange of palatine **CI=0.11**. (Paixão & Toledo-Piza, 2009, Ch. 19).

0. Present and incomplete
1. Present and complete
2. Absent

For most *Sturisoma* species, except *S. barbatum*, *S. monopelte*, and *S. nigrirostrum*, a present but incomplete lateral flange (state 0) was observed. In most Loricariini, a complete lateral flange (state 1) is present. The absence of such flange (state 2) was observed on *Sturisomatichthys*, except *St. kneri* and *St. panamensis*, and *Farlowella* except *F. henriquei*, *F. jauruensis*, *F. oxyrryncha*, *F. paraguayensis*, and *F. smithi*.

49. Palatine anterior process **CI=0.20**. (Rapp Py-Daniel, 1997, Ch. 26; Ghazzi, 2003, Ch. 23; Fichberg, 2008, Ch. 68).

0. Absent
1. Present

The presence of the palatine anterior process (state 1) was generally observed among Harttiini and Farlowellini taxa, except *Lamontichthys avacanoeiro*, *L. parakana*, *Farlowella myriodon*, *F. acus*, and *F. paraguayensis*. Absence of process (state 0) is the general condition among the Loricariini and the taxa named above.

50. Palatine shape **CI=0.16**. (Regan, 1911; Gosline, 1975; de Pinna 1993, Ch. 18; Rapp Py-Daniel, 1997, Ch. 23; Ghazzi, 2003, Ch. 22; modified).

0. Rod-like, irregular (Fig. 8A,C)
1. Rectangular, straight (Fig. 8B)

51. Palatine splint **CI=0.07**. (Schaefer, 1987; Rapp Py-Daniel, 1997, Ch. 24; Fichberg, 2008, Ch. 73; Paixão & Toledo-Piza, 2009, Ch. 20).

0. Absent

1. Present

The palatine splint is an anterior additional process that is absent (state 0) or present (state 1; Fig. 8A) among loricariids. For an extensive discussion of its homology, the reader is referred to Schaefer (1987).

52. Length of cup-shaped portion of premaxilla relative to cup shaped portion of dentary **CI=0.16**. (Rapp PY-Daniel, 1997, Ch. 28; Paixão & Toledo-Piza, 2009, Ch. 22; modified).

0. Similar
1. Distinctly longer
2. Distinctly shorter

53. Coronoid process of dentary **CI=0.16**. (Paixão & Toledo-Piza, 2009, Ch. 23; Provenzano, 2011, Ch. 36; modified).

0. Large, with small robust area
1. Large, with large robust area
2. Small
3. Absent

Ventrally, the dentary possesses a process which can be variable among loricariids. Its function have been described to serve for insertion of the *adductor* muscles (Schaefer, 1987; Paixão & Toledo-Piza, 2009). *Harttia* invariable has a large coronoid process, with small robust area (state 0) although not exclusive for the genus. *Harttiella*, *Lamontichthys*, *Cteniloricaria*, *Pterosturisoma*, and *Farlowella* have a large coronoid process, with large robust area (state 1; Fig. 6A,F), except for *F. myriodon*, *F. oxyrryncha*, *F. rugosa*, and *F. venezuelensis*. Among members of *Sturisoma*, *Sturisomatichthys*, and the Loricariini a small coronoid process (state 2; Fig. 6E) and the absence of such process (state 3) was observed; nevertheless, state 0 and 1, were observed on some of the taxa belonging to those groups.

54. Posteroventral lamina of dentary **CI=0.25**. (Paixão & Toledo-Piza, 2009, Ch. 24).

0. Present
1. Absent

The dentary of loricariids usually has a long posteroventral lamina of bone that overlies the posterior face of the anguloarticular (Schaefer, 1987:12; Paixão & Toledo-Piza, 2009: 545). In Harttiini and Farlowellini such lamina is invariably present (state 0); in members of the Loricariini the lamina is absent (state 1). Our results corroborates those of Paixão & Toledo-Piza (2009).

55. Process on posteroventral lamina of bone of dentary **CI=0.11**. (Paixão & Toledo-Piza, 2009, Ch. 25; modified).

0. Present, relatively distant from main body of dentary
1. Present, close to main body of dentary
2. Absent or very narrow

Farlowella invariably possesses a process relatively distant from the main body of dentary (state 0; Fig. 6A), while a process close to the main body of dentary (state 1; Fig. 6E,F) was observed across several taxa distributed among the Harttiini and the Farlowellini. Absence of such a process, or a narrow, almost vestigial one (state 2) was observed to be the general condition for the Loricariini.

56. Dentary teeth **CI=1.00**. (Fichberg, 2008, Ch. 169; modified).

0. More than 20 teeth
1. Less than 20 teeth
- . Inapplicable

For the Harttiini and Farlowellini, more than 20 dentary teeth (state 0) was the generalized condition observed; this corroborates observations of previous authors while defining groups within Loricariinae (i.e. Regan, 1904, 1911, 1913; Gosline 1945, 1970, 1971; Isbrücker 1979, 1980, 1981; Covain & Fisch-Muller, 2007) as a phylogenetically informative character to diagnose these groups from the Loricariini. The latter was observed to possess invariably less than 20 dentary teeth (state 1); although for *Loricariichthys* and *Hemiodontichthys,* this character is inapplicable due to the absence or vestigial state of the dentary bone, and thus, absence of teeth.

57. Shape of teeth cusps **CI=0.15**. (Rapp Py-Daniel, 1997, Ch. 184; Rodriguez, 2003; Fichberg, 2008, Ch. 143; modified).

0. Slightly rounded, oval
1. Rounded
2. Slightly pointed
3. Strongly pointed
- . Inapplicable

For the Harttiini and *Sturisoma*, except *S. rostratum*, *S. robustum*, *S. tenuirostre* and *Sturisoma* Madre de Dios, the generalized state is that of teeth with the longer cusp, straight (state 0). For *Lamontichthys*, *Pterosturisoma*, *Farlowella acus*, *F. myriodon*, *F. venezuelensis* and *F. vittata*, the above-mentioned *Sturisoma* species, *Sturisomatichthys* except *St. dariensis*, *St. frenatus* and *St. kneri,* rounded cusps (state 1) were observed. For the remainder species of *Farlowella*, slightly pointed cusps are present (state 2), while for the Loricariini strongly pointed teeth are the general condition (state 3). For *Loricariichthys* and *Hemiodontichthys* this character is inapplicable.

58. Cusp size of dentary teeth **CI=0.12**. (Fichberg, 2008, Ch. 145; modified).

0. Cusps with same size or approximately with same size
1. Inner cusp slightly longer than outer
2. Inner cusp distinctly longer than outer
3. Only inner cusp present
- . Inapplicable

59. Length of dentary compared to anguloarticular **CI=0.28**. (Provenzano, 2011, Ch. 38; modified).

0. Approximately with same size
1. Dentary almost twice size of anguloarticular (Fig. 6A,E)
2. Dentary half or little less than half anguloarticular length (Fig. 6F)

60. Shape of premaxillary teeth **CI=0.33**. (Paixão & Toledo-Piza, 2009, Ch. 26; modified).

0. Teeth robust, relatively short and wide, straight
1. Teeth delicate, long and narrow, tooth cusp forming angle of approximately 45° with longer axis of tooth

- . Inapplicable

In the Loricariini and remainder of subfamilies examined robust teeth (state 0) was the generalized condition, while for the Harttiini and Farlowellini delicate teeth (state 1) was invariably observed. For *Hemiodontichthys* this character is inapplicable.

61. Cusp size of premaxillary teeth **CI=0.16**. (Boeseman, 1971; Schaefer, 1987; Rapp Py-Daniel, 1997, Ch. 184; Fichberg, 2008, Ch. 168; modified).

0. Almost equal
1. One cusp visible larger than the other
-. Inapplicable

62. Size of premaxillary teeth compared to dentary teeth **UNINFORMATIVE** (Fichberg, 2008, Ch. 170; modified).

0. Premaxillary teeth smaller or with same size as dentary teeth
1. Premaxillary teeth larger than dentary teeth
2. Premaxillary teeth absent

For the Harttiini and the Farlowellini the general condition is the possession of premaxillary teeth smaller or equal in size as dentary teeth (state 0). *Loricaria* sp. possesses premaxillary teeth larger than dentary teeth (state 1), while in *Hemiodontichthys* premaxillary teeth are absent (state 2).

63. Premaxilla shape **CI=0.40**. (Rapp-Py Daniel, 1997, Ch. 28; Ghazzi, 2003, Ch. 25; Provenzano, 2011, Ch. 31; modified).

0. Thick, quadrangular
1. Bony lamina
2. Reduced, vestigial

Harttiini and Farlowellini invariably have a thick, quadrangular premaxilla, as well as *Hemiloricaria lanceolata* and *Rineloricaria* (state 0). Most of the Loricariini possess the premaxilla shaped as a bony lamina (state 1), or reduced, vestigial (state 2).

64. Length versus width of cup-shaped region of premaxilla **CI=0.50**. (Paixão & Toledo-Piza, 2009, Ch. 21; modified).

0. Two to three times longer than wide
1. Length and width equivalent
- . Inapplicable

In Harttiini and Farlowellini the length of the cup-shaped region of the premaxillary is two to three times longer than wide (state 0), while in the Loricariini length and width are invariably equivalent (state 1). This character is inapplicable for *Hemiodontichthys*.

65. Length of premaxilla relative to dentary **CI=0.07**.

0. Shorter, smaller
1. Same size and length
2. Larger, bigger
- . Inapplicable

Members of the Loricariini have a shorter, smaller premaxilla (state 0). On the other hand, in members of the Harttiini and Farlowellini the premaxilla is either the same size as the dentary (state 1), or larger, bigger (state 2).

66. Premaxilla size compare to palatine size **CI=0.15**.

0. Same size
1. Larger, bigger
2. Smaller, shorter

A premaxilla the same size as the palatine (state 0), or larger, bigger (state 1) was present across several taxa among the groups studied. On the other hand, in *Farlowella* except *F. myriodon*, *Sturisoma* and *Sturisomatichthys* except *S. tamanae,* the premaxilla is smaller, shorter compared to the palatine (state 2).

67. Maxilla size **CI=0.07**. (Provenzano, 2011, Ch. 33; modified).

0. Slightly larger than palatine (Fig. 8B)
1. Same size as palatine
2. Shorter, smaller than palatine (Fig. 8A,C)

68. Thickness of maxilla compared to palatine **CI=0.33**. (Fichberg, 2008, Ch. 74).

0. Maxilla thicker than palatine
1. Maxilla as thick as palatine

The generalized condition for the Loricariinae is same thickness on both structures (state 1). A maxillary bone thicker than the palatine (state 0) was observed only on some taxa outside the Loricariinae.

SUSPENSORIUM

69. Metapterygoid canal **CI=0.08**. (Howes, 1983; Schaefer 1987, Ch. 2; 1991, Ch. 15; Rapp-Py Daniel, 1997, Ch. 36; Ghazzi, 2003, Ch. 29; Fichberg, 2008, Ch. 70; modified).

0. Shallow, inconspicuous
1. Deep, partially covered by bony shelf
2. Deep, totally covered by bony shelf

As described by several authors (e.g. Lundberg, 1982; Arratia, 1987; Schaefer, 1987) a horizontal or to some extent, vertical crest, can be present on the metapterygoid. The function of this crest has been described as insertion area of the *levator arcus palatini* muscle, and its development could be directly related to the development of that muscle. It was found a correlation regarding the dentary size, and the type of canal; since the canal is related to the insertion of the *levator arcus palatini* muscle, it could be related to the dentary size, and hence, the feeding behavior. For the Loricariini, the generalized, but not exclusive condition is that of a shallow, inconspicuous canal (state 0); while for members of the Harttiini and the Farlowellini, both a deep, partially covered canal (state 1; Fig. 6C,F), and a deep, totally covered canal (state 2; Fig. 6A,B,E) were observed. For the Loricariini a weaker, smaller dentary is observed, and thicker and bigger dentary are characteristic of the Harttiini and Farlowellini.

70. Condyle on articulation metapterygoid-lateral ethmoid **CI=0.03**. (Provenzano, 2011, Ch. 44).

0. Absent

1. Present

The contact between the metapterygoid and the lateral ethmoid was already described above (see character 12). Nevertheless, it was observed, that the metapterygoid cannot (state 0) or can (state 1) possess a condyle as part of that contact. Contrary to what Provenzano (2011) described, we did not observe here the condyle to be present on all *Farlowella* (including *F. myriodon*) and the Harttiini. It was found that not only for the Harttiini, but also for the Farlowellini and Loricariini, the presence or absence of this structure is variable, and not characteristic of any of those groups.

71. Suture between metapterygoid and hyomandibular **CI=0.05**. (Arratia 1990; Schaefer, 1991, Ch. 16; Rapp-Py Daniel, 1997, Ch. 39; Ghazzi, 2003, Ch. 32).

0. Short, less than half contact area between both structures
1. Long, more than half contact area between both structures

72. Metapterygoid shape **CI=0.25**.

0. Inverted triangle, without anterodorsal process (Fig. 6B,C,D,F)
1. Asymmetrical, with ventral straight border (Fig. 6E)
2. Inverted triangle, with anterodorsal process
3. Dorsal border greatly expanded (Fig. 6A)
4. Ventral and dorsal base straight and equally expanded

73. Metapterygoid anterior process (Rapp Py-Daniel, 1997, Ch. 37) **CI=0.05**.

0. Absent
1. Present

Among species of *Harttia*, it was invariably observed the presence of an anterior process (state 1; Fig. 6C). Nevertheless, the process is present among several species belonging to the Farlowellini and Loricariini as well.

74. Dorsal canal on the metapterygoid **CI=0.25**.

0. Present
1. Absent

The presence of a dorsal canal is observed (state 0, Fig. 6) among all the Harttiini and Farlowellini examined here; the absence of the canal (state 1) was observed on Loricariini.

75. Contact between metapterygoid, hyomandibular, and symphyseal cartilage **CI=0.15**.

0. Extensive contact of bones without symphyseal intervening cartilage
1. Extensive contact of bones, symphyseal intervening cartilage limiting contact of structures along their entire length
2. Reduced contact of bones with symphyseal cartilage in between
3. Reduced contact of bones without symphyseal cartilage in between

An extensive and direct contact of the bones without symphyseal intervening cartilage (state 0; Fig. 6B,D) was observed on *Pterosturisoma*, *Sturisoma guentheri*, *S. nigrirostrum*, *S. robustum*, and *S. tenuirostre*, *Sturisomatichthys citurensis*, and some Loricariini. The condition of an extensive contact of the bones, but with symphyseal intervening cartilage precluding contact of the structures along their entire length (state 1; Fig. 6C,E,F) was observed in the Harttiini, *Lamontichthys*, the remainder *Sturisomatichthys* species, *Farlowella oxyrryncha*, *F. paraguayensis*, *F. platorynchus*, and *F. vittata*. Nevertheless, the remainder *Farlowella* and *Sturisoma* species, except *S. monopelte*, presented reduced contact of the bones with symphyseal cartilage in between (state 2; Fig. 6A). Finally, the latter and some Loricariini presented reduced contact of the bones without syimphyseal cartilage in between (state 3).

76. Quadrate size **CI=0.20**. (Rapp Py-Daniel, 1997, Ch. 48).

0. Large, broad
1. Tall posterior border, short (Fig. 6B,C,F)
2. Short posterior border, elongate (Fig. 6A,D,E)
3. Long and narrow almost throughout its entire length

77. Quadrate shape **CI=0.33**. (Provenzano, 2011, Ch. 46; modified)

0. Base straight, with curved dorsal border
1. Anterior portion narrow, becoming broader posteriorly ending on straight border

In Loricariinae the general condition of the quadrate is the anterior portion narrow, becoming broader posteriorly ending on a straight border (state 1; Fig. 6).

78. Symphyseal cartilage size **CI=0.37**.

0. Long and thin, occupying more than half hyomandibular ventral border
1. Large and broad, can overpass quadrate height
2. Short, small, overpass quadrate posterior border height
3. Reduced or absent

Hemipsilichthys gobio possesses a long and thin syimphyseal cartilage, occupying more than half the hyomandibular ventral border (state 0), as an autapomorphy. A short, small, the height of the quadrate posterior border (state 1) and a reduced or absent (state 3) symphyseal cartilage were observed among the Loricariini and taxa outside the Loricariinae. It is characteristic of the Harttiini and the Farlowellini a large and broad symphyseal cartilage, which can overpass the quadrate height (state 2; Fig. 6).

79. Hyomandibular surface type **CI=0.05**. (Schaefer 1991, Ch. 17; Rapp Py-Daniel, 1997, Ch. 41; Ghazzi, 2003, Ch. 34; modified).

0. Large concavity area (Fig. 6A,B,D,E)
1. Reduced concavity area (Fig. 6C,F)

80. Foramen on hyomandibular surface **CI=0.05**.

0. Absent (Fig. 6B,C,E,F)
1. Present (Fig. 6A,D)

81. Posterior extension of hyomandibular **CI=0.16**. (Lundberg 1970; Rapp Py-Daniel, 1997, Ch. 40; Ghazzi, 2008, Ch. 38; modified).

0. Absent
1. Present

The absence of an extension or process on the posterior portion of the hyomandibular (state 0; Fig. 6B,C) is characteristic of *Harttia*, *Cteniloricaria*, *Lamontichthys*, *Pterosturisoma*, *Sturisomatichthys*, and the Loricariini. In *Harttiella*, *Sturisoma* and *Farlowella* the presence of such extension (state 1; Fig. 6A,D,E,F) was invariable among their species.

82. Synchondrial joint between hyomandibular and cranium **CI=0.07**. (Lundberg 1970; Arratia 1990; Rapp Py-Daniel, 1997, Ch. 43; Ghazzi, 2003, Ch. 35; Provenzano, 2011, Ch. 52).

0. Including sphenotic, prootic and compound pterotic
1. Including only sphenotic and prootic

83. Hyomandibular *levator arcus palatine* crest **CI=0.05**. (Rapp Py-Daniel, 1997, Ch. 40; Provenzano, 2011, Ch. 50; modified).

0. Present (Fig. 6A,B,D,E)
1. Absent (Fig. 6C,F)

84. Articulation of posterior border of hyomandibular with compound pterotic **CI=0.05**. (Rapp Py-Daniel, 1997, Ch. 47; Provenzano, 2011, Ch. 53).

0. Only synchondral
1. Sutural and synchondral

85. Total contribution of compound pterotic to junction of hyomandibular and cranium **CI=0.06**. (Rapp Py-Daniel, 1997, Ch. 44; Ghazzi, 2003, Ch. 36; modified).

0. Large contribution, almost same as contribution of prootic
1. Reduced contribution, less than half that of prootic

86. Preopercle shape (Rapp Py-Daniel, 1997, Ch. 50) **CI=0.25**. (verificar com ch. 32)

0. Rectangular
1. Irregular, ventral border rounded
2. Inverted triangle, pointed ventral process
3. Thin lamina, occupying almost entire length of suspensorium base

The preopercule is located at the base of the suspensorium, joined to the quadrate anteriorly, and hyomandibular posteriorly (Fig. 6). This structure showed considerable variation regarding its shape among groups studied here. For the Harttiini, except

Harttiella, some *Sturisoma* and *Farlowella*, except *F. myriodon*, a rectangular preopercle (state 0; Fig. 6A,C) was observed. *Harttiella* showed an irregular preocpercle, with ventral border rounded (state 1; Fig. 6F) as an exclusive synapomorphy within the Loricariinae; some taxa belonging to other subfamilies showed that state as well. On the other hand, *F. myriodon*, *Pterosturisoma*, *Sturisomatichthys* and some *Sturisoma* species have the preopercle as an inverted triangle, with a pointed ventral process (state 2; Fig. 6B,D,E). Finally, in Loricariini, a preopercle has a thin lamina, occupying almost the entire length of the suspensorium base (state 3); an exclusive synapomorphy for the tribe.

87. Preopercle anterior process **CI=0.22**.

0. Short, reaching only base of quadrate
1. Long, reaching half or most of length of quadrate
2. Absent

A short process (state 0) was observed as the general and exclusive condition within Loricariinae for *Sturisomatichthys*, except *Sturisomatichthys* Baudó. For the Harttiini and the remainder Farlowellini, a long process (state 1; Fig. 6) is the general condition. *Sturisoma rostratum* and the Loricariini lack the process (state 2).

88. Shape of suspensorium **CI=0.14**. (Fichberg, 2008, Ch. 62; modified).

0. Square, not elongated
1. Rectangular, elongated

The Harttiini, *Lamontichthys*, *Farlowella myriodon*, *Pterosturisoma* and *Sturisomatichthys* have a square-shaped suspensorium (state 0; Fig. 6B,C,F), while the remaining *Farlowella*, *Sturisoma*, and some Loricariini have a rectangular and elongated suspensorium (state 1; Fig. 6A,D,E).

BRANCHIAL ARCHES

89. Relative width of ventral laminar expansion along posterior border of anterior ceratohyal **CI=0.15**. (Paixão & Toledo-Piza, 2009, Ch. 10; modified).

0. Widens gradually from medial to lateral portion, broad
1. Widens gradually from medial to lateral portion, narrow
2. Widens abruptly in lateral portion
3. Without ventral lamina

According to Paixão & Toledo-Piza (2009), in *Farlowella*, *Pterosturisoma* and *Sturisomatichthys*, the laminar expansion of anterior ceratohyal widens abruptly in the lateral portion of the bone. On the other hand, in *Harttia*, *Lamontichthys*, except *L. avacanoeiro*, and *Sturisoma* the ventral expansion of the anterior ceratohyal is relatively narrow overall, and it widens gradually along the extension of the bone (Paixão & Toledo-Piza, 2009: 540); this was partially corroborated here. In Harttiini, *Lamontichthys*, *Sturisoma* except *S. monopelte*, *S. nigrirostrum*, *S. rostratum*, *S. tenuirostre*, *Sturisoma* Madre de Dios, *Sturisomatichthys* Baudó, and *Sturisomatichthys* San Juan, it was observed a broad ventral expansion of the ceratohyal, that widens gradually from medial to lateral portion (state 0; Fig. 9A,B,C). In *Pterosturisoma*, some *Farlowella*, the above mentioned *Sturisoma* and the remaining *Sturisomatichthys*, a narrow ventral expansion that widens gradually from medial to lateral portion (state 1; Fig. 9D) was observed. Only for *Farlowella acus*, *F. curtirostra*, *F. hasemani* and *F. henriquei*, the laminar expansion widens abruptly (state 2). Finally, for some Loricariini and members of the other subfamilies included here, the posterior border of anterior ceratohyal lack a ventral lamina (state 3).

90. Anterior margin of ceratohyal **CI=0.18**. (Fichberg, 2008, Ch. 80; modified).

0. Irregular on proximal and distal portion
1. Irregular at middle portion of bone
2. Irregular along entire margin
3. Smooth

A ceratohyal anterior margin irregular on proximal and distal portion (state 0) was only observed on *Sturisoma tenuirostre* and *Sturisoma* Madre de Dios, members of the Neoplecostominae, and *Hemipsilichthys gobio*. *Lamontichthys*, *Farlowella myriodon*, *Sturisoma*, except *S. monopelte*, *S. robustum*, and *Sturisomatichthys* except *St. aureus*, showed an irregular margin at middle portion of bone (state 1; Fig. 9C). An anterior irregular margin along the entire margin (state 2; Fig. 9D) is present on *Pterosturisoma*, the remaining *Farlowella*, and some Loricariini. On the other hand, the Harttiini, *S. monopelte*, *S. robustum*, *St. aureus*, some Loricariini and members of another subfamilies, have a smooth anterior margin (state 3; Fig. 9A,B).

91. Ceratohyal anterior margin **CI=0.13**. (Schaefer, 1987, Ch. 28; Rapp Py-Daniel, 1997, Ch. 63; Fichberg, 2008, Ch. 84; modified).

0. Greatly expanded
1. Slightly expanded
2. Not expanded

Most *Farlowella*, *Sturisomatichthys aureus* and some Loricariini possess the ceratohyal as expanded as the hypohyal (state 0; Fig. 9D). Harttiini, *Pterosturisoma*, and the remaining *Sturisomatichthys*, have an expanded ceratohyal, while the hypohyal are not (state 1; Fig. 9A,B,C). *Lamontichthys*, *Sturisoma* and some *Farlowella* do not have any of those structures expanded (state 2).

92. Connection between ceratohyal and hypohyals **CI=0.12**. (Lundberg 1970; Rapp Py-Daniel, 1997, Ch. 62; Ghazzi, 2003, Ch. 47; Fichberg, 2008, Ch. 83).

0. Synchondral and suture
1. Only synchondral
2. Only suture

93. Anterior hypohial expansion **CI=0.20**.

0. Absent
1. Present

The anterior portion of the hypohyal can lack (state 0; Fig. 9C,D) or have an expansion (state 1; Fig. 9A,B).

94. Urohyal shape in dorsal view **CI=0.42**. (Fichberg, 2008, Ch. 77; modified).

0. Triangular with convex sides
1. Elliptical
2. Rectangular

3. Equilateral triangle

There is variation in shape regarding this structure among groups examined. A triangular urohyal, with convex sides (state 0) is exclusive of members outside Loricariinae. An elliptical urohyal (state 1) is exclusive of *Sturisomatichthys* and *Farlowella*, except *F. myriodon*, plus *Sturisoma nigrirostrum*. On the other hand, a rectangular bone (state 2) was found to be the generalized state for the Harttiini, in addition to *F. myriodon*. Moreover, an urohyal shaped as an equilateral triangle (state 3) is present on *Lamontichthys*, *Pterosturisoma*, the remaining *Sturisoma* and some Loricariini.

95. Posterior hypohial dorsal hook **CI=0.28**. (Rapp Py-Daniel, 1997, Ch. 61; Ghazzi, 2003, Ch. 46; Fichberg, 2008, Ch. 82).

0. Short, not projected
1. Large, projected
2. Absent

The posterior hypohial is located laterally to the ceratohyal, separated by a cartilage (Fig. 9, 10, 11, 12). It was observed a dorsal process on the posterior hypohial, which could vary in size. For the Loricariinae the generalized condition is that of a short, not projected hook (state 0). Nevertheless, for some Loricariini as *Loricaria* sp., *Crossoloricaria* sp., *Loricariichthys anus*, and *Dasyloricaria*, a large, projected hook was observed (state 1). The absence of the dorsal hook (state 2) was found to be an autapomomorphy for *Farlowella myriodon*.

96. Hypobranchial 1 shape **CI=0.23**. (de Pinna, 1993, Ch. 147; Rapp Py-Daniel 1997, Ch. 71; Ghazzi, 2003, Ch. 51; Paixão, 2004, Ch. 12; modified).

0. Hourglass like (Fig. 9B)
1. Fan like
2. Rod like (Fig. 9C,D)
3. Square

Hypobranchial 1 is located posterior to hypohyal and ceratohyal, and laterally to basibranchial (Fig. 11). Only the hypobranchial 1 is ossified in the Loricariidae. In non-Loricariinae taxa, except for *Harttia garavelloi*, an hourglass-shaped hypobranchial 1 was observed (state 0). Fan-like hypobranchial 1 (state 1) is present on *Cteniloricaria platystoma* as an autapomorphy within the Harttiini, in addition to *Loricariichthys*, *Loricaria* sp., and *Limatulichthys griseus*. Rod-like hypobranchial 1 (state 2) was the most common state observed within the Loricariinae, for the remainder Harttiini, *Lamontichthys*, *Sturisoma* except *S. rostratum*, *S. robustum* and *Sturisoma* Madre de Dios, *Sturisomatichthys*, *Farlowella* except *F. curtirostra*, *F. myriodon*, *F. platorynchus* and *F. rugosa*. Finally, a square hypobranchial 1 (state 3) was observed in *Pterosturisoma*, and the exceptions within genera mentioned for state 2.

97. Number of ossified basibranchials **CI=0.25**. (de Pinna, 1993; Rapp Py-Daniel, 1997, Ch. 64; Ghazzi, 2003, Ch. 48; modified).

0. One (Fig. 9A)
1. Two (Fig. 11)

98. Third basibranchial shape **CI=0.11**.

0. Vestigial (Fig. 9A)
1. Short (Fig. 9C)
2. Elongate (Fig. 9B)
3. As long as second basibranchial (Fig. 11)

99. Second basibranchial shape **CI=0.25**. (Rapp Py-Daniel, 1997, Ch. 67; Ghazzi, 2003, Ch. 50; modified).

0. Elongated (Fig. 9B, 11)
1. Extremely elongated
2. Short (Fig. 9A)
3. Vestigial

100. Ossification on basibranchial 3 **CI=0.33**. (Paixão & Toledo-Piza, 2009, Ch. 11).

0. Absent (Fig. 9A)
1. Present (Fig. 9B,C,D)

101. First ceratobranchial anterior flange **CI=0.28**. (Schaefer, 1987; Rapp Py-Daniel, 1997, Ch. 72; Ghazzi, 2003, Ch. 52; Fichberg, 2008, Ch. 91; Provenzano, 2011, Ch. 55; modified).

0. Large, covering half ceratobranchial, with or without filaments
1. Huge, same size, or larger than ceratobranchial, with or without filaments
2. Absent or very small, inconspicuous, no filaments

Ceratobranchials are located dorsally to epibranchials, and a cartilage plug (Fig. 9,12) attaches those structures. Ceratobranchial 1 was observed to possess an anterior process, which varies in size. A large anterior flange, covering half the ceratobranchial, with or without filaments (state 0; Fig. 9C,D; Fig. 12) is present on the Farlowellini, except for *Pterosturisoma*. For the Harttiini was observed a huge anterior flange, that can be the same size, or larger than ceratobranchial, with or without filaments (state 1; Fig. 9A,B) as an exclusive synapomorphy for the tribe. On *Pterosturisoma* and the Loricariini, an absent or very small, inconspicuous anterior flange, with no gill filaments (state 2) was observed.

102. Thickness of anterior flange on first ceratobranchial **CI=1.00**. (Ghazzi, 2003, Ch. 53; Fichberg, 2008, Ch. 92; Paixão & Toledo-Piza, 2009, Ch. 14; modified).

0. Thicker and broader lamina
1. Same thickness as ceratobranchial
-. Inapplicable

103. Fourth pharyngobranchial shape **CI=0.14**. (Rapp Py-Daniel, 1997, Ch. 81; Ghazzi, 2003, Ch. 64; modified).

0. Thick, large ossified shelf
1. Reduced ossified shelf, nodular, with thick cartilage around it
2. Nodular developed cartilage

Fourth pharyngobranchial is located ventrally to the upper pharyngeal plate. A variation in development and size of the structure across taxa examined was observed.

104. Fifth ceratobranchial or lower pharyngeal plate shape **CI=0.25**. (Rapp Py-Daniel, 1997, 81; Ghazzi, 2003, 65; modified).

0. Triangular (Fig. 13B)

1. Rod-like, with an expansion in the middle
2. Trapezoidal (Fig. 13A)
3. L-shaped

105. Fifth ceratobranchial or lower pharyngeal plate dentition **CI=0.25**. (Ghazzi, 2003, Ch. 66; modified).

0. Present
1. Absent

106. Fifth ceratobranchial or lower pharyngeal plate teeth shape **CI=1.00**. (Fichberg, 2008, Ch. 112; modified).

0. Reduced, pointed
1. Long, pointed
2. Long, broad
- . Inapplicable

The difference between shapes of teeth on pharyngeal plates could be related to ecological requirements of the Loricariidae. For most of the Harttiini and Farlowellini and *Metaloricaria*, reduced, pointed teeth (state 0) are the general condition. For the remainder Loricariini, except *Loricaria* sp. and *Crossoloricaria* sp., long pointed teeth (state 1) are present. Long, broad teeth (state 2) were observed only on the former and latter. For *Harttiella*, *Pterosturisoma*, *Farlowella myriodon*, and *F. hahni* this character is inapplicable.

107. Fifth ceratobranchial or lower pharyngeal plate teeth distribution (Rapp Py-Daniel, 1997, Ch. 85) **CI=0.30**.

0. Teeth restricted to mesial area
1. Teeth only on central area of plate
2. Plate almost, to completely toothed
3. Teeth lacking, or almost

108. Anterior process on first epibranchial **CI=0.06**. (Rapp Py-Daniel, 1997. Ch. 73; Ghazzi, 2003. Ch. 54; Fichberg, 2008, Ch. 93, modified).

0. Present (Fig. 12)

1. Absent (Fig. 9A)

109. Shape of anterior process on first epibranchial **CI=0.11**. (Rapp Py-Daniel, 1997. Ch. 73; modified),

0. Elongated and rounded in shape (Fig. 9B)
1. Relatively elongated and triangular
2. Reduced, as a triangle (Fig. 12)
- . Inapplicable

The presence/absence of anterior process on first epibranchial (see character 108) was variable among taxa examined, and hgh variation was observed within the monophyletic groups found here. The same was found regarding the difference in shape of that same process.

110. Posterior process on first epibranchial **CI=0.08**. (Ghazzi, 2003, Ch. 55; Fichberg, 2008, Ch. 94; modified).

0. Present
1. Absent

111. Shape of posterior process on first epibranchial **CI=0.09**. (Ghazzi, 2003, Ch. 55; modified).

0. Small, inconspicuous
1. Long, pointed
2. Large, laminar
- . Inapplicable

112. Anterior process on second epibranchial **CI=0.09**. (Ghazzi, 2003, Ch. 56; modified).

0. Short flap, laminar (Fig. 9A)
1. Absent (Fig. 9B,C,D)

113. Posterior process on second epibranchial **CI=0.19**. (Rapp Py-Daniel, 1997, Ch. 74; Ghazzi, 2003, Ch. 57; Fichberg, 2008, Ch. 96; modified).

0. Absent
1. Reduced

2. Small, uncinated, base expanded
3. Large, laminar
4. Elongated and laminar, expanded along its entire length

Metaloricaria, *Hemiodontichthys acipenserinus*, *Limatulichthys griseus*, and *Hemipsilichthys gobio* do not have a posterior process on the second epibranchial (state 0). A reduced process (state 1) was only observed on *Farlowella nattereri*, *F. rugosa*, *F. venezuelensis, Spatuloricaria puganensis* and members of the Hypostominae examined here. Some *Farlowella*, *Sturisomatichthys* except *S. kneri* and *S. panamensis*, and remaining members of other subfamilies outside Loricariinae, have a small, uncinated process, expanded on the base (state 2). A large, laminar process (state 3) was observed for *Harttiella longicauda*, *Sturisoma*, and some *Farlowella*. Finally, for *Harttia*, *Harttiella crassicauda*, *Ctenioricaria, Lamontichthys* and *Pterosturisoma,* an elongated and laminar process, expanded along its entire length (state 4) was the general condition.

114. Posterior process on third epibranchial **CI=0.44**. (Rapp Py-Daniel, 1997, Ch. 76; Ghazzi, 2003, Ch. 58; Fichberg, 2008, Ch. 97; modified).

0. Uncinated, laterally expanded
1. Elongated, laterally expanded
2. Short, not laterally expanded
3. Small, short
4. Absent

Taxa outside the Loricariinae possess an uncinated, laterally expanded process (state 0). Members of the Harttiini and Farlowellini, except *Farlowella venezuelensis* have an elongated, laterally expanded process (state 1). *Loricariichthys* and *Hemiodontichthys acipenserinus* were the only taxa with a short, not laterally expanded process (state 2). *Farlowella venezuelensis*, *Crossoloricaria* sp., *Limatulichthys griseus* and the Hypostominae possess a small and short process (state 3). The absence of a process was observed on the remaining Loricariini examined here (State 4).

115. Fourth epibranchial shape **CI=0.21**. (Fichberg, 2008, Ch. 114; modified).

0. L-shaped, base expanded on distal portion

1. Distal portion slightly expanded, not L-shaped
2. Curved rod
3. Straight rod

Harttiini and *Farlowella henriquei* possess an L-shaped epibranchial, with its base expanded on the distal portion in contact with fourth pharyngobranchial (state 0). *Lamontichthys*, *Pterosturisoma* and Hypostominae have the fourth epibranchial with the distal portion slightly expanded, not L-shaped (state 1). Most *Farlowella*, *Sturisomatichthys* and some Loricariini presented the fourth epibranchial as a curved rod (state 2). An epibranchial as straight rod (state 3) was observed on some *Farlowella*, all *Sturisoma*, and some Loricariini.

116. Shape of posterior process on fourth epibranchial **CI=0.21**. (Rapp Py-Daniel, 1997, Ch. 78; Ghazzi, 2003, Ch. 59; Fichberg, 2008, Ch. 99; modified).

0. Thick flap
1. Thin lamina
2. Short, small flap
3. Uncinated
4. Absent

117. Anterior process on fourth epibranchial **CI=0.06**. (Ghazzi, 2003, Ch. 60).

0. Reduced, inconspicuous
1. Conspicuous

118. Gill filaments on fourth epibranchial **CI=0.50**. (Rapp Py-Daniel, 1997, Ch. 79; Ghazzi, 2003, Ch. 61; Fichberg, 2008, Ch. 101; modified).

0. Strongly attached
1. Weakly attached
2. Without filaments

On the Harttiini, Farlowellini and members of subfamilies outside the Loricariinae, the gill filaments were observed to be strongly attached (state 0; Fig. 9). On members of the Loricariini, both weakly attached filaments (state 1) and the absence of them (state 2), were observed.

119. Upper pharyngeal tooth plates shape **CI=0.42**. (Rapp Py-Daniel, 1997, Ch. 87; Ghazzi, 2003, Ch. 68; Fichberg, 2008, Ch. 108; modified).

0. Round, oval
1. L-shaped
2. Club-shaped
3. Triangle-shaped

Loricariini possess round, oval upper pharyngeal plates (state 0) as an exclusive synapomorphy for the tribe within Loricariinae. While the Harttiini, exclusively possess L-shaped upper pharyngeal plates (state 1). A club-shaped pharyngeal plate (state 2) was observed to be exclusive of the Farlowellini, except *Sturisoma*. For the latter, a triangle-shaped upper pharyngeal plate (state 3) was observed to be an exclusive synapomorphy.

120. Upper pharyngeal plates dentition **CI=0.20**. (Rapp Py-Daniel, 1997, Ch. 88; Ghazzi, 2003, Ch. 70; Fichberg, 2008, Ch. 110; modified).

0. Complete
1. Incomplete

For the Loricariini, *Sturisomatichthys*, *Lamontichthys filamentosus* and *L. llanero*, a complete dentition on upper pharyngeal plates was observed (state 0). On the Harttiini and the remainder Farlowellini, an incomplete dentition (state 1) was the general condition.

121. Branchiostegal rays **CI=0.50**. (Rapp Py-Daniel, 1997, Ch. 55; Ghazzi, 2003, Ch. 44; Armbruster, 2004, Ch. 5; Fichberg, 2008, Ch. 79; modified).

0. Four
1. Less than four

Within the Loricariinae, the presence of four branchiostegal rays is the general condition (state 0). Nevertheless, it was found that *Farlowella*, except *F. myriodon*, have less than four branchiostegal rays (state 1; Fig. 9D).

WEBERIAN APPARATUS AND AXIAL SKELETON

122. Connection between transcapular ligament and fourth vertebra parapophyses **CI=0.50**. (Rapp Py-Daniel, 1997, Ch. 92).

0. Abutting ventrally
1. Abutting posteriorly
2. No contact

On *Farlowella*, *Sturisomatichthys* and the Loricariini, the transcapular ligament abuts ventrally to the fourth vertebra parapophyses (state 0). For *Pterosturisoma* and *Sturisoma* the ligament abuts posteriorly (state 1). Finally, for the Harttiini and *Lamontichthys*, absence of contact (state 2) was the general condition.

123. Fenestra with laminar process between transversal process of Weberian apparatus and transcapular ligament **CI=1.00**.

0. Absent
1. Present

The Weberian apparatus comprises the first five fused vertebrae and associated ribs for the loricariids (Alexander, 1965; Chardon, 1968; Grande, 1987), and its origin has been extensively studied (Rosen & Greenwood, 1970; Grande & de Pinna, 2004; Diogo, 2009). The apparatus possess an expansion, the transversal process of the complex centrum, which articulates with the compound pterotic and encapsulates the swim bladder (Schaefer, 1987; Londoño-Burbano & Reis, 2016). A fenestra with a laminar process between the apparatus and the associated structure, the transversal process (state 1; Fig. 5A), was observed as an exclusive synapomorphy for *Sturisomatichthys*. This condition is absent on the remaining taxa included here (Fig. 5B).

124. Type of contact between fourth vertebra parapophyses and compound pterotic **CI=0.25**. (Rapp Py-Daniel, 1997, Ch. 93).

0. Abuting
1. Suture

125. Length of fourth vertebra parapophyses **CI=0.21**. (Rapp Py-Daniel, 1997, Ch. 94; Fichberg, 2008, Ch. 32).

0. Short, not reaching compound pterotic border
1. Approximately same size as compound pterotic
2. Long, surpassing compound pterotic border
3. Long, reaching sixth vertebral rib

126. Lamina for articulation between sixth vertebra pterygiophore and ventral surface of supraoccipital **CI=0.28**. (Provenzano, 2011, Ch. 24).

0. Developed, leaned
1. Developed, expanded, straight
2. Reduced or absent

Harttia loricariformis, *H. gracilis*, *H. leiopleura*, *H. novalimensis*, *H. longipinna*, *H. rhombocepahala*, *Metaloricaria*, and taxa outside the Loricariinae, showed a developed, leaned lamina on the articulation between sixth vertebra and supraoccipital (state 0). *Farlowella*, except *F. myriodon*, showed a developed, expanded and straight lamina (state 1) as an exclusive synapomorphy contrary to what was observed by Provenzano (2011: 147) regarding the genus. A reduced or absent lamina (state 2), was observed on the remaining species of *Harttia*, and *Harttiella*, *Lamontichthys*, *Pterosturisoma*, *Sturisoma*, *Sturisomatichthys*, the Loricariini, and *F. myriodon*; we agree with Provenzano (2011) regarding the state of the latter.

127. Aortic canal extension **CI=0.18**. (Rapp Py-Daniel, 1997, Ch. 98; Fichberg, 2008, Ch. 36; modified).

0. Reaching sixth or seventh vertebrae
1. Reaching eight vertebra
2. Reaching ninth through eleventh vertebrae

128. Flange on lateral region of seventh vertebra **CI=0.33**. (Paixão & Toledo-Piza, 2009, Ch. 39).

0. Absent
1. Present, anteriorly directed
2. Present, posteriorly directed

We agree with Paixão & Toledo-Piza (2009) in that, in general, most of the Loricariidae lack a flange on the seventh vertebra (state 0). Nevertheless, for *Farlowella knerii*, *Sturisomatichthys citurensis*, and all *Lamontichthys* examined, the flange is present and anteriorly directed (state 1), including *L. avacanoeiro*, which according to Paixão & Toledo-Piza (2009) have the flange posteriorly directed. On the other hand, a posteriorly directed flange (state 2) was observed on *Farlowella jauruensis*, *Limatulichthys griseus*, and *Spatuloricaria puganensis*.

129. Seventh vertebra pleural rib **CI=0.18**. (Rapp Py-Daniel, 1997, Ch. 113).

0. Present and complete
1. Present but short
2. Vestigial or absent

130. Connecting bone **CI=0.18**. (Baskin, 1972; Rapp Py-Daniel, 1997, Ch. 119; Ghazzi, 2003, Ch. 83; Paixão & Toledo-Piza, 2009, Ch. 59; modified).

0. Contacting processes of second dorsal pterygiophore
1. Contacting processes of first pterygiophore
2. No contact with pterygiophores
3. Absent

Conditions regarding *Harttia*, *Farlowella* and *Lamontichthys* were confirmed when compared to those exposed by Paixão & Toledo-Piza (2009: 556). Some *Harttia*, all *Lamontichthys*, some *Sturisomatichthys*, *Cteniloricaria*, *Pterosturisoma*, and *Metaloricaria*, have the connecting bone contacting processes on the second dorsal pterygiophore (state 0). Some *Sturisoma* and Loricariini, presents contact with processes of dorsal first pterygiophore (state 1). The remaining *Sturisoma* and *Sturisomatichthys* do not show contact with dorsal pterygiophores (state 2). Finally, *Harttiella*, *Farlowella*, and the remaining *Harttia* do not have connecting bone (state 3).

131. Ventral process of Weberian complex **CI=0.21**. (Rapp Py-Daniel, 1997, Ch. 96; Fichberg, 2008, Ch. 34; modified).

0. Strong, at tip of complex centrum ventral process
1. Fragile, at tip
2. Fragile, at middle of ventral process
3. Non-ossified

132. Dorsal-fin spinelet **CI=0.09**. (Rapp Py-Daniel, 1997, Ch. 114; Ghazzi, 2003, Ch. 80; Armbruster, 2004, Ch. 149; Fichberg, 2008, Ch. 37; Paixão & Toledo-Piza, 2009, Ch. 52).

0. Present
1. Absent

According to Armbruster (2004), in callichthyids and most loricariids, as well as most other catfishes, the first dorsal-fin spine is a short, V-shaped structure often termed spinelet. That structure is in front of, and firmly attached to, the second, much longer, dorsal-fin spine. The author goes on and cites Alexander (1962) in saying that the spinelet slips under the nuchal plate to lock the dorsal-fin spine in an upright position by friction. Even though we observed presence of spinelet (state 0) on some taxa, it was not as generalized as Armbruster (2004) suggested. A considerable number of species belonging to *Harttia*, *Harttiella*, *Farlowella* and the Loricariini, do not have such structure (state 1).

133. Number of dorsal fin pterygiophores **CI=0.25**. (Rapp Py-Daniel, 1997, Ch. 116; Ghazzi, 2003, Ch. 82).

0. Eight
1. Less than eight
2. More than eight

134. Extent of contact between adjacent dorsal fin pterygiophores **CI=0.15**. (Rapp Py-Daniel, 1997, Ch. 117).

0. All pterygiophores partially separated
1. First and second in complete contact, others partially separated
2. Restricted contact only between second and third pterygiophore, all others in complete contact
3. Complete contact between all pterygiophores

135. Orientation of lateral process on second dorsal pterygiophore **CI=0.20**. (Rapp Py-Daniel, 1997, Ch. 118; Paixão & Toledo-Piza, 2009, Ch. 55).

0. Straight, directed laterally
1. Inclined or diagonally oriented
2. Strongly curved, dorsoanteriorly oriented

Harttia except *H. garavelloi*, *Farlowella*, *Sturisomatichthys*, some *Sturisoma*, *Metaloricaria*, and some Loricariini have the lateral process of second dorsal pterygiophore straight, directed laterally (state 0). Diagonally oriented lateral process (state 1) is an autapomorphy for *H. garavelloi*. A strongly curved, dorsoanteriorly oriented process (state 2) is found in *Lamontichthys*, *Ctenoloricaria*, *Pterosturisoma*, some *Sturisoma*, and some Loricariini. Our results partially agree with those of Rapp Py-Daniel (1997) and Paixão & Toledo-Piza (2009).

136. Type of articulation between proximal portion of dorsal fin spine and second dorsal-fin pterygiophore **CI=0.15**. (Rapp Py-Daniel, 1997, Ch. 115; Paixão & Toledo-Piza, 2009, Ch. 53; Provenzano, 2011, Ch. 63).

0. Through condyle on dorsal region of pterygiophore
1. Through simple contact with pterygiophore, no condyle
2. Through a circular hollow structure

As discussed by Paixão & Toledo-Piza (2009), dorsal-fin spine articulates with second pterygiophore via a chain-like structure (referred here as a circular hollow structure), a condition proposed as synapomorphic for Loricariinae by Schaefer (1987) and Armbruster (2004). This condition was partially corroborated here for Loricariinae, since an articulation through a condyle (state 0) was observed mainly outside the subfamily, plus *Pterosturisoma* and *Metaloricaria*. Nevertheless, *Harttia*, *Harttiella*, *Lamontichthys*, *Ctenoloricaria*, some *Sturisoma*, *Sturisomatichthys* and *Farlowella myriodon* have a simple contact with pterygiophore, without condyle (state 1). Taxa with articulation through a circular hollow structure (state 2) were restricted to *Sturisoma lyra*, *S. robustum*, *Sturisoma* Madre de Dios, the remaining *Farlowella*, *Loricariichthys*, *Hemiodontichthys acipenserinus*, *Loricaria* sp., *Crossoloricaria* sp., *Limatulichthys griseus*, *Dasyloricaria*, the Hypostominae, and *Pareiorhaphis calmoni*. Our observations differ significantly from those of Paixão & Toledo-Piza (2009).

137. Length of transverse process of first dorsal-fin pterygiophore relative to second dorsal-fin pterygiophore **CI=0.33**. (Paixão & Toledo-Piza, 2009, Ch. 54).

0. Shorter
1. Similar length
2. Longer
3. Absent

Schaefer (1991) described the transverse process on the first and second dorsal pterygiophore, as involved on the nuchal plate and first dorsal ray. *Pterosturisoma*, *Sturisomatichthys citurensis*, *S. tamanae*, *Metaloricaria*, and taxa outside Loricariinae, presented a shorter process of first dorsal-fin pterygiophore relative to second dorsal-fin pterygiophore (state 0). *Harttia punctata*, *Lamontichthys filamentosus*, *L. avacanoeiro*, *L. parakana*, and *Ctenilorcaria* have a process of similar length (state 1). A longer process (state 2) is present on *Sturisomatichthys festivus* and *Farlowella knerii*. Process absent (state 3) was the most common condition within Loricariinae, with most *Harttia*, *Harttiella*, *L. llanero*, *Sturisoma*, and the remaining *Sturisomatichthys* and *Farlowella* presenting that condition.

138. Transverse process on fifth dorsal-fin pterygiophore **CI=0.06**. (Paixão & Toledo-Piza, 2009, Ch. 57).

0. Present
1. Absent

Contrary to what was suggested by Paixão & Toledo-Piza (2009), the lack of process is observed on some *Sturisomatichthys* species, but also on some *Harttia* and *Farlowella*.

139. Transverse process of sixth dorsal-fin pterygiophore **CI=0.06**. (Paixão & Toledo-Piza, 2009, Ch. 58; Provenzano, 2011, Ch. 57).

0. Present
1. Absent

We partially agree with Paixão & Toledo-Piza (2009) in that *Harttia* and *Sturisomatichthys* lack transverse process, while *Lamontichthys*, *Farlowella*, and *Sturisoma* have process.

140. Number of precaudal vertebrae **CI=0.12**. (Rapp Py-Daniel, 1997, Ch. 110; Ghazzi, 2003, Ch. 78; Paixão & Toledo-Piza, 2009, Ch. 50; Provenzano, 2011, Ch. 58; modified).

0. More than 14
1. 13
2. 12
3. 11

Within Loricariinae more than 14 precaudal vertebrae were not observed, which agrees with previous authors (Schaefer, 1987; Rapp Py-Daniel, 1997; Paixão & Toledo-Piza, 2009). Nevertheless, the reduction to 11 precaudal vertebrae was not found to be exclusive of *Sturisomatichthys*, but across taxa of the Harttiini, Farlowellini, and Loricariini.

141. Shape of first paraneural spines in contact with dorsal plates **CI=1.00**. (Ghazzi, 2003, Ch. 76).

0. Long, broad or narrow
1. Short, broad or narrow

Short paraneural spines were found to be an exclusive synapomorphy of *Farlowella* (state 1; Fig. 14).

142. Bifid hemal spine on first caudal vertebra **CI=0.08**. (Paixão & Toledo-Piza, 2009, Ch. 41).

0. Short, almost inconspicuous
1. Medium, length approximately ½ width of corresponding vertebra
2. Long, approximately as long as corresponding vertebra

Length of bifid hemal spine on first caudal vertebra as described by Paixão & Toledo-Piza (2009) was partially corroborated here. Most of *Farlowella* species, *Sturisoma nigrirostrum*, and taxa outside Loricariinae, have a very short, almost inconspicuous bifid hemal spine (state 0). On the other hand, a medium (state 1) and a long (state 2) bifid hemal spine, were observed as unique among taxa of the Loricariinae.

143. Paraneural + parahemal spines projections on vertebrae **CI=1.00**. (Rapp Py-Daniel, 1997, Ch. 106; Paixão & Toledo-Piza, 2009, Ch. 43).

0. Absent
1. Present

As described by Rapp Py-Daniel (1997) and Paixão & Toledo-Piza (2009) the presence of bilateral projections on vertebrae is unique within Loricariinae, which was confirmed here.

144. Orientation of ventrally directed bilateral projections on second caudal vertebra **CI=0.16**. (Paixão & Toledo-Piza, 2009, Ch. 44).

0. Ventral to slightly anteriorly or posteriorly directed
1. Distinctly posteriorly directed

Most taxa examined here presented the bilateral projection on the second caudal vertebra, ventral to slightly anteriorly or posteriorly directed (state 0). On the other hand *Harttia loricariformis*, *H. garavelloi*, *H. longipinna*, *H. fluminensis*, *H. kronei*, *Harttiella crassicauda*, *Cteniloricaria platystoma*, and *Farlowella schreitmuelleri*, have distinctly posteriorly directed bilateral projections (state 1), this partially agree with Paixão & Toledo-Piza (2009) regarding *Harttia* species.

145. Length of posterior process of hemal spine of second preural centrum **CI=0.10**. (Paixão & Toledo-Piza, 2009, Ch. 46).

0. Long
1. Short

We found here that taxa belonging to *Harttia*, *Harttiella*, *Sturisomatichthys*, and *Metaloricaria*, as well as members outside Loricariinae, have a long posterior process of hemal spine on second preural centrum (state 0). A short process (state 1) was the most common condition within the Loricariinae, and for Hypostominae.

146. Cartilage on posterior tip of hemal spine of second preural centrum **CI=0.33**. (Rapp Py-Daniel, 1997, Ch. 47; Paixão & Toledo-Piza, 2009, Ch. 47; modified).

0. Present
1. Absent

We agree with Rapp Py-Daniel (1997) and Paixão & Toledo-Piza (2009) that the presence of cartilage on posterior tip of hemal spine of second preural centrum, within the Loricariinae is observed only for *Harttia*.

147. Relative length of neural spine of second preural centrum **CI=0.40**. (Rapp Py-Daniel, 1997, Ch. 134; Paixão & Toledo-Piza, 2009, Ch. 48).

0. Reaches vertical through 1/2 length of hypural plate
1. Reaches vertical through 1/3 length of hypural plate
2. Reaches vertical through posterodorsal tip of hypural plate

Harttia punctata, the Loricariini, and members outside the Loricariinae, presented a length of neural spine of second preural centrum through 1/2 length of hypural plate (state 0). The remainder taxa of the Harttiini and Loricariini have a spine that reaches a vertical through 1/3 length of hypural plate (state 1). Finally, a spine that reaches a vertical through posterodorsal tip of hypural plate (state 2), was found to be an exclusive synapomorphy for *Metaloricaria*.

148. Caudal peduncle **CI=0.50**. (Rapp Py-Daniel, 1997, Ch. 108; Ghazzi, 2003, Ch. 77; Paixão & Toledo-Piza, 2009, Ch. 49).

0. Cylindrical or moderately depressed
1. Depressed

As proposed by several authors (Regan, 1904; Gosline 1945, 1947; Isbrücker, 1981; Schaefer, 1987) a depressed caudal peduncle is a synapomorphy for the Loricariinae. Even though this characteristic is also found in *Acestridium*, *Niobichthys*, and *Oxyropsis* (belonging to the Hypoptopomatinae).

PECTORAL GIRDLE

149. Branched rays on pectoral fin **CI=1.00**. (Rapp Py-Daniel, 1997, Ch. 139; Ghazzi, 2003, Ch. 99; Fichberg, 2008, Ch. 132; Paixão & Toledo-Piza, 2009, Ch. 60).

0. Six
1. Seven

Seven branched rays on the pectoral fin was found to be an exclusive synapomorphy for *Lamontichthys*.

150. Anterior margin of cleithrum **CI=0.31**. (Rapp Py Daniel, 1997, Ch. 140; Ghazzi, 2003, Ch. 100; Fichberg, 2008, Ch. 128; modified).

0. Slightly convex at cleithral symphysis level
1. Curved on its entire length
2. Rounded, expanded
3. With straight projecting points
4. Slightly curved and convex at symphysis level
5. Transversally straight
6. Straight, with prominent points

A curved, slightly convex anterior margin of the cleithrum at cleithral symphysis level (state 0) was found only outside the Loricariinae, except for the Hypostominae. *Lamontichthys*, some *Farlowella*, *Hemiloricaria lanceolata*, *Rineloricaria*, *Crossoloricaria* sp., *Spatuloricaria puganensis*, and *Pterygoplichthys lituratus* have an anterior margin curved on its entire length (state 1; Fig. 15A). A bilobed, rounded, expanded anterior margin (state 2; Fig. 15B,C) was observed on *Harttiella*, *Sturisoma*, *Sturisomatichthys kneri*, *Metaloricaria*, *Loricariichthys*, *Loricaria* sp., *Limatulichthys griseus*, and *Dasyloricaria*. *Pterosturisoma* and *Cteniloricaria* possess a bilobed margin with projecting points (state 3; Fig. 15D). On the other hand, most *Farlowella* species have a bilobed anterior margin, slightly curved and slightly convex at symphysis level (state 4). A transversally straight anterior margin (state 5; Fig. 15E) was found only for *Harttia* and the remaining Hypostominae. Finally, a straight, oblique, with prominent points anterior margin (state 6; Fig. 15F) is the general condition for the remaining *Sturisomatichthys*.
As it was described, the anterior margin of the cleithurm possess a large variation among loricariids which can be related to the strength on the pectoral fins, that at the same time, could be related to adaptations to fast currents in case of stronger pectoral girdles. Nevertheless, except in the case of *Sturisomatichthys, Sturisoma*, *Harttiella* and *Harttia*, a

general condition within a genus was observed, but it is not constant among members of each tribe studied here.

151. Cleithral type of contact **CI=0.50**. (Rapp Py-Daniel, 1997, Ch. 143; Ghazzi, 2003, Ch. 103; modified).

0. Total sutural contact
1. Partial sutural contact
2. Without suture, symphiseal contact

Harttiini, Farlowellini, and *Crossoloricaria* sp., have total sutural cleithral contact (state 0; Fig. 15, 16). Only *Hemiodontichthys acipenserinus* presented partial sutural contact (state 1). Finally, *Metaloricaria* and Loricariini, except the above-mentioned taxa, have contact without suture (state 2).

152. Orientation of vertical walls of cleithrum **CI=0.06**. (Rapp Py-Daniel, 1997, Ch. 144; Ghazzi, 2003, Ch. 104; modified).

0. Straight
1. Posteriorly oriented

153. Coracoid posterior process **CI=0.30**. (Rapp Py-Daniel, 1997, Ch. 145; Ghazzi, 2003, Ch. 105; Provenzano, 2011, Ch. 71; modified).

0. Broad
1. Thick and proximally broad
2. Thin process and tip
3. Thin, long
4. Short, broad

Lamontichthys filamentosus, *L. parakana*, *Farlowella marialenae*, *F. paraguayensis*, *Loricariichthys*, *Hemiloricaria lanceolata*, *Loricaria* sp., *Limatulichthys griseus*, *Spatuloricaria puganensis*, *Dasyloricaria latiura*, and most of the taxa outside Loricariinae have a broad posterior process, with a thin tip (state 0; Fig. 15A). A thick and proximally broad, defined process with thin tip (state 1; Fig. 15F) was found to be an exclusive synapomorphy for *Sturisomatichthys*. Harttiini, the remaining *Lamontichthys*, *Pterosturisoma*, *Sturisoma*, *Metaloricaria*, *Hemiodontichthys acipenserinus*, *Rineloricaria*, *Crossoloricaria* sp., the remaining *Dasyloricaria*, and *Hisonotus laevior* have thin process and tip, shorter than total girdle length (state 2; Fig. 15B,E). A thin, long process, with a broad tip is autapomorphic on *Farlowellla myriodon* (state 3). The remaining *Farllowella* a short, broad process (state 4).

154. *Ventral abductor* fossa **CI=1.00**. (Schaefer 1991, Ch. 41; Rapp PY-Daniel, 1997, Ch. 146; Ghazzi, 2003, Ch. 106; modified).

0. Large, with two distinctive depths
1. Absent or partially encapsulated by the coracoids laminae

Only Hypoptopomatinae presented the absence or partially encasement of the abductor fossa.

155. Posterior process of cleithrum **CI=0.12**. (Ghazzi, 2003, Ch. 109).

0. Long, exposed narrow portion, with odontodes
1. Short, exposed narrow portion, with odontodes
2. Short, exposed broad portion, with odontodes

Within Farlowellini, *Sturisomatichthys* and *Lamontichthys filamentosus* are the only taxa that have a long, narrow process (state 0; Fig. 15F), cited by Ghazzi (2003), and it was observed here outside the Loricariinae. Some *Harttia*, *Harttiella*, the remaining *Lamontichthys*, *Pterosturisoma*, *Cteniloricaria*, some *Farlowella* and some Loricariini, have a short, narrow process (state 1; Fig. 15D). The remaining *Harttia*, *Farlowella*, and Loricariini, and all *Sturisoma*, have a short, broad process (state 2; Fig. 15A); the observations regarding the latter agree with those of Ghazzi (2003).

156. Length of cleithrum symphysis relative to coracoid symphysis **CI=0.09**. (Rapp Py-Daniel, 1997, Ch. 142; Paixão & Toledo-Piza, 2009, Ch. 61).

0. Similar
1. Twice as short
2. Twice as long

Harttia leiopleura, *H. torrenticola*, *H. longipinna*, most *Farlowella*, *Sturisomatichthys leightoni*, *Rineloricaria*, *Spatuloricaria puganensis*, *Ancistrus brevipinnis*, *Pterygoplichthys lituratus*, *Neoplecostomus microps*, and *Hemipsilichthys gobio* have cleithrum and coracoid symphyses of similar length (state 0; Fig. 15A). The remaining *Harttia*, *Sturisomatichthys* and Neoplecostominae, *Harttiella*, *Farlowella myriodon* and *F. jauruensis*, *Pterosturisoma*, *Cteniloricaria*, *Sturisoma*, *Hemiloricaria lanceolata*, *Chaetostoma breve*, and *Hisonotus laevior* have the cleithrum symphysis twice as short compared to coracoid's symphysis (state 1; Fig. 15D,E). The remainder *Farlowella*, *Metaloricaria*, *Loricariichthys*, *Hemiodontichthys acipenserinus*, *Loricaria* sp., *Crossoloricaria* sp., *Limatulichthys griseus*, *Dasyloricaria*, and the remaining taxa outside Loricariinae, possess a cleithrum symphysis twice as long (state 2). Our results agree with those of Paixão & Toledo-Piza (2009).

157. Cleithrum anterolateral process **CI=0.12**. (Rapp Py-Daniel, 1997, Ch. 141).

0. Absent (Fig. 15E)
1. Small (Fig. 15D)
2. Large, anterior
3. Large, lateral (Fig. 15A)

158. Bony lamina on ventrolateral portion of coracoid **CI=0.16**. (Paixão & Toledo-Piza, 2009, Ch. 62).

0. Absent
1. Present

159. Coracoid posterior process length compared to its inferior margin length **CI=0.28**. (Fichberg, 2008, Ch. 127; modified).

0. Approximately same length
1. Posterior process longer than inferior margin
2. Posterior process shorter than inferior margin

Only taxa outside Loricariinae possess posterior process and anterior margin of the coracoids approximately the same length (state 0). Harttiini, Farlowellini, and most

Loricariini have the posterior process longer than the inferior margin (state 1; Fig. 15). The remaining taxa included here have shorter posterior process (state 2).

160. Coracoid posterior process orientation **CI=0.04**. (Fichberg, 2008, Ch. 129).

0. Laterally oriented, not on the same axis as body
1. Straight, on the same axis as body

161. Fenestra between coracoids and cleithra symphyses, including both halves of the girdle **CI=0.06**. (Rapp Py-Daniel, 1997, Ch. 143; Fichberg, 2008, Ch. 131; modified).

0. Absent (Fig. 15E)
1. Rounded (Fig. 15C; Fig. 16)
2. Quadrangular, with straight borders (Fig. 15B)

PELVIC GIRDLE

162. Type of connection of basipterygium symphysis (Rapp Py-Daniel, 1997, Ch. 148) **CI=0.50**.

0. Presence of a cartilage plug (cartilage facet between an anterior and/or posterior bone contact)
1. Presence of reduced cartilage plug, more area of bone contact
2. Only synchondral, no bone contact

On the Harttiini, except *Harttiella*, the Farlowellini, the Loricariini, and taxa outside Loricariinae except some taxa of the Hypoptopomatinae, the connection is through presence of cartilage plug, being the cartilage facet between an anterior and/or posterior bone contact (state 0; Fig. 17A,B,C). For *Harttiella* and *Metaloricaria*, a reduced cartilage plug, which results in more area of bone contact (state 1; Fig. 17D), was observed. Finally, only for *Hisonotus laevior* and *Acestridium scutatum*, the contact is synchondral only (state 2).

163. Contact between anterior internal processes of basipterygium **CI=0.11**. (Rapp Py-Daniel, 1997, Ch. 150; Paixão & Toledo-Piza, 2009, Ch. 63; modified).

0. In contact along their entire medial margins
1. In contact anteriorly and posteriorly at midline, with small foramen in between
2. Not in contact, distal tip of each process close to each other or connected by ligaments
- . Inapplicable

Harttiella crassicauda, some *Farlowella* species, *Metaloricaria*, and members outside Loricariinae, except *Pterygoplichthys lituratus,* have an entire contact between internal anterior processes of the basipterygium (state 0; Fig. 17D). *Farlowella oxyrryncha, F. reticulata*. *F. rugosa*, *F. vittata*, *Hemiloricaria lanceolata*, *Loricaria* sp., *Limatulichthys griseus*, and *Dasyloricaria* showed contact anteriorly and posteriorly of the processes, forming a small foramen in the middle (state 1). On most of the Harttiini, Farlowellini and Loricariini except taxa mentioned above, and some members outside Loricariini, there is no contact of the internal processes (state 2;Fig. 17A,B,C,). *Hemipsilichthys gobio* have internal processes fused with the external process, and it was codified as inapplicable for this character.

164. Type of anterior and posterior contact of basipterygium to cartilage plug or symphysis **CI=0.21**. (Rapp Py-Daniel, 1997, Ch. 149; modified).

0. Anterior and posterior sutures
1. Posterior suture to cartilage
2. Anterior suture to cartilage
3. No sutures

The Harttiini, the Farlowellini except *Sturisoma* and some *Farlowella* species, the Loricariini except *Loricariichthys*, and most taxa outside the Loricariinae except *Hisonotus laevior* and *Acestridium scutatum*, showed anterior and posterior suture to the cartilage (state 0; Fig. 17A). *Farlowella hasemani*, *F. henriquei*, *F. nattereri,* and *F. venezuelensis* were the only taxa to present only posterior suture to the cartilage (state 1). Within Loricariinae, only *Sturisoma*, *Sturisomatichthys leightoni*, and *Loricariichthys* showed only anterior suture to the cartilage (state 2; Fig. 17B). *Metaloricaria*, *Hisonotus laevior*, and *Acestridium scutatum* have no sutures (state 3).

165. Shape of cartilage between basipterygia **CI=0.15**. (Rapp Py-Daniel, 1997, Ch. 148; Fichberg, 2008, Ch. 117; modified).

0. Quadrangular, broad sutures
1. Short rectangle, broad sutures (Fig. 17A)
2. Long rectangle, broad sutures (Fig. 17B)
3. Long and thin rectangle, thin sutures
4. Reduced

166. Orientation of anterior internal processes of basipterygium **CI=0.50**. (Rapp Py-Daniel, 1997, Ch. 152; Paixão & Toledo-Piza, 2009, Ch. 64).

0. Antero-medial
1. Medial
- . Inapplicable

As proposed by Rapp Py-Daniel (1997) and Paixão & Toledo-Piza (2009), it was found here that an antero-medial orientation of the anterior internal processes of basipterygium (state 0; Fig. 17A) is characteristic of *Harttia*. In addition, *Harttiella crassicauda* and *Cteniloricaria platystoma* also possess this condition. *Hemipsilichthys gobio* was codified as inapplicable for this character.

167. Shape of basipterygium anterolateral processes **CI=0.12**.

0. Long and thin
1. Round and broad

Most of the Farlowellini, the Loricariini and taxa outside Loricariinae, have long and thin anterolateral processes (state 0; Fig. 17C,D). While the Harttiini, *Farlowella oxyrryncha, Sturisomatichthys citurensis*, *Hemiloricaria lanceolata*, *Crossoloricaria* sp., and the Hypoptopomatinae have rounded and broad anterolateral processes (state 1; Fig. 17A,B).

168. Shape of basipterygium posterolateral process **CI=0.18**. (Rapp Py-Daniel, 1997, Ch. 153; Fichberg, 2008, Ch. 122).

0. Round (Fig. 17D)
1. Lanceolate (Fig. 17C)
2. Long, thin, pointed
3. Short, slightly triangular (Fig. 17A)
4. Lanceolate, long

169. Basipterygium anterolateral processes **CI=0.60**. (Schaefer, 1990, Ch. 49; Rapp Py-Daniel, 1997, Ch. 151; Ghazzi, 2003, Ch. 113).

0. Remote from each other
1. Converging mesially, ligament points joining them medially
2. Converging mesially, points fused on the middle, forming a couple of foramina
3. Absent

The Harttiini, the Farlowellini, and the Loricariini except *Loricaria* sp. and *Crossoloricaria* sp., plus *Pterygoplichthys lituratus*, have external anterior processes remote from each other (state 0; Fig. 17). *Ancistrus brevipinnis* and *Chaetostoma breve* have processes converging mesially, with ligament points joining them medially (state 1). Neoplecostominae showed processes converging mesially, with points fused on the middle, forming a couple of foramina (state 2). The absence of external anterior processes was observed on *Loricaria* sp., *Crossoloricaria* sp., and the Hypoptopomatinae (state 3).

170. Relative width of two laminar expansions of anterolateral process of basipterygium **CI=0.30**. (Rapp Py-Daniel, 1997, Ch. 155; Ghazzi, 2003, Ch. 115; Fichberg, 2008, Ch. 125; Paixão & Toledo-Piza, 2009, Ch. 65).

0. Ill-developed
1. Dorsal wider than ventral
2. Dorsal and ventral of similar widths
3. Dorsal narrower than ventral

Hisonotus laevior, *Acestridium scutatum*, and *Hemipsilichthys gobio* have ill-developed laminar expansions (state 0). Among taxa of the Harttiini and the Farlowellini, as well as for the Hypostominae, Neoplecostominae and *Parotocinclus maculicauda*, both dorsal wider than ventral expansions (state 1; Fig. 17A) and dorsal and ventral expansions of similar widths (state 2; Fig. 17B,C,D) were observed. Only the Loricariini showed dorsal expansion narrower than ventral (state 3). Our results agree with those presented by the authors mentioned above.

171. Lateropterygium **CI=0.06**. (Shelden , 1937; de Pinna, 1993, Ch. 227; Rapp Py-Daniel, 1997, Ch. 157; Fichberg, 2008, Ch. 124; Paixão & Toledo-Piza, 2009, Ch. 66; modified)..

0. Present (Fig. 17)
1. Absent

172. Lateropterygium size and shape **CI=0.19**. (de Pinna, 1993, Ch. 227; Rapp Py-Daniel, 1997, Ch. 157; Fichberg, 2008, Ch. 124; Paixão & Toledo-Piza, 2009, Ch. 66; modified).

0. Reduced, rod-shaped
1. Reduced, triangular with rounded base (Fig. 17C)
2. Short, triangular (Fig. 17B)
3. Large, stick-shaped (Fig. 17D)
4. Well-developed, spike-shaped (Fig. 17A)
-. Inapplicable

CAUDAL AND ANAL FIN

173. Centrum of articulation of first anal-fin pterygiophore **CI=1.00**. (Paixão & Toledo-Piza, 2009, Ch. 68).

0. Centrum 15
1. Centra 12, 13 or 14

Outside Loricariinae, the articulation was observed to occur on centrum 15 (state 0). For Loricariinae, as an exclusive synapomorphy the articulation occur between 12th and 14th centra (state 1). Our results agree with those of Paixão & Toledo-Piza (2009).

174. Relative distance of adjacent proximal portions of first three anal-fin pterygiophores **CI=0.11**. (Rapp Py-Daniel, 1997, Ch. 122; Paixão & Toledo-Piza, 2009, Ch. 69).

0. Relatively distant
1. Relatively close
2. In contact

Harttiella, *Sturisoma*, most of the Loricariini, *Metaloricaria* and taxa outside the Loricariinae presented relatively distant proximal portions of first three anal-fin pterygiophores (state 0). Most of the Harttiini and the Farlowellini showed both proximal portions of first three anal-fin pterygiophores relatively close (state 1) or in contact (state 2).

175. Relative length and shape of upper and lower lobes of hypural plate **CI=0.50**. (Schaefer, 1987, Ch. 21; Paixão & Toledo-Piza, 2009, Ch. 71; modified).

0. Symmetric, posterior border vertically aligned
1. Asymmetric, lower lobe extending beyond posterior margin of upper lobe
2. Symmetric, posterior border V-shaped

For *Farlowella* except *Farlowella myriodon*, and taxa outside Loricariinae except Hypostominae, the general condition is that of upper and lower lobes of hypural plate symmetric, with posterior border vertically aligned (state 0). Hypostominae showed as exclusive synapomorphy asymmetric upper and lower lobes, with the lower love extending beyond the margin of the upper lobe (state 1). For the Harttiini, Loricariini, and most of the Farlowellini, symmetric, V-shaped hypural plate, was the general condition (state 2).

176. Shape of hypurapophysis **CI=0.10**. (Lundberg & Baskin, 1969; Schaefer, 1987; Rapp Py-Daniel, 1997, Ch. 129; Paixão & Toledo-Piza, 2009, Ch. 72; modified).

0. Relatively elongate, keel-shaped
1. Broad, laminar, wing-shaped
2. Robust, approximately triangular
3. Robust, approximately square

177. Relative length of hypurapophysis **CI=0.06**. (Paixão & Toledo-Piza, 2009, Ch. 73).

0. Short, not projecting to second preural centrum
1. Long, projecting to second preural centrum

The Harttiini, some *Farlowella*, *Pterosturisoma*, *Sturisoma* except *S. rostratum* and *S. nigrirostrum*, and taxa outside Loricariinae, have a short hypurapophysis, which is not projected to the second preural centrum (state 0). On the other hand, *Lamontichthys*, both *Sturisoma* species named above, *Sturisomatichthys*, the remaining *Farlowella*, and the Loricariini have long hyporapophysis, which is projected to the second preural centrum. Our results partially agree with those of Paixão & Toledo-Piza (2009).

178. Presence and relative size of epural **CI=0.33**. (Schaefer, 1987; Rapp Py-Daniel, 1997, Ch. 127; Paixão & Toledo-Piza, 2009, Ch. 75).

0. Large, length approximately equal to height of lower lobe of hypural plate
1. Small, length shorter than 1/2 of height of lower lobe of hypural plate
2. Missing as a separate element

Taxa outside Loricariinae, except Hypostominae, have a large epural, which is approximately equal to height of lower lobe of hypural plate (state 0). Hypostominae, *Metaloricaria*, *Loricariichthys*, *Rineloricaria*, *Crossoloricaria* sp., and *Dasyloricaria* have a small epural, which length is shorter than 1/2 of height of lower lobe of hypural plate (State 1). The Harttiini, the Farlowellini, and the remaining Loricariini lack the epural as a separate element (state 2).

179. Second ural centrum apophyses **CI=0.10**. (Rapp Py-Daniel, 1997, Ch. 130; Ghazzi, 2003, Ch. 92).

0. One, low
1. Two, well developed
2. Absent

180. Neural and hemal spines on second preural centrum **CI=0.12**. (Schaefer, 1991, Ch. 29; Rapp Py-Daniel, 1997, Ch. 133; Ghazzi, 2003, Ch. 93).

0. Dorsally and ventrally expanded
1. Ill-expanded or not expanded at all

181. Second preural centrum neural spine length **CI=0.25**. (Schaefer, 1987; Rapp Py-Daniel, 1997, Ch. 134; Ghazzi, 2003, Ch. 94).

0. Long, reaching posterior border of hypural plates
1. Long, not reaching posterior border of hypural plates
2. Reduced, less than 1/3 of hypural plates

Taxa outside Loricariinae, except *Ancistrus brevipinnis* and *Chaetostoma breve*, have long neural spine on second preural, which reaches the posterior border of hypural plates (state 0). *Harttia novalimensis, H. longipinna, H. dissidens, H. duriventris, H. guianensis, H. punctata, H. trombetensis, H. fluminensis, H. fowleri, H. kronei*, and the Hypostominae mentioned above, also have long spine, but do not reaches the posterior border of hypural plates (state 1). The remaining *Harttia* and Harttiini, the Farlowellini, and the Loricariini, have reduced spine, less than 1/3 of length of hypural plates (state 2).

182. Second preural centrum length relative to hypural plates length **CI=0.11**. (Schaefer, 1987; Rapp Py-Daniel, 1997, Ch. 136; Ghazzi, 2003, Ch. 96).

0. Second preural centrum a lot shorter than hypural plates
1. Second preural centrum equal or slightly longer than hypural plates
2. Second preural centrum slightly shorter than hypural plates

183. Posterior margin of hypural plates **CI=0.07**. (Schaefer, 1991, Ch. 34; Rapp Py-Daniel,1997, Ch. 126; Ghazzi, 2003, Ch. 89).

0. Notch, no fenestra
1. Notch and fenestra
2. Without notch nor fenestra

EXTERNAL MORPHOLOGY

184. Snout shape **CI=0.16**. (Rapp Py-Daniel, 1997, Ch. 185)

0. Round
1. Triangular
2. Elongated

The Harttiini except *Cteniloricaria*, *Lamontichthys*, *Sturisomatichthys citurensis*, *Hemiloricaria lanceolata*, and taxa outside the Loricariinae presented a round snout (state 0; Fig. 3A,C). *Farlowella myriodon*, *F. curtirostra*, *Pterosturisoma*, *Cteniloricaria*, *Sturisomatichthys tamanae*, and the remaining Loricariini, have triangular snout (state 1). *Sturisoma*, and the remaining *Sturisomatichthys* and *Farlowella* have a prolonged snout (state 2; Fig. 3B).

185. Surface of snout tip **CI=0.15**. (Paixão & Toledo-Piza, 2009, Ch. 80).

0. Without plates, with thick layer of soft connective tissue without papillae (Fig. 3A,B)

1. Without plates, with thick layer of soft connective tissue covered by papillae
2. With plates on thick layer of soft connective tissue
3. With plates, without thick layer of soft connective tissue (Fig. 3C)

186. Groove on snout, anterior of nostril **CI=0.06**. (Paixão & Toledo-Piza, 2009, Ch. 79).

0. Present, anterior portion formed by distinct fold of skin
1. Present, anterior portion not formed by distinct fold of skin
2. Absent

It was observed that on some taxa there is a groove which could be form, or not, by a fold of skin (Fig. 3C). This groove, when present, was observed to run from the anterior border of the nostril to the anteroventral border of the snout (Paixão & Toledo-Piza, 2009: 560). Our results partially agree with those of Paixão & Toledo-Piza (2009).

187. Distribution of hyperthrophied odontodes on males **CI=0.13**. (Fichberg, 2008, Ch. 173; modified).

0. On the sides of head (reaching anterior tip of snout)
1. On several portions of head and body, they do not appear more developed on a specific region
2. Covering almost the entire body, more developed on lateral portion of caudal peduncle, first ray of pectoral fin, and sides of head

188. Orbit shape **CI=1.00**. (Rapp Py-Daniel, 1997, Ch. 186; Ghazzi, 2003, Ch. 128; modified).

0. Round, without notch
1. Round or oval, with notch
2. Oval or elliptic, without notch

The Harttiini, the Farlowellini, and taxa outside the Loricariinae, have round orbits, without notch (state 0; Fig. 3). The Loricariini are characterized by possessing round or oval orbits, with notch (state 1). An oval or elliptic orbit, with notch, was found to be an exclusive synapomorphy for *Metaloricaria*.

189. Upper lip margin **CI=0.28**. (Ghazzi, 2003, Ch. 124).

0. Fringed, with papillae
1. Smooth, no papillae
2. With filaments

Most of the Harttiini, the Farlowellini, the Loricariini, and taxa outside the Loricariinae, have a fringed upper lip margin, with papillae (state 0). *Lamontichthys avacanoeiro*, *L. parakana*, *Sturisoma lyra*, *Loricariichthys platymetopon*, *Hemiodontichthys acipenserinus*, *Limatulichthys griseus*, and *Spatuloricaria puganensis*, have a smooth margin, without papillae (state 1). Finally, filaments on the margin on the upper lip were only observed on *Loricaria* sp. and *Crossoloricaria* sp. (state 2).

190. Plates on the upper lip **CI=0.50**. (Rapp Py-Daniel, 1997, Ch. 176; Paixão & Toledo-Piza, 2009, Ch. 81; modified).

0. Absent
1. Present

Within the Loricariinae, only the Farlowellini and Metaloricariini have plates on the upper lip (state 1). This was also reported by Paixão & Toledo-Piza (2009) for the former.

191. Rictal barbel length **CI=0.13**. (Rapp Py-Daniel, 1997, Ch. 178; Ghazzi, 2003, Ch. 125; Fichberg, 2008, Ch. 139; modified).

0. Shorter than orbit diameter
1. Half the length of orbit diameter
2. Longer than orbit diameter
3. Absent

192. Central buccal papillae **CI=0.20**. (Rapp Py-Daniel, 1997, Ch. 182; Paixão & Toledo-Piza, 2009, Ch. 82; modified).

0. Absent
1. Present, small
2. Present, large

The Harttiini, most of the Farlowellini and the Loricariini, and taxa outside Loricariinae do not have buccal papillae (state 0). *Sturisoma*, *Sturisomatichthys* except *S. citurensis* and *S. tamanae*, some *Farlowella* species, and *Limatulichthys griseus*, have small central buccal papillae (state 1). Large papillae (state 2) were found only on *Loricaria* sp. and *Crossoloricaria* sp.

193. Premaxillary teeth **CI=0.25**. (repetido?)

0. More than 20
1. Less than 20

Within Loricariinae, the Harttiini and the Farlowellini are characterized by possessing more than 20 teeth on each premaxilla (state 0). The Loricariini have less than 20 teeth (state 1).

194. Shape of premaxillary teeth **CI=0.12**.

0. Curved almost in a 90° angle
1. Slightly curved
2. Almost straight
- . Inapplicable

Both the Harttiini and the Farlowellini, showed premaxillary teeth curved, almost in a 90° angle (state 0) and teeth slightly curved (state 1); the latter was observed on *Metaloricaria paucidens* as well. While some Loricariini and *Metaloricaria nijsseni* showed straight teeth (state 2).

195. Lower lip margin (Rapp PY-Daniel, 1997, Ch. 177) **CI=0.25**.

0. Ill-developed papillae
1. Well-developed papillae
2. Filaments
3. Smooth

196. Dorsal plates shape **CI=0.12**. (Schaefer, 1991; Fichberg, 2008, Ch. 151; modified).

0. Rectangular, without lateral keels
1. Irregular shaped, almost rectangular, without keels
2. Semitrapezoidal, without keels

197. Number of rows of plates on dorsal-fin base **CI=0.28**. (Fichberg, 2008, Ch. 167; Rodriguez & Reis, 2008; modified).

0. Five rows
1. Four rows
2. Six rows
3. Three rows
4. More than six rows

198. Abdominal plates **CI=0.12**. (Rapp Py-Daniel, 1997, Ch. 189; Fichberg, 2008, Ch. 155; modified).

0. Absent
1. Present

199. Cleithrum plates **CI=0.18**.

0. Absent
1. Present, reaching posterior border of lower lip
2. Present, not reaching posterior border of lower lip

The Harttiini except *Cteniloricaria*, *Hemiodontichthys acipenserinus*, *Crossoloricaria* sp., and taxa outside the Loricariinae do not have plates covering the cleithrum (state 0). *Lamontichthys*, *Pterosturisoma*, *Sturisoma*, and *Farlowella* have plates covering the cleithrum, and reaches the posterior border of lower lip (state 1). *Sturisomatichthys* and Loricariini, as well as the Hypoptopomatinae, have plates on the cleithrum, but do not reaches the posterior border of the lower lip (state 2).

200. Abdominal plates shape **CI=0.30**. (Rapp Py-Daniel, 1997, Ch. 190; Provenzano, 2011, Ch. 88; modified).

0. Patches of odontodes
1. Very small, irregular, packed
2. Small, roughly quadrangular but well-separated
3. Large, quadrangular
- . Inapplicable

201. Abdominal plate organization **CI=0.20**. (Rapp Py-Daniel, 1997, Ch. 191; modified).

0. Not organized
1. Organized in series
- . Inapplicable

Between the Harttiini and the Farlowellini, only *Sturisoma* and *Farlowella* have abdominal plates organized in series (state 1).

202. Series of thoracic plates **CI=0.18**. (Rapp Py-Daniel, 1997, Ch. 188; modified).

0. Absent
1. Present, flat
2. Present, angled

203. Long filament at distal tip of dorsal-fin unbranched ray **CI=0.33**. (Paixão & Toledo-Piza, 2009, Ch. 87).

0. Absent
1. Present

In addition to the taxa reported by Paixão & Toledo-Piza (2009: 563) to possess a filament on the dorsal fin, it was observed here that *Sturisomatichthys festivus* also has this characteristic.

204. Pectoral girdle **CI=0.50**.

0. Covered by skin or plates
1. Exposed

Among the Loricariidae, only Hypoptopomatinae have an exposed pectoral girdle.

205. Filament at distal tip of unbranched ray of pectoral and dorsal fin **CI=0.20**. (Fichberg, 2008, Ch. 133; modified).

0. Absent
1. Present

206. Pelvic fin length **CI=0.09**. (Fichberg, 2008, Ch. 171; modified).

0. Not surpassing origin of anal fin

1. Slightly surpassing origin of anal fin
2. Visibly surpassing origin of anal fin

207. Relative position of pelvic fins related to dorsal fin position **CI=0.22**. (Fichberg, 2008, Ch. 179; modified).

0. On the same vertical
1. Anterior to dorsal fin
2. Posterior to dorsal fin

208. Anal plate **CI=0.10**. (Rapp Py-Daniel, 1997, Ch. 192).

0. Absent
1. Present

Most members of Loricariinae have an anal plate (state 1). In this study, we found that only some species of *Harttia*, *Loricaria* sp., and *Crossoloricaria* sp. do not have anal plate among the loricariines.

209. Adipose fin **CI=0.33**. (Isbrücker, 1981; Rapp Py-Daniel, 1997, Ch. 123; Fichberg, 2008, Ch. 46; Paixão & Toledo-Piza, 2009, Ch. 78).

0. Present
1. Absent

In spite the absence of adipose fin being diagnostic of the Loricariinae, within the Loricariidae there are members of the Neoplecostominae, Hypostominae, and the Hypoptopomatinae that also lack adipose fin.

210. Caudal peduncle width **CI=0.25**.

0. Gradually narrower towards base of caudal fin
1. Abruptly narrower towards base of caudal fin

Only *Harttia* has a caudal peduncle abruptly narrowed towards the base of caudal fin (state 1). Nevertheless, it was observed that for *H. leiopleura*, *H. torrenticola*, *H. carvalhoi*, and *H. kronei*, this condition is not as visible as in their congeners.

211. Supracaudal plates **CI=1.00**. (Schaefer, 1987; Rapp Py-Daniel, 1997, Ch. 137; Paixão & Toledo-Piza, 2009, Ch. 86).

0. Short and numerous
1. Elongate and few

Only Loricariinae possess elongate and few supracaudal plates (state 1).

212. Caudal fin rays **CI=0.40**. (Schaefer, 1991, Ch. 35; Rapp Py-Daniel, 1997, Ch. 124; Ghazzi, 2003, Ch. 87; Fichberg, 2008, Ch. 44; modified).

0. 16
1. 13 or 14
2. 12
3. 11
4. 10

Hemipsilichthys gobio was the only taxon with 16 caudal rays in this study (state 0); the remaining non-Loricariinae taxa, except *Acestridium scutatum*, showed 13 or 14 rays (state 1). The Harttiini, the Farlowellini except *Farlowella*, *Metaloricaria*, and *A. scutatum* have 12 caudal rays. *Farlowella* species have either 11 (state 3) or 10 (state 4) caudal rays, which are diagnostic for the genus.

213. Filament on upper caudal ray **CI=0.10**. (Fichberg, 2008, Ch. 161).

0. Short or without filament
1. Less than half the TL
2. Exceeding TL

214. Body coloration **CI=0.18**. (Ghazzi, 2003, Ch. 132; Fichberg, 2008, Ch. 147; modified).

0. Faint dark spots
1. Without defined spots nor stripes
2. Dark transversal stripes
3. Dark transversal stripes and dark spots or points
4. Heavily spotted
5. Lateral-dorsal dark stripes on both sides of the body passing over the eye, from the tip of the snout without reaching caudal fin base

6. Lateral-dorsal dark stripes on both sides of the body passing under the eye, from the tip of the snout without reaching caudal fin base

215. Longitudinal band on dorsal fin **CI=0.50**.

0. Absent
1. Present on the first two to three rays, including unbranched ray
2. Present on almost the entire fin

A longitudinal stripe present on the first two to three rays, including unbranched ray is characteristic of *Sturisomatichthys, Pterosturisoma*, and *Ctenilotricaria* (state 1). A stripe on the entire fin is an autapomorphy of *Sturisomatichthys frenatus* (state 2).

216. Pectoral-fin coloration **CI=0.18**.

0. Hyaline
1. Spotted
2. Inconspicuous spot
3. Conspicuous spot
4. Longitudinal spot, extending to almost all rays
5. Transversal spot

Molecular characters

217-2718. 12S and 16S rRNA (mitochondrial): The 12S and 16S rRNA data includes 66 terminals with 1843-2445 base pairs after edition including only sequences from GenBank, deposited from studies of Covain *et al*. (2008, 2016). The division of the sequences into individual genes followed information provided on the sequences deposited on GenBank, and Covain *et al*. (2016); see below and Appendix 1 for details. The dataset is composed of 2502 characters after alignment of which 1502 are conserved sites, 978 are variable sites, and 745 are parsimony informative sites.

2719-3775. Cytb (mitochondrial): The Cytb data includes 58 terminals with 761-1057 base pairs after edition, including sequences from GenBank. The dataset is composed of 1057 characters after alignment of which 563 are conserved sites, 494 are variable sites, and 432 are parsimony informative sites.

3776-4412. MyH6 (nuclear): The MyH6 data includes 51 terminals with 601-637 base pairs after edition, including sequences from GenBank. The dataset is composed of 637 characters after alignment of which 417 are conserved sites, 220 are variable sites, and 178 are parsimony informative sites.

4413-5126. RAG1 (nuclear): The RAG1 data includes 75 terminals with 648-714 base pairs after edition, including sequences from GenBank. The dataset is composed of 714 characters after alignment of which 481 are conserved sites, 233 are variable sites, and 152 are parsimony informative sites.

5127-5905. RAG2 (nuclear): The RAG2 data includes 61 terminals with 579-779 base pairs after edition, including sequences from GenBank. The dataset is composed of 779 characters after alignment of which 514 are conserved sites, 265 are variable sites, and 172 are parsimony informative sites.

5906-6839. nd2 (mitochondrial): The nd2 data include 63 terminals with 662-934 base pairs after edition; do not include sequences from GenBank. The dataset is composed of 934 characters after alignment of which 407 are conserved sites, 527 are variable sites, and 466 are parsimony informative sites.

Total evidence data matrix

The concatenated matrix was analyzed by Maximum Parsimony and Bayesian inference, under a Total Evidence approach. Both analyses included 100 terminals, 22 belonging to the outgroup (including the root), and 78 composing the ingroup. The total number of characters is 6,839. Molecular characters include 374 sequences belonging to seven markers. Only data from the 12S and 16S mitochondrial markers were taken in its totality from GenBank (Covain *et al*., 2008, 2016), while sequences from the remaining markers (Cytb, MyH6, Rag1, Rag2 and nd2) are mostly new data for the Loricariinae.

Phylogenetic analysis

Cladistic relationships

The Maximum Parsimony analysis found 30 most parsimonious trees with a length of 18,254 steps, consistency index (CI) of 0.37 and retention index (RI) of 0.59, the primary trees were summarized as a strict consensus tree shown in Fig. 1. Numbers above the branches are node numbers, and below the branches are Bremer support values. Names in bold correspond to type species. The subfamily Loricariinae is corroborated as monophyletic (node 9). As part of the Loricariinae, four major clades are here proposed with tribe status: Metaloricariini (node 10), Harttiini (node 12), Loricariini (node 32), and Farlowellini (node 45). The Metaloricariini was found as monotypic, composed only by *Metaloricaria*. *Harttia*, *Cteniloricaria*, and *Harttiella* (see Discussion below for differences regarding parsimony and Bayesian analyses) compose the Harttiini. Loricariini was found to be composed as follows (*Crossoloricaria* (*Loricaria* (*Dasyloricaria latiura* (*D. filamentosa* + *D. paucisquama*))) (*Loricariichthys anus* + *Loricariichthys platymetopon*)+(*Hemiodontichthys acipenserinus* + *Limatulichthys griseus*) (*Spatuloricaria puganensis* (*Hemiloricaria lanceolata* (*Rineloricaria cadeae* + *Rineloricaria quadrensis*))). Nevertheless, since this group was used here as outgroup, the totality of the tribe was not included in this study (see Covain *et al*., 2016 for its entire composition as “Loricariina”). The Farlowellini is configured as (*Lamontichthys* (*Pterosturisoma* (*Sturisoma* (*Sturisomatichthys* + *Farlowella*)))), with *Aposturisoma* as a new junior synonym to *Farlowella*. All genera included in the analysis were found to be monophyletic, a different composition for *Sturisoma sensu stricto* was proposed, *Sturisoma caquetae* was transferred back to *Sturisomatichthys* (see Discussion below and Chapter 2), most groups within *Farlowella sensu* Retzer & Page were shown to be not monophyletic, and three new species, one *Sturisoma* and two *Sturisomatichthys*, were discovered.

The following character-states were optimized in the most parsimonious trees and constitute the synapomorphies that diagnose the clades ranked in the phylogenetic classification of the Loricariinae proposed herein. Common synapomorphies of the 30 trees found are listed according to the nodes shown in the consensus tree of Fig. 1. For each clade, morphological synapomorphies are listed. See Appendix 1 for all character-states transformations and optimizations in all nodes and terminals. Identification keys for genera of both the Harttiini and Farlowellini, are offered.

Classification of the Loricariinae

Loricariinae Bonaparte, 1831

Immediately more inclusive taxon: Loricariidae Rafinesque, 1815

Composition: Four tribes: Harttiini Boeseman, 1971; Farlowellini Fowler, 1958; Loricariini Bonaparte, 1831; Metaloricariini Isbrücker, 1980.

Branch length: 88 synapomorphies diagnose this subfamily.

Bremer support: >50 (Fig. 1 and Appendix 1: node 6).

Synapomorphies: 18 morphological and 70 molecular (36 mitochondrial and 34 nuclear). See node 6 in Appendix 1 to individualize characters and transformations of their character-states.

Phenotypic characters that diagnose this node are (exclusive synapomorphies in bold):

Char. 18: (0 --> 3) Extensive participation of frontal in dorsal border of orbital rim, covering half or slightly more than half of dorsal border of orbital rim **CI=0.14**.

Char. 28: (0 --> 1) Contribution of compound pterotic to articulation of hyomandibula extense, same length as joint of prootic with cranium **CI=0.22**.

Char. 46: (0 --> 2) Lateral line ending on supracaudal plates **CI=0.08**.

Char. 51: (0 --> 1) Palatine splint present **CI=0.07**.

Char. 94: (0 --> 3) Urohyal as equilateral triangle CI=0.42.

Char. 127: (0 --> 1) Aortic canal reaching eighth vertebra **CI=0.18**.

Char. 129: (0 --> 1) Seventh vertebra pleural rib present but short **CI=0.18**.

Char. 140: (0 --> 3) Eleven precaudal vertebrae **CI=0.12**.

Char. 142: (0 --> 2) Bifid hemal spine on first caudal vertebra long, approximately as long as corresponding vertebra **CI=0.08**.

Char. 143: (0 --> 1) Bilateral projections on vertebrae CI=1.00.

Char. 148: (0 --> 1) Caudal peduncle depressed **CI=0.50**.

Char. 153: (0 --> 2) Thin coracoid posterior process and tip **CI=0.30**.

Char. 173: (0 --> 1) Articulation of first anal-fin pterygiophore on centra 12th CI=1.00.

Char. 181: (0 --> 2) Length of neural spine of second preural centrum reduced, less than 1/3 of hypural plates **CI=0.25**.

Char. 183: (0 --> 1) Posterior margin of hypural plates with notch and fenestra **CI=0.07**.

Char. 209: (0 --> 1) Adipose fin absent **CI=0.33**.

Char. 211: (0 --> 1) Supracaudal plates elongate and few CI=1.00.

Char. 214: (0 --> 3) Body with dark transversal stripes and dark spots or points **CI=0.18**.

Distribution: South America, from Panama to Argentina, excluding Chile and Patagonia. South American main river systems: Orinoco, Amazonas, Tocantins, Xingú, Tapajós, São Francisco, Tocantins, Madre de Dios, Essequibo, Oyapok, Cupe, Bayano, and Tuyra Rivers, which drain to the Pacific and Atlantic Ocean in Panama. The Atrato, San Juan, Baudó, Patía, Sinú, Magdalena, Cauca, Catatumbo rivers that drain to the Caribbean and Pacific Ocean in Colombia. Esmeraldas River in Ecuador. Lake Maracaibo and Valencia basin in Venezuela.

Harttiini Boeseman, 1971

Immediately more inclusive taxon: Loricariinae Bonaparte, 1831

Composition: Three genera: *Harttia* Steindachner 1877; *Harttiella* Boeseman, 1971; *Cteniloricaria* Isbrücker & Nijssen, 1979.

Branch length: 47 synapomorphies diagnose this tribe.

Bremer support: 18 (Fig. 1 and Appendix 1: node 12 and 28).

Synapomorphies: Seven morphological and 40 molecular (36 mitochondrial and four nuclear). See node 12 and 28 in Appendix 1 to individualize characters and transformations of their character-states.

Phenotypic characters that diagnose this node are (exclusive synapomorphies in bold):

Char. 10: (1 --> 0) Sphenotic width (its largest extension) reduced, less than half length of frontal **CI=0.20**.

Char. 17: (1 --> 0) Lateral laminae of orbitosphenoid reduced, not participating extensively of lateral border of orbital rim, dorsally oriented **CI=0.07**.

Char. 55: (2 --> 1) Process on posteroventral lamina of dentary present, close to main body of dentary **CI=0.11**.

Char. 93: (0 --> 1) Anterior hypohyals expansion present **CI=0.20**.

Char. 94: (3 --> 2) Urohyal rectangular **CI=0.42**.

Char. 166: (0 --> 1) Anteromesial processes of basipterygium oriented medial **CI=0.50**.

Char. 200: (2 --> 1) Abdominal plates very small, irregular, packed **CI=0.30**.

Distribution: South America, including Brazil, Guiana, French Guiana, Suriname, and Venezuela. River basins: Amazonas, Orinoco, Tapajós, Tocantins, Paraná, São Francisco, Paraíba do Sul, Caura, Marowijne, Essequibo, Oyapock, Maroni, Corantijn, Paru de Oeste, Suriname, and Coppename.

Harttia **Steindachner, 1877**

Harttia Steindachner, 1877: 668. Fem. Type species: *Harttia loricariformis* Steindachner, 1877.

Quiritixys Isbrücker, in Isbrücker *et al.*, 2001: 21. Fem. Type species: *Harttia leiopleura* Oyakawa, 1993.

Immediately more inclusive taxon: Tribe Harttiini Boeseman, 1971

Sister group: *Cteniloricaria* Isbrücker & Nijssen, 1979; Clade 13, Fig. 1.

Composition: 23 species: *Harttia absaberi* Oyakawa, Fichberg & Langeani, 2013; *Harttia carvalhoi* Miranda Ribeiro, 1939; *Harttia depressa* Rapp Py-Daniel & Oliveira, 2001; *Harttia dissidens* Rapp Py-Daniel & Oliveira, 2001; *Harttia duriventris* Rapp Py-Daniel & Oliveira, 2001; *Harttia fluminensis* Covain & Fisch-Muller, 2012; *Harttia fowleri* (Pellegrin, 1908); *Harttia garavelloi* Oyakawa, 1993; *Harttia gracilis* Oyakawa, 1993; *Harttia guianensis* Rapp Py-Daniel & Oliveira, 2001; *Harttia kronei* Miranda Ribeiro, 1908; *Harttia leiopleura* Oyakawa, 1993; *Harttia longipinna* Langeani, Oyakawa & Montoya-Burgos, 2001; *Harttia loricariformis* Steindachner, 1877; *Harttia merevari* Provenzano, Machado-Allison, Chernoff, Willink & Petry, 2005; *Harttia novalimensis* Oyakawa, 1993; *Harttia punctata* Rapp Py-Daniel & Oliveira, 2001; *Harttia rhombocephala* Miranda Ribeiro, 1939; *Harttia surinamensis* Boeseman, 1971; *Harttia torrenticola* Oyakawa, 1993; *Harttia trombetensis* Rapp Py-Daniel & Oliveira, 2001; *Harttia tuna* Covain & Fisch-Muller, 2012; *Harttia uatumensis* Rapp Py-Daniel & Oliveira, 2001.

Branch length: 46 synapomorphies diagnose this genus.

Bremer support: 15 (Fig. 1 and Appendix 1: node 14).

Synapomorphies: 11 morphological and 34 molecular (29 mitochondrial and five nuclear). See node 14 in Appendix 1 to individualize characters and transformations of their character-states.

Phenotypic characters that diagnose this node are (exclusive synapomorphies in bold):

Char. 41: (1 --> 0) Point of bifurcation of infraorbital and supraorbital canals on sphenotic **CI=0.12**.

Char. 45: (0 --> 1) Parietal branch curved **CI=0.18**.

Char. 53: (1 --> 0) Coronoid process of dentary large, with small robust area **CI=0.16**.

Char. 124: (0 --> 1) Contact between parapophysis of fourth vertebra and compound pterotic through suture **CI=0.25**.

Char. 140: (3 --> 2) Twelve precaudal vertebrae **CI=0.12**.

Char. 146: (1 --> 0) Cartilage present on posterior tip of hemal spine of second preural centrum **CI=0.33**.

Char. 181: (2 --> 1) Second preural centrum neural spine long, not reaching posterior border of hypural plates **CI=0.25**.

Char. 187: (1 --> 2) Odontodes on males covering almost entire body, more developed on lateral portion of caudal peduncle, first ray of pectoral fin, and sides of head **CI=0.13**.

Char. 195: (1 --> 0) Lower lip with ill-developed papillae **CI=0.25**.

Char. 196: (0 --> 2) Dorsal plates semitrapezoidal, without keels **CI=0.12**.

Char. 210: (0 --> 1) Caudal peduncle abruptly narrower towards base of caudal fin CI=0.25.

Distribution: South America, Brazil, French Guiana, Suriname, Venezuela: River basins: Paraíba do Sul, Uatumã, Tapajós, Tocantins, Fanado, Araçuaí, São Joao, São Francisco, Trombetas, Amazon basin; Paraná, La Plata basin; Sinnamary, Approuague, Coppename, Paru de Oeste, Maroni, Marowijne, Oyapock, Suriname and French Guiana; Upper Caura, Orinoco basin.

Harttiella Boeseman, 1971

Harttiella Boeseman, 1971: 25. Fem. Type species: *Harttia crassicauda* Boeseman, 1953.

Immediately more inclusive taxon: Tribe Harttiini Boeseman, 1971

Sister group: Tribe Loricariini Bonaparte, 1831; Clade 32

Composition: Seven species: *Harttiella crassicauda* (Boeseman, 1953); *Harttiella intermedia* Covain & Fisch-Muller, 2012; *Harttiella janmoli* Covain & Fisch-Muller, 2012; *Harttiella longicauda* Covain & Fisch-Muller, 2012; *Harttiella lucifer* Covain & Fisch-Muller, 2012; *Harttiella parva* Covain & Fisch-Muller, 2012; *Harttiella pilosa* Covain & Fisch-Muller, 2012.

Branch length: 154 synapomorphies diagnose this genus.

Bremer support: 15 (Fig. 1 and Appendix 1: node 28).

Synapomorphies: 154 molecular (145 mitochondrial and nine nuclear). See node 28 in Appendix 1 to individualize characters and transformations of their character-states.

No phenotypic synapomorphies were found to diagnose this node; see Discussion of the genus below for Diagnosis.

Distribution: South America, Guiana, French Guiana and Suriname: River basins: Sinnamary, Essequibo, Approuague, Coppename, Paru de Oeste, Maroni, Marowijne, and Oyapock.

Ctenilioricaria Isbrücker & Nijssen, 1979

Ctenilioricaria Isbrücker & Nijssen, 1979: 88. Fem. Type species: *Loricaria platystoma* Günther, 1868

Immediately more inclusive taxon: Tribe Harttiini Boeseman, 1971

Sister group: *Harttia* Steindachner, 1877; Clade 14

Composition: Two species: *Ctenilioricaria napova* Covain & Fisch-Muller, 2012; *Ctenilioricaria platystoma* (Günther, 1868)

Branch length: 88 synapomorphies diagnose this genus.

Bremer support: 15 (Fig. 1 and Appendix 1: node 13).

Synapomorphies: 88 molecular (54 mitochondrial and 34 nuclear). See node 13 in Appendix 1 to individualize characters and transformations of their character-states.

No phenotypic synapomorphies were found to diagnose this node; see Discussion of the genus below for Diagnosis.

Distribution: South America, Brazil and Suriname: River basins: Upper Paru de Oeste, Erepecuru and Suriname.

Identification key for genera of Harttiini

1. Abdomen totally or partially covered by plates; lateral plates series smooth, without keels; odontodes not well developed on lateral sides of head or predorsal region; canal-bearing cheek plate with short, broad ventral process……………..……………..................2

1’ Abdomen naked; lateral plates series with keels, not smooth; odontodes well developed on lateral sides of head or predorsal region; canal-bearing cheek plate with long and thin ventral process…………………………………………………………..….*Harttiella*

2. Snout rounded; caudal peduncle with abrupt narrowing at mid distance between dorsal and caudal fins; dorsal-fin spinelet absent; head short and broad; when present, abdominal plates not reaching cleithral region.………………………………………………..*Harttia*

2’ Snout triangle-shaped; caudal peduncle narrowing smoothly along its entire length; dorsal-fin spinelet present; head long and narrower; abdominal plates always present, reaching cleithral region…….…………………………………………………*Ctenilorcaria*

Farlowellini Fowler, 1958

Immediately more inclusive taxon: Loricariinae Bonaparte, 1831

Composition: Five genera: *Farlowella* Eigenmann & Eigenmann, 1889, including *Aposturisoma* Isbrücker, Britski, Nijssen & Ortega, 1983 (**New Synonym)**; *Lamontichthys* Miranda Ribeiro, 1939; *Pterosturisoma* Isbrücker & Nijssen, 1978a; *Sturisoma* Swainson 1838; *Sturisomatichthys* Isbrücker & Nijssen, 1979.

Branch length: 47 synapomorphies diagnose this tribe.

Bremer support: 13 (Fig. 1 and Appendix 1: node 45).

Synapomorphies: Nine morphological and 38 molecular (29 mitochondrial and nine nuclear). See node 45 in Appendix 1 to individualize characters and transformations of their character-states.

Phenotypic characters that diagnose this node are (exclusive synapomorphies in bold):

Char. 44: (4 --> 3) Parietal branch terminal ending on supraoccipital **CI=0.14**.

Char. 65: (1 --> 2) Premaxilla larger and bigger relative to dentary **CI=0.07**.

Char. 115: (0 --> 1) Fourth epibranchial with distal portion slightly expanded, not L-shaped **CI=0.21**.

Char. 119: (01 --> 2) Upper pharyngeal tooth plates club-shaped **CI=0.42**.

Char. 135: (0 --> 2) Lateral process on second dorsal pterygiophore strongly curved, dorsal-anteriorly oriented **CI=0.20**.

Char. 190: (0 --> 1) Plates present on upper lip **CI=0.50**.

Char. 199: (0 --> 1) Cleithrum plates present, reaching posterior border of lower lip **CI=0.18**.

Char. 206: (0 --> 2) Pelvic fin visibly surpassing origin of anal fin **CI=0.09**.

Char. 214: (3 --> 1) Body without defined spots nor stripes **CI=0.18**.

Distribution: South America, from Panama to Argentina, excluding Chile and Patagonia. River basins: Amazonas, Orinoco, Tocantins, La Plata, Xingú, Guaviare, Paraguay, Paraná, Araguaia, Negro, Madeira, Guaripiche, Ucayali, Madre de Dios, Huallaga, Juruá, and Meta. Magdalena, Cauca, Atrato, Baudó, San Juan, Sinú, Catatumbo, San Jorge, rivers draining to the Pacific and Caribbean oceans in Colombia. Napo, Pastaza, Aguarico, and Pacific Versant Rivers of Ecuador. Essequibo, Marowijne, Oyapock, Corantijn, and Rupununi Rivers, French Guiana and Suriname. Tuyra, Bayano, Chucunaque, Cupe River basins in Panama, including tributaries of the Darien region. Lake Valencia and Maracaibo Basin, and Mavaca River basin in Venezuela.

Farlowella Eigenmann & Eigenmann, 1889

Farlowella Eigenmann & Eigenmann, 1889: 32. Fem. Type species: *Acestra acus* Kner, 1853

Acestra Kner, 1853:93. Fem. Type species: *Acestra acus* Kner, 1853. Invalid, preoccupied by *Acestra* Bonaparte, 1846 in fishes and by Dallas 1852 in Hemiptera, replaced by *Farlowella* Eigenmann & Eigenmann, 1889.

Aposturisoma Isbrücker, Britski, Nijssen & Ortega, 1983: 34. Neut. Type species: *Aposturisoma myriodon* Isbrücker, Britski, Nijssen & Ortega 1983. **New Synonym**

Immediately more inclusive taxon: Tribe Farlowellini Fowler, 1958

Sister group: *Sturisomatichthys* Isbrücker & Nijssen, 1979; Clade 57

Composition: 31 species: *Farlowella acus* (Kner, 153); *Farlowella altocorpus* Retzer, 2006; *Farlowella amazona* (Günther, 1864); *Farlowella colombiensis* Retzer & Page, 1997; *Farlowella curtirostra* Myers, 1942; *Farlowella gianetii* Ballen, Pastana & Peixoto, 2016; *Farlowella gladiolus* (Günther, 1864); *Farlowella gracilis* Regan, 1904; *Farlowella hahni* Meinken, 1937; *Farlowella hasemani* Eigenmann & Vance, 1917; *Farlowella henriquei* Miranda Ribeiro, 1918; *Farlowella isbruckeri* Retzer & Page, 1997; *Farlowella jauruensis* Eigenmann & Vance, 1917; *Farlowella knerii* (Steindachner, 1882); *Farlowella mariaelenae* Martín Salazar, 1964; *Farlowella martini* Fernández-Yépez, 1972; *Farlowella mitoupibo* Ballen, Urbano-Bonilla & Zamudio, 2016; *Farlowella myriodon* (Isbrücker, Britski, Nijssen & Ortega, 1983), **new combination**; *Farlowella nattereri* Steindachner, 1910; *Farlowella odontotumulus* Retzer & Page, 1997; *Farlowella oxyrryncha* (Kner, 1853); *Farlowella paraguayensis* Retzer & Page, 1997; *Farlowella platorynchus* Retzer & Page, 1997; *Farlowella reticulata* Boeseman, 1971; *Farlowella rugosa* Boeseman, 1971; *Farlowella schreitmuelleri* Ahl, 1937; *Farlowella smithi* Fowler, 1913; *Farlowella taphorni* Retzer & Page, 1997; *Farlowella venezuelensis* Martín Salazar, 1964; *Farlowella vittata* Myers, 1942; *Farlowella yarigui* Ballen & Mojica, 2014.

Branch length: 20 synapomorphies diagnose this genus.

Bremer support: 13 (Fig. 1 and Appendix 1: node 67).

Synapomorphies: 20 morphological. See node 67 in Appendix 1 to individualize characters and transformations of their character-states.

Phenotypic characters that diagnose this node are (exclusive synapomorphies in bold):

Char. 4: (1 --> 2) Mesethmoid process anterior to mesethmoid disk well-developed, united to mesethmoid disk CI=0.37.

Char. 69: (2 --> 1) Metapterygoid canal deep, partially covered by bony shelf **CI=0.08**.

Char. 86: (2 --> 0) Preopercle rectangular **CI=0.25**.

Char. 91: (1 --> 0) Anterior margin of ceratohyal greatly expanded **CI=0.13**.

Char. 98: (1 --> 3) Third basibranchial as long as second basibranchial **CI=0.11**.

Char. 121: (0 --> 1) Less than four branchiostegal rays CI=0.50.

Char. 126: (2 --> 1) Lamina for articulation between sixth vertebra neural spine and ventral surface of supraoccipital developed, expanded and straight CI=0.28.

Char. 127: (1 --> 0) Aortic canal reaching to sixth or seventh vertebrae **CI=0.18**.

Char. 129: (1 --> 2) Seventh vertebra pleural rib vestigial or absent CI=0.18.

Char. 130: (0 --> 3) Connecting bone absent **CI=0.18**.

Char. 132: (0 --> 1) Dorsal-fin spinelet absent **CI=0.09**.

Char. 141: (0 --> 1) First paraneural spine short, broad or narrow, in contact with dorsal plates CI=1.00.

Char. 156: (1 --> 0) Similar length of cleithrum symphysis relative to coracoid symphysis **CI=0.09**.

Char. 157: (1 --> 2) Cleithrum lateral-anterior process large, anterior **CI=0.12**.

Char. 165: (1 --> 3) Cartilage between basipterygia as a long, thin rectangle, with thin sutures **CI=0.15**.

Char. 168: (0 --> 5) Basipterygium posterolateral process lanceolate, long CI=0.18.

Char. 175: (2 --> 0) Upper and lower lobes of hypural plate symmetric, posterior border vertically aligned **CI=0.50**.

Char. 187: (1 --> 0) Odontodes on sides of head of males reaching anterior tip of snout **CI=0.13**.

Char. 206: (1 --> 0) Pelvic fin not surpassing origin of anal fin **CI=0.09**.

Char. 212: (2 --> 4) Ten caudal fin rays **CI=0.40**.

Distribution: South America, Brazil, Colombia, Ecuador, Peru, Suriname, Venezuela: River basins: Tocantins, Araguaia, Paraguay, Ucayali, Huacamayo, Madeira, Amazon basin; La Plata, Paraná, La Plata basin; Meta River, Orinoco basin; Caquetá, Magdalena Rivers, Colombia; Napo, Pastaza, Aguarico Rivers, Ecuador; Essequibo, Suriname; Lake Valencia and Maracaibo basin, Portuguesa, Mavaca River, Venezuela.

Lamontichthys Miranda Ribeiro, 1939

Lamontichthys Miranda Ribeiro, 1939: 12. Masc. Type species: *Harttia filamentosa* La Monte, 1935

Immediately more inclusive taxon: Tribe Farlowellini Fowler, 1958

Sister group: Remaining Farlowellini; Clade 50

Composition: Six species: *Lamontichthys avacanoeiro* Paixão & Toledo-Piza, 2009; *Lamontichthys filamentosus* (Eigenmann & Allen, 1942); *Lamontichthys llanero* Taphorn

& Lilyestrom, 1984; *Lamontichthys maracaibero* Taphorn & Lilyestrom, 1984; *Lamontichthys parakana* Paixão & Toledo-Piza, 2009; *Lamontichthys stibaros* Isbrücker & Nijssen, 1978.

Branch length: Nine synapomorphies diagnose this genus.

Bremer support: 13 (Fig. 1 and Appendix 1: node 46).

Synapomorphies: Nine morphological. See node 46 in Appendix 1 to individualize characters and transformations of their character-states.

Phenotypic characters that diagnose this node are (exclusive synapomorphies in bold):

Char. 43: (1 --> 0) Parietal branch very short, reaching only half sphenotic **CI=0.11**.

Char. 66: (2 --> 1) Premaxilla larger and bigger compared to palatine **CI=0.15**.

Char. 91: (1 --> 2) Ceratohyal anterior margin not expanded **CI=0.13**.

Char. 108: (0 --> 1) Anterior process on first epibranchial absent **CI=0.06**.

Char. 128: (0 --> 1) Flange on lateral region of seventh vertebra present, anteriorly directed **CI=0.33**.

Char. 149: (0 --> 1) Seven branched rays on pectoral fin CI=1.00.

Char. 165: (1 --> 2) Cartilage between basipterygia as long rectangle, with broad sutures **CI=0.15**.

Char. 179: (2 --> 1) Two, well-developed apophyses on second ural centrum **CI=0.10**.

Char. 200: (2 --> 1) Very small, irregular and packed abdominal plates **CI=0.30**.

Distribution: South America, Brazil, Ecuador, Peru and Venezuela: River basins: Tocantins, Huallaga, Jurua, Pastaza, Amazon basin; Guanare Viejo, Orinoco basin; Motatán River and Lake Maracaibo basin.

Pterosturisoma Isbrücker & Nijssen, 1978

Pterosturisoma Isbrücker & Nijssen, 1978: 69. Neut. Type species: *Harttia microps* Eigenmann & Allen 1942

Immediately more inclusive taxon: Tribe Farlowellini

Sister group: Remaining Farlowellini, arising from the next most basal node to *Lamontichthys* Miranda Ribeiro, 1939; Clade 51

Composition: One species: *Pterosturisoma microps* (Eigenmann & Allen, 1942)

Branch length: 162 autapomorphies diagnose this genus.

Bremer support: 13 (Fig. 1 and Appendix 1: node 50).

Autapomorphies: 24 morphological and 138 molecular (115 mitochondrial and 23 nuclear). See node 50 in Appendix 1 to individualize characters and transformations of their character-states.

Phenotypic characters that diagnose this node are (exclusive in bold):

Char. 13: (1 --> 4) Laterodorsal process of lateral ethmoid absent **CI=0.26**.

Char. 20: (0 --> 1) Basioccipital lateral processes small, shorter than height of basioccipital, not ventrally expanded **CI=0.08**.

Char. 36: (0 --> 1) Preopercle connection to dermal plates via dorsal ridge of preopercle **CI=0.27**.

Char. 58: (1 --> 0) Cusp of dentary teeth of same size, or approximately same size **CI=0.12**.

Char. 59: (1 --> 2) Length of dentary half, or little less than half of anguloarticular **CI=0.28**.

Char. 66: (2 --> 0) Premaxilla with same size compared to palatine **CI=0.15**.

Char. 83: (1 --> 0) Posterior crest on external surface of hyomandibular, present **CI=0.05**.

Char. 96: (2 --> 3) Hypobranchials square-shaped **CI=0.23**.

Char. 105: (0 --> 1) Teeth absent on fifth ceratobranchial (or lower pharyngeal plate) **CI=0.25**.

Char. 107: (0 --> 3) Teeth lacking or almost lacking on fifth ceratobranchial (or lower pharyngeal plate) **CI=0.30**.

Char. 116: (1 --> 2) Posterior process on fourth epibranchial as short, small flap **CI=0.21**.

Char. 136: (1 --> 0) Articulation between proximal portion of dorsal fin spine and second dorsal-fin pterygiophore through condyle on dorsal region of pterygiophore **CI=0.15**.

Char. 137: (3 --> 0) Transverse process of first dorsal-fin pterygiophore shorter than second dorsal-fin pterygiophore **CI=0.33**.

Char. 150: (12 --> 3) Anterior margin of cleithrum with straight, projecting points **CI=0.31**.

Char. 161: (02 --> 1) Rounded fenestra between coracoids and cleithra symphyses, including both halves of the girdle **CI=0.06**.

Char. 168: (0 --> 4) Short, slightly triangular basipterygium posterolateral process **CI=0.18**.

Char. 185: (0 --> 3) Surface of snout tip with plates, without thick layer of soft connective tissue **CI=0.15**.

Char. 186: (0 --> 2) Groove on snout abesent anterior to nostril **CI=0.06**.

Char. 194: (1 --> 0) Premaxillary teeth curved, in almost 90° angle **CI=0.12**.

Char. 196: (3 --> 0) Dorsal plates rectangular, without lateral keels **CI=0.12**.

Char. 197: (01 --> 2) Six rows of plates at dorsal fin base **CI=0.28**.

Char. 205: (0 --> 1) Filament present at distal tip of unbranched ray of pectoral and dorsal fin **CI=0.20**.

Char. 213: (0 --> 2) Filament on upper caudal ray exceeding TL **CI=0.10**.

Char. 215: 0 --> 1 Longitudinal stripe on dorsal fin present on the first two to three rays, including unbranched ray **CI=0.50**.

Distribution: South America, Bolivia and Peru: River basins: Upper Amazonas, Iquitos.

Sturisoma Swainson, 1838

Sturisoma Swainson, 1838: 333. Neut. Type species: *Loricaria rostrata* Spix & Agassiz, 1829

Oxyloricaria Bleeker, 1862:3. Fem. Type species: *Loricaria barbata* Kner 1853

Parasturisoma Miranda Ribeiro, 1911:109. Neut. Type species: *Loricaria brevirostris* Eigenmann & Eigenmann 1889.

Immediately more inclusive taxon: Tribe Farlowellini Fowler, 1958

Sister group: Clade composed by *Sturisomatichthys* Isbrücker & Nijssen, 1979 and *Farlowella* Eigenmann & Eigenmann, 1889; Clade 56

Composition: Ten species: *Sturisoma barbatum* (Kner, 1853); *Sturisoma brevirostre* (Eigenmann & Eigenmann, 1889); *Sturisoma guentheri* (Regan, 1904); *Sturisoma lyra* (Regan, 1904); *Sturisoma* Madre de Dios; *Sturisoma monopelte* Fowler, 1914; *Sturisoma nigrirostrum* Fowler, 1940; *Sturisoma robustum* (Regan, 1904); *Sturisoma rostratum* (Spix & Agassiz, 1829); *Sturisoma tenuirostre* (Steindachner, 1910).

Branch length: 82 synapomorphies diagnose this genus.

Bremer support: 8 (Fig. 1 and Appendix 1: node 52).

Synapomorphies: 21 morphological and 61 molecular (50 mitochondrial and 11 nuclear). See node 52 in Appendix 1 to individualize characters and transformations of their character-states.

Phenotypic characters that diagnose this node are (exclusive synapomorphies in bold):

Char. 5: (1 --> 2) Mesethmoid disk laminar, circular **CI=0.38**.

Char. 16: (0 --> 1) Nasal bone approximately rectangular, with lateral extension at anterior distal portion of bone **CI=0.04**.

Char. 25: (0 --> 1) Expansion of transcapular ligament only ventrally expanded **CI=0.07**.

Char. 26: (0 --> 2) Lamina formed by lateral process of basioccipital joint to ventral lamina of compound pterotic, posteriorly oriented **CI=0.13**.

Char. 41: (1 --> 0) Bifurcation of infraorbital and supraorbital canals on sphenotic **CI=0.12**.

Char. 59: (1 --> 0) Dentary approximately same size as anguloarticular **CI=0.28**.

Char. 67: (1 --> 2) Maxillary bone shorter than palatine **CI=0.07**.

Char. 71: (1 --> 0) Suture between metapterygoid and hyomandibular short, less than half length of contact area between both structures **CI=0.05**.

Char. 76: (1 --> 2) Quadrate with short posterior border, elongate **CI=0.20**.

Char. 85: (0 --> 1) Reduced contribution of compound pterotic to junction of hyomandibular and cranium, less than half than that of prootic **CI=0.06**.

Char. 91: (1 --> 2) Ceratohyal anterior margin not expanded **CI=0.13**.

Char. 108: (0 --> 1) Anterior process on first epibranchial, absent **CI=0.06**.

Char. 112: (1 --> 0) Anterior process on second epibranchial as short flap, laminar **CI=0.09**.

Char. 119: (2 --> 3) Upper pharyngeal tooth plate triangular-shaped CI=0.42.

Char. 130: (0 --> 2) Connecting bone not contacting dorsal-fin pterygiopohres **CI=0.18**.

Char. 131: (1 --> 2) Ventral process of Weberian complex fragile, at middle of structure CI=0.21.

Char. 155: (1 --> 2) Posterior process of cleithrum short, exposed, broad portion with odontodes **CI=0.12**.

Char. 157: (1 --> 3) Latero-anterior process of cleithrum large, lateral **CI=0.12**.

Char. 165: (1 --> 2) Cartilage between basipterygia as long rectangle, with broad sutures **CI=0.15**.

Char. 191: (0 --> 1) Rictal barbel half length of orbit diameter **CI=0.13**.

Char. 213: (0 --> 1) Filament on upper caudal ray less than half TL **CI=0.10**.

Distribution: South America, Argentina, Bolivia, Brazil, French Guiana, Paraguay, Peru, Venezuela: River basins: Solimões, Madre de Dios, Juruá, Ucayali, Amazon basin; Essequibo; Paraguay, La Plata basin; Meta River, Orinoco basin.

Sturisomatichthys Isbrücker & Nijssen, 1979

Isbrücker & Nijssen, 1979: 91. Masc. Type species: *Oxyloricaria leightoni* Regan, 1912

Immediately more inclusive taxon: Tribe Farlowellini Fowler, 1958

Sister group: *Farlowella* Eigenmann & Eigenmann, 1889; Clade 67

Composition: 12 species: *Sturisomatichthys aureus* (Steindachner, 1900); *Sturisomatichthys* Baudó; *Sturisomatichthys caquetae* (Fowler, 1945) **New Combination**; *Sturisomatichthys citurensis* (Meek & Hildebrand, 1913); *Sturisomatichthys dariensis* (Meek & Hildebrand, 1913); *Sturisomatichthys festivus* (Myers, 1942); *Sturisomatichthys frenatus* (Boulenger, 1902); *Sturisomatichthys kneri* (Ghazzi, 2005); *Sturisomatichthys leightoni* (Regan, 1912); *Sturisomatichthys panamensis* (Eigenmann & Eigenmann, 1889); *Sturisomatichthys* San Juan; *Sturisomatichthys tamanae* (Regan, 1912).

Branch length: 26 synapomorphies diagnose this genus.

Bremer support: 10 (Fig. 1 and Appendix 1: node 57).

Synapomorphies: Eight morphological and 18 molecular (16 mitochondrial and two nuclear). See node 57 in Appendix 1 to individualize characters and transformations of their character-states.

Phenotypic characters that diagnose this node are (exclusive synapomorphies in bold):

Char. 22: (1 --> 0) Exoccipital quadrangular in ventral view, expanded **CI=0.09**.

Char. 47: (1 --> 0) Posterior process of palatine long, extending beyond anterior condyle of lateral ethmoid **CI=0.09**.

Char. 120: (1 --> 0) Upper pharyngeal plate dentition complete **CI=0.20**.

Char. 123: (0 --> 1) Fenestra with laminar process between transversal process of Weberian apparatus and transcapular ligament, present CI=1.00.

Char. 133: (1 --> 2) More than eight dorsal fin pterygiophores **CI=0.25**.

Char. 145: (1 --> 0) Posterior process of hemal spine of second preural centrum, long **CI=0.10**.

Char. 155: (1 --> 0) Posterior process of cleithrum long, narrow portion exposed with odontodes **CI=0.12**.

Char. 215: (0 --> 1) Longitudinal stripe on dorsal fin present on first two or three rays, including unbranched ray **CI=0.50**.

Distribution: South America, Colombia, Ecuador, Panama, Venezuela: River basins: Magdalena, Cauca, Catatumbo, Sinú, San Jorge, Atrato, Baudó, San Juan, Caquetá, Patía, Orinoco, Esmeraldas, Bayano, Tuyra, Cupe, Lake Maracaibo basin.

Identification key for the genera of Farlowellini

1. Snout round; rostrum not produced; minute abdominal plates; eye small and dorsally positioned……...………………………..........................……………………..2

1’ Snout triangle-shaped; rostrum generally elongated; medium size to big abdominal plates; eye large and laterodorsally positioned ……………………………………………..3

2. Seven branched rays on pectoral fin…………………………..………..*Lamontichthys*

2’ Six branched rays on pectoral fin………………………………………….*Pterosturisoma*

3. Nuchal plate twice size of predorsal plates; when present, rostrum not as long as head length; dorsal-fin origin on same vertical as pelvic-fin origin; laterodorsal longitudinal stripe, when present passing over eye; lateral abdominal plates separate from central abdominal plates by skin; numerous small central abdominal plates.………………………4

3’ Nuchal plate same size as predorsal plates; rostrum generally as long as head length, sometimes longer; dorsal-fin origin between pelvic fin and anal fin origin; laterodorsal longitudinal stripe, when present passing below eye; lateral abdominal plates absent or, when present, contacting central abdominal plates; few large central abdominal plates.……………………………………………………………………….....*Farlowella*

4. Central abdominal plates not arranged in defined series; dark spots on either, or all, dorsal-, pectoral-, pelvic, or anal-fins present; 15-18 lateral plates on median series……………………………………………………………....….*Sturisomatichthys*

4’ Central abdominal plates arranged in three longitudinal defined series; dark spots absent from all fins, sometimes present on pectoral fin; 20-21 lateral plates on median series…………………………………………………………...………..…*Sturisoma*

Loricariini Bonaparte, 1831

Immediately more inclusive taxon: Loricariinae Bonaparte, 1831

Composition: 22 genera; groups not included in this study followed the classification offered by Covain *et al.* (2016) as “Loricariina”: *Apistoloricaria* Isbrücker & Nijssen, 1976; *Brochiloricaria* Isbrücker & Nijssen, 1979; *Crossoloricaria* Isbrücker, 1979; *Dasyloricaria* Isbrücker & Nijssen, 1979; *Dentectus* Martín Salazar, Isbrücker & Nijssen, 1982; *Fonchiiloricaria* Rodriguez, Ortega & Covain, 2011; *Furcodontichthys* Rapp Py-Daniel, 1981; *Hemiloricaria* Bleeker, 1862; *Hemiodontichthys* Bleeker, 1862; *Limatulichthys* Isbrücker & Nijssen, 1979; *Loricaria* Linnaeus, 1758; *Loricariichthys* Bleeker, 1862; *Paraloricaria* Isbrücker, 1979; *Planiloricaria* Isbrücker, 1971; *Proloricaria* Isbrücker, 2001; *Pseudohemiodon* Bleeker, 1862; *Pseudoloricaria* Bleeker, 1862; *Pyxiloricaria* Isbrücker & Nijssen, 1984; *Reganella* Eigenmann, 1905; *Rhadinoloricaria* Isbrücker & Nijssen, 1974; *Ricola* Isbrücker & Nijssen, 1978b; *Rineloricaria*, Bleeker, 1862; *Spatuloricaria* Schultz, 1944.

Branch length: 47 synapomorphies diagnose this tribe.

Bremer support: 13 (Fig. 1 and Appendix 1: node 32).

Synapomorphies: 46 morphological and one molecular (mitochondrial, Cytb). See node 32 in Appendix 1 to individualize characters and transformations of their character-states.

Phenotypic characters that diagnose this node are (exclusive synapomorphies in bold):

Char. 5: (1 --> 3) Mesethmoid disk as triangular lamina **CI=0.38**.

Char. 7: (0 --> 3) Lateroventral crest of mesethmoid well developed along entire mesethmoid **CI=0.11**.

Char. 8: (1 --> 0) Lateral process of sphenotic, short **CI=0.13**.

Char. 9: (0 --> 1) Orbital notch, present CI=1.00.

Char. 13: (1 --> 4) Laterodorsal process of lateral ethmoid, absent **CI=0.26**.

Char. 18: (3 --> 4) Frontal contributes to almost entire dorsal border of orbital rim **CI=0.14**.

Char. 20: (0 --> 2) Basioccipital lateral processes big, laterally expanded **CI=0.08**.

Char. 22: (0 --> 1) Exoccipital in ventral view rectangular, narrow **CI=0.09**.

Char. 33: (1 --> 0) Preopercle ventral process, absent **CI=0.50**.

Char. 36: (0 --> 2) Preopercle strongly sutured to dermal plates **CI=0.27**.

Char. 37: (2 --> 1) Canal-bearing cheek plate on head, ventrolateral **CI=0.40**.

Char. 49: (1 --> 0) Palatine anterior process, absent **CI=0.20**.

Char. 50: (0 --> 1) Palatine rectangular, straight **CI=0.16**.

Char. 51: (1 --> 0) Palatine splint, absent **CI=0.07**.

Char. 52: (0 --> 2) Cup-shaped portion of premaxilla distinctly shorter relative to cup shaped portion of dentary **CI=0.16**.

Char. 54: (0 --> 1) Posteroventral lamina of dentary, absent **CI=0.25**.

Char. 56: 0 --> 1 Dentary teeth less than 20 CI=1.00.

Char. 60: (1 --> 0) Maxillary teeth robust, relatively short and wide, straight **CI=0.50**.

Char. 63: (0 --> 1) Premaxillary bone as lamina **CI=0.40**.

Char. 64: (0 --> 1) Length versus width of cup-shaped region of premaxilla, equivalent **CI=0.50**.

Char. 71: (1 --> 0) Suture between metapterygoid and hyomandibular short, less than half the contact area between both structures **CI=0.05**.

Char. 72: (0 --> 4) Metapterygoid with ventral and dorsal base straight and equally expanded **CI=0.25**.

Char. 74: (0 --> 1) Dorsal canal on metapterygoid absent **CI=0.25**.

Char. 76: (1 --> 3) Quadrate long and narrow almost throughout its entire length **CI=0.20**.

Char. 87: (1 --> 2) Preopercle anterior process absent **CI=0.22**.

Char. 89: (0 --> 3) Posterior border of anterior ceratohyal without ventral lamina **CI=0.15**.

Char. 95: (0 --> 1) Posterohyal dorsal hook large, projected **CI=0.28**.

Char. 115: (0 --> 3) Fourth epibranchial as straight rod **CI=0.21**.

Char. 116: (1 --> 4) Posterior process on fourth epibranchial absent CI=0.21.

Char. 118: (0 --> 2) Fourth epibranchial without filaments **CI=0.50**.

Char. 120: (1 --> 0) Upper pharyngeal plate dentition complete **CI=0.20**.

Char. 122: (2 --> 0) Connection between transcapular ligament and fourth vertebra parapophyses abutting ventrally **CI=0.50**.

Char. 136: (1 --> 2) Articulation between proximal portion of dorsal fin spine and second dorsal-fin pterygiophore through circular hollow structure **CI=0.15**.

Char. 147: (1 --> 0) Neural spine of second preural centrum reaching vertical through 1/2 length of hypural plate **CI=0.40**.

Char. 156: (1 --> 2) Cleithrum symphysis relative to coracoid symphysis, twice as long **CI=0.09**.

Char. 157: (0 --> 2) Cleithra lateral-anterior process large, anterior **CI=0.12**.

Char. 165: (1 --> 3) Cartilage between basipterygia as long and thin rectangle, with thin sutures **CI=0.15**.

Char. 170: (2 --> 3) Dorsal laminar expansion of anterolateral process of basipterygium, narrower than ventral CI=0.30.

Char. 179: (2 --> 0) One apophysis on second ural centrum **CI=0.10**.

Char. 180: (0 --> 1) Neural and hemal spines on second preural centrum, ill expanded or not expanded at all **CI=0.12**.

Char. 186: (0 --> 1) Groove on snout, anterior of nostril present, anterior portion not formed by distinct fold of skin **CI=0.06**.

Char. 188: (0 --> 1) Orbit shape round or oval, with notch CI=1.00.

Char. 191: (0 --> 2) Rictal barbel longer than orbit diameter CI=0.13.

Char. 193: (0 --> 1) Less than 20 premaxillary teeth **CI=0.25**.

Char. 194: (1 --> 2) Premaxillary teeth straight **CI=0.12**.

Char. 212: (2 --> 4) Ten caudal branched fin rays **CI=0.40**.

Distribution: South America, from the La Plata drainage in the south to the Caribbean and Pacific coastal rivers in the North. South American main river systems: Amazonas, Orinoco, Tocantins, La Plata, Xingú, Paraguay, Paraná, Araguaia, Negro, Branco, Madeira, Ucayali, Madre de Dios, Huallaga, Juruá, Meta Rivers. Magdalena, Cauca, Caquetá, Atrato, Baudó, San Juan, Sinú, Catatumbo, San Jorge basins, rivers draining to the Pacific and Caribbean oceans in Colombia. Napo, Pastaza, Aguarico, and Pacific Versant Rivers of Ecuador. Essequibo, Marowijne, Oyapock, Corantijn, and Rupununi Rivers, French and British Guiana and Suriname. Tuyra, Bayano, Cupe River basins in Panama, including the Darien region. Lake Valencia and Maracaibo Basin in Venezuela.

Loricariini species: The Loricariini do not fall within the scope of this study. For composition of Loricariini genera, the reader is referred to Isbrücker (1980, 1981), Covain & Fisch-Muller (2007) and Covain *et al*. (2016; as their "Loricariina").

Metaloricariini Isbrücker, 1980

Immediately more inclusive taxon: Loricariinae Bonaparte, 1831

Composition: One genus: *Metaloricaria* Isbrücker, 1975

Branch length: 103 synapomorphies diagnose this tribe.

Bremer support: 46 (Fig. 1 and Appendix 1: node 10).

Synapomorphies: 35 morphological and 68 molecular (61 mitochondrial and seven nuclear). See node 10 in Appendix 1 to individualize characters and transformations of their character-states.

Phenotypic characters that diagnose this node are (exclusive synapomorphies in bold):

Char. 2: (0 --> 1) Ventral depression at anterior tip of mesethmoid present **CI=0.16**.

Char. 7: (0 --> 3) Lateroventral crest of mesethmoid well developed along entire mesethmoid **CI=0.11**.

Char. 8: (1 --> 2) Lateral process of sphenotic long and thin **CI=0.13**.

Char. 14: (0 --> 2) Posteroventral border of lateral ethmoid well developed, contributing to border of orbital rim **CI=0.09**.

Char. 22: (0 --> 1) Exoccipital in ventral view rectangular, narrow **CI=0.09**.

Char. 32: (0 --> 1) Preopercle same height as quadrate, with thin projection passing through quadrate **CI=0.37**.

Char. 36: (0 --> 2) Preopercle strongly sutured to dermal plates **CI=0.27**.

Char. 48: (2 --> 1) Lateral flange of palatine present and complete **CI=0.11**.

Char. 50: (0 --> 1) Palatine rectangular, straight **CI=0.16**.

Char. 52: (0 --> 2) Cup-shaped portion of premaxilla distinctly shorter relative to cup shaped portion of dentary **CI=0.16**.

Char. 54: (0 --> 1) Posteroventral lamina of dentary absent **CI=0.25**.

Char. 56: (0 --> 1) Less than 20 dentary teeth **CI=1.00**.

Char. 57: (0 --> 3) Extremely pointed teeth cusps **CI=0.15**.

Char. 59: (1 --> 2) Dentary half or slightly less than half anguloarticular length **CI=0.28**.

Char. 63: (0 --> 1) Premaxilla as bony lamina **CI=0.40**.

Char. 64: (0 --> 1) Length versus width of cup-shaped region of premaxilla, equivalent **CI=0.50**.

Char. 65: (1 --> 0) Premaxilla shorter and smaller relative to dentary **CI=0.07**.

Char. 72: (0 --> 4) Metapterygoid with ventral and dorsal bases straight and equally expanded **CI=0.25**.

Char. 74: (0 --> 1) Dorsal canal on metapterygoid absent **CI=0.25**.

Char. 88: (0 --> 1) Suspensorium rectangular, elongated **CI=0.14**.

Char. 110: (0 --> 1) Posterior process on first epibranchial absent **CI=0.08**.

Char. 115: (0 --> 3) Fourth epibranchial as straight rod **CI=0.21**.

Char. 116: (1 --> 2) Posterior process on fourth epibranchial short, as small flap **CI=0.21**.

Char. 120: (1 --> 0) Upper pharyngeal plates dentition complete **CI=0.20**.

Char. 125: (0 --> 2) Parapophysis of fourth vertebra long, surpassing compound pterotic border **CI=0.21**.

Char. 133: (0 --> 1) Less than eight dorsal-fin pterygiophores **CI=0.25**.

Char. 157: (0 --> 2) Cleithrum lateral-anterior process large, anterior oriented **CI=0.12**.

Char. 162: (0 --> 1) Connection of basipterygium symphysis through reduced cartilage plug, more area of bone suture **CI=0.50**.

Char. 164: (0 --> 3) Anterior and posterior contact of basipterygium to cartilage plug or symphysis without sutures **CI=0.21**.

Char. 177: (0 --> 1) Hypurapophysis long, projecting to second preural centrum **CI=0.06**.

Char. 180: (0 --> 1) Neural and hemal spines on second pleural centrum ill-expanded or not expanded **CI=0.12**.

Char. 188: (0 --> 2) Orbit oval or elliptic, without notch CI=1.00.

Char. 190: (0 --> 1) Plates present on upper lip **CI=0.50**.

Char. 193: (0 --> 1) Less than 20 premaxillary teeth **CI=0.25**.

Char. 199: 0 --> 2 Cleithrum plates present, not reaching posterior border of lower lip **CI=0.18**.

Distribution: South America, French Guiana and Suriname. Main river systems: Suriname, Saramacca, Nickerie, Corantijn River basins, Suriname, and Oyapock, Sinnamary and Marowijne River basins, French Guiana.

Metaloricaria Isbrücker, 1975

Metaloricaria Isbrücker, 1975: 2. Fem. Type species: *Metaloricaria paucidens* Isbrücker, 1975

Immediately more inclusive taxon: Subfamily Loricariinae Bonaparte, 1831

Sister group: Remaining Loricariinae Bonaparte, 1831; Clade 10

Composition: Two species: *Metaloricaria nijsseni* Boeseman, 1976; *Metaloricaria paucidens* Isbrücker, 1975

Branch length: Same as for Metaloricariini.

Bremer support: 46 (Fig. 1 and Appendix 1: node 10).

Synapomorphies: See node 10 in Appendix 1 to individualize characters and transformations of their character-states on each of the taxa belonging to *Metaloricaria*.

Phenotypic characters to diagnose this node are included above in the definition of Metaloricariini.

Distribution: As for the tribe.

Discussion

Morphological characters

Phylogenetic analyses of the Loricariinae, as the main objective, are scarce. To date there are four studies dealing with the whole subfamily: two morphology-based, which are not published (Rapp Py-Daniel, 1997 and Provenzano, 2011); and two molecular-based (Covain *et al*., 2008, 2016). There have been studies dealing with phylogenetic analyses of genera of the Loricariinae (e.g. *Farlowella* by Retzer & Page, 1997; *Sturisoma* by Ghazzi, 2003; *Rineloricaria* by Fichberg, 2008; *Lamontichthys* by Paixão & Toledo-Piza, 2009; *Fonchiiloricaria* by Rodriguez *et al*, 2011; *Loricaria* by Thomas, 2011; *Loricariichthys* by Paixão, 2012; *Dasyloricaria* by Londoño-Burbano & Reis, 2016). Nevertheless, studies regarding the taxonomy of the Loricariinae have a long history (see also Introduction), the most relevant ones being Boeseman (1971, 1972, 1976), Covain & Fisch-Muller (2007), Covain *et al*. (2006, 2012), Gosline (1945, 1947, 1948), Isbrücker (1975, 1978a,b, 1979, 1980, 1981), and Regan (1904, 1912, 1913).

The studies of Boeseman (1971, 1972, 1976) and Covain *et al*. (2012) are focused on the Harttiini. Nevertheless, the first study that included the tribe in a phylogenetic analysis is that of Rapp Py-Daniel (1997). The author found the tribe to be composed by *Sturisomatichthys*, *Aposturisoma* (= *Farlowella*), *Farlowella*, *Sturisoma*, *Harttia*, *Cteniloricaria* (assumed as synonym of *Harttia* by the author), *Lamontichthys*, *Harttiella*, and *Pterosturisoma*. However, Rapp Py-Daniel (1997) split the tribe into two subtribes: the Harttiina and the Farlowellina, arrangement not corroborated here (see above and Discussion below). Rapp Py-Daniel (1997) conducted a morphology-based phylogeny with 192 characters, including both osteology and external morphology; in the present study 97 characters used by that author were tested. According to her analysis, Harttiini possesses the following synapomorphies: preopercle ventral process (CI=1.00); second basibranchial vestigial (CI=0.5); basipterygia cartilage plug short (CI=0.5); lips with plates (CI=0.5); more than 50 jaw teeth (CI=0.43); palatine anterior process present (CI=0.33); upper pharyngeal plate with bony shelf (CI=0.33); parapophyses of fourth vertebra abutting posteriorly to transcapular ligament (CI=0.33); connecting bone not contacting dorsal pterygiophores (CI=0.33). A preopercle ventral process (character 33) was corroborated as a synapomorphy for the Harttiini here, but as a non-exclusive synapomorphy shared by Harttiini and Farlowellini, and absent in the Loricariini. According to Rapp Py-Daniel (1997), the presence/absence of a vestigial second basibranchial was tested; the codification used here is different. That character was codified here in order to evaluate the different shapes of the second basibranchial found throughout the terminals included here (character 99). A vestigial second basibranchial was not found among Harttiini nor Farlowellini, on the contrary, it was found only outside the Loricariinae in *Pterygoplichthys lituratus*, which belongs to the Hypostominae. The significant difference between observations exposed here and those of Rapp Py-Daniel (1997) regarding this structure could be due to the species included or the size of the specimens used in each study; here, adult specimens were the priority for osteological observations. The shape of the cartilage between the basipterygia (character 165) was found to be short only in *Cteniloricaria*, *Harttia*, *Harttiella*, *Pterosturisoma*, and *Sturisomatichthys*, partially in agreement with what was observed by Rapp Py-Daniel (1997). This could be due to the difference in the terminal taxa of each genus included in each study. Apparently, Rapp Py-Daniel (1997) evaluated the presence/absence of plates on both upper and lower lips. Here, it was found that only plates on upper lip (character 190) diagnose the Farlowellini from the Harttiini and the Loricariini. Rapp Py-Daniel (1997) codified her character 183 as “more than 50 jaw teeth”, which was useful to diagnose the Harttiini. This was also found here, even though the codification used was based on more than 20 teeth (Character 56 and 195), this character diagnose both the Harttiini and the Farlowellini. The presence of an anterior process on the palatine was invariable for the Harttiini according to Rapp Py-Daniel (1997). We agree partially with the author, since the absence of the process (character 49) was observed only in *Lamontichthys avacanoeiro*, *L. parakana*, *Farlowella myriodon*, *F. acus*, and *F. paraguayensis*. Of those taxa, Rapp Py-Daniel included only *F. myriodon* in her analysis. Regarding the upper pharyngeal tooth plates shape (character 119) no bony shelf was observed in the present study. Several states were observed for the contact of the parapophyses of the fourth vertebra and transcapular ligament (character 122). On *Farlowella*, *Sturisomatichthys*, and the Loricariini the transcapular ligament abuts ventrally to the parapophyses of the fourth vertebra, while in *Pterosturisoma* and *Sturisoma* the ligament abuts posteriorly, and in the Harttiini and *Lamontichthys*, there is no contact. Observations included here do not show a unique condition among taxa of the Harttiini nor the Farlowellini. The same case was observed concerning the connecting bone and dorsal-fin pterygiophores (Character 130). Some *Harttia*, all *Lamontichthys*, some *Sturisomatichthys*, *Cteniloricaria*, *Pterosturisoma*, and *Metaloricaria*, have the connecting bone contacting the transverse process on the second dorsal pterygiophore. Some *Sturisoma* and Loricariini, have contact with the transverse process of the first pterygiophore, while the remaining *Sturisoma* and *Sturisomatichthys* do not show contact with pterygiophores. Finally, *Harttiella*, *Farlowella*, and the remaining *Harttia* do not have connecting bone.

The analysis offered by Rapp Py-Daniel (1997) had as objective to test the monophyly of the Loricariinae. The author did a more intensive sampling within the Loricariini, which has significantly more species (146 spp., Eschmeyer *et al*., 2017) than the Harttiini + Farlowellini (93 spp., Eschmeyer *et al*., 2017). Of the Harttiini and Farlowellini, the author included 16 terminal taxa (10 *Harttia*, one *Lamontichthys*, one *Sturisoma*, three *Farlowella* (including *F. myriodon*), and one *Sturisomatichthys*) compared to 45 terminal taxa of the Loricariini (15 *Rineloricaria*, two *Spatuloricaria*, five *Loricaria*, one *Dentectus*, one *Planiloricaria*, six *Pseudohemiodon* spp., one *Apistoloricaria*, five *Crossoloricaria*, one *Rhadinoloricaria*, two *Pseudoloricaria*, one *Limatulichthys*, one *Furcodontichthys*, three *Loricariichthys*, one *Reganella*, and one *Hemiodontichthys*). The present sampling includes

78 spp. of the Harttiini and Farlowellini, and 13 Loricariini (see Table 1 and Fig. 1,2) included in this analysis as part of the outgroup (see Methods).

The sampling intensity of each clade analyzed by Rapp Py-Daniel (1997) and the present study could account for the differences regarding our observations and taxonomic arrangement proposed herein. On fig. 48 and 49 of Rapp Py-Daniel (1997), the clade encompassing the genera included as ingroup here is divided into three groups. Rapp Py-Daniel (1997) found (*Sturisomatichthys* + ((*Farlowella* + *Aposturisoma*) *Sturisoma*) + (*Lamontichthys* + *Harttia*))), and from this result, the author divided Harttiini in Farlowellina (*Farlowella* (*Aposturisoma* + *Sturisoma*)) and Harttiina (*Lamontichthys* + *Harttia*), suggesting *Sturisomatichthys* as sister to both subtribes; according to the author, neither *Harttiella* or *Pterosturisoma* were available for inclusion. Here, a different composition was found. As shown in Fig. 1 and 2, the composition of the Harttiini *sensu* Rapp Py-Daniel, comprises three groups within the Loricariinae. From the parsimony analysis (Fig. 1), the composition of the Loricariinae is: (*Metaloricaria* + (*Cteniloricaria*+*Harttia*)) + (*Harttiella*+Loricariini) + (*Lamontichthys* (*Pterosturisoma* (*Sturisoma* (*Sturisomatichthys*+*Farlowella*)))). On the other hand, from the Bayesian analysis shown in Fig. 2, the following is observed: (*Harttiella* (*Harttia*+*Cteniloricaria*)) + (*Metaloricaria* (Loricariini)) + (*Lamontichthys* (*Pterosturisoma* (*Sturisoma* (*Sturisomatichthys*+*Farlowella*)))).

From these results, taking into account the high Bremer support (Fig. 1) and posterior probabilities (Fig. 2) on the clades, a taxonomic arrangement different from that suggested by Rapp Py-Daniel (1997) is proposed. Loricariinae is divided into four tribes: The Metaloricariini (including only *Metaloricaria*); the Harttiini, without subtribal division, including *Harttia*, *Harttiella* and *Cteniloricaria*; the Farlowellini, as a tribe instead of as a subtribe as proposed by Rapp Py-Daniel (1997) with a different composition, including *Farlowella*, *Lamontichthys*, *Pterosturisoma*, *Sturisoma* and *Sturisomatichthys*, and the Loricariini including the 13 species analyzed here and all remaining Loricariinae.

Despite the differences observed between both analyses, there are congruencies. The Farlowellina *sensu* Rapp Py-Daniel is composed of taxa sharing synapomorphies related to snout and body elongation, as well as body plating (Rapp Py-Daniel, 1997: 137), which was corroborated here. Isbrücker *et al*. (1983) in their original description of *Aposturisoma*, proposed that their monotypic genus resembled both *Farlowella* and *Sturisoma*, and that possibly this taxa could represent an intermediate state between those genera. In addition, the authors included the genus in the Farlowellini *sensu* Isbrücker, and both the authors and Rapp Py-Daniel (1997) proposed the genera as more closely related to *Farlowella*, the latter including *Aposturisoma* as a member of her Farlowellina and proposing *Aposturisoma* and *Farlowella* as more derived than *Sturisoma*. We agree with Rapp Py-Daniel in most of her discussion regarding *Aposturisoma*. *Farlowella* appeared here as more derived in relation to *Sturisoma* (Fig. 1 and 2), but as sister to *Sturisomatichthys*, which was not found by the author. Nevertheless, *Aposturisoma* was found nested within *Farlowella*, as sister to *Farlowella acus* (Fig. 1, clade 77; see discussion below). This group is sister to the remaining *Farlowella* species distributed along the Amazon and Orinoco basins (Fig. 1, node 78; see Discussion below).

Provenzano (2011) carried out another morphology-based phylogenetic analysis of the Loricariinae. The author included 90 characters, 21 of which, most of them modified, were tested here (see Description of morphological characters). The author showed several results of different analyses, using different software (*i.e.* PAST, Winclada, PAUP) following the maximum parsimony principle, and testing different conditions for the analyses, including weighting of characters and calculating Bootstrap support; all of his analyses were rooted on *Pareiorhaphis steindachneri* (Neoplecostominae). Of the members of Harttiini + Farlowellini (*sensu* the present study) included by that author are *Farlowella myriodon*, *F. venezuelensis*, *F. curtirostra*, *Farlowella* sp., *Harttia merevari*, *H. platystoma* (=*Cteniloricaria platystoma*), *H. surinamensis*, *Lamontichthys llanero*, *Sturisoma tenuirostre*, and *Sturisomatichthys leightoni*. In addition, 18 species belonging to the Loricariini were also included (genera *Apistoloricaria*, *Crossoloricaria*, *Dasyloricaria*, *Dentectus*, *Furcodontichthys*, *Hemiodontichthys*, *Limatulichthys*, *Loricaria*, *Loricariichthys*, *Paraloricaria*, *Planiloricaria*, *Proloricaria*, *Pseudohemiodon*, *Pseudoloricaria*, *Rineloricaria*, and *Spatuloricaria*).

The various results by Provenzano (2011), showed, in general, the same topology within the Loricariinae. Nevertheless, the results discussed here are the ones obtained by that author on his analysis using Winclada associated with NONA, applying TBR branch swapping and non-additive character states (Provenzano, 2011: 227; fig. 103). Within the Harttiini + Farlowellini, the relationships were not fully resolved. A polytomy including *Harttia platystoma* (=*Cteniloricaria platystoma*), *Lamontichthys llanero*, *Sturisoma tenuirostre*, and *Sturisomatichthys leightoni* was followed by two clades, which positions are not fully resolved. A clade formed by *Harttia merevari* and *H. surinamensis*, followed by a clade formed by the species of *Farlowella*, with *F. myriodon* as part of that clade as well. The author discusses the differences regarding the topology of those clades when compared to previous studies. According to Provenzano (2011), it is necessary to test the hypothesis involving taxa belonging to the Harttiini in a greater extend (following proposals such as Isbrücker, 1980 and Rapp Py-Daniel, 1997), including a higher number of representatives to conclude the analysis of that tribe.

Provenzano (2011) did not detail the relationships of the Loricariinae at a higher level (*i.e.* genera, tribes, subtribes), nor suggested taxonomic arrangements within the subfamily. Nevertheless, from his analyses, the division of the Loricariinae in several groups (three according to him, without the inclusion of *Metaloricaria*) was corroborated. The composition of the Harttiini + Farlowellini *sensu* this study was partially recovered, and this was justified by the author himself, stating that a heavy sampling within that clade should be done. On the other hand, Provenzano did not offer a discussion regarding synapomorphies or character state changes to support his hypothesis. A brief discussion of the characters illustrated by the author, and found to be present in the clades Harttiini and Farlowellini is presented here.

The following are synapomorphies illustrated by Provenzano (2011; fig. 111) from his analyses using the software PAUP. When present, only exclusive synapomorphies will be included in this discussion; if the author did not report exclusive synapomorphies, non-exclusive synapomorphies will be discussed. Two non-exclusive synapomorphies were found to support the clade including the Harttiini + Farlowellini: Longitudinal development of lateral laminae of orbitosphenoid, limited (15:1) and hyomandibular rectangular, elongated dorsoventrally, with anterior and posterior borders straight, parallel and vertical (49:2). Only the lateral laminae of the orbitosphenoid was tested here (character 17, see

Character Description). Codification used here is different from that of Provenzano, but what the author suggested was partially corroborated here. Only in *Lamontichthys*, except *L. filamentosus*, *Pterosturisoma*, *Sturisomatichthys aureus, S. panamensis, Sturisoma barbatum*, *St. lyra*, *St. monopelte* and *St. nigrirostrum*, the lateral laminae are next to the lateral border of the orbital rim and do not contribute extensively, but is not reduced. Regarding the hyomandibular shape, no evidence was found to include it as an informative character. The clade (*Harttia platystoma* (*Harttia merevari* + *Harttia surinamensis*)) is supported by two exclusive synapomorphies, ventral surface of orbitosphenoid with a central notch at posterior border, with a slight projection on that border (13:2), and absence of a round hollow structure on the articulation of the first dorsal-fin ray (63:2). Of these characters, only the latter was tested here. The absence of a hollow structure as part of articulation between the proximal portion of the dorsal fin spine and second dorsal-fin pterygiophore was indeed observed invariably among *Harttia* species (character 136:1, see Character Description). Nevertheless, it was not found to be exclusive of the genus, since this state was also observed in *Harttiella*, *Cteniloricaria*, *Lamontichthys*, *Sturisomatichthys*, and *Sturisoma* except *S. robustum* and *Sturisoma* Madre de Dios.

The clade (*Lamontichthys* (*Sturisoma* (*Sturisomatichthys* (*Farlowella*)))) presented by Provenzano (2011, fig. 111), is supported by a single exclusive synapomorphy: external exposition of pectoral girdle (cleithrum and coracoid) (66:2). According to Provenzano (2011:191), small portions of the pectoral girdle are exposed in *Lamontichthys llanero*, *L. maracaibero*, *Sturisoma tenuirostre*, and *Sturisomatichthys leightoni* on the ventral and lateral distal portions, as part of the posterior projection of the coracoid; this was not observed here. As stated in previous studies of the Hypoptopomatinae and Loricariidae in general, only the Hypoptopomatinae presents the state of an exposed pectoral girdle (Ghazzi, 2003; Fichberg, 2008; Paixão & Toledo-Piza, 2009; Pereira & Reis, 2017; Rapp Py-Daniel, 1997; Reis *et al*., 2006; Schaefer, 1987, 1988, 1991, 1997; this study).

Two exclusive synapomorphies supported the clade (*Sturisoma* (*Sturisomatichthys* (*Farlowella*))) proposed by Provenzano: Anterior border of mesethmoid straight or slightly rounded (1:2), and encapsulation of the nares complete, anterior canal narrow, almost as a tunnel (7:3). It was found here that the anterior border of the mesethmoid, or presence

/absence of cornua as characterized here (character 1, see Character Description), is useful to diagnose the Farlowellini. In addition to the absence of the cornua among its members, and as stated by Provenzano, a slightly rounded anterior border can be used as well. On the other hand, an encapsulation, as named by Provenzano, was not tested here. The nasal bone shape (character 16, see Character Description) was tested, but the present codification is not comparable to that of Provenzano. Finally, *Farlowella* including *F. myriodon* was supported by 13 non-exclusive and one exclusive synapomorphy (Provenzano, 2011). According to the author, this genus exclusively possesses a firmly attached rib on the sixth vertebra (57:1). Nevertheless, the degree of attachment of ribs along the axial skeleton was not formally tested (see genera Discussion below).

In conclusion, even though the results presented and discussed by Provenzano (2011) do not deal with taxonomic arrangements and suggestions regarding the Loricariinae, only partial congruence between results presented here and his work was found. The low number of terminals that belong to the Harttiini and Farlowellini included by the author could account for differences regarding composition at the tribe and genera level. However, the division of the Loricariinae in several lineages is evident and was corroborated in this study as well as in Rapp Py-Daniel (1997).

Covain & Fisch-Muller (2007) offered an identification key for genera of the Loricariinae as an updated version of the last Loricariinae key published by Isbrücker (1981). The authors found characters to diagnose groups that were corroborated here by means of the phylogenetic analysis. These include, as the authors stated: “The Harttiini [are] characterized by numerous and pedunculated teeth, a caudal fin with more branched rays, the absence of postorbital notches, and predorsal keels, a rounded mouth, papillose lips weakly or not fringed, and short maxillary barbels. The Loricariini [are] characterized by a more important variation in lips and teeth shape, the frequent presence of postorbital notches and predorsal keels, longer maxillary barbels, less numerous teeth, and branched rays in the caudal fin” (Covain & Fisch-Muller, 2007:6). As it was shown above, and it will be discussed later, these characteristics were found to be useful for the discrimination of the four tribes proposed here. The authors suggested the Harttiini to be composed by *Aposturisoma*, *Harttia* (*Cteniloricaria* as junior synonym), *Harttiella*, *Farlowella*, *Lamontichthys*, *Metaloricaria*, *Pterosturisoma*, *Sturisoma* and *Sturisomatichthys*. According to the authors, the inclusion of *Metaloricaria* followed Isbrücker (1979). The composition of the Harttiini *sensu* Isbrücker was the one assumed as the ingroup in this study, and as it was shown above (Figs. 1 and 2), such configuration renders the tribe paraphyletic. Thus, in order to include only monophyletic groups within the Loricariinae, four tribes are proposed here (see Classification of Loricariinae above).

Covain *et al*. (2008) carried out a molecular-based phylogenetic analysis. However, they also included some external morphological features to characterize groups within Loricariinae. The authors stated "…mouth characteristics appeared as the most important features for discriminating the different groups of this subfamily, as traits linked to this organ show the strongest variations correlated to [our] phylogeny" (Covain *et al*., 2008:1000). Even though differences were found here regarding teeth cusps, lip ornamentation, ornamentation inside the mouth, and general characteristics related to the mouth, no evidence was found that these features are synapomorphies of the groups proposed here (i.e. genera, tribes). However, as it was exposed by Covain *et al*. (2008:1000) "…species occurring over sandy substrates, such as the representatives of the *Pseudohemiodon* and *Loricaria* groups, possess a bilobate mouth with filamentous lips, whereas more rheophilic species like representatives of *Harttia* or *Lamontichthys* (which live on stones) possess an elliptical mouth with papillose lips". Thus, when comparing taxa of the Loricariini *versus* Harttiini and Farlowellini a higher diversity regarding characteristics related to the mouth in the Loricariini was observed. Within the latter, as shown by Covain & Fisch-Muller (2007) and Covain *et al*. (2008), these characteristics are indeed useful for the grouping of taxa. On the other hand, and as it was shown here, within the Harttiini and Farlowellini there is a conservative morphology regarding lip structure due to ecological requirements of the groups, occupying mainly rock substrates and fast water currents. In addition, the authors also discussed the usefulness of counts of branched caudal-fin rays and number of premaxillary and dentary teeth. Those characters are indeed useful to diagnose the clades described here, as it was stated by Covain *et al*. (2008:1000): "…from 14 [branched caudal rays] (13 in *Farlowella*) in Sturisomina [(=Farlowellina)], to 12 in Loricariina (13 in *Metaloricaria*)". In addition "…from Harttiini (bearing 80 premaxillary and 70 dentary teeth) to Loricariini (bearing less than 60 premaxillary and 50 dentary teeth), and then between Sturisomina [(=Farlowellina)] (bearing 20 to 60 premaxillary and 15 to 50 dentary teeth) and Loricariina (bearing 0 to 15 premaxillary and 3 to 15 dentary teeth)". Counts of branched caudal-fin rays reported here agree with those informed by the authors. Nevertheless, counts of premaxillary and dentary teeth slightly differ from those proposed by the authors. Loricariini is restricted here, as proposed by several authors (Gosline, 1948; Boeseman, 1971; Isbrücker, 1979, 1980, 1981; Rapp Py-Daniel, 1997; Ghazzi, 2003; Paixão & Toledo-Piza, 2009, Provenzano, 2011; Londoño-Burbano & Reis, 2016), to taxa with less than 20 premaxillary and dentary teeth, as well as for Metaloricariini. Taxa with higher teeth counts are included on both the Harttiini and Farlowellini. No evidence was found to include taxa with higher teeth counts in a subtribe within the Loricariini as proposed by Covain *et al*. (2016).

Even though neither cladistic nor probabilistic approaches were implemented, it is worth discussing the implications and results of the study carried out by Boeseman (1971) dealing with the diversity and taxonomy of the Harttiini (his Harttiinae) of the Suriname. The author followed mainly the conclusion offered by Gosline (1948:95): "The Loricariinae shows some indication of being biphyletic. The subfamily can at least be split into two apparently distinct groups on the basis of gill racker structure, pharyngeal teeth development, number of teeth, and possibly the presence or absence of an orbital notch". Boeseman then annotates "…it is striking that in some characters the scarce-toothed forms [namely the Loricariini] present a much wider range of variation within the group, comparable to that found in the whole series of the comb-toothed genera [namely the Harttiini and Farlowellini]. This gives the impression of a parallel development rather than of a direct derivation of one group from the other…" (Boeseman, 1971:4). These two statements have been confirmed by means of cladistics and probabilistic analyses (Rapp Py-Daniel, 1997; Provenzano, 2011; Lujan *et al*., 2015; Covain *et al*., 2016; this study), although the division of the Loricariinae into two different subfamilies is rejected. Characters used by the author to diagnose his Hartiinae includes "teeth numerous (15-125), evidently increasing in number with age, not minute, bilobed, forming a comb; gill rakers little developed, filamentous; pharyngeal teeth small, villiform, or possibly lacking; no orbital notch; no adipose dorsal fin; usually strongly depressed, in dorsal view varying from rather broad to extremely slender" (Boeseman, 1971:10). Even though these characters are indeed present in Harttiini and Farlowellini, an elevation of these groups to subfamily level is not supported. There are shared characteristics among the four tribes proposed here (see synapomorphies for each tribe on the Classification of the Loricariinae above and Appendix 1) which identify these groups as part of the same subfamily level group, the Loricariinae.

Boeseman (1971) also suggested "Here may be an evolutionary line leading from a Neoplecostomine ancestor, via *Harttiella*, *Harttia*, *Parasturisoma* [(=*Sturisoma*)], and presumably *Sturisoma*, to *Farlowella*, as in principle already suggested by Gosline (1948:95)…. Another obvious tendency, towards a reduction of the body width continues through all three genera, evidently to reach its limits in *Farlowella*" (Boeseman, 1971:7); such tendency was already discussed and suggested by Rapp Py-Daniel (1997; see Discussion above). This was also observed here as a progression throughout the Loricariinae regarding body slenderness and presence of an elongated snout. However, an origin from the Neoplecostominae is not assumed here taking into account that the Hypostominae is proposed as the sister group to the Loricariinae (Figs. 1 and 2), and an evolutionary study would be necessary to answer such question regarding direction and origin, which falls out of the scope of this study. Metaloricariini, Harttiini and Loricariini are stockier fishes, with wider heads in general than those in the Farlowellini, and with a short snout. In addition, the relationships within the Farlowellini, when general body shape is compared, reflect those proposed by Gosline (1948) and Boeseman (1971). From *Pterosturisoma* that is sister to the remaining Farlowellini, followed by *Lamontichthys*, which are slender than those mentioned above, but have shorter snout. Following *Sturisoma*, which have or have not an elongated snout but are not as slender as the clade formed by *Sturisomatichthys* and *Farlowella*, which are slender and most of their species have elongated snout, which can be assumed as a derived condition within the Loricariinae as proposed by Gosline (1948), Boeseman (1971) and Rapp Py-Daniel (1997); see Fig. 1.

Molecular characters

Covain *et al*. (2008) carried out a phylogenetic analysis using the partial 12S and 16S mitochondrial genes from 20 Loricariinae species representing 14 genera (*Farlowella*, *Harttia*, *Lamontichthys*, *Sturisoma*, *Sturisomatichthys*, *Metaloricaria*, *Dasyloricaria*, *Rineloricaria*, *Limatulichthys*, *Loricariichthys*, *Hemiodontichthys*, *Loricaria*, *Planiloricaria*, and *Crossoloricaria*). The sequence alignment included 1739 positions from which 238 corresponded to the 12S rRNA gene, 73 corresponded to the tRNA Val gene, and 1,428 belonged to the 16S rRNA gene (Covain *et al*., 2008:990).

The authors proposed the division of Loricariinae into two tribes, the Harttiini including only *Harttia*, and the Loricariini, divided in two subtribes, Loricariina and Sturisomina (the latter corrected by Covain *et al*., 2010 as Farlowellina). Covain *et al*. (2008) assumed the Farlowellina containing *Farlowella*, *Lamontichthys*, *Sturisoma* and *Sturisomatichthys*, as part of the Loricariini, which was later supported by Rodriguez *et al*. (2011). Both studies have not corroborated the relationships within the Loricariinae proposed on the traditional taxonomic studies of the subfamily. As shown in Fig. 1 and 2, the taxa included by the authors as part of their Farlowellina were found here to be part of the Farlowellini (following Fowler, 1958). Both osteological (see Classification of Loricariinae above) and external characters including presence of plates on upper lip, cleithrum plates reaching border of upper lip (which can also be found on some *Loricaria* species), absence of orbital notch, number of caudal rays, and number of premaxilla and dentary teeth, support this group and its distinctness from the Loricariini.

Another result found by the authors is a paraphyletic *Farlowella*, with *F. platorynchus* as sister to *Sturisomatichthys*, and *F. oxyrryncha* as part of the *Sturisoma* clade. The authors discussed that the first group was not found in neither the Neighbor-joining nor Maximum parsimony tree topologies, and the node giving *F. platorynchus* as sister to *Sturisomatichthys* was weakly supported by the two methods (Covain *et al*., 2008:990). This could indicate the paraphyletic state of *Farlowella* in that study as an artifact of few representatives of the genus, and/or few markers used for the inference of their hypothesis. A monophyletic *Farlowella*, including *Aposturisoma*, was found in the present study.

Covain *et al*. (2016) published the most recent phylogenetic study regarding the Loricariinae; a molecular-based phylogeny, using two mitochondrial genes, 12S and 16S, and one nuclear marker, f-rtn4r. The authors included 350 representatives, which include several species of Loricariinae, and 8426 nucleotide positions in their analysis, corresponding to 962 positions for the 12S rRNA gene, 74 for the tRNA Val gene, and 1509 for the 16S rRNA gene. In addition, 5881 to the nuclear f-rtn4r gene (894 positions for the exonic regions, and 4987 for the intronic regions) (Covain *et al*., 2016:504). Their results support the division of the Loricariinae into two tribes, Harttiini and Loricariini. Harttiini was proposed to include *Harttia*, *Harttiella*, and *Cteniloricaria*. While Farlowellina, as proposed by Covain *et al*. (2008) and Rodriguez *et al*. (2011), was included as a subtribe of Loricariini, including *Lamontichthys*, *Pterosturisoma*, *Sturisoma*, *Farlowella*, *Aposturisoma*, and *Sturisomatichthys*.

Results here partially agree with Covain *et al.* (2016) regarding the division of Loricariinae, including the composition of both the Harttiini and Farlowellini, but not the inclusion of the latter within Loricariini. Additionally, strong evidence was found to assume Farlowellina *sensu* Covain *et al*. not as a subtribe, but in the tribe rank, as shown on Fig. 1 and 2. The Farlowellini was found here to be supported by several non-exclusive synapomorphies (see Classification of Loricariinae above). One of the characters found here to diagnose the Farlowellini within the Loricariinae and to differentiate it from the Harttiini (except *Ctenilоricaria*), cleithrum plates present and reaching posterior border of lower lip (character 199:1 in this study), *versus* absence of plates (character 199:0 in this study), was also observed and used by Covain *et al*. (2016) to define Harttiini and their Farlowellina. The authors stated, "…[In Harttiini] the abdominal cover made of small rhombic platelets can be present or absent, and when present, the abdominal cover never extends to the lower lip margin. The latter condition is, on the contrary, always observed in Farlowellina [(=Farlowellini)]" (Covain *et al.*, 2016:513), which was corroborated here.

On the other hand, and related to Farlowellini, the authors found *Aposturisoma* nested within *Farlowella*, as it was also found here. Covain *et al*. (2016) discussed that if *Aposturisoma* is maintained, *Farlowella sensu stricto* should be assumed as paraphyletic, and to avoid this issue, *Aposturisoma* should be placed as junior synonym of *Farlowella*. Nevertheless, the authors indicated that such question needed further investigation, and thus did not formally propose that synonymy. As shown on Fig. 1, *Aposturisoma myriodon* appeared as sister of *Farlowella acus*, both type species of their respective genera. We concur with the authors in that "…*Aposturisoma* corresponds to a local form of *Farlowella* adapted to rheophilic habits…the morphological characteristics of *Aposturisoma* [could be] adaptations to stream habitat rather than an intermediary shape between *Farlowella* and *Sturisoma* as supposed by Isbrücker *et al*. (1983)" (Covain *et al*., 2016:513). Indeed, the external morphology of *F*. *myriodon* is quite different from the typical *Farlowella* species. Nevertheless, the following non-exclusive synapomorphies were found to support the clade conformed by *F*. *myriodon* and *F*. *acus* (see node 77 on Appendix 1) within *Farlowella sensu stricto*: exoccipital fenestra between ventral lamina and transcapular ligament absent (23:1); parietal branch canal length very short, reaching only to half of sphenotic (43:0); palatine anterior process absent (49:0); teeth cusps rounded (57:1); transverse process on fifth dorsal-fin pterygiophore absent (138:1); transverse process of sixth dorsal-fin pterygiophore absent (139:1). In addition as exclusive synapomorphies supporting this clade one synapomorphy from 16S (character 2223), two synapomorphies from RAG2 (characters 5351 and 5519), and two synapomorphies from nd2 (characters 5917 and 6783) were revealed.

Finally, Covain *et al*. (2016) highlighted the fact that *Sturisoma* (including trans-Andean species) is paraphyletic. They suggested that a strong biogeographical component is observed regarding that genus and *Sturisomatichthys*. As it can be seen in Fig. 1 and 2, the results of Covain *et al*. (2016) also show two monophyletic clades. One including *Sturisoma rostratum*, type species of the genus, collected in rivers of Brazil (description of its type locality by Spix & Agassiz, 1829) grouped with the remaining cis-Andean species of the genus. In addition, another clade including *Sturisomatichthys leightoni,* type species of the genus, collected in the upper río Magdalena, in Honda, Colombia (Regan, 1912), grouped with *Sturisomatichthys* species, and trans-Andean species located in *Sturisoma sensu lato*. As proposed by the authors, *Sturisoma* is assumed here to include only Cis-Andean species (see monophyly of the genus below) and *Sturisomaticthys* to include Trans-Andean species of both genera, plus the fully Cis-Andean *Sturisomatichthys caquetae* (see comments on monophyly of the genus below and Chapter 2).

Monophyly of Loricariinae

Loricariinae was found to be monophyletic under a total evidence approach, using both Maximum Parsimony analysis (Fig. 1, node 9), and Bayesian Inference analysis (Fig. 2). The subfamily was found to contain four monophyletic clades, treated here as tribes (see Classification of Loricariinae above and Discussion below). Bonaparte (1831) first recognized the subfamily, since then assumed as a monophyletic group mainly through taxonomic studies (e.g. Regan, 1904; Gosline, 1948; Boeseman, 1971; Isbrücker, 1979, 1980, 1981; Covain & Fisch-Muller, 2007) which added characters for its definition and different taxonomic arrangements. Even though these first studies were based mainly on external observations without use of a cladistic approach, some of those characters were tested in this analysis.

Schaefer (1987) was the first to test these external characteristics, as well as osteological ones. Even though his study dealt mainly with the Hypostominae, it corroborated Loricariinae as monophyletic. The author proposed the monophyly of Loricariinae supported by seven exclusive synapomorphies. Three of those characters (13, 14 and 18 in Schaefer, 1987) were not analyzed here, the remaining four (10, 12, 20 and 21 in Schaefer, 1987) were analyzed here as characters 136, 140, 183 and 211, respectively (see Classification of Loricariinae, node 9 in Appendix 1, and Character Description). These characters were found to be synapomorphic for the Loricariinae, being only character 211 exclusive of the subfamily. Armbruster (2004), on his morphology-based phylogeny of the Hypostominae, included some Loricariinae species, and found it as sister to Hypostominae. Nevertheless, the author stated that due to the small sample of the Loricariinae and instability of the clade Loricariinae + Hypostominae, he had no confidence on the synapomorphies found to support the monophyly of that clade. However, it is worth noting that the author also confirmed the monophyly of the Loricariinae based on traditional external and osteological characteristics.

Rapp Py-Daniel (1997) found the Loricariinae to be monophyletic and supported by 27 synapomorphies. Six of those (her characters 106, 156, 100, 102, 155 and 64) were not included here. The remaining 21 (her characters 124, 133, 73, 108, 137, 190, 157, 74, 150, 94, 110, 115, 123, 138, 172, 96, 134, 185, 188, 192) were analyzed, and only five of those (characters 46, 140, 148, 211 and 209, see Character Description and node 9 in Appendix 1) were found to be synapomorphic for Loricariinae.

Provenzano (2011) proposed 10 synapomorphies to support the monophyly of Loricariinae. Five (his characters 25, 27, 59, 62, 69) were not included in this study, while the remaining five (his characters 60, 61, 63, 71, 86) were tested. Four (characters 140, 142, 153, 209, see Character Description and node 9 in Appendix 1) were found here as non-exclusive synapomorphies for the Loricariinae.

On the other hand, and by means of a molecular-based phylogeny, Covain *et al*. (2008, 2016) found the Loricariinae as monophyletic. The first study included two mitochondrial markers (12S and 16S), and the second included the same markers, plus a nuclear one, f-rtn4. The 12S and 16S data deposited on Genbank by Covain *et al*. (2008, 2016; see Material and Methods) was included here. In addition, Lujan *et al*. (2015) carried out a molecular-based phylogeny with emphasis on the Ancistrini, and included five markers, two mitochondrial (16S and Cytb) and three nuclear (MyH6, RAG1 and RAG2); four of these markers were amplified in this study for the Loricariinae (see Methods). Even though the main objective of Lujan *et al*. (2015) was the Hypostominae, with emphasis on the Ancistrini, they also found strong evidence of Loricariinae monophyly.

A total of 88 characters were found here to be synapomorphic of the Loricariinae, 18 morphological (see Classification of Loricariinae, node 9 in Appendix 1, and Characters Description), and 70 molecular synapomorphies (exclusive synapomorphies in bold). The latter includes 14 synapomorphies from Cytb (characters 2745, **2790, 2850, 2952,** 3000, 3084, **3213, 3399**, 3423, 3501, 3633, **3669**, 3708**, 3735**); 11 synapomorphies from RAG1 (characters 4436, **4457, 4479, 4700, 4745, 4791, 4800, 4898, 4964, 4971**, 5030); 23 synapomorphies from RAG2 (characters **5127, 5136, 5171, 5201**, 5249, **5259, 5267, 5312, 5318, 5330, 5354, 5357, 5360, 5366, 5384, 5429, 5698**, 5754, **5816, 5818, 5820**, 5843, 5849) and 22 synapomorphies from nd2 (characters 5950, 5989, 6094, 6235, 6271, 6313, 6336, 6347, 6466, **6499**, 6506, 6525, 6529, 6531, **6564, 6568, 6580, 6581, 6589, 6631**, 6811, 6823).

Monophyly of Harttiini

When analyzed under Maximum parsimony (Fig. 1), Harttiini appeared to be: (Metaloricariini) (*Cteniloricaria* + *Harttia*) (*Harttiella* + Loricariini) (Farlowellini))), which renders the Harttiini *sensu* Covain *et al*. paraphyletic, and by means of a Bayesian approach (Fig. 2) the relationships found were: (*Harttiella* (*Harttia* + *Cteniloricaria*)) + (Metaloricariini (Loricariini)) + (Farlowellini), which corroborates the Harttiini *sensu* Covain *et al*. as monophyletic.

Rapp Py-Daniel (1997) used Maximum parsimony for her analyses, but did not find neither of the compositions of the Harttiini proposed here (Fig. 1 and 2). The author proposed for the Harttiini to be classified as (*Sturisomatichthys* (*Farlowella* + *Aposturisoma*) *Sturisoma* (*Lamontichthys* (*Harttia*)))). It is worth noting that in her study neither *Harttiella* nor *Cteniloricaria* were included. On the other hand, Provenzano (2011) found Harttiini to be composed only by *Harttia*; the author did not include any *Harttiella* species and assumed *Cteniloricaria* as synonym of *Harttia*.

A higher support for the tribe including *Harttia*, *Harttiella*, and *Cteniloricaria*, with a posterior probability of 1 (Fig. 2) was found, while on the parsimony analysis the clade encompassed by *Harttiella* and Loricariini has a Bremer support of 13 (Fig. 1, node 27). Throughout the discussion, both analyses cited above have been taken into account, although relying most of the conclusions on the parsimony analysis. Nevertheless, and taking into account the higher support of the Harttiini including the three genera mentioned above, and the results of Covain *et al*. (2016), from which two markers were included in this study (see Material and Methods), the Harttiini is assumed here as composed by *Harttia*, *Harttiella*, and *Cteniloricaria*.

There are characters of *Harttiella* (see Classification of Loricariinae above, and monophyly of *Harttiella* below) which are shared with Harttiini but no Loricariini, and are useful to differentiate both tribes. Furthermore, if the hypothesis found by the parsimony analysis is assumed, taxonomic instability regarding both the Harttiini and Loricariini would increase. If *Harttiella* is to be assumed as part of the Loricariini, evidence provided by characters of external morphology such as absence of orbital notch, number of teeth on premaxilla and dentary, pattern of abdominal plates, and number of caudal-fin rays, which were tested here and found to be phylogenetically informative to differentiate lineages within the Loricariinae, would be ignored.

The clade formed by *Cteniloricaria* and *Harttia* found by the maximum parsimony analysis (Fig. 1, node 12) is supported by seven non-exclusive morphological synapomorphies (characters 10, 17, 55, 93, 94, 166, 200, see characters under Classification of Loricariinae, Characters Description and, node 12 in Appendix 1). In addition, 40 molecular synapomorphies (exclusive synapomorphies in bold), including nine synapomorphies from 12S (characters 340, **702**, 803, 966, 968, 1134, 1193, 1299, 1313), one synapomorphy from tRNA Val (character 1475), nine synapomorphies from 16S (characters 1826, 1894, 1988, 2119, 2385, 2399, **2419**, 2420, 2480), 13 synapomorphies from Cytb (characters 2727, 2751, 2829, 2988, 2994, 3012, 3090, 3108, 3216, **3278**, 3576, 3685, 3705), three synapomorphies from MyH6 (characters 3992, 4123, 4321), one synapomorphy from RAG1 (character **4445**), and four synapomorphies from nd2 (characters 6097, 6367, 6754, 6828). Synapomorphies for *Harttiella* will be listed below.

Monophyly of *Harttia*

Harttia (Fig. 1, node 14, and Fig. 2) is herein recovered as monophyletic, corroborating Rapp Py-Daniel (1997), Provenzano (2011), and Covain *et al*. (2016). Rapp Py-Daniel (1997) found seven synapomorphies to support the monophyly of the genus (her characters 152, 166, 72, 150, 92, 174, 54). All characters were tested here (characters 166, 41, 101, 163, 122, 44, 34, see Classification of Loricariinae, node 14 in Appendix 1, and Character Description above) and only one, point of bifurcation of the infraorbital and supraorbital canals on the sphenotic (character 41) was found to be a non-exclusive synapomorphy of the genus. Provenzano (2011) found two exclusive synapomorphies for *Harttia* (his characters 13 and 63). Only one (character 136, see character description above) was included here, but not found as synapomorphic for the genus.

Even though only the studies mentioned above have dealt with several species of *Harttia* in a phylogenetic context, and corroborated its monophyly, there have been taxonomic studies that contributed with characters of external morphology to diagnose the genus. Steindachner (1877) on his original description diagnosed *Harttia* by having elongated body, absence of adipose fin, lateral plates without keels, emarginated caudal fin, and developed plates surrounding urogential pore. These characteristics were found not to be unique of *Harttia* and they can be found throughout several genera of the Loricariinae (i.e. *Cteniloricaria, Harttiella*, members of the Farlowellini).

Boeseman (1971) diagnosed *Harttia* by possessing round orbits and numerous mandibular teeth (60-120). Both characters are useful to diagnose the Harttiini and Farlowellini from the Loricariini, but not exclusive of *Harttia*.

Oyakawa (1993) included as diagnostic: round snout, rictal barbel reduced or absent, second dorsal pterygiophore absent or inconspicuous, and spinelet absent. The first two characters were found not to be exclusive of *Harttia* (see Classification of Loricariinae and character description above, and Appendix 1). However, Rapp Py-Daniel (1997) already discussed the second dorsal pterygiophore absent or inconspicuous, and assumed that Oyakawa could be referring to an articulation of the dorsal pterygiofore via condyle. If this is the case, we agree with both Oyakawa (1993) and Rapp Py-Daniel (1997) in that such state is present in *Harttia* (see above), but not synapomorphic for the genus. In addition, we also agree with Oyakawa (1993) in that *Harttia* lacks a spinelet, but again, it was not found to be synapomorphic for this group.

Rapp Py-Daniel & Oliveira (2001) on their description of seven species of *Harttia* from the Amazonas and Guianas, stated that the presence of lateral keels and abdominal plates are highly variable within *Harttia*, thus not diagnostic for the genus; we agree with the authors. Groups of species within *Harttia* with abdomen totally covered by plates (i.e. *H. duriventris, H. fowleri, H. dissidens, H. longipinna, H. surinamensis, H. rhombocephala*), or with naked abdomen (i.e. *H. carvalhoi, H. punctata, H. depressa, H. guianensis, H. fluminensis, H. tuna, H. trombetensis, H. kronei, H. loricariformis, H. garavelloi, H. gracilis, H. leiopleura, H. novalimensis, H. torrenticola*) were observed. Moreover, developed lateral keels were observed to be effect of sexual dimorphism in males, thus, not useful to diagnose *Harttia*.

Harttia was found here to be supported by 45 synapomorphies, 11 morphological (see characters under Classification of Loricariinae, Characters Description and Appendix 1) and 34 molecular. The latter include (exclusive in bold) five synapomorphies from 12S (characters 349, 371, 1033, 1034, 1140), two synapomorphies from 16S (characters 1909, 2818), nine synapomorphies from Cytb (characters 3021, 3105, 3171, 3180, **3381**, 3412, 3423, 3624, 3688), five synapomorphies from MyH6 (3862, 3940, 4048, 4255, 4300), and 13 synapomorphies from nd2 (characters 5926, 5980, 6004, 6019, 6109, 6118, 6154, 6214, 6382, 6479, 6512, 6766, 6791).

Relationships within *Harttia* at species level were well resolved, with exception of a polytomy formed by *H. dissidens, H. duriventris, H. fowleri,* and *H. trombetensis* (Fig. 1). The configuration of the genus was found to be (*H. guianensis* (*H. tuna* (*H. fluminensis* + *H. surinamensis*))) + (*H. dissidens, H. duriventris, H. fowleri, H. trombetensis* (*H. punctata* + *H. rhombocephala*)) + (*H. kronei* (*H. loricariformis* (*H. garavelloi* + *H. longipinna*) *H. gracilis* (*H. leiopleura* + *H. novalimensis*) (*H. carvalhoi* + *H. torrenticola*))).

The maximum parsimony analysis recovered most of the relationships showed by Covain *et al*. (2016, fig. 2). The topology of the species (*H. kronei* (*H. loricariformis* (*H. garavelloi* + *H. longipinna*) *H. gracilis* (*H. leiopleura* + *H. novalimensis*) (*H. carvalhoi* + *H. torrenticola*))) was the same obtained by the Bayesian inference, and in this study using both Bayesian and parsimony analyses (Fig. 2, and Fig. 1, node 14). On the other hand, the polytomy showed by the parsimony analysis was resolved in the Bayesian analysis (Fig. 2). The clade (*H. dissidens* (*H. duriventris* + *H. trombetensis*) *H. punctata* (*H. rhombocephala* (*H. fowleri*))) was recovered, which is a similar clade recovered by Covain *et al*. (2016, fig. 2) with exception of *H. rhombocephala*, which was not included by those authors.

Finally, through the use of both parsimony and Bayesian analyses, a well-supported group (Bremer support of 15, and pp=1) was obtained here: (*H. guianensis* (*H. tuna* (*H. fluminensis* + *H. surinamensis*))) (Fig. 1, node 15, and Fig. 2). Covain *et al*. (2016) found the same group of species. This clade shows a strong biogeographical component, since the four species are distributed along the Guiana Shield. This clade is diagnosed by three morphological (characters 58, 132, 198, see characters under Classification of Loricariinae, node 15 in Appendix 1, and Characters Description and Appendix 1), and 88 molecular synapomorphies. The latter contains (exclusive in bold) 15 synapomorphies from 12S (characters 307, 413, 439, 440, **565**, 585, 1121, 1130, **1138**, 1139, 1196, **1323**, 1339, 1343, 1430), two synapomorphies from tRNA Val (characters 1474 and 1525), 30 synapomorphies from 16S (characters 1668, **1680**, **1681**, 1694, 1700, 1730, 1737, 1738, 1748, 1802, 1827, 1839, 1941, 1997, 2065, 2085, 2113, 2191, 2238, 2376, 2454, **2463**, 2472, 2475, **2508**, 2516, 2572, 2590, 2610, 2632), 32 synapomorphies from Cytb (characters 2784, 2826, 2857, 2868, 2877, 2895, 2958, 2967, 2985, 3054, 3060, 3165, 3183, 3240, 3264, 3288, 3294, 3360, 3366, 3378, 3390, 3416, 3418, 3435, 3436, 3489, 3495, 3561, **3657**, 3681, 3704, 3759), four synapomorphies from RAG1 (characters 4595, 4754, **4790**, 4970), and five synapomorphies from RAG2 (characters **5153**, **5423**, 5510, 5698, 5702).

As shown above, most of the synapomorphic characters were recovered from mitochondrial markers, what makes sense considering species-level relationships are being discussed. Mitochondrial markers show a more rapid evolution, contrary to nuclear ones (Avise, 1993), which is why they are recommended when identification studies at species level, or population studies are the main objective. It is worth noting that even though the relationships within *Harttia* were resolved, the Guianas-Suriname clade has a higher support than the remaining clades within the genus, also found in Covain *et al*. (2016:505) as a highly supported monophyletic group (100 BP and pp=1) but were weakly supported as members of *Harttia* (BP below 50). These authors also discussed this issue regarding *Harttia* and Harttiini in general, in that “Deeper relationships within Harttiini are not resolved due to very short internal branches suggesting explosive radiation of the main lineages” (Covain *et al*., 2016:513). Due to the high support of the Guianas and Suriname species clade found here, what was stated above by Covain *et* al. (2016), and its position relative to the remaining *Harttia* (Fig. 1, node 18, and Fig. 2), it could be suggested that this group belong to a different genus, other than *Harttia*. However, this taxonomic arrangement could increase instability in the already confusing taxonomy of *Harttia* and the Loricariinae in general. Nevertheless, this question deserves further investigation.

Monophyly of *Harttiella*

Harttiella was found to be monophyletic (Fig. 1, node 28, and Fig. 2). Boeseman (1953) described *Harttia crassicauda* (= *Harttiella crassicauda*), type species of the genus. The author highlighted its close relationship with *Harttia kronei,* stating that the new species is characterized by the naked abdomen (also present on *H. kronei*), the pre-anal plates, the number of scutes, the caudal fin not emarginated, and the more robust shape, especially of the tail (Boeseman, 1953:12). Later, Boeseman (1971) formally described the genus *Harttiella*, giving a new combination for his species, *Harttiella crassicauda*. The diagnosis of the genus, according to the author, is that given in his description of the type species (see above). In that same study, the author included a second species in *Harttiella*, *Harttiella montebelloi* (=*Rineloricaria steinbachi*), from Monte Bello, Tarija, Bolivia described by Fowler (1940) as *Canthopomus montebelloi*. This species was unnoticed until Isbrücker & Nijssen (in Isbrücker, 1979) described the genus *Ixinandria* and included *Loricaria steinbachi* Regan (1906) as the type species, along with *Canthopomus montebelloi* in the genus.

Rodriguez *et al*. (2008) carried out a study on the taxonomy of *Ixinandria* based on molecular and morphological data. The authors found *Ixinandria montebelloi* to be synonym of *I. steinbachi*. In that study, populations from the Juramento River basin, upper Salado River drainage (type-locality of *I. steinbachi*), a population from the upper Bermejo River drainage in northern Argentina, a population from the upper Bermejo River in southern Bolivia (type-locality of *I. montebelloi*), and two specimens from the upper Pilcomayo River in Bolivia, were included. The authors found a significant difference between the population in the Bermejo River in Salta and that in the tributaries to the same river in Tarija, Bolivia, type locality of *I. montebelloi*. However, according to the authors, that difference is smaller than those usually found among species clearly distinct, and is not enough to warrant separate species recognition (Rodriguez *et al*., 2008:375). Only differences regarding the degree of development of odontodes along the sides of the head in mature males, width of the pectoral-fin spine, and size of the naked skin area at the tip of the snout, were found (Rodriguez *et al*., 2008:375). The authors included in their discussion that "…[*Harttiella*] and a few species of *Harttia* also have the abdomen completely devoid of plates, and can be distinguished from *Ixinandria* by having 12 branched caudal-fin rays (vs. 10 in *Ixinandria*) and by the absence of postorbital notch, which is present in *Ixinandria*" (Rodriguez *et al*., 2008:369). To date, and according to results offered by Covain *et al*. (2016), *Ixinandria* is a junior synonym of *Rineloricaria*.

Harttiella has been a monotypic genus since Isbrücker & Nijssen (in Isbrücker, 1979) transferred *I. montebelloi* to *Ixinandria*. It was not until the study of Covain *et al*. (2012) that additional species were included in the genus. The authors described six new species: *Harttiella intermedia*, *H. janmoli*, *H. longicauda*, *H. lucifer*, *H. parva*, and *H. pilosa*. To date, the genus has seven valid species; five of them were included in this study. Covain *et al*. (2012) diagnosed *Harttiella* mainly by body and head measurements (see Covain *et al*., 2012:136), and by having the abdomen naked with exception of lateral abdominal plates and, rarely, preanal plates; small size (largest known specimen reached 52.46mm SL); body densely covered by odontodes; subpreopercle not exposed; and lateral plates not keeled. It was found here that both the naked abdomen and the lateral plates not keeled, are shared with both *Harttia* and *Cteniloricaria*, thus not diagnostic for the genus. The authors also suggested that within *Harttiella* there are two groups, the *H. crassicauda* group, including the stockier forms, and the *H. longicauda* group, including slender species. As shown in Fig. 1, node 28, and Fig. 2, the species groups suggested by the authors were corrobotared in the present study. Nevertheless, *H. lucifer* was found as sister to both groups, not supporting the suggestion of its inclusion in the *H. longicauda* group. However, both the validity and the assignment of the species to *Harttiella* are corroborated.

We found species of *Harttiella* to be to be related as follows (*H. lucifer* (*H. intermedia* + *H. longicauda*) (*H. crassicauda* + *H. pilosa*)). This is the same topology found by Covain *et al*. (2016, fig. 2). We found the genus to be supported by 154 molecular synapomorphies. It includes (exclusive in bold), 51 synapomorphies from 12S (characters **217**, **258**, 280, 285, **301**, 318, 319, 326, 340, **400**, 404, 406, 445, 453, **460**, 506, 536, 569, 577, 580, 605, 622, **697**, 698, 703, **706**, 710, **761**,773, **834**, 931, 966, **1065**, 1106, 1121, 1130, 1140, **1175**, **1180**, 1288, 1299, 1314, 1319, 1365, 1372, **1435**, 1442, **1444**, 1445, 1451, **1554**), 40 synapomorphies from 16S (characters 1619, **1642**, **1665**, 1700, 1723, 1728, 1738, 1791, 1822, 1838, 1839, 1888, 1893, 1894, 1905, 1916, 1920, **1944**, 1988, 2036, **2053**, 2080, 2082, 2097, **2109**, 2111, 2116, 2119, 2132, **2194**, 2218, **2291**, **2380**, 2385, 2399, 2419, 2421, 2562, **2695**, **2703**), nine synapomorphies from RAG1 (characters **4445**, **4557**, 4598, **4667**, 4698, **4759**, 4910, 4955, 5090, and 54 synapomorphies from nd2 (characters 5918, **5927**, 5959, 5960, 5986, 6004, 6019, 6067, 6079, 6082, 6090, 6091, 6097, 6116, 6133, 6145, 6150, 6156, 6184, 6190, 6217, 6226, 6237, 6306, 6319, 6328, 6331, 6341, 6343, 6376, 6395, 6418, 6435, 6439, 6476, 6500, 6507, 6512, 6531, 6563, 6573, 6602, 6634, 6640, 6684, 6739, 6742, 6743, 6748, **6830**, 6831, 6835, 6838, 6839).

Covain *et al*. (2016) discussed that samples of *Harttiella intermedia* were found to be included in the clade containing *H. longicauda*, indicating a possible synonymy between these species. Nevertheless, the authors pointed out that *H. intermedia* represents a rather recent vicariant form of *H. longicauda* isolated in the Trinité Massif in French Guiana, showing a fast evolving morphology, not genetically differentiated yet (Covain *et al*., 2016:513). This is due to a result found by Covain *et al.* (2012) in which the barcode COI sequence of *H. intermedia* was also identical to that of *H. longicauda*, and introgressive hybridization or a recent founder effect in an isolated population was hypothesized to explain this similarity (Covain *et al*., 2016:513). However, the authors conclude that because of the use of the nuclear f-rtn4 gene, and the topological result is identical to that obtained using barcode sequences, the hypothesis of introgressive hybridization is invalid. Nevertheless, we found molecular synapomorphies that differentiate *H. longicauda* (characters 834 from 12S, and character 5577 from RAG2 as exclusive, and 1416 from tRNA Val as non-exclusive) from *H. intermedia*. In addition, and after examining specimens from the type series of both species, there are differences regarding general body shape, more elongated in *H. longicauda*, and as reported by Covain *et al*. (2012), presence of small preanal plates. Thus, we assume both species as valid.

Externally, *Harttiella* species can be distinguished from *Harttia* by a caudal peduncle broad, and the same width along its entire length (vs. slender caudal peduncle, becoming narrower towards caudal fin origin), and absence of abdominal plates (vs. presence, except in *H. carvalhoi*, *H. punctata*, *H. depressa*, *H. guianensis*, *H. fluminensis*, *H. tuna*, *H. trombetensis*, *H. kronei*, *H. loricariformis*, *H. garavelloi*, *H. gracilis*, *H. leiopleura*, *H. novalimensis*, *H. torrenticola*). From *Cteniloricaria* it can be distinguished by the absence of abdominal plates (*vs*. presence). Furthermore, *Harttiella* possesses a canal-bearing cheek plate with a long and thin ventral process (*vs*. short, broad process in both genera), plus fully mature adults of *Harttiella* reach to a maximum of 60mm of SL (*vs*. adults with more than 100mm SL, except *Harttia absaberi*).

Monophyly of *Cteniloricaria*

Results show *Cteniloricaria* to be monophyletic (Fig. 1, node 13 and Fig. 2), and formed by two valid species, *C. platystoma* (type species) and *C. napova*. On both morphology-based phylogenetic studies dealing with Loricariinae (Rapp Py-Daniel, 1997; Provenzano, 2011), this genus was assumed as synonym of *Harttia*. Provenzano (2011) included the type species of *Cteniloricaria* (as *Harttia platystoma*) in his analysis, and recovered it as sister to (*Harttia merevari* + *H. surinamensis*), the only two species of *Harttia* included in that analysis. On the other hand, Rapp Py-Daniel (1997) did not include *C. platystoma* in her analysis. The genus was described by Isbrücker & Nijssen (in Isbrücker, 1979), and since then, treated as synonym of *Harttia* (Oyakawa, 1993; Rapp Py-Daniel, 1997; Rapp Py-Daniel & Oliveira, 2001; Provenzano *et al*., 2005; Covain & Fisch-Muller, 2007; Provenzano, 2011), or as a valid genus (Isbrücker, 1980, 1981, 2001; Ferraris, 2003, 2007; Covain *et al*., 2006, 2012, 2016; Oyakawa *et al*., 2013; this study).

Isbrücker & Nijssen (in Isbrücker, 1979) described the genus to contain *C. platystoma* (type species), *C. fowleri* (= *Harttia fowleri*), and *C. maculata* (= *C. platystoma*). Covain *et al*. (2006) first assumed as valid both *C. maculata* and *C. fowleri*, but assigned them to *Harttia* in a morphological study of populations from French Guiana and Suriname, analyzing 28 continuous quantitative variables, 20 categorical quantitative variables, and six qualitative variables by means of a multivariate analysis. Nevertheless, Covain *et al*. (2012) found *H. maculata* to be synonym of *C. platystoma* stating "…certain specimens exhibit much longer pectoral and dorsal fins, the pectoral spines sometimes bearing short but more developed odontodes on their external surface, compared to others of the same size collected at the same place. Such specimens may represent males, which typically exhibit this type of feature in other species. [If so, the] lectotype of *C. platystoma* represents, thus a male specimen, whereas the holotype of *C. maculata* corresponds to a female [of the same species]" (Covain *et al*., 2012:134,135). The type series of neither *Loricaria platystoma*, or *Parasturisoma maculata* (= *H. maculata*) Boeseman (1971) were analyzed here. Nevertheless, samples of specimens identified as *H. maculata* (following its original description), illustrated in Appendix 3 were included here, and they belong to the same clade of samples identified as *C. platystoma* by Covain *et al*. (2016) and this study.

In that same work, Covain *et al*. (2012) described the second species included in *Cteniloricaria*, *C. napova*. The new species was diagnosed from *C. platystoma* by its distinctly spotted color pattern, numerous premaxillary teeth, and body and head measurements (see Covain *et al*., 2012:136). We examined paratypes of the species deposited at MHNG, and one additional non-type specimen (MPEG 34190) from Brazil, Pará, Óbidos, Erepecuru River (also known as Cuminá, or Paru de Oeste), Trombetas basin, and corroborated those characters when compared to *C. platystoma*. Enough material of *C. napova* to clear and stain to include osteological characters for the phylogenetic analysis was not available. Nevertheless, external morphology characters, and molecular data were included, and revealed the species to be valid (Fig. 1, node 13, and Fig. 2), and to belong to *Cteniloricaria*, as did Covain *et al*. (2016). It is worth noting that the specimen included in MPEG 34190 constitutes a new record for the species, which was so far only known from its type locality, Sipaliwini Savannah in Trio Amerindian territory at the Suriname-Brazil border, Four Brothers Mountains in a tributary of the Paru de Oeste River (see original description in Covain *et al*., 2012 for exact location).

Cteniloricaria is supported by 88 molecular synapomorphies. These include (exclusive in bold) nine synapomorphies from 12S (characters 437, 584, 647, 719, 770, 877, 975, **1203**, 1213, 1216, 1261, 1297, 1302, 1341, 1357, 1371, 1375, 1414, 1446), 17 synapomorphies from 16S (characters 1629, 1729, 1730, 1745, 1889, 1902, 1918, 1924, 2097, 2251, 2479, 2485, 2513, **2547**, 2570, 2573, 2583), 20 synapomorphies from Cytb (characters **2739**, 2746, 2791, **2820**, 2992, 3114, 3219, 3243, 3303, **3345**, 3363, 3402, 3429, 3454, 3477, 3525, 3534, 3588, **3615**, 3708), 20 synapomorphies from MyH6) characters 3781, 3826, 3886, 3910, 3913, 3976, 3985, 4030, 4051, 4063, 4108, 4150, 4189, 4222, 4225, 4237, 4324, 4342, 4354, 4366), four synapomorphies from RAG1 (characters 4778, **4865**, **5000**, 5078), and six synapomorphies from nd2 (characters 6040, 6073, 6220, 6403, 6508, 6684).

Externally, *Cteniloricaria* species can be distinguished from *Harttia* and *Harttiella* by the numerous and bigger abdominal plates, reaching the cleithral region (*vs*. when present, not reaching cleithral region, or scarce and small); snout triangle-shaped (*vs*. rounded snout); body and head mottled or spotted (*vs*. transversal dorsal bars); and presence of spinelet (*vs*. absence).

Monophyly of Loricariini

The main objective of this study was the Harttiini (namely the Harttiini and the Farlowellini), and members of the Loricariini were treated as outgroup in the phylogenetic analysis. Thus, only a brief discussion of our results regarding the tribe, based on the most recent Loricariinae study of Covain *et* al. (2016), is presented below.

Loricariini was found to be monophyletic (Fig. 1, node 32 and Fig. 2). The tribe is suggested to be formed by the clade encompassing: *Dasyloricaria*, *Rineloricaria*, *Limatulichthys*, *Loricariichthys*, *Hemiodontichthys*, *Spatuloricaria*, *Loricaria*, *Crossoloricaria*, and *Hemiloricaria*. The reader is referred to Covain *et al*. (2016) for the complete composition of the tribe (assumed by the authors as “Loricariina”).

Covain *et al*. (2016) divided the Loricariini in several groups: the *Rineloricaria* group (comprising only of *Rineloricaria*, and divided in several subgroups), the *Loricaria* group (*Loricaria*, *Proloricaria*, *Brochiloricaria*, *Paraloricaria*), and the *Pseudohemiodon* group (*Pseudohemiodon*, *Crossoloricaria*, *Rhadinoloricaria*, *Apistoloricaria*, *Planiloricaria*). The remaining genera included by the authors (i.e. *Spatuloricaria*, *Dasyloricaria*, *Metaloricaria*, *Fonchiiloricaria*, *Loricariichthys*, *Pseudoloricaria*, and *Hemiodontichthys*) even though were found as monophyletic, were not included in any group by Covain *et al*. (2016).

Loricariini was found to be classified as (*Crossoloricaria* (*Loricaria* (*Dasyloricaria latiura* (*D. filamentosa* + *D. paucisquama*))) (*Loricariichthys anus* + *Loricariichthys platymetopon*) + (*Hemiodontichthys acipenserinus* + *Limatulichthys griseus*) (*Spatuloricaria puganensis* (*Hemiloricaria lanceolata* (*Rineloricaria cadeae* +

Rineloricaria quadrensis))). Relationships of members of groups proposed by Covain *et al*. (2016) were partially recovered. According to those authors, the *Loricaria* group clade is sister to the *Pseudohemiodon* group clade (their fig. 7), which was partially corroborated here, being *Crossoloricaria* sister to (*Loricaria* ((*Dasyloricaria latiura* (*D. filamentosa* + *D. paucisquama*)). Nevertheless, the position we found for *Dasyloricaria* within Loricariini, is not what Covain *et al*. (2016) proposed. The authors found *Dasyloricaria* as sister to the remaining Loricariini, in a clade sister to *Fonchiiloricaria* (not included in this study), and that clade sister to *Metaloricaria* (which will be discussed below). The results regarding *Dasyloricaria* and its intergeneric and intraspecific relationships do not agree with those found by Londoño-Burbano & Reis (2016). Nevertheless, and taking into account that *Dasyloricaria* was treated here as part of the outgroup, the relationships proposed by Londoño-Burbano & Reis (2016) for the genus, are assumed as more accurate since the genus was the main object of that study.

The clade (*Loricariichthys anus* + *Loricariichthys platymetopon*) + (*Hemiodontichthys acipenserinus* + *Limatulichthys griseus*), agrees partially with what was found by Covain *et al*. (2016). The authors found the *Loricariichthys* clade as sister to ((*Limatulichthys* + *Pseudoloricaria*) (*Hemiodontichthys*)). *Pseudoloricaria* was not included here, but we found, as shown above, *Loricariichthys* as sister to both *Hemiodontichthys* and *Limatulichthys*. Finally, our results disagree with those of Covain *et al*. (2016) regarding *Spatuloricaria*, *Rineloricaria*, and *Hemiloricaria*. The authors found *Hemiloricaria* to be synonym of *Rineloricaria*, and the latter as a big clade not related to *Spatuloricaria*, which is sister to the *Loricaria* group clade + *Pseudohemiodon* group clade. We partially recovered the results of Londoño-Burbano & Reis (2016), who carried out a morphology-based phylogeny of *Dasyloricaria,* and included both *Rineloricaria* and *Spatuloricaria* in their analysis, the latter recovered as sister to *Dasyloricaria*.

Loricariini is supported by 48 synapomorphies. Forty-seven morphological synapomorphies, including six exclusive (see characters under Classification of Loricariinae, Character Description and Appendix 1), and one molecular, non-exclusive synapomorphy, character 3940 from Cytb.

Monophyly of Farlowellini

Farlowellini is recovered as monophyletic (Fig. 1, node 45 and Fig. 2), elevated to tribe level (from Farlowellina *sensu* Covain *et al*.), and its composition maintained the genera *Farlowella* (*Aposturisoma* as synonym), *Lamontichthys*, *Pterosturisoma*, *Sturisoma* and *Sturisomatichthys*.

Fowler (1958) described the Farlowellidi (=Farlowellini), as a suprageneric group containing *Farlowella*, and restricted its members to those having numerous setiform teeth in jaws, and circular orbit without a distinct notch (Fowler, 1958:14). Later, Isbrücker (1979:90) described and diagnosed the Farlowellini, restricted to *Farlowella*, based on the position of dorsal fin, head and body elongation, numerous and viliform mandibullary teeth, and coracoids completely covered by plates. Even though most of these characters are present in the genera proposed here to be included in Farlowellini, members of the Harttiini also possess some of those characters. The tribe is supported by 47 synapomorphies, nine morphological (see characters under Classification of Loricariinae, Character Description and node 45 in Appendix 1), and 38 molecular synapomorphies. These include (exclusive in bold) nine synapomorphies from 12S (characters 530, 702, 729,734, 770, 1115, 1216, 1340, **1340**), 11 synapomorphies from 16S (characters 1717, 1718, 1720, 1721, 1833, 2076, **2145**, 2173, 2253, 2379, **2498**), two synapomorphies from Cytb (3408, 3474), two synapomorphies from MyH6 (3874, 3979), three synapomorphies from RAG1 (characters 4493, 5000, **5081**), four synapomorphies from RAG2 (characters **5441**, 5492, 5781, **5893**), and seven synapomorphies from nd2 (characters 6235, 6253, 6289, 6412, 6439, 6445, 6479).

Rapp Py-Daniel (1997) divided the Harttiini into Farlowellina (*Farlowella*, *Aposturisoma*, and *Sturisoma*) and Harttiina (*Harttia* and *Lamontichthys*). The author diagnosed Farlowellina by possessing 7-40 mandibular teeth (183.1), quadrate elongate (48.0), abdominal plates large and quadrangular (190.3), fourth epibranchial bone twisted, without flange (78.2), cleithral latero-anterior process absent (141.0), and abdominal plates organized in series (191.1). All of these characters were included here (characters 56.0, 76.2, 200.3, 116.3, 157.0, 201.1, respectively; see Characters Description), but none was found to be synapomorphic of the Farlowellini. On the other hand, that author diagnosed

Harttiina by having sphenotic reduced (14.1), seventh pleural rib present and short (113.1), parietal branch curved (172.1), preopercle straight, with two exits (54.0), connecting bone contacting the processes of the second dorsal pterygiophore (119.0), long parietal branch (173.1), and anal plate absent (192.0). All of these characters were included here (characters 10.0, 129.1, 45.1, 34.0, 130.0, 43.1, 208.0, respectively; see Characters Description), but none was found to be synapomorphic of the Farlowellini.

Provenzano (2011) did not discuss any taxonomic arrangement within the Loricariinae. That author recovered the clade (*Lamontichthys llanero* (*Sturisoma tenuirostre* (*Sturisomatichthys leightoni* (*Aposturisoma myriodon* (*Farlowella acus* (*Farlowella curtirostra* + *Farlowella* sp.)))))), which contains genera belonging to the Farlowellini *sensu* this study. This clade, according to the author, is supported by one exclusive synapomorphy, small portions of the coracoids exposed. As discussed above (see Morphological Characters) this is not the case for Farlowellini, or Loricariinae for that matter, and only Hypoptopomatinae among the Loricariidae, possess an exposed cleithral girdle.

Covain *et al*. (2016), as discussed above (see Molecular Characters), found the same composition of their Farlowellina as our Farlowellini. According to our results, this clade should be elevated to the tribe rank.

Monophyly of *Farlowella*

Kner (1853) first described the genus *Acestra* (=*Farlowella*), based mainly on measurements of body and head structures of the species described in that same study, *Acestra acus* (=*Farlowella acus*) from Caracas, Venezuela, and *Acestra oxyrryncha* (=*Farlowella oxyrryncha*) from Mamoré River, Brazil. Following these characters, the author diagnosed the genus by possessing: longitudinal lateral dark stripes along the entire sides of the body, snout long and covered by short but numerous bristles, continuing onto the sides of the head, below the eye, and appearing to be present on the predorsal plates, while the dorsal surface of the head is smooth. The author continues by stating that there are plates present on the upper lip, premaxilla and dentary in an angle with 19-24 long, slim teeth, abdomen covered by two or three rows of well-developed plates passing over the urogenital pore, lower caudal ray extended in a filament, and all fins with black spots, as on the dorsal surface of the head (Kner, 1853: 29,30; our translation). However, the author did not assigned a type species. Bleeker (1862) assigned *Acestra acus* as type species, by subsequent designation.

Nevertheless, and according to Eigenmann & Eigenmann (1889), Dallas (1852) preoccupied the name *Acestra* in Hemiptera, thus the authors gave a new name for the genus, *Farlowella*. The authors offered a description based on *Farlowella carinata* (=*F. amazona*), also focused on body and head measurements. Nevertheless, in this description, the authors highlighted the varying length of the snout depending on the species, and counts of coalesent and not coalescent plates. Five valid species for the genus were cited in that study: *F. acus, F. gladiolus, F. carinata* (=*F. amazona*), *F. knerii* and *F. oxyrryncha*.

Regan (1904) on his monography of the Loricariidae, followed Eigenmann & Eigenmann (1889), and offered an identification key for *Farlowella*, including seven valid species, from which, one was described in that study, *F. gracilis*. Eigenmann & Vance (1917) offered another key for the genus, describing three new species, *F. azygia* (=*F. amazona*), *F. jauruensis,* and *F. hasemani,* including 14 valid species in *Farlowella*. Martín Salazar (1964) carried out a study of the *Farlowella* from Venezuela, and provided an update to the identification key offered by previous authors, plus the reference of 14 valid species distributed in Venezuela, which includes six described in the same study. Yet, these identification keys did not offer a clear definition for the species, and the authors did not propose any synonymies, contributing to a confusing taxonomy of the genus. After those studies, Isbrücker (1979:88) included *Farlowella* as the only member of his Farlowellini, and listed 37 valid species (the reader is referred to the reference for the complete list of species).

Almost 20 years passed without any revisionary study of *Farlowella,* until Retzer & Page (1997) carried out the only taxonomic revision regarding the genus published to date. The authors recognized 25 valid species, which included six described in that study (see reference for the complete list of species). The authors identified that among *Farlowella* species, only snout-mouth, snout-eye, head, and anal fin lengths, and body width and depth, are related to sexual dimorphism; the differentiation of the species was made through a PCA. Finally, the authors carried out an analysis of 34 morphological characters (measurements) through "Heuristic searches…performed with random selection of starting trees" (Retzer & Page, 1997:40); however, the authors did not mention any optimization that could have been used for this analysis, or conditions of it for that matter. Nineteen species were placed in six species groups that, according to the authors, were recognized as monophyletic, and six species as *incertae sedis*. The authors only included *Aposturisoma myriodon* (=*F. myriodon*) as outgroup and taxon where tress were rooted, thus, no intergeneric relationships of *Farlowella* were proposed. The authors proposed the following groups (see below for composition of each group): The *F. curtirostra* species group, the *F. nattereri* species group, the *F. acus* species group, the *F. amazona* species group, and the *F. knerii* species group. *Farlowella gracilis*, *F. hahni*, *F. oxyrryncha*, *F. paraguayensis*, *F. reticulata*, and *F. smithi*, were regarded as *incertae sedis*. The authors suggested these groups based mainly on the presence and number of vertical rows of lateral plates (counted from predorsal to lateral abdominal plates), number of rows of abdominal plates, degree of development of odontodes on the snout, and length and broadness of the snout. Subsequent to this study, descriptions of new species (e.g. Retzer, 2006; Ballen & Mojica, 2014; Ballen *et al*., 2016a,b), were based following the groups and characters proposed by Retzer & Page (1997). Nevertheless, as will be shown below, five of the six groups as proposed by the authors are not monophyletic, nor the characters proposed to diagnose such groups are phylogenetically informative.

Covain & Fisch-Muller (2007) followed Rapp Py-Daniel (1997) and Montoya-Burgos *et al*. (1998) in suggesting *Farlowella* as sister to *Sturisoma*. The authors highlighted ecological aspects regarding *Farlowella*, possible relationships regarding *Aposturisoma*, and offered an identification key for the Loricariinae, including *Farlowella*. Both Covain *et al*. (2008) and Rodriguez *et al*. (2011) supported the hypothesis that *Farlowella* is sister to *Sturisoma*; both studies included two species of *Farlowella*, *F. oxyrryncha* and *F. platorynchus*.

Farlowella was found here as sister to *Sturisomatichthys* (Fig. 1, node 56). This clade was supported by 11 morphological (13.2, 18.2, 38.0, 44.4, 55.0, 94.1, 103.0, 104.0, 122.0, 135.0, 177.1, see characters on node 56 on Appendix 1, and Character Description), and 21 molecular synapomorphies. The latter includes (exclusive in bold) five synapomorphies from 12S (characters 280, 506, **890**, 978, 1103), seven synapomorphies from Cytb (characters 3144, 3168, 3300, 3495, 3600, 3615, 3691), three synapomorphies from RAG1 (characters **4637**, **4726**, **5044**), two synapomorphies from RAG2 (characters 5525, **5756**), and four synapomorphies from nd2 (characters 5986, 6367, 6656, 6686).

Externally, both genera share the elongation of the snout (absent in some *Sturisomatichthys* and reduced in some *Farlowella*) and the presence of longitudinal stripes along both sides of the body, although the broadness and location related to the eye, differs in both genera. Covain *et al*. (2016) also found strong support to suggest *Farlowella* as sister to *Sturisomatichthys* (pp=1, fig. 3).

As stated above, according to Rapp Py-Daniel (1997), *Farlowella* is part of her Farlowellina. That author suggested the genus to be monophyletic and supported by the following synapomorphies: less than four anal pterygiophores (121.3); 12 caudal principal rays (124.3); frontal excluded from the orbital rim (15.1); second basibranchial short (67.0); aortic groove absent (97.1); basipterygia with long cartilage plug (148.1); basipterygia symphysis sutured only posterior to the cartilage (149.1); basipterygium posterior process elongate (153.3); 12 precaudal vertebrae (110.2); lateral line complete (138.1); parapophysis of fourth vertebra oriented backwards, reaching sixth rib (94.3); mesethmoid crest large and more conspicuous on the anterior part of the bone (7.3); preopercular canal straight with two exits (54.0); neurospine suturing to the first dorsal pterygiophore (104.0); anal pterygiophores short and showing almost complete contact between adjacent vertical walls (122.2); and second preural neural spine short (134.2). In that analysis, the author included *F. amazona*, *Farlowella* sp., and *F. myriodon*. Twelve of those characters (see below) found by the author as synapomorphic for *Farlowella* were included here, while four (her characters 97, 104, 121, 153) were not included. Some differences regarding the results offered by the author were found. From the 12 characters included here, and tested by Rapp Py-Daniel (1997), nine were not corroborated as synapomorphic for the genus (characters 7, 18, 34, 46, 125, 140, 147, 164, 174, see Character Description). On the other hand, three characters tested by the author (her characters 67, 124, 148), were found as synapomorphic for the genus, but different states were recovered. The author states that 12 principal caudal fin is synapomorphic for *Farlowella*, but that count was found to be autapomorphic of *F. reticulata* here, while for the genus, 10 principal caudal rays is proposed as synapomorphic (character 212.4); it is worth noting that within Farlowellini this is the only genus with this characteristic. The author proposed a short second basibranchial in *Farlowella*, here was found that instead an elongated third basibranchial (character 98.3) is synapomorphic for the genus; the second basibranchial was observed to be elongated as well for *Farlowella*. Finally, Rapp Py-Daniel (1997) proposed the basipterygia with long cartilage plug to be synapomorphic for *Farlowella*. That state was confirmed here, described as cartilage plug as a long, thin rectangle with thin sutures (character 165.3). It is worth noting that these differences could be due to the higher number of species included here (24 spp.) when compared to the analysis offered by Rapp Py-Daniel (1997; three spp.).

Provenzano (2011) found 14 synapomorphies to support the *Farlowella* clade, which included *F. myriodon*; seven of those characters were not evaluated here (his characters 4, 26, 49, 57, 58, 72, 77). From the other seven characters that were included here (characters 8, 12, 18, 82, 126, 153, 200, see Character Description), only one was found to be synapomorphic for the genus (character 126.1; see characters under Classification of Loricariinae, and Appendix 1).

According to Covain *et al*. (2016, fig. 3) *Farlowella* is divided into two groups: "*Farlowella* 2" including the stockier forms (*F. platorynchus*, *F. amazona*, *F.* aff. *rugosa*, *F. taphorni* and *F. curtirostra*), and "*Farlowella* 1" (including *F. hahni*, *F. paraguayensis*, *F. smithi*, *F. oxyrryncha*, *F. knerii*, *F. mariaelenae*, *F. acus*, *F. vittata*, *F. nattereri*, *F. martini*, as sister to *A. myriodon* [=*F. myriodon*]). All species included by those authors were included here, plus *F. hasemani*, *F. henriquei*, *F. isbruckeri*, *F. jauruensis*, *F. reticulata*, *F. schreitmuelleri*, *F. venezuelensis*, and *F. yarigui*. As shown in Fig. 1 (node 82), we also found the clade "*Farlowella* 2" as proposed by Covain *et al*. (2016), except for *F. amazona*.

The first clade within *Farlowella* is (*F. platorynchus* + *F. rugosa*) (*F. yarigui* (*F. curtirostra* + *F. taphorni*)), with *F. venezuelensis* as sister to all *Farlowella*. That clade is supported by six synapomorphies (characters 57.2, 58.2, 71.0, 142.0, 185.3, and 191.3; see

Character Description); nevertheless, none of these characters is related to the general body shape of the group. As proposed by Retzer & Page (1997), both *F. curtirostra* and *F. taphorni* are members of the *F. curtirostra* species group, as is *F. yarigui* according to Ballen & Mojica (2014). That group, according to Retzer & Page (1997:48) is characterized by having the second row of anterior lateral scutes thickened and forming a smoothly keeled ridge, plus the presence of odontodes on the lateral sides of the snout. That group was found here as sister to (*F. platorynchus* + *F. rugosa*), which do not belong to the *F. curtirostra* group. The *F. curtirostra* species group *sensu* Ballen & Mojica (i.e. *F. yarigui*, *F. curtirostra* and *F. taphorni*), was found here to be exclusively supported by molecular synapomorphies (exclusive in bold). These include 13 synapomorphies from Cytb (characters 2817, 2830, 2831, 2880, 3103, 3198, 3289, 3423, 3474, 3490, 3528, 3568, 3579), nine synapomorphies from RAG1 (characters 4479, 4653, 4670, 4682, 4691, 4733, **4853**,**4880**, 5000), and 10 synapomorphies from RAG2 (characters 5204, 5216, 5321, 5357, 5387, 5408, **5444**, 5591, 5678, 5705). In addition, none of the characters proposed by Retzer & Page (1997) and Ballen & Mojica (2014) to characterize this group was found to be phylogenetically informative.

The clade (*F. platorynchus*+ *F. rugosa*) (Fig. 1, node 70) was found to be supported by two morphological (103.2 and 176.0, see Characters Description and node 70 in Appendix 1) and 48 molecular synapomorphies. The latter includes (exclusive in bold) 20 synapomorphies from 12S (characters 275, 314, 326, 404, 425, **503**, **530**, 578, 592, 597, 615, **699**, 877, 938, 982, 1004, 1042, 1096, 1216, 1366), 16 synapomorphies from 16S (characters 1578, **1600**, 1746, 1820, 1936, 2042, 2078, 2115, 2142, 2169, 2253, 2374, 2433, 2540, 2549, **2638**), nine synapomorphies from Cytb (characters 2775, 2856, 3093, 3102, 3165, 3303, 3345, 3507, 3534), and three synapomorphies from RAG1 (characters 4605, 4955, 4970). According to Retzer & Page (1997), *F. platorynchus* and *F. rugosa* belong to the *F. amazona* species group along with *F. amazona* and *F. henriquei*, a hypothesis which was not corroborated. According to the authors, that group is diagnosed by three unique synapomorphies, very broad long snout, eye elevated on head, and short blunt breeding odontodes (odontodes unknown in *F. platorynchus* and *F. henriquei*), and a fourth synapomorphy found elsewhere in *Farlowella* only in species of the *F. acus* species group: two rows of abdominal scutes (Retzer & Page, 1997:68). None of those characters was found to be phylogenetically informative. Nevertheless, the number of rows of abdominal plates was not evaluated here. On the other hand, abdominal plates organized in series was found to be present, between the Harttiini and the Farlowellini, only in *Sturisoma* and *Farlowella*, which is useful in the diagnoses of these genera, and in the case of *Farlowella*, could be useful for differentiation among species.

The entire clade (*F. platorynchus* + *F. rugosa*) (*F. yarigui* (*F. curtirostra* + *F. taphorni*)), which includes species from the Upper Amazon in Colombia and Peru, the Essequibo basin, Magdalena and Lake Maracaibo basins, is supported by two morphological (20.1 and 96.3, see Character Description) and 21 molecular synapomorphies. The latter includes (exclusive in bold) 12 synapomorphies from 12S (characters 349, 350, 371, 422, 593, 594, 823, 1099, 1116, 1120, 1132, 1329) and nine synapomorphies from 16S (characters 1566, 1712, 1725, 2036, 2118, 2170, 2171, 2251, 2417). The entire clade do not appear to have any biogeographical component, other than (*F. yarigui* (*F. curtirostra* + *F. taphorni*) composed by Trans-Andean species, and the clade (*F. platorynchus* + *F. rugosa*) by Amazonian species. Nevertheless, a relation between these biogeographical areas could be explained by the existence of the proto-Orinoco-Amazon system, which emptied into the Caribbean Sea. As time went by, the proto-Orinoco-Amazon mega river system became fragmented by tectonic events (i.e. the Central and Eastern Cordilleras in Colombia, and the Venezuelan or Mérida branch of the Andes). In addition, the movements of the associated tectonic plates that eventually divided the fishes into separate biotas (Rodríguez-Olarte *et al.*, 2011:243), could explain the relationships among biotas of both systems. Furthermore, according to Lujan & Armbruster (2011b:213), the Guiana Shield has been embedded among headwaters of the Amazon, Orinoco, Essequibo, and their paleofluvial predecessors since their inception, showing a direct relation between the Amazon and Essequibo basins.

It is worth noting the taxonomic state of *F. platorynchus*. According to Covain *et al.* (2016:513), Retzer and Page (1997) described *F. platorynchus* without examining the holotype of *F. amazona*. Covain *et al.* (2016), after examining the holotypes of both species, suggested *F. platorynchus* as junior synonym of *F. amazona*, plus *F. gladiolus* (which was a junior synonym to *F. amazona*) to be revalidated. The authors did not offer any characters nor evidence to support these taxonomic decisions, and stated that identification at specific level remains difficult due to the very divergent morphology of the genus and the great similarity of its members; consequently, species with a large geographic distribution may comprise species complexes (Covain *et al*., 2016:513). We agree with the authors in that last statement. Even though *Farlowella* is here corroborated as a monophyletic group, its conservative morphology makes it difficult to achieve an easy differentiation among species, and species groups as proposed by Retzer & Page (1997) were here shown to be non-natural assemblages. Nevertheless, a grouping of species by complexes is a good first step towards the understanding of the complex taxonomy of the group. The type series of neither *F. platorynchus*, *F. amazona*, nor *F. gladiolus* were analyzed here, but autapomorphies were found to maintain *F. platorynchus* as a valid species. There are 22 morphological autapomorphies supporting this taxon, plus 20 molecular autapomorphies. The latter includes (exclusive in bold) 17 autapomorphies from Cytb (characters 2730, 2791, 2847, 2905, 3000, 3028, 3067, 3132, 3291, 3318, 3394, 3426, 3483, 3498, 3501, 3741, 3748) and three autapomorphies from RAG1 (4667, 4668, 4706). Taking into account these characters, we propose here to revalidate *F. platorynchus*. On the other hand, and not having included any specimen of *F. gladiolus* to test its validity, we follow Covain *et al*. (2016) in maintaining it as valid, and not as synonym to *F. amazona*.

The next subclade found within *Farlowella* (Fig. 1, node 74) was (*F. reticulata* (*F. isbruckeri* + *F. oxyrryncha*)). Covain et al. (2016) did not include *F. isbruckeri*, but the authors also proposed the relationship between *F. reticulata* and *F. oxyrryncha*, plus *F. knerii* included in that clade, which was not corroborated here. This clade was found to be supported by three morphological (131.0, 161.2, 179.0, see Character Description and Appendix 1) and 31 molecular synapomorphies. The latter including (exclusive in bold) eight synapomorphies from 12S (characters 436, 902, 1134, 1200, 1262, 1328, 1357, 1430), seven synapomorphies from 16S (characters 1897, 1902, 1970, 2378, 2484, 2489, 2572), eight synapomorphies from Cytb (characters 2775, 2856, 3093, 3102, 3165, 3303, 3345, 3507, 3534), three synapomorphies from RAG1) characters 4605,4955, 4970), and four synapomorphies from RAG2 (characters 5132, 5137, 5281, 5575). On the other hand, the clade (*F. isbruckeri* + *F. oxyrryncha*) is supported by 10 morphological synapomorphies

(11.2, 25.1, 39.2, 44.3, 69.2, 71.1, 98.2, 110.1, 150.1, 191.0, see Character Description and node 75 in Appendix 1). According to Retzer & Page (1997), *F. isbruckeri* belongs to the *Farlowella vittata* species group, and *F. oxyrryncha* and *F. reticulata* are *incertae sedis*. The *Farlowella vittata* species group is characterized by having five rows of anterior lateral scutes, which according to the authors, is not present on all the members of the group, which includes *F. hasemani*, *F. isbruckeri*, *F. jauruensis*, *F. nattereri* and *F. odontotumulus* (only the latter was not included in this study). Nevertheless, the group was not found to be monophyletic, being most of the members included in different clades (Fig. 1 and 2).

The clade (*F. acus* + *F. myriodon*) appeared as sister to the remaining *Farlowella* (Fig. 1, node 77). This clade is supported by six morphological (23.1, 43.0, 49.0, 57.1, 138.1, 139.1, see Character Description and Appendix 1) and 37 molecular synapomorphies. The latter includes (exclusive in bold) nine synapomorphies from 12S (characters 702, 770, 985, 1004, 1006, 1102, 1139, 1326, 1387), one synapomorphy from tRNA Val (character 1512), eight synapomorphies from 16S (characters 1918, 1935, 2049, 2119, **2233**, 2460, 2510, 2622), six synapomorphies from RAG2 (characters 5204, 5216, 5222, **5351**, **5519**, 5649), and 12 synapomorphies from nd2 (characters **5917**, 6043, 6229, 6343, 6398, 6403, 6551, 6562, 6607, 6619, 6760, 6781, **6783**). Retzer & Page (1997) included *F. acus* (type species of *Farlowella*) in the *Farlowella acus* species group, which as shown above, is not monophyletic. On the other hand, *F. myriodon* was originally described as *Aposturisoma myriodon*, as type species of *Aposturisoma* Isbrücker, Britski, Nijssen & Ortega, 1983. As discussed above, the authors suggested that the taxon could represent an intermediate form between *Sturisoma* and *Farlowella*, but more related to the latter, also suggested by Rapp Py-Daniel (1997), Covain & Fisch-Muller (2007) and Covain *et al*. (2016). In the latter, the authors found *A. myriodon* (= *F. myriodon*) within *Farlowella* as sister to the clade "*Farlowella* 2" (their Figure 3). Those authors stated that "If one considers *Aposturisoma* a valid genus, based on its particular body shape, ecological habits and restricted distribution to the Huacamayo Aguaytia drainage, members of the *F. amazona* species group (*sensu* Retzer and Page, 1997) should be placed in a new genus" (Covain *et al*., 2016:513). However, due to the lack of characteristics to easily distinguish species of the *F. amazona* from the remaining species of *Farlowella*, *Aposturisoma* should be considered as synonym of *Farlowella*, in order to avoid the paraphyly of the latter (see also Discussion above). Nevertheless, Covain *et al*. (2016) kept *Aposturisoma* as valid, regardless of the result of a paraphyletic *Farlowella*. As shown above and on Fig. 1 (node 77) we found *F. myriodon* as sister to the type species of *Farlowella*, and nested within *Farlowella*, supported by several morphological and molecular synapomorphies (see above). Externally, both species show a short, broad snout, and a somewhat stockier body, which, as claimed by Covain *et al*. (2016), could be an indication for rheophilic habits in *F. myriodon*, which also could be the case for *F. acus.* Due to the evidence found here, and the strong suggestions throughout the studies dealing with *F. myriodon* of its close relation and possible synonym of *Farlowella* (i.e. Isbrücker, 1981; Isbrücker *et al*., 1983; Rapp Py-Daniel, 1997; Ghazzi, 2003; Covain & Fisch-Muller, 2007; Covain *et al*., 2016; this study), we formally propose *Aposturisoma* as junior synonym of *Farlowella*.

The following group was found to be (*F. martini* + *F. vittata*) (*F. henriquei* + *F. nattereri*) (Fig. 1, node 79). This clade is supported by two morphological (25.1 and 176.0, see Character Description and Appendix 1) and four molecular synapomorphies. The latter includes (exclusive in bold) one synapomorphy from 12S (character 506), and three synapomorphies from 16S (characters 1802, 1917, **2457**). Both *F. martini* and *F. vittata* belong to the *Farlowella acus* species group (*sensu* Retzer & Page, 1997; for diagnosis of the group see above). Nevertheless, the composition of the group, as delimited by the authors, was not found to be monophyletic. *Farlowella martini* was described from the Maracaibo Lake basin, while *F. vittata* was described and is distributed in the Orinoco basin, in Colombia and Venezuela. Both drainages share an historic relationship, before the uplifting of the Perijá Mountains, which divided part of the proto-Orinoco, and formed what we know today as the Orinoco and Lake Maracaibo basin. This clade (*F. martini* + *F. vittata*), was found to be supported by molecular synapomorphies exclusively. These include (exclusive in bold) 13 synapomorphies from 12S (characters 253, 352, 436, 526, 579, 878, 1132, 1140, 1200, 1201, 1277, **1286**, 1335), one synapomorphy from tRNA Val (character **1470**), and nine synapomorphies from 16S (characters 1700, 1738, 1822, 1902, 2050, 2137, 2170, 2514, 2622). On the other hand, the clade (*F. henriquei* + *F. nattereri*) was supported exclusively by morphological synapomorphies (12.1, 79.1, 108.1, 131.0, 160.1, see Character description and node 81 in Appendix 1). *Farlowella henriquei* is distributed in the Paranaiba River, an affluent to the Paraná River, La Plata Drainage, while *F. nattereri* is distributed in the upper Amazon and Essequibo River basin; the latter having an Amazonian origin (see above). To explain faunal similarities among the Amazonas and Paraná, an intracontinental seaway through western Amazonia, linking the western Caribbean to the Río de la Plata estuary via western Amazonia and the modern Paraná Drainage Basin, has been proposed, but to date is subject of much controversy (Brea & Zucol, 2011:79). Nevertheless, an affinity of fauna among the Amazonas and the Paraná basins have been reported (see references on Brea & Zucol, 2011). Ihering (1927, in Brea & Zucol, 2011:79) hypothesized that an ""Arm of the Tethys" [the so called "intracontinental seaway", could] explain the similarities between Caribbean and Argentinean marine faunas during the Miocene and the migration of the faunas from the north to the south". However, as discussed by Marengo (2006), Hernández *et al.* (2005), and Latrubesse *et al.* (2007), this migration was not possible through the continental interior, and it was probably done by the eastern continental platform of South America. According to this, there is not apparent biogeographic component for this clade. Furthermore, these species belong to two different groups (*sensu* Retzer & Page, 1997). *Farlowella henriquei* was designated to the *Farlowella amazona* species group (for diagnostic characters see above), and *F. nattereri* was part of the *Farlowella nattereri* species group (for diagnostic characters see above). Results presented here rendered these groups as paraphyletic, and no support was found to maintain their diagnostic characters since they are not phylogenetically informative. In spite of the disjunctive distribution of the species and apparent no relation *sensu* Retzer & Page (1997), we found evidence for their inclusion as sister species, and to maintain both as valid.

The last clade found within *Farlowella* was (*F. amazona*) (*F. mariaelenae*) (*F. knerii* + *F. schreitmuelleri*) + (*F. jauruensis* + *F. smithi*) + (*F. paraguayensis* (*F. hahni* + *F. hasemani*)). *Farlowella amazona* was not grouped with any of the species proposed to be part of the *Farlowella amazona* species group *sensu* Retzer & Page (1997). On the other hand, *F. mariaelenae* is the only member of the *Farlowella mariaelenae* species group *sensu* Retzer & Page (1997). Short breeding odontodes cover head and second ray of dorsal fin, and anal fin entirely dark in some individuals diagnose that group according to the authors, which is the diagnosis for the species presented by the authors as well. Martín Salazar (1964) did not include these characters in his original description of the species. Furthermore, the author did not offer diagnostic characters for *F. mariaelenae*, but discussed its close relationship with *F. knerii*, which was partially recovered here. We did not find any of the characteristics suggested by Retzer & Page (1997) to be autapomoprhic of the species. The clade (*F. knerii* + *F. schreitmuelleri*) was supported by three morphological (12.1, 174.2, and 191.0, see Character Description and node 85 in Appendix 1) and 14 molecular synapomorphies. The latter includes (exclusive in bold) one synapomorphy from 12S (character 982), three synapomorphies from 16S (characters 1725, 1802, 2622), seven synapomorphies from Cytb (3429, 3498, 3546, 3685, 3720, 3726, 3753), one synapomorphy from RAG2 (character 5540), and two synapomorphies from nd2 (characters 6751, 6812). *Farlowella knerii* is distributed in the upper Amazon, in the Napo River, Ecuador, and according to Retzer & Page (1997) belongs to the *Farlowella knerii* species group, as well as for *F. schreitmuelleri*, which is distributed in the lower Amazon, in Brazil. The *Farlowella knerii* species group *sensu* Retzer & Page (1997:73) is diagnosed by short snout, snout-mouth length/pectoral fin length, and very dark reticulations on snout and head, which according to the authors, are found elsewhere on long-snouted members of the *F. amazona* species group and on *F. reticulata*. Neither of the two diagnostic characters offered by the authors as synapomorphies for the group were recovered here, but found that group to be monophyletic. In addition, its representatives are strictly Amazonian species, which includes a biogeographical component to this group.

The entire clade (*F. knerii* + *F. schreitmuelleri*) + (*F. jauruensis* + *F. smithi*) + (*F. paraguayensis* (*F. hahni* + *F. hasemani*)) was found to be supported by 22 molecular synapomorphies (exclusive in bold), including four from 12S (characters 436, 700, 902, 1262), seven from 16S (characters 1866, 1924, 1970, 2002, 2378, 2484, 2572), and 11 from nd2 (characters 6289, 6310, 6319, **6457**, 6467, **6479**, 6502, 6568, **6584**, 6610, 6754). This clade contains exclusively species distributed in the Amazonas Drainage, and on the main tributaries of the La Plata Drainage, (i.e. Paraguay and Paraná Rivers), giving a clear biogeographical component to this group. Covain *et al*. (2016) did not include *F. schreitmuelleri*, *F. jauruensis*, and *F. hasemani*, and did not find this clade.

The clade (*F. jauruensis*+ *F. smithi*) is here supported by six morphological synapomorphies (5.2, 7.2, 11.2, 20.0, 35.1, 113.3, see Character Description and node 87 in Appendix 1). Retzer & Page (1997) included *F. jauruensis* as part of the *Farlowella nattereri* species group (for diagnosis see above), and is distributed at the Upper Paraguay River basin. *Farlowella smithi* is *incertae sedis* according to Retzer & Page (1997), and is distributed in the Middle Madeira River basin. As discussed above regarding the Paraná River, it is historically related to the Amazonian Drainage; the Paraguay River belongs to the La Plata basin, and thus, have the same relation regarding the Amazonian Drainage as the Paraná River has.

Finally, the clade (*F. paraguayensis* (*F. hahni* + *F. hasemani*)) is supported by one morphological (71.1, see Character Description and node 88 in Appendix 1) and three molecular synapomorphies. The latter includes (exclusive in bold) two synapomorphies from 12S (characters **904**, 985), and one synapomorphy from 16S (character **2493**). On the other hand, the clade (*F. hahni* + *F. hasemani*) was found to be supported by eight morphological synapomorphies (39.2, 65.1, 73.1, 79.1, 116.1, 131.3, 138.1, 139.1, see Character Description and node 89 in Appendix 1).

In conclusion, *Farlowella* remains a problematic group regarding its taxonomy and diagnosis of its species, due to its very conservative morphology and low variation between species. As it was stated by Covain et al. (2016:513), “The taxonomy of *Farlowella* is also confused and the group needs further revision”. We agree with the authors, since even though we included morphological characters, most of the synapomorphies found to support the several groups proposed, were osteological, and characters of external morphology showed to be homoplastic and not useful for a diagnosis at the species level. *Farlowella* is supported exclusively by morphological synapomorphies (some of them exclusive of the genus; see characters under Classification of Loricariinae, node 67 in Appendix 1, and Discussion above). Nevertheless, characters of easy identification for a stable taxonomy of the group were not identified. In spite of this situation, we believe that the results regarding the genus shown here are a good start towards an understanding of

Farlowella. By delimiting several groups and defining valid species, we give the basis for a taxonomy study of the genus, in order to finally bring a much needed identification key of the species, and delimitation of autapomorphic, useful characters to define valid and future new species, since the richness of the genus is far from being totally understood and described.

Monophyly of *Lamontichthys*

Lamontichthys was described by Miranda Ribeiro (1939) based on *Harttia filamentosa* LaMonte, 1935, from the Jurua River, a tributary to the Solimões River, Brazil. Miranda Ribeiro (1939) based his description of *Lamontichthys* on the presence of seven branched rays on the pectoral fins. Boeseman (1971) suggested *Lamontichthys* to be a junior synonym of *Parasturisoma* (=*Sturisoma*). Nevertheless, Isbrücker & Nijssen (1978a), based on the same characters proposed by Miranda Ribeiro (1939), revalidated *Lamontichthys*, and described a new species, *L. stibaros*, from the Pastaza River, Upper Amazon, in Ecuador. Later, Isbrücker (1980) proposed *Harttia filamentissima* Eigenmann & Vance, 1942 from the Huallaga River, Upper Amazon, in Peru, as junior synonym to *L. filamentosus*. Taphorn & Lilyestrom (1984) described two species from the Lake Maracaibo basin and the Apure River, in Venezuela, *L. maracaibero* and *L. llanero*, respectively. The authors also presented a summary of the knowledge of the Harttiina *sensu* Boeseman, and an identification key for *Lamontichthys*. The most recent and complete study regarding the genus is that of Paixão & Toledo-Piza (2009), in which the authors carried out a taxonomic revision with description of two new species, *L. avacanoeiro*, from Upper Tocantins, and *L. parakana* from the Lower Tocantins, plus a morphology-based phylogeny.

Lamontichthys is monophyletic, supported by morphological synapomorphies (exclusive in bold; characters 43.0, 66.1, 91.2, 108.1, 128.1, **149.1**, 165.2, 179.1, 200.1, see Character Description and node 46 in Appendix 1). *Lamontichthys* was found at the base of the Farlowellini, as sister to all remaining Farlowellini (Fig. 1, node 46) as (*L. avacanoeiro* + *L. parakana*) + (*L. llanero* (*L. filamentosus* + *L. stibaros*)). Paixão & Toledo-Piza

(2009:563, Fig. 55) found the following (*L. avacanoeiro* + *L. stibaros*) + (*L. maracaibero* (*L. filamentosus* + *L. llanero*)). The authors did not include *L. parakana* due to the lack of specimens for c&s for osteological observations. On the other hand, we did not include *L. maracaibero* due to the lack of both specimens and tissues for DNA extraction. Nevertheless, we found a similar configuration for this clade, mainly regarding the position of *L. filamentosus* (type species).

Rapp Py-Daniel (1997) included only *L. filamentosus* in her phylogenetic analysis, suggesting the genus as sister to *Harttia* and belonging to her Harttiina. The genus was proposed as valid by the author, and supported by eight pectoral-fin rays (139.1), large and spike-like lateropterygium (157.1), fourth pharyngobranchial nodular and cartilaginous (81.2), lower pharyngeal plate triangular (82.1), and second preural spine short (134.2). All five characters were included here (characters 149, 172, 103, 104, 147, see Character Description). However, only one was identified as a synapomorphy for *Lamontichthys*, seven branched rays on pectoral fins (149.1). This was also the case regarding the study carried out by Provenzano (2011).

Paixão & Toledo-Piza (2009:563) suggested *Lamontichthys* as monophyletic, and to include six valid species. The authors found the following as synapomorphies of the genus: trapezoidal shape of lower pharyngeal plate (13.1>4), triangular and relatively long posterior expansion of first epibranchial (14.1>2), large coronoid process of dentary, with large robust area, not concave (23.0>1), presence of I-7 pectoral-fin rays (60.0>1), proximal portions of first three anal-fin pterygiophores in (or almost) in contact (69.1>2), presence of two broad apophyses on second preural centrum (77.0>3). As ambiguous characters, the authors proposed: narrow ventral laminar expansion along posterior border of anterior ceratohyal gradually widening from medial to lateral portion (10.0>1; present in *Sturisoma*), presence of 23-25 caudal vertebrae (51.1>0; present in *Farlowella*, *Sturisoma* and *Pterosturisoma*), presence of transverse process on sixth dorsal-fin pterygiophore (58.0>1; present in *Farlowella*, *Pterosturisoma* and *Rineloricaria*), presence of large central buccal papillae (82.1>2; present in *Harttia*). Here, nine of the ten characters reported by the authors (characters 104, 111, 53, 149, 174, 179, 89, 139, 192, see Character Description) were included. Two of them (characters 149 and 179) corroborated as synapomorphies for *Lamontichthys* (see characters under Classification of Loricariinae and node 46 in Appendix 1).

The clade (*L. avacanoeiro* + *L. parakana*) was found to be supported by five morphological synapomorphies (characters 36.1, 47.0, 49.0, 103.0, 189.1, see Character Description and node 47 in Appendix 1). Neither Paixão & Toledo-Piza (2009) nor Covain *et al*. (2016) found this clade due to the absence of *L. parakana* in the former, and of both species in the latter. Paixão & Toledo-Piza (2009) found *L. avacanoeiro* as sister to *L. stibaros,* that clade supported by snout tip covered by soft connective tissue lacking papillae (character 80 in Paixão & Toledo-Piza, 2009). That character was found not to be synapomorphic for any clade proposed here. The clade (*L. avacanoeiro* + *L. parakana*) includes a biogeographical component, since both species are distributed at the Tocantins River (Upper and Lower, respectively).

The clade (*L. llanero* (*L. filamentosus* + *L. stibaros*) was found to be supported by 10 morphological synapomorphies (2.1, 13.0, 82.1, 83.0, 120.0, 129.0, 196.2, 203.1, 205.1, 213.2, see Character Description and node 48 in Appendix 1). On the other hand, the clade (*L. filamentosus* + *L. stibaros*) was found to be supported by 29 molecular synapomorphies, including (exclusive in bold) eight synapomorphies from 12S (characters 347, 880, 936, **965**, 1116, **1191**, 1254, 1371), six synapomorphies from 16S (characters 1702, 1735, 1802, 2027, 2116, 2562), and 15 synapomorphies from Cytb (characters 2988, 3033, 3075, 3103, 3132, 3171, 3182, 3201, 3291, 3501, 3504, 3648, 3705, 3708, 3709). Neither Paixão & Toledo-Piza (2009) nor Covain *et al*. (2016) found these clades.

Genus *Pterosturisoma*

Eigenmann & Allen (1942) described *Harttia microps,* from Iquitos, Peru. The authors based their description of the new species on five adult specimens, centering their description on the number of lateral abdominal plates, minute central abdominal plates, filaments on the pectoral fins, and highlighted the small diameter of the orbit, characteristic of this species and genus. Isbrücker & Nijssen (1978) described the genus *Pterosturisoma* with *H. microps* (=*Pterosturisoma microps*) as its type species. The authors highlighted the resemblance of *Pterosturisoma* with *Lamontichthys*, from which it differs by the number of branched pectoral-fin rays (six *vs*. seven), size of the orbit, number of lateral plates with lateral-line pores (more numerous in *Pterosturisoma*), and fewer central abdominal plates on *Pterosturisoma*. As seen in *Lamontichthys, P. microps* lacks any sexual dimorphic characters.

Pterosturisoma was recovered as a monotypic genus, belonging to the Farlowellini, as sister to (*Sturisoma* (*Sturisomatichthys* + *Farlowella*)). *Pterosturisoma microps,* possesses 24 morphological, and 138 molecular autapomorphies. The latter including (exclusive in bold) 18 synapomorphies from 12S (characters **237**, 275, 306, 318, 323, 340, 350, 382, **596**, **697**, 975, 1098, 1116, 1132, 1138, 1297, 1302, 1319), one synapomorphy from tRNA Val (character 1538), 15 synapomorphies from 16S (characters 1697, 1700, 1745, 1800, **1896**, 2014, **2040**, 2107, 2108, 2117, 2119, 2376, 2460, 2496, 2570), 47 synapomorphies from Cytb (characters 2733, 2736, **2742**, 2745, 2746, 2805, 2859, 2868, 2901, 2910, 2985, 2988, 2994, 3030, 3054, 3066, **3138**, 3153, 3231, 3243, **3246**, 3258, 3273, 3291, 3303, 3312, 3394, 3399, 3414, 3489, 3507, 3546, 3549, 3576, 3580, 3586, 3601, 3607, 3618, 3660, **3673**, 3699, 3704, 3705, 3753, 3756, 3771), 10 synapomorphies from RAG1 (characters 4436, 4490, **4491**, 4654, 4668, **4775**, 4889, 4970, 5064, **5090**), 11 synapomorphies from RAG2 (characters 5192, 5232, 5372, **5493**, 5504, 5522, 5618, **5643**, 5714, 5833, **5903**), and 34 synapomorphies from nd2 (characters 5953, 5956, 6016, 6040, 6044, 6130, 6151, 6169, 6172, 6208, 6238, 6259, 6277, 6286, 6328, 6364, 6370, 6385, 6388, **6394**, 6437, 6478, 6496, **6556**, 6593, 6607, 6655, 6661, 6664, 6691, 6697, 6751, 6766, 6816).

On the other hand, the clade (*Pterosturisoma*) + (*Sturisoma* (*Sturisomatichthys* + *Farlowella*)) is supported by 11 morphological (see characters under Loricariinae Classification, and node 50 in Appendix 1, and Character Description) and 57 molecular synapomorphies. The latter including (exclusive in bold) 15 synapomorphies from 12S (characters **300**,307, 317, 351, 371, 558, 676, 710, 723, 823, 824, 937, 1129, 1293, 1359, 1442), 11 synapomorphies from 16S (characters 1725, 1791, 1916, 1918, 2084, 2420, 2558, 2572, 2590, 2604, 2632), seven synapomorphies from Cytb (characters 2826, 2831, 2835, 3012, 3405, 3423, 3579), two synapomorphies from RAG1 (characters 4670, 4799), two synapomorphies from RAG2 (characters **5141**, **5747**), and 18 synapomorphies from nd2 (characters 5960, 5983, 5992, 6017, **6064**, 6094, 6121, 6184, 6217, 6355, 6467, 6468, 6469, 6470, 6602, 3706, 3736, 3781, 6794).

Rapp Py-Daniel (1997) did not include *Pterosturisoma* in her analysis. However, the author did examine specimens in alcohol and c&s. Based on those specimens she stated "I agree with its current placement in the Harttiini *sensu* Isbrücker, based on the presence of a well-developed palatine splint, lateropterygium, and large premaxillae and dentaries. [*Pterosturisoma* can be distinguished from *Lamontichthys*] by presenting fewer pectoral-fin rays, and a longer, deeper head" (Rapp Py-Daniel, 1997:144). The author assigned *Pterosturisoma* to her Harttiina based on the possession of the connecting bone contacting the lateral processes of the second dorsal pterygiophore, lack of derived features related to snout elongation, and abdominal plates organized in series. Only the latter was found here to be diagnostic of the Farlowellini (Harttiina in Rapp Py-Daniel, 1997).

Paixão & Toledo-Piza (2009) found *Pterosturisoma* to be included in a clade along with *Sturisoma*, *Farlowella*, *Rineloricaria*, *Pseudoloricaria*, *Loricaria*, and *Sturisomatichthys*; but its relationships were not fully resolved in that analysis. The authors found two autapomorphies that supported *Pterosturisoma*, the lack of a crest on the lateral surface of hyomandibula for the insertion of the *levator arcus palatine* muscle (31.0>1), and the elongate and narrow distal portion of the hemal spine of the last precaudal vertebra (40.1>2) (Paixão & Toledo-Piza, 2009:565). The former was corroborated as autapomorphic (but not exclusive) to *Pterosturisoma* (character 83.1, see Character Description and Appendix 1), but the latter was not included here.

Finally, Covain *et al*. (2016) also found *Pterosturisoma* as sister to a clade composed of (*Sturisoma* (*Sturisomatichthys* + *Farlowella*)) (their fig. 3), and included in the clade comprehending the Farlowellini *sensu* this study. This shows a high stability for the position of the taxon within Farlowellini when different approaches and optimizations are compared.

Monophyly of *Sturisoma*

Sturisoma was described by Swainson (1838), designating *Loricaria rostrata* Agassiz (in Spix & Agassiz, 1829) as the type species. Most of the species currently included in *Sturisoma* were originally described as *Loricaria* Linnaeus (1758) or *Oxyloricaria* Bleeker (1862) (except *Oxyloricaria fowleri*, valid as *Harttia fowleri* (Pellegrin 1908)). It was not until Eigenmann (1910), who proposed *Oxyloricaria* as a junior synonym of *Sturisoma*, and then transferred most *Oxyloricaria* species to the latter, that authors started to describe species as *Sturisoma sensu stricto*.

Despite the genus was described in the XIX Century, its taxonomy has not been extensively studied. Regan (1904) in his monograph of the Loricariidae, proposed a differentiation of *Oxyloricaria* and *Loricaria* based on the number of teeth, absence of postorbital notch, and development of the rostrum, and still described new species in *Oxyloricaria*. Later, Isbrücker (1980), following the synonymy proposed by Eigenmann (1910), includes *Sturisoma* as a member of his Harttiini with 15 valid species. Rapp Py-Daniel (1997) was the first author to include *Sturisoma* in a phylogenetic analysis of the Loricariinae, based on morphological evidence, and suggested the genus is part of her subtribe Farlowellina, in disagreement with the classification of Isbrücker (1980). Ghazzi (2003) was the first author to perform a taxonomic revision and a phylogenetic analysis of *Sturisoma*, aiming to include all valid species. The author found *Sturisoma* to be monophyletic by including the Trans-Andean species to her "“Trans” new genus". That author proposed a number of exclusive osteological synapomorphies for the genus, but that study is still unpublished.

Sturisoma is monophyletic, including only Cis-Andean species of the *Sturisoma sensu lato* (Fig. 1, node 52). *Sturisoma* belongs to the Farlowellini, and appears as sister to the clade (*Sturisomatichthys* + *Farlowella*). Interspecific relationships of the genus were found as (*Sturisoma* Madre de Dios, *S. monopelte*, *S. robustum*, *S. tenuirostre*) + (*S. nigrirostrum* (*S. guentheri* (*S. barbatum*, *S. lyra*, *S. rostratum*))). Interspecific relationships as seen on Fig. 1 (node 52) were not fully resolved, since two polytomies were found at the base and tip of the clade. Even though relationships within the *Sturisoma* clade were not fully resolved, the genus is supported by 21 morphological (see characters under Classification of Loricariinae, node 52 in Appendix 1, and Character Description) and 61 molecular synapomorphies. The latter including (exclusive in bold) nine synapomorphies from 12S (characters 276, 350, 504, 611, 1126, 1129, 1287, 1333, 1341), six synapomorphies from 16S (characters 1578, **1653**, 1802, 1868, 2269, 2583), 18 synapomorphies from Cytb (characters 2970, 2982, 2994, 3054, 3058, 3093, 3189, 3414, 3418, 3453, 3477, 3528, 3555, 3617, 3708, 3744, 3747, 3750), three synapomorphies from MyH6 (characters 4189, 4378, 4405), seven synapomorphies from RAG1 (characters 4451, **4517**, **4730**, **4880**, 4883, **4912**, **4913**), one synapomorphy from RAG2 (character **5672**), and 17 synapomorphies from nd2 (characters 5992, 6007, 6145, 6181, 6259, 6271, 6320, 6330, 6334, 6371, **6373**, 6427, 6551, 6574, 6577, 6595, 6598). Nevertheless, these relationships were resolved by means of a Bayesian analysis, with the following topology (*Sturisoma* Madre de Dios + *S. tenuirostre*) (*S. robustum* (*S. monopelte*)) + (*S. barbatum* + *S. rostratum* (*S. lyra*)) (*S. guentheri* (*S. nigrirostrum*)) (Fig. 2).

Rapp Py-Daniel (1997) included *Sturisoma* sp. in her analysis, and found the genus to be sister to the (*Farlowella* + *Aposturisoma*) as part of her Farlowellina. The author diagnosed the genus by “highly homoplasious synapomorphies”, which included tranverse process of 4th vertebra reaching beyond compound pterotic border (94.2), parapophysis of fourth vertebra abutting ventrally to transcapular ligament (92.2), hyomandibula concavity large without foramen (41.1), fourth pharyngobranchial nodular and cartilaginous (81.2), and lower pharyngeal plate triangular (82.1). All four characters were included here (characters 125, 122, 79, 103, 104, see Character Description and node 52 in Appendix 1) but neither was found to be synapomorphic for the genus.

Provenzano (2011) included only *S. tenuirostre*, and found it to be sister to his (*Sturisomatichthys* (*Aposturisoma* + *Farlowella*)). According to the author, *S. tenuirostre* is diagnosed by two autapomorphies: lateral lamina of orbitosphenoid reaching more than half of its length (15.0), and small cavity at base of lateral lamina of orbitosphenoid (16.2). Neither of the characters were included here.

Ghazzi (2003) carried out a morphology-based phylogeny including eight valid species of *Sturisoma sensu lato*, plus five undescribed species. Ghazzi found a monophyletic *Sturisoma* including only Cis-Andean species, plus *S. kneri* (=*Sturisomatichthys kneri*), which was not found here to belong to *Sturisoma*. The author proposed several synapomorphies to support that clade. As exclusive synapomorphies, the author indicated the ventral lamina of compound pterotic joined to lateral process of basioccipital, oriented posteriorly relative to transversal axis of body (20.2), flange of first ceratobranchial as narrow lamina, triangular-shaped with even edges (53.3), fourth epibranchial process as thin flap, oriented ventrally, dorsally convex (59.4), insertion of *obliqui dorsalis* muscle in short posterior dorsal projection on third pharyngobrnachial (63.2), sixth plate of infraorbital canal with two exits, latero-dorsal and dorsal (121.1), and dark stripe on predorsal plates (135.1). In addition, as non-exclusive traits, the sphenotic with short ventral process (13.2), plate between infraorbital five and preopercle contacting sphenotic (15.1), hyomandibular with posterior elongation (38.0), small exposed surface of preopercle with odontodes (42.1), fifth ceratobranchial trapezoidal (65.2), fifth ceratobranchial with teeth covering posterior border (66.3), upper pharyngeal plates, triangular (68.2), incomplete dentition of upper pharyngeal plates (70.1), transverse process of Weberian apparatus approximately with same length as compound pterotic (73.1), epural reduced (90.1), latero-anterior process of cleithrum, absent (101.0), upper lip border with papillae (124.1), rictal barbel short, approximately half size of orbit (125.1), and narrow lateral stripe from tip of snout to caudal peduncle (132.1). Of the 20 characters proposed by Ghazzi (2003) as synapomorphies, 12 were included here (characters 101, 116, 8, 81, 35, 105, 119, 120, 178, 189, 191, 214, see Character Description and node 52 in Appendix 1). Of these, only two were corroborated as synapomorphies for the genus, upper pharyngeal tooth plates triangle-shaped (119.3) as exclusive to the genus, and rictal barbel half of orbit diameter (191.1) as non-exclusive, and as the same state observed by Ghazzi (2003). Moreover, *Sturisomatichthys kneri* was not found as part of *Sturisoma* but to *Sturisomatichthys*, contrary to what was suggested by the author (see below and Chapter 2). Our conclusion regarding this species agree with that of Covain *et al*. (2016).

The clade (*S. nigrirostrum* (*S. guentheri* (*S. barbatum*, *S. lyra*, *S. rostratum*))) was found to be supported by three morphological (22.0, 57.0, 140.3, see Character Description and node 53 in Appendix 1) and 18 molecular synapomorphies. The latter including (exclusive in bold) 14 synapomorphies from 12S (characters 248, 452, **504**, 547, 558, 584, 723, 984, 1102, 1116, 1128, **1135**, **1212**, 1300), and four synapomorphies from 16S (characters **1783**, 1826, 2117, 2460). Ghazzi (2003) did not find this clade; the author did not include *S. nigrirostrum*.

Covain *et al*. (2016) found the clade (*S. monopelte* + *S. nigrirostrum*) (*S. guentheri*) + (*S. robustum*) + (*Sturisoma* sp.). A direct comparison of both analyses is difficult due to the differences in terminals. However, a close relationship between *S. nigrirostrum* and *S. guentheri* was also found here, both species distributed at the Upper Amazon indicating an historical connection between these populations. In addition, we also found a clear separation of the Cis-Andean and Trans-Andean species belonging to *Sturisoma sensu stricto* (before the division proposed by Covain *et al*., 2016). If *Sturisoma* is assumed to include all Cis- and Trans-Andean species, the result would be a paraphyletic *Sturisoma*. Thus, we agree with Covain *et al*. (2016) in that *Sturisoma* is restricted to only the Cis-Andean species, while the Trans-Andean species belong to *Sturisomatichthys* (see below and Chapter 2). Nevertheless, Covain *et al*. (2016) also included *Sturisomatichthys caquetae* as part of *Sturisoma,* relying only on its distribution (Cis-Andean, Caquetá River, Upper Amazon, Colombia) to suggest the species as part of the genus. We do not follow the authors in transferring *St. caquetae* to *Sturisoma*, since the authors did not include any specimen in their analysis nor analyzed its holotype. Even though we did not include any specimens of *St. caquetae* in our phylogenetic analysis either, we studied the holotype of *Harttia caquetae* Fowler, 1945; ANSP 71719. According to characters found to be diagnostic of *Sturisomatichthys* (see below and Chapter 2), this species do belong to *Sturisomatichthys* as first proposed by Isbrücker & Nijssen (in Isbrücker, 1979), and not to *Sturisoma* as proposed by Covain *et al*. (2016).

Finally, an undescribed species was found, *Sturisoma* Madre de Dios from several localities along the Madre de Dios basin, Upper Amazon, Peru. Several osteological autapomorphies were observed (characters 8.1, 14.1, 18.2, 19.0, 29.0, 30.2, 31.1, 34.2, 35.1, 36.3, 75.1, 96.3, 110.1, 131.1, 136.2, 157.2, 160.0, 176.2, 186.1, 214.5, see Character Description and Appendix 1) to distinguish it as a different taxon, even though it was found to be sympatric with *S. guentheri*. In addition to meristic and external morphology characters, to help diagnose this taxon. As shown above, *Sturisoma* is strictly a Cis-Andean genus, and most of its richness is located along the Amazon basin (e.g. *S. guentheri*, *S. nigrirostrum*, *S.*

rostratum, *S. barbatum*, *S. robustum*, S. *lyra,* S. *brevirostre*). The finding of a new species among the already known abundance of the genus is an indication that the complete composition of the genus is far from fully known, and its relationships not fully understood. Even though several characters were found to support the monophyly of the genus, its taxonomy is ill studied. We strongly suggest the development of a taxonomic study of the genus, in order to discover characters to clearly diagnose the species. As discussed above regarding *Farlowella*, this study is a good first step towards understanding the taxonomy of both genera, which are among the more numerous in Loricariinae.

Monophyly of *Sturisomatichthys*

Isbrücker & Nijssen (in Isbrücker, 1979) described *Sturisomatichthys* to include *Oxyloricaria leightoni* Regan, 1912 (type species, Upper Magdalena basin, Colombia), *Harttia caquetae* Fowler, 1945 (Caquetá River, Upper Amazon, Colombia), *Oxyloricaria citurensis* Meek & Hildebrand, 1913 (Cupe River, Tuyra Basin, Panama), and *Oxyloricaria tamanae* Regan, 1912 (San Juan River, Pacific Slope, Colombia). The authors highlighted the resemblance of the new genus to *Sturisoma*, from which it could be differentiated by the absence of a rostrum, being the only diagnostic character for *Sturisomatichthys* (for a complete taxonomic account of the genus see Chapter 2).

After the description of the genus there were no taxonomic studies involving its species, until Rapp Py-Daniel (1997), who included *S. citurensis* in her phylogenetic analysis. The author found the genus to be part of her Harttiini, as sister to the remaining genera included in her Harttiina and Farlowellina, more related to *Farlowella*, which was also recovered here (see below). The author found only one synapomorphy to support the genus (with a CI below of 0.3), presence of parietal branch terminal exit on border between frontal and sphenotic (174.1). That character was included here (44.4, see Character Description and node 57 in Appendix 1) and it was not found to be synapomorphic for the genus. In addition, among species of *Sturisomatichthys*, the terminal exit of the parietal branch ends on the sphenotic, not on the border between frontal and sphenotic as suggested by Rapp Py-Daniel (1997).

Ghazzi (2003) included three species of *Sturisomatichthys* in her phylogenetic analysis, *S. leightoni*, *S. citurensis*, and *S. tamanae*. The author found *S. citurensis* and *S. tamanae* to be part of a separate clade than that which included *S. leightoni*, while three undescribed (Trans-Andean) species revealed by the author, and *S. panamensis* and *S. festivus*, did appear in the clade containing the type species of *Sturisomatichthys*. Ghazzi (2003), in her Discussion, proposed a "”Trans" New Genus" to include the undescribed species plus *S. panamensis*, *S. frenatus* and *S. festivus*. That genus was proposed based on the exclusive synapomorphy (according to the author) of lateral longitudinal stripes, on both sides of the body from the tip of the snout to the caudal peduncle. Nevertheless, this characteristic was observed here to be present also in *S. leightoni*, *S. aureus*, *S. dariensis*, *S. kneri*, and species of *Farlowella* and *Sturisoma*, which renders the character not diagnostic of a new genus. Furthermore, Ghazzi (2003) did not explain why the decision of describing a new genus instead of the inclusion of the species cited above in *Sturisomatichthys*, since her new species and Trans-Andean species belonging to *Sturisoma sensu lato*, were part of the same clade as *S. leightoni*. The clear separation of Trans- and Cis-Andean species of both *Sturisomatichthys* and *Sturisoma* was corroborated here, as Covain *et al*. (2016) also discussed. Nevertheless, a new genus as proposed by Ghazzi (2003) was not supported here, and we refer two of her new species, *Sturisomatichthys* Baudó and *Sturisomatichthys* San Juan (included in this analysis), to belong to *Sturisomatichthys* (see below and Chapter 2). Finally, the author assumed *S. dariensis* as junior synonym of *S. panamensis*, and *S. aureus* considered as incertae sedis. The former was found as a valid species (see below and Chapter 2), and *S. aureus* as sister to *S. leightoni*. In addition, a redescription of the latter and designation of a neotype is presented (see below and Chapter 2).

On the other hand, Provenzano (2011) included only *S. leightoni* in his analysis. The author found the species to be sister to the clade (*Aposturisoma* + *Farlowella*), which was corroborated here. One autapomorphy was found for the species in that study: reduction of lateropterygium (75.1). This was partially corroborated here, since it was found among species of *Sturisomatichthys* a short or reduced lateropterygium (172.1 and 172.2, see Character Description and node 57 in Appendix 1). Nevertheless, it was not found to be synapomorphic for the genus. On the other hand, the author found a single synapomorphy to support his clade (*Sturisomatichthys* (*Aposturisoma* + *Farlowella*)), maxillary bone curved (34.1). However, this character was not included here.

Regarding molecular analyses of the Loricariinae, Covain *et al.* (2008) and Rodriguez *et al.* (2011) included *S. citurensis*. Both studies found the species as sister to *Farlowella*, a topology also found here (see below).

This is the first phylogenetic analysis including nine of the 10 valid species of the genus, plus two undescribed species. A monophyletic *Sturisomatichthys* is proposed here (Fig. 1, node 57), (*S. citurensis* + *S. tamanae*) + (*S. festivus* + *S. kneri*) + (*Sturisomatichthys* Baudó + *Sturisomatichthys* San Juan) + (*S. dariensis* + *S. frenatus*) + (*S. panamensis* (*S. aureus* + *S. leightoni*)). The genus is supported by eight morphological (see Characters under Loricariinae Classification and node 57 in Appendix 1) and 18 molecular synapomorphies. The latter includes (exclusive in bold) five synapomorphies from 12S (characters 308, 346, 347, 536, 624), one synapomorphy from 16S (character 1998), seven synapomorphies from Cytb (characters 2733, 2805, 2814, 2988, 3324, 3622, 3732), two synapomorphies from RAG2 (characters 5372, 5633), and three synapomorphies from nd2 (characters 6118, 6217, 631). The character proposed by Isbrücker & Nijssen (in Isbrücker, 1979) (absence of rostrum) is not informative to separate the genus from *Sturisoma*; this was already suggested by Covain *et al*. (2008, 2016; see below). One character was found to be exclusive of *Sturisomatichthys*: presence of fenestra with laminar process between transversal process of Weberian apparatus and transcapular ligament (Character 123.1; Fig. 5A). On the other hand, and as proposed in previous studies, we found *Sturisomatichthys* as sister to *Farlowella* (Fig. 1, node 56 and Fig. 2). The clade is supported by 11 morphological (see Characters under Classification of Loricariinae and Appendix 1) and 20 molecular synapomorphies. The latter includes (exclusive in bold) four synapomorphies from 12S (characters 280, 506, **890**, 978), seven synapomorphies from Cytb (characters 3144, 3168, 3300, 3495, 3600, 3615, 3691), three characters from RAG1 (characters **4637**, **4726**, **5044**), two synapomorphies from RAG2 (characters 5525, **5756**), and four synapomorphies from nd2 (characters 5986, 6367, 6656, 6686).

Trans-Andean species of *Sturisoma sensu lato* were found within the clade comprehending the three species of *Sturisomatichthys sensu stricto*, which includes its type species (*S.*

leightoni; Fig. 1, node 57). As proposed by Covain *et al*. (2016), and found here as well, *Sturisomatichthys* is composed by both the Trans-Andean species of *Sturisoma sensu lato*, and the Trans-Andean species included in *Sturisomatichthys* in its original description. Thus, we found the genus to be composed by *S. leightoni*, *S. aureus*, *S. citurensis*, *S. dariensis*, *S. festivus*, *S. frenatus*, *S. kneri*, *S. panamensis*, *S. tamanae*, and two new species (see Chapter 2), *Sturisomatichthys* Baudó and *Sturisomatichthys* San Juan. It is worth noting that Covain *et al*. (2016) suggested that *S. caquetae* should be included in *Sturisoma*, since it is a Cis-Andean species. Nevertheless, the authors did not include any specimen in their analysis, and their recommendation for transferring the species to *Sturisoma* is solely based on the distribution of *S. caquetae*. Even though we did not include specimens of *S. caquetae* in our analysis, we did examine the holotype of *Harttia caquetae* (ANSP 71719) and found it to possess diagnostic characters of *Sturisomatichthys* (see Chapter 2). Thus, we here transfer *Sturisoma caquetae* back to *Sturisomatichthys*, as suggested by Isbrücker & Nijssen (in Isbrücker, 1979) in the original description of the genus. It is worth noting the fact that *S. caquetae* is the only fully Cis-Andean species within the genus (*S. leightoni* being Trans-Andean, but present in the Orinoco basin as well, see below and Chapter 2 for comments), but non-type material is needed to redescribe and diagnose more accurately this species.

The sister pair (*S. citurensis* + *S. tamanae*) was found as sister of the remaining *Sturisomatichthys* (Fig. 1, node 58). This clade was found to be supported by 12 morphological (see Characters under Classification of Loricariinae and Appendix 1) and 65 molecular synapomorphies. The latter includes (exclusive in bold) 32 synapomorphies from Cytb (characters 2730, 2808, 2817, 2820, 2850, 2880, 2895, 2940, 2985, 3063, 3069, 3102, 3114, 3141, 3156, 3171, 3229, 3418, 3423, 3426, 3447, 3450, 3462, 3498, 3504, **3516**, 3601, 3603, 3606, 3627, 3675, 3711), and 33 synapomorphies from nd2 (characters 5956, 5986, 5989, 5992, 6079, 6133, 6184, 6194, 6235, 6253, 6306, 6349, 6415, 6488, 6517, 6534, 6551, 6574, 6581, 6589, 6593, 6601, 6619, 6661, 6692, 6709, 6712, 6742, 6754, 6760, 6796, 6805, 6812). As it will be discussed in Chapter 2, both *S. citurensis* and *S. tamanae* show a characteristic short snout and absence of rostrum when compared to its congeners (except *S. caquetae*). The general appearance of these species is different from the considered typical *Sturisomatichthys* (see Fig. 1 and Fig. 18 in Chapter 2). Covain & Fisch-Muller (2007:37) already highlighted this, and discussed that *S. citurensis* "…seems to be significantly different from all congeneric species in having an abdominal plate cover consisting of small platelets without any particular organization", which is also the case for *S. tamanae*, as it will be discussed in Chapter 2. The authors continued in stating, "Other species may represent a species complex with a short snout as in the genus *Farlowella* with reference to the representatives of the *F. curtirostra* group" (Covain & Fisch-Muller, 2007:37). Even though any other congener with these characteristics was found, apart from *S. caquetae* which was not included in the phylogenetic analysis, both species were found as a separate group from the remaining congeners. Nevertheless, there is not sufficient evidence to suggest both species as members of a new undescribed genus, thus, we suggest maintaining them as part of *Sturisomatichthys*, but this question deserves further study. Additionally, as shown in Appendix 3, samples identified as *S. citurensis* (from the Chucunaque and Bayano Rivers, Pacific Slope, Panama; samples of *S. citurensis* 62, 64, 73, 76, 77, 79, see Table 1) that are clustered outside the *Sturisomatichthys* clade, and could represent undescribed species of either *Sturisomatichthys* or a new undescribed genus, were included. Due to the insufficiency of material from these localities, we refrain from describing a new group, but noting that this question should be further studied. Finally, Covain *et al*. (2016) also found *S. citurensis* as sister to the remaining *Sturisomatichthys*, but the authors did not include *S. tamanae*.

The clade ((*S. festivus* + *S. kneri*) (*Sturisomatichthys* Baudó + *Sturisomatichthys* San Juan)) ((*S. dariensis* + *S. frenatus*) + (*S. panamensis* (*S. aureus* + *S. leightoni*))) (Fig. 1, node 59) is supported by one morphological synapomorphy (see Characters under Classification of Loricariinae and Appendix 1) and 35 molecular synapomorphies. The latter includes (exclusive in bold) eight synapomorphies from 12S (characters 307, 326, 350, 422, 1042, 1099, 1128, 1340), seven synapomorphies from 16S (characters 1729, 1730, 1970, 2064, 2118, 2142, **2147**), and 20 synapomorphies from Cytb (characters 2829, 2874, 2910, 2928, 2943, 3051, 3054, 3066, 3108, 3165, 3289, **3321**, 3333, 3336, 3345, 3474, 3477, 3522, 3639, 3756). The typical slender *Sturisomatichthys*, with lateral longitudinal stripes, and abdominal plates bigger and unorganized in rows, mostly represent this clade. As will be exposed in Chapter 2, these nine species share several external characteristics.

The clade (*S. festivus* + *S. kneri*) is supported by three morphological synapomorphies (see Characters under Classification of Loricariinae and node 61 in Appendix 1). There is a strong biogeographical component for this clade, being both species sympatric at the Lake Maracaibo Basin, Venezuela. Even though *S. kneri* do not show the external morphology of the typical *Sturisomatichthys,* evidence was found to include it as part of this genus. On the other hand, the clade ((*S. festivus* + *S. kneri*) + (*Sturisomatichthys* Baudó + *Sturisomatichthys* San Juan)) is supported by four morphological synapomorphies (see Characters under Classification of Loricariinae and node 60 in Appendix 1). Moreover, (*Sturisomatichthys* Baudó + *Sturisomatichthys* San Juan) is supported by nine morphological synapomorphies (see Characters under Classification of Loricariinae and node 62 in Appendix 1). This clade is restricted to species of the northern Pacific slope of Colombia, and the fact that is composed by two new species shows that the richness for this genus in the region is underestimated, and new species should be discovered through a heavily sampling of surrounding areas. Covain *et al*. (2016) did not find this clade, but suggested *S. festivus* as sister to all *Sturisomatichthys* except *S. citurensis*, which arises from the next most basal node in relation to *S. festivus* (their fig. 3). *Sturisomatichthys kneri* was not included in that study.

The clade ((*S. dariensis* + *S. frenatus*) + (*S. panamensis* (*S. aureus* + *S. leightoni*))) is supported by one morphological (see Characters under Loricariinae Classification and node 63 in Appendix 1) and 21 molecular synapomorphies. The latter includes 13 synapomorphies from Cytb (characters 2772, 2830, 2831, 2857, 3204, 3415, 3416, 3453, 3510, 3546, 3630, 3660, 3711), one synapomorphy from RAG1 (character 4847), and seven synapomorphies from nd2 (characters 6151, 6290, 6320, 6490, **6679**, 6704, 6739). The clade (*S. dariensis* + *S. frenatus*) is supported by five morphological (see Characters under Loricariinae Classification and node 64 in Appendix 1) and 11 molecular synapomorphies. The latter includes (exclusive in bold) five synapomorphies from Cytb (characters 2907, 2997, 3159, 3231, 3678), two synapomorphies from RAG1 (characters 4919, **4928**), and four synapomorphies from nd2 (characters 6238, 6367, 6496, 6769).

Sturisomatichthys dariensis was described from the Tuyra River, Darien Province, in the Pacific Slope of Panama, while *S. frenatus* was described from the Esmeraldas River, Pacific Slope in Ecuador. Even though both species are distributed along the Pacific Slope or northern South America, both localities do not appear to have an historic nor current relation. In any case, Covain *et al*. (2016) also found this clade, with *S. panamensis* as sister to it, which was not the case here.

The clade (*S. panamensis* (*S. aureus* + *S. leightoni*)) is supported by one morphological (see Characters under Loricariinae Classification and node 65 in Appendix 1) and 21 molecular synapomorphies. The latter includes (exclusive in bold) 13 synapomorphies from Cytb (characters 2772, 2830, 2831, 2857, 3204, 3415, 3416, 3453, 3510, 3546, 3630, 3660, 3711), one synapomorphy from RAG1 (character 4847), and seven synapomorphies from nd2 (characters 6151, 6290, 6320, 6490, **6679**, 6704, 6739). This clade includes species distributed at the Magdalena and Catatumbo basins, which share an historic relation before the uplifting of the eastern Cordillera of the Andes and of the Serranía del Perijá (see also Discussion in Monophyly of *Farlowella*). Finally, (*S. aureus* + *S. leightoni*) is supported by six morphological (see Characters under Loricariinae Classification and node 66 in Appendix 1) and six molecular synapomorphies. The latter includes (exclusive in bold) three synapomorphies from 12S (characters 597, 982, 1132) and three synapomorphies from 16S (characters 1834, 1896, 2620). Both species are distributed in the Magdalena basin, being *S. leightoni* distributed in the Upper and Middle Magdalena and Upper Cauca (part of the Magdalena basin system) and *S. aureus* in the Lower Magdalena, plus the San Jorge, Baudó, Cesar, and Sinú rivers on the Caribbean and Pacific slope of Colombia. *Sturisomatichthys leightoni* is also found at the Orinoco basin, in one of the most western point of the basin, at Cumaral, Meta, Colombia (see Chapter 2). Specimens from the Orinoco basin were collected by Apolinario Maria, in February, 1917, in Cumaral, Meta department, Colombia, and sent to Eigenmann to be included in his study of the fishes from western South America (Eigenmann, 1922). Cumaral is a small town just east to the eastern Cordillera of the Andes, and belonging to the Orinco basin, which do not show a direct relationship to the Magdalena-Cauca fauna. Three explanations could be offered for the presence of *S. leightoni* at the Orinoco basin: 1) stream capture, since the only barrier separating this point of both the Magdalena-Cauca and Orinoco basin is the Southern most point of the eastern Cordillera, which could lead to division of populations of the species; 2) introduction of the species in the Orinoco basin, which is unlikely since the species lack of commercial value, for both ornamentation and consumption; and 3) mistake regarding the collection point from either A. Maria or Eigenmann when the specimens were registered. In any case, the species is here assumed as present on both Trans- and Cis-Andean localities until further information can be obtained.

Sturisomatichthys shows a much higher richness than that described by Isbrücker & Nijssen (in Isbrücker, 1979). With 10 valid, plus two undescribed species, *Sturisomatichthys* went from a species-poor genus in Loricariinae, to one of the most numerous. To the date only *Farlowella*, *Harttia*, *Loricaria*, *Loricariichthys*, *Rineloricaria*, and *Spatuloricaria*, have more species. On the other hand, *Sturisomatichthys* surpasses *Sturisoma*, which was considered as one of the largest genera of the subfamily, and which is restricted here to nine strictly Cis-Andean species. Even though the richness of this group was greatly underappreciated and understudied, we believe that there is still much to describe regarding the richness of *Sturisomatichthys*, since its known range of distribution includes ill-studied localities of difficult access (i.e. Pacific Slope and Upper Amazon in Colombia). Nevertheless, this study and that of Covain *et al*. (2016) are efforts towards the knowledge of this group and its taxonomy, which remained obscure for almost 30 years, and it is prove of the need of taxonomic studies not only for Loricariinae, but also for the Neotropical fishes, and to put effort into the sampling of poor-studied areas.

Bayesian analysis

An analysis using Bayesian inference (see Material and Methods) was also carried out. The results obtained through this method (Fig. 2) did not differ regarding intergeneric and most interspecific relationships when compared to the maximum parsimony analysis (Fig. 1). Nevertheless, five main differences were found.

Harttiella appeared as sister to the clade formed by *Ctenilloricaria* and *Harttia* (Fig. 2) with a pp=1, which indicates high stability of this clade. Even though *Harttiella* was found as sister to the Loricariini by means of the parsimony analysis (Fig. 1, node 27), we corroborated here the former to be part of the Harttiini, and not as part of the Loricariini or as a monotypic tribe. Covain *et al*. (2016) also found this configuration by means of a Bayesian analysis. Even though explicit synapomorphies for the support of *Harttiella* as part of the Harttiini are offered here, we follow Covain *et al*. (2016) in order to maintain stability in the taxonomy of the Loricariinae. In addition to this, *Harttiella* presented characters observed on the Harttiini, and not in the Loricariini (i.e. absence of orbital notch, more than 20 dentary and premaxillary teeth, and 10 branched caudal-fin rays). Another explanation for the differences observed regarding *Harttiella* when comparing both analyses is the absence of morphological data for three of the five species (*Harttiella lucifer*, *H. pilosa*, and *H. intermedia*). The amount of missing data for the three taxa named above, and similarities regarding osteological structures that could exist among *H. crassicauda* and *H. longicauda* (c&s specimens examined here) with Loricariini representatives, could lead to the clade formed by these two groups, which is fairly stable (Bremer of 13; see node 27 in Appendix 1 for synapomorphies for the *Harttiella*-Loricariini clade). The inclusion of morphology in an analysis for *Harttiella* is needed, since only the type series of species recently described by Covain *et al.* (2012) were available for study, but not for cleared and stained for osteological observations.

A polytomy formed by *Harttia dissidens*, *H. duriventris*, *H. fowleri*, and *H. trombetensis* was found through the parsimony analysis (Fig. 1, node 18). The clade (*H. fowleri* (*H. dissidens* (*H. punctata*, *H. rhombocephala* (*H. duriventris* + *H. trombetensis*)))) was recovered by the Bayesian analysis (Fig. 2). Even though the polytomy was resolved, the relationships within *Harttia* remained unchanged, except for the clade formed by *H. punctata* and *H. rhombocephala*, which was not fully resolved on the Bayesian analysis. Also, on the parsimony analysis that clade is poorly supported (Bremer of 1, Fig. 1, node 19) and its position not fully resolved within *Harttia*, which is also the case in the Bayesian analysis (pp of 0.77, Fig. 2). These species are distributed along the Lower and Middle Amazon basin (Brazil), and in the case of *H. fowleri*, in the Oyapock River basin, which shares tributaries on both the French Guiana and its political border with Brazil. The morphology of *Harttia* is extremely conservative (as it is for most of the Loricariinae), which did not yield high stability of the interspecific relationships nor high resolution of the clades effectively recovered (Fig. 1, node 14). As discussed above, Covain *et al*. (2016) also suggested the low support found for their analysis regarding *Harttia*. A specific study at the taxonomic and phylogenetic level of the genus is needed.

Metaloricaria appeared as sister to the Loricariini in the Bayesian analysis (Fig. 2). This was not the case for the parsimony analysis (Fig. 1, node 10), where the genus was found as sister to the remaining Loricariinae, and proposed as the only genus of the Metaloricariini. This monotypic tribe was already proposed by Isbrücker (1980, 1981) while Covain *et al*. (2016) proposed the genus as sister to the clade (*Dasyloricaria* + *Fonchiiloricaria*) and to belong to their Loricariina (see fig. 4 and table 4 on Covain *et al*., 2016). We here maintain the suggestion of a monotypic Metaloricariini based on several morphological and molecular synapomorphies, and noting that both species of *Metaloricaria* present a highly divergent morphology from both *Dasyloricaria* (included in this study) and *Fonchiiloricaria* (characters observed from its original description in Rodriguez *et al*., 2011). As stated by Covain *et al*. (2008), the Loricariini appears to have a high diversity regarding structures related to the mouth, which can explain its high diversity and easy distinction from the Harttiini (and Farlowellini). This can also be the case for *Metaloricaria* when compared to the remaining three lineages proposed in this study (namely the Harttiini, Farlowellini, and Loricariini). The angle of the premaxilla, lower number of teeth, shape of cusps on both dentary and premaxillary teeth, and surface of the lower lip, are highly divergent from those observed on the other three lineages mentioned above. In addition to that, lateral and predorsal keels are well developed on Loricariini representatives, which is not the case for *Metaloricaria,* which has character states more related to those found in the Harttiini and Farlowellini, of smooth predorsal and lateral plates, without prominent ridges. In addition to the easy external identification of *Metaloricaria* and differentiation from the Loricariini, Harttiini, and Farlowellini, the genus is additionally supported by molecular exclusive synapomorphies (see node 10 on Appendix 1).

Sturisoma appeared as a well-supported group (pp=1) with well resolved interspecific relationships in the Bayesian analysis (Fig. 2) (*S. monopelte* (*S. robustum* (*Sturisoma*

Madre de Dios + *S. tenuirostre*))) + (*S. nigrirostrum* (*S. guentheri* (*S. lyra* (*S. barbatum* + *S. rostratum*)))), contrary to the polytomy found through the parsimony analysis (see above and Fig. 1, node 52). The difference of topology regarding this group when both optimizations are compared, could be due to a similar situation as in *Harttiella* (see above). For only four (*S. monopelte*, *S. nigrirostrum*, *S. robustum*, and *S. tenuirostre*) of the nine species included here, tissues for DNA sequence were obtained. The conservative morphology observed in *Sturisoma* and the missing data for six of the nine terminals included, could lead to the low resolution of interspecific relationships within the genus. *Sturisoma* remains as a poorly studied genus regarding its taxonomy, and additional characters for the proper diagnose of this group are needed. Ghazzi (2003) carried out the only taxonomic revision of the genus, but is still unpublished. Our definition of the genus is a first step towards an understanding of this group, but a specific study regarding its taxonomy is in need.

Finally, even though *Aposturisoma myriodon* (= *Farlowella myriodon*) was found nested within *Farlowella* in the Bayesian analysis (Fig. 2), it was not recovered as sister to *F. acus*, type species of the genus, as in the parsimony analysis (Fig. 1, node 77). Nevertheless, the nested position of the terminal, and high support of its position within *Farlowella* (pp=0.83), confirms the finding of the parsimony analysis of *Aposturisoma* as junior synonym to *Farlowella*. Additionally, through the Bayesian analysis, *F. venezuelensis* was recovered as sister to the remaining *Farlowella*, except to the clades (*F. platorynchus* + *F. rugosa*) (*F. yarigui* (*F. curtirostra* + *F. taphorni*)) and (*F. isbruckeri* (*F. oxyrryncha* (*F. reticulata*))) (Fig. 2). Nevertheless, the general interspecific relationships of *Farlowella* found through the parsimony analysis (Fig. 1, node 67) do not differ significantly from those obtained through the Bayesian inference.

As exposed by McMahan *et al.* (2015:525), numerous aspects of the analysis as taxon sampling, outgroup selection, number and types of characters/genes included, chosen method of analysis, species *vs*. gene trees, may help explain the discordance between phylogenies derived from different data types (namely morphological vs. molecular). The authors aimed at comparing two different datasets of the Squamata (lizards, snakes, amphisbaenians) as a case study for these differences. It was found in that study that the hypothesis of molecular data as incongruent with morphological hypotheses of squamate evolutionary relationships, is not because the molecular data are correct or that the morphology is rife with homoplasy, but because there may be an inherent analytical problem with the molecular data (McMahan *et al*., 2015:528). The authors proposed that to choose a distant outgroup for any analysis, is a good starting place. We here confirmed that both datasets are not exclusive of each other. The subtle differences found on both of our analyses (i.e. Maximum Parsimony and Bayesian inference) is evidence of the usefulness of both kinds of evidence, and when one dataset fails to explain or to resolve any given relationship, that same problem could be resolved by means of the opposite dataset. Finally, and as stated by McMahan *et al*. (2015) regarding the selected outgroup for an analysis, we found our selection to be suitable for the scope of this analysis, and we provided further information regarding relationships within and outside the Loricariinae for future studies.

Classification of the Loricariinae (Tribe Loricariini partly proposed in this study, and following the “Loricariina” of Covain *et al.*, 2016).

- Subfamily Loricariinae Bonaparte, 1831
  - Tribe Metaloricariini Isbrücker, 1980
    - *Metaloricaria* Isbrücker, 1975
  - Tribe Harttiini Boeseman, 1971
    - *Harttia* Steindachner, 1877
    - *Cteniloricaria* Isbrücker & Nijssen, 1979
    - *Harttiella* Boeseman, 1953
  - Tribe Loricariini Bonaparte, 1831
    - *Loricaria* Linnaeus, 1758
    - *Apistoloricaria* Isbrücker & Nijssen, 1976
    - *Brochiloricaria* Isbrücker & Nijssen, 1979
    - *Crossoloricaria* Isbrücker, 1979
    - *Dasyloricaria* Isbrücker & Nijssen, 1979
    - *Dentectus* Martín Salazar, Isbrücker & Nijssen, 1982
    - *Fonchiiloricaria* Rodriguez, Ortega & Covain, 2011
    - *Furcodontichthys* Rapp Py-Daniel, 1981
    - *Hemiloricaria* Bleeker, 1862
    - *Hemiodontichthys* Bleeker, 1862
    - *Limatulichthys* Isbrücker & Nijssen, 1979
    - *Loricariichthys* Bleeker, 1862
    - *Paraloricaria* Isbrücker, 1979
    - *Planiloricaria* Isbrücker, 1971
    - *Proloricaria* Isbrücker, 2001
    - *Pseudohemiodon* Bleeker, 1862
    - *Pseudoloricaria* Bleeker, 1862
    - *Pyxiloricaria* Isbrücker & Nijssen, 1984
    - *Reganella* Eigenmann, 1905
    - *Rhadinoloricaria* Isbrücker & Nijssen, 1974
    - *Ricola* Isbrücker & Nijssen, 1978b
    - *Rineloricaria*, Bleeker, 1862
    - *Spatuloricaria* Schultz, 1944
  - Tribe Farlowellini Fowler, 1958
    - *Farlowella* Eigenmann & Eigenmann, 1889
    - *Aposturisoma* Isbrücker, Britski, Nijssen & Ortega, 1983 (new junior synonym)
    - *Lamontichthys* Miranda Ribeiro, 1939
    - *Pterosturisoma* Isbrücker & Nijssen, 1978a
    - *Sturisoma* Swainson 1838
    - *Sturisomatichthys* Isbrücker & Nijssen, 1979

Material examined.

INGROUP

***Aposturisoma myriodon*:** MHNG 2710.035. 2 of 17alc, 1c&s. Peru, Ucayali department, Ucayali River basin, Huacamayo River, no date information. ***Cteniloricaria napova*:** MHNG 2704.030. 6alc, paratypes. Suriname, Sipaliwini district, Savannah in trio Amerindian territory at the Suriname-Brazil border, Four Brothers Mountains in a tributary of the Paru de Oeste River, gift of the trio tribe in Sipaliwini, 20-21/10/2007. MPEG 34190. 1alc. Brazil, Pará state, Óbidos municipality, Trombetas River basin, Erepecuru River (also known as Cuminá, or Paru de Oeste), 0°57'S 55°30'W, F. Silva & L. Peixoto, 22/04/2008. ***Cteniloricaria platystoma*:** AUM 48174. 8alc, 1c&s. Guyana, Rupununi-Essequibo River drainage, Region 8 Potaro-Siapruni, Burro Burro River, at Suraima, L.S. de Souza et al., 12/11/2003. ***Farlowella acus*:** ANSP 130038. 55alc, 1c&s. Venezuela, Carabobo state, Vigirima River tributary of Guacara River, about 10 km NNW of Guacara, on dirt road which joins unpaved road, 10°24'N 67° 55'W, N.R. Foster et al., 30/11/1966. ***Farlowella amazona*:** MCP 15183. 1alc. Brazil, Pará state, Itaituba municipality, Tapajós River basin, at Piracuna neighborhood, Itaituba, 04°16'00"S 055°59'00"W, C.A.S. Lucena, 11/12/1991. MCP 29737. 1alc. Brazil, Amazonas state, Tefé municipality, Solimoes River basin, Lake Tefé at headwaters of Lake, 03°34'35"S 064°59'19"W, W. Crampton, 29/11/1999. MCP 45943. 2alc, 1c&s. Brazil, Mato Grosso do Sul state, Novo Horizonte do Sul municipality, Upper Paraná River, Guiraí River, tributary of Ivinhema River, between Naviraí and Ivinhema, M. Rocha, 16/12/2010. ***Farlowella curtirostra*:** UF 30778. 4alc. Venezuela, Merida state, Lake Maracaibo basin, Chama River just north of El Vigia on the road to Merida, 6114210°N 71.6321880°W, D.C. Taphorn et al., 15/03/1981. USNM 121081. 3alc, 1c&s. Venezuela, Trujillo state, Lake Maracaibo basin, Motatan River system at San Pedro River, L.P. Schultz, 20/03/1942. ***Farlowella hahni*:** MCP 10982. 3alc. Argentina, Santa Fé province, Santa Fé municipality, Lower Parana basin, 31°35'00"S 060°41'00"W, S. Martinez & G.M. Achenbach, 15/03/1976. MCP 16461. 1alc, 1c&s. Argentina, Santa Fé state, Santa Fé municipality, Parana River basin, GMA, no date information. ***Farlowella hasemani*:** MCP 36626. 5alc, 1c&s. Brazil, Acre state, Brasiléia municipality, Purus River basin, Entrocamento Creek, about 5km east from Brasiléia, at BR-317 highway, 11°01'40"S 068°41'46"W, R.E. Reis et al., 23/07/2004. ***Farlowella henriquei*:** MCP 41992. 3alc, 1c&s. Brazil, Goiás state, Montes Claros de Goiás municipality, Tocantins River basin, Água Limpa Creek, at tributaries of Claro River basin, tributary of Araguaia River, 15°57'52"S 051°18'40"W, G.A. Pereira, 27/02/2007. ***Farlowella isbruckeri*:** MCP 36601. 2alc, 1c&s. Brazil, Mato Grosso state, Nova Lacerda municipality, Madeira River basin, Retiro Creek, tributary of Guaporé River, at BR-174 highway, 14°48'07"S 059°19'24"W, V. Bertaco et al., 12/07/2004. ***Farlowella jauruensis*:** MCP 36625. 2alc, 1c&s. Brazil, Rondônia state, Ji-Paraná municipality, Madeira River basin, small tributary of right margin of Machado River, about 8km South of bridge on BR-364 highway at Ji-Paraná, 10°57'08"S 061°55'15"W, P. Buckup et al., 15/07/2004. MCP 36588. 2alc. Brazil, Mato Grosso state, Mirassol d`Oeste municipality, Paraguay River basin, small river tributary of Caeté River, tributary of Jauru River at BR-174 highway about 72km northwest from Paraguay River, 15°49'34"S 058°11'45"W, R.E. Reis et al., 11/07/2004. ***Farlowella knerii*:** FMNH 99143. 6alc, 1c&s. Ecuador, Napo province, Amazon River basin, Capihuara Creek, tributary of Payamino River, Latitude -0.5 Longitude -77.2417, D.J. Stewart, 13/11/1983. ***Farlowella mariaelenae*:** USNM 349392. 11alc, 1c&s. Venezuela, Portuguesa state, Guanare municipality, Orinoco River basin, Portuguesa River, just Upstream of highway 5, 11km northwest of Guanare, J.W. Arbruster & O. Leon, 28/02/1998. ***Farlowella nattereri*:** AUM 27707. 2alc. Venezuela, Portuguesa state, Apure-Orinoco River system, Portuguesa River, just upstream of hwy 5, 11 km WNW of Guanare, J.W. Armbruster & O. León, 25/02/1998. MCP 29715. 1alc, 1c&s. Brazil, Amazonas state, Alvarães municipality, Solimões River basin at Içé island, 03°16'00"S 064°41'00"W, W. Crampton, 03/09/1999. ***Farlowella oxyrryncha*:** MCP 44240. 6alc, 1c&s. Peru, Ucayali province, Pucallpa district, Ucayali River basin, Cashibo channel, Yarinacocha, 08°16'52"S 074°37'50"W, T.P. Carvalho et al., 28/07/2009. ***Farlowella paraguayensis*:** FMNH 108585. 11alc, 1c&s. Brazil, Mato Grosso state, Corguinho municipality, lagoon next to Chacara da Portela Creek, Latitude -19.8111 Longitude -54.8442, N. Menezes et al., 26/08/1998. ***Farlowella platorynchus*:** FMNH 111528. 1alc, 1c&s. Peru, Loreto province, Amazon River basin, Yanayacu River, about 6-7km above mouth in Rio Amazonas, Latitude -4.3333 Longitude -73.25, B. Chernoff et al., 29/08/1988. MHNG 2550.012. 2 of 4alc. Brazil, Pará state, Amazonas River basin, Guama River at about 20km downstream from Ourém, R. Stawikowski, 22/09/1990. UF 33089, paratypes. 2alc. Peru, Loreto province, Amazon River basin, within 30mi of Iquitos; Auigon, Manati, Itaya, and/or Neuse Rivers, 3.7418890°S 73.2396690°W, 1960. ***Farlowella reticulata*:** AUM 36210. 10alc, 1c&s. Guyana, Rupununi-Essequibo drainage, Region 9 Upper Takutu and Essequibo River, Takutu River - Rio Branco - Rio Negro - Rio Amazonas, Yuora River, tributary of the Ireng River, 6.7 km NE Karasabai, J.W. Armbruster et al., 31/10/2002. ***Farlowella rugosa*:** AUM 48805. 10alc, 1c&s. Guyana, Rupununi-Essequibo River drainage, Region 9 Upper Takutu and Essequibo Rivers, Rupununi River, at Massara landing, L.S. de Souza et al., 22/11/2007. ***Farlowella schreitmuelleri*:** FMNH 106985. 2alc, 1c&s. Bolivia, Pando province, Garape Preto, small river at bridge and above on road to Cobija, Latitude -11.2414 Longitude -68.9925, B. Chernoff et al., 07/09/1996. ***Farlowella smithi*:** MCP 22491. 6alc, 1c&s. Brazil, Pará state, Castanhal municipality, Apeú Creek, at Belém-Brasília BR-010 highway, tributary of Guamá River, 01°18'06"S 047°59'11"W, R.E. Reis et al., 21/07/1998. ***Farlowella venezuelensis*:** USNM 163179. 2alc, 1c&s. Venezuela, Monagas state, Caicara municipality, Guarapiche River, F.D. Smith, 05/1952. ***Farlowella vittata*:** AUM 27727. 12alc, 1c&s. Venezuela, Portuguesa state, Apure-Orinoco River system, Las Marias channel, at town of Quebrada Seca, approximately 45 min. upstream by car from Hwy.5, 22 km NNW of Guanare, J.W. Armbruster & O. León, 28/02/1998. ***Harttia carvalhoi*:** MCP 18055. 10alc, 1c&s. Brazil, Minas Gerais state, Frei Inocêncio municipality, Leste River basin, Suaçuí River, tributary of Doce River, on bridge of BR-116 highway at Frei Inocêncio, 18°34'21"S 041°54'42"W, R.E. Reis et al., 18/01/1995. ***Harttia dissidens*:** MNRJ 35543. 20alc, 1c&s. Brazil, Pará state, Ruropolis municipality, Tapajos River basin, Tamber stream, tributary of Cupari River, 4°7’26’’S 54°57’32’’W 102masl, P.A. Buckup, C. Zawadski, L. Fries, 09/27/2008. ***Harttia duriventris*:** MZUSP

34229. 11alc, 1c&s. Brazil, Pará state, Tocantins River basin, Itacaiunas River, Serra dos Carajas, 5°52'S 50°32'W, M. Goulding, 04/1983. ***Harttia fluminensis*:** FMNH 116944. 22alc, 1c&s. Suriname, Rapids of Sidonkrutu, Latitude 4.5308 Longitude -56.5156, J.H. Mol et al., 09/03/2004. ***Harttia fowleri*:** MHNG 2682.038. 1alc, 1c&s of 13alc. French Guiana, St. Georges-Oyapok, Oyapok River basin, downstream of creek opposite to Roche-Mon-Père at about 1h. canoe downstream of Camopi and 15 min. downstream of Sikini Creek, 03°16'56.3"N 52°12'36.6"W 52masl, S. Fisch-Muller et al., 06/11/2006. ***Harttia garavelloi*:** MZUSP 94432. 3alc, 1c&s. Brazil, Minas Gerais state, Minas Novas municipality, São Francisco River basin, Fanado River at Minas Novas, on bridge at exit from Minas Novas to Turmalina, 17°13'14.0"S 42°35'46.0"W, 12/04/2007. ***Harttia gracilis*:** MZUSP 99678. 28alc, 1c&s. Brazil, São Paulo state, São Bento do Sapucaí municipality, Ribeirao do Lajeado River, tributary of Sapucaí River at San José da Rosa, SP-42 highway near of SP-52 highway at São Bento do Sapucaí, 22°47'9.0"S 45°41'17.0"W, O. Oyakawa et al., 30/05/2008. ***Harttia guianensis*:** ANSP 187328. 24alc. Suriname, Sipalawini district, Marowijne drainage, Lawa River, base camp ca. 8 km south-southwest of Anapaike/Kawemhakan (airstrip), 3°19'31"N 54°3'48"W, J. Lundberg et al., 18-22/04/2007. MHNG 2643.033. 1c&s. French Guyana, Approuague River, no date information. ***Harttia kronei*:** MCP 20148. 25alc, 1c&s. Brazil, Paraná state, Rio Branco do Sul municipality, Ribeira River basin, Piedade River at road Rio Branco do Sul – Açungui, about 26km NW of Rio Branco do Sul, 25°00'42"S 049°20'20"W, R.E. Reis et al., 09/01/1997. ***Harttia leiopleura*:** MNRJ 12140, paratypes. 3 of 12alc. Brazil, Minas Gerais state, Nova Lima municipality, das Velhas River basin, creek tributary to stream da Mutuca, 20°60’-32768’’S 43°55’-2768’’W, O.T. Oyakawa et al., 05/05/1987. MZUSP 109426. 9alc, 1c&s. Brazil, Minas Gerais state, Ouro Preto municipality, São Francisco River basin, da Prata River, tributary of das Velhas River, 20°23'36.0"S 43°54'28.0"W, no date information. ***Harttia longipinna*:** MCP 24232. 2alc, 1c&s. Brazil, Mato Grosso state, São Francisco River basin, at São Francisco River. ***Harttia loricariformis*:** MCP 11707. 1alc, 1c&s. Brazil, Rio de Janeiro state, Barra do Piraí district, Paraiba River basin, at Paraiba do Sul River at road between Piraí and Vassouras municipalities, 22°28'00"S 043°49'00"W, L.R. Malabarba et al., 01/02/1987. UFRGS 18816. 4alc. Brazil, Rio de Janeiro state, Teresópolis municipality, river downstream from Venda Nova, at road next to BR-492 highway, 22°18'12.02" S 42°52'11.89"W, P.C. Silva et al., 09/01/2014. ***Harttia novalimensis*:** MNRJ 23962. 21alc, 1c&s. Brazil, São Paulo state, Campos do Jordao municipality, Sapuca River, dos tabacos neighborhood at limits of Campos do Jordao e Piranguss municipalities, 35°46’S 45°28’33’’W, P. Buckup et al., 05/30/2002. ***Harttia punctata*:** MCP 15857. 1alc, 1c&s. Brazil, Goiás state, Uruaçu municipality, Tocantins-Maranhão System, Tocantins River basin, Passa Três River, approximately 2km north of Uruaçu at road Belém-Brasilia (BR-153), 14°30'21"S 049°09'13"W, R..E. Reis et al., 18/07/1992. MCP 45591. 2alc. Brazil, Goiás state, Nova Roma municipality, Tocantins River basin, das Pedras I River, 13°36'55"S 047°04'02"W, F.L.T. Garro, 29/07/2008. ***Harttia rhombocephala*:** MCP 16007. 3alc, 1c&s. Brazil, Goiás state, Niquelândia municipality, Tocantins River basin, Arara River 500mts from mouth of Maranhao River at Rosariana, 14°01'00"S 048°25'00"W, R.E. Reis et al., 14/07/1992. ***Harttia surinamensis*:**

FMNH 116942. 4alc, 1c&s. Suriname, Rapids of Midden Coppename River, Latitude 4.2147 Longitude -56.5983, J.H. Mol et al., 02/03/2004. ***Harttia torrenticola*:** MNRJ 12144, paratypes. 2 of 20alc, 1c&s. Brazil, Minas Gerais state, Moeda municipality, Paraopeba River system, stream tributary of Paraopeba River, Pedra Vermelha at Km10 of BR-040 highway, below waterfalls, O.T. Oyakawa & J.C. Oliveira, 02/08/1987. ***Harttia trombetensis*:** MHNG 2551.071. 4alc, 1c&s. Brazil, Pará state, Cachoeira Porteira municipality, Trombetas River basin, left margin at 5mts downstream from fall, B. Killian & C. Seidel, no date information. ***Harttiella crassicauda*:** AUM 50837. 23alc, 1c&s. Suriname, Sipaliwini district, Marowijne (Maroni) River, Paramaka Creek, Ijskreek from road on top of plateau to near base of waterfall after edge, to 3.5 km northeast of Suralco Base Camp, Nassau Mountain, J.W. Armbruster et al., 09/09/2009. ***Harttiella intermedia*:** MHNG 2713.087. 2alc, paratypes. French Guiana, Sinnamary River basin, tabular Mountain of trinité massif, Crique grand Leblond, 4°36’35’’N -53°21’33’’W 320masl, Tostain & Ravet, 06/10/2009. ***Harttiella janmoli*:** MHNG 2695.059. 36alc, paratypes. French Guiana, Maroni River basin, Kotika Mountain, 3°57’16’’N -54°10’50’’W 515 masl, Tostain, 05/09/2007. ***Harttiella longicauda*:** MHNG 2699.070. 23alc, paratypes. French Guiana, Trinité Mountains, Mana River basin, in a tributary of Crique Baboune, Crique aya around 100mts in front of Aya Camp, 4°36’11’’N -53°25’04’’W 122masl, Montoya-Burgos & Melki, 28/11-04/12/2007. MHNG 2723.042. 2 of 27alc, 1c&s. French Guyana, Approuague River, Cascade Creek & Dam Creek, Arataï River, J.I. Montoya-Burgos & Y. Surjet, 19/11/2010. ***Harttiella lucifer*:** MHNG 2721.088. 4alc, paratypes. French Guiana, Mana River basin, Lucifer Mountains, West of Crique Cascade, 4°47’44.7’’N-53°55’49.4’’W 450masl, Montoya-Burgos & Fischer, 10/02/ 2010. ***Harttiella parva*:** MHNG 2723.093. 3alc, paratypes. French Guiana, Maroni River drainage, Atachi Bakka Mountains, Gaucher, 06/2009. ***Harttiella pilosa*:** MHNG 2724.004, holotype. French Guiana, Tortue Mountains, orapu River drainage in Crique grillon at the ONF camp, Covain et al., 8 Nov. 2006. MHNG 2682.055. 4alc, paratypes. Same data as holotype. MHNG 2724.002. 1alc, paratype. French guiana, tortue Mountains, Orapu River drainage in Crique grillon at the ONF camp, Vigouroux et al., 07/11/2003. ***Lamontichthys avacanoeiro*:** MNRJ 18553, paratypes. 6alc, 1c&s. Brazil, Goiás state, Tocantins River basin, pools below U.H.E. Serra da Mesa, D.F. Moraes et al., 1996. MNRJ 23643. 2alc. Brazil, Goiás state, Niquelandia municipality, Tocantins River basin, Trairas River, D.F. Moraes et al., 08/12/1996. ***Lamontichthys filamentosus*:** AUM 45589. 7alc, 1c&s. Peru, Amazonas Province, Amazonas River basin, Marañón River, pongo above Borja, 35.5km northeast of Juan Velasco (Sta Maria de Nieva), N.K. Lujan et al., 06/08/2006. ***Lamontichthys llanero*:** AUM 22108. 1alc, 1c&s. Venezuela, Portuguesa state, Apure-Orinoco River system, Portuguesa River at highway 5 at bridge, J.W. Armbruster et al., 17/12/1999. AUM 22791. 3alc. Venezuela, Portuguesa state, Apure-Orinoco River system, Portuguesa River at highway 5 at bridge, J.W. Armbruster et al., 31/12/1999. ***Lamontichthys parakana*:** MNRJ 13300. 6alc, 1c&s. Brazil, Goiás state, Minaçu/Cavalcante municipality, Tocantins River basin, at future location of dam of Serra da Mesa hydroelectric, 13°50’-32768’’S 48°19’-32768’’W, D.F. Moraes et al., 24-31/07/1988. ***Metaloricaria nijsseni*:** ROM 98120. 8alc, 1c&s. Suriname, Nickerie district, Nickerie River, H. López-Fernández et al., 11/12/2014. ***Metaloricaria paucidens*****:** ANSP 187327. 1alc. Suriname, Sipalawini district, Lawa River, Marowijne drainage, large cataract complex in side channel west of base camp (SUR 07-01), about 8km southwest of Anapaike, 3°19'52"N 54°4'20"W, M. Sabaj et al., 21-24/04/2007. ROM 97928. 1alc, 1c&s. Suriname, Marowijne River, 4.65385 -54.43175, H. López-Fernández et al., 10/2014. ***Pterosturisoma microps*****:** MCP 33231. 1alc. Brazil, Amazonas state, Alvarães municipality, Solimoes River basin, Caborini beach at confluence of Japurá-Solimões Rivers, 03°19'08"S 064°47'04"W, W. Crampton, 19/02/2001.MHNG 2677.072. 1 of 4alc. Peru, Amazonas River basin, aquarium trade. MZUSP 79909. 1c&s, Brazil, Amazonas state, Amazonas River basin, Solimões River below rio Içá, 8.4mts below Paraná do Jarimirim, -3°10’43’’S 67°55’38’’W, J.P. Friel et al., 21/11/2993. ***Sturisoma barbatum*****:** MCP 36446. 2alc, 1c&s. Brazil, Rondonia state, Ji-Paraná municipality, Madeira River basin, Machado River. ***Sturisoma brevirostre*****:** MCZ 8095**,** holotype. Brazil, Amazonas state, Amazonas River basin, Iça River, tributary of Solimões River. ***Sturisoma guentheri*****:** USNM 324250, 3alc, 1c&s. Peru, Amazonas state, Amazonas River basin, Madre de Dios Region, Manu, Pakitza, Martin Pescador Creek. ***Sturisoma lyra*****:** MCP 45730. 2alc, 1c&s. Peru, Ucayali province, Purus River basin, Novia Creek, 2km above mouth, 09°48'00"S 070°43'07"W, R.E. Reis et al., 31/07/2010. ***Sturisoma monopelte*****:** AUM 47893. 9alc, 1c&s. Guyana, Essequibo River drainage, Rupununi River, at Yupukari, sidewater bay, region 9 (Up. Takutu – Up. Essequibo). ***Sturisoma nigrirostrum*****:** ANSP 199936. 1alc, 1c&s. Peru, Loreto province, Amazon River basin, Nanay River, just downstream of sandy beach (Las Camelias) along left bank, 7km W of Iquitos. ***Sturisoma robustum*****:** MCP 15812. 8alc, 1c&s. Brazil, Mato Grosso state, Cáceres municipality, Paraguay River basin in Cáceres. MCP 28835. 6alc. Brazil, Acre state, Bujari municipality, Purus River basin, Antimari Creek, on route of highway BR-364, 58km SE of Sena Madureira. ***Sturisoma rostratum*****:** MCP 36445. 8alc, 1c&s. Brazil, Rondonia state, Ji-Paraná municipality, Miolo Creek, 15km NW from Ji-Paraná on BR-364 highway. ***Sturisoma tenuirostre*****:** USNM 258280. 4alc, 1c&s. Venezuela, Apure state, Orinoco River basin, main channel of Apure River in region of San Fernando de Apure. ***Sturisoma* Madre de Dios:** MUSM 58700 (ex ROM 64044). Peru, Amazonas state, Madre de Dios River basin, Picaflor Creek, at Pakitza guard post, Castanel Trail #12 to Caña Brava Trail #16, 11°49’60”S 71°20’59”W, H. Ortega, 21/04/1991. ROM 64044, 1c&s. Same data as MUSM 58700. USNM 263920. 3alc, paratypes. Peru, Amazonas state, Manu province, Madre de Dios River basin, Tambopata River, opposite boat landing for Explorer’s Inn, 12°50’S 69°18’W, H. Ortega & R.P. Vari, 21/08/1983. ***Sturisomatichthys aureus*****:** NRM 15150. 4alc, 1c&s. Colombia, Chocó department, Rio Baudó basin, Boca de Pepé, various tributaries and river close to village, -8°59’4’’N 77°3’W, S.O. Kullander & M.C. Silvergrip, 12/02/1989. ***Sturisomatichthys caquetae*****:** ANSP 71719, 90.0mm SL, holotype. Colombia, Caquetá department, Morelia minucipality, Upper Amazon basin, Caquetá River, Mr. Kjell von Sneidern. ***Sturisomatichthys citurensis*****:** USNM 78364. 7alc. Panama, Darien Province, Chepo district, Mamon River, S.E. Meek & S.F. Hildebrand, 21/03/1911. USNM 78365. 1alc, 1c&s. Panama, Darien Province, Rio Tuyra at Marrigante, S.E. Meek & S.F. Hildebrand, 09/03/1912. ***Sturisomatichthys dariensis*****:** STRI 8386. 1alc. Panama, Darien Province, Chucunaque River basin, Tupisa River, 08°12’4.6’’N 82°41’2.4’’W, 02/18/2013. USNM 78373. 2alc. Panama, Darien Province, Yape River, S.E. Meek & S.F. Hildebrand, 06/03/1912. USNM 293273. 1c&s. Panama, Darien Province, Rio Tuyra 2-3km above Pinogana (Pacific), 08°06’N 77°47’W, W.C. Starnes, J. Martinez, M. Stiassny & R. Bouchard, 19/02/1985. ***Sturisomatichthys festivus*:** CAS 136506. 4alc, paratypes. Venezuela, Trujillo state, Lake Maracaibo basin, Monay River, 35km north of Trujillo, F.F. Bond, 14/03/1938. CAS 168512. 1c&s. Venezuela, Lake Maracaibo basin, Motatan River, no date information. ***Sturisomatichthys frenatus*:** CAS 13643. 3alc. Colombia, Nariño department, Patia River between Magui River and Telembi River. A. Henn, 05/04/1945. USNM 341993. 2 of 3alc, 1c&s. Colombia, Nariño department, Teresita district, Salado River, H.G. Loftin & Dean, 08/02/1968. ***Sturisomatichthys kneri*:** MCNG 33535. 1c&s, paratype. Venezuela, Zulia state, Lake Maracaibo basin, creek Urumana, Cataneja farm, Goajira, C. Lilyestron et al., 23/03/1973. ***Sturisomatichthys leightoni*:** FMNH 55136. 6alc, 1c&s. Colombia, Paila municipality. C.H. Eigenmann, 1912. ***Sturisomatichthys panamensis*:** USNM 293412. 10 of 14alc, 1c&s. Panama, Darien Province, Tuira River between Calle Larga and Pinogana, above El Real, Pacific slope, J. Lundberg et al., 18/02/1985. ***Sturisomatichthys tamanae*:** ANSP 198426. 1alc. Colombia, Chocó department, San Juan River basin, O. Lucanus, 2015. CAS 67414. 2 of 15alc, 1c&s. Colombia, Chocó department, Istmina municipality, San Juan River basin, A.W. Henn & C. Wilson, 1913. ***Sturisomatichthys* Baudó sp.n.:** NRM XXXX (ex NRM 15155), 199.0mm SL, holotype. Colombia, Chocó department, Baudó River drainage, Boca de Pepé, various tributaries and river close to village, -8°59’4’’N 77°3’W, S.O. Kullander & M.C. Silvergrip, 12/02/1989. NRM 15155. 12alc, 1c&s, 129.4-179.7mm SL, paratypes. Same data as holotype. ***Sturisomatichthys* San Juan sp.n.:** CAS XXXX (ex CAS 67414). 5alc, 1c&s, 114.7-165.7mm SL, paratypes. Colombia, Chocó department, Istmina municipality, San Juan River basin. A.W. Henn & C. Wilson, 1913.

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***Acestridium scutatum*:** MCP 37785. 9alc, 2c&s, paratypes. Brazil, Amazonas state, Humaitá municipality, Madeira River basin, Traíra River about 35km east from Madeira River via dirt road, 07°35'33"S 062°44'45"W, R.E. Reis et al., 27/07/2004. ***Ancistrus brevipinnis*:** MCP 21449. 12alc, 1c&s. Brazil, Rio Grande do Sul, Tapera municipality, Jacui River basin, Colorado River at Ibirubá-Tapera road, 28°38'49"S 052°55'28"W, R.E. Reis et al., 12/10/1998. ***Chaetostoma breve*:** AUM 46515. 40alc, 1c&s. Peru, Amazonas province, Amazonas River basin, Marañón River basin, Utcubamba River, 23km southeast of Bagua Chica, N.K. Lujan et al., 12/08/2006. ***Crossoloricaria* sp.:** MCP 36580. 1alc, 1c&s. Brazil, Mato Grosso, Nova Lacerda municipality, Madeira River basin, Galera River, tributary of Guaporé River at Galera balneary, 14°28'59"S 059°35'07"W, V. Bertaco et al., 12/07/2004. ***Dasyloricaria filamentosa*:** CP-UCO 1359. 6alc, 1 c&s, Colombia, Cesar department, El Paso district, Magdalena River basin, Cesar River, no date information. ***Dasyloricaria latiura*:** CAS 13187. 3 of 6alc. Colombia, Chocó department, Boca de

Certegui district, Atrato River basin. USNM 293296. 1 c&s, Panama, Darien province, Tuyra River basin, ½ km above Boca de Cupe. ***Dasyloricaria paucisquama*:** MPUJ 6019, holotype. Colombia, Caldas department, La Dorada municipality, La Española farm at Zona El Gigante, Magdalena River basin, Purrio River, 5°21’N 74°48’W 243masl, S. Prada et al., 30/10/2009. CP-UCO 143. 1c&s, paratype. Colombia, Antioquia department, Magdalena River basin, southern Samaná River, tributary to La Miel River in Butantan, 5°41’N 74°46’W 189masl, U. Jaramillo, 31/01/2006. MCP 46920. 1alc, paratype. Same data as holotype. ***Hemiloricaria lanceolata*:** MCP 36454. 10alc, 2c&s. Brazil, Mato grosso state, Nova Lacerda municipality, Madeira River basin, Retiro Creek tributary of Guaporé River at BR-174 highway, 14°48'07"S 059°19'24"W, V. Bertaco et al., 12/07/2004. ***Hemiodontichthys acipenserinus*:** MCP 21975. 6alc, 1c&s. Brazil, Maranhão state, Santa Inês municipality, Norte River basin, Pindaré River, West from Santa Ines at Pará-Maranhão BR-316 highway, tributary of Mearim River, 03°39'36"S 045°27'59"W, R.E. Reis et al., 24/07/1998. ***Hemipsilichthys gobio*:** MCP 19780, 7alc, 2c&s. Brazil, São Paulo state, Silveiras municipality, Paraiba River basin, Macaquinho Creek, tributary of Paraitinga River, about 5km northwest from Bairro dos Macacos, 22°50'47"S 044°50'30"W, J. Pezzi et al., 16/01/1997. ***Hisonotus laevior*:** 56alc, 4c&s. Brazil, Rio Grande do Sul state, Pedro Osório municipality, São Gonçalo River, Arambaré Creek, about 5km South from Vila Brasílio, at road towards Pedro Osório, 31°51'51"S 052°49'24"W, R.E. Reis et al, 22/04/2005. ***Limatulichthys griseus*:** MCP 21987. 12alc, 1c&s. Brazil, Pará state, Ourém municipality, Amazonas River basin, Guamá River at Tupinambá at road between São Miguel do Guamá and Ourem, 01°35'07"S 047°15'21"W, R.E. Reis et al., 22/07/1998. ***Loricaria* sp.:** MCP 36565. 5alc, 1c&s. Brazil, Mato Grosso state, Pontes e Lacerda municipality, Madeira River basin, Bugre River, about 42km north of Guaporé River on BR-174 highway, 14°51'35"S 059°17'57"W, R.E. Reis et al., 12/07/2004. ***Loricariichthys anus*:** MCP 11221. 2alc, 1c&s. Brazil, Rio Grande do Sul state, Cidrera municipality, Cidrera Lagoon, rod Cidrera-Porto Alegre, coastal system, 30°13'00"S 050°15'00"W, E.H.L Pereira et al., 28/03/1987. ***Loricariichthys platymetopon*:** MCP 36443. 7alc, 1c&s. Brazil, Mato Grosso state, Poconé municipality, Paraguay River basin, channel on Transpanteneira road towards Porto Manga, about 16km from Poconé, 16°20'59"S 056°38'41"W, J. Pezzi et al., 10/07/2004. ***Neoplecostomus microps*:** MCP 42432. 5alc, 1c&s. Brazil, São Paulo state, Pindamonhangaba municipality, Paraiba River basin, Ribeirão Grande River, at Ribeirão Grande on road of Nova Gokula Hare Krishna Temple, 22°46'23"S 045°27'33"W, T.P. Carvalho et al., 07/01/2008. ***Pareiorhaphis calmoni*:** MCP 17276. 15alc, 1c&s. Brazil, Santa Catarina, Aguas Mornas municipality, Sudeste River basin, Teresópolis River, tributary of Cubatao River, 27°45'00"S 048°56'00"W, C.A.S. Lucena et al., 16/10/1993. ***Parotocinclus maculicauda*:** MCP 29086. 17alc, 2c&s. Brazil, Santa Cataina state, Itajaí municipality, Sudeste River basin, creek tributary of do Meio River, about 5km from BR-486 highway towards do Meio River, 26°57'00"S 048°43'00"W, V.A. Bertaco & V.C. Baumbach, 21/02/2002. ***Pterygoplichthys lituratus*:** MCP 35757. 2alc, 1c&s. Brazil, Mato Grosso state, Pontes e Lacerda municipality, Madeira River basin, river tributary of Guaporé River at BR-174 highway, between Pontes e Lacerda and Comodoro municipalitites, 14°55'15"S 059°17'29"W, A.

Cardoso & R.E. Reis, 12/07/2004. ***Rineloricaria cadeae*:** MCP 25920. 30alc, 1c&s. Brazil, Rio Grande do Sul state, Lavras do Sul municipality, Camaqua River basin, Mantiqueira Creek, 30°54'24"S 053°58'06"W, C.A.S. Lucena et al., 26/04/2000. ***Rineloricaria quadrensis*:** MCP 11039. 40alc, 1c&s. Brazil, Santa Catarina state, Gravatal municipality, Sudeste River basin, Capivari River at road Gravatal-Armazém, 28°17'00"S 049°02'00"W, C.A.S. Lucena et al., 10/12/1986. ***Spatuloricaria puganensis*:** AUM 45638. 7alc, 1c&s. Peru, Amazonas province, Amazonas River basin, Marañón River, pongo Renema, purchased at Bagua Chica fish market, H. Ortega, 11/08/2006.

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Table 1. Vocuhers included for DNA extraction, amplification, and sequencing.

Terminal taxa	**Voucher specimens**	**Molecular markers**	**Available data**	**GenBank Accesion Number**	**Reference**
OUTGROUP					
Delturinae					
Hemipsilichthys gobio	MCP 42452	12S16S	No	Not available	-
		Cytb	Yes	Not available	This study
		MyH6	Yes	Not available	This study
		RAG1	Yes	Not available	This study
		RAG2	No	Not available	-
		nd2	Yes	Not available	This study
Hypoptopomatinae					
Acestridium scutatum	MCP 37785	12S16S	No	Not available	-
		Cytb	No	Not available	-
		MyH6	Yes	Not available	This study
		RAG1	Yes	Not available	This study
		RAG2	No	Not available	-
		nd2	Yes	Not available	This study
Hisonotus laevior	MCP 23005	12S16S	No	Not available	-
		Cytb	Yes	Not available	This study
		MyH6	Yes	Not available	This study
		RAG1	Yes	Not available	This study
		RAG2	Yes	Not available	This study
		nd2	Yes	Not available	This study

Parotocinclus maculicauda	MCP 41911	12S16S	No	Not available	-
		Cytb	Yes	Not available	This study
		MyH6	Yes	Not available	This study
		RAG1	Yes	Not available	This study
		RAG2	Yes	Not available	This study
		nd2	Yes	Not available	This study
Neoplecostominae					
Neoplecostomus microps	MCP 42432	12S16S	Yes	2442 KR478211	Covain *et al*., 2016
	MHNG 2588.002	Cytb	Yes	Not available	This study
		MyH6	No	Not available	-
		RAG1	Yes	Not available	This study
		RAG2	Yes	Not available	This study
		nd2	Yes	Not available	This study
Pareiorhaphis calmoni	MCP 41275	12S16S	No	Not available	-
		Cytb	Yes	Not available	This study
		MyH6	Yes	Not available	This study
		RAG1	Yes	Not available	This study
		RAG2	No	Not available	-
		nd2	Yes	Not available	This study
Hypostominae					
Ancistrus brevipinnis	MCP 25167	12S16S	No	Not available	-
		Cytb	Yes	Not available	This study
		MyH6	No	Not available	-
		RAG1	Yes	Not available	This study

		RAG2	Yes	Not available	This study
		nd2	No	Not available	-
Chaetostoma breve	AUM 4063	12S16S	No	Not available	-
		Cytb	Yes	Not available	This study
		MyH6	Yes	Not available	This study
		RAG1	Yes	Not available	This study
		RAG2	Yes	Not available	This study
		nd2	Yes	Not available	This study
Pterygoplichthys lituratus	MCP 35757	12S16S	No	Not available	-
		Cytb	No	Not available	-
		MyH6	Yes	Not available	This study
		RAG1	Yes	Not available	This study
		RAG2	Yes	Not available	This study
		nd2	No	Not available	-
Loricariinae (Loricariini)					
Crossoloricaria sp.	MCP 36579	12S16S	No	Not available	-
		Cytb	No	Not available	-
		MyH6	Yes	Not available	This study
		RAG1	No	Not available	-
		RAG2	No	Not available	-
		nd2	No	Not available	-
Dasyloricaria filamentosa	CZUT 5104	12S16S	No	Not available	-
		Cytb	No	Not available	-
		MyH6	Yes	Not available	This study

		RAG1	Yes	Not available	This study
		RAG2	Yes	Not available	This study
		nd2	Yes	Not available	This study
Dasyloricaria latiura	STRI 1559	12S16S	Yes	2424 KR477966	Covain *et al*., 2016
		Cytb	No	Not available	-
		MyH6	Yes	Not available	This study
		RAG1	Yes	Not available	This study
		RAG2	Yes	Not available	This study
		nd2	Yes	Not available	This study
Dasyloricaria paucisquama	CZUT 5105	12S16S	No	Not available	-
		Cytb	No	Not available	-
		MyH6	Yes	Not available	This study
		RAG1	Yes	Not available	This study
		RAG2	Yes	Not available	This study
		nd2	Yes	Not available	This study
Hemiloricaria lanceolata	MCP 34465	12S16S	No	Not available	-
		Cytb	Yes	Not available	This study
		MyH6	Yes	Not available	This study
		RAG1	No	Not available	-
		RAG2	Yes	Not available	This study
		nd2	Yes	Not available	This study
Hemiodontichthys acipenserinus	MCP 28819	12S16S	Yes	2424 KR478142	Covain *et al*., 2016
		Cytb	No	Not available	-
		MyH6	No	Not available	-

		RAG1	No	Not available	-
		RAG2	No	Not available	-
		nd2	No	Not available	-
Limatulichthys griseus	MCP 46112 MHNG 2651.013	12S16S	Yes	1689 EU310450	Covain *et al*., 2008
		Cytb	No	Not available	-
		MyH6	Yes	Not available	This study
		RAG1	Yes	Not available	This study
		RAG2	Yes	Not available	This study
		nd2	Yes	Not available	This study
Loricaria sp.	MCP 46205	12S16S	No	Not available	-
		Cytb	No	Not available	-
		MyH6	No	Not available	-
		RAG1	Yes	Not available	This study
		RAG2	Yes	Not available	This study
		nd2	Yes	Not available	This study
Loricariichthys anus	MCP 28415	12S16S	Yes	2430 KR478175	Covain *et al*., 2016
		Cytb	No	Not available	-
		MyH6	No	Not available	-
		RAG1	Yes	Not available	This study
		RAG2	Yes	Not available	This study
		nd2	Yes	Not available	This study
Loricariichthys platymetopon	MCP 21614 MHNG 2677.004	12S16S	Yes	2427 KR478118	Covain *et al*., 2016
		Cytb	No	Not available	-
		MyH6	No	Not available	-

		RAG1	Yes	Not available	This study
		RAG2	Yes	Not available	This study
		nd2	Yes	Not available	This study
Rineloricaria cadeae	MCP 21217	12S16S	Yes	2424 KR477987	Covain *et al*., 2016
	LBP 901	Cytb	No	Not available	-
		MyH6	No	Not available	-
		RAG1	Yes	Not available	This study
		RAG2	Yes	Not available	This study
		nd2	No	Not available	-
Rineloricaria quadrensis	MCP 21195	12S16S	No	Not available	-
		Cytb	No	Not available	-
		MyH6	No	Not available	-
		RAG1	Yes	Not available	This study
		RAG2	Yes	Not available	This study
		nd2	Yes	Not available	This study
Spatuloricaria puganensis	AUM 4067	12S16S	Yes	2421 KR478043	Covain *et al*., 2016
	ANSP 180486	Cytb	Yes	Not available	This study
		MyH6	Yes	Not available	This study
		RAG1	Yes	Not available	This study
		RAG2	Yes	Not available	This study
		nd2	Yes	Not available	This study
INGROUP					
Aposturisoma myriodon	MHNG 2710.035	12S16S	Yes	2435 KR477910	Covain *et al*., 2016

	MHNG 2710.043	Cytb	Yes	Not available	This study
		MyH6	No	Not available	-
		RAG1	Yes	Not available	This study
		RAG2	Yes	Not available	This study
		nd2	Yes	Not available	This study
Cteniloricaria napova	MHNG 2704.030	12S16S	Yes	2440 KR477882	Covain *et al*., 2016
		Cytb	Yes	Not available	This study
		MyH6	Yes	Not available	This study
		RAG1	Yes	Not available	This study
		RAG2	No	Not available	-
		nd2	Yes	Not available	This study
Cteniloricaria platystoma	AUM 3890	12S16S	Yes	2439 KR477888	Covain *et al*., 2016
	MHNG 2683.027	Cytb	Yes	Not available	This study
	MHNG 2672.067	MyH6	Yes	Not available	This study
		RAG1	Yes	Not available	This study
		RAG2	No	Not available	-
		nd2	Yes	Not available	This study
Farlowella acus	STRI MER95T-22	12S16S	Yes	2440 KR477936	Covain *et al*., 2016
	STRI MER95T-23	Cytb	No	Not available	-
		MyH6	Yes	Not available	This study
		RAG1	No	Not available	-
		RAG2	Yes	Not available	This study
		nd2	Yes	Not available	This study
Farlowella amazona	MCP 42432	12S16S	Yes	2432 KR477937	Covain *et al*., 2016

	MHNG 2601.065	Cytb	Yes	Not available	This study
	UFRGS 13826	MyH6	Yes	Not available	This study
		RAG1	Yes	Not available	This study
		RAG2	Yes	Not available	This study
		nd2	No	Not available	-
Farlowella curtirostra	STRI MER95T-13	12S16S	Yes	2435 KR477938	Covain *et al*., 2016
	STRI MER95T-14	Cytb	Yes	Not available	This study
	STRI MER95T-15	MyH6	Yes	Not available	This study
	STRI MER95T-16	RAG1	Yes	Not available	This study
		RAG2	Yes	Not available	This study
		nd2	Yes	Not available	This study
Farlowella hahni	STRI 2205	12S16S	Yes	2437 KR477941	Covain *et al*., 2016
	STRI 2206	Cytb	Yes	Not available	This study
	MHNG 2678.022	MyH6	Yes	Not available	This study
		RAG1	Yes	Not available	This study
		RAG2	Yes	Not available	This study
		nd2	Yes	Not available	This study
Farlowella hasemani	MCP 36626	12S16S	No	Not available	-
		Cytb	No	Not available	-
		MyH6	No	Not available	-
		RAG1	Yes	Not available	This study
		RAG2	No	Not available	-
		nd2	No	Not available	-
Farlowella knerii	MHNG 2710.052	12S16S	Yes	2437 KR477954	Covain *et al*., 2016

		Cytb	Yes	Not available	This study
		MyH6	No	Not available	-
		RAG1	Yes	Not available	This study
		RAG2	Yes	Not available	This study
		nd2	Yes	Not available	This study
Farlowella mariaelenae	STRI MER95T-2	12S16S	Yes	2439 KR477939	Covain *et al*., 2016
	STRI MER95T-3	Cytb	No	Not available	-
	STRI MER95T-8	MyH6	No	Not available	-
	STRI VZ-59	RAG1	Yes	Not available	This study
		RAG2	No	Not available	-
		nd2	Yes	Not available	This study
Farlowella martini	STRI VZ-126	12S16S	Yes	2436 KR477940	Covain *et al*., 2016
	STRI VZ-127	Cytb	Yes	Not available	This study
		MyH6	No	Not available	-
		RAG1	Yes	Not available	This study
		RAG2	Yes	Not available	This study
		nd2	Yes	Not available	This study
Farlowella nattereri	MCP 36600	12S16S	Yes	2439 KR477952	Covain *et al*., 2016
	MHNG 2650.099	Cytb	No	Not available	-
		MyH6	No	Not available	-
		RAG1	No	Not available	-
		RAG2	No	Not available	-
		nd2	No	Not available	-
Farlowella oxyrryncha	MCP 44240	12S16S	Yes	2437 KR477960	Covain *et al*., 2016

	MHNG 2613.035	Cytb	Yes	Not available	This study
		MyH6	Yes	Not available	This study
		RAG1	Yes	Not available	This study
		RAG2	Yes	Not available	This study
		nd2	No	Not available	-
Farlowella paraguayensis	LBP 5217	12S16S	Yes	2434 KR477962	Covain *et al*., 2016
		Cytb	Yes	Not available	This study
		MyH6	No	Not available	-
		RAG1	Yes	Not available	This study
		RAG2	Yes	Not available	This study
		nd2	No	Not available	-
Farlowella platorynchus	STRI MER95T-25	12S16S	Yes	2435 KR477949	Covain *et al*., 2016
	STRI MER95T-26	Cytb	Yes	Not available	This study
	STRI MER1B	MyH6	No	Not available	-
	MHNG 2650.096	RAG1	Yes	Not available	This study
		RAG2	No	Not available	-
		nd2	No	Not available	-
Farlowella reticulata	AUM 3642	12S16S	Yes	2438 KR477942	Covain *et al*., 2016
	MHNG 2683.070	Cytb	Yes	Not available	This study
		MyH6	No	Not available	-
		RAG1	Yes	Not available	This study
		RAG2	Yes	Not available	This study
		nd2	No	Not available	-
Farlowella rugosa	AUM 3648	12S16S	Yes	2435 KR477948	Covain *et al*., 2016

	ANSP 178614	Cytb	Yes	Not available	This study
	ANSP 179768	MyH6	No	Not available	-
		RAG1	Yes	Not available	This study
		RAG2	Yes	Not available	This study
		nd2	No	Not available	-
Farlowella schreitmuelleri	MHNG 2601.087	12S16S	Yes	2437 KR477943	Covain *et al*., 2016
		Cytb	Yes	Not available	This study
		MyH6	Yes	Not available	This study
		RAG1	Yes	Not available	This study
		RAG2	Yes	Not available	This study
		nd2	Yes	Not available	This study
Farlowella smithi	MCP 36623	12S16S	Yes	2436 KR477945	Covain *et al*., 2016
	ANSP 180541	Cytb	No	Not available	-
	UFRGS 13826	MyH6	No	Not available	-
		RAG1	No	Not available	-
		RAG2	No	Not available	-
		nd2	No	Not available	-
Farlowella taphorni	STRI VZ-89	12S16S	Yes	2433 KR477946	Covain *et al*., 2016
	STRI VZ-90	Cytb	Yes	Not available	This study
		MyH6	Yes	Not available	This study
		RAG1	Yes	Not available	This study
		RAG2	Yes	Not available	This study
		nd2	Yes	Not available	This study
Farlowella vittata	AUM 3607	12S16S	Yes	2438 KR477947	Covain *et al*., 2016

	STRI VZ-63	Cytb	Yes	Not available	This study
		MyH6	No	Not available	-
		RAG1	Yes	Not available	This study
		RAG2	Yes	Not available	This study
		nd2	Yes	Not available	This study
Farlowella yarigui	ICNMHN 17789	12S16S	No	Not available	-
		Cytb	Yes	Not available	This study
		MyH6	No	Not available	-
		RAG1	Yes	Not available	This study
		RAG2	Yes	Not available	This study
		nd2	No	Not available	-
Harttia carvalhoi	MHNG 2587.027	12S16S	Yes	2432 KR477891	Covain *et al*., 2016
	LBP 2115	Cytb	Yes	Not available	This study
		MyH6	Yes	Not available	This study
		RAG1	Yes	Not available	This study
		RAG2	Yes	Not available	This study
		nd2	Yes	Not available	This study
Harttia dissidens	LBP 5859	12S16S	Yes	2435 KR477892	Covain *et al*., 2016
		Cytb	Yes	Not available	This study
		MyH6	Yes	Not available	This study
		RAG1	Yes	Not available	This study
		RAG2	No	Not available	-
		nd2	Yes	Not available	This study
Harttia duriventris	LBP 7505	12S16S	Yes	2432 KR477915	Covain *et al*., 2016

		Cytb	No	Not available	-
		MyH6	No	Not available	-
		RAG1	No	Not available	-
		RAG2	No	Not available	-
		nd2	No	Not available	-
Harttia fluminensis	MHNG 2690.013	12S16S	Yes	2435 KR477884	Covain *et al*., 2016
		Cytb	No	Not available	-
		MyH6	No	Not available	-
		RAG1	No	Not available	-
		RAG2	No	Not available	-
		nd2	No	Not available	-
Harttia fowleri	MHNG 2643.022	12S16S	Yes	2442 KR477880	Covain *et al*., 2016
		Cytb	Yes	Not available	This study
		MyH6	Yes	Not available	This study
		RAG1	Yes	Not available	This study
		RAG2	Yes	Not available	This study
		nd2	Yes	Not available	This study
Harttia gracilis	LBP 6331	12S16S	Yes	2433 KR477916	Covain *et al*., 2016
	UFRGS 11358	Cytb	Yes	Not available	This study
		MyH6	No	Not available	-
		RAG1	Yes	Not available	This study
		RAG2	Yes	Not available	This study
		nd2	Yes	Not available	This study
Harttia guianensis	MHNG 2757.008	12S16S	Yes	2438 KR477885	Covain *et al*., 2016

	MHNG 2717.003	Cytb	Yes	Not available	This study
	MHNG 2662.091	MyH6	Yes	Not available	This study
		RAG1	Yes	Not available	This study
		RAG2	Yes	Not available	This study
		nd2	No	Not available	-
Harttia kronei	MCP 42440	12S16S	Yes	2424 KR477900	Covain *et al*., 2016
	MHNG 2586.058	Cytb	Yes	Not available	This study
		MyH6	Yes	Not available	This study
		RAG1	Yes	Not available	This study
		RAG2	Yes	Not available	This study
		nd2	Yes	Not available	This study
Harttia leiopleura	LBP 6847	12S16S	Yes	2435 KR477918	Covain *et al*., 2016
	LBP 6492	Cytb	Yes	Not available	This study
		MyH6	No	Not available	-
		RAG1	Yes	Not available	This study
		RAG2	No	Not available	-
		nd2	Yes	Not available	This study
Harttia longipinna	DZSJRP 2819	12S16S	Yes	2429 KR477903	Covain *et al*., 2016
		Cytb	Yes	Not available	This study
		MyH6	Yes	Not available	This study
		RAG1	Yes	Not available	This study
		RAG2	Yes	Not available	This study
		nd2	Yes	Not available	This study
Harttia loricariformis	LBP 2121	12S16S	Yes	2435 KR477896	Covain *et al*., 2016

	UFRGS 18816	Cytb	No	Not available	-
		MyH6	No	Not available	-
		RAG1	Yes	Not available	This study
		RAG2	No	Not available	-
		nd2	Yes	Not available	This study
Harttia novalimensis	LBP 5836	12S16S	Yes	2429 KR477897	Covain *et al*., 2016
		Cytb	Yes	Not available	This study
		MyH6	Yes	Not available	This study
		RAG1	Yes	Not available	This study
		RAG2	Yes	Not available	This study
		nd2	Yes	Not available	This study
Harttia punctata	LBP 5839	12S16S	Yes	2431 KR477893	Covain *et al*., 2016
	MHNG 2645.059	Cytb	Yes	Not available	This study
		MyH6	Yes	Not available	This study
		RAG1	Yes	Not available	This study
		RAG2	No	Not available	-
		nd2	Yes	Not available	This study
Harttia surinamensis	MHNG 2674.042	12S16S	Yes	2438 KR477883	Covain *et al*., 2016
		Cytb	Yes	Not available	This study
		MyH6	Yes	Not available	This study
		RAG1	Yes	Not available	This study
		RAG2	Yes	Not available	This study
		nd2	Yes	Not available	This study
Harttia torrenticola	LBP 5835	12S16S	Yes	2433 KR477913	Covain *et al*., 2016

		Cytb	Yes	Not available	This study
		MyH6	Yes	Not available	This study
		RAG1	Yes	Not available	This study
		RAG2	Yes	Not available	This study
		nd2	Yes	Not available	This study
Harttia tuna	MHNG 2704.029	12S16S	Yes	2437 KR477909	Covain *et al*., 2016
		Cytb	Yes	Not available	This study
		MyH6	Yes	Not available	This study
		RAG1	Yes	Not available	This study
		RAG2	Yes	Not available	This study
		nd2	Yes	Not available	This study
Harttiella crassicauda	AUM 4198	12S16S	Yes	2418 KR478145	Covain *et al*., 2016
	MHNG 2679.098	Cytb	No	Not available	-
	AUF 4558	MyH6	Yes	Not available	This study
		RAG1	Yes	Not available	This study
		RAG2	No	Not available	-
		nd2	No	Not available	-
Harttiella intermedia	MHNG 2713.087	12S16S	Yes	2418 KR478164	Covain *et al*., 2016
		Cytb	No	Not available	-
		MyH6	No	Not available	-
		RAG1	Yes	Not available	This study
		RAG2	Yes	Not available	This study
		nd2	Yes	Not available	This study
Harttiella longicauda	MHNG 2699.070	12S16S	Yes	2419 KR478159	Covain *et al*., 2016

	MHNG 2723.094	Cytb	Yes	Not available	This study
		MyH6	Yes	Not available	This study
		RAG1	Yes	Not available	This study
		RAG2	Yes	Not available	This study
		nd2	No	Not available	-
Harttiella lucifer	MHNG 2754.082	12S16S	Yes	2414 KR478153	Covain *et al*., 2016
	MHNG 2721.088	Cytb	No	Not available	-
		MyH6	No	Not available	-
		RAG1	Yes	Not available	This study
		RAG2	No	Not available	-
		nd2	Yes	Not available	This study
Harttiella pilosa	MHNG 2682.055	12S16S	Yes	2419 KR478138	Covain *et al*., 2016
	MHNG 2724.002	Cytb	No	Not available	-
		MyH6	Yes	Not available	This study
		RAG1	Yes	Not available	This study
		RAG2	Yes	Not available	This study
		nd2	Yes	Not available	This study
Lamontichthys filamentosus	AUM 4024	12S16S	Yes	2433 KR477930	Covain *et al*., 2016
	LBP 162	Cytb	Yes	Not available	This study
		MyH6	Yes	Not available	This study
		RAG1	Yes	Not available	This study
		RAG2	No	Not available	-
		nd2	Yes	Not available	This study
Lamontichthys llanero	MHNG 2749.019	12S16S	Yes	2434 KR477928	Covain *et al*., 2016

		Cytb	Yes	Not available	This study
		MyH6	Yes	Not available	This study
		RAG1	Yes	Not available	This study
		RAG2	Yes	Not available	This study
		nd2	Yes	Not available	This study
Lamontichthys stibaros	AUM 57480	12S16S	Yes	2433 KR477931	Covain *et al*., 2016
	MHNG 2677.039	Cytb	Yes	KP960068.1	Lujan *et al*., 2015
	MHNG 2710.049	MyH6	Yes	KP960374.1	Lujan *et al*., 2015
		RAG1	Yes	KP959909	Lujan *et al*., 2015
		RAG2	Yes	KP960219.1	Lujan *et al*., 2015
		nd2	No	Not available	-
Metaloricaria nijsseni	MHNG 2756.054	12S16S	Yes	2437 KR477967	Covain *et al*., 2016
	MHNG 2672.053	Cytb	Yes	Not available	This study
		MyH6	No	Not available	-
		RAG1	Yes	Not available	This study
		RAG2	Yes	Not available	This study
		nd2	Yes	Not available	This study
Metaloricaria paucidens	MHNG 2756.049	12S16S	Yes	2439 KR477932	Covain *et al*., 2016
	MHNG 2757.008	Cytb	Yes	Not available	This study
	MHNG 2681.042	MyH6	No	Not available	-
		RAG1	No	Not available	-
		RAG2	Yes	Not available	This study
		nd2	Yes	Not available	This study
Pterosturisoma microps	MHNG 2677.072	12S16S	Yes	2439 KR477921	Covain *et al*., 2016

		Cytb	Yes	Not available	This study
		MyH6	No	Not available	-
		RAG1	Yes	Not available	This study
		RAG2	Yes	Not available	This study
		nd2	Yes	Not available	This study
Sturisoma monopelte	AUM 3616	12S16S	Yes	1707 EU310461	Covain *et al*., 2008
	MHNG 2651.033	Cytb	Yes	Not available	This study
		MyH6	Yes	Not available	This study
		RAG1	Yes	Not available	This study
		RAG2	No	Not available	-
		nd2	No	Not available	-
Sturisoma nigrirostrum	ANSP 182587	12S16S	Yes	2444 KR478162	Covain *et al*., 2016
	ANSP 178322	Cytb	Yes	Not available	This study
	STRI 15936	MyH6	Yes	Not available	This study
	STRI 15938	RAG1	No	Not available	-
		RAG2	Yes	Not available	This study
		nd2	Yes	Not available	This study
Sturisoma robustum	MHNG 2677.002	12S16S	Yes	2443 KR478161	Covain *et al*., 2016
		Cytb	Yes	Not available	This study
		MyH6	No	Not available	-
		RAG1	Yes	Not available	This study
		RAG2	Yes	Not available	This study
		nd2	Yes	Not available	This study
Sturisoma tenuirostre	MCP 34083	12S16S	No	Not available	-

		Cytb	Yes	Not available	This study
		MyH6	Yes	Not available	This study
		RAG1	Yes	Not available	This study
		RAG2	Yes	Not available	This study
		nd2	Yes	Not available	This study
Sturisomatichthys aureus	MHNG 2684.019 Uncat. Specimen	12S16S	Yes	2442 KR478160	Covain *et al*., 2016
		Cytb	Yes	Not available	This study
		MyH6	Yes	Not available	This study
		RAG1	Yes	Not available	This study
		RAG2	Yes	Not available	This study
		nd2	Yes	Not available	This study
Sturisomatichthys citurensis	STRI 909 STRI 3657 STRI 3587 STRI 3588 STRI 4132 STRI 4133 STRI 7678 STRI 7679 STRI 18651 STRI 26790 STRI 26791 STRI 26792 STRI 26793 STRI 26794 STRI 26862	12S16S	Yes	1703 EU310462	Covain *et al*., 2008
		Cytb	Yes	Not available	This study
		MyH6	No	Not available	-
		RAG1	No	Not available	-
		RAG2	No	Not available	-
		nd2	Yes	Not available	This study

Sturisomatichthys dariensis	MHNG 2674.059	12S16S	Yes	2440 KR477922	Covain *et al*., 2016
	STRI 26795	Cytb	Yes	Not available	This study
	STRI 26861	MyH6	Yes	Not available	This study
		RAG1	Yes	Not available	This study
		RAG2	Yes	Not available	This study
		nd2	Yes	Not available	This study
Sturisomatichthys festivus	STRI MER95T-20	12S16S	Yes	2443 KR477923	Covain *et al*., 2016
		Cytb	Yes	DQ119467	Hardman, 2005
		MyH6	No	Not available	-
		RAG1	No	Not available	-
		RAG2	No	Not available	-
		nd2	No	Not available	-
Sturisomatichthys frenatus	STRI 872	12S16S	No	Not available	-
		Cytb	Yes	Not available	This study
		MyH6	Yes	Not available	This study
		RAG1	Yes	Not available	This study
		RAG2	Yes	Not available	This study
		nd2	Yes	Not available	This study
Sturisomatichthys leightoni	STRI 789	12S16S	Yes	2440 KR477927	Covain *et al*., 2016
	STRI 790	Cytb	No	Not available	-
	MPUJ 7865	MyH6	Yes	Not available	This study
	Uncat. Specimen	RAG1	Yes	Not available	This study
		RAG2	Yes	Not available	This study
		nd2	Yes	Not available	This study

Sturisomatichthys panamensis	ICNMHN 17733	12S16S	Yes	2443 KR478163	Covain *et al*., 2016
	MHNG 2674.058	Cytb	Yes	Not available	This study
		MyH6	Yes	Not available	This study
		RAG1	Yes	Not available	This study
		RAG2	Yes	Not available	This study
		nd2	Yes	Not available	This study
Sturisomatichthys tamanae	ANSP 198426	12S16S	No	Not available	-
		Cytb	Yes	Not available	This study
		MyH6	Yes	Not available	This study
		RAG1	Yes	Not available	This study
		RAG2	Yes	Not available	This study
		nd2	Yes	Not available	This study

Table 2. Primers, references, and annealing temperatures used in amplification of molecular markers.

DNA marker	Primer Name	Primer Sequences (5'–>3')	Annealing temperature	Reference	Notes
Cytb	CytbFa	TCCCACCCGGACTCTAACCGA	Touchdown 50°C - 62°C	Lujan *et al*., 2015	
	CytbRa	CCGGATTACAAGACCGGCGCT	Touchdown 50°C - 62°C	Lujan *et al*., 2015	
MyH6	myh6_F459	CATMTTYTCCATCTCAGATAATGC	Touchdown 53°C - 62°C	Li *et al*., 2007	1st PCR forward primer
	myh6_F507	GGAGAATCARTCKGTGCTCATCA	Touchdown 53°C - 62°C	Li *et al*., 2007	2nd PCR forward primer
	myh6_R1325	ATTCTCACCACCATCCAGTTGAA	Touchdown 53°C - 62°C	Li *et al*., 2007	1st PCR reverse primer
	myh6_R1322	CTCACCACCATCCAGTTGAACAT	Touchdown 53°C - 62°C	Li *et al*., 2007	2nd PCR reverse primer
RAG1	RAG1Fa	CCTGGTTTTCATGCATTTGAGTGGCA	Touchdown 48°C - 60°C	Lujan *et al*., 2015	
	RAG1Ra	AGGGCATCTAATGTGGGCTGTGT	Touchdown 48°C - 60°C	Lujan *et al*., 2015	
RAG2	RAG2Fc	ATGGAGGCCGAACACCCAACA	Touchdown 53°C - 58°C	Lujan *et al*., 2015	
	RAG2R961	CGCTGCTGWACTCCATTT	Touchdown 53°C - 58°C	Lujan *et al*., 2015	
nd2	nd2_Dist_f	AGCTTTTGGGCCCATACCCCA	58°C	Arroyave *et al*., 2013	
	nd2_Dist_r	AGGRACTAGGAGATTTTCACTCCTGCT	58°C	Arroyave *et al*., 2013	

Table 3. Nucleotude substitution models by gene and codon position found in PartitionFinder.

Subset	Scheme of partition	Partitions	Best-fit model
1	12S16S	217-2718	GTR+I+G
2	Cytb first position	2719-3775	TVMEF+I+G
3	Cytb second position	2720-3773	GTR+I+G
4	Cytb third position	2721-3774	GTR+G
5	MyH6 first position	3776-4412	GTR+G
6	MyH6 second position	3777-4410	GTR+I+G
7	MyH6 third position	3778-4411	GTR+I+G
8	RAG1 first position	4413-5124	TRNEF+I+G
9	RAG1 second position	4414-5125	TVM+I+G
10	RAG1 third position	4415-5126	GTR+I+G
11	RAG2 first position	5127-5904	SYM+G
12	RAG2 second position	5128-5905	TVM+I+G
13	RAG2 third position	5129-5903	HKY+I+G
14	nd2 first position	5906-6839	TRN+I+G
15	nd2 second position	5907-6837	GTR+G
16	nd2 third position	5908-6838	TVM+G
lnL: -65297.069397		Parameters: 312	

FIGURES

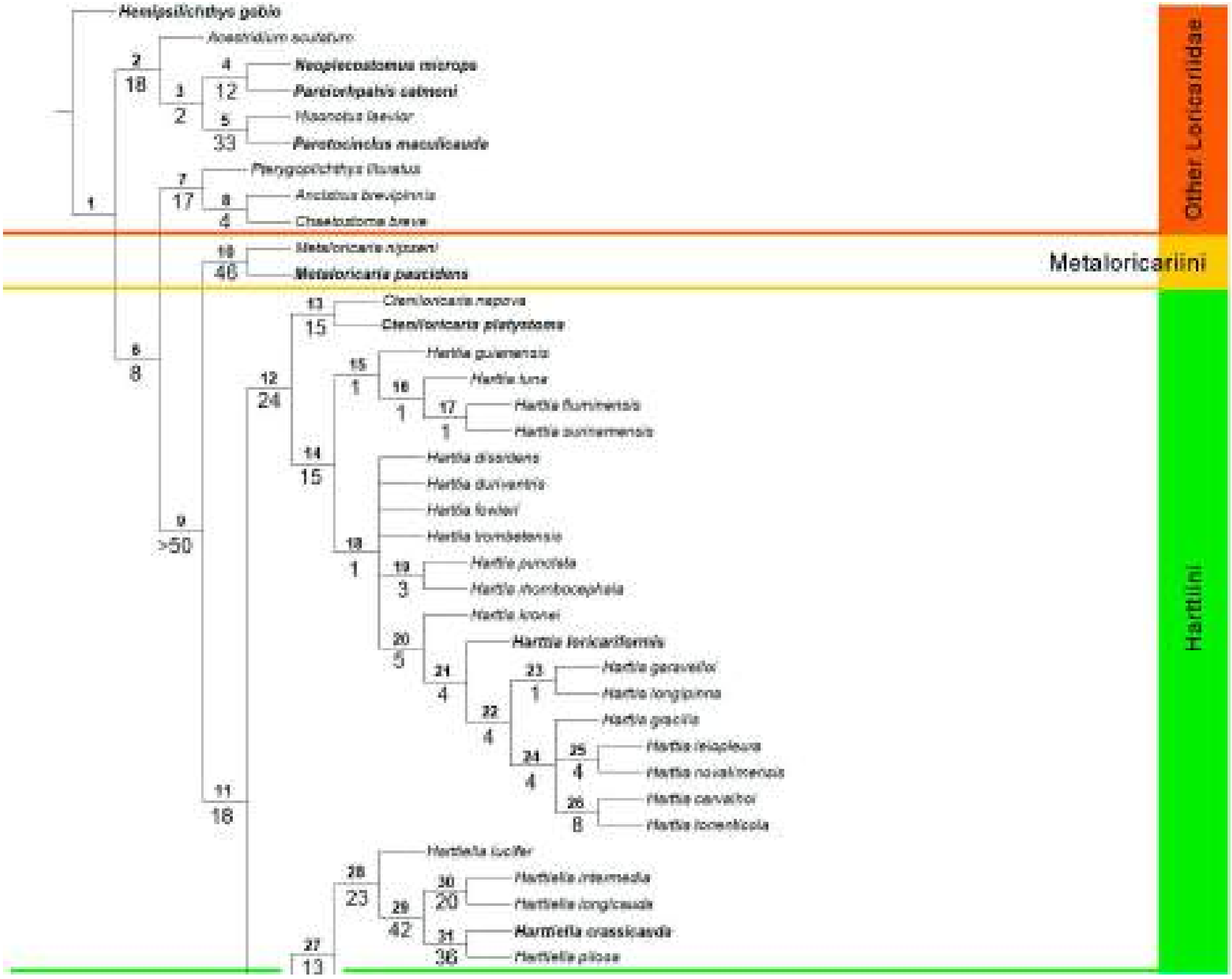

Fig. 1. Strict consensus cladogram from the maximum parsimony analysis. Numbers above branches are node identification numbers; numbers below branches are Bremer values. Type species names in bold.

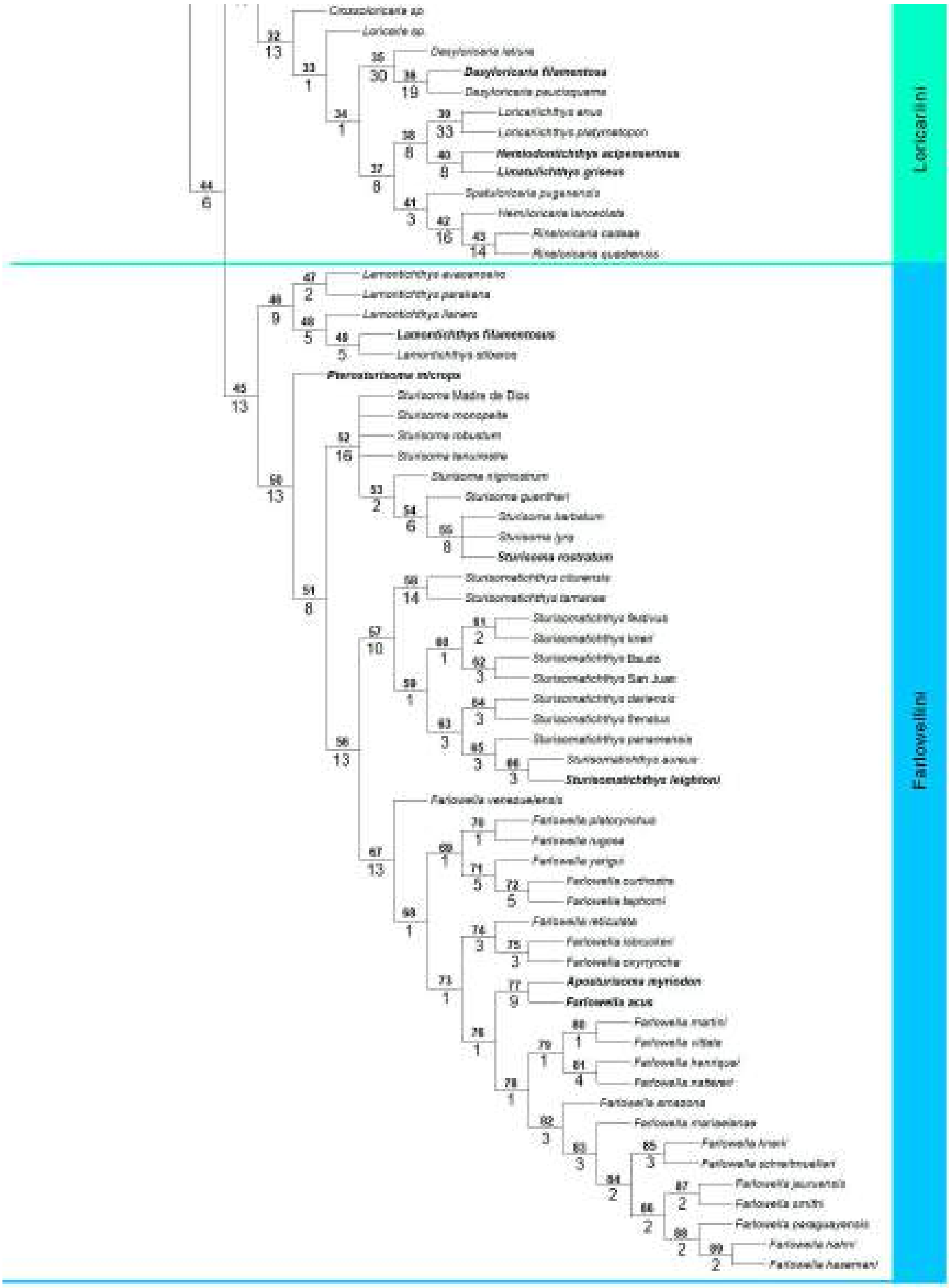

Fig. 1. Continuation.

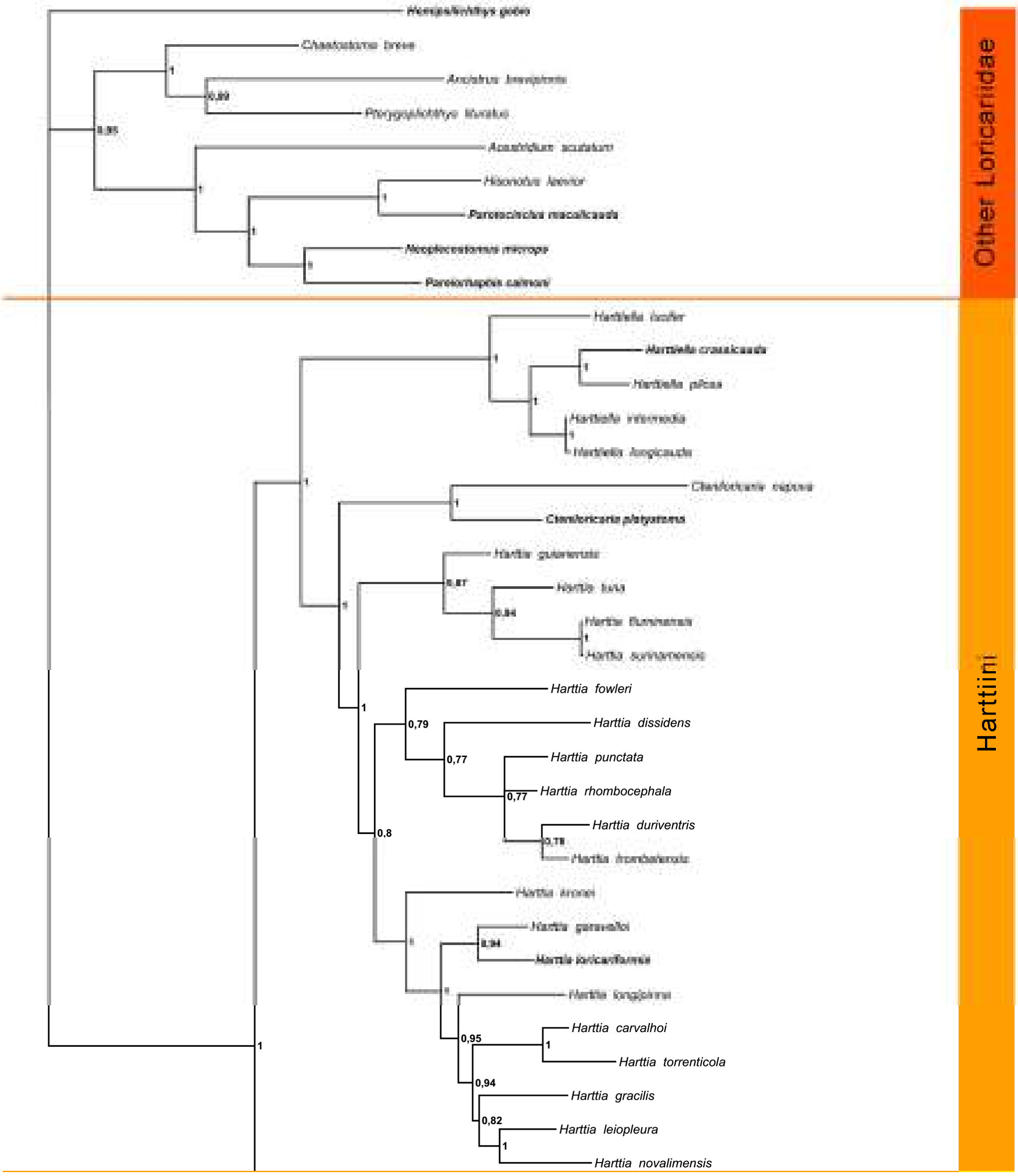

Fig. 2. Tree obtained from Bayesian Inference analysis. Posterior probabilities values on branches. Type species names in bold.

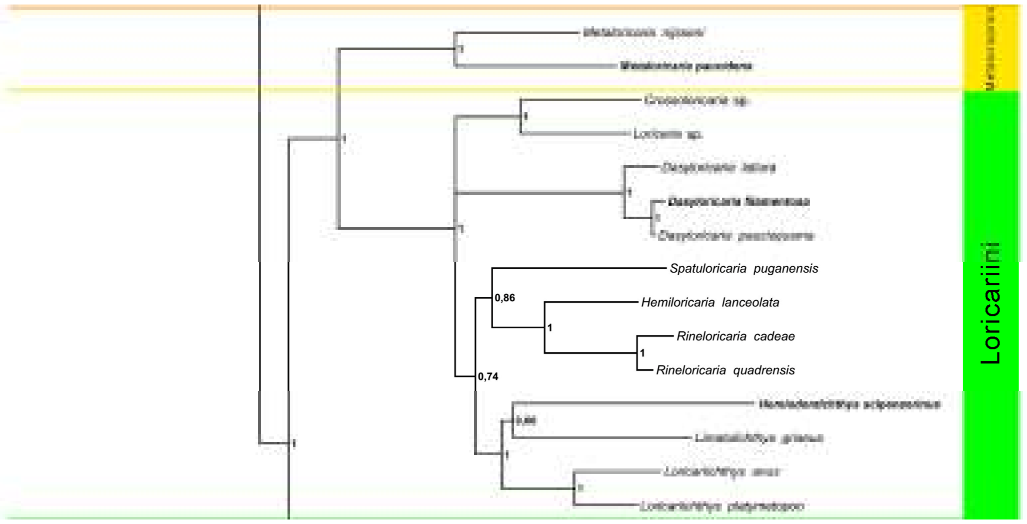

Fig. 2. Continuation

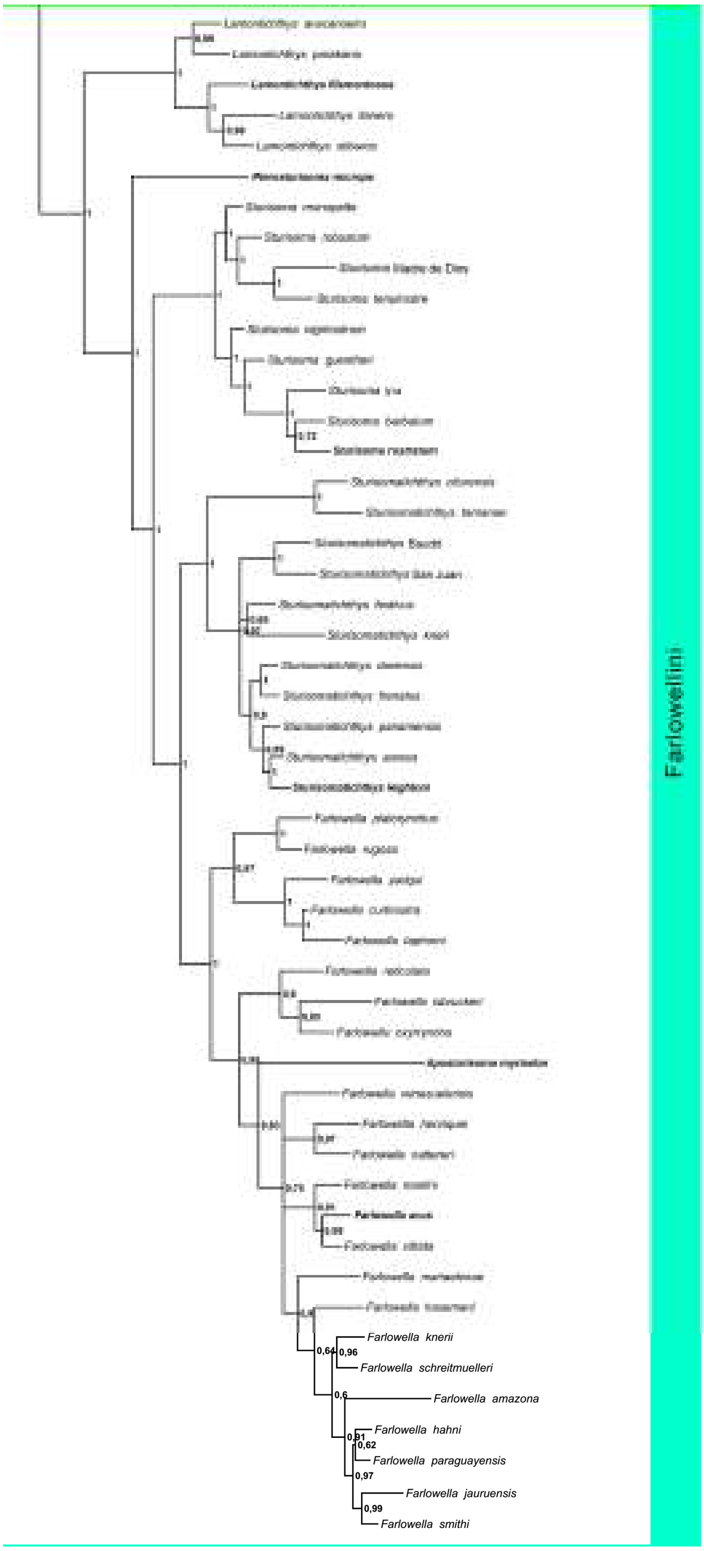

Fig. 2. Continuation

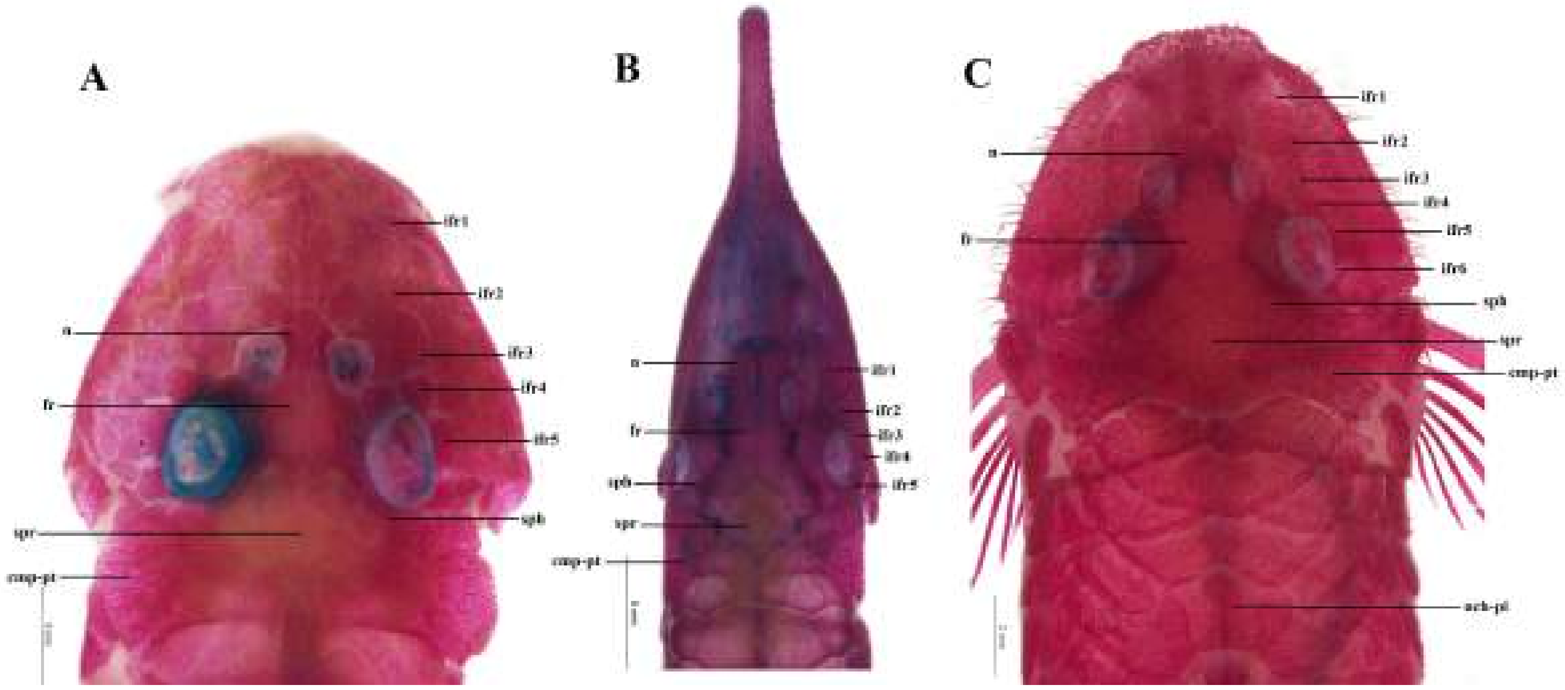

Fig. 3. Neurocranium in dorsal view: **A.** *Harttia gracilis*, MZUSP 99678; **B.** *Farlowella mariaelenae*, USNM 349392; **C.** *Harttiella crassicauda*, AUM 50837. Abbreviations: cmp-pt= compound pterotic; fr= frontal; ifr1-6= infraorbital 1-6; n= nasal; nch-pl= nuchal plate; sph= sphenotic; spr= supraoccipital.

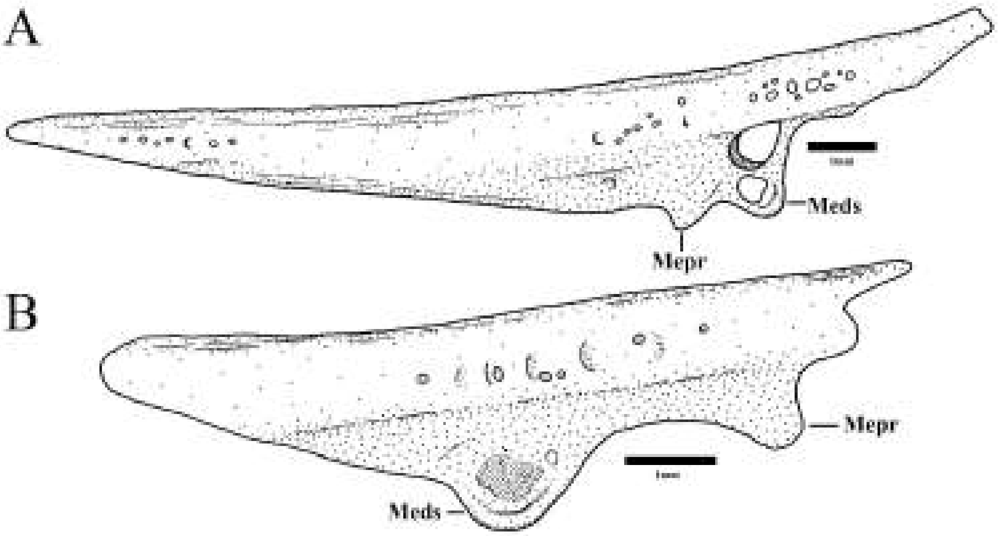

Fig. 4. Mesethmoid in lateral view; anterior portion towards left: **A.** *Farlowella acus*, ANSP 130038; **B.** *Sturisomatichthys festivus*, CAS 168512. Abbreviations: Meds= Mesethmoid disk; Mepr= Mesethmoid process. Drawings by Maria Laura S. Delapieve.

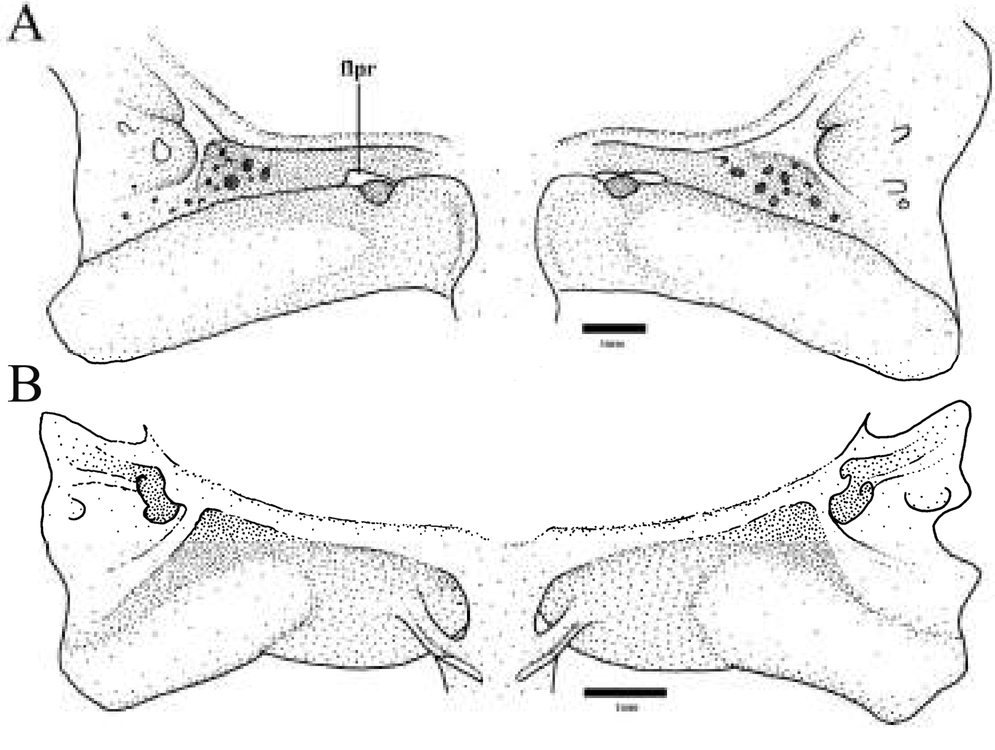

Fig. 5. Transversal process of Weberian apparatus in ventral view: **A.** *Sturisomatichthys festivus*, CAS 168512; **B.** *Sturisoma robustum*, MCP 15812. Abbreviations: flpr= Fenestra with laminar process. Drawings by Maria Laura S. Delapieve.

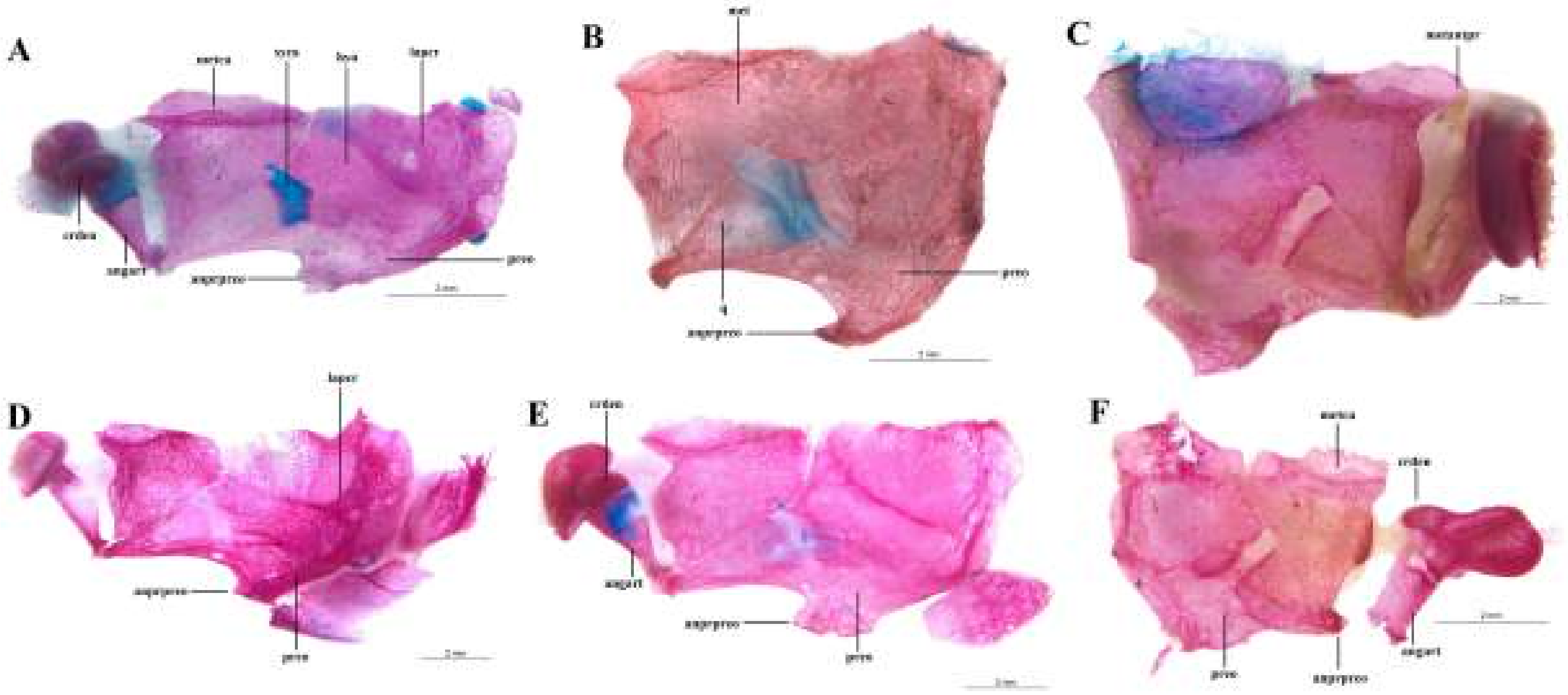

Fig. 6. Suspensorium in lateral view; anterior portion towards left: **A.** *Farlowella mariaelenae*, USNM 349392; **B.** *Pterosturisoma microps*, MZUSP 79909; **C.** *Harttia gracilis*, MZUSP 99678; **D.** *Sturisoma robustum*, MCP 15812; **E.** *Sturisomatichthys* Baudó, NRM 15155; **F.** *Harttiella crassicauda*, AUM 50837. Abbreviations: anprpreo= anterior process of preopercle; crden= coronoid process of dentary; hyo= hyomandibular; lapcr= *levator arcus palatine* crest; met= metapterygoid; metca= metapterygoid canal; metantpr= metapterygoid anterior process; preo= preopercle; q= quadrate; syca= symphiseal cartilage.

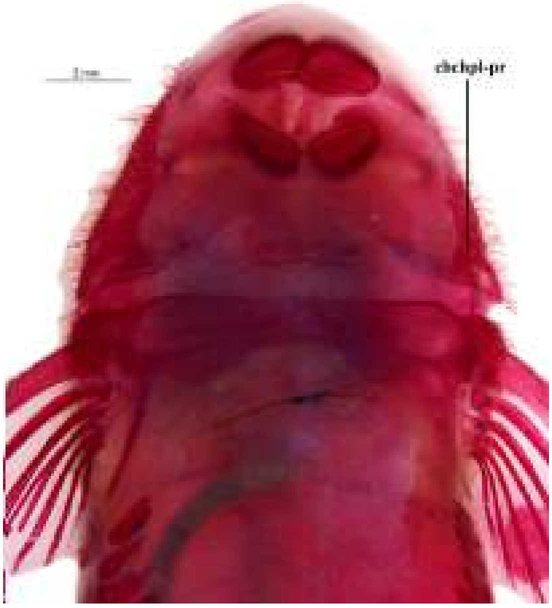

Fig. 7. Canal-bearing cheek plate process in ventral view: *Harttiella crassicauda*, AUM 50837. Abbreviations: cbchpl-pr= canal-bearing cheek plate.

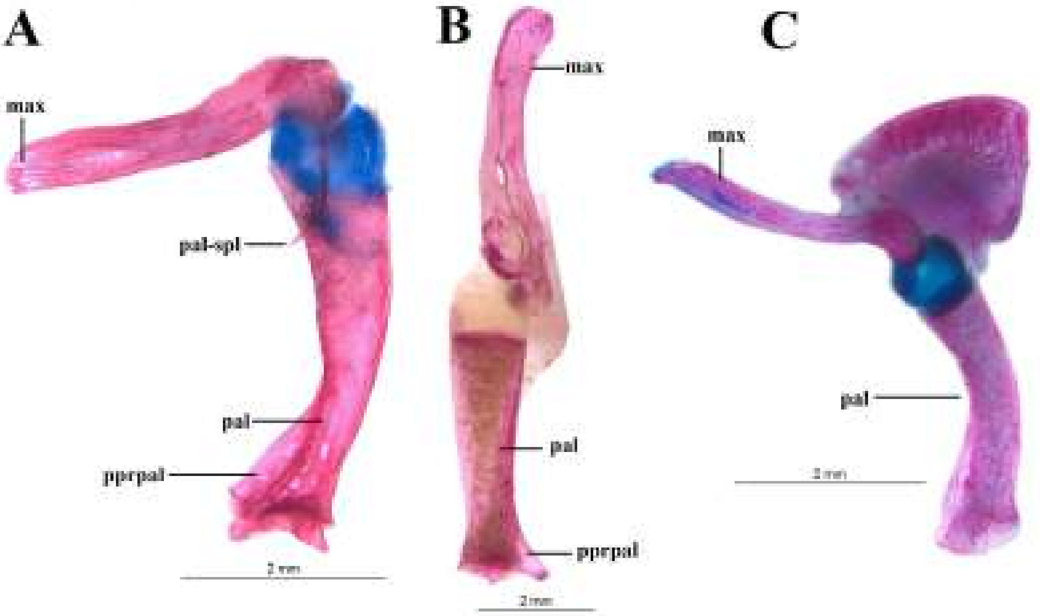

Fig. 8. Palatine and maxilla: **A.** *Sturisomatichthys* Baudó, NRM 15155, ventral view; **B.** *Harttia gracilis*, MZUSP 99678, lateral view; **C.** *Farlowella mariaelenae*, USNM 349392, lateral view. Abbreviations: pal= palatine; pal-spl= palatine splint; max= maxilla; pprpal= posterior process of palatine.

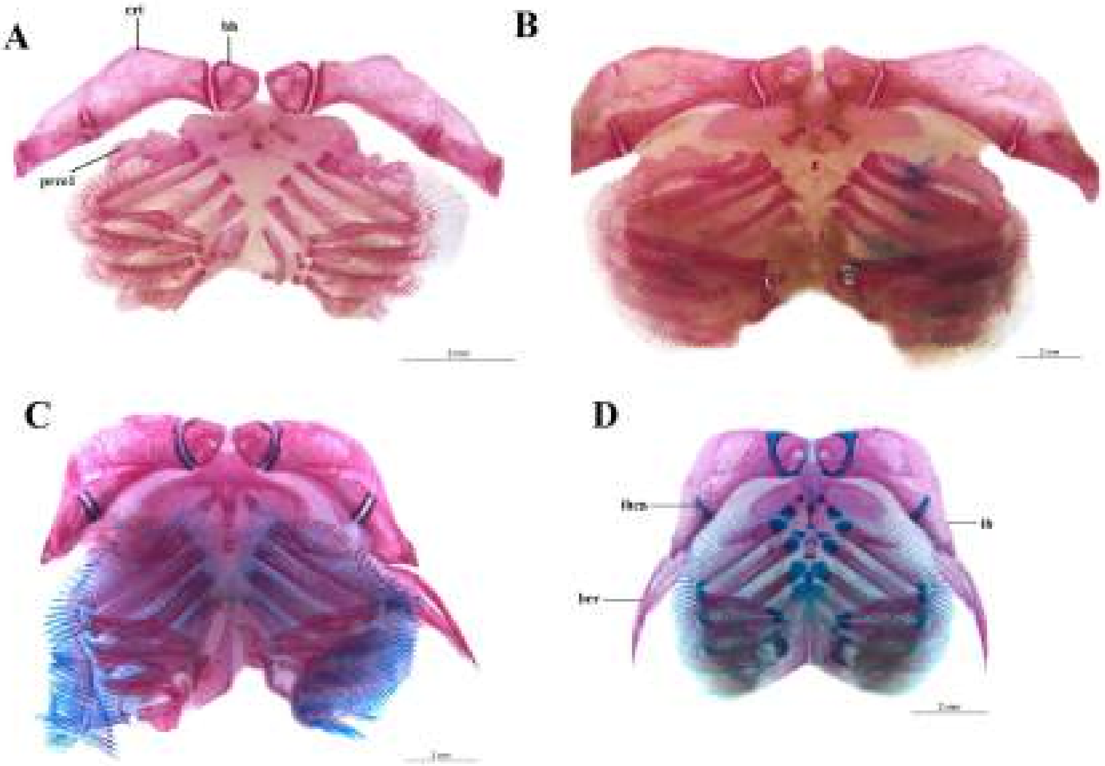

Fig. 9. Hyoid and branchial arch in ventral view: **A.** *Harttiella crassicauda*, AUM 50837; **B.** *Harttia gracilis*, MZUSP 99678; **C.** *Sturisomatichthys* Baudó, NRM 15155; **D.** *Farlowella mariaelenae*, USNM 349392. Abbreviations: brr= branchistegal rays; crt= ceratohyal; hh= hypohial; ih= interhyal; ihca= interhyal cartilage; prce1= process of ceratobranchial 1.

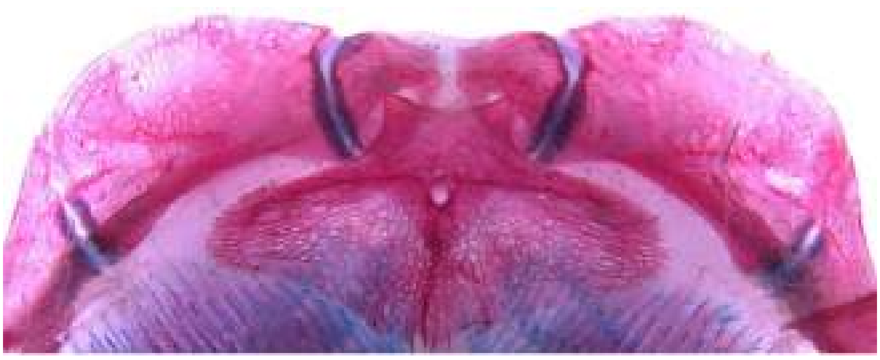

Fig. 10. Branchial arch in dorsal view showing urohyal: *Sturisomatichthys* Baudó, NRM 15155.

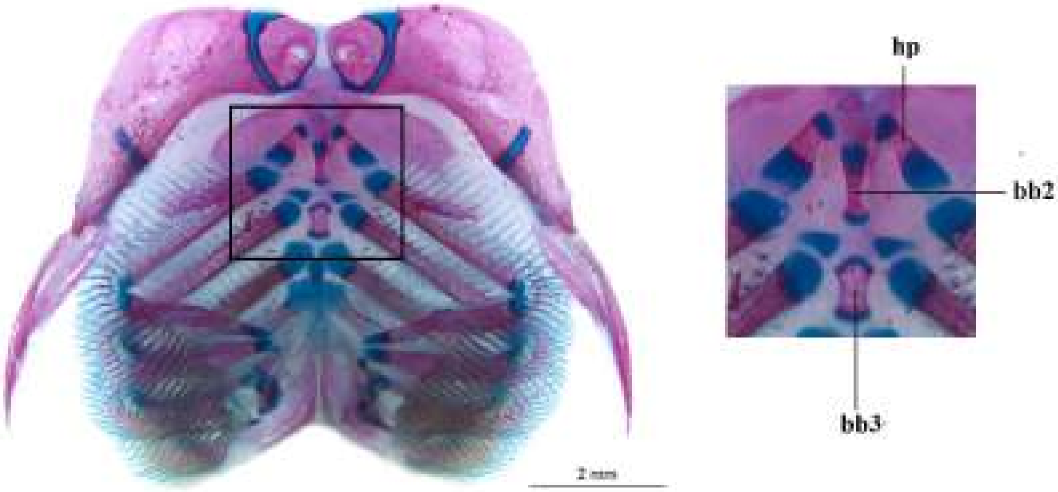

Fig. 11. Hyoid and branchial arch in ventral view: *Farlowella mariaelenae,* USNM 349392. Abbreviations: bb2= basibranchial 2; bb3= basibranchial 3; hp= hipobranchial.

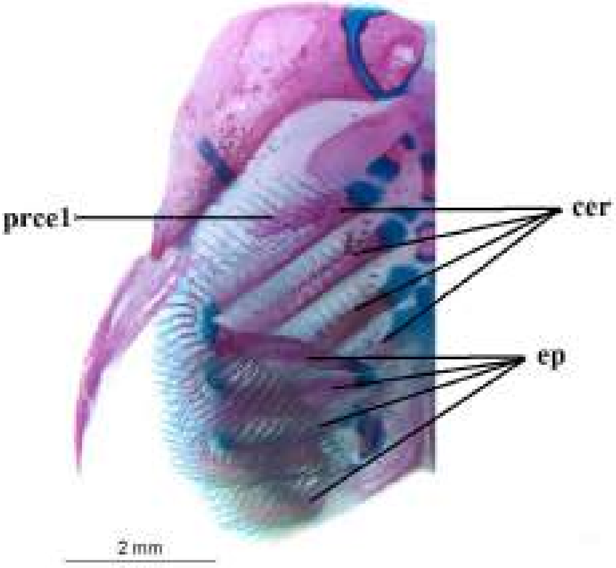

Fig. 12. Right side of hyoid and branchial arch in ventral view: *Farlowella mariaelenae*, USNM 349392. Abbreviations: ep= epibranchial 1, 2, 3 and 4; cer= ceratobranchial 1, 2, 3 and 4; prce1= process of ceratobranchial 1.

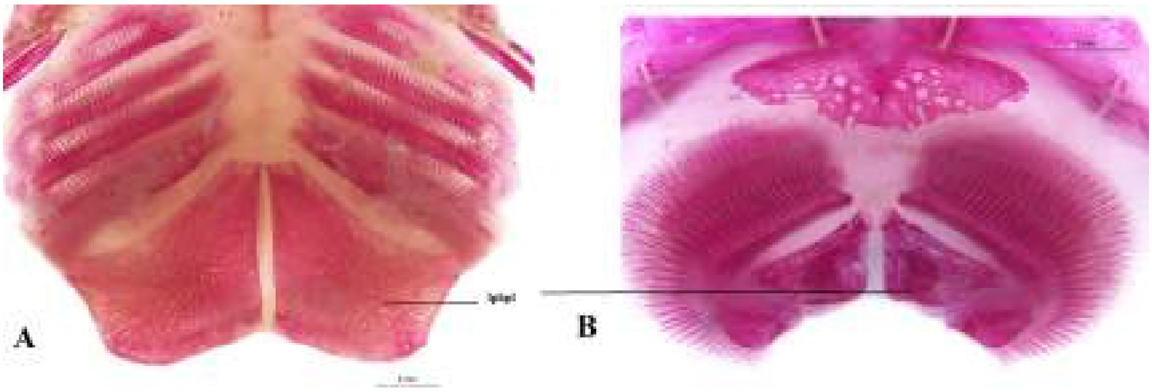

Fig. 13. Lower pharyngeal plates (or ceratobranchial 5) in dorsal view: **A.** *Sturisoma lyra*, MCP 45730; **B.** *Sturisomatichthys* Baudó, NRM 15155. Abbreviations: lphpl= lower pharyngeal plates.

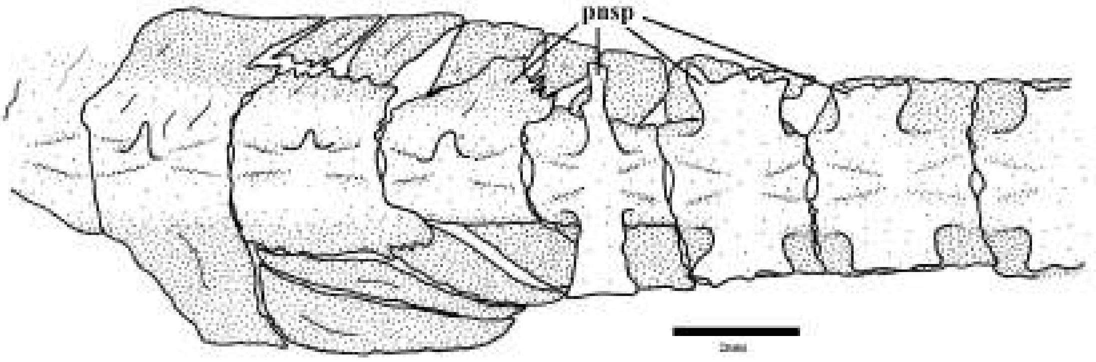

Fig. 14. Paraneural spines in lateral view: *Farlowella venezuelensis*, USNM 163179. Abbreviations: pnsp= paraneural spines. Drawing by Maria Laura S. Delapieve.

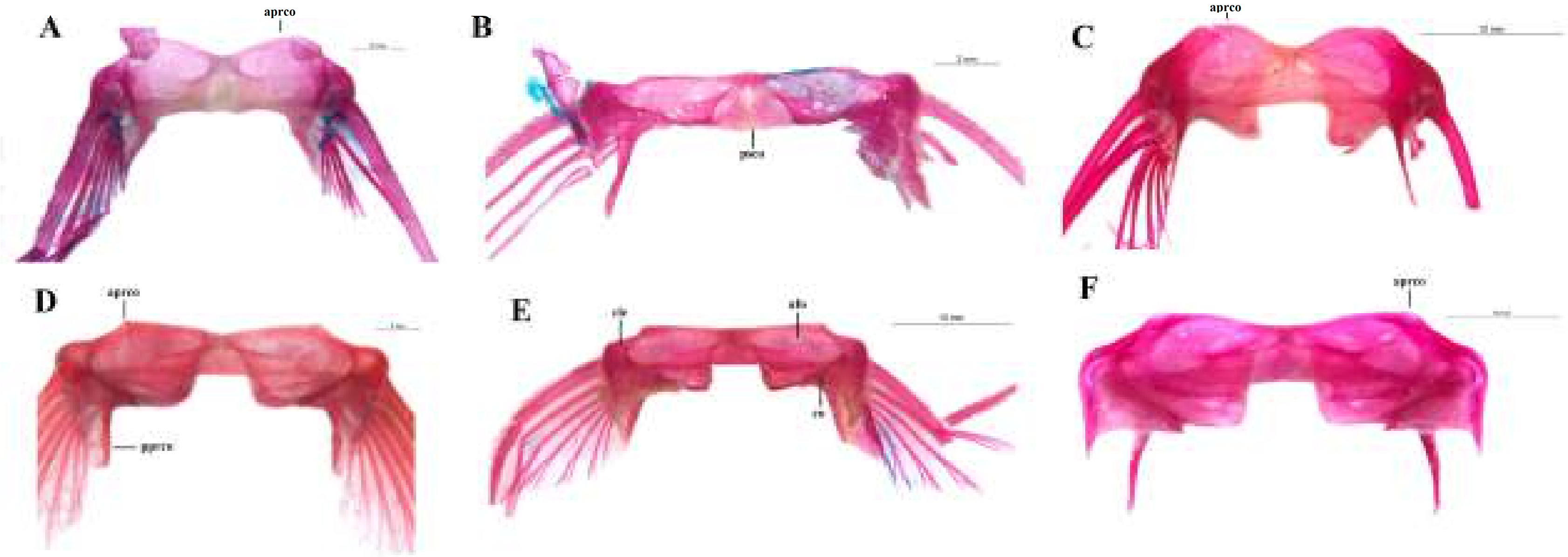

Fig. 15. Pectoral girdle in dorsal view: **A.** *Farlowella mariaelenae*, USNM 349392; **B.** *Harttiella longicauda*, MHNG 2723.042; **C.** *Sturisoma robustum*, MCP 15812; **D.** *Pterosturisoma microps*, MZUSP 79909; **E.** *Harttia gracilis*, MZUSP 99678; **F.** *Sturisomatichthys tamanae*, CAS 67414. Abbreviations: cle= cleithrum; co= coracoids; aprco =anterior process of coracoids; afo = arrector fossa; pprco = posterior process of coracoids; pss = posterior synchondral joint of coracoids.

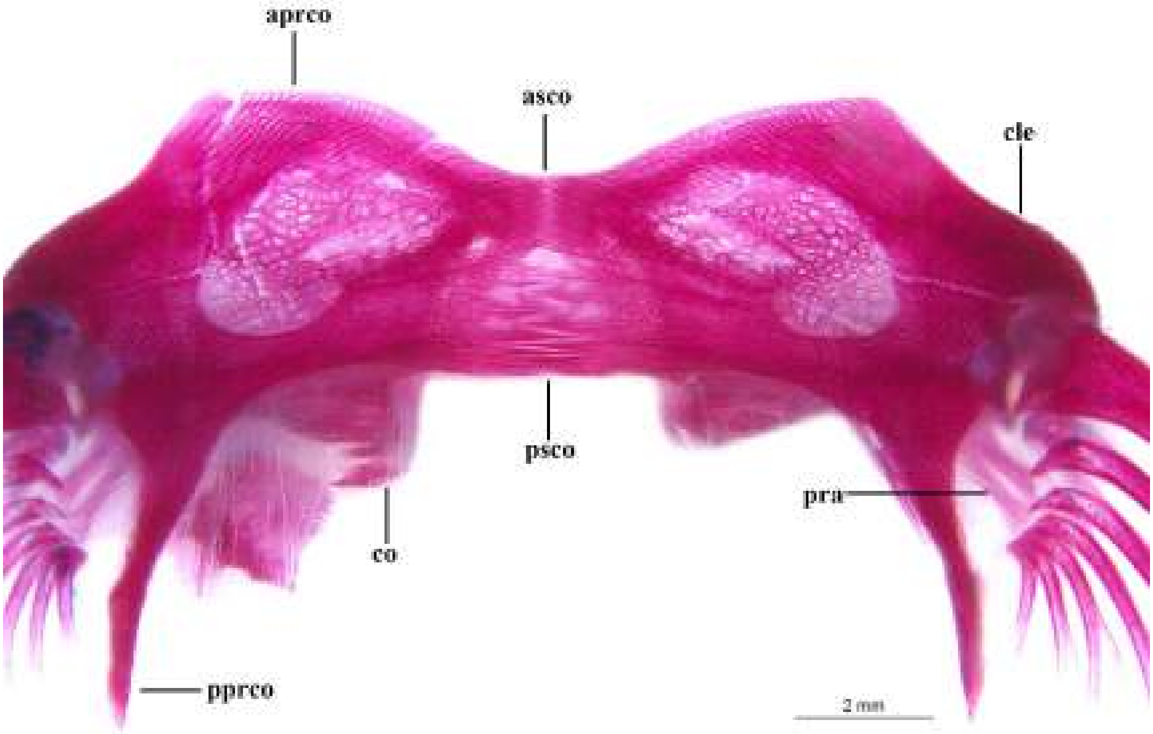

Fig. 16. Pectoral girdle in ventral view: *Sturisoma robustum*, MCP 15812. Abbreviations: asco= anterior synchondral joint of coracoids; cle= cleithrum; co = coracoids; aprco =anterior process of coracoids; pprco = posterior process of coracoids; pra= pectoral radials; psco = posterior synchondral joint of coracoids.

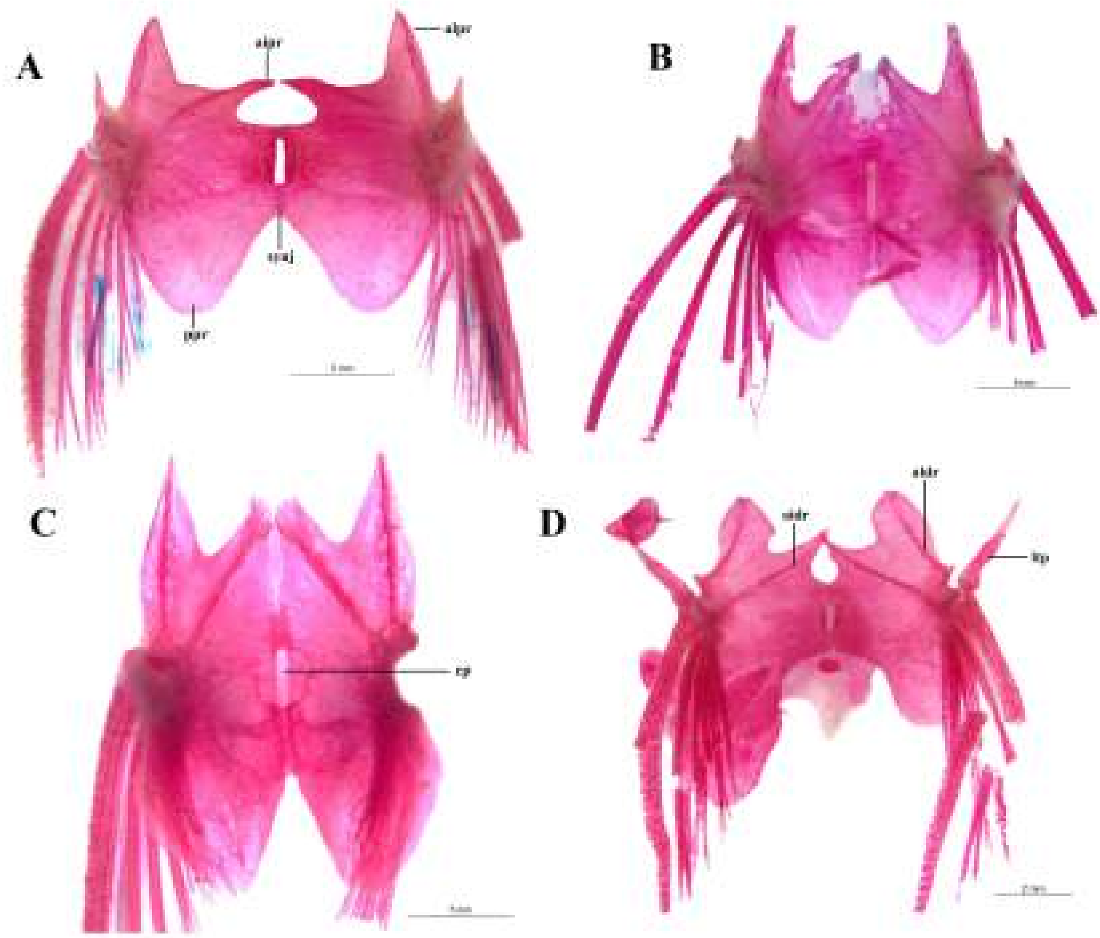

Fig. 17. Pelvic girdle in ventral view: **A.** *Harttia gracilis*, MZUSP 99678; **B.** *Sturisoma nigrirostrum*, ANSP 199936; **C.** *Sturisomatichthys* Baudó, NRM 15155; **D.** *Harttiella crassicauda*, AUM 50837. Abbreviations: aipr = anterior internal process of basipterygium; alpr= anterior alteral process of basipterygium; aidr = anterior internal dorsal ridge; aldr = anterior lateral dorsal ridge; cp= cartilague pluge; ltp= Lateropterygium; ppr= posterior process of basipterygium; synj= synchondral joint.

Appendix I

Common synapomorphies from 31 most parsimonious trees found. Character-state transformations listed according to nodes shown in consensus tree (Fig. 1, node numbers above branches). Characters 1-216 corresponds to morphology; characters 217-1465 corresponds to 12S; characters 1466-1539 corresponds to *tRNA* Val gene; characters 1540-2718 corresponds to 16S; characters 2719-3775 corresponds to Cytb; characters 3776-4412 corresponds to MyH6; characters 4413-5126 corresponds to RAG1; characters 5127-5905 corresponds to RAG2; and characters 5906-6839 corresponds to nd2. Character-states codification of molecular characters as follows: 0=A, 1=C, 2=G, 3=T.

Node 1: Loricariidae except Delturinae

No synapomorphies

Node 2: Hypoptopomatinae + Neoplecostominae

Char. 20: 0-->1
Char. 113: 0-->2
Char. 169: 0-->3
Char. 196: 0-->3
Char. 207: 0-->1
Char. 3862: 0-->3
Char. 3985: 0-->2
Char. 4108: 2-->0
Char. 4177: 1-->0
Char. 4192: 2-->0
Char. 4234: 3-->1
Char. 4252: 2-->0
Char. 4285: 3-->1
Char. 4547: 2-->3
Char. 4605: 2-->0
Char. 4654: 2-->0
Char. 4670: 2-->0
Char. 4676: 2-->0
Char. 4700: 2-->3
Char. 4847: 2-->0
Char. 4871: 1-->3
Char. 4931: 1-->3
Char. 4979: 3-->1
Char. 5120: 3-->1
Char. 5956: 0-->2
Char. 6110: 2-->1
Char. 6116: 0-->2
Char. 6298: 0-->3
Char. 6338: 1-->0
Char. 6361: 0-->1
Char. 6490: 3-->1
Char. 6544: 1-->0
Char. 6565: 0-->2
Char. 6603: 3-->1
Char. 6607: 1-->0
Char. 6709: 3-->0

Node 3: Hypoptopomatinae + Neoplecostominae except *Acestridium*

Char. 18: 0-->2
Char. 70: 0-->1
Char. 3901: 1-->3
Char. 3925: 3-->2
Char. 4060: 2-->3
Char. 4081: 3-->1
Char. 4324: 3-->1
Char. 4481: 3-->0
Char. 4598: 1-->0
Char. 4728: 2-->0
Char. 4754: 2-->0
Char. 4805: 1-->3
Char. 4886: 3-->1
Char. 4970: 1-->0
Char. 5030: 0-->2
Char. 5069: 1-->3
Char. 6184: 0-->1
Char. 6325: 0-->1
Char. 6337: 3-->1
Char. 6347: 2-->0
Char. 6479: 0-->2
Char. 6534: 2-->1
Char. 6584: 2-->0
Char. 6619: 0-->1
Char. 6622: 1-->0
Char. 6688: 0-->3

Node 4: Neoplecostominae

Char. 17: 0-->1
Char. 69: 0-->2
Char. 114: 0-->1
Char. 125: 0-->1
Char. 152: 1-->0
Char. 169: 3-->2
Char. 4544: 2-->0
Char. 4803: 3-->1

Char. 4934: 3-->1
Char. 6004: 1-->3
Char. 6019: 0-->1
Char. 6141: 1-->3
Char. 6151: 3-->1
Char. 6157: 1-->3
Char. 6304: 0-->1
Char. 6343: 0-->1
Char. 6361: 1-->3
Char. 6415: 1-->3
Char. 6470: 1-->3
Char. 6526: 0-->2
Char. 6560: 0-->2
Char. 6757: 1-->3
Char. 6835: 2-->0

Node 5: *Parotocinclus + Hisonotus*

Char. 3: 0-->1
Char. 37: 0-->1
Char. 67: 2-->1
Char. 89: 3-->1
Char. 154: 0-->1
Char. 2781: 3-->1
Char. 2841: 1-->3
Char. 2856: 1-->3
Char. 2857: 1-->3
Char. 2862: 0-->1
Char. 2904: 0-->3
Char. 2931: 1-->3
Char. 2952: 2-->0
Char. 2979: 1-->3
Char. 2993: 3-->1
Char. 3066: 1-->3
Char. 3084: 1-->0
Char. 3204: 0-->2
Char. 3246: 0-->1
Char. 3255: 1-->3
Char. 3271: 0-->2
Char. 3288: 1-->3
Char. 3291: 1-->3
Char. 3294: 1-->3
Char. 3349: 2-->3
Char. 3361: 0-->1
Char. 3381: 1-->0
Char. 3405: 3-->1
Char. 3407: 3-->1
Char. 3411: 0-->1
Char. 3450: 1-->3
Char. 3838: 3-->1
Char. 3904: 1-->3
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Char. 4063: 0-->2
Char. 4315: 1-->3
Char. 4363: 0-->2
Char. 4430: 2-->3
Char. 4472: 1-->3
Char. 4475: 1-->2
Char. 4505: 0-->2
Char. 4637: 1-->3
Char. 4653: 0-->1
Char. 4796: 1-->3
Char. 5013: 3-->1
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Char. 5066: 1-->3
Char. 5282: 3-->1
Char. 5290: 2-->1
Char. 5330: 0-->2
Char. 5501: 3-->1
Char. 5571: 3-->1
Char. 5740: 0-->2
Char. 5763: 2-->1
Char. 5833: 2-->3
Char. 5971: 3-->1
Char. 5986: 13-->2
Char. 5989: 0-->1
Char. 6037: 0-->2
Char. 6074: 1-->3
Char. 6133: 0-->1
Char. 6238: 1-->3
Char. 6254: 2-->3
Char. 6298: 3-->1
Char. 6310: 0-->2
Char. 6313: 3-->1
Char. 6382: 1-->0
Char. 6385: 0-->2
Char. 6437: 0-->2
Char. 6439: 3-->0
Char. 6496: 0-->2
Char. 6583: 3-->1
Char. 6616: 0-->2
Char. 6664: 0-->3
Char. 6721: 1-->0
Char. 6739: 1-->3
Char. 6823: 2-->1

Node 6: Hypostominae + Loricariinae

Char. 8: 0-->1
Char. 10: 0-->1
Char. 17: 0-->1
Char. 19: 0-->1
Char. 21: 0-->123
Char. 37: 0-->1
Char. 41: 0-->1
Char. 44: 0-->4
Char. 48: 0-->2
Char. 55: 0-->2
Char. 59: 0-->1
Char. 73: 0-->1
Char. 83: 0-->1
Char. 96: 0-->2
Char. 102: 0-->1
Char. 131: 0-->1
Char. 146: 0-->1
Char. 147: 0-->2
Char. 160: 0-->1
Char. 178: 0-->1
Char. 2746: 2-->0
Char. 2757: 3-->1
Char. 3058: 2-->0
Char. 3108: 0-->1
Char. 3114: 0-->1
Char. 3291: 1-->0
Char. 3361: 0-->3
Char. 3408: 1-->3
Char. 3648: 2-->0
Char. 4312: 0-->2
Char. 4598: 1-->3
Char. 4691: 0-->2
Char. 4948: 0-->2
Char. 6337: 3-->0
Char. 6343: 0-->1
Char. 6353: 2-->0
Char. 6469: 1-->3
Char. 6577: 0-->3

Node 7: Hypostominae

Char. 14: 0-->1
Char. 16: 0-->1
Char. 35: 0-->2
Char. 70: 0-->1
Char. 104: 0-->1
Char. 113: 0-->1
Char. 115: 0-->1
Char. 119: 0-->2
Char. 136: 0-->2
Char. 197: 0-->4
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Char. 207: 0-->2
Char. 3946: 3-->1
Char. 4225: 0-->1
Char. 4324: 3-->1
Char. 4886: 3-->1
Char. 4934: 3-->1
Char. 5120: 3-->0
Char. 5125: 1-->3
Char. 5639: 3-->1
Char. 5682: 1-->2
Char. 5702: 2-->0
Char. 5751: 2-->0

Node 8: *Chaetostoma breve + Ancistrus brevipinnis*

Char. 44: 4-->2
Char. 67: 2-->0
Char. 68: 1-->0
Char. 79: 0-->1
Char. 109: 1-->2
Char. 135: 0-->2
Char. 140: 0-->1
Char. 169: 0-->1
Char. 172: 3-->4
Char. 181: 0-->1
Char. 4653: 0-->3
Char. 5690: 2-->0

Node 9: Loricariinae

Char. 18: 0-->3
Char. 28: 0-->1
Char. 46: 0-->2
Char. 51: 0-->1
Char. 94: 0-->3
Char. 127: 0-->1
Char. 129: 0-->1
Char. 140: 0-->3
Char. 142: 0-->2
Char. 143: 0-->1
Char. 148: 0-->1
Char. 153: 0-->2
Char. 173: 0-->1
Char. 181: 0-->2
Char. 183: 0-->1
Char. 209: 0-->1
Char. 211: 0-->1
Char. 214: 0-->3
Char. 2745: 1-->3
Char. 2790: 1-->0
Char. 2850: 0-->1
Char. 2952: 2-->1
Char. 3000: 1-->3
Char. 3084: 1-->0
Char. 3213: 3-->0
Char. 3399: 2-->1
Char. 3423: 0-->1
Char. 3501: 1-->3
Char. 3633: 0-->1
Char. 3669: 3-->1
Char. 3708: 1-->3
Char. 3735: 3-->0
Char. 4436: 3-->1
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Char. 4898: 3-->1
Char. 4964: 2-->0
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Char. 5030: 0-->2
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Char. 5249: 1-->3
Char. 5259: 1-->3
Char. 5267: 2-->0
Char. 5312: 2-->0
Char. 5318: 1-->3
Char. 5330: 0-->3
Char. 5354: 1-->3
Char. 5357: 3-->1
Char. 5360: 3-->0
Char. 5366: 2-->0
Char. 5384: 0-->1
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Char. 5698: 1-->2
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Char. 5816: 0-->3
Char. 5818: 1-->2
Char. 5820: 3-->1
Char. 5843: 2-->0
Char. 5849: 0-->3
Char. 5950: 1-->0
Char. 5989: 0-->1
Char. 6094: 1-->3
Char. 6235: 1-->3
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Char. 6313: 3-->1
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Char. 6506: 2-->0
Char. 6525: 3-->0
Char. 6529: 1-->0
Char. 6531: 3-->1
Char. 6564: 2-->1
Char. 6568: 1-->0
Char. 6580: 3-->0
Char. 6581: 0-->1
Char. 6589: 0-->1
Char. 6631: 0-->1
Char. 6811: 1-->0
Char. 6823: 0-->1

Node 10: *Metaloricaria*

Char. 2: 0-->1
Char. 7: 0-->3
Char. 8: 1-->2
Char. 14: 0-->2
Char. 22: 0-->1
Char. 32: 0-->1
Char. 36: 0-->2
Char. 48: 2-->1
Char. 50: 0-->1
Char. 52: 0-->2
Char. 54: 0-->1
Char. 56: 0-->2
Char. 57: 0-->3
Char. 59: 1-->2
Char. 63: 0-->1
Char. 64: 0-->1
Char. 65: 1-->0
Char. 72: 0-->4
Char. 74: 0-->1
Char. 88: 0-->1
Char. 110: 0-->1
Char. 115: 0-->3
Char. 116: 1-->2
Char. 120: 1-->0
Char. 125: 0-->2
Char. 133: 0-->1
Char. 157: 0-->2
Char. 162: 0-->1
Char. 164: 0-->3
Char. 177: 0-->1
Char. 180: 0-->1
Char. 188: 0-->2
Char. 190: 0-->1
Char. 193: 0-->1
Char. 199: 0-->2
Char. 254: 3-->1
Char. 277: 1-->3
Char. 296: 0-->2
Char. 904: 0-->1
Char. 934: 1-->3
Char. 986: 2-->0
Char. 1003: 1-->3
Char. 1030: 1-->3
Char. 1142: 0-->1
Char. 1390: 1-->3
Char. 1407: 0-->3
Char. 1414: 1-->3
Char. 1421: 0-->1
Char. 1582: 2-->0
Char. 1738: 1-->0
Char. 1832: 3-->1
Char. 1997: 0-->2
Char. 2076: 3-->1
Char. 2085: 3-->1
Char. 2374: 3-->1
Char. 2375: 1-->3
Char. 2379: 3-->1
Char. 2416: 0-->1
Char. 2418: 0-->3
Char. 2459: 0-->2
Char. 2583: 3-->1
Char. 2610: 1-->0
Char. 2632: 3-->1
Char. 2772: 1-->3
Char. 2792: 1-->3
Char. 2857: 1-->3
Char. 2883: 1-->3
Char. 2913: 1-->3
Char. 2994: 0-->2
Char. 3048: 1-->3
Char. 3072: 0-->1
Char. 3159: 0-->3
Char. 3190: 1-->0
Char. 3274: 0-->2
Char. 3288: 1-->3
Char. 3418: 1-->3
Char. 3546: 1-->3
Char. 3586: 1-->3
Char. 3607: 1-->3
Char. 3627: 0-->1
Char. 3711: 0-->3
Char. 3739: 1-->2
Char. 3759: 0-->1
Char. 5132: 1-->2
Char. 5135: 2-->0
Char. 5137: 2-->0
Char. 5372: 2-->0
Char. 5537: 0-->1
Char. 5752: 1-->3
Char. 5763: 2-->0
Char. 5918: 1-->3
Char. 5926: 3-->1
Char. 6010: 1-->3
Char. 6070: 1-->3
Char. 6284: 1-->3
Char. 6451: 3-->1
Char. 6454: 0-->2
Char. 6601: 0-->3
Char. 6602: 0-->2
Char. 6628: 0-->3
Char. 6691: 1-->0
Char. 6757: 1-->3
Char. 6784: 1-->3

Node 11: Harttiini + Loricariini + Farlowellini

Char. 6: 0-->1
Char. 33: 0-->1
Char. 37: 1-->2
Char. 49: 0-->1
Char. 60: 0-->1
Char. 69: 0-->2
Char. 79: 0-->1
Char. 87: 2-->1
Char. 100: 0-->1
Char. 103: 0-->2
Char. 113: 0-->4
Char. 122: 0-->2
Char. 126: 0-->2
Char. 136: 0-->1
Char. 137: 0-->3
Char. 147: 2-->1
Char. 163: 0-->2
Char. 178: 1-->2
Char. 250: 3-->1
Char. 280: 1-->3
Char. 440: 0-->2
Char. 978: 1-->3
Char. 1098: 3-->1
Char. 1126: 1-->3
Char. 1138: 1-->0
Char. 1262: 0-->2
Char. 1263: 3-->1
Char. 1291: 3-->1
Char. 1326: 0-->3
Char. 1512: 1-->3
Char. 1839: 3-->1
Char. 1935: 3-->1
Char. 2562: 1-->3
Char. 2766: 3-->1
Char. 2814: 0-->1
Char. 2946: 0-->1

Char. 3024: 1-->0
Char. 3051: 3-->1
Char. 3276: 3-->1
Char. 3425: 1-->3
Char. 3564: 3-->1
Char. 3666: 3-->1
Char. 3747: 1-->3
Char. 4670: 2-->0
Char. 4999: 3-->1
Char. 6470: 1-->3
Char. 6607: 1-->3
Char. 6610: 0-->1

Node 12: *Cteniloricaria* + *Harttia*

Char. 10: 1-->0
Char. 17: 1-->0
Char. 55: 2-->1
Char. 93: 0-->1
Char. 94: 3-->2
Char. 166: 0-->1
Char. 200: 2-->1
Char. 340: 1-->0
Char. 702: 3-->0
Char. 803: 1-->3
Char. 966: 1-->3
Char. 968: 1-->3
Char. 1134: 1-->3
Char. 1193: 1-->3
Char. 1299: 0-->3
Char. 1313: 1-->3
Char. 1475: 1-->0
Char. 1826: 0-->1
Char. 1894: 1-->0
Char. 1988: 3-->1
Char. 2119: 1-->3
Char. 2385: 0-->2
Char. 2399: 1-->3
Char. 2419: 0-->1
Char. 2420: 0-->3
Char. 2480: 1-->0
Char. 2727: 1-->3
Char. 2751: 1-->3
Char. 2829: 3-->0
Char. 2988: 1-->3
Char. 2994: 0-->1
Char. 3012: 1-->3
Char. 3090: 1-->3
Char. 3108: 1-->3
Char. 3216: 0-->3
Char. 3278: 1-->2
Char. 3576: 0-->2
Char. 3685: 0-->2
Char. 3705: 0-->3
Char. 3992: 3-->2
Char. 4123: 1-->3
Char. 4312: 2-->1
Char. 4445: 0-->1
Char. 6097: 0-->1
Char. 6367: 0-->3
Char. 6754: 3-->1
Char. 6828: 1-->3

Node 13: *Ctenilоricaria*

Char. 437: 3-->1
Char. 584: 2-->0
Char. 647: 0-->2
Char. 719: 0-->3
Char. 770: 1-->3
Char. 877: 1-->0
Char. 975: 3-->1
Char. 1099: 3-->1
Char. 1203: 2-->0
Char. 1213: 3-->1
Char. 1216: 3-->1
Char. 1261: 1-->3
Char. 1297: 3-->1
Char. 1302: 1-->0
Char. 1341: 3-->0
Char. 1357: 1-->3
Char. 1371: 3-->1
Char. 1375: 3-->1
Char. 1414: 1-->3
Char. 1446: 1-->3
Char. 1629: 2-->0
Char. 1729: 1-->3
Char. 1730: 1-->0
Char. 1745: 1-->3
Char. 1889: 1-->3
Char. 1902: 3-->1
Char. 1918: 3-->0
Char. 1924: 3-->1
Char. 2097: 1-->3
Char. 2251: 3-->1
Char. 2479: 1-->3
Char. 2485: 0-->3
Char. 2513: 1-->0
Char. 2547: 0-->3
Char. 2570: 0-->3
Char. 2573: 1-->3
Char. 2583: 3-->1
Char. 2739: 3-->0
Char. 2746: 0-->2
Char. 2791: 2-->0
Char. 2820: 0-->1
Char. 2992: 1-->3
Char. 3114: 1-->0
Char. 3219: 1-->3
Char. 3243: 1-->3
Char. 3303: 1-->3
Char. 3306: 1-->3
Char. 3345: 0-->1
Char. 3363: 0-->2
Char. 3402: 1-->3
Char. 3429: 1-->3
Char. 3454: 1-->3
Char. 3477: 1-->3
Char. 3525: 1-->3
Char. 3534: 3-->1
Char. 3588: 0-->2
Char. 3615: 0-->3
Char. 3708: 3-->1
Char. 3781: 0-->2
Char. 3826: 3-->1
Char. 3886: 3-->1
Char. 3910: 1-->3
Char. 3913: 3-->1
Char. 3976: 0-->2
Char. 3985: 0-->2
Char. 4030: 3-->1
Char. 4051: 0-->2
Char. 4063: 0-->2
Char. 4108: 2-->0
Char. 4150: 0-->1
Char. 4189: 2-->3
Char. 4222: 0-->3
Char. 4225: 0-->1
Char. 4237: 3-->1
Char. 4324: 3-->2
Char. 4342: 1-->3

Char. 4354: 3-->1
Char. 4366: 0-->2
Char. 4778: 0-->2
Char. 4865: 3-->0
Char. 5000: 2-->3
Char. 5078: 3-->1
Char. 6040: 3-->1
Char. 6073: 1-->3
Char. 6220: 1-->0
Char. 6403: 1-->3
Char. 6508: 0-->1
Char. 6684: 0-->2

Node 14: *Harttia*

Char. 41: 1-->0
Char. 45: 0-->1
Char. 53: 1-->0
Char. 124: 0-->1
Char. 140: 3-->2
Char. 146: 1-->0
Char. 181: 2-->1
Char. 187: 1-->2
Char. 195: 1-->0
Char. 196: 0-->2
Char. 210: 0-->1
Char. 349: 0-->1
Char. 371: 3-->1
Char. 1033: 0-->2
Char. 1034: 3-->1
Char. 1140: 1-->3
Char. 1909: 1-->3
Char. 2818: 1-->3
Char. 3021: 1-->0
Char. 3105: 1-->0
Char. 3171: 1-->3
Char. 3180: 1-->3
Char. 3381: 1-->3
Char. 3412: 1-->3
Char. 3423: 1-->3
Char. 3624: 0-->3
Char. 3688: 1-->3
Char. 3862: 0-->2
Char. 3940: 3-->1
Char. 4048: 2-->0
Char. 4255: 2-->0
Char. 4300: 3-->2
Char. 5926: 3-->1
Char. 5980: 1-->3
Char. 6004: 1-->0
Char. 6019: 0-->1
Char. 6109: 0-->3
Char. 6118: 1-->3
Char. 6154: 0-->3
Char. 6214: 0-->1
Char. 6382: 1-->3
Char. 6479: 0-->2
Char. 6512: 1-->3
Char. 6766: 1-->3
Char. 6791: 0-->3

Node 15: Guianas-Suriname *Harttia*

Char. 58: 1-->0
Char. 132: 0-->1
Char. 198: 1-->0
Char. 307: 0-->2
Char. 413: 1-->0
Char. 439: 2-->0
Char. 440: 2-->0
Char. 565: 1-->3
Char. 585: 2-->0
Char. 1121: 1-->3
Char. 1130: 3-->0
Char. 1138: 0-->3
Char. 1139: 1-->3
Char. 1196: 1-->3
Char. 1323: 3-->1
Char. 1339: 1-->3
Char. 1343: 0-->2
Char. 1430: 2-->0
Char. 1474: 0-->2
Char. 1525: 1-->0
Char. 1668: 0-->2
Char. 1680: 0-->3
Char. 1681: 0-->3
Char. 1694: 1-->3
Char. 1700: 1-->3
Char. 1730: 1-->3
Char. 1737: 1-->0
Char. 1738: 1-->3
Char. 1748: 2-->0
Char. 1802: 1-->3
Char. 1827: 1-->3
Char. 1839: 1-->3
Char. 1941: 3-->1
Char. 1997: 0-->2
Char. 2065: 1-->3
Char. 2085: 3-->1
Char. 2113: 0-->2
Char. 2191: 1-->3
Char. 2238: 1-->3
Char. 2376: 1-->3
Char. 2454: 0-->2
Char. 2463: 1-->3
Char. 2472: 3-->1
Char. 2475: 0-->2
Char. 2508: 2-->0
Char. 2516: 3-->1
Char. 2572: 0-->1
Char. 2590: 2-->0
Char. 2610: 1-->3
Char. 2632: 3-->1
Char. 2784: 1-->3
Char. 2826: 1-->3
Char. 2857: 1-->3
Char. 2868: 1-->3
Char. 2877: 1-->3
Char. 2895: 1-->3
Char. 2958: 1-->3
Char. 2967: 1-->3
Char. 2985: 1-->3
Char. 3054: 1-->3
Char. 3060: 1-->3
Char. 3165: 1-->2
Char. 3183: 1-->3
Char. 3240: 1-->3
Char. 3264: 0-->1
Char. 3288: 1-->3
Char. 3294: 1-->3
Char. 3360: 1-->3
Char. 3366: 1-->3
Char. 3378: 1-->3
Char. 3390: 1-->3
Char. 3416: 1-->3
Char. 3418: 1-->3
Char. 3435: 1-->3
Char. 3436: 1-->3
Char. 3489: 0-->1

Char. 3495: 1-->3
Char. 3561: 0-->1
Char. 3657: 1-->3
Char. 3681: 1-->3
Char. 3704: 3-->1
Char. 3759: 0-->1
Char. 4595: 1-->3
Char. 4754: 2-->0
Char. 4790: 0-->2
Char. 4970: 1-->3
Char. 5153: 2-->0
Char. 5423: 1-->3
Char. 5510: 1-->3
Char. 5698: 2-->0
Char. 5702: 2-->1

Node 16:

Char. 254: 3-->1
Char. 340: 0-->2
Char. 348: 0-->3
Char. 382: 1-->3
Char. 391: 1-->3
Char. 512: 2-->0
Char. 555: 0-->1
Char. 566: 1-->0
Char. 569: 1-->3
Char. 589: 2-->3
Char. 702: 0-->2
Char. 705: 1-->3
Char. 719: 0-->2
Char. 723: 2-->0
Char. 848: 2-->0
Char. 904: 0-->2
Char. 1099: 3-->1
Char. 1202: 1-->3
Char. 1262: 2-->0
Char. 1277: 2-->0
Char. 1300: 1-->3
Char. 1303: 1-->3
Char. 1390: 1-->3
Char. 1488: 3-->1
Char. 1745: 1-->3
Char. 1789: 2-->0
Char. 1892: 0-->1
Char. 1966: 2-->0
Char. 2076: 3-->1
Char. 2137: 1-->3
Char. 2150: 0-->2
Char. 2233: 0-->1
Char. 2275: 0-->3
Char. 2766: 1-->3
Char. 2819: 3-->1
Char. 2831: 3-->1
Char. 2938: 0-->2
Char. 2952: 1-->3
Char. 3000: 3-->1
Char. 3021: 0-->2
Char. 3182: 0-->2
Char. 3214: 2-->0
Char. 3327: 1-->3
Char. 3331: 0-->2
Char. 3337: 1-->3
Char. 3345: 0-->2
Char. 3405: 3-->1
Char. 3426: 1-->3
Char. 3441: 1-->3
Char. 3453: 3-->1
Char. 3564: 1-->3
Char. 3576: 2-->0
Char. 3607: 1-->3
Char. 3612: 0-->2
Char. 3613: 2-->0
Char. 3624: 3-->1
Char. 3675: 1-->3
Char. 3686: 1-->3
Char. 3693: 0-->2
Char. 3705: 3-->1
Char. 3729: 0-->2
Char. 5173: 2-->0
Char. 5273: 1-->2
Char. 5421: 3-->2
Char. 5787: 1-->3

Node 17:

Char. 229: 2-->0
Char. 315: 2-->0
Char. 329: 1-->3
Char. 381: 1-->3
Char. 404: 0-->2
Char. 495: 3-->0
Char. 502: 3-->1
Char. 561: 3-->1
Char. 709: 0-->2
Char. 839: 1-->3
Char. 879: 0-->3
Char. 1042: 1-->3
Char. 1101: 0-->2
Char. 1184: 1-->3
Char. 1192: 0-->2
Char. 1255: 3-->1
Char. 1288: 1-->3
Char. 1314: 0-->3
Char. 1458: 0-->2
Char. 1552: 2-->0
Char. 1795: 0-->2
Char. 1796: 1-->3
Char. 1922: 1-->3
Char. 2070: 0-->2
Char. 2071: 2-->0
Char. 2072: 0-->2
Char. 2331: 2-->0
Char. 2514: 3-->1
Char. 2515: 0-->2
Char. 2556: 3-->1
Char. 2626: 3-->1
Char. 2637: 0-->2

Node 18: *Harttia* except Guianas-Suriname clade

Char. 20: 0-->1
Char. 29: 1-->0
Char. 66: 2-->1
Char. 186: 0-->1
Char. 529: 2-->0
Char. 536: 0-->3
Char. 561: 3-->1
Char. 593: 1-->3
Char. 641: 1-->3
Char. 680: 2-->0
Char. 683: 1-->3
Char. 698: 0-->3

Char. 1115: 3-->0
Char. 1201: 0-->13
Char. 1359: 1-->3
Char. 1693: 2-->0
Char. 1702: 0-->2
Char. 1720: 3-->0
Char. 1935: 1-->3
Char. 2107: 0-->1
Char. 2108: 3-->1
Char. 2166: 2-->0
Char. 2377: 1-->3
Char. 2421: 0-->3
Char. 2607: 2-->0
Char. 2613: 1-->3
Char. 2940: 1-->3
Char. 2943: 1-->3
Char. 2946: 1-->3
Char. 2979: 1-->3
Char. 2982: 1-->3
Char. 3138: 1-->3
Char. 3182: 0-->1
Char. 3216: 3-->1
Char. 3291: 0-->3
Char. 3332: 3-->1
Char. 3333: 1-->3
Char. 3369: 1-->3
Char. 3424: 0-->2
Char. 3425: 3-->1
Char. 3474: 3-->1
Char. 3501: 3-->0
Char. 3543: 1-->0
Char. 3627: 0-->1
Char. 3709: 1-->3
Char. 3747: 3-->1
Char. 4712: 1-->3
Char. 5971: 3-->1
Char. 6140: 2-->0
Char. 6310: 0-->1
Char. 6367: 3-->1
Char. 6602: 0-->2
Char. 6703: 3-->1

Node 19:

Char. 7: 0-->1
Char. 8: 1-->2
Char. 14: 0-->1
Char. 24: 1-->0
Char. 38: 1-->2
Char. 65: 2-->1
Char. 70: 0-->1
Char. 79: 1-->0
Char. 80: 0-->1
Char. 129: 1-->0
Char. 214: 3-->4
Char. 216: 0-->1

Node 20:

Char. 38: 1-->2
Char. 55: 1-->0
Char. 65: 2-->1
Char. 93: 1-->0
Char. 99: 0-->2
Char. 108: 1-->0
Char. 117: 0-->1
Char. 132: 0-->1
Char. 144: 0-->1
Char. 176: 0-->1
Char. 191: 0-->3
Char. 197: 0-->2
Char. 198: 1-->0
Char. 529: 0-->2
Char. 561: 1-->3
Char. 593: 3-->1
Char. 683: 3-->1
Char. 698: 3-->0
Char. 1115: 0-->3
Char. 1132: 1-->3
Char. 1201: 13-->2
Char. 1277: 2-->0
Char. 1357: 1-->3
Char. 1390: 1-->3
Char. 1414: 1-->3
Char. 1446: 1-->3
Char. 1566: 0-->2
Char. 1720: 0-->1
Char. 1725: 2-->0
Char. 1749: 1-->3
Char. 1839: 1-->3
Char. 1924: 3-->1
Char. 1997: 0-->2
Char. 2146: 3-->0
Char. 2169: 0-->2
Char. 2472: 3-->1
Char. 2610: 1-->3
Char. 2620: 1-->3
Char. 2841: 1-->3
Char. 3024: 0-->1
Char. 3064: 3-->1
Char. 3182: 1-->0
Char. 3309: 1-->3
Char. 3332: 1-->3
Char. 3408: 3-->1
Char. 3412: 3-->1
Char. 3495: 1-->3
Char. 3504: 0-->3
Char. 3546: 1-->3
Char. 3624: 3-->0
Char. 3688: 3-->1
Char. 3726: 0-->1
Char. 3759: 0-->1
Char. 3765: 1-->3
Char. 3871: 3-->1
Char. 4445: 1-->3
Char. 4646: 2-->0
Char. 4655: 3-->1
Char. 4817: 3-->1
Char. 5066: 1-->0
Char. 5318: 3-->1
Char. 5435: 1-->3
Char. 5522: 1-->3
Char. 5574: 2-->3
Char. 5586: 0-->1
Char. 5960: 1-->3
Char. 5986: 1-->3
Char. 6031: 3-->1
Char. 6073: 1-->3
Char. 6109: 3-->1
Char. 6145: 1-->3
Char. 6382: 3-->1
Char. 6398: 1-->0
Char. 6439: 3-->1
Char. 6468: 3-->1
Char. 6484: 1-->3
Char. 6577: 3-->1
Char. 6592: 1-->3
Char. 6613: 1-->3
Char. 6742: 3-->1

Char. 6793: 3-->1

Node 21:

Char. 34: 2-->1
Char. 58: 1-->0
Char. 126: 2-->0
Char. 130: 0-->3
Char. 145: 0-->1
Char. 155: 1-->2
Char. 181: 1-->2
Char. 186: 1-->0
Char. 326: 1-->3
Char. 978: 3-->1
Char. 1126: 3-->1
Char. 1200: 2-->0
Char. 1254: 0-->2
Char. 1475: 0-->1
Char. 1902: 3-->1
Char. 1935: 3-->1
Char. 2091: 3-->0
Char. 2119: 3-->1
Char. 2137: 1-->3
Char. 2460: 0-->2
Char. 2485: 0-->3
Char. 4481: 3-->2
Char. 4668: 1-->2
Char. 4952: 1-->3
Char. 5920: 0-->1
Char. 5980: 3-->1
Char. 5983: 1-->3
Char. 5996: 2-->0
Char. 6029: 0-->2
Char. 6043: 3-->1
Char. 6091: 3-->1
Char. 6349: 1-->3
Char. 6355: 3-->1
Char. 6467: 0-->2
Char. 6475: 1-->3
Char. 6478: 2-->0
Char. 6607: 3-->1

Node 22:

Char. 29: 0-->1
Char. 69: 2-->1
Char. 109: 1-->2
Char. 349: 1-->0
Char. 439: 2-->0
Char. 943: 2-->0
Char. 968: 3-->1
Char. 1096: 3-->0
Char. 1319: 1-->0
Char. 1442: 3-->1
Char. 1619: 3-->1
Char. 1702: 2-->0
Char. 2142: 2-->0
Char. 2421: 3-->0
Char. 4574: 1-->3
Char. 4667: 1-->0
Char. 5971: 1-->3
Char. 6076: 1-->3
Char. 6121: 3-->1
Char. 6148: 3-->1
Char. 6343: 1-->3
Char. 6418: 1-->3
Char. 6470: 3-->1
Char. 6512: 3-->1

Node 23:

Char. 83: 1-->0
Char. 117: 1-->0
Char. 129: 1-->0
Char. 157: 0-->1

Node 24:

Char. 23: 0-->1
Char. 70: 0-->1
Char. 144: 1-->0
Char. 197: 2-->0
Char. 440: 2-->0
Char. 538: 3-->1
Char. 1446: 3-->1
Char. 2064: 1-->3
Char. 2769: 1-->0
Char. 2778: 0-->1
Char. 2818: 3-->1
Char. 2982: 3-->1
Char. 3018: 1-->3
Char. 3333: 3-->1
Char. 3453: 3-->1
Char. 3483: 3-->1
Char. 3504: 3-->1
Char. 3600: 1-->3
Char. 3681: 1-->3
Char. 3703: 2-->0
Char. 3750: 3-->1
Char. 3772: 0-->1
Char. 5960: 3-->1
Char. 5990: 1-->3
Char. 6142: 1-->3
Char. 6211: 1-->3
Char. 6310: 1-->0
Char. 6328: 1-->3
Char. 6469: 3-->1
Char. 6628: 0-->12
Char. 6643: 1-->3

Node 25:

Char. 7: 0-->1
Char. 16: 0-->1
Char. 30: 2-->1
Char. 208: 1-->0

Char. 624: 0-->2
Char. 683: 1-->3
Char. 769: 0-->1
Char. 968: 1-->3
Char. 1139: 1-->3
Char. 1579: 3-->1
Char. 1614: 0-->1
Char. 1636: 2-->0
Char. 1695: 0-->1
Char. 2082: 2-->0
Char. 2142: 0-->2
Char. 2150: 0-->2
Char. 2396: 1-->3
Char. 2414: 0-->2
Char. 2711: 2-->0
Char. 2751: 3-->1
Char. 2874: 1-->3
Char. 3214: 2-->0
Char. 3399: 1-->0
Char. 3507: 1-->3
Char. 3516: 0-->1
Char. 3546: 3-->1
Char. 4425: 2-->0
Char. 4481: 2-->0
Char. 4668: 2-->0
Char. 4692: 3-->0
Char. 4728: 2-->0
Char. 4730: 2-->0
Char. 4796: 1-->3
Char. 6121: 1-->3
Char. 6217: 1-->3
Char. 6343: 3-->1
Char. 6361: 3-->1
Char. 6640: 1-->3
Char. 6739: 1-->3
Char. 6742: 1-->3
Char. 6745: 0-->1

Node 26:

Char. 8: 1-->2
Char. 34: 1-->2
Char. 66: 1-->2
Char. 109: 2-->1
Char. 117: 1-->0
Char. 126: 0-->2
Char. 140: 2-->3
Char. 180: 0-->1
Char. 183: 1-->0
Char. 210: 1-->0
Char. 317: 0-->2
Char. 349: 0-->1
Char. 437: 3-->1
Char. 506: 3-->1
Char. 549: 1-->3
Char. 559: 1-->3
Char. 625: 1-->3
Char. 848: 2-->0
Char. 877: 1-->3
Char. 879: 0-->1
Char. 904: 0-->2
Char. 932: 1-->0
Char. 1103: 1-->3
Char. 1255: 3-->1
Char. 1300: 2-->0
Char. 1314: 0-->3
Char. 1329: 3-->1
Char. 1380: 2-->0
Char. 1414: 3-->1
Char. 1629: 2-->0
Char. 1702: 0-->2
Char. 1747: 1-->3
Char. 1789: 2-->0
Char. 1790: 0-->2
Char. 1825: 0-->2
Char. 1827: 1-->3
Char. 1853: 0-->2
Char. 1909: 3-->1
Char. 1970: 3-->1
Char. 1996: 2-->0
Char. 2014: 0-->1
Char. 2050: 1-->0
Char. 2065: 1-->3
Char. 2076: 3-->1
Char. 2106: 1-->2
Char. 2118: 1-->3
Char. 2166: 0-->2
Char. 2169: 2-->0
Char. 2371: 1-->3
Char. 2377: 3-->1
Char. 2379: 3-->1
Char. 2419: 1-->0
Char. 2460: 2-->0
Char. 2503: 2-->0
Char. 2544: 0-->2
Char. 2545: 3-->0
Char. 2549: 2-->1
Char. 2562: 3-->1
Char. 2635: 3-->1
Char. 2736: 0-->2
Char. 2748: 1-->3
Char. 2773: 2-->0
Char. 2820: 0-->3
Char. 2958: 1-->3
Char. 3093: 3-->1
Char. 3096: 1-->0
Char. 3129: 0-->2
Char. 3141: 1-->0
Char. 3153: 0-->1
Char. 3163: 2-->0
Char. 3165: 1-->3
Char. 3181: 0-->2
Char. 3259: 1-->3
Char. 3294: 1-->3
Char. 3349: 2-->0
Char. 3375: 3-->1
Char. 3447: 0-->3
Char. 3556: 0-->2
Char. 3580: 3-->1
Char. 3594: 1-->3
Char. 3621: 0-->1
Char. 3641: 0-->2
Char. 3660: 2-->1
Char. 3664: 0-->3
Char. 3666: 1-->3
Char. 3688: 1-->3
Char. 3759: 1-->3
Char. 4799: 1-->3
Char. 4830: 1-->2
Char. 4886: 3-->0
Char. 5073: 0-->2
Char. 5819: 1-->3
Char. 5971: 3-->1
Char. 6034: 1-->3
Char. 6043: 1-->3
Char. 6065: 2-->0
Char. 6133: 0-->2
Char. 6149: 0-->1
Char. 6235: 3-->0
Char. 6295: 0-->2
Char. 6307: 1-->3
Char. 6451: 3-->1
Char. 6467: 2-->0
Char. 6613: 3-->1

Node 27: *Harttiella* + Loricariini

Char. 59: 1-->2
Char. 69: 2-->1
Char. 127: 1-->0
Char. 129: 1-->0
Char. 132: 0-->1
Char. 254: 3-->1
Char. 347: 1-->0
Char. 644: 2-->0
Char. 677: 1-->3
Char. 1196: 1-->3
Char. 1313: 1-->0
Char. 1430: 2-->0
Char. 1460: 1-->3
Char. 1636: 2-->0
Char. 1729: 1-->0
Char. 2014: 0-->2
Char. 2085: 3-->1
Char. 2166: 2-->0
Char. 2491: 3-->1
Char. 2573: 1-->0
Char. 2736: 0-->3
Char. 2823: 0-->2
Char. 2835: 0-->3
Char. 2928: 1-->3
Char. 2949: 1-->3
Char. 2994: 0-->3
Char. 3006: 0-->2
Char. 3009: 1-->3
Char. 3021: 1-->3
Char. 3039: 0-->2
Char. 3081: 0-->2
Char. 3084: 0-->2
Char. 3103: 1-->3
Char. 3126: 1-->3
Char. 3164: 3-->1
Char. 3180: 1-->3
Char. 3289: 1-->3
Char. 3300: 1-->2
Char. 3339: 0-->2
Char. 3384: 1-->3
Char. 3387: 0-->2
Char. 3423: 1-->3
Char. 3441: 1-->3
Char. 3495: 1-->3
Char. 3519: 0-->2
Char. 3528: 1-->3
Char. 3529: 1-->3
Char. 3537: 1-->3
Char. 3567: 0-->2
Char. 3568: 1-->3
Char. 3570: 0-->2
Char. 3573: 0-->2
Char. 3582: 0-->3
Char. 3597: 1-->0
Char. 3600: 1-->3
Char. 3607: 1-->3
Char. 3612: 0-->2
Char. 3615: 0-->2
Char. 3660: 0-->2
Char. 3691: 2-->0
Char. 3714: 0-->2
Char. 3862: 0-->2
Char. 5929: 1-->3
Char. 6043: 3-->1
Char. 6073: 1-->3
Char. 6118: 1-->3
Char. 6129: 3-->1
Char. 6141: 1-->3
Char. 6214: 0-->1
Char. 6503: 2-->0
Char. 6796: 1-->3

Node 28: *Harttiella*

Char. 217: 2-->0
Char. 258: 3-->1
Char. 280: 3-->1
Char. 285: 2-->0
Char. 301: 1-->3
Char. 318: 1-->3
Char. 319: 2-->0
Char. 326: 1-->3
Char. 340: 1-->0
Char. 400: 0-->2
Char. 404: 0-->2
Char. 406: 1-->3
Char. 445: 0-->3
Char. 453: 1-->3
Char. 460: 0-->2
Char. 506: 3-->1
Char. 536: 0-->3
Char. 569: 1-->3
Char. 577: 1-->0
Char. 580: 1-->3
Char. 605: 0-->2
Char. 622: 3-->0
Char. 697: 0-->2
Char. 698: 0-->3
Char. 703: 3-->1
Char. 706: 0-->2
Char. 710: 3-->1
Char. 761: 3-->1
Char. 773: 0-->1
Char. 834: 1-->0
Char. 931: 2-->0
Char. 966: 1-->3
Char. 1065: 2-->0
Char. 1106: 1-->0
Char. 1121: 1-->3
Char. 1130: 3-->0
Char. 1140: 1-->3
Char. 1175: 1-->3
Char. 1180: 2-->0
Char. 1288: 1-->3
Char. 1299: 0-->3
Char. 1314: 1-->0
Char. 1319: 0-->1
Char. 1365: 1-->3
Char. 1372: 2-->0
Char. 1435: 0-->3
Char. 1442: 3-->0
Char. 1444: 0-->2
Char. 1445: 0-->1
Char. 1451: 3-->0
Char. 1554: 3-->0
Char. 1619: 3-->1
Char. 1642: 1-->0
Char. 1665: 1-->3
Char. 1700: 1-->3
Char. 1723: 1-->0
Char. 1728: 1-->3
Char. 1738: 1-->3
Char. 1791: 3-->0
Char. 1822: 1-->3
Char. 1838: 1-->3
Char. 1839: 1-->3
Char. 1888: 2-->0
Char. 1893: 1-->3

Char. 1894: 1-->0
Char. 1905: 3-->0
Char. 1916: 3-->1
Char. 1920: 0-->3
Char. 1944: 2-->0
Char. 1988: 3-->1
Char. 2036: 2-->0
Char. 2053: 3-->1
Char. 2080: 0-->2
Char. 2082: 2-->0
Char. 2097: 1-->0
Char. 2109: 1-->3
Char. 2111: 3-->1
Char. 2116: 1-->3
Char. 2119: 1-->3
Char. 2132: 1-->3
Char. 2194: 2-->0
Char. 2218: 1-->2
Char. 2291: 3-->1
Char. 2380: 0-->3
Char. 2385: 0-->2
Char. 2399: 1-->3
Char. 2419: 0-->3
Char. 2421: 0-->3
Char. 2562: 3-->1
Char. 2695: 3-->2
Char. 2703: 2-->3
Char. 4445: 0-->2
Char. 4557: 2-->1
Char. 4598: 3-->1
Char. 4667: 1-->2
Char. 4698: 2-->0
Char. 4759: 0-->1
Char. 4910: 1-->3
Char. 4955: 2-->0
Char. 5090: 3-->1
Char. 5918: 1-->3
Char. 5927: 2-->3
Char. 5959: 1-->2
Char. 5960: 1-->3
Char. 5986: 3-->2
Char. 6004: 1-->0
Char. 6019: 0-->1
Char. 6067: 1-->3
Char. 6079: 3-->1
Char. 6082: 0-->1
Char. 6090: 1-->3
Char. 6091: 0-->3
Char. 6097: 0-->1
Char. 6116: 0-->2
Char. 6133: 0-->1
Char. 6145: 1-->0
Char. 6150: 3-->1
Char. 6156: 3-->1
Char. 6184: 0-->1
Char. 6190: 0-->1
Char. 6217: 3-->1
Char. 6226: 0-->1
Char. 6237: 1-->3
Char. 6306: 1-->0
Char. 6319: 0-->1
Char. 6328: 1-->0
Char. 6331: 1-->3
Char. 6341: 1-->3
Char. 6343: 1-->0
Char. 6376: 1-->3
Char. 6395: 0-->3
Char. 6418: 1-->3
Char. 6435: 3-->1
Char. 6439: 3-->0
Char. 6476: 1-->3
Char. 6500: 3-->2
Char. 6507: 1-->3
Char. 6512: 1-->3
Char. 6531: 1-->3
Char. 6563: 3-->1
Char. 6573: 1-->3
Char. 6602: 0-->2
Char. 6634: 0-->3
Char. 6640: 1-->3
Char. 6684: 0-->2
Char. 6739: 1-->3
Char. 6742: 1-->3
Char. 6743: 1-->3
Char. 6748: 0-->3
Char. 6830: 0-->3
Char. 6831: 1-->3
Char. 6835: 2-->3
Char. 6838: 1-->3
Char. 6839: 1-->0

Node 29:

Char. 236: 1-->3
Char. 307: 0-->2
Char. 348: 1-->3
Char. 447: 0-->3
Char. 504: 2-->0
Char. 505: 0-->2
Char. 700: 0-->3
Char. 910: 0-->3
Char. 968: 1-->3
Char. 1094: 1-->3
Char. 1097: 0-->3
Char. 1254: 0-->2
Char. 1390: 1-->3
Char. 1750: 2-->0
Char. 1800: 0-->2
Char. 1826: 0-->1
Char. 2107: 0-->2
Char. 2182: 1-->0
Char. 2238: 1-->3
Char. 2374: 3-->1
Char. 2379: 3-->1
Char. 2418: 0-->3
Char. 2483: 0-->3
Char. 2500: 0-->2
Char. 4466: 0-->2
Char. 4511: 2-->1
Char. 4805: 1-->3
Char. 4889: 1-->3
Char. 5004: 0-->2
Char. 5039: 0-->2
Char. 5947: 0-->1
Char. 5975: 1-->3
Char. 5996: 2-->0
Char. 5998: 1-->3
Char. 6124: 1-->3
Char. 6139: 1-->3
Char. 6162: 1-->3
Char. 6220: 1-->3
Char. 6238: 1-->3
Char. 6253: 0-->2
Char. 6320: 1-->3
Char. 6353: 0-->2
Char. 6367: 0-->1
Char. 6397: 0-->2
Char. 6412: 0-->3
Char. 6518: 3-->1
Char. 6535: 1-->3
Char. 6589: 1-->3
Char. 6625: 1-->0
Char. 6656: 1-->3
Char. 6694: 1-->3
Char. 6706: 3-->1

Char. 6760: 1-->3
Char. 6802: 1-->0

Node 30:

Char. 245: 3-->1
Char. 275: 0-->2
Char. 439: 2-->0
Char. 1091: 1-->3
Char. 1102: 1-->0
Char. 1211: 2-->0
Char. 1337: 0-->2
Char. 2114: 0-->2
Char. 3777: 1-->2
Char. 3778: 1-->3
Char. 3781: 0-->2
Char. 3799: 1-->2
Char. 3802: 3-->0
Char. 3803: 3-->1
Char. 3808: 2-->0
Char. 3826: 3-->1
Char. 3838: 3-->0
Char. 3862: 2-->3
Char. 3886: 3-->1
Char. 3901: 1-->3
Char. 3910: 1-->3
Char. 3967: 2-->0
Char. 3976: 0-->2
Char. 3992: 3-->2
Char. 4006: 1-->3
Char. 4017: 3-->0
Char. 4028: 3-->0
Char. 4039: 2-->0
Char. 4061: 3-->1
Char. 4072: 1-->3
Char. 4108: 2-->0
Char. 4126: 3-->1
Char. 4162: 3-->1
Char. 4216: 3-->0
Char. 4219: 3-->0
Char. 4225: 0-->1
Char. 4237: 3-->1
Char. 4255: 2-->0
Char. 4267: 2-->0
Char. 4306: 0-->2
Char. 4312: 2-->1
Char. 4324: 3-->2
Char. 4327: 0-->2
Char. 4354: 3-->1
Char. 4366: 0-->2
Char. 4369: 1-->3
Char. 4619: 1-->3
Char. 4700: 1-->3

Node 31:

Char. 302: 1-->3
Char. 315: 2-->0
Char. 371: 3-->0
Char. 537: 0-->2
Char. 549: 1-->3
Char. 904: 0-->2
Char. 1132: 3-->0
Char. 1255: 3-->1
Char. 1326: 3-->1
Char. 1338: 1-->3
Char. 1693: 2-->0
Char. 1714: 0-->2
Char. 1749: 1-->3
Char. 1834: 0-->2
Char. 2143: 2-->0
Char. 2243: 1-->3
Char. 2422: 1-->0
Char. 4479: 2-->0
Char. 4602: 2-->0
Char. 4971: 1-->3

Node 32: Loricariini

Char. 5: 1-->3
Char. 7: 0-->3
Char. 8: 1-->0
Char. 9: 0-->1
Char. 13: 1-->4
Char. 18: 3-->4
Char. 20: 0-->2
Char. 22: 0-->1
Char. 33: 1-->0
Char. 36: 0-->2
Char. 37: 2-->1
Char. 49: 1-->0
Char. 50: 0-->1
Char. 51: 1-->0
Char. 52: 0-->2
Char. 54: 0-->1
Char. 56: 0-->1
Char. 60: 1-->0
Char. 63: 0-->1
Char. 64: 0-->1
Char. 71: 1-->0
Char. 72: 0-->4
Char. 74: 0-->1
Char. 76: 1-->3
Char. 87: 1-->2
Char. 89: 0-->3
Char. 95: 0-->1
Char. 115: 0-->3
Char. 116: 1-->4
Char. 118: 0-->2
Char. 120: 1-->0
Char. 122: 2-->0
Char. 136: 1-->2
Char. 147: 1-->0
Char. 156: 1-->2
Char. 157: 0-->2
Char. 165: 1-->3
Char. 170: 2-->3
Char. 179: 2-->0
Char. 180: 0-->1
Char. 186: 0-->1
Char. 188: 0-->1
Char. 191: 0-->2
Char. 193: 0-->1
Char. 194: 1-->2
Char. 212: 2-->4
Char. 3940: 3-->1

Node 33:

Char. 58: 1-->2
Char. 69: 1-->0
Char. 84: 1-->0
Char. 85: 0-->1
Char. 86: 0-->3
Char. 88: 0-->1
Char. 103: 2-->0
Char. 125: 0-->2
Char. 151: 0-->2
Char. 153: 2-->0
Char. 199: 0-->2

Node 34:

Char. 5: 3-->4
Char. 8: 0-->3
Char. 61: 0-->1
Char. 106: 2-->1
Char. 118: 2-->1
Char. 172: 3-->1
Char. 177: 0-->1
Char. 6070: 1-->3
Char. 6087: 3-->1
Char. 6143: 2-->0
Char. 6468: 3-->1
Char. 6583: 0-->3
Char. 6706: 3-->0
Char. 6760: 1-->0
Char. 6781: 3-->1

Node 35:

Char. 6: 1-->0
Char. 13: 4-->1
Char. 74: 1-->0
Char. 89: 3-->0
Char. 176: 0-->2
Char. 178: 2-->1
Char. 191: 2-->1
Char. 194: 2-->1
Char. 3808: 2-->0
Char. 3856: 1-->3
Char. 3895: 2-->0
Char. 3925: 3-->2
Char. 3992: 3-->2
Char. 4255: 2-->0
Char. 4550: 0-->2
Char. 4653: 0-->2
Char. 4662: 2-->1
Char. 4663: 1-->3
Char. 4664: 2-->3
Char. 4700: 1-->2
Char. 4730: 0-->3
Char. 4740: 2-->1
Char. 4805: 1-->3
Char. 4940: 1-->3
Char. 5192: 1-->3
Char. 5327: 3-->1
Char. 5390: 1-->3
Char. 5540: 1-->3
Char. 5781: 1-->0
Char. 5792: 0-->2
Char. 5932: 1-->3
Char. 5989: 1-->0
Char. 6004: 1-->3
Char. 6031: 1-->3
Char. 6034: 1-->3
Char. 6046: 0-->3
Char. 6056: 0-->2
Char. 6067: 1-->0
Char. 6069: 1-->3
Char. 6079: 3-->1
Char. 6112: 0-->3
Char. 6121: 3-->1
Char. 6122: 0-->3
Char. 6133: 0-->1
Char. 6152: 0-->2
Char. 6175: 0-->2
Char. 6227: 1-->3
Char. 6232: 1-->3
Char. 6259: 0-->3
Char. 6299: 2-->0
Char. 6310: 0-->1
Char. 6317: 0-->2
Char. 6332: 1-->3
Char. 6341: 1-->3
Char. 6343: 1-->0
Char. 6385: 0-->2
Char. 6415: 3-->1
Char. 6424: 0-->3
Char. 6437: 0-->2
Char. 6454: 0-->2
Char. 6463: 0-->2
Char. 6503: 0-->2
Char. 6549: 1-->3
Char. 6592: 0-->2
Char. 6602: 0-->2
Char. 6605: 1-->0
Char. 6731: 1-->3
Char. 6739: 1-->3
Char. 6742: 1-->3
Char. 6749: 1-->0
Char. 6766: 1-->3
Char. 6778: 1-->0
Char. 6786: 1-->3
Char. 6787: 0-->3
Char. 6790: 1-->3
Char. 6799: 0-->3
Char. 6832: 1-->0

Node 36:

Char. 142: 2-->1
Char. 153: 0-->2
Char. 155: 1-->2
Char. 179: 0-->1
Char. 183: 1-->0
Char. 202: 1-->2
Char. 4084: 3-->1
Char. 4162: 3-->0
Char. 4734: 2-->0
Char. 5911: 1-->3
Char. 5960: 1-->3
Char. 6181: 0-->2

Char. 6292: 3-->1
Char. 6364: 0-->2
Char. 6367: 0-->2
Char. 6439: 3-->1
Char. 6467: 0-->2
Char. 6469: 3-->1
Char. 6473: 0-->2
Char. 6520: 3-->1
Char. 6550: 0-->2

Node 37:

Char. 16: 0-->1
Char. 91: 1-->2
Char. 308: 1-->0
Char. 347: 0-->3
Char. 550: 1-->3
Char. 592: 2-->0
Char. 690: 3-->1
Char. 770: 1-->3
Char. 830: 3-->1
Char. 1039: 0-->3
Char. 1115: 3-->1
Char. 1120: 1-->3
Char. 1293: 3-->1
Char. 1471: 1-->3
Char. 1507: 3-->1
Char. 1729: 0-->3
Char. 1827: 1-->3
Char. 1894: 1-->3
Char. 1902: 3-->1
Char. 1923: 3-->1
Char. 2238: 1-->3
Char. 2338: 3-->1
Char. 2416: 0-->1
Char. 2581: 0-->2
Char. 2588: 2-->0
Char. 4033: 1-->3
Char. 5929: 3-->1
Char. 6185: 1-->3
Char. 6214: 1-->0
Char. 6479: 0-->2
Char. 6490: 3-->1
Char. 6531: 1-->3
Char. 6534: 2-->1
Char. 6595: 3-->1

Node 38:

Char. 99: 0-->1
Char. 114: 4-->2
Char. 183: 1-->0
Char. 202: 1-->2
Char. 346: 1-->3
Char. 547: 2-->3
Char. 569: 1-->3
Char. 583: 0-->2
Char. 723: 2-->0
Char. 877: 1-->3
Char. 1112: 3-->1
Char. 2488: 0-->2
Char. 4436: 1-->3
Char. 4605: 2-->0
Char. 4616: 0-->2
Char. 5272: 1-->0
Char. 5847: 1-->3
Char. 5990: 1-->0
Char. 6058: 1-->3
Char. 6422: 1-->3
Char. 6767: 3-->1

Node 39: *Loricariichthys*

Char. 15: 0-->1
Char. 26: 1-->2
Char. 47: 02-->1
Char. 60: 0-->1
Char. 61: 1-->0
Char. 67: 2-->1
Char. 73: 1-->0
Char. 92: 1-->0
Char. 125: 2-->1
Char. 134: 0-->3
Char. 155: 1-->0
Char. 157: 2-->3
Char. 164: 0-->2
Char. 178: 2-->1
Char. 186: 1-->0
Char. 196: 3-->0
Char. 206: 0-->1
Char. 932: 1-->3
Char. 999: 0-->2
Char. 1127: 0-->1
Char. 1134: 1-->3
Char. 1140: 1-->3
Char. 1275: 1-->0
Char. 1340: 0-->2
Char. 1511: 1-->3
Char. 1513: 1-->3
Char. 1636: 0-->2
Char. 1729: 3-->1
Char. 1936: 1-->0
Char. 2100: 0-->2
Char. 2118: 0-->1
Char. 2169: 0-->3
Char. 2170: 0-->2
Char. 2604: 0-->2
Char. 2621: 0-->3
Char. 5297: 2-->1
Char. 5372: 2-->0
Char. 5570: 1-->0
Char. 5956: 0-->2
Char. 5989: 1-->0
Char. 6004: 1-->3
Char. 6034: 1-->3
Char. 6074: 1-->3
Char. 6143: 0-->2
Char. 6163: 0-->2
Char. 6181: 0-->3
Char. 6254: 2-->0
Char. 6340: 0-->1
Char. 6343: 1-->3
Char. 6376: 1-->3
Char. 6436: 3-->1
Char. 6565: 0-->1

Char. 6583: 3-->1
Char. 6602: 0-->2
Char. 6610: 1-->0
Char. 6697: 1-->3
Char. 6757: 1-->3
Char. 6758: 0-->2
Char. 6797: 0-->3
Char. 6805: 1-->3
Char. 6812: 1-->3

Node 40:

Char. 7: 3-->2
Char. 20: 2-->1
Char. 25: 1-->0
Char. 82: 1-->0
Char. 107: 2-->1
Char. 109: 1-->0
Char. 113: 3-->0
Char. 115: 3-->2
Char. 118: 1-->2
Char. 171: 0-->1
Char. 966: 1-->3
Char. 1298: 3-->1
Char. 1365: 1-->3
Char. 1442: 3-->1
Char. 1553: 2-->0
Char. 1730: 1-->3
Char. 2116: 1-->3
Char. 2503: 2-->0
Char. 2514: 3-->1
Char. 2545: 1-->3
Char. 2558: 1-->3

Node 41:

Char. 44: 4-->3
Char. 70: 0-->1
Char. 136: 2-->1
Char. 150: 2-->1
Char. 156: 2-->0
Char. 157: 23-->0
Char. 307: 0-->3
Char. 495: 3-->1
Char. 1004: 1-->0
Char. 1103: 3-->1
Char. 1457: 1-->3
Char. 1791: 3-->1
Char. 1998: 1-->3
Char. 2190: 0-->2
Char. 2472: 3-->0
Char. 2474: 0-->3
Char. 2562: 3-->1
Char. 4439: 2-->0
Char. 6271: 3-->1
Char. 6364: 0-->2
Char. 6469: 3-->0

Node 42:

Char. 8: 3-->2
Char. 10: 1-->0
Char. 46: 2-->1
Char. 61: 1-->0
Char. 63: 1-->0
Char. 91: 2-->0
Char. 130: 2-->1
Char. 132: 1-->0
Char. 135: 0-->2
Char. 177: 1-->0
Char. 186: 1-->0
Char. 5232: 1-->0
Char. 5366: 0-->2
Char. 5372: 2-->0
Char. 5402: 0-->3
Char. 5507: 2-->0
Char. 5555: 3-->1
Char. 5702: 2-->3
Char. 6079: 3-->1
Char. 6105: 3-->1
Char. 6166: 1-->3
Char. 6167: 1-->3
Char. 6296: 2-->0
Char. 6306: 1-->0
Char. 6370: 0-->1
Char. 6398: 3-->1
Char. 6418: 1-->0
Char. 6500: 3-->2
Char. 6502: 1-->3
Char. 6562: 1-->3
Char. 6577: 0-->1
Char. 6596: 2-->0
Char. 6661: 3-->1
Char. 6753: 2-->1

Node 43: *Rineloricaria*

Char. 26: 1-->0
Char. 89: 3-->1
Char. 107: 2-->1
Char. 127: 0-->1
Char. 153: 0-->2
Char. 161: 0-->2
Char. 178: 2-->1
Char. 179: 0-->1
Char. 182: 2-->1
Char. 183: 1-->0
Char. 191: 2-->1
Char. 5137: 2-->0
Char. 5738: 2-->0
Char. 5791: 3-->1
Char. 5819: 1-->3

Node 44: *Harttiella* + Loricariini + Farlowellini

Char. 170: 1-->2
Char. 196: 0-->3
Char. 1132: 1-->3
Char. 1507: 1-->3
Char. 2545: 3-->1
Char. 2733: 1-->0
Char. 2739: 3-->1
Char. 2851: 1-->3
Char. 2895: 1-->3
Char. 3064: 3-->1
Char. 3072: 0-->3
Char. 3105: 1-->2
Char. 3153: 0-->1
Char. 3174: 3-->1
Char. 3372: 0-->1
Char. 3411: 0-->1
Char. 3432: 0-->1
Char. 3501: 3-->2
Char. 3504: 0-->1
Char. 3648: 0-->1
Char. 3759: 0-->3
Char. 3763: 0-->2
Char. 3765: 1-->0
Char. 5959: 0-->1
Char. 5986: 1-->3
Char. 6361: 0-->1
Char. 6584: 2-->0

Node 45: Farlowellini

Char. 44: 4-->3
Char. 65: 1-->2
Char. 115: 0-->1
Char. 119: 1-->2
Char. 135: 0-->2
Char. 190: 0-->1
Char. 199: 0-->1
Char. 206: 0-->2
Char. 214: 3-->1
Char. 530: 0-->3
Char. 702: 3-->1
Char. 729: 0-->2
Char. 734: 1-->3
Char. 770: 1-->3
Char. 1115: 3-->0
Char. 1216: 3-->1
Char. 1340: 0-->1
Char. 1347: 0-->1
Char. 1717: 3-->0
Char. 1718: 3-->1
Char. 1720: 3-->1
Char. 1721: 3-->1
Char. 2076: 3-->1
Char. 2145: 1-->0
Char. 2173: 2-->0
Char. 2253: 0-->2
Char. 2379: 3-->1
Char. 2498: 0-->1
Char. 3408: 3-->1
Char. 3474: 3-->1
Char. 3874: 1-->3
Char. 3979: 1-->3
Char. 4493: 1-->0
Char. 5000: 2-->0
Char. 5081: 3-->1
Char. 5441: 0-->1
Char. 5492: 1-->3
Char. 5781: 1-->0
Char. 5893: 1-->2
Char. 6235: 3-->1
Char. 6253: 0-->2
Char. 6289: 0-->1,3
Char. 6412: 0-->1
Char. 6439: 3-->1
Char. 6445: 3-->1
Char. 6479: 0-->2

Node 46: *Lamontichthys*

Char. 43: 1-->0
Char. 66: 2-->1
Char. 91: 1-->2
Char. 108: 0-->1
Char. 128: 0-->1
Char. 149: 0-->1
Char. 165: 1-->2
Char. 179: 2-->1
Char. 200: 2-->1

Node 47:

Char. 36: 0-->1
Char. 47: 1-->0
Char. 49: 1-->0
Char. 103: 2-->0
Char. 189: 0-->1

Node 48:

Char. 2: 0-->1
Char. 13: 1-->0
Char. 82: 0-->1
Char. 83: 1-->0
Char. 120: 1-->0
Char. 129: 1-->0
Char. 196: 3-->2
Char. 203: 0-->1
Char. 205: 0-->1
Char. 213: 0-->2

Node 49:

Char. 347: 1-->3
Char. 880: 0-->3
Char. 936: 0-->2
Char. 965: 0-->2
Char. 1116: 3-->1
Char. 1191: 0-->2
Char. 1254: 0-->2
Char. 1371: 3-->1
Char. 1702: 0-->2
Char. 1735: 2-->0
Char. 1802: 1-->3
Char. 2027: 2-->0
Char. 2116: 1-->3
Char. 2562: 3-->1
Char. 2988: 1-->3
Char. 3033: 1-->3
Char. 3075: 0-->2
Char. 3103: 1-->3
Char. 3132: 1-->3
Char. 3171: 1-->3
Char. 3182: 0-->1
Char. 3201: 0-->2
Char. 3291: 0-->2
Char. 3501: 2-->0
Char. 3504: 1-->0
Char. 3648: 1-->0
Char. 3705: 0-->2
Char. 3708: 3-->1
Char. 3709: 1-->3

Node 50:

Char. 1: 0-->1
Char. 4: 0-->1
Char. 22: 0-->1
Char. 51: 1-->0
Char. 52: 0-->1
Char. 79: 1-->0
Char. 86: 0-->2
Char. 89: 0-->1
Char. 122: 2-->1
Char. 133: 0-->1
Char. 142: 2-->1
Char. 172: 3-->2
Char. 300: 3-->1
Char. 307: 0-->2
Char. 317: 0-->2
Char. 351: 3-->1
Char. 371: 3-->1
Char. 558: 3-->1
Char. 676: 1-->3
Char. 710: 3-->1
Char. 723: 2-->0
Char. 823: 1-->3
Char. 824: 1-->3
Char. 937: 2-->0
Char. 1102: 1-->3
Char. 1129: 3-->1
Char. 1293: 3-->1
Char. 1359: 1-->3
Char. 1442: 3-->1
Char. 1725: 0-->2
Char. 1791: 3-->1
Char. 1916: 3-->1
Char. 1918: 3-->1
Char. 2084: 1-->0
Char. 2420: 0-->1
Char. 2558: 0-->1
Char. 2572: 0-->1
Char. 2590: 2-->0
Char. 2604: 0-->2
Char. 2632: 3-->1
Char. 2826: 1-->3
Char. 2829: 3-->1
Char. 2831: 3-->1
Char. 2835: 0-->1
Char. 3405: 3-->1
Char. 3423: 1-->0
Char. 3579: 3-->1
Char. 4670: 0-->2
Char. 4799: 1-->3
Char. 5141: 1-->3
Char. 5747: 1-->3
Char. 5960: 1-->3
Char. 5983: 1-->3
Char. 5992: 0-->1
Char. 6017: 3-->2
Char. 6064: 0-->1
Char. 6094: 3-->1
Char. 6121: 3-->1
Char. 6184: 0-->1
Char. 6217: 3-->1
Char. 6355: 3-->1
Char. 6467: 0-->2
Char. 6468: 3-->1
Char. 6469: 3-->1
Char. 6470: 3-->1
Char. 6602: 0-->2
Char. 6706: 3-->0
Char. 6736: 1-->3
Char. 6781: 3-->1
Char. 6794: 2-->3

Node 51: *Sturisoma + Sturisomatichthys + Farlowella*

Char. 6: 1-->2
Char. 17: 1-->0
Char. 27: 0-->1
Char. 32: 0-->1
Char. 45: 0-->1
Char. 72: 0-->1
Char. 180: 0-->1
Char. 192: 0-->1
Char. 200: 2-->3
Char. 206: 2-->1
Char. 391: 1-->3
Char. 982: 0-->2
Char. 1105: 1-->3
Char. 1130: 3-->1
Char. 1357: 1-->3
Char. 1707: 0-->1
Char. 2149: 3-->1
Char. 2817: 1-->3
Char. 2928: 1-->3
Char. 3501: 2-->0

Char. 3597: 1-->0
Char. 4457: 1-->3
Char. 4643: 2-->0
Char. 4805: 1-->3
Char. 4895: 3-->2
Char. 5012: 2-->0
Char. 5078: 3-->1
Char. 5421: 3-->0
Char. 5489: 3-->2
Char. 5531: 3-->1
Char. 6028: 1-->3
Char. 6034: 1-->3
Char. 6073: 1-->3
Char. 6133: 0-->1
Char. 6506: 0-->2
Char. 6557: 1-->3
Char. 6739: 1-->3

Node 52: *Sturisoma*

Char. 5: 1-->2
Char. 16: 0-->1
Char. 25: 0-->1
Char. 26: 0-->2
Char. 41: 1-->0
Char. 59: 1-->0
Char. 67: 1-->2
Char. 71: 1-->0
Char. 76: 1-->2
Char. 85: 0-->1
Char. 91: 1-->2
Char. 108: 0-->1
Char. 112: 1-->0
Char. 119: 2-->3
Char. 130: 0-->2
Char. 131: 1-->2
Char. 155: 1-->2
Char. 157: 1-->3
Char. 165: 1-->2
Char. 191: 0-->1
Char. 213: 0-->1
Char. 276: 1-->3
Char. 350: 1-->0
Char. 504: 2-->0
Char. 611: 1-->3
Char. 1126: 3-->1
Char. 1129: 1-->0
Char. 1287: 0-->1
Char. 1333: 1-->0
Char. 1341: 3-->1
Char. 1578: 0-->2
Char. 1653: 3-->2
Char. 1802: 1-->3
Char. 1868: 1-->3
Char. 2269: 1-->3
Char. 2583: 3-->1
Char. 2970: 0-->2
Char. 2982: 1-->3
Char. 2994: 0-->2
Char. 3054: 1-->3
Char. 3058: 0-->2
Char. 3093: 1-->0
Char. 3189: 3-->1
Char. 3198: 3-->1
Char. 3414: 0-->3
Char. 3418: 1-->3
Char. 3453: 1-->3
Char. 3477: 1-->3
Char. 3528: 1-->3
Char. 3555: 0-->3
Char. 3617: 3-->1
Char. 3708: 3-->1
Char. 3744: 0-->1
Char. 3747: 3-->1
Char. 3750: 3-->1
Char. 4189: 2-->3
Char. 4378: 1-->3
Char. 4405: 3-->2
Char. 4451: 1-->3
Char. 4517: 3-->1
Char. 4730: 2-->1
Char. 4880: 2-->1
Char. 4883: 3-->1
Char. 4912: 3-->0
Char. 4913: 3-->0
Char. 5672: 2-->0
Char. 5992: 1-->3
Char. 6007: 1-->3
Char. 6145: 1-->3
Char. 6181: 0-->2
Char. 6259: 0-->3
Char. 6271: 3-->1
Char. 6320: 1-->3
Char. 6330: 1-->3
Char. 6334: 0-->2
Char. 6371: 1-->3
Char. 6373: 0-->2
Char. 6427: 1-->3
Char. 6551: 1-->3
Char. 6574: 1-->3
Char. 6577: 1-->0
Char. 6595: 1-->3
Char. 6598: 1-->0

Node 53:

Char. 22: 1-->0
Char. 57: 1-->0
Char. 140: 2-->3
Char. 248: 2-->0
Char. 452: 3-->1
Char. 504: 0-->3
Char. 547: 2-->0
Char. 558: 1-->3
Char. 584: 2-->0
Char. 723: 0-->2
Char. 984: 3-->1
Char. 1102: 3-->1
Char. 1116: 3-->1
Char. 1128: 1-->3
Char. 1135: 0-->3
Char. 1212: 0-->3
Char. 1300: 1-->3
Char. 1783: 0-->1
Char. 1826: 0-->3
Char. 2117: 0-->2
Char. 2460: 2-->0

Node 54:

Char. 14: 0-->1
Char. 19: 1-->0
Char. 21: 1-->2
Char. 36: 0-->3
Char. 82: 0-->1
Char. 84: 1-->0
Char. 89: 1-->0
Char. 130: 2-->1
Char. 152: 0-->1
Char. 168: 0-->2
Char. 174: 1-->0
Char. 185: 0-->3

Node 55:

Char. 34: 1-->0
Char. 38: 1-->0
Char. 43: 1-->0
Char. 44: 3-->4
Char. 45: 1-->0
Char. 70: 1-->0
Char. 75: 0-->2
Char. 99: 0-->2
Char. 142: 1-->2

Node 56: *Sturisomatichthys + Farlowella*

Char. 13: 1-->2
Char. 18: 3-->2
Char. 38: 1-->0
Char. 44: 3-->4
Char. 55: 2-->0
Char. 94: 3-->1
Char. 103: 2-->0
Char. 104: 2-->0
Char. 122: 1-->0
Char. 135: 2-->0
Char. 177: 0-->1
Char. 280: 3-->1
Char. 506: 3-->1
Char. 890: 0-->2
Char. 978: 3-->1
Char. 3144: 1-->3
Char. 3168: 1-->0
Char. 3300: 1-->0
Char. 3495: 1-->3
Char. 3600: 1-->3
Char. 3615: 0-->2
Char. 3691: 2-->0
Char. 4637: 1-->0
Char. 4726: 2-->0
Char. 5044: 0-->2
Char. 5525: 3-->2
Char. 5756: 2-->0
Char. 5986: 3-->1
Char. 6367: 0-->2
Char. 6656: 1-->3
Char. 6686: 1-->3

Node 57: *Sturisomatichthys*

Char. 22: 1-->0
Char. 47: 1-->0
Char. 120: 1-->0
Char. 123: 0-->1
Char. 133: 1-->2
Char. 145: 1-->0
Char. 155: 1-->0
Char. 215: 0-->1
Char. 308: 1-->3
Char. 346: 1-->3
Char. 347: 13-->0
Char. 536: 0-->2
Char. 624: 0-->2
Char. 1998: 1-->3
Char. 2733: 0-->2
Char. 2805: 1-->3
Char. 2814: 1-->0
Char. 2988: 1-->3
Char. 3324: 1-->3
Char. 3622: 1-->3
Char. 3732: 3-->1
Char. 5372: 2-->0
Char. 5633: 1-->3
Char. 6118: 1-->3
Char. 6217: 1-->3
Char. 6318: 1-->3

Node 58:

Char. 1: 1-->0
Char. 4: 1-->3
Char. 37: 2-->1
Char. 55: 0-->1
Char. 72: 1-->2
Char. 73: 1-->0
Char. 82: 0-->1
Char. 85: 0-->1
Char. 89: 1-->0
Char. 137: 3-->0
Char. 187: 1-->2
Char. 192: 1-->0
Char. 2730: 1-->3
Char. 2808: 1-->3
Char. 2817: 3-->1
Char. 2820: 0-->3
Char. 2850: 1-->0
Char. 2880: 1-->3
Char. 2895: 3-->1
Char. 2940: 1-->3

Char. 2985: 1-->3
Char. 3063: 1-->3
Char. 3069: 0-->1
Char. 3102: 0-->3
Char. 3114: 1-->3
Char. 3141: 1-->3
Char. 3156: 0-->1
Char. 3171: 1-->3
Char. 3229: 1-->3
Char. 3418: 1-->3
Char. 3423: 0-->3
Char. 3426: 1-->3
Char. 3447: 0-->1
Char. 3450: 1-->3
Char. 3462: 1-->3
Char. 3498: 1-->3
Char. 3504: 1-->3
Char. 3516: 0-->3
Char. 3601: 3-->1
Char. 3603: 0-->2
Char. 3606: 0-->3
Char. 3627: 0-->3
Char. 3675: 1-->3
Char. 3711: 0-->2
Char. 5956: 0-->2
Char. 5986: 1-->0
Char. 5989: 1-->3
Char. 5992: 1-->3
Char. 6079: 3-->1
Char. 6133: 1-->3
Char. 6184: 1-->0
Char. 6194: 0-->1
Char. 6235: 1-->3
Char. 6253: 2-->0
Char. 6306: 1-->0
Char. 6349: 1-->3
Char. 6415: 1-->3
Char. 6488: 0-->2
Char. 6517: 0-->2
Char. 6534: 2-->1
Char. 6551: 1-->3
Char. 6574: 1-->0
Char. 6581: 1-->3
Char. 6589: 1-->3
Char. 6593: 2-->0
Char. 6601: 0-->3
Char. 6619: 0-->2
Char. 6661: 3-->1
Char. 6692: 1-->3
Char. 6709: 3-->1
Char. 6712: 1-->3
Char. 6742: 1-->3
Char. 6754: 3-->1
Char. 6760: 1-->3
Char. 6796: 1-->0
Char. 6805: 1-->3
Char. 6812: 1-->3

Node 59:

Char. 16: 0-->1
Char. 307: 2-->0
Char. 326: 1-->3
Char. 350: 1-->3
Char. 422: 0-->3
Char. 1042: 0-->2
Char. 1099: 3-->1
Char. 1128: 1-->3
Char. 1340: 1-->0
Char. 1729: 1-->3
Char. 1730: 1-->3
Char. 1970: 3-->1
Char. 2064: 1-->3
Char. 2118: 1-->3
Char. 2142: 2-->0
Char. 2147: 0-->2
Char. 2829: 1-->3
Char. 2874: 1-->3
Char. 2910: 1-->3
Char. 2928: 3-->1
Char. 2943: 1-->3
Char. 3051: 1-->3
Char. 3054: 1-->3
Char. 3066: 0-->2
Char. 3108: 1-->3
Char. 3165: 1-->3
Char. 3289: 1-->3
Char. 3321: 1-->0
Char. 3333: 3-->1
Char. 3336: 1-->0
Char. 3345: 0-->2
Char. 3474: 1-->3
Char. 3477: 1-->3
Char. 3522: 0-->2
Char. 3639: 0-->2
Char. 3756: 3-->1

Node 60:

Char. 18: 2-->1
Char. 38: 0-->1
Char. 161: 0-->2
Char. 185: 0-->3

Node 61:

Char. 4: 1-->0
Char. 82: 0-->1
Char. 116: 1-->2

Node 62:

Char. 12: 3-->1
Char. 35: 2-->1
Char. 71: 1-->0
Char. 89: 1-->0
Char. 168: 0-->2
Char. 174: 1-->0
Char. 186: 0-->2
Char. 187: 1-->0
Char. 216: 3-->4

Node 63:

Char. 19: 1-->0
Char. 29: 1-->0
Char. 538: 1-->0
Char. 997: 0-->3
Char. 1129: 1-->3
Char. 1465: 1-->3
Char. 2094: 3-->1
Char. 2478: 3-->1
Char. 2946: 1-->3
Char. 3318: 0-->2
Char. 3495: 3-->1
Char. 3585: 0-->3

Node 64:

Char. 179: 2-->0
Char. 184: 1-->2
Char. 196: 3-->2
Char. 206: 1-->2
Char. 216: 3-->4
Char. 2907: 1-->3
Char. 2997: 1-->3
Char. 3159: 0-->2
Char. 3231: 0-->2
Char. 3678: 0-->2
Char. 4919: 1-->3
Char. 4928: 3-->1
Char. 6238: 1-->3
Char. 6367: 2-->0
Char. 6496: 0-->2
Char. 6769: 0-->2

Node 65:

Char. 174: 1-->2
Char. 2772: 1-->3
Char. 2830: 2-->0
Char. 2831: 1-->3
Char. 2857: 1-->3
Char. 3204: 1-->2
Char. 3415: 0-->2
Char. 3416: 1-->3
Char. 3453: 1-->3
Char. 3510: 3-->1
Char. 3546: 1-->3
Char. 3630: 1-->3
Char. 3660: 0-->2
Char. 3711: 0-->2
Char. 4847: 2-->0
Char. 6151: 3-->0
Char. 6290: 0-->2
Char. 6320: 1-->3
Char. 6490: 1-->3
Char. 6679: 0-->2
Char. 6704: 0-->2
Char. 6739: 3-->1

Node 66:

Char. 16: 1-->0
Char. 38: 0-->1
Char. 46: 2-->1
Char. 52: 1-->0
Char. 72: 1-->2
Char. 79: 0-->1
Char. 597: 0-->2
Char. 982: 2-->0
Char. 1132: 3-->0
Char. 1834: 1-->3
Char. 1896: 0-->3
Char. 2620: 1-->3

Node 67: *Farlowella*

Char. 4: 1-->2
Char. 69: 2-->1
Char. 86: 2-->0
Char. 91: 1-->0
Char. 98: 1-->3
Char. 121: 0-->1
Char. 126: 2-->1
Char. 127: 1-->0
Char. 129: 1-->2
Char. 130: 0-->3
Char. 132: 0-->1
Char. 141: 0-->1
Char. 156: 1-->0
Char. 157: 1-->2
Char. 165: 1-->3
Char. 168: 0-->5
Char. 175: 2-->0
Char. 187: 1-->0
Char. 206: 1-->0
Char. 212: 2-->4

Node 68:

Char. 57: 1-->2
Char. 58: 1-->2
Char. 71: 1-->0
Char. 142: 1-->0
Char. 185: 0-->3
Char. 191: 0-->3

Node 69:

Char. 20: 0-->1
Char. 96: 2-->3
Char. 349: 1-->3
Char. 350: 1-->0
Char. 371: 1-->3
Char. 422: 0-->3
Char. 593: 1-->3
Char. 594: 1-->3
Char. 823: 3-->1
Char. 1099: 3-->1
Char. 1116: 3-->1
Char. 1120: 1-->3
Char. 1132: 3-->1
Char. 1329: 0-->3
Char. 1566: 2-->0
Char. 1712: 0-->2
Char. 1725: 2-->0
Char. 2036: 2-->0
Char. 2118: 1-->3
Char. 2170: 0-->2
Char. 2171: 0-->3
Char. 2251: 3-->1
Char. 2417: 3-->1

Node 70:

Char. 103: 0-->2
Char. 176: 1-->0
Char. 275: 0-->2
Char. 314: 2-->0
Char. 326: 1-->3
Char. 404: 0-->2
Char. 425: 0-->2
Char. 503: 0-->2
Char. 530: 3-->1
Char. 578: 3-->1
Char. 592: 2-->0
Char. 597: 0-->2
Char. 615: 0-->2
Char. 699: 0-->2
Char. 877: 1-->0
Char. 938: 2-->0
Char. 982: 2-->0
Char. 1004: 1-->3
Char. 1042: 0-->3
Char. 1096: 3-->0
Char. 1216: 1-->0
Char. 1366: 3-->1
Char. 1578: 0-->3
Char. 1600: 2-->0
Char. 1746: 0-->1
Char. 1820: 3-->1
Char. 1936: 1-->3
Char. 2042: 1-->3
Char. 2078: 0-->2
Char. 2115: 1-->3
Char. 2142: 2-->0
Char. 2169: 2-->0
Char. 2253: 2-->0
Char. 2374: 3-->0
Char. 2433: 2-->0
Char. 2540: 2-->0
Char. 2549: 2-->0
Char. 2638: 2-->0
Char. 2775: 1-->3
Char. 2856: 1-->3
Char. 3093: 1-->3
Char. 3102: 0-->2
Char. 3165: 1-->3
Char. 3303: 1-->3
Char. 3345: 0-->2
Char. 3507: 1-->3
Char. 3534: 3-->1
Char. 4605: 2-->0
Char. 4955: 2-->0
Char. 4970: 1-->3

Node 71:

Char. 2817: 3-->1
Char. 2829: 1-->3
Char. 2830: 2-->0
Char. 2831: 1-->3
Char. 2880: 1-->3
Char. 3103: 1-->3
Char. 3198: 3-->1
Char. 3289: 1-->3
Char. 3423: 1-->3
Char. 3474: 1-->3
Char. 3490: 1-->3
Char. 3528: 1-->3
Char. 3568: 1-->3
Char. 3579: 1-->3
Char. 4479: 2-->3
Char. 4653: 0-->3
Char. 4670: 2-->0
Char. 4682: 2-->0
Char. 4691: 2-->0
Char. 4733: 0-->2
Char. 4853: 0-->3
Char. 4880: 2-->0
Char. 5000: 0-->2
Char. 5204: 1-->3
Char. 5216: 2-->0
Char. 5321: 1-->3
Char. 5357: 1-->3
Char. 5387: 1-->3
Char. 5408: 2-->0
Char. 5444: 0-->3
Char. 5591: 1-->0
Char. 5678: 0-->2
Char. 5705: 1-->3

Node 72:

Char. 2826: 1-->3
Char. 2877: 3-->1
Char. 2895: 3-->1
Char. 2905: 2-->0
Char. 2943: 1-->3
Char. 3063: 1-->3
Char. 3066: 0-->3
Char. 3201: 0-->2

Char. 3291: 0-->2
Char. 3462: 1-->3
Char. 3510: 3-->1
Char. 3576: 0-->2
Char. 3585: 0-->2
Char. 3685: 0-->2
Char. 3723: 0-->2
Char. 3729: 0-->2
Char. 3768: 1-->3
Char. 5440: 1-->3

Node 73:

Char. 160: 1-->0
Char. 177: 1-->0
Char. 439: 2-->0
Char. 527: 2-->0
Char. 577: 1-->3
Char. 599: 1-->0
Char. 626: 1-->3
Char. 904: 0-->1
Char. 1125: 3-->0
Char. 1138: 0-->1
Char. 1333: 1-->3
Char. 1340: 1-->3
Char. 1341: 3-->1
Char. 1445: 0-->1
Char. 1539: 0-->1
Char. 1578: 0-->2
Char. 1730: 1-->3
Char. 1827: 1-->3
Char. 1840: 3-->1
Char. 1894: 1-->0
Char. 1916: 1-->3
Char. 1996: 2-->0
Char. 2027: 2-->0
Char. 2088: 0-->3
Char. 2137: 3-->1
Char. 2146: 1-->3
Char. 2556: 3-->1
Char. 2583: 3-->1
Char. 2610: 1-->3
Char. 2688: 3-->1
Char. 4312: 2-->0

Node 74:

Char. 131: 1-->0
Char. 161: 0-->2
Char. 179: 2-->0
Char. 436: 3-->1
Char. 902: 1-->0
Char. 1134: 1-->3
Char. 1200: 0-->2
Char. 1262: 2-->0
Char. 1328: 3-->1
Char. 1357: 3-->1
Char. 1430: 2-->0
Char. 1897: 0-->3
Char. 1902: 3-->1
Char. 1970: 3-->1
Char. 2378: 1-->3
Char. 2484: 0-->3
Char. 2489: 0-->1
Char. 2572: 1-->0
Char. 2775: 1-->3
Char. 2856: 1-->3
Char. 3093: 1-->3
Char. 3102: 0-->2
Char. 3165: 1-->3
Char. 3303: 1-->3
Char. 3345: 0-->2
Char. 3507: 1-->3
Char. 3534: 3-->1
Char. 4605: 2-->0
Char. 4955: 2-->0
Char. 4970: 1-->3
Char. 5132: 1-->3
Char. 5137: 2-->0
Char. 5281: 0-->1
Char. 5575: 1-->3

Node 75:

Char. 11: 1-->2
Char. 25: 0-->1
Char. 39: 0-->2
Char. 44: 4-->3
Char. 69: 1-->2
Char. 71: 0-->1
Char. 98: 3-->2
Char. 110: 0-->1
Char. 150: 4-->1
Char. 191: 3-->0

Node 76:

Char. 67: 1-->2
Char. 2736: 0-->1
Char. 2928: 3-->1
Char. 2950: 1-->0
Char. 2982: 1-->3
Char. 2988: 1-->3
Char. 2992: 1-->3
Char. 3018: 1-->3
Char. 3058: 0-->2
Char. 3182: 0-->1
Char. 3261: 1-->0
Char. 3418: 1-->3
Char. 3419: 3-->1
Char. 3490: 1-->3
Char. 3510: 3-->1
Char. 3591: 3-->1
Char. 3594: 1-->3
Char. 3615: 2-->0
Char. 3693: 1-->3
Char. 3744: 0-->3
Char. 3774: 1-->3
Char. 3862: 3-->2
Char. 4012: 1-->3
Char. 4096: 1-->3

Char. 4375: 0-->2
Char. 5729: 3-->0

Node 77: *Farlowella acus* + *Aposturisoma myriodon* (= *F. myriodon*)

Char. 23: 0-->1
Char. 43: 1-->0
Char. 49: 1-->0
Char. 57: 2-->1
Char. 138: 0-->1
Char. 139: 0-->1
Char. 702: 1-->3
Char. 770: 3-->1
Char. 985: 0-->2
Char. 1004: 1-->3
Char. 1006: 2-->0
Char. 1102: 1-->3
Char. 1139: 1-->3
Char. 1326: 3-->1
Char. 1387: 1-->3
Char. 1512: 3-->1
Char. 1918: 3-->1
Char. 1935: 3-->1
Char. 2049: 1-->3
Char. 2119: 1-->0
Char. 2233: 0-->3
Char. 2460: 2-->0
Char. 2510: 3-->1
Char. 2622: 1-->3
Char. 5204: 1-->3
Char. 5216: 2-->0
Char. 5222: 3-->2
Char. 5351: 0-->1
Char. 5519: 3-->0
Char. 5649: 2-->0
Char. 5917: 0-->3
Char. 6043: 3-->1
Char. 6229: 0-->2
Char. 6343: 1-->3
Char. 6398: 1-->3
Char. 6403: 1-->3
Char. 6551: 1-->3
Char. 6562: 1-->3
Char. 6607: 3-->1
Char. 6619: 0-->2
Char. 6760: 1-->0
Char. 6781: 1-->0
Char. 6783: 0-->1

Node 78:

Char. 20: 0-->1
Char. 76: 1-->2
Char. 140: 3-->2
Char. 2823: 2-->0
Char. 2829: 1-->3
Char. 3027: 1-->3
Char. 3028: 0-->2
Char. 3153: 1-->3
Char. 3180: 3-->1
Char. 3246: 0-->1
Char. 3300: 0-->1
Char. 3339: 2-->0
Char. 3360: 1-->3
Char. 3441: 3-->1
Char. 3529: 3-->1
Char. 3576: 0-->3
Char. 3579: 1-->3
Char. 3588: 0-->3
Char. 3617: 3-->1
Char. 3627: 0-->3
Char. 3691: 0-->2
Char. 3753: 1-->3
Char. 3768: 1-->3
Char. 4436: 1-->3
Char. 4682: 2-->0
Char. 5321: 1-->3
Char. 5651: 3-->1
Char. 5789: 3-->0
Char. 5792: 0-->3
Char. 6139: 1-->3
Char. 6166: 1-->3
Char. 6373: 0-->3
Char. 6376: 1-->3
Char. 6538: 0-->1
Char. 6584: 0-->2
Char. 6587: 2-->0
Char. 6593: 2-->0
Char. 6595: 1-->3
Char. 6817: 0-->1

Node 79:

Char. 25: 0-->1
Char. 176: 1-->0
Char. 506: 1-->3
Char. 1802: 1-->3
Char. 1917: 3-->1
Char. 2457: 0-->3

Node 80:

Char. 253: 0-->2
Char. 352: 0-->1
Char. 436: 3-->1
Char. 526: 0-->2
Char. 579: 0-->2
Char. 878: 1-->0
Char. 1132: 3-->1
Char. 1140: 1-->3
Char. 1200: 0-->2
Char. 1201: 2-->0
Char. 1277: 0-->2
Char. 1286: 0-->2
Char. 1335: 0-->2
Char. 1470: 0-->2
Char. 1700: 1-->3
Char. 1738: 1-->0

Char. 1822: 1-->3
Char. 1902: 3-->1
Char. 2050: 1-->3
Char. 2137: 1-->3
Char. 2170: 0-->2
Char. 2514: 3-->1
Char. 2622: 1-->3

Node 81:

Char. 12: 3-->1
Char. 79: 0-->1
Char. 108: 0-->1
Char. 131: 1-->0
Char. 160: 0-->1

Node 82:

Char. 177: 0-->1
Char. 212: 4-->3
Char. 551: 0-->2
Char. 982: 2-->0
Char. 1725: 2-->0
Char. 2826: 1-->3
Char. 2838: 0-->2
Char. 2865: 0-->2
Char. 2877: 3-->1
Char. 2922: 1-->3
Char. 2934: 1-->3
Char. 2940: 1-->3
Char. 3000: 3-->1
Char. 3096: 0-->2
Char. 3132: 1-->2
Char. 3154: 1-->3
Char. 3291: 0-->2
Char. 3432: 1-->0
Char. 3504: 1-->0
Char. 3600: 3-->1
Char. 3684: 0-->2
Char. 3708: 3-->1
Char. 3732: 3-->1
Char. 3747: 3-->1
Char. 4451: 1-->3
Char. 4766: 1-->0
Char. 4769: 1-->3
Char. 4778: 0-->2
Char. 5734: 2-->0

Node 83:

Char. 34: 1-->0
Char. 65: 1-->2
Char. 69: 1-->2
Char. 116: 1-->2
Char. 870: 0-->2
Char. 1132: 3-->1
Char. 1134: 1-->3
Char. 1200: 0-->2
Char. 1328: 3-->1
Char. 1430: 2-->0
Char. 1897: 0-->3
Char. 1902: 3-->1
Char. 2489: 0-->1
Char. 2546: 0-->2

Node 84:

Char. 436: 3-->1
Char. 700: 0-->2
Char. 902: 1-->0
Char. 1262: 2-->0
Char. 1866: 0-->2
Char. 1924: 1-->0
Char. 1970: 3-->1
Char. 2002: 1-->3
Char. 2378: 1-->3
Char. 2484: 0-->3
Char. 2572: 1-->0
Char. 6289: 3-->1
Char. 6310: 0-->3
Char. 6319: 1-->3
Char. 6457: 1-->2
Char. 6467: 2-->0
Char. 6479: 2-->3
Char. 6502: 1-->0
Char. 6568: 0-->3
Char. 6584: 2-->3
Char. 6610: 1-->3
Char. 6754: 3-->1

Node 85:

Char. 12: 3-->1
Char. 174: 1-->2
Char. 191: 3-->0
Char. 982: 0-->2
Char. 1725: 0-->2
Char. 1802: 1-->3
Char. 2622: 1-->3
Char. 3429: 1-->3
Char. 3498: 1-->3
Char. 3546: 1-->3
Char. 3685: 0-->2
Char. 3720: 3-->1
Char. 3726: 1-->3
Char. 3753: 3-->1
Char. 5540: 1-->3
Char. 6751: 0-->2
Char. 6812: 1-->3

Node 86:

Char. 172: 2-->1
Char. 371: 1-->3
Char. 536: 0-->2
Char. 551: 2-->0
Char. 1300: 1-->3
Char. 1344: 0-->2
Char. 1841: 3-->1
Char. 2050: 1-->3
Char. 2091: 0-->2
Char. 2418: 0-->2
Char. 2500: 0-->2

Node 87:

Char. 5: 1-->2
Char. 7: 1-->2
Char. 11: 1-->2
Char. 20: 1-->0
Char. 35: 2-->1
Char. 113: 2-->3

Node 88:

Char. 71: 0-->1
Char. 904: 1-->3
Char. 985: 0-->2
Char. 2493: 0-->2

Node 89:

Char. 39: 0-->2
Char. 65: 2-->1
Char. 73: 0-->1
Char. 79: 0-->1
Char. 116: 2-->1
Char. 131: 1-->3
Char. 138: 0-->1
Char. 139: 0-->1

Appendix II. Partial data matrix, characters corresponds to osteology and external morphology. Missing taxa are only represented by DNA data in the analyses.

Taxon/Character	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**
Hemipsilichthys gobio	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acestridium scutatum	1	0	0	0	0	2	0	0	0	0	0	?	3	0	0	0	0	0	0	1	0	0	0	?	0	0	0	?	0	0
Ancistrus brevipinnis	0	0	0	0	0	0	1	1	0	1	0	1	0	1	1	1	1	2	0	0	2	0	0	1	0	0	0	0	1	2
Chaetostoma breve	0	0	?	0	0	1	0	2	0	1	0	1	1	1	0	1	1	4	1	0	3	0	1	1	1	1	0	?	1	?
Crossoloricaria sp.	1	1	1	0	3	1	3	0	1	1	2	0	4	2	0	1	1	4	0	2	3	1	0	0	1	1	0	1	1	1
Dasyloricaria filamentosa	0	0	0	0	4	0	3	3	1	1	1	0	1	2	0	0	1	4	1	2	2	1	1	0	1	1	0	1	1	1
Dasyloricaria latiura	1	0	0	0	4	0	3	3	1	1	1	0	1	1	0	0	1	4	1	2	3	1	0	0	1	1	0	0	1	1
Dasyloricaria paucisquama	0	0	0	0	4	0	3	3	1	1	1	0	2	1	0	1	1	4	1	2	3	1	0	0	1	1	0	0	1	1
Hemiloricaria lanceolata	0	0	1	0	4	1	3	2	1	0	1	0	4	1	0	1	1	4	1	2	1	1	1	0	1	1	0	1	1	0
Hemiodontichthys acipenserinus	1	0	0	0	5	2	2	2	1	0	1	0	4	1	0	1	1	4	1	1	1	1	0	0	0	0	0	?	1	2
Hisonotus laevior	0	0	1	0	0	1	0	0	0	1	0	0	3	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0
Limatulichthys griseus	0	1	1	0	4	1	2	0	1	1	1	0	4	2	0	1	1	4	1	1	2	1	1	1	0	1	0	1	1	1
Loricaria sp.	0	0	0	0	3	1	3	0	1	1	1	0	4	1	0	0	0	4	1	2	1	1	1	0	1	1	0	1	1	1
Loricariichthys anus	0	0	0	0	3	0	3	3	1	1	1	0	4	2	1	1	1	4	1	2	1	0	0	1	1	2	0	1	1	1
Loricariichthys platymetopon	0	0	?	0	3	1	3	3	1	1	1	0	2	1	1	1	1	4	1	2	1	1	0	1	1	2	0	1	1	1
Neoplecostomus microps	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	0	1	0	0	0	0	0	1	0	0	0	0
Pareiorhaphis calmoni	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	1	3	1	0	1	0	0	1	1	0	0	0	0	0
Parotocinclus maculicauda	0	0	1	0	0	1	1	0	0	0	0	0	3	0	0	0	0	2	0	1	1	0	0	0	0	0	0	0	1	0
Pterygoplichthys lituratus	1	0	0	0	2	0	3	1	0	1	1	1	0	1	0	1	1	0	1	0	1	0	0	1	0	0	0	0	0	?
Rineloricaria cadeae	0	0	0	0	4	1	3	2	1	0	2	0	4	1	0	1	0	4	1	2	1	1	0	0	1	0	0	?	1	1
Rineloricaria quadrensis	1	0	0	0	3	1	3	2	1	0	1	0	4	0	0	1	1	4	1	2	1	1	0	0	1	0	0	1	1	1
Spatuloricaria puganensis	0	0	0	0	4	0	3	3	1	1	1	0	2	1	0	1	1	4	1	2	3	1	0	1	1	1	0	1	1	1

Taxon/Character	**31**	**32**	**33**	**34**	**35**	**36**	**37**	**38**	**39**	**40**	**41**	**42**	**43**	**44**	**45**	**46**	**47**	**48**	**49**	**50**	**51**	**52**	**53**	**54**	**55**	**56**	**57**	**58**	**59**	**60**
Hemipsilichthys gobio	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acestridium scutatum	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0
Ancistrus brevipinnis	0	2	0	1	2	0	1	0	0	0	1	0	0	2	2	0	1	2	0	0	0	0	1	0	1	0	0	2	1	0
Chaetostoma breve	?	2	0	0	2	?	1	0	0	0	1	0	0	2	0	1	2	2	0	0	1	0	1	0	2	0	0	3	1	0
Crossoloricaria sp.	0	2	0	4	2	2	1	0	0	0	1	0	1	4	1	1	2	0	0	1	0	2	3	1	2	1	1	1	2	0
Dasyloricaria filamentosa	2	3	0	0	1	2	1	0	0	0	1	0	1	3	1	2	2	2	0	1	0	2	2	1	2	1	3	2	2	0
Dasyloricaria latiura	0	3	0	0	2	2	1	0	0	0	1	0	1	4	1	2	2	1	0	1	0	2	2	1	2	1	3	2	2	0
Dasyloricaria paucisquama	0	3	0	0	1	2	1	0	0	0	1	0	1	4	1	2	2	1	0	1	0	2	2	1	2	1	2	2	2	0
Hemiloricaria lanceolata	0	3	0	1	1	2	1	0	0	1	1	0	1	3	1	1	1	1	0	1	0	2	3	1	2	1	2	2	2	0
Hemiodontichthys acipenserinus	0	3	0	0	1	2	1	0	0	0	1	0	1	1	1	1	0	1	0	1	0	-	-	1	2	-	-	?	2	?
Hisonotus laevior	0	0	0	0	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	1	0	0
Limatulichthys griseus	0	3	0	0	1	2	1	0	0	0	1	0	1	4	0	2	2	1	0	1	0	2	3	1	2	1	2	2	2	0
Loricaria sp.	0	3	0	0	2	2	1	0	0	0	0	0	1	4	1	2	0	1	0	1	0	2	2	1	2	1	2	2	2	0
Loricariichthys anus	0	3	0	1	1	2	1	0	0	0	1	0	1	4	0	2	1	1	0	1	0	-	-	1	2	-	-	?	2	?
Loricariichthys platymetopon	0	3	0	1	1	2	1	0	0	0	1	0	1	4	1	2	1	1	0	1	0	-	-	1	2	-	-	?	2	?
Neoplecostomus microps	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	1	0	0	0	0	0	1	1	2	0	0	2	0	0
Pareiorhaphis calmoni	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	2	0	0
Parotocinclus maculicauda	0	0	0	1	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	1	0	0
Pterygoplichthys lituratus	?	3	0	2	2	2	1	0	0	0	1	0	1	4	2	0	2	2	0	1	0	0	1	1	2	0	2	2	1	0
Rineloricaria cadeae	0	3	0	1	1	?	1	0	0	0	1	0	1	3	1	1	2	1	0	1	0	2	3	1	2	1	2	1	2	0
Rineloricaria quadrensis	0	3	0	1	1	2	1	0	0	0	1	0	1	3	1	1	2	1	0	1	0	2	3	1	2	1	2	2	2	0
Spatuloricaria puganensis	0	3	0	4	1	2	1	0	0	0	1	0	1	3	1	2	0	0	0	1	0	2	3	1	2	1	3	3	2	0

Taxon/Character	**61**	**62**	**63**	**64**	**65**	**66**	**67**	**68**	**69**	**70**	**71**	**72**	**73**	**74**	**75**	**76**	**77**	**78**	**79**	**80**	**81**	**82**	**83**	**84**	**85**	**86**	**87**	**88**	**89**	**90**
Hemipsilichthys gobio	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acestridium scutatum	1	0	0	0	1	2	2	1	1	0	1	0	0	0	0	2	1	1	0	1	0	?	0	?	?	3	2	1	2	3
Ancistrus brevipinnis	0	0	0	0	1	0	0	0	2	1	1	0	1	0	1	2	1	3	1	0	0	0	1	1	0	3	2	0	3	2
Chaetostoma breve	1	0	0	0	0	1	0	0	1	1	1	0	1	0	0	0	0	3	1	0	0	?	1	?	?	3	2	0	3	3
Crossoloricaria sp.	0	0	1	1	0	2	2	1	1	1	0	4	1	1	3	3	1	3	1	0	0	1	1	1	0	0	2	0	3	2
Dasyloricaria filamentosa	1	0	1	1	1	2	2	1	0	0	0	4	1	0	2	3	1	1	0	0	0	1	1	0	1	3	2	1	0	2
Dasyloricaria latiura	1	0	1	1	1	2	2	1	0	0	0	4	1	0	2	3	1	1	0	0	0	1	1	0	1	3	2	1	0	2
Dasyloricaria paucisquama	1	0	1	1	1	2	2	1	0	1	0	4	1	0	2	3	1	1	0	0	0	1	1	0	1	3	2	1	0	2
Hemiloricaria lanceolata	0	0	0	1	0	2	2	1	2	1	0	4	1	1	3	3	1	1	1	1	1	1	1	0	1	3	2	1	3	3
Hemiodontichthys acipenserinus	-	2	2	?	?	2	2	1	0	0	0	4	1	1	2	3	1	3	1	0	0	0	1	0	1	3	2	1	0	3
Hisonotus laevior	1	0	0	0	2	2	1	1	0	1	1	0	1	0	0	2	1	1	1	0	0	0	1	1	1	0	0	0	1	1
Limatulichthys griseus	0	0	1	1	0	2	2	1	0	1	0	4	1	1	3	3	1	2	0	1	1	0	1	0	1	3	2	1	3	2
Loricaria sp.	0	1	2	1	1	2	2	1	0	0	0	4	1	1	0	3	1	1	0	1	1	1	0	0	1	3	2	1	3	2
Loricariichthys anus	1	0	1	1	2	2	1	1	0	0	0	4	0	1	2	3	1	1	1	0	0	1	1	0	1	3	2	1	3	2
Loricariichthys platymetopon	1	0	1	1	2	2	1	1	0	0	0	4	0	1	2	3	1	1	1	0	0	1	1	0	1	3	2	1	3	2
Neoplecostomus microps	0	0	0	0	1	2	2	1	2	1	1	0	0	0	0	2	1	1	1	0	0	0	1	0	1	1	0	0	3	0
Pareiorhaphis calmoni	0	0	0	0	1	0	0	0	2	1	1	0	1	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0
Parotocinclus maculicauda	1	0	0	0	1	2	1	1	0	1	1	0	0	0	0	2	1	1	1	0	0	0	0	1	0	0	0	0	1	1
Pterygoplichthys lituratus	1	0	0	0	1	2	2	1	0	1	0	0	1	1	1	2	1	1	0	0	0	0	1	1	0	3	2	0	1	3
Rineloricaria cadeae	0	0	0	1	0	2	2	1	0	0	0	4	1	1	3	3	1	1	1	0	0	1	1	0	1	3	2	1	1	2
Rineloricaria quadrensis	0	0	0	1	0	2	2	1	0	1	0	4	1	1	3	3	1	1	1	0	0	1	1	0	1	3	2	1	1	2
Spatuloricaria puganensis	1	0	1	1	1	2	2	1	1	1	1	4	0	1	0	3	1	1	1	0	0	1	1	0	1	3	2	1	3	2

Taxon/Character	**91**	**92**	**93**	**94**	**95**	**96**	**97**	**98**	**99**	**100**	**101**	**102**	**103**	**104**	**105**	**106**	**107**	**108**	**109**	**110**	**111**	**112**	**113**	**114**	**115**
Hemipsilichthys gobio	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acestridium scutatum	0	1	0	0	0	0	0	0	3	0	2	-	0	0	0	0	0	0	2	0	0	0	2	0	2
Ancistrus brevipinnis	0	0	0	0	1	2	0	0	0	0	1	1	0	1	0	0	0	0	2	0	0	0	1	3	1
Chaetostoma breve	2	1	0	0	0	?	?	?	0	0	1	1	0	1	0	0	0	0	2	0	0	0	1	3	1
Crossoloricaria sp.	2	1	0	3	1	2	1	1	0	1	2	-	2	3	0	2	2	0	1	1	-	0	2	3	3
Dasyloricaria filamentosa	1	1	0	3	1	2	1	1	0	1	2	-	0	0	0	1	2	0	1	0	2	0	3	4	3
Dasyloricaria latiura	0	1	0	3	1	2	1	2	0	1	2	-	0	0	0	1	1	0	1	0	2	0	3	4	3
Dasyloricaria paucisquama	1	1	0	3	1	2	1	3	0	1	2	-	0	0	0	1	1	0	1	0	2	0	3	4	3
Hemiloricaria lanceolata	0	0	0	3	0	2	1	2	0	1	2	-	0	0	0	1	2	0	1	1	-	0	3	4	3
Hemiodontichthys acipenserinus	2	1	0	3	0	2	0	0	1	0	2	-	1	2	0	1	1	0	0	0	0	0	0	2	2
Hisonotus laevior	0	0	0	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0
Limatulichthys griseus	2	1	0	3	1	1	1	1	1	1	2	-	0	0	0	1	1	0	0	0	2	0	0	3	2
Loricaria sp.	1	1	0	3	1	1	1	3	0	1	2	-	0	3	0	2	2	0	1	1	-	0	3	4	3
Loricariichthys anus	2	0	0	3	1	1	1	1	1	1	2	-	0	0	0	1	2	0	1	0	2	0	3	2	3
Loricariichthys platymetopon	2	0	0	3	0	1	1	1	1	1	2	-	0	0	0	1	2	0	1	0	2	0	3	2	3
Neoplecostomus microps	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	2	0	0	0	2	1	0
Pareiorhaphis calmoni	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	1	0	0	0	2	1	0
Parotocinclus maculicauda	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	2	0	0
Pterygoplichthys lituratus	2	1	0	0	2	2	0	0	3	0	2	-	1	1	0	0	0	0	1	0	0	0	1	3	1
Rineloricaria cadeae	0	1	0	3	0	2	1	1	0	1	2	-	0	0	0	1	1	0	1	1	-	0	3	4	3
Rineloricaria quadrensis	0	1	0	3	0	2	1	2	0	1	2	-	0	0	0	1	1	0	1	1	-	0	3	4	3
Spatuloricaria puganensis	2	2	0	3	0	?	?	?	0	1	2	-	0	3	0	1	2	0	1	1	-	0	1	4	2

Taxon/Character	**116**	**117**	**118**	**119**	**120**	**121**	**122**	**123**	**124**	**125**	**126**	**127**	**128**	**129**	**130**	**131**	**132**	**133**	**134**	**135**	**136**
Hemipsilichthys gobio	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acestridium scutatum	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
Ancistrus brevipinnis	1	0	0	2	1	?	0	0	0	0	0	0	0	0	0	1	0	0	0	2	2
Chaetostoma breve	1	0	0	2	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	2	2
Crossoloricaria sp.	4	1	2	0	0	?	0	0	0	0	2	0	0	0	2	0	1	0	0	0	2
Dasyloricaria filamentosa	4	0	1	0	0	0	0	0	0	2	2	0	0	0	2	1	1	0	0	0	2
Dasyloricaria latiura	4	0	1	0	0	0	0	0	0	2	2	0	0	0	2	1	1	0	0	0	2
Dasyloricaria paucisquama	4	0	1	0	0	0	0	0	0	2	2	0	0	0	2	1	1	0	0	0	2
Hemiloricaria lanceolata	2	0	2	0	0	0	0	0	0	3	2	0	0	0	1	0	0	1	0	2	1
Hemiodontichthys acipenserinus	4	1	2	0	0	0	0	0	0	0	2	0	0	0	2	0	1	0	0	0	2
Hisonotus laevior	3	0	0	2	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
Limatulichthys griseus	4	1	2	0	0	0	0	0	0	2	2	0	2	0	0	0	1	2	0	0	2
Loricaria sp.	4	0	2	0	0	?	0	0	0	2	2	0	0	0	2	1	1	0	0	0	2
Loricariichthys anus	4	1	1	0	0	0	0	0	0	1	2	0	0	0	2	1	1	0	3	0	2
Loricariichthys platymetopon	4	0	1	0	0	0	0	0	0	1	2	0	0	0	2	1	1	0	3	0	2
Neoplecostomus microps	3	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Pareiorhaphis calmoni	1	0	0	2	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	2
Parotocinclus maculicauda	3	0	0	2	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	2	0
Pterygoplichthys lituratus	1	0	0	2	1	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	2
Rineloricaria cadeae	4	0	1	0	0	0	0	0	0	2	2	1	0	0	1	0	0	0	0	2	1
Rineloricaria quadrensis	4	0	1	0	0	0	0	0	0	2	2	1	0	0	1	0	0	0	0	2	1
Spatuloricaria puganensis	4	0	1	0	0	0	0	0	0	1	2	0	2	0	2	0	1	0	3	0	1

Taxon/Character	**137**	**138**	**139**	**140**	**141**	**142**	**143**	**144**	**145**	**146**	**147**	**148**	**149**	**150**	**151**	**152**	**153**	**154**	**155**	**156**
Hemipsilichthys gobio	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acestridium scutatum	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	2
Ancistrus brevipinnis	0	0	0	1	0	0	0	0	1	1	0	0	0	5	2	1	0	0	0	0
Chaetostoma breve	0	0	0	1	0	0	0	0	1	0	2	0	0	5	2	1	0	0	?	1
Crossoloricaria sp.	3	0	0	3	0	2	1	0	1	1	0	1	0	1	0	1	2	0	2	2
Dasyloricaria filamentosa	3	0	0	3	0	1	1	0	1	1	0	1	0	2	2	1	2	0	2	2
Dasyloricaria latiura	3	0	0	3	0	2	1	0	1	1	0	1	0	2	2	1	0	0	1	2
Dasyloricaria paucisquama	3	0	0	3	0	1	1	0	1	1	0	1	0	2	2	1	2	0	2	2
Hemiloricaria lanceolata	3	0	0	3	0	2	1	0	1	1	0	1	0	1	2	1	0	0	0	1
Hemiodontichthys acipenserinus	3	0	0	0	0	1	1	0	1	1	0	1	0	4	1	1	2	0	?	2
Hisonotus laevior	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	1	0	1
Limatulichthys griseus	3	0	0	3	0	2	1	0	1	1	0	1	0	2	2	1	0	0	1	2
Loricaria sp.	3	0	0	3	0	2	1	0	1	1	0	1	0	2	2	1	0	0	1	2
Loricariichthys anus	3	0	0	3	0	2	1	0	1	1	0	1	0	2	2	1	0	0	0	2
Loricariichthys platymetopon	3	0	0	3	0	2	1	0	1	1	0	1	0	2	2	1	0	0	0	2
Neoplecostomus microps	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pareiorhaphis calmoni	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Parotocinclus maculicauda	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	2
Pterygoplichthys lituratus	0	1	1	0	0	0	0	0	1	1	2	0	0	1	2	1	0	0	1	0
Rineloricaria cadeae	3	0	0	3	0	2	1	0	1	1	0	1	0	1	2	1	2	0	1	0
Rineloricaria quadrensis	3	0	0	3	0	2	1	0	1	1	0	1	0	1	2	1	2	0	1	0
Spatuloricaria puganensis	3	1	1	3	0	2	1	0	1	1	0	1	0	1	2	1	0	0	?	0

Taxon/Character	**157**	**158**	**159**	**160**	**161**	**162**	**163**	**164**	**165**	**166**	**167**	**168**	**169**	**170**	**171**	**172**	**173**	**174**	**175**	**176**
Hemipsilichthys gobio	0	0	0	0	0	0	-	0	0	-	0	0	0	0	0	0	0	0	0	0
Acestridium scutatum	2	0	1	0	2	2	0	3	3	0	1	2	3	0	1	-	0	1	0	0
Ancistrus brevipinnis	0	0	1	0	0	0	0	0	1	0	0	0	1	1	0	4	0	0	1	3
Chaetostoma breve	0	1	0	1	0	0	0	0	1	0	0	0	1	1	0	4	0	0	1	0
Crossoloricaria sp.	2	0	1	1	0	0	2	0	3	0	1	3	3	3	1	-	1	0	2	0
Dasyloricaria filamentosa	3	0	1	1	0	0	1	0	3	0	0	0	0	3	0	1	1	0	2	2
Dasyloricaria latiura	3	0	1	0	1	0	1	0	3	0	0	0	0	3	1	-	1	0	2	2
Dasyloricaria paucisquama	3	0	1	1	0	0	1	0	3	0	0	0	0	3	0	1	1	0	2	2
Hemiloricaria lanceolata	0	1	2	1	0	0	1	0	3	0	1	0	0	3	1	-	1	0	2	1
Hemiodontichthys acipenserinus	2	0	1	1	2	0	2	0	3	0	0	0	0	3	1	-	1	2	2	0
Hisonotus laevior	0	0	0	0	0	2	0	3	3	0	1	2	3	0	0	4	0	1	0	0
Limatulichthys griseus	2	0	1	1	0	0	1	0	3	0	0	3	0	3	1	-	1	0	2	1
Loricaria sp.	2	0	1	1	0	0	1	0	3	0	0	1	3	3	0	3	1	0	2	0
Loricariichthys anus	3	1	2	1	0	0	2	2	3	0	0	0	0	3	0	1	1	0	2	0
Loricariichthys platymetopon	3	1	2	1	0	0	2	2	3	0	0	0	0	3	0	1	1	0	2	0
Neoplecostomus microps	0	0	0	0	0	0	0	0	1	0	0	0	2	1	0	3	0	0	0	0
Pareiorhaphis calmoni	0	0	1	0	0	0	0	0	3	0	0	0	2	1	0	4	0	0	0	0
Parotocinclus maculicauda	0	0	1	0	0	0	0	0	3	0	1	2	3	1	0	3	0	0	0	0
Pterygoplichthys lituratus	1	1	1	1	2	0	2	0	0	0	0	0	0	1	0	3	0	0	1	3
Rineloricaria cadeae	0	1	1	1	2	0	2	0	2	0	0	0	0	3	1	-	1	0	2	0
Rineloricaria quadrensis	2	0	1	1	2	0	2	0	2	0	0	0	0	3	0	0	1	0	2	0
Spatuloricaria puganensis	0	1	2	1	0	0	2	0	2	0	0	0	0	3	0	2	1	0	2	1

Taxon/Character	**177**	**178**	**179**	**180**	**181**	**182**	**183**	**184**	**185**	**186**	**187**	**188**	**189**	**190**	**191**	**192**	**193**	**194**	**195**	**196**
Hemipsilichthys gobio	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acestridium scutatum	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	1	1	1	3
Ancistrus brevipinnis	0	1	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	1	1	0
Chaetostoma breve	0	1	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	1	3
Crossoloricaria sp.	0	1	0	1	2	1	2	1	3	1	1	1	2	0	2	2	1	2	2	3
Dasyloricaria filamentosa	1	1	1	1	2	1	0	1	0	1	1	1	0	0	1	0	1	1	0	3
Dasyloricaria latiura	1	1	0	1	2	2	1	1	0	0	1	1	0	0	1	0	1	1	1	3
Dasyloricaria paucisquama	1	1	1	1	2	1	0	1	0	1	1	1	0	0	1	0	1	1	0	3
Hemiloricaria lanceolata	0	2	0	1	2	2	1	0	3	0	1	1	0	0	2	0	1	2	1	0
Hemiodontichthys acipenserinus	1	2	2	0	0	1	0	2	0	2	2	1	1	0	2	0	-	-	3	3
Hisonotus laevior	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	3
Limatulichthys griseus	1	2	0	1	2	2	2	1	3	1	1	1	1	0	0	1	1	2	0	3
Loricaria sp.	0	2	1	1	2	1	1	1	0	1	1	1	2	0	2	2	1	2	2	3
Loricariichthys anus	1	1	2	1	2	2	0	1	0	0	1	1	0	0	0	0	-	-	0	0
Loricariichthys platymetopon	1	1	2	1	2	2	0	1	0	0	1	1	1	0	2	0	-	-	0	0
Neoplecostomus microps	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	3
Pareiorhaphis calmoni	0	0	2	0	0	0	0	0	2	0	0	0	0	0	0	0	0	1	1	3
Parotocinclus maculicauda	0	0	2	0	0	0	0	0	3	1	0	0	0	0	0	0	1	1	2	0
Pterygoplichthys lituratus	0	1	2	0	0	0	2	0	0	0	1	0	0	0	1	0	0	1	1	0
Rineloricaria cadeae	0	1	1	1	2	1	0	1	0	0	0	1	0	0	1	0	1	2	1	3
Rineloricaria quadrensis	0	1	1	1	2	1	0	1	0	0	1	1	0	0	1	0	1	2	1	3
Spatuloricaria puganensis	1	2	0	1	2	2	1	1	0	1	2	1	1	0	2	0	1	1	1	3

Taxon/Character	**197**	**198**	**199**	**200**	**201**	**202**	**203**	**204**	**205**	**206**	**207**	**208**	**209**	**210**	**211**	**212**	**213**	**214**	**215**	**216**
Hemipsilichthys gobio	0	0	0	-	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acestridium scutatum	1	1	2	2	1	1	0	1	0	0	1	1	1	0	0	2	0	1	0	0
Ancistrus brevipinnis	2	0	0	-	-	0	0	0	0	2	2	0	0	0	0	1	0	0	0	0
Chaetostoma breve	4	0	0	-	-	0	0	0	0	1	2	0	0	0	0	1	0	1	0	0
Crossoloricaria sp.	0	1	0	0	0	1	0	0	0	0	1	0	1	0	1	4	1	3	0	1
Dasyloricaria filamentosa	0	1	2	2	1	2	0	0	0	0	1	1	1	0	1	4	2	2	0	1
Dasyloricaria latiura	0	1	2	2	1	1	0	0	0	1	1	1	1	0	1	4	1	2	0	1
Dasyloricaria paucisquama	0	1	2	2	1	2	0	0	0	0	1	1	1	0	1	4	0	2	0	1
Hemiloricaria lanceolata	0	1	2	2	0	1	0	0	0	1	1	1	1	0	1	4	1	3	0	5
Hemiodontichthys acipenserinus	0	1	0	3	1	2	0	0	0	0	0	1	1	0	1	4	0	1	0	2
Hisonotus laevior	0	1	2	0	0	0	0	1	0	0	1	1	1	0	0	1	0	1	0	1
Limatulichthys griseus	0	1	2	3	1	2	0	0	0	0	1	1	1	0	1	4	0	3	0	1
Loricaria sp.	0	1	2	2	0	1	0	0	0	2	1	0	1	0	1	4	1	2	0	2
Loricariichthys anus	2	1	2	2	1	2	0	0	0	1	1	1	1	0	1	4	0	1	0	5
Loricariichthys platymetopon	0	1	2	3	1	2	0	0	0	1	1	1	1	0	1	4	0	3	0	1
Neoplecostomus microps	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	1
Pareiorhaphis calmoni	0	0	0	-	-	0	0	0	0	0	1	0	0	0	0	1	0	0	0	1
Parotocinclus maculicauda	0	1	2	2	0	1	0	1	0	0	1	1	0	0	0	1	0	1	0	0
Pterygoplichthys lituratus	4	0	0	-	-	0	0	0	0	2	2	0	0	0	0	1	0	0	0	1
Rineloricaria cadeae	0	1	2	2	0	1	0	0	0	0	1	1	1	0	1	4	0	0	0	1
Rineloricaria quadrensis	0	1	2	2	0	2	0	0	0	0	1	1	1	0	1	4	0	2	0	1
Spatuloricaria puganensis	0	1	2	0	0	1	0	0	0	2	1	1	1	0	1	4	2	3	0	1

Taxon/Character	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Aposturisoma myriodon	1	0	0	0	1	2	1	1	0	1	1	3	1	0	1	1	0	2	1	0	2	0	1	0	1	0	1	0	0	2
Cteniloricaria platystoma	0	0	1	0	1	1	1	2	0	0	0	3	1	0	0	0	0	3	0	0	1	0	0	1	0	1	0	1	1	1
Farlowella acus	1	0	?	2	1	2	0	1	0	1	2	4	2	0	0	1	0	1	1	0	1	1	1	1	0	2	1	1	1	?
Farlowella amazonum	1	0	?	2	2	2	1	1	0	1	1	3	2	0	0	0	0	2	1	1	1	1	0	1	0	0	1	0	1	1
Farlowella curtirostra	1	0	?	2	1	2	2	1	0	1	1	3	2	0	0	0	0	?	1	1	1	1	0	1	0	0	1	0	1	?
Farlowella hahni	1	0	?	2	1	2	1	1	0	1	1	3	2	0	0	0	0	3	1	0	2	1	0	1	1	0	1	0	0	?
Farlowella hasemani	1	0	1	2	1	2	2	1	0	1	2	3	2	0	0	1	0	0	1	1	1	1	0	1	0	0	1	?	1	1
Farlowella henriquei	1	0	1	2	1	2	1	1	0	1	1	1	2	0	0	0	0	2	1	1	1	1	0	1	1	2	1	0	1	1
Farlowella isbruckeri	1	0	1	2	1	2	0	1	0	1	2	3	2	2	0	1	0	2	1	0	1	1	0	1	1	2	1	0	1	1
Farlowella jauruensis	1	0	1	2	2	2	2	1	0	1	2	3	2	0	0	1	0	1	1	0	1	1	0	1	0	2	1	0	1	1
Farlowella knerii	1	0	0	2	1	2	1	1	0	1	1	1	2	0	0	0	0	0	1	1	1	1	0	0	0	0	1	0	1	?
Farlowella mariaelenae	1	0	0	2	1	2	2	1	0	1	2	3	2	2	0	1	0	1	1	0	1	1	0	1	1	0	1	0	1	1
Farlowella nattereri	1	0	1	2	1	2	1	1	0	1	1	1	2	0	0	0	0	0	1	1	1	1	0	1	1	0	1	0	1	?
Farlowella oxyrryncha	1	0	1	2	1	2	2	1	0	1	2	3	2	0	0	1	0	0	1	1	1	1	0	1	1	0	1	0	1	0
Farlowella paraguayensis	1	0	0	2	1	2	1	1	0	1	1	1	2	0	0	0	0	2	1	1	1	1	0	1	0	0	1	0	1	1
Farlowella platorynchus	1	0	1	2	1	2	1	1	0	1	1	0	2	0	0	1	0	0	1	1	2	1	0	1	0	0	1	0	1	1
Farlowella reticulata	1	0	1	2	2	2	2	1	0	1	1	3	2	0	0	1	0	1	1	0	1	1	0	1	0	0	1	0	1	1
Farlowella rugosa	1	0	1	2	1	2	2	1	0	1	1	1	2	0	0	0	0	2	1	2	1	1	0	1	0	0	1	0	1	1
Farlowella schreitmuelleri	1	0	0	2	1	2	1	1	0	1	1	1	2	1	0	0	0	0	1	1	1	1	0	1	0	0	1	0	1	1
Farlowella smithi	1	0	0	2	2	2	2	1	0	1	2	3	2	0	0	0	0	0	1	0	1	1	0	1	0	0	1	0	1	1
Farlowella venezuelensis	1	0	1	2	1	2	1	1	0	1	1	3	2	0	0	0	0	0	1	2	1	1	0	1	0	2	1	0	1	?
Farlowella vittata	1	0	1	2	1	2	2	1	0	1	1	3	2	1	0	0	0	1	1	1	1	1	0	1	1	0	1	0	1	1

Taxon/Character	**31**	**32**	**33**	**34**	**35**	**36**	**37**	**38**	**39**	**40**	**41**	**42**	**43**	**44**	**45**	**46**	**47**	**48**	**49**	**50**	**51**	**52**	**53**	**54**	**55**	**56**	**57**	**58**	**59**	**60**
Aposturisoma myriodon	0	0	1	0	2	1	2	1	0	0	0	0	0	4	0	2	1	2	0	0	0	0	0	0	0	0	1	0	1	1
Cteniloricaria platystoma	0	1	1	2	0	0	2	1	0	0	1	0	0	4	0	2	1	2	1	0	1	0	1	0	1	0	0	1	1	1
Farlowella acus	?	1	1	1	2	?	2	0	0	0	1	0	0	2	1	1	0	2	0	0	?	1	1	0	2	0	1	2	1	1
Farlowella amazonum	0	1	1	1	2	0	2	0	2	0	1	0	0	2	1	1	0	2	1	0	0	1	1	0	0	0	2	2	1	1
Farlowella curtirostra	?	1	1	1	2	?	2	0	2	0	1	0	1	3	1	1	1	2	1	0	?	?	1	0	0	0	2	2	1	1
Farlowella hahni	?	1	1	0	2	3	2	0	2	0	1	0	1	3	1	1	1	2	1	0	?	1	1	0	0	0	2	2	1	1
Farlowella hasemani	2	1	1	0	2	?	2	0	2	0	1	0	1	3	1	2	1	2	1	0	0	1	1	0	0	0	2	2	1	1
Farlowella henriquei	0	1	1	1	2	0	2	0	1	0	1	0	1	3	1	1	1	0	1	0	0	1	1	0	0	0	2	2	1	1
Farlowella isbruckeri	2	1	1	1	2	0	2	0	2	0	1	0	1	3	1	2	1	2	1	0	0	1	1	0	0	0	2	2	1	1
Farlowella jauruensis	0	1	1	0	1	0	2	0	0	0	1	0	1	3	1	1	1	0	1	0	0	1	1	0	0	0	2	2	1	1
Farlowella knerii	?	1	1	0	2	0	2	0	0	0	1	0	1	3	1	2	1	2	1	0	0	1	1	0	0	0	2	2	1	1
Farlowella mariaelenae	0	1	1	0	2	0	2	0	0	0	1	0	1	4	1	1	1	2	1	0	0	1	1	0	0	0	2	2	1	1
Farlowella nattereri	?	1	1	0	2	0	2	0	0	0	1	0	1	4	1	2	1	2	1	0	0	1	1	0	0	0	2	2	1	1
Farlowella oxyrryncha	1	1	1	0	2	0	2	0	2	0	1	0	1	3	1	1	0	0	1	0	0	1	2	0	0	0	2	1	1	1
Farlowella paraguayensis	2	1	1	3	2	0	2	0	0	0	1	0	1	3	1	1	1	0	0	0	0	1	1	0	0	0	2	2	1	1
Farlowella platorynchus	1	1	1	1	2	0	2	1	2	0	1	0	0	4	1	2	1	2	1	0	0	1	1	0	0	0	2	1	1	1
Farlowella reticulata	0	1	1	1	2	0	2	0	0	1	1	0	1	4	1	1	1	2	1	0	0	1	1	0	0	0	2	2	1	1
Farlowella rugosa	0	1	1	1	2	0	2	0	0	0	1	0	1	4	1	1	1	2	1	0	0	1	2	0	0	0	2	2	1	1
Farlowella schreitmuelleri	0	1	1	1	2	0	2	0	0	0	1	0	1	4	1	1	1	2	1	0	0	0	1	0	0	0	2	1	1	1
Farlowella smithi	2	1	1	0	1	0	2	0	0	0	1	0	1	4	1	2	1	0	1	0	0	1	1	0	0	0	2	1	1	1
Farlowella venezuelensis	?	1	1	0	2	?	2	0	0	0	1	0	1	4	1	1	1	2	1	0	0	1	2	0	0	0	1	1	1	1
Farlowella vittata	0	1	1	1	2	0	2	0	2	1	1	0	1	4	1	2	1	2	1	0	0	0	1	0	0	0	1	2	1	1

Taxon/Character	**61**	**62**	**63**	**64**	**65**	**66**	**67**	**68**	**69**	**70**	**71**	**72**	**73**	**74**	**75**	**76**	**77**	**78**	**79**	**80**	**81**	**82**	**83**	**84**	**85**	**86**	**87**	**88**	**89**	**90**
Aposturisoma myriodon	0	0	0	0	1	1	0	1	1	0	0	0	0	0	2	1	1	2	0	1	1	0	0	1	0	2	1	0	1	1
Cteniloricaria platystoma	0	0	0	0	1	2	1	1	2	0	0	0	1	0	1	1	1	2	1	1	0	0	0	0	1	0	1	0	0	3
Farlowella acus	0	0	0	0	1	2	2	1	1	1	0	1	1	0	2	1	1	2	0	1	1	0	1	?	?	0	1	1	2	2
Farlowella amazonum	0	0	0	0	1	2	2	1	1	0	0	1	0	0	2	2	1	2	0	1	1	0	0	1	0	0	1	1	1	2
Farlowella curtirostra	0	0	0	0	1	2	1	1	1	1	0	3	1	0	2	1	1	2	0	1	1	0	0	1	0	0	1	1	2	2
Farlowella hahni	0	0	0	0	1	2	2	1	2	0	1	3	1	0	2	2	1	2	1	1	1	0	1	0	1	0	1	1	1	2
Farlowella hasemani	0	0	0	0	1	2	2	1	2	0	1	1	1	0	2	2	1	2	1	1	1	?	1	?	?	0	1	1	2	2
Farlowella henriquei	0	0	0	0	1	2	2	1	1	0	0	1	0	0	2	2	1	2	1	1	1	0	1	1	0	0	1	1	2	2
Farlowella isbruckeri	0	0	0	0	1	2	1	1	2	1	1	1	0	0	2	1	1	2	0	1	1	0	1	1	0	0	1	1	1	2
Farlowella jauruensis	0	0	0	0	2	2	2	1	1	1	0	3	0	0	2	2	1	2	0	1	1	0	1	1	0	0	1	1	1	2
Farlowella knerii	0	0	0	0	2	2	2	1	2	0	0	1	0	0	2	2	1	2	1	1	1	0	1	1	0	0	1	1	1	2
Farlowella mariaelenae	0	0	0	0	2	2	2	1	2	1	0	3	0	0	2	2	1	2	0	1	1	0	0	1	0	0	1	1	1	2
Farlowella nattereri	0	0	0	0	1	2	1	1	1	0	0	1	0	0	2	2	1	2	1	1	1	0	1	1	0	0	1	1	1	2
Farlowella oxyrryncha	0	0	0	0	2	2	1	1	2	0	1	1	1	0	1	1	1	2	0	1	1	0	0	1	0	0	1	1	1	2
Farlowella paraguayensis	0	0	0	0	2	2	2	1	2	0	1	3	0	0	1	2	1	2	0	1	1	0	1	1	0	0	1	1	1	2
Farlowella platorynchus	0	0	0	0	2	2	2	1	2	0	0	3	1	0	1	1	1	2	0	1	1	0	1	1	0	0	1	1	1	2
Farlowella reticulata	0	0	0	0	2	2	1	1	1	0	0	3	1	0	2	2	1	2	0	1	1	0	1	1	0	0	1	1	1	2
Farlowella rugosa	0	0	0	0	1	2	1	1	0	0	0	3	1	0	2	2	1	2	1	1	1	0	1	1	0	0	1	1	1	2
Farlowella schreitmuelleri	0	0	0	0	2	2	2	1	2	1	0	1	1	0	2	2	1	2	0	1	1	0	1	1	0	0	1	1	1	2
Farlowella smithi	0	0	0	0	2	2	2	1	2	1	0	3	1	0	2	2	1	2	0	1	1	0	1	1	0	0	1	1	1	2
Farlowella venezuelensis	0	0	0	0	2	2	1	1	1	1	1	3	1	0	2	2	1	2	0	1	1	0	1	1	0	0	1	1	1	2
Farlowella vittata	0	0	0	0	1	2	2	1	2	1	1	3	1	0	1	2	1	2	0	1	1	0	1	1	0	0	1	1	1	2

Taxon/Character	**91**	**92**	**93**	**94**	**95**	**96**	**97**	**98**	**99**	**100**	**101**	**102**	**103**	**104**	**105**	**106**	**107**	**108**	**109**	**110**	**111**	**112**	**113**	**114**	**115**
Aposturisoma myriodon	0	1	0	2	2	3	1	1	0	1	0	1	1	2	1	-	3	1	-	0	0	1	2	1	2
Cteniloricaria platystoma	1	0	1	2	0	1	1	1	0	1	1	1	2	0	0	0	0	0	0	0	1	1	4	1	0
Farlowella acus	0	1	0	1	0	2	1	3	0	1	0	1	0	0	0	0	0	0	2	0	0	1	2	1	3
Farlowella amazonum	0	1	0	1	0	2	1	3	0	1	0	1	0	0	0	0	0	0	2	1	-	0	3	1	3
Farlowella curtirostra	0	1	0	1	0	3	1	1	0	1	0	1	0	0	0	0	0	0	2	0	2	1	2	1	3
Farlowella hahni	0	1	0	1	0	2	1	3	0	1	0	1	2	0	1	-	3	0	2	0	2	1	3	1	2
Farlowella hasemani	0	1	0	1	0	2	1	3	0	1	0	1	0	0	0	0	0	0	2	0	0	1	2	1	2
Farlowella henriquei	0	1	0	1	0	2	1	3	0	1	0	1	0	0	0	0	0	1	-	0	0	1	2	1	0
Farlowella isbruckeri	0	1	0	1	0	2	1	2	0	1	0	1	0	0	0	0	0	1	-	1	-	1	3	1	2
Farlowella jauruensis	0	1	0	1	0	2	1	3	0	1	0	1	0	0	0	0	0	1	-	1	-	1	3	1	2
Farlowella knerii	0	1	0	1	0	2	1	3	0	1	0	1	2	0	0	0	0	1	-	1	-	1	2	1	2
Farlowella mariaelenae	0	1	0	1	0	2	1	3	0	1	0	1	0	0	0	0	0	0	2	0	0	1	2	1	2
Farlowella nattereri	0	1	0	1	0	2	1	3	0	1	0	1	2	0	0	0	0	1	-	0	0	1	1	1	2
Farlowella oxyrryncha	2	1	0	1	0	2	1	2	0	1	0	1	0	0	0	0	0	0	1	1	-	0	3	1	2
Farlowella paraguayensis	0	1	0	1	0	2	1	2	0	1	0	1	0	0	0	0	0	1	-	0	2	0	2	1	2
Farlowella platorynchus	0	1	0	1	0	3	1	3	0	1	0	1	2	0	0	0	0	0	0	0	0	0	3	1	3
Farlowella reticulata	0	1	0	1	0	2	1	3	0	1	0	1	2	0	0	0	0	0	1	0	2	0	3	1	2
Farlowella rugosa	2	1	0	1	0	3	1	2	0	1	0	1	2	0	0	0	0	0	2	0	0	1	1	1	2
Farlowella schreitmuelleri	2	1	0	1	0	2	1	3	0	1	0	1	0	0	0	0	0	0	2	0	2	0	3	1	2
Farlowella smithi	2	1	0	1	0	2	1	2	0	1	0	1	0	0	0	0	0	1	-	0	0	1	3	1	2
Farlowella venezuelensis	0	1	0	1	0	2	1	3	0	1	0	1	0	0	0	0	0	1	-	0	0	1	1	3	2
Farlowella vittata	0	1	0	1	0	2	1	2	0	1	0	1	0	0	0	0	0	0	2	1	-	1	2	1	2

Taxon/Character	**116**	**117**	**118**	**119**	**120**	**121**	**122**	**123**	**124**	**125**	**126**	**127**	**128**	**129**	**130**	**131**	**132**	**133**	**134**	**135**	**136**
Aposturisoma myriodon	2	1	0	2	1	0	0	0	0	0	2	1	0	?	3	1	1	1	0	0	1
Cteniloricaria platystoma	1	0	0	1	1	0	2	0	0	0	2	1	0	1	0	1	0	0	1	2	1
Farlowella acus	1	0	0	2	1	1	0	0	0	0	1	0	0	?	?	1	1	1	3	0	2
Farlowella amazonum	1	0	0	2	1	1	0	0	0	0	1	0	0	2	3	1	1	1	3	0	2
Farlowella curtirostra	1	0	0	2	1	1	0	0	0	0	1	0	0	2	3	1	1	1	3	0	2
Farlowella hahni	1	0	0	2	1	1	0	0	0	0	1	0	0	2	3	3	1	1	3	0	2
Farlowella hasemani	1	0	0	2	1	1	0	0	0	0	1	0	0	2	3	3	1	1	3	0	2
Farlowella henriquei	1	0	0	2	1	1	0	0	0	0	1	0	0	2	3	0	1	1	3	0	2
Farlowella isbruckeri	2	0	0	2	1	1	0	0	0	1	1	0	0	2	3	0	1	1	1	0	2
Farlowella jauruensis	2	0	0	2	1	1	0	0	0	0	1	0	2	2	3	0	1	1	2	0	2
Farlowella knerii	2	0	0	2	1	1	0	0	0	0	1	0	1	2	3	1	1	1	3	0	2
Farlowella mariaelenae	2	0	0	2	1	1	0	0	0	0	1	0	0	1	3	1	0	1	3	0	2
Farlowella nattereri	2	1	0	2	1	1	0	0	0	0	1	0	0	2	3	0	1	1	3	0	2
Farlowella oxyrryncha	1	1	0	2	1	1	0	0	0	0	1	0	0	2	3	0	1	1	3	0	2
Farlowella paraguayensis	2	0	0	2	1	1	0	0	0	1	1	0	0	2	3	1	1	1	3	0	2
Farlowella platorynchus	3	0	0	2	1	1	0	0	0	1	1	0	0	2	3	1	1	1	3	0	2
Farlowella reticulata	1	1	0	2	1	1	0	0	0	0	1	0	0	2	3	0	1	1	2	0	2
Farlowella rugosa	2	0	0	2	1	1	0	0	0	0	1	0	0	2	3	0	1	1	3	0	2
Farlowella schreitmuelleri	2	0	0	2	1	1	0	0	0	0	1	0	0	2	3	0	1	1	3	0	2
Farlowella smithi	2	0	0	2	1	1	0	0	0	0	1	0	0	2	3	1	1	1	3	0	2
Farlowella venezuelensis	1	0	0	2	1	1	0	0	0	1	1	0	0	2	3	1	1	1	2	0	2
Farlowella vittata	1	0	0	2	1	1	0	0	0	0	1	0	0	2	3	1	1	1	1	0	2

Taxon/Character	**137**	**138**	**139**	**140**	**141**	**142**	**143**	**144**	**145**	**146**	**147**	**148**	**149**	**150**	**151**	**152**	**153**	**154**	**155**	**156**
Aposturisoma myriodon	3	1	1	3	1	2	1	0	1	1	1	1	0	4	0	0	3	0	1	1
Cteniloricaria platystoma	1	0	0	3	0	1	1	1	1	1	1	1	0	3	0	1	2	0	1	1
Farlowella acus	3	1	1	1	1	0	1	0	1	1	1	1	0	1	0	0	4	0	?	2
Farlowella amazonum	3	1	1	2	1	0	1	0	1	1	1	1	0	4	0	0	4	0	1	0
Farlowella curtirostra	3	1	1	2	1	0	1	0	1	1	1	1	0	4	0	1	4	0	1	0
Farlowella hahni	3	1	1	2	1	0	1	0	1	1	1	1	0	4	0	1	4	0	1	0
Farlowella hasemani	3	1	1	2	1	1	1	0	1	1	1	1	0	4	0	0	4	0	?	2
Farlowella henriquei	3	0	0	2	1	2	1	0	1	1	1	1	0	4	0	0	4	0	1	2
Farlowella isbruckeri	3	0	0	3	1	0	1	0	1	1	1	1	0	1	0	1	4	0	1	0
Farlowella jauruensis	3	0	0	2	1	0	1	0	1	1	1	1	0	4	0	0	4	0	1	1
Farlowella knerii	2	0	0	2	1	0	1	0	1	1	1	1	0	4	0	0	4	0	1	0
Farlowella mariaelenae	3	0	0	3	1	0	1	0	1	1	1	1	0	1	0	1	0	0	2	0
Farlowella nattereri	3	0	0	2	1	2	1	0	1	1	1	1	0	1	0	1	4	0	?	0
Farlowella oxyrryncha	3	1	1	3	1	0	1	0	1	1	1	1	0	1	0	0	4	0	1	0
Farlowella paraguayensis	3	0	0	3	1	0	1	0	1	1	1	1	0	4	0	0	0	0	?	0
Farlowella platorynchus	3	1	1	3	1	0	1	0	1	1	1	1	0	4	0	0	4	0	2	2
Farlowella reticulata	3	0	0	3	1	1	1	0	1	1	1	1	0	4	0	0	4	0	1	2
Farlowella rugosa	3	0	0	3	1	0	1	0	1	1	1	1	0	4	0	0	4	0	1	0
Farlowella schreitmuelleri	3	0	0	3	1	0	1	1	1	1	1	1	0	4	0	0	4	0	1	0
Farlowella smithi	3	1	1	2	1	1	1	0	1	1	1	1	0	4	0	1	4	0	1	0
Farlowella venezuelensis	3	0	0	3	1	1	1	0	1	1	1	1	0	1	0	0	4	0	?	0
Farlowella vittata	3	0	0	2	1	1	1	0	1	1	1	1	0	4	0	0	4	0	1	0

Taxon/Character	**157**	**158**	**159**	**160**	**161**	**162**	**163**	**164**	**165**	**166**	**167**	**168**	**169**	**170**	**171**	**172**	**173**	**174**	**175**	**176**
Aposturisoma myriodon	0	0	1	0	0	0	2	0	3	0	0	4	0	2	0	2	1	2	2	1
Cteniloricaria platystoma	0	0	1	1	2	0	2	0	1	1	1	0	0	1	1	-	1	1	2	0
Farlowella acus	2	0	1	0	0	0	0	0	3	0	0	4	0	2	1	-	1	1	0	1
Farlowella amazonum	2	0	1	0	2	0	0	0	3	0	0	4	0	2	1	-	1	1	0	1
Farlowella curtirostra	2	0	1	1	0	0	0	0	3	0	0	4	0	2	1	-	1	1	0	1
Farlowella hahni	2	0	1	0	0	0	2	0	2	0	0	4	0	2	0	2	1	1	0	1
Farlowella hasemani	2	0	1	1	1	0	2	1	3	0	0	4	0	2	0	1	1	2	0	2
Farlowella henriquei	3	0	1	1	0	0	2	1	1	0	0	4	0	2	0	2	1	2	0	0
Farlowella isbruckeri	2	0	1	1	2	0	2	0	2	0	0	4	0	2	1	-	1	1	0	1
Farlowella jauruensis	2	0	1	0	0	0	2	0	2	0	0	4	0	2	0	1	1	1	0	0
Farlowella knerii	3	0	1	1	2	0	2	0	1	0	0	4	0	2	0	2	1	2	0	0
Farlowella mariaelenae	3	0	1	0	0	0	0	0	1	0	0	4	0	2	0	2	1	1	0	1
Farlowella nattereri	2	0	1	1	0	0	0	1	2	0	0	4	0	2	0	2	1	1	0	0
Farlowella oxyrryncha	3	0	1	0	2	0	1	0	3	0	1	4	0	2	0	1	1	2	0	2
Farlowella paraguayensis	3	0	1	1	1	0	2	0	2	0	0	4	0	2	0	1	1	1	0	0
Farlowella platorynchus	3	0	1	1	0	0	2	1	2	0	0	4	0	2	0	1	1	2	0	0
Farlowella reticulata	2	0	1	0	2	0	1	0	1	0	0	4	0	2	1	-	1	2	0	0
Farlowella rugosa	2	0	1	1	0	0	1	0	1	0	0	4	0	2	0	2	1	2	0	0
Farlowella schreitmuelleri	2	0	1	1	0	0	0	0	3	0	0	4	0	2	0	2	1	2	0	0
Farlowella smithi	2	0	1	0	0	0	2	0	1	0	0	4	0	2	0	1	1	1	0	1
Farlowella venezuelensis	2	0	1	1	0	0	2	1	3	0	0	4	0	2	0	2	1	1	0	0
Farlowella vittata	2	0	1	0	0	0	1	2	3	0	0	4	0	2	0	1	1	2	0	0

Taxon/Character	**177**	**178**	**179**	**180**	**181**	**182**	**183**	**184**	**185**	**186**	**187**	**188**	**189**	**190**	**191**	**192**	**193**	**194**	**195**	**196**
Aposturisoma myriodon	0	2	2	1	2	0	0	1	?	0	?	0	0	1	0	?	0	?	1	0
Cteniloricaria platystoma	0	2	2	1	2	2	1	1	0	2	1	0	0	0	0	0	0	1	1	0
Farlowella acus	0	2	2	1	2	1	0	2	0	0	0	0	0	1	3	0	0	1	0	3
Farlowella amazonum	1	2	2	1	2	1	1	2	3	1	0	0	0	1	3	0	0	1	0	3
Farlowella curtirostra	1	2	2	1	2	1	2	1	3	2	0	0	0	1	3	1	0	1	0	3
Farlowella hahni	1	2	2	1	2	1	1	2	3	1	0	0	0	1	0	1	0	1	1	3
Farlowella hasemani	1	2	2	1	2	1	1	2	3	0	0	0	0	1	3	1	0	1	1	3
Farlowella henriquei	0	2	0	1	2	1	2	2	3	0	0	0	0	1	3	0	0	1	1	3
Farlowella isbruckeri	0	2	0	1	2	1	1	2	3	1	0	0	0	1	0	1	0	1	1	3
Farlowella jauruensis	1	2	2	1	2	1	0	2	3	0	0	0	0	1	3	1	0	1	1	3
Farlowella knerii	0	2	0	1	2	1	1	2	0	0	0	0	0	1	0	1	0	1	1	3
Farlowella mariaelenae	1	2	0	1	2	1	0	2	3	0	0	0	0	1	3	1	0	1	1	3
Farlowella nattereri	0	2	1	1	2	1	1	2	3	0	0	0	0	1	3	1	0	1	1	3
Farlowella oxyrryncha	1	2	0	1	2	1	2	2	3	0	0	0	0	1	0	1	0	1	1	3
Farlowella paraguayensis	1	2	2	1	2	1	2	2	0	0	0	0	0	1	3	1	0	1	1	3
Farlowella platorynchus	0	2	2	1	2	1	0	2	3	0	0	0	0	1	3	0	0	1	1	3
Farlowella reticulata	0	2	0	1	2	1	0	2	3	0	0	0	0	1	3	0	0	1	1	3
Farlowella rugosa	1	2	2	1	2	1	2	2	3	1	0	0	0	1	0	1	0	1	1	3
Farlowella schreitmuelleri	1	2	0	1	2	1	0	2	3	0	0	0	0	1	0	1	0	1	1	3
Farlowella smithi	0	2	0	1	2	1	2	2	3	0	0	0	0	1	3	1	0	1	1	3
Farlowella venezuelensis	1	2	0	1	2	1	0	2	0	1	0	0	0	1	0	1	0	1	1	3
Farlowella vittata	0	2	2	1	2	1	0	2	0	0	0	0	0	1	0	1	0	1	1	3

Taxon/Character	**197**	**198**	**199**	**200**	**201**	**202**	**203**	**204**	**205**	**206**	**207**	**208**	**209**	**210**	**211**	**212**	**213**	**214**	**215**	**216**
Aposturisoma myriodon	?	1	1	3	1	2	0	0	0	0	1	1	1	0	1	2	0	1	0	2
Ctenilocaria platystoma	0	1	2	1	0	2	0	0	0	1	0	1	1	0	1	2	0	0	1	3
Farlowella acus	3	1	1	3	1	2	0	0	0	0	1	1	1	0	1	4	0	1	0	1
Farlowella amazonum	3	1	1	3	1	2	0	0	0	0	1	1	1	0	1	3	0	1	0	1
Farlowella curtirostra	3	1	1	3	1	2	0	0	0	0	1	1	1	0	1	4	0	6	0	1
Farlowella hahni	3	1	1	3	1	2	0	0	0	0	1	1	1	0	1	3	0	1	0	1
Farlowella hasemani	3	1	1	3	1	2	0	0	0	0	1	1	1	0	1	3	1	6	0	1
Farlowella henriquei	3	1	1	3	1	2	0	0	0	0	1	1	1	0	1	4	1	6	0	1
Farlowella isbruckeri	3	1	1	3	1	2	0	0	0	0	1	1	1	0	1	3	0	6	0	1
Farlowella jauruensis	3	1	1	3	1	2	0	0	0	0	1	1	1	0	1	3	1	6	0	1
Farlowella kneri	3	1	1	3	1	2	0	0	0	0	1	1	1	0	1	3	0	6	0	1
Farlowella mariaelenae	3	1	1	3	1	2	0	0	0	0	1	1	1	0	1	3	1	6	0	1
Farlowella nattereri	3	1	1	3	1	2	0	0	0	0	1	1	1	0	1	4	1	6	0	1
Farlowella oxyrryncha	3	1	1	3	1	2	0	0	0	0	1	1	1	0	1	3	0	6	0	1
Farlowella paraguayensis	3	1	1	3	1	2	0	0	0	0	1	1	1	0	1	3	1	6	0	1
Farlowella platorynchus	3	1	1	3	1	1	0	0	0	0	1	1	1	0	1	3	0	1	0	1
Farlowella reticulata	3	1	1	3	1	2	0	0	0	0	1	1	1	0	1	2	0	1	0	1
Farlowella rugosa	3	1	1	3	1	2	0	0	0	0	1	1	1	0	1	4	1	1	0	1
Farlowella schreitmuelleri	3	1	1	3	1	2	0	0	0	0	1	1	1	0	1	3	1	1	0	1
Farlowella smithi	3	1	1	3	1	2	0	0	0	0	1	1	1	0	1	3	1	6	0	1
Farlowella venezuelensis	3	1	1	3	1	2	0	0	0	0	1	1	1	0	1	4	0	6	0	1
Farlowella vittata	3	1	1	3	1	2	0	0	0	0	1	1	1	0	1	4	1	6	0	1

Taxon/Character	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Harttia carvalhoi	0	1	0	0	1	1	1	2	0	0	0	1	1	1	0	0	0	3	1	1	3	0	1	?	0	0	0	1	1	2
Harttia dissidens	0	0	0	0	1	1	0	1	0	0	0	1	1	0	0	0	0	3	1	1	3	0	0	1	0	0	0	1	0	2
Harttia duriventris	0	0	0	0	1	1	1	1	0	0	0	1	1	0	0	1	0	3	1	1	3	1	1	1	0	0	0	1	0	2
Harttia fluminensis	0	0	0	0	1	1	0	2	0	0	0	0	1	1	0	0	0	3	1	0	3	0	0	1	0	0	0	1	1	2
Harttia fowleri	0	0	0	0	1	1	0	1	0	0	0	1	1	1	0	0	0	3	1	0	3	1	0	1	0	0	0	1	1	1
Harttia garavelloi	0	0	0	0	1	1	0	1	0	0	0	1	1	0	0	1	0	3	1	1	3	1	0	1	0	0	0	1	1	2
Harttia gracilis	0	0	0	0	1	1	0	1	0	0	0	1	1	0	0	0	0	3	1	1	3	0	1	1	0	0	0	1	1	2
Harttia guianensis	0	0	0	0	1	1	0	1	0	0	0	1	1	0	0	0	0	3	1	0	3	0	0	1	0	0	0	1	1	2
Harttia kronei	0	0	0	0	1	1	0	1	0	0	0	1	1	0	0	1	0	3	1	1	3	0	0	1	0	0	0	1	0	2
Harttia leiopleura	0	0	0	0	1	1	1	1	0	0	0	0	1	0	0	1	0	3	1	1	3	0	1	1	1	0	0	1	1	1
Harttia longipinna	0	0	0	0	1	1	1	1	0	0	0	1	1	0	0	0	0	3	1	1	3	0	0	1	0	0	0	1	1	1
Harttia loricariformis	0	0	0	0	1	1	0	2	0	0	0	1	1	0	0	0	0	3	1	1	3	0	0	1	0	0	0	1	0	2
Harttia novalimensis	0	0	0	0	1	1	1	2	0	0	0	1	1	0	0	1	0	3	1	1	3	0	0	1	0	0	0	1	1	1
Harttia punctata	0	0	1	0	1	1	1	2	0	0	0	0	1	1	0	1	0	3	1	0	3	0	0	0	0	0	0	1	0	2
Harttia rhombocephala	0	0	0	0	1	1	1	2	0	0	0	1	1	1	0	0	0	3	1	1	3	0	0	0	0	0	0	1	1	2
Harttia torrenticola	0	0	0	0	1	1	0	2	0	0	0	1	1	0	0	1	0	3	1	1	3	0	1	1	0	0	0	1	1	2
Harttia trombetensis	0	0	0	0	1	1	1	2	0	0	0	1	1	1	0	0	0	3	1	1	3	0	1	1	0	0	0	1	0	2
Harttiella crassicauda	0	0	0	0	1	1	0	1	0	1	0	2	1	0	0	0	0	3	1	0	3	0	1	0	1	1	0	1	1	2
Harttiella longicauda	0	1	0	0	1	1	0	1	0	1	0	0	1	0	0	0	0	3	1	1	3	0	1	0	0	0	0	0	1	2
Lamontichthys avacanoeiro	0	0	0	0	1	1	0	2	0	1	1	1	1	0	0	1	1	2	1	0	1	0	0	1	0	0	0	0	0	2
Lamontichthys filamentosus	1	1	0	0	1	1	0	2	0	1	1	1	0	0	0	0	0	3	1	1	3	0	0	1	0	0	0	1	1	1
Lamontichthys llanero	0	1	0	0	1	1	0	1	0	1	0	1	0	0	0	0	1	2	1	0	1	0	0	1	0	0	0	1	0	1
Lamontichthys parakana	0	0	0	0	1	1	0	2	0	1	1	1	1	0	0	0	1	3	1	0	1	0	0	1	0	0	0	1	0	2
Metaloricaria nijsseni	0	1	0	0	4	0	3	2	0	1	0	0	4	2	0	0	1	3	1	0	2	1	0	0	0	1	0	1	1	0
Metaloricaria paucidens	0	1	0	0	4	0	3	2	0	1	0	0	4	2	0	0	1	3	1	0	2	1	0	0	0	1	0	1	1	0

Taxon/Character	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
Harttia carvalhoi	0	0	1	2	0	0	2	2	0	0	0	0	1	4	1	2	1	2	1	0	1	0	0	0	1	0	0	0	1	1
Harttia dissidens	2	0	1	0	0	0	2	1	0	0	0	0	1	3	1	2	1	2	1	0	1	0	0	0	1	0	0	1	1	1
Harttia duriventris	0	0	1	2	0	0	2	1	0	0	0	0	1	4	1	2	1	2	1	0	0	0	0	0	0	0	0	1	1	1
Harttia fluminensis	0	0	1	2	0	0	2	1	0	0	0	0	1	4	1	2	1	2	1	0	1	0	0	0	1	0	0	0	1	1
Harttia fowleri	0	0	1	2	0	0	2	1	0	0	0	0	0	2	1	2	1	2	1	0	0	0	0	0	1	0	0	1	1	1
Harttia garavelloi	0	0	1	1	0	0	2	2	0	0	0	0	1	3	1	1	1	2	1	0	1	0	0	0	0	0	0	0	1	1
Harttia gracilis	0	0	1	1	0	0	2	2	0	0	0	0	1	4	1	2	1	2	1	0	1	0	0	0	0	0	0	0	1	1
Harttia guianensis	0	0	1	2	0	0	2	1	0	0	0	0	1	4	1	2	1	2	1	0	1	0	0	0	0	0	0	0	1	1
Harttia kronei	0	0	1	2	0	0	2	2	0	0	0	0	1	4	1	1	1	2	1	0	1	0	0	0	0	0	0	1	1	1
Harttia leiopleura	0	0	1	1	0	0	2	?	?	0	0	0	1	3	1	2	1	2	1	0	1	0	0	0	0	0	0	0	1	1
Harttia longipinna	0	0	1	1	0	0	2	?	?	0	0	0	1	4	1	2	1	2	1	0	0	0	0	0	0	0	0	1	1	1
Harttia loricariformis	0	0	1	1	0	0	2	2	0	0	0	0	1	0	1	0	0	2	1	0	1	0	0	0	0	0	0	0	1	1
Harttia novalimensis	0	0	1	2	1	0	2	2	0	0	0	0	1	4	1	2	0	2	1	0	1	0	0	0	0	0	0	2	1	1
Harttia punctata	2	0	1	2	0	0	2	2	0	0	0	0	1	4	1	2	1	2	1	0	1	0	0	0	1	0	0	1	1	1
Harttia rhombocephala	0	0	1	2	0	0	2	2	0	0	0	0	1	4	1	2	1	2	1	0	1	0	0	0	1	0	0	1	1	1
Harttia torrenticola	0	0	1	2	1	0	2	2	0	0	0	0	1	4	1	2	1	2	1	0	1	0	0	0	0	0	0	1	1	1
Harttia trombetensis	0	0	1	2	0	0	2	1	0	0	0	0	1	4	1	2	1	2	1	0	1	0	0	0	0	0	0	0	1	1
Harttiella crassicauda	2	0	1	2	1	0	2	3	0	0	0	0	1	4	1	1	0	2	1	0	1	0	1	0	0	0	0	1	2	1
Harttiella longicauda	2	0	1	2	1	0	2	3	1	0	0	0	1	3	0	2	0	2	1	0	1	0	1	0	0	0	0	1	2	1
Lamontichthys avacanoeiro	0	0	1	3	0	1	2	1	0	0	0	0	0	3	0	2	0	2	0	0	1	0	1	0	2	0	1	1	1	1
Lamontichthys filamentosus	0	0	1	3	?	0	2	1	0	0	1	0	0	3	0	1	1	2	1	0	1	0	1	0	2	0	1	1	1	1
Lamontichthys llanero	0	0	1	2	0	?	2	1	0	0	0	0	0	3	0	1	1	2	1	0	0	0	1	0	2	0	1	1	0	1
Lamontichthys parakana	2	0	1	3	0	1	2	1	0	0	1	0	0	4	1	1	0	2	0	0	1	1	1	0	2	0	1	1	1	1
Metaloricaria nijsseni	0	1	0	0	0	2	1	0	0	0	1	0	1	4	0	2	2	1	0	1	1	2	?	1	2	1	3	2	2	0
Metaloricaria paucidens	0	1	0	0	0	2	1	0	0	0	1	0	1	4	0	2	2	1	0	1	1	2	?	1	2	1	3	2	2	0

Taxon/Character	**61**	**62**	**63**	**64**	**65**	**66**	**67**	**68**	**69**	**70**	**71**	**72**	**73**	**74**	**75**	**76**	**77**	**78**	**79**	**80**	**81**	**82**	**83**	**84**	**85**	**86**	**87**	**88**	**89**	**90**
Harttia carvalhoi	0	0	0	0	1	2	2	1	1	1	1	0	1	0	1	1	1	2	1	1	0	0	1	0	1	0	1	0	0	3
Harttia dissidens	0	0	0	0	2	2	2	1	1	0	0	0	1	0	1	1	1	2	1	0	0	1	1	0	1	0	1	0	0	3
Harttia duriventris	0	0	0	0	2	1	2	1	2	0	1	0	1	0	1	1	1	2	1	0	0	1	1	0	1	0	1	0	0	3
Harttia fluminensis	0	0	0	0	2	2	0	1	1	0	1	0	1	0	1	1	1	2	0	0	0	0	1	1	0	0	1	0	0	3
Harttia fowleri	0	0	0	0	2	1	0	1	1	1	0	0	1	0	1	1	1	2	0	0	0	0	1	0	1	0	1	0	0	3
Harttia garavelloi	0	0	0	0	1	1	1	1	1	0	1	0	1	0	1	1	1	2	1	1	0	0	0	1	0	0	1	0	0	3
Harttia gracilis	0	0	0	0	2	1	0	1	1	1	1	0	1	0	1	1	1	2	1	0	0	1	1	0	1	0	1	0	0	3
Harttia guianensis	0	0	0	0	1	2	1	1	2	1	1	0	1	0	1	1	1	2	1	1	0	0	1	1	0	0	1	0	0	3
Harttia kronei	0	0	0	0	1	1	2	1	2	1	1	0	1	0	1	1	1	2	0	1	0	0	0	0	1	0	1	0	0	3
Harttia leiopleura	0	0	0	0	1	1	1	1	2	1	1	0	1	0	1	1	1	2	1	0	0	1	1	0	1	0	1	0	0	3
Harttia longipinna	0	0	0	0	2	2	1	1	1	0	1	0	1	0	1	1	1	2	1	0	0	0	0	0	1	0	1	0	0	3
Harttia loricariformis	0	0	0	0	1	2	2	1	2	0	0	0	1	0	1	1	1	2	1	1	0	0	1	1	0	0	1	0	0	3
Harttia novalimensis	0	0	0	0	1	1	1	1	1	1	1	0	1	0	1	1	1	2	1	0	0	0	0	1	0	0	1	0	0	3
Harttia punctata	0	0	0	0	1	1	1	1	1	1	1	0	1	0	1	1	1	2	0	1	0	0	1	0	1	0	1	0	0	3
Harttia rhombocephala	0	0	0	0	1	1	0	1	2	1	0	0	1	0	1	1	1	2	0	1	0	0	1	0	1	0	1	0	0	3
Harttia torrenticola	0	0	0	0	1	2	2	1	1	0	1	0	1	0	1	1	1	2	1	0	0	1	1	0	1	0	1	0	0	3
Harttia trombetensis	0	0	0	0	2	1	1	1	2	0	1	0	1	0	1	1	1	2	1	0	0	1	1	0	1	0	1	0	0	3
Harttiella crassicauda	0	0	0	0	1	2	2	1	1	0	1	0	1	0	1	1	1	2	1	0	1	1	1	1	0	1	1	0	0	3
Harttiella longicauda	0	0	0	0	1	2	2	1	1	1	1	0	1	0	1	1	1	2	1	0	1	0	0	1	0	1	1	0	0	3
Lamontichthys avacanoeiro	0	0	0	0	2	1	1	1	2	0	1	0	0	0	1	1	1	2	1	0	0	0	1	0	1	0	1	0	0	1
Lamontichthys filamentosus	0	0	0	0	2	1	1	1	2	1	1	0	0	0	1	1	1	2	1	1	0	1	0	0	1	0	1	0	0	1
Lamontichthys llanero	0	0	0	0	2	1	1	1	2	1	1	0	1	0	1	1	1	2	1	0	0	1	0	0	1	0	1	0	0	1
Lamontichthys parakana	0	0	0	0	2	1	1	1	2	1	1	0	0	0	1	1	1	2	1	0	0	0	1	1	0	0	1	0	0	1
Metaloricaria nijsseni	0	0	1	1	0	2	2	1	0	0	1	4	1	1	0	3	1	3	0	0	0	0	1	1	0	3	2	1	3	?
Metaloricaria paucidens	0	0	1	1	0	2	2	1	0	0	1	4	1	1	0	3	1	3	0	0	0	0	1	1	0	3	2	1	3	?

Taxon/Character	**91**	**92**	**93**	**94**	**95**	**96**	**97**	**98**	**99**	**100**	**101**	**102**	**103**	**104**	**105**	**106**	**107**	**108**	**109**	**110**	**111**	**112**	**113**	**114**	**115**
Harttia carvalhoi	1	1	1	2	0	2	1	1	0	1	1	1	2	0	0	0	0	0	1	1	-	1	4	1	0
Harttia dissidens	1	0	1	2	0	2	1	2	0	1	1	1	2	0	0	0	0	1	-	0	1	1	4	1	0
Harttia duriventris	1	1	1	2	0	2	1	1	0	1	1	1	2	0	0	0	0	1	-	0	1	1	4	1	0
Harttia fluminensis	1	1	0	2	0	2	1	1	0	1	1	1	2	0	0	0	0	0	0	0	1	1	4	1	0
Harttia fowleri	1	0	1	2	0	2	1	1	0	1	1	1	2	0	0	0	0	1	-	0	1	1	4	1	0
Harttia garavelloi	1	1	0	2	0	0	1	1	2	1	1	1	2	0	0	0	0	0	2	0	0	1	4	1	0
Harttia gracilis	1	1	0	2	0	2	1	2	0	1	1	1	2	0	0	0	0	0	2	1	-	1	4	1	0
Harttia guianensis	1	0	1	2	0	2	1	1	0	1	1	1	1	0	0	0	0	1	-	0	1	1	4	1	0
Harttia kronei	1	1	0	2	0	2	0	0	2	1	1	1	2	0	0	0	0	0	1	0	1	1	4	1	0
Harttia leiopleura	1	1	0	2	0	2	1	0	2	1	1	1	2	0	0	0	0	1	-	0	1	1	4	1	0
Harttia longipinna	1	1	0	2	0	2	1	0	2	1	1	1	2	0	0	0	0	0	2	0	0	1	4	1	0
Harttia loricariformis	1	1	0	2	0	2	1	1	2	1	1	1	2	0	0	0	0	0	1	0	1	1	4	1	0
Harttia novalimensis	1	1	0	2	0	2	1	1	0	1	1	1	2	0	0	0	0	0	2	0	1	1	4	1	0
Harttia punctata	1	0	1	2	0	2	1	1	0	1	1	1	2	0	0	0	0	1	-	0	1	1	4	1	0
Harttia rhombocephala	1	0	1	2	0	2	1	1	0	1	1	1	2	0	0	0	0	1	-	0	1	1	4	1	0
Harttia torrenticola	1	1	0	2	0	2	1	0	2	1	1	1	2	0	0	0	0	0	1	0	0	1	4	1	0
Harttia trombetensis	1	1	1	2	0	2	1	1	0	1	1	1	2	0	0	0	0	1	-	0	1	1	4	1	0
Harttiella crassicauda	1	1	1	2	0	2	0	0	2	0	1	1	1	1	1	-	3	1	-	0	0	1	4	1	0
Harttiella longicauda	1	1	0	2	0	2	0	0	0	0	1	1	1	1	1	-	3	1	-	0	0	0	3	1	0
Lamontichthys avacanoeiro	2	1	0	3	0	2	1	1	0	1	0	1	0	2	0	0	0	1	-	0	2	1	4	1	1
Lamontichthys filamentosus	2	1	0	3	0	2	1	1	2	1	0	1	2	1	0	0	0	1	-	0	1	1	4	1	1
Lamontichthys llanero	2	0	0	3	0	2	1	2	0	1	0	1	?	2	0	0	0	1	-	0	2	0	4	1	1
Lamontichthys parakana	2	1	0	3	0	2	1	1	0	1	0	1	0	2	0	0	0	1	-	0	2	1	4	1	1
Metaloricaria nijsseni	?	1	0	3	0	2	?	?	?	0	2	-	0	0	0	0	0	0	1	1	-	0	0	4	3
Metaloricaria paucidens	?	1	0	3	0	2	?	?	?	0	2	-	0	0	0	0	0	0	1	1	-	0	0	4	3

Taxon/Character	**116**	**117**	**118**	**119**	**120**	**121**	**122**	**123**	**124**	**125**	**126**	**127**	**128**	**129**	**130**	**131**	**132**	**133**	**134**	**135**	**136**
Harttia carvalhoi	1	0	0	1	1	0	2	0	1	0	2	1	0	1	0	1	1	0	1	0	1
Harttia dissidens	1	1	0	1	1	0	2	0	1	0	2	1	0	1	3	1	0	0	1	0	1
Harttia duriventris	1	1	0	1	1	0	2	0	1	0	2	1	0	0	0	1	0	0	1	0	1
Harttia fluminensis	1	0	0	1	1	0	2	0	1	0	2	1	0	1	0	1	1	0	1	0	1
Harttia fowleri	1	0	0	1	1	0	2	0	1	0	2	1	0	1	0	1	0	0	1	0	1
Harttia garavelloi	0	0	0	1	1	0	2	0	1	0	2	1	0	0	3	1	1	0	1	1	1
Harttia gracilis	1	1	0	1	1	0	2	0	1	0	0	1	0	1	3	1	0	0	1	0	1
Harttia guianensis	1	0	0	1	1	0	2	0	1	0	2	1	0	1	0	1	1	0	1	0	1
Harttia kronei	1	1	0	1	1	0	2	0	1	0	2	1	0	1	0	1	1	0	1	0	1
Harttia leiopleura	1	1	0	1	1	0	2	0	1	0	0	0	0	1	3	1	1	0	1	0	1
Harttia longipinna	1	0	0	1	1	0	2	0	1	0	0	1	0	0	3	1	1	0	1	0	1
Harttia loricariformis	0	1	0	1	1	0	2	0	1	0	0	1	0	1	3	1	1	0	1	0	1
Harttia novalimensis	1	1	0	1	1	0	2	0	1	0	0	1	0	0	3	1	1	0	1	0	1
Harttia punctata	1	0	0	1	1	0	2	0	1	0	2	1	0	0	0	1	0	0	1	0	1
Harttia rhombocephala	1	0	0	1	1	0	2	0	1	0	0	0	0	0	3	1	0	0	1	0	1
Harttia torrenticola	1	0	0	1	1	0	2	0	1	0	2	1	0	0	3	1	1	0	1	0	1
Harttia trombetensis	1	0	0	1	1	0	2	0	1	0	2	1	0	0	0	1	1	0	1	0	1
Harttiella crassicauda	1	1	0	1	1	0	2	0	0	1	2	0	0	0	3	1	1	1	1	0	1
Harttiella longicauda	1	0	0	1	1	0	2	0	0	1	2	0	0	0	3	1	1	1	1	0	1
Lamontichthys avacanoeiro	1	1	0	2	1	0	2	0	0	0	2	1	1	1	0	1	0	0	1	2	1
Lamontichthys filamentosus	1	0	0	2	0	0	2	0	1	0	2	1	1	0	0	1	0	0	1	2	1
Lamontichthys llanero	1	1	0	2	0	0	2	0	1	0	2	1	1	0	0	1	0	0	1	2	1
Lamontichthys parakana	1	1	0	2	1	0	2	0	1	0	2	1	1	1	0	1	0	0	1	2	1
Metaloricaria nijsseni	2	0	0	0	0	0	0	0	0	2	0	1	0	1	0	1	0	1	0	0	0
Metaloricaria paucidens	2	0	0	0	0	0	0	0	0	2	0	1	0	1	0	1	0	1	0	0	0

Taxon/Character	**137**	**138**	**139**	**140**	**141**	**142**	**143**	**144**	**145**	**146**	**147**	**148**	**149**	**150**	**151**	**152**	**153**	**154**	**155**	**156**
Harttia carvalhoi	3	1	1	3	0	2	1	0	1	0	1	1	0	5	0	1	2	0	2	1
Harttia dissidens	3	1	1	3	0	2	1	0	0	0	1	1	0	5	0	1	2	0	2	1
Harttia duriventris	3	1	1	2	0	2	1	0	1	0	1	1	0	5	0	1	2	0	1	1
Harttia fluminensis	3	0	0	2	0	2	1	1	0	0	1	1	0	5	0	1	2	0	1	1
Harttia fowleri	3	0	0	3	0	2	1	0	0	0	1	1	0	5	0	1	2	0	1	1
Harttia garavelloi	3	1	1	1	0	2	1	1	1	0	1	1	0	5	0	1	2	0	2	1
Harttia gracilis	3	1	1	2	0	2	1	0	1	0	1	1	0	5	0	1	2	0	2	1
Harttia guianensis	3	1	1	2	0	1	1	0	0	0	1	1	0	5	0	1	2	0	?	1
Harttia kronei	3	1	1	3	0	1	1	1	0	0	1	1	0	5	0	1	2	0	1	1
Harttia leiopleura	3	1	1	3	0	2	1	0	1	0	1	1	0	5	0	1	2	0	1	0
Harttia longipinna	3	1	1	2	0	2	1	1	1	0	1	1	0	5	0	1	2	0	1	0
Harttia loricariformis	3	1	1	2	0	1	1	1	1	0	1	1	0	5	0	1	2	0	2	1
Harttia novalimensis	3	1	1	2	0	2	1	0	0	0	1	1	0	5	0	1	2	0	2	1
Harttia punctata	1	1	1	2	0	1	1	0	0	0	0	1	0	5	0	1	2	0	1	1
Harttia rhombocephala	3	1	1	2	0	2	1	0	1	0	1	1	0	5	0	1	2	0	1	1
Harttia torrenticola	3	1	1	3	0	1	1	0	1	0	1	1	0	5	0	1	2	0	?	0
Harttia trombetensis	3	1	1	2	0	1	1	0	0	0	1	1	0	5	0	1	2	0	1	1
Harttiella crassicauda	3	0	0	3	0	2	1	1	0	1	1	1	0	2	0	1	2	0	1	1
Harttiella longicauda	3	0	0	3	0	1	1	0	0	1	1	1	0	2	0	1	2	0	1	1
Lamontichthys avacanoeiro	1	0	0	2	0	2	1	0	1	1	1	1	1	1	0	0	2	0	1	1
Lamontichthys filamentosus	1	0	0	3	0	2	1	0	1	1	1	1	1	1	0	0	0	0	0	1
Lamontichthys llanero	3	0	0	3	0	2	1	0	1	1	1	1	1	1	0	0	2	0	1	1
Lamontichthys parakana	1	0	0	3	0	2	1	0	1	1	1	1	1	1	0	0	0	0	1	1
Metaloricaria nijsseni	0	0	0	3	0	2	1	0	0	1	2	1	0	2	2	1	2	0	2	2
Metaloricaria paucidens	0	0	0	3	0	2	1	0	0	1	2	1	0	2	2	1	2	0	2	2

Taxon/Character	**157**	**158**	**159**	**160**	**161**	**162**	**163**	**164**	**165**	**166**	**167**	**168**	**169**	**170**	**171**	**172**	**173**	**174**	**175**	**176**
Harttia carvalhoi	0	0	1	1	0	0	2	0	1	1	1	0	0	1	0	4	1	1	2	1
Harttia dissidens	1	0	1	1	0	0	2	0	1	1	1	3	0	2	0	4	1	1	2	0
Harttia duriventris	0	0	1	1	1	0	2	0	1	1	1	0	0	2	0	4	1	1	2	0
Harttia fluminensis	0	0	1	1	0	0	2	0	1	1	1	3	0	1	1	-	1	1	2	1
Harttia fowleri	0	0	1	1	0	0	2	0	1	1	1	3	0	1	1	-	1	1	2	0
Harttia garavelloi	1	0	1	1	2	0	2	0	1	1	1	3	0	1	0	4	1	1	2	1
Harttia gracilis	0	0	1	1	0	0	2	0	1	1	1	3	0	1	0	4	1	1	2	0
Harttia guianensis	0	0	1	1	0	0	2	0	1	1	1	0	0	1	1	-	1	1	2	0
Harttia kronei	1	0	1	1	2	0	2	0	1	1	1	0	0	1	0	4	1	1	2	1
Harttia leiopleura	0	0	1	1	0	0	2	0	1	1	1	3	0	1	0	4	1	1	2	1
Harttia longipinna	1	0	1	1	0	0	2	0	1	1	1	0	0	2	0	4	1	1	2	1
Harttia loricariformis	0	0	1	1	2	0	2	0	1	1	1	3	0	1	0	4	1	1	2	1
Harttia novalimensis	0	0	1	0	0	0	2	0	1	1	1	0	0	2	0	4	1	1	2	1
Harttia punctata	0	0	1	1	0	0	2	0	1	1	1	3	0	1	0	2	1	1	2	1
Harttia rhombocephala	0	0	1	1	2	0	2	0	1	1	1	3	0	1	0	4	1	1	2	0
Harttia torrenticola	0	0	1	1	2	0	2	0	1	1	1	3	0	1	0	4	1	1	2	1
Harttia trombetensis	0	0	1	1	2	0	2	0	1	1	1	0	0	1	1	-	1	1	2	1
Harttiella crassicauda	0	0	1	0	0	1	0	0	1	1	1	0	0	2	0	4	1	0	2	2
Harttiella longicauda	0	0	1	1	2	1	2	0	1	0	1	0	0	2	0	4	1	0	2	0
Lamontichthys avacanoeiro	1	0	1	1	2	0	2	0	2	0	0	0	0	2	0	3	1	1	2	1
Lamontichthys filamentosus	0	0	1	1	2	0	2	0	2	0	0	0	0	2	0	3	1	1	2	0
Lamontichthys llanero	1	0	1	1	2	0	2	0	2	0	0	0	0	2	0	3	1	1	2	1
Lamontichthys parakana	0	0	1	1	2	0	2	0	2	0	0	0	0	2	0	3	1	1	2	1
Metaloricaria nijsseni	2	1	1	1	0	1	0	3	4	0	0	0	0	1	0	3	1	0	2	0
Metaloricaria paucidens	2	1	1	1	0	1	0	3	4	0	0	0	0	1	0	3	1	0	2	0

Taxon/Character	**177**	**178**	**179**	**180**	**181**	**182**	**183**	**184**	**185**	**186**	**187**	**188**	**189**	**190**	**191**	**192**	**193**	**194**	**195**	**196**
Harttia carvalhoi	0	2	2	1	2	0	0	0	0	0	2	0	0	0	0	0	0	1	0	3
Harttia dissidens	0	2	2	0	1	2	0	0	0	1	2	0	0	0	0	0	0	0	0	2
Harttia duriventris	0	2	2	0	1	2	1	0	0	1	2	0	0	0	0	0	0	1	0	2
Harttia fluminensis	0	2	2	0	1	0	0	0	0	0	2	0	0	0	0	0	0	0	0	2
Harttia fowleri	0	2	2	0	1	0	1	0	0	1	2	0	0	0	0	0	0	0	0	2
Harttia garavelloi	0	2	2	0	2	0	1	0	0	1	2	0	0	0	3	0	0	0	0	2
Harttia gracilis	0	2	2	0	2	0	1	0	0	0	2	0	0	0	3	0	0	1	0	2
Harttia guianensis	0	2	2	0	1	2	1	0	0	0	2	0	0	0	0	0	0	1	0	2
Harttia kronei	0	2	2	0	1	2	0	0	0	1	2	0	0	0	3	0	0	1	0	3
Harttia leiopleura	0	2	2	1	2	0	1	0	0	1	2	0	0	0	3	0	0	1	0	2
Harttia longipinna	0	2	2	0	1	2	0	0	0	0	2	0	0	0	0	0	0	0	0	2
Harttia loricariformis	0	2	2	0	2	0	1	0	0	0	2	0	0	0	3	0	0	0	0	2
Harttia novalimensis	0	2	2	0	1	2	1	0	0	0	2	0	0	0	3	0	0	1	0	2
Harttia punctata	0	2	2	0	1	0	1	0	0	1	2	0	0	0	0	0	0	0	0	2
Harttia rhombocephala	0	2	2	1	2	0	1	0	0	0	2	0	0	0	0	0	0	1	0	2
Harttia torrenticola	0	2	2	1	2	0	0	0	0	?	2	0	?	?	?	?	0	?	0	2
Harttia trombetensis	0	2	2	0	1	0	1	0	0	?	2	0	?	?	?	?	0	?	0	2
Harttiella crassicauda	0	2	2	0	2	1	0	0	0	0	1	0	0	0	0	0	0	1	0	2
Harttiella longicauda	0	2	2	0	2	1	1	0	0	0	1	0	0	0	0	0	0	1	0	3
Lamontichthys avacanoeiro	1	2	1	0	2	1	1	0	0	2	1	0	1	1	0	0	0	1	1	3
Lamontichthys filamentosus	0	2	1	0	2	1	0	0	0	0	1	0	0	1	0	0	0	0	1	2
Lamontichthys llanero	1	2	1	0	2	1	1	0	2	0	1	0	0	1	0	0	0	1	1	2
Lamontichthys parakana	1	2	1	0	2	0	1	0	0	0	2	0	1	1	0	0	0	1	1	3
Metaloricaria nijsseni	1	1	2	1	2	2	1	1	2	2	1	2	0	1	1	0	1	2	1	0
Metaloricaria paucidens	1	1	2	1	2	2	1	1	0	1	0	2	0	1	0	0	1	1	1	0

Taxon/Character	**197**	**198**	**199**	**200**	**201**	**202**	**203**	**204**	**205**	**206**	**207**	**208**	**209**	**210**	**211**	**212**	**213**	**214**	**215**	**216**
Harttia carvalhoi	0	0	0	-	-	1	0	0	0	1	0	0	1	0	1	2	0	3	0	0
Harttia dissidens	0	1	0	1	0	2	0	0	0	1	0	1	1	1	1	2	0	4	0	1
Harttia duriventris	0	1	0	1	0	2	0	0	0	0	0	1	1	1	1	2	0	4	0	1
Harttia fluminensis	0	0	0	-	-	2	0	0	0	0	0	1	1	1	1	2	0	3	0	0
Harttia fowleri	1	1	0	1	0	2	0	0	0	1	0	1	1	1	1	2	0	3	0	0
Harttia garavelloi	2	0	0	-	-	2	0	0	0	1	2	0	1	1	1	2	0	3	0	0
Harttia gracilis	0	0	0	-	-	2	0	0	0	0	0	1	1	1	1	2	0	4	0	1
Harttia guianensis	2	0	0	-	-	2	0	0	0	0	0	1	1	1	1	2	0	3	0	0
Harttia kronei	2	0	0	-	-	1	0	0	0	0	0	0	1	0	1	2	0	3	0	0
Harttia leiopleura	0	0	0	-	-	2	0	0	0	0	0	0	1	0	1	2	0	3	0	0
Harttia longipinna	2	1	0	1	0	2	0	0	0	0	0	1	1	1	1	2	0	4	0	1
Harttia loricariformis	2	0	0	-	-	2	0	0	0	0	0	1	1	1	1	2	0	1	0	0
Harttia novalimensis	2	0	0	-	-	2	0	0	0	0	0	0	1	1	1	2	0	3	0	0
Harttia punctata	0	0	0	-	-	2	0	0	1	2	0	1	1	1	1	2	0	4	0	1
Harttia rhombocephala	0	1	0	1	0	2	0	0	0	0	0	1	1	1	1	2	0	4	0	1
Harttia torrenticola	?	0	0	-	-	?	0	0	0	0	0	1	1	0	1	2	0	3	0	0
Harttia trombetensis	0	1	0	0	0	2	0	0	0	?	?	1	1	1	1	2	0	3	0	0
Harttiella crassicauda	2	0	0	-	-	1	0	0	0	1	2	0	1	0	1	2	0	3	0	0
Harttiella longicauda	0	0	0	-	-	1	0	0	0	1	1	1	1	0	1	2	0	3	0	0
Lamontichthys avacanoeiro	1	1	1	1	0	2	0	0	0	2	2	1	1	0	1	2	0	1	0	2
Lamontichthys filamentosus	1	1	1	1	0	2	1	0	1	2	0	1	1	0	1	2	2	1	0	2
Lamontichthys llanero	1	1	1	1	0	2	1	0	1	2	0	1	1	0	1	2	2	1	0	2
Lamontichthys parakana	1	1	1	1	0	2	0	0	0	1	0	1	1	0	1	2	1	3	0	2
Metaloricaria nijsseni	0	1	2	2	0	1	0	0	0	0	0	1	1	0	1	2	0	3	0	1
Metaloricaria paucidens	0	1	2	2	0	1	0	0	0	0	0	1	1	0	1	2	0	4	0	0

Taxon/Character	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**
Pterosturisoma microps	1	0	1	1	1	1	0	1	0	1	0	3	4	0	0	0	1	3	1	1	3	1	0	1	0	0	0	2	1	2
Sturisoma barbatum	1	0	0	0	2	2	2	0	0	1	1	1	1	1	0	1	1	3	0	0	2	0	0	1	1	2	0	1	1	0
Sturisoma guentheri	1	0	1	1	2	2	2	1	0	1	1	3	1	1	0	1	0	2	0	0	2	0	0	1	1	2	1	0	1	1
Sturisoma lyra	1	0	1	1	2	2	2	0	0	1	0	3	1	1	0	1	1	3	0	1	2	0	0	1	1	2	1	0	1	1
Sturisoma monopelte	1	0	0	1	2	2	2	0	0	1	1	3	1	0	0	1	1	3	0	1	1	1	0	1	1	2	1	0	1	1
Sturisoma nigrirostrum	1	0	0	1	2	2	2	0	0	1	1	1	1	0	0	1	1	3	1	0	1	0	0	1	0	2	1	0	0	1
Sturisoma robustum	1	0	0	1	2	2	2	0	0	1	1	3	4	0	0	1	0	3	1	0	1	1	0	1	1	2	1	0	1	1
Sturisoma rostratum	1	0	0	0	2	2	2	0	0	1	1	3	1	1	0	1	0	3	0	0	?	0	0	1	1	2	?	?	0	1
Sturisoma tenuirostre	1	0	1	1	2	2	2	0	0	1	0	1	1	0	0	1	0	3	1	0	2	1	0	1	1	2	1	0	1	1
Sturisoma Madre de dios	1	0	1	1	2	2	2	1	0	1	1	3	1	1	0	1	0	2	0	0	1	1	0	1	1	2	1	0	0	2
Sturisomatichthys aureus	1	0	0	1	1	2	2	0	0	1	0	3	2	0	0	0	1	3	0	0	1	0	1	1	0	0	1	0	0	1
Sturisomatichthys citurensis	0	0	?	3	1	2	1	2	0	1	0	3	2	0	0	0	0	2	1	0	1	0	1	1	0	0	1	0	0	?
Sturisomatichthys dariensis	1	0	0	1	1	2	1	0	0	1	0	3	2	0	0	1	0	1	0	0	2	0	1	1	0	0	1	0	0	1
Sturisomatichthys festivus	1	0	0	0	1	2	1	0	0	1	0	3	2	0	0	1	0	1	1	1	2	0	0	1	0	0	1	0	1	1
Sturisomatichthys frenatus	1	0	0	1	1	2	1	0	0	1	0	3	2	0	0	1	0	2	0	0	1	0	0	1	0	0	1	0	0	1
Sturisomatichthys kneri	1	0	1	0	2	2	2	0	0	1	0	3	2	1	0	1	0	1	0	1	1	1	0	1	0	0	1	0	1	1
Sturisomatichthys leightoni	1	0	0	3	1	2	1	1	0	1	0	3	2	0	0	0	0	0	1	0	1	0	0	1	0	0	1	0	1	?
Sturisomatichthys panamensis	1	0	0	1	1	2	1	0	0	1	0	1	2	1	0	1	1	2	0	1	2	0	0	1	0	0	1	0	0	1
Sturisomatichthys tamanae	0	0	?	3	1	2	1	2	0	1	0	3	2	0	0	0	0	2	1	0	1	0	0	1	0	0	1	0	1	?
Sturisomatichthys San Juan	1	0	1	1	1	2	1	0	0	1	0	1	2	0	0	1	0	1	1	0	1	0	0	1	0	0	1	0	1	1
Sturisomatichthys Baudó	1	0	?	1	1	2	1	0	0	1	0	1	2	1	0	0	0	1	1	1	1	0	0	1	0	0	1	0	1	1

Taxon/Character	**31**	**32**	**33**	**34**	**35**	**36**	**37**	**38**	**39**	**40**	**41**	**42**	**43**	**44**	**45**	**46**	**47**	**48**	**49**	**50**	**51**	**52**	**53**	**54**	**55**	**56**	**57**	**58**	**59**	**60**
Pterosturisoma microps	0	0	1	1	0	1	2	1	0	0	1	0	1	3	0	1	1	2	1	0	0	1	1	0	2	0	1	0	2	1
Sturisoma barbatum	0	1	1	0	1	3	2	0	0	0	0	0	0	4	0	2	1	2	1	0	1	1	2	0	2	0	0	1	0	1
Sturisoma guentheri	0	1	1	1	2	3	2	1	0	1	0	0	1	3	1	2	1	2	1	0	0	0	2	0	2	0	0	1	1	1
Sturisoma lyra	0	1	1	0	2	3	2	0	0	1	0	0	0	4	0	2	1	0	1	0	1	1	3	0	2	0	0	1	0	1
Sturisoma monopelte	0	1	1	0	2	3	2	0	0	0	0	0	1	3	1	2	1	2	1	0	0	0	1	0	2	0	0	1	0	1
Sturisoma nigrirostrum	0	1	1	2	2	0	2	1	0	0	0	0	1	3	1	2	1	2	1	0	0	1	2	0	0	0	0	1	0	1
Sturisoma robustum	0	1	1	1	0	0	2	0	0	1	0	0	1	3	1	2	1	0	1	0	0	0	1	0	2	0	1	1	0	1
Sturisoma rostratum	0	1	1	0	0	3	?	?	?	0	0	0	0	4	0	2	1	0	1	0	0	1	2	0	2	0	1	1	0	1
Sturisoma tenuirostre	1	1	1	1	2	0	2	1	0	0	0	0	1	3	1	2	1	0	1	0	0	1	2	0	2	0	1	1	0	1
Sturisoma Madre de dios	1	1	1	2	1	3	2	1	0	0	0	0	1	3	1	2	1	2	1	0	0	1	2	0	2	0	1	1	0	1
Sturisomatichthys aureus	0	1	1	1	0	0	2	1	0	0	1	0	1	4	1	1	0	0	1	1	1	0	2	0	0	0	1	0	1	1
Sturisomatichthys citurensis	?	1	1	1	?	?	1	0	0	0	1	0	1	3	1	2	0	2	1	1	?	1	1	0	1	0	0	1	1	1
Sturisomatichthys dariensis	0	1	1	1	0	0	2	0	0	0	1	0	1	3	1	2	0	2	1	0	0	1	2	0	2	0	0	2	1	1
Sturisomatichthys festivus	0	1	1	0	0	0	2	1	0	0	1	0	1	2	1	1	0	2	1	1	1	1	2	0	0	0	1	0	1	1
Sturisomatichthys frenatus	0	1	1	0	0	0	?	?	0	0	1	0	1	4	1	2	0	2	1	1	0	1	2	0	0	0	0	0	1	1
Sturisomatichthys kneri	0	1	1	1	2	0	2	1	0	1	1	0	1	3	1	2	0	0	1	1	0	1	3	0	0	0	0	0	1	1
Sturisomatichthys leightoni	?	1	1	1	?	0	2	1	0	0	1	0	1	4	1	1	1	2	1	1	0	0	1	0	1	0	0	0	1	1
Sturisomatichthys panamensis	0	1	1	1	1	0	2	0	1	0	1	0	1	4	1	2	0	0	1	1	0	1	2	0	0	0	1	2	1	1
Sturisomatichthys tamanae	?	1	1	1	?	3	1	0	0	0	1	0	1	4	1	2	0	2	1	0	0	?	1	0	1	0	0	0	1	1
Sturisomatichthys San Juan	0	1	1	1	1	0	2	1	0	0	1	0	1	4	1	2	1	2	1	1	0	0	2	0	0	0	1	0	1	1
Sturisomatichthys Baudó	0	1	1	2	1	0	2	1	0	0	1	0	1	4	1	2	0	0	1	0	1	1	2	0	2	0	0	0	1	1

Taxon/Character	**61**	**62**	**63**	**64**	**65**	**66**	**67**	**68**	**69**	**70**	**71**	**72**	**73**	**74**	**75**	**76**	**77**	**78**	**79**	**80**	**81**	**82**	**83**	**84**	**85**	**86**	**87**	**88**	**89**	**90**
Pterosturisoma microps	0	0	0	0	2	0	1	1	2	0	1	0	1	0	0	1	1	2	0	0	0	0	0	1	0	2	1	0	1	2
Sturisoma barbatum	0	0	0	0	2	2	2	1	2	0	0	1	1	0	2	2	1	2	0	1	1	1	1	0	1	0	1	1	0	1
Sturisoma guentheri	0	0	0	0	1	2	2	1	2	1	1	1	1	0	0	1	1	2	0	0	1	1	1	0	1	2	1	1	0	1
Sturisoma lyra	0	0	0	0	2	2	2	1	2	0	0	1	1	0	2	2	1	2	0	1	1	1	1	0	1	0	1	1	0	1
Sturisoma monopelte	0	0	0	0	2	2	2	1	2	1	0	1	1	0	3	2	1	2	0	1	1	0	1	0	1	0	1	1	1	3
Sturisoma nigrirostrum	0	0	0	0	2	2	1	1	2	1	0	1	1	0	0	1	1	2	0	1	1	0	1	1	1	0	1	1	1	1
Sturisoma robustum	0	0	0	0	1	2	2	1	1	1	1	0	0	0	0	2	1	2	0	1	1	0	0	0	1	2	1	1	1	3
Sturisoma rostratum	0	0	0	0	2	2	2	1	2	0	0	1	0	0	2	2	1	2	0	1	1	?	0	?	?	0	2	1	0	1
Sturisoma tenuirostre	0	0	0	0	2	2	2	1	1	0	0	2	1	0	0	2	1	2	0	1	1	1	1	1	1	2	1	1	1	0
Sturisoma Madre de dios	0	0	0	0	2	2	2	1	2	1	0	1	1	0	1	2	1	2	0	1	1	0	1	1	1	2	1	1	1	0
Sturisomatichthys aureus	0	0	0	0	2	2	2	1	2	1	1	2	1	0	1	1	1	2	1	0	0	0	0	1	0	2	0	0	1	3
Sturisomatichthys citurensis	0	0	0	0	2	1	1	1	2	1	1	2	0	0	0	1	1	2	0	0	0	1	0	0	1	2	1	0	0	1
Sturisomatichthys dariensis	0	0	0	0	2	2	1	1	2	1	1	1	1	0	1	1	1	2	0	1	0	0	0	1	0	2	0	0	1	1
Sturisomatichthys festivus	0	0	0	0	2	2	2	1	2	1	1	1	1	0	1	1	1	2	0	0	0	1	1	0	1	2	0	0	1	1
Sturisomatichthys frenatus	0	0	0	0	2	2	1	1	2	1	1	1	1	0	1	2	1	2	0	1	0	0	1	1	1	2	0	1	1	1
Sturisomatichthys kneri	0	0	0	0	2	2	2	1	2	1	1	2	1	0	1	1	1	2	0	0	0	1	1	1	0	2	0	0	1	1
Sturisomatichthys leightoni	0	0	0	0	1	2	1	1	2	0	1	2	1	0	1	1	1	2	1	0	0	0	0	1	0	2	1	0	0	1
Sturisomatichthys panamensis	0	0	0	0	2	2	2	1	2	1	1	1	1	0	1	1	1	2	0	1	0	0	1	1	0	2	1	0	1	1
Sturisomatichthys tamanae	0	0	0	0	1	2	1	1	2	1	1	2	0	0	1	1	1	2	0	0	0	1	0	1	1	2	1	0	0	1
Sturisomatichthys San Juan	0	0	0	0	1	2	1	1	2	1	0	1	1	0	1	1	1	2	0	1	0	0	0	0	1	2	0	0	0	1
Sturisomatichthys Baudó	0	0	0	0	2	2	2	1	2	1	0	1	1	0	1	2	1	2	0	0	0	0	0	1	0	2	1	0	0	1

Taxon/Character	**91**	**92**	**93**	**94**	**95**	**96**	**97**	**98**	**99**	**100**	**101**	**102**	**103**	**104**	**105**	**106**	**107**	**108**	**109**	**110**	**111**	**112**	**113**	**114**	**115**
Pterosturisoma microps	1	1	0	3	0	3	1	1	0	1	2	-	2	2	1	-	3	0	1	0	2	1	4	1	1
Sturisoma barbatum	2	1	0	3	0	2	1	1	2	1	0	1	2	2	0	0	0	1	-	0	2	0	3	1	3
Sturisoma guentheri	2	1	0	3	0	2	1	2	0	1	0	1	2	2	0	0	0	1	-	0	2	0	3	1	3
Sturisoma lyra	2	1	0	3	0	2	1	1	2	1	0	1	2	2	0	0	0	1	-	0	2	0	3	1	3
Sturisoma monopelte	2	1	0	3	0	2	1	2	0	1	0	1	2	2	0	0	0	1	-	0	2	0	3	1	3
Sturisoma nigrirostrum	2	0	0	1	0	2	1	2	0	1	0	1	2	2	0	0	0	0	0	0	2	0	3	1	3
Sturisoma robustum	2	1	0	3	0	3	1	1	0	1	0	1	2	2	0	0	0	1	-	0	0	0	3	1	3
Sturisoma rostratum	2	1	0	3	0	3	1	1	2	1	0	1	2	2	0	0	0	1	-	0	2	0	3	1	3
Sturisoma tenuirostre	2	1	0	3	0	2	1	1	0	1	0	1	2	2	0	0	0	1	-	0	0	0	3	1	3
Sturisoma Madre de dios	2	1	0	3	0	3	1	1	0	1	0	1	2	2	0	0	0	1	-	1	-	0	3	1	3
Sturisomatichthys aureus	0	1	0	1	0	2	1	1	0	1	0	1	0	0	0	0	0	0	2	0	0	1	2	1	2
Sturisomatichthys citurensis	1	0	0	1	0	2	1	1	0	1	0	1	0	1	0	0	0	0	1	0	0	1	2	1	2
Sturisomatichthys dariensis	1	1	0	1	0	2	1	2	0	1	0	1	0	0	0	0	0	0	2	0	0	1	2	1	2
Sturisomatichthys festivus	1	1	0	1	0	2	1	1	0	1	0	1	0	0	0	0	0	0	1	0	2	1	2	1	2
Sturisomatichthys frenatus	1	1	0	1	0	2	1	1	0	1	0	1	0	0	0	0	0	0	2	0	1	1	2	1	2
Sturisomatichthys kneri	1	0	0	1	0	2	1	1	0	1	0	1	0	0	0	0	0	0	2	0	1	1	3	1	2
Sturisomatichthys leightoni	1	0	0	1	0	2	1	1	0	1	0	1	0	0	0	0	0	0	1	0	1	1	2	1	2
Sturisomatichthys panamensis	1	1	0	1	0	2	1	1	0	1	0	1	0	0	0	0	0	0	2	0	1	1	3	1	2
Sturisomatichthys tamanae	1	1	0	1	0	2	1	1	0	1	0	1	0	0	0	0	0	0	1	0	1	1	2	1	2
Sturisomatichthys San Juan	1	1	0	1	0	2	1	1	2	1	0	1	0	1	0	0	0	0	2	0	0	1	2	1	2
Sturisomatichthys Baudó	1	1	0	1	0	2	1	1	0	1	0	1	0	0	0	0	0	0	2	0	0	1	2	1	2

Taxon/Character	**116**	**117**	**118**	**119**	**120**	**121**	**122**	**123**	**124**	**125**	**126**	**127**	**128**	**129**	**130**	**131**	**132**	**133**	**134**	**135**	**136**
Pterosturisoma microps	2	0	0	2	1	0	1	0	0	0	2	1	0	1	0	1	0	1	0	2	0
Sturisoma barbatum	1	0	0	3	1	0	1	0	0	0	2	1	0	?	1	2	0	1	0	2	1
Sturisoma guentheri	1	1	0	3	1	0	1	0	0	0	2	1	0	1	1	3	0	1	0	2	1
Sturisoma lyra	1	0	0	3	1	0	1	0	0	0	2	0	0	1	1	2	0	1	1	0	2
Sturisoma monopelte	1	0	0	3	1	0	1	0	0	1	2	2	0	1	2	2	0	1	0	2	1
Sturisoma nigrirostrum	1	0	0	3	1	0	1	0	0	1	2	1	0	1	2	2	0	1	0	0	1
Sturisoma robustum	1	0	0	3	1	0	1	0	0	0	2	1	0	1	2	2	0	0	0	0	2
Sturisoma rostratum	1	0	0	3	1	0	?	?	?	0	2	1	0	1	1	2	0	1	0	2	1
Sturisoma tenuirostre	1	0	0	3	1	0	1	0	0	0	2	1	0	1	2	0	0	1	0	2	1
Sturisoma Madre de dios	1	0	0	3	1	0	1	0	0	0	2	1	0	1	2	1	0	1	0	2	2
Sturisomatichthys aureus	2	0	0	2	0	0	0	1	0	0	2	1	0	1	0	1	0	2	3	0	1
Sturisomatichthys citurensis	1	0	0	2	0	0	0	1	0	0	2	1	1	1	2	1	0	2	1	0	2
Sturisomatichthys dariensis	2	0	0	2	0	0	0	1	0	0	2	1	0	1	3	1	0	2	0	0	1
Sturisomatichthys festivus	2	0	0	2	0	0	0	1	0	0	2	1	0	1	0	1	0	2	2	0	1
Sturisomatichthys frenatus	1	0	0	2	0	0	0	1	0	0	2	1	0	1	2	1	0	2	1	0	1
Sturisomatichthys kneri	2	0	0	2	0	0	0	1	0	0	2	2	0	1	0	1	0	2	1	0	1
Sturisomatichthys leightoni	1	0	0	2	0	0	0	1	0	0	2	2	0	1	2	1	0	2	3	0	2
Sturisomatichthys panamensis	1	0	0	2	0	0	0	1	1	0	2	1	0	?	0	1	0	2	3	0	1
Sturisomatichthys tamanae	1	0	0	2	0	0	0	1	0	0	2	1	0	1	0	1	1	2	3	0	2
Sturisomatichthys San Juan	1	0	0	2	0	0	0	1	0	0	2	1	0	1	2	1	0	2	1	0	1
Sturisomatichthys Baudó	1	0	0	2	0	0	0	1	0	0	2	1	0	1	0	1	0	2	0	0	1

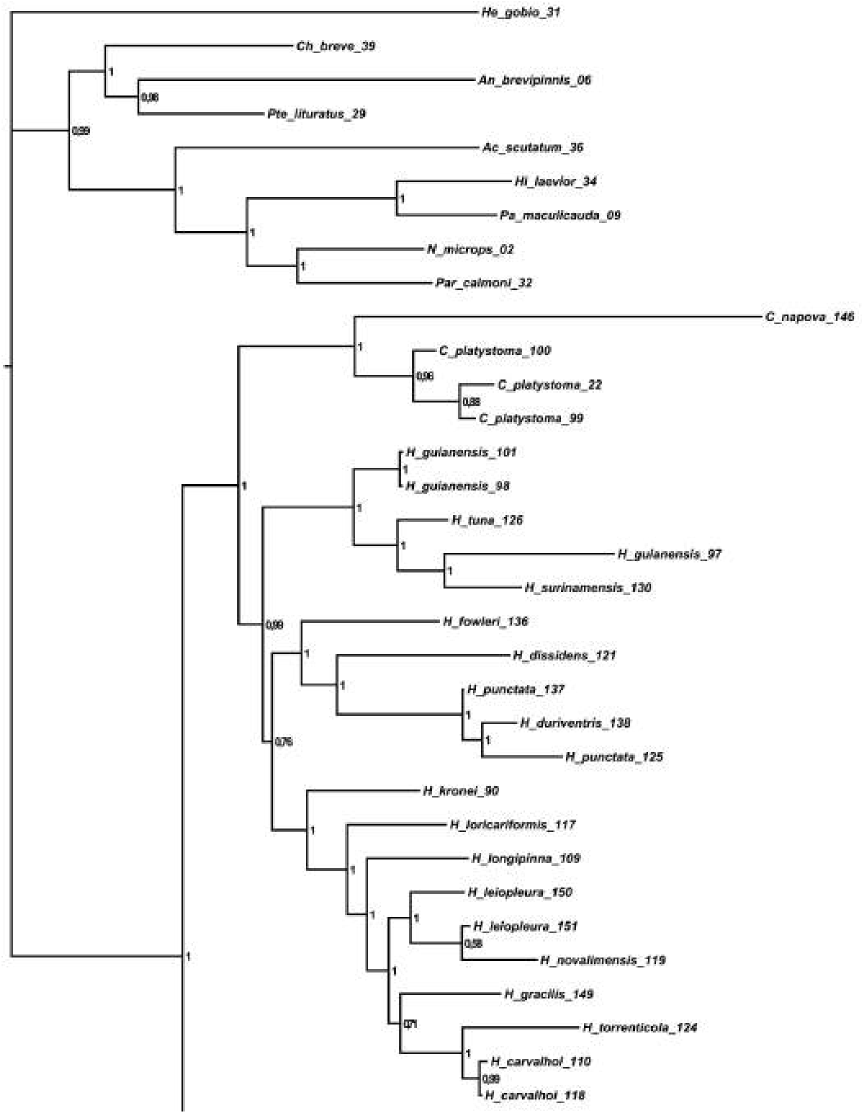
Taxon/Character	**137**	**138**	**139**	**140**	**141**	**142**	**143**	**144**	**145**	**146**	**147**	**148**	**149**	**150**	**151**	**152**	**153**	**154**	**155**	**156**
Pterosturisoma microps	0	0	0	2	0	1	1	0	1	1	1	1	0	3	0	1	2	0	1	1
Sturisoma barbatum	3	0	0	3	0	2	1	0	1	1	1	1	0	2	0	1	2	0	2	1
Sturisoma guentheri	3	1	1	3	0	1	1	0	1	1	1	1	0	2	0	1	2	0	2	1
Sturisoma lyra	3	0	0	3	0	2	1	0	1	1	1	1	0	2	0	1	2	0	2	1
Sturisoma monopelte	3	0	0	2	0	1	1	0	1	1	1	1	0	2	0	0	2	0	2	1
Sturisoma nigrirostrum	3	0	0	3	0	0	1	0	1	1	1	1	0	2	0	0	2	0	2	1
Sturisoma robustum	3	0	0	2	0	1	1	0	1	1	1	1	0	2	0	1	2	0	2	1
Sturisoma rostratum	3	0	0	3	0	2	1	0	1	1	1	1	0	2	0	1	2	0	2	1
Sturisoma tenuirostre	3	0	0	2	0	1	1	0	1	1	1	1	0	2	0	0	2	0	2	1
Sturisoma Madre de dios	3	0	0	2	0	1	1	0	1	1	1	1	0	2	0	0	2	0	2	1
Sturisomatichthys aureus	3	0	0	3	0	2	1	0	0	1	1	1	0	6	0	0	1	0	0	1
Sturisomatichthys citurensis	0	1	1	3	0	1	1	0	0	1	1	1	0	6	0	1	1	0	0	1
Sturisomatichthys dariensis	3	0	0	3	0	2	1	0	0	1	1	1	0	2	0	1	1	0	0	1
Sturisomatichthys festivus	2	0	0	3	0	1	1	0	1	1	1	1	0	6	0	0	1	0	0	1
Sturisomatichthys frenatus	3	1	1	2	0	1	1	0	0	1	1	1	0	6	0	0	1	0	0	1
Sturisomatichthys kneri	3	1	1	3	0	1	1	0	0	1	1	1	0	2	0	0	1	0	0	1
Sturisomatichthys leightoni	3	0	0	2	0	2	1	0	0	1	1	1	0	6	0	1	1	0	0	0
Sturisomatichthys panamensis	3	0	0	2	0	2	1	0	0	1	1	1	0	6	0	0	1	0	0	1
Sturisomatichthys tamanae	0	0	0	3	0	1	1	0	0	1	1	1	0	6	0	0	1	0	0	1
Sturisomatichthys San Juan	3	0	0	2	0	1	1	0	0	1	1	1	0	6	0	1	1	0	0	1
Sturisomatichthys Baudó	3	0	0	1	0	1	1	0	0	1	1	1	0	6	0	0	1	0	0	1

Taxon/Character	**157**	**158**	**159**	**160**	**161**	**162**	**163**	**164**	**165**	**166**	**167**	**168**	**169**	**170**	**171**	**172**	**173**	**174**	**175**	**176**
Pterosturisoma microps	1	0	1	1	1	0	2	0	1	0	0	3	0	2	0	2	1	1	2	0
Sturisoma barbatum	3	0	1	0	1	0	2	2	2	0	0	1	0	1	0	2	1	0	2	2
Sturisoma guentheri	3	0	1	0	2	0	2	2	2	0	0	1	0	2	0	2	1	0	2	1
Sturisoma lyra	3	0	1	1	0	0	2	2	2	0	0	0	0	2	0	2	1	0	2	1
Sturisoma monopelte	3	0	1	0	1	0	2	2	2	0	0	0	0	2	0	2	1	0	2	1
Sturisoma nigrirostrum	3	0	1	1	2	0	2	2	2	0	0	0	0	2	0	2	1	1	2	1
Sturisoma robustum	3	0	1	1	1	0	2	0	2	0	0	1	0	2	0	1	1	0	2	0
Sturisoma rostratum	3	0	1	1	2	0	2	2	2	0	0	1	0	2	0	2	1	0	2	1
Sturisoma tenuirostre	3	0	1	1	2	0	2	0	2	0	0	0	0	2	0	2	1	1	2	1
Sturisoma Madre de dios	2	0	1	0	2	0	2	2	2	0	0	0	0	2	0	2	1	1	2	2
Sturisomatichthys aureus	1	0	1	0	2	0	2	0	0	0	0	0	0	2	0	1	1	2	2	1
Sturisomatichthys citurensis	1	0	1	1	0	0	2	0	1	0	1	1	0	2	0	2	1	1	2	1
Sturisomatichthys dariensis	1	0	1	0	0	0	2	0	2	0	0	1	0	2	0	1	1	1	2	0
Sturisomatichthys festivus	1	0	1	1	2	0	2	2	1	0	0	0	0	2	0	2	1	1	2	1
Sturisomatichthys frenatus	1	0	1	1	2	0	2	0	2	0	0	0	0	2	0	1	1	1	2	1
Sturisomatichthys kneri	2	0	1	1	1	0	2	0	2	0	0	0	0	2	0	2	1	1	2	1
Sturisomatichthys leightoni	1	0	1	1	0	0	2	2	1	0	0	0	0	2	0	1	1	2	2	1
Sturisomatichthys panamensis	1	0	1	0	0	0	2	0	2	0	0	1	0	2	0	2	1	2	2	1
Sturisomatichthys tamanae	1	0	1	1	0	0	2	0	1	0	0	0	0	2	0	1	1	1	2	1
Sturisomatichthys San Juan	1	0	1	1	2	0	2	0	1	0	0	1	0	2	0	1	1	0	2	1
Sturisomatichthys Baudó	1	0	1	1	2	0	2	0	1	0	0	1	0	2	0	1	1	0	2	1

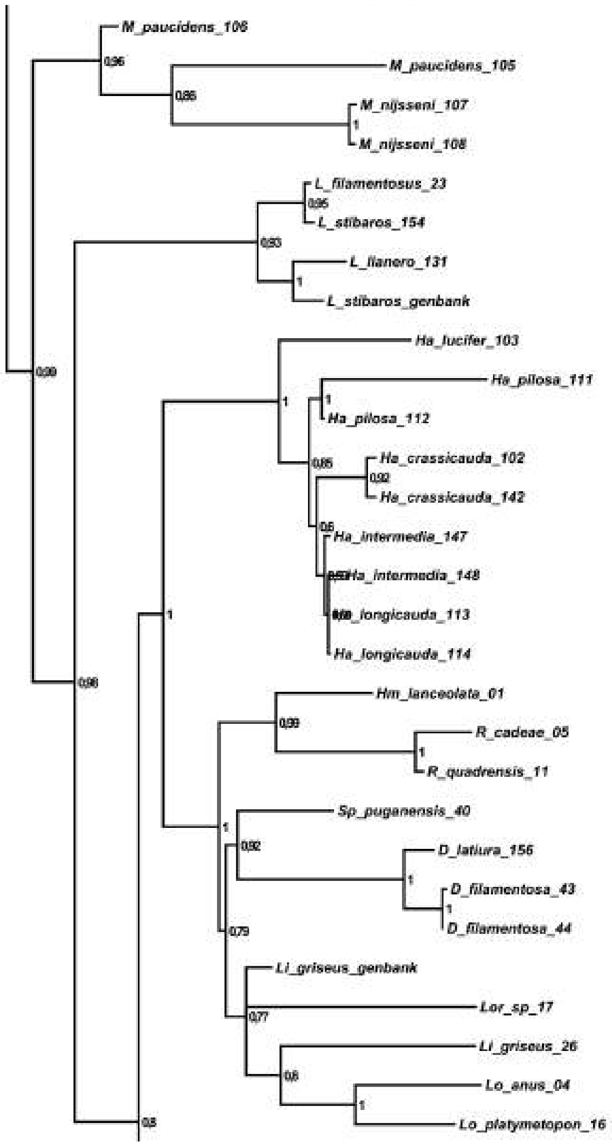
Taxon/Character	**177**	**178**	**179**	**180**	**181**	**182**	**183**	**184**	**185**	**186**	**187**	**188**	**189**	**190**	**191**	**192**	**193**	**194**	**195**	**196**
Pterosturisoma microps	0	2	2	0	2	2	0	1	3	2	1	0	0	1	0	0	0	0	1	0
Sturisoma barbatum	0	2	2	1	2	2	1	2	3	0	1	0	0	1	1	1	0	1	1	3
Sturisoma guentheri	0	2	2	1	2	2	1	2	3	1	1	0	0	1	1	1	0	1	1	3
Sturisoma lyra	0	2	2	1	2	2	1	2	3	0	0	0	1	1	1	1	0	1	1	3
Sturisoma monopelte	0	2	2	1	2	2	1	2	0	0	1	0	0	1	1	1	0	1	1	3
Sturisoma nigrirostrum	1	2	2	1	2	2	1	2	0	0	1	0	0	1	1	1	0	1	1	3
Sturisoma robustum	0	2	2	1	2	2	1	2	3	0	1	0	0	1	0	1	0	1	1	3
Sturisoma rostratum	1	2	2	1	2	2	1	2	0	1	1	0	0	1	1	1	0	1	1	3
Sturisoma tenuirostre	0	2	2	1	2	2	1	2	3	1	0	0	0	1	1	1	0	1	1	3
Sturisoma Madre de dios	0	2	2	1	2	2	1	2	0	1	1	0	0	1	1	1	0	1	1	3
Sturisomatichthys aureus	1	2	2	1	2	1	0	1	3	1	1	0	0	1	1	1	0	1	1	3
Sturisomatichthys citurensis	1	2	2	1	2	1	0	1	0	0	2	0	0	1	0	0	0	1	1	3
Sturisomatichthys dariensis	1	2	0	1	2	1	0	2	0	0	0	0	0	1	1	1	0	1	1	2
Sturisomatichthys festivus	1	2	0	1	2	1	0	1	3	1	1	0	0	1	1	1	0	1	1	0
Sturisomatichthys frenatus	1	2	0	1	2	1	0	2	0	1	1	0	0	1	0	1	0	1	1	2
Sturisomatichthys kneri	1	2	2	1	2	1	0	1	?	0	?	0	?	1	?	?	0	1	1	3
Sturisomatichthys leightoni	1	2	2	1	2	1	0	1	0	2	2	0	0	1	0	1	0	1	1	3
Sturisomatichthys panamensis	0	2	2	1	2	1	0	1	0	0	1	0	0	1	0	1	0	1	1	0
Sturisomatichthys tamanae	1	2	2	1	2	1	0	1	0	0	2	0	0	1	0	0	0	1	1	3
Sturisomatichthys San Juan	1	2	2	1	2	1	0	1	3	2	0	0	0	1	0	1	0	0	1	3
Sturisomatichthys Baudó	1	2	2	1	2	1	1	1	3	2	0	0	0	1	0	1	0	1	1	3

Taxon/Character	**197**	**198**	**199**	**200**	**201**	**202**	**203**	**204**	**205**	**206**	**207**	**208**	**209**	**210**	**211**	**212**	**213**	**214**	**215**	**216**
Pterosturisoma microps	2	1	1	2	0	2	0	0	1	2	1	1	1	0	1	2	2	1	1	3
Sturisoma barbatum	0	1	1	3	1	2	0	0	0	1	0	1	1	0	1	2	0	5	0	1
Sturisoma guentheri	0	1	1	3	1	2	0	0	0	1	0	1	1	0	1	2	1	1	0	2
Sturisoma lyra	0	1	1	3	1	2	0	0	0	1	0	1	1	0	1	2	0	1	0	1
Sturisoma monopelte	0	1	1	3	1	2	0	0	0	1	0	1	1	0	1	2	1	1	0	0
Sturisoma nigrirostrum	0	1	1	3	1	2	0	0	0	1	0	1	1	0	1	2	0	5	0	0
Sturisoma robustum	0	1	1	3	1	2	1	0	1	1	0	1	1	0	1	2	1	1	0	1
Sturisoma rostratum	0	1	1	3	1	2	0	0	0	1	0	1	1	0	1	2	0	1	0	1
Sturisoma tenuirostre	0	1	1	3	1	2	0	0	0	1	0	1	1	0	1	2	1	1	0	0
Sturisoma Madre de dios	0	1	1	3	1	2	0	0	0	1	0	1	1	0	1	2	1	5	0	1
Sturisomatichthys aureus	1	1	2	3	0	2	0	0	0	1	1	1	1	0	1	2	0	5	1	3
Sturisomatichthys citurensis	1	1	2	3	0	2	0	0	0	1	1	1	1	0	1	2	0	3	1	3
Sturisomatichthys dariensis	1	1	2	3	0	2	0	0	0	2	1	1	1	0	1	2	0	5	1	4
Sturisomatichthys festivus	1	1	2	3	0	2	1	0	1	2	1	1	1	0	1	2	1	5	1	3
Sturisomatichthys frenatus	1	1	1	3	0	2	0	0	0	2	1	1	1	0	1	2	0	5	2	4
Sturisomatichthys kneri	1	1	2	3	0	2	0	0	0	1	1	1	1	0	1	2	1	5	1	0
Sturisomatichthys leightoni	1	1	1	3	0	2	0	0	0	1	1	1	1	0	1	2	0	5	1	3
Sturisomatichthys panamensis	1	1	2	3	0	2	0	0	0	1	1	1	1	0	1	2	0	5	1	3
Sturisomatichthys tamanae	1	1	1	3	0	2	0	0	0	1	1	1	1	0	1	2	0	3	1	3
Sturisomatichthys San Juan	1	1	2	3	0	2	0	0	0	1	1	1	1	0	1	2	0	5	1	4
Sturisomatichthys Baudó	1	1	2	3	0	2	0	0	0	2	1	1	1	0	1	2	1	5	1	4

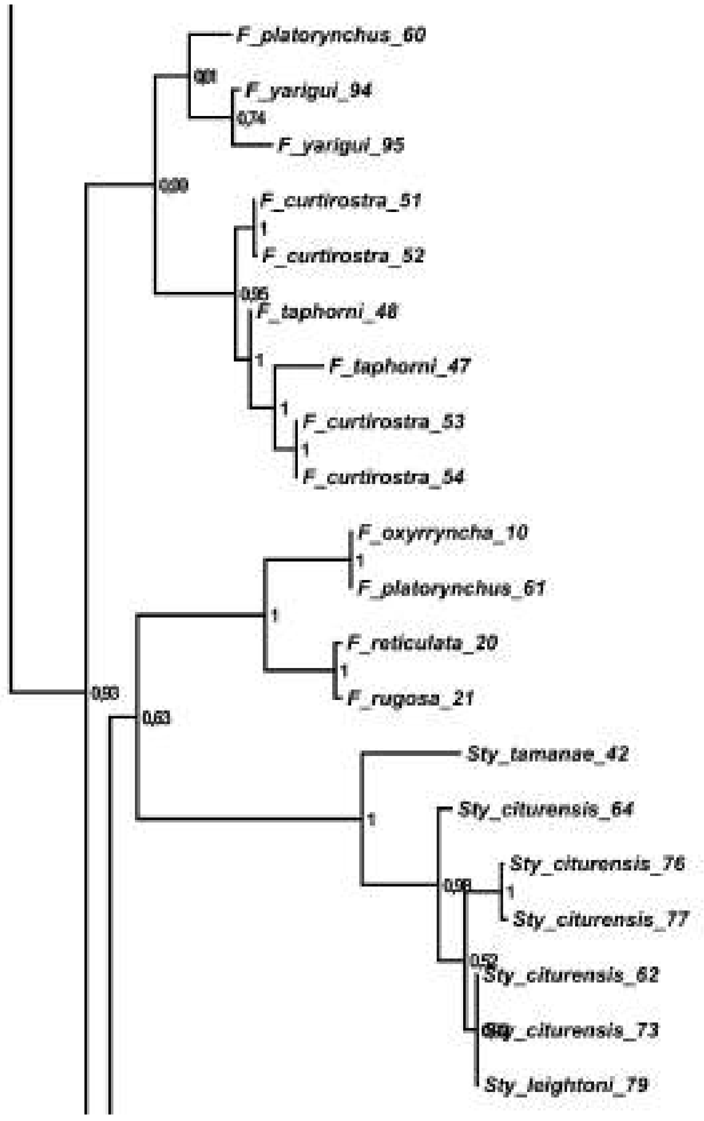
Appendix III. Bayasian analysis of populations samples.



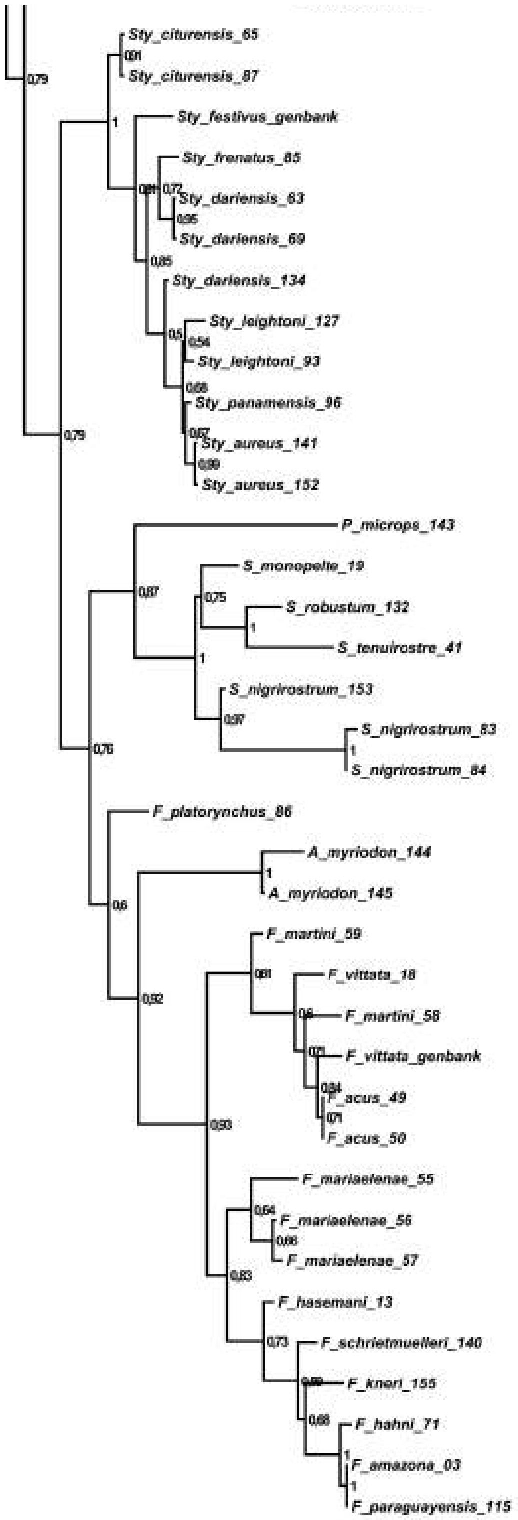
Appendix III. Continuation



Appendix III. Continuation



Appendix III. Continuation



TAXONOMIC REVISION OF *Sturisomatichthys* ISBRÜCKER & NIJSSEN, 1979 (LORICARIIDAE: LORICARIINAE), WITH DESCRIPTION OF TWO NEW SPECIES

Alejandro Londoño-Burbano & Roberto E. Reis

RUNNING TITLE: Taxonomic revision of *Sturisomatichthys*

KEY WORDS: Armored catfishes; taxonomy; neotropical fish; Northwestern South America; *Sturisoma*; Colombia.

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ABSTRACT

A taxonomic revision of *Sturisomatichthys* is presented. A total of 358 specimens including both type an non-type specimens of all valid species were examined. *Sturisomatichthys* was found to encompass 10 valid species: *Sturisomatichthys aureus, S. caquetae, S. citurensis, S. dariensis, S. festivus, S. frenatus, S. kneri, S. leightoni, S. panamensis, S. tamanae*. In addition, two new species are described, *Sturisomatichthys* Baudó n.sp. from the Baudó River, in Northwestern Colombia, belonging to the Caribbean slope of the continent, and *Sturisomatichthys* San Juan n.sp. from the San Juan River basin in western Colombia, on the Pacific slope. *Sturisomatichthys caquetae*, from the Morelia River, upper Amazon, is transferred back from *Sturisoma* and *S. leightoni* was found to be distributed, besides the Magdalena-Cauca basin, in the Orinoco basin; thus, *Sturisomatichthys* is discovered to be distributed in both trans- and cis-Andean drainages. A neotype is designated for *S. aureus* from the Lower Magdalena basin. New records of localities in the Northwestern region of South America, as well as the redescription and taxonomic comments of all valid species, are provided. A map with the distribution of the genus and a key of identification of the species are provided.

Loricariinae currently includes 239 valid species (Eschmeyer & Fong, 2017) classified in 31 genera (Covain et al., 2016), distributed from La Plata in southern Argentina to the northern Caribbean basins (Ferraris, 2003). The species of this subfamily are characterized by presenting a long and depressed caudal peduncle and absence of adipose fin. They usually live in the substrate and show marked variations in the shape of their body due to the different colonized environments, from lotic to lentic systems, in organic or inorganic substrates such as rocks, trunks or substrate (Covain et al., 2008).

Isbrücker & Nijssen (in Isbrücker, 1979) suggested a classification of the Loricariinae including several tribes and subtribes, while describing several new genera and species. *Sturisomatichthys* Isbrücker & Nijssen, 1979 was described in that study and as part of the Harttiini along with *Sturisoma* Swainson, 1838, *Harttia* Steindachner, 1877, *Lamontichthys* Miranda Ribeiro, 1939, *Harttiella* Boeseman, 197, *Pterosturisoma* Isbrücker & Nijssen, 1978, *Cteniloricaria* Isbrücker & Nijssen, 1979, and *Metaloricaria* Isbrücker, 1975. *Sturisomatichthys* included four species, *S. leightoni* (Regan, 1912: type species) from the Magdalena River basin, Colombia, *S. citurensis* (Meek & Hildebrand, 1913) from the Tuyra River, Panama, *S. tamanae* (Regan, 1912) from the San Juan River basin, Colombia, and *S. caquetae* (Fowler, 1945) from the Morelia River, Amazon basin, Colombia. The genus was compared to *Sturisoma* from which, according to the authors, it was distinguished by the absence of an enlarged rostrum (vs. presence in *Sturisoma*) as the only diagnostic character. The authors offered no further comments regarding the genus.

Sturisomatichthys has remained as an ill-studied group within the Loricariinae and to date it has not receive a taxonomic revision of the genus. It was not until Rapp Py-Daniel (1997) who carried out a morphology-based phylogeny of the Loricariinae, that a representative of the genus was included in an analysis of the subfamily. *Sturisomatichthys citurensis* was found by the author to be part of her Harttiini, as sister to the remaining genera included in her Harttiina and Farlowellina, more related to *Farlowella* Eigenmann & Eigenmann, 1889.

Posteriorly, Ghazzi (2003) in a morphology-based and taxonomic revision of *Sturisoma* included three species of *Sturisomatichthys*, *S. leightoni*, *S. citurensis*, and *S. tamanae*. The author found *S. citurensis* and *S. tamanae* to be part of a separate clade than that which included *S. leightoni*, while three undescribed (trans-Andean) species revealed by the author, plus *S. panamensis* (Eigenmann & Eigenmann, 1889) and *S. festivus* (Myers, 1942), did appear in the clade containing the type species of *Sturisomatichthys*. The author proposed a “”Trans” New Genus” to include the undescribed species plus *S. panamensis*, *S. frenatus* (Boulenger, 1902) and *S. festivus*.

Molecular-based phylogenies of the Loricariinae offered by Covain et al. (2008) and Rodriguez et al. (2011) included *S. citurensis*. Both studies found the species as sister to *Farlowella*. Additionally, Covain et al. (2008) included an analysis of morphological traits within Loricariinae and tested their validity as informative characters. Regarding the only diagnostic character proposed for *Sturisomatichthys* (absence of enlarged rostrum), the authors found it to be not informative, and suggested that a deeper study of the genus was needed, and that probably the genus represented a synonym of *Sturisoma*, which was also previously suggested by Covain & Fisch-Muller (2007).

Covain et al. (2016) included both *S. leightoni* and *S. citurensis* in their molecular-based phylogeny of the Loricariinae. The authors found *S. leightoni* nested within a clade comprising *S. aureus* (Steindachner, 1900), *S. dariensis* (Meek & Hildebrand, 1913), *S. frenatus, S. panamensis, S. festivus,* and *S. citurensis*; those species, except *S. citurensis,* belonged to *Sturisoma sensu lato* and represented all trans-Andean species. Thus, the authors suggested the above-mentioned species to belong to *Sturisomatichthys* along with the *sensu stricto* species of the genus. Nevertheless, Covain et al. (2016) proposed that due to the trans-Andean characteristic of the new configuration of *Sturisomatichthys, S. caquetae*, the only cis-Andean species of the genus, should be transferred to *Sturisoma,* assumed by the author as fully cis-Andean. However, the authors did not include *S. caquetae* in their analysis, nor analyzed its holotype (ANSP 71719), and suggested its new generic placement based only on its distribution. In the same way, the authors suggested *S. tamanae* and *S. kneri* (Ghazzi, 2005) to belong to *Sturisomatichthys* based on their distribution, but neither of the species were included in that study. Thus, Covain et al. (2016) suggested *Sturisomatichthys* to include *S. aureus*, *S. citurensis, S. dariensis*, *S. festivus*, *S. frenatus*, *S. kneri*, *S. leightoni*, *S. panamensis,* and *S. tamanae,* and *Sturisoma* to comprise the remaining *Sturisoma sensu lato* cis-Andean species, plus *S. caquetae*.

Londoño-Burbano & Reis (Chapter I) included all *Sturisomatichthys* species of Covain et al. (2016) plus *S. tamanae* in their total evidence analysis of the Harttiini. The authors corroborated the configuration for *Sturisomatichthys* suggested by Covain et al. (2016), including *S. tamanae* as part of the genus. Nevertheless, and through the analysis of the holotype of *S. caquetae*, it was found that the species presents diagnostic characters of *Sturisomatichthys* (this study), thus not being part of *Sturisoma* but of *Sturisomatichthys* as first suggested by Isbrücker & Nijssen (in Isbrücker, 1979). Londoño-Burbano & Reis (Chapter I) found the genus to be monophyletic and part of the Farlowellini, along with *Farlowella*, *Lamontichthys*, *Pterosturisoma*, and *Sturisoma* (proposed in that study), and as sister group to *Farlowella*.

The aim of this study is to perform a taxonomic revision of *Sturisomatichthys*. Since no taxonomic issues regarding the genus have been addressed since its description, the analysis of the type series of all species was aimed to be included, as well as an ample comparison to non-type material of the species of the Loricariinae, especially to those belonging to the Farlowellini. Redescription of species, except *S. kneri*, are presented, as well as updated diagnostic characters for the genus and the species, and the description of two new species. An identification key for the species of the genus and an update on their distribution are also provided.

MATERIALS AND METHODS

Measurements and counts follow Ghazzi (2005), with the addition of pre-pectoral length (from tip of snout to origin of pectoral fin); distance between tip of snout and anterior border of nostril; and internareal distance (taken at the posteriormost margin of the nares). Measurements were taken point to point with digital calipers (0.1 mm precision). Bilateral counts and measurements were taken from the left side of the specimens except when the structure being measured or counted was damaged, in which case data were acquired from the right side.

Counts and nomenclature of lateral plate series follow Ballen et al. (2016), nomenclature of abdominal plate series follow Londoño-Burbano & Reis (2016), and tooth cusp names follow Müller & Weber (1992). Number of specimens in alcohol and cleared and stained are indicated by "alc" and "c&s", respectively.

Institutional abbreviations follow Sabaj (2016). Osteological nomenclature follows Paixão & Toledo-Piza (2009). Specimens for osteological observations were cleared and counterstained for bone and cartilage using the method of Taylor & Van Dyke (1985). The construction of the distribution map for the species followed the tutorial described by Calegari et al. (2016) using the software and map packages in QGIS v. 2.18 and Google Earth.

RESULTS

Sturisomatichthys Isbrücker & Nijssen, 1979

Sturisomatichthys Isbrücker & Nijssen, in Isbrücker, 1979:91 (type species: *Oxyloricaria leightoni* Regan, 1912, by original designation; gender: male).

Included taxa: *Sturisomatichthys aureus* (Steindachner, 1900); *S. caquetae* (Fowler, 1945), **new combination**; *S. citurensis* (Meek & Hildebrand, 1913); *S. dariensis* (Meek & Hildebrand, 1913); *S. festivus* (Myers, 1942); *S. frenatus* (Boulenger, 1902); *S. kneri* (Ghazzi, 2005); *S. leightoni* (Regan, 1912); *S. panamensis* (Eigenmann & Eigenmann, 1889); *S. tamanae* (Regan, 1912); *Sturisomatichthys* Baudó, **new species**; *Sturisomatichthys* San Juan, **new species**.

Placement in Loricariinae: *Sturisomatichthys* belongs to the Farlowellini Fowler, 1958, along with *Farlowella* Eigenmann & Eigenmann, 1889 (type genus); *Lamontichthys* P. de Miranda Ribeiro, 1939; *Pterosturisoma* Isbrücker & Nijssen, 1978; and *Sturisoma* Swainson, 1838.

Diagnosis: *Sturisomatichthys* can be distinguished from members of the Loricariini by the possession of more than 30 teeth on both premaxilla and dentary (vs. less than 20); absence of orbital notch (vs. presence); and 12 branched caudal-fin rays (vs. 10 branched caudal-fin rays). From genera belonging to the Harttiini, encompassing *Harttia, Harttiella* and *Cteniloricaria* , *Sturisomatichthys* can be diagnosed by the presence of a produced rostrum (vs. rostrum not produced, except for *S. caquetae, S. citurensis,* and *S. tamanae*); abdominal plates always present, developed, irregular, covering the entire abdomen (vs. abdomen plates absent, or small and scarce, except *Cteniloricaria, Harttia dissidens, H. duriventris, H. fowleri, H. longipinna,* and *H. surinamensis*); 15-18 plates on median series plates (vs. 19-21 plates on median series plates); abdominal plates always reaching to the posterior border of lower lip, covering cleithral region (vs. cleithral region naked); and anterior abdominal plates larger and slender than central abdominal plates (vs. plates absent, or the same size as central abdominal plates). From Farlowellini, encompassing *Farlowella, Lamontichthys*, *Pterosturisoma* and *Sturisoma*, *Sturisomatichthys* is diagnosed by having the third predorsal plate at least twice the size of the first two plates (vs. predorsal plates the same size, except *Sturisoma*). From *Lamontichthys* it can be distinguished by the possession of six branched pectoral-fin rays (vs. seven branched pectoral-fin rays). It can be diagnosed from *Farlowella* by having irregular, numerous central abdominal plates without arrangement in defined series (vs. two or three well-arranged series of large central abdominal plates); and absence, or possession of a short rostrum (vs. well-developed rostrum, except *F. curtirostra* and *F. myriodon*). It is diagnosed from *Pterosturisoma* by the possession of a rostrum (vs. absence, except for *S. caquetae*, *S. citurensis*, and *S. tamanae*). *Sturisomatichthys caquetae*, *S. citurensis*, and *S. tamanae* are differentiated from *Pterosturisoma* by having 19-21 coalescent plates in the caudal peduncle (vs. 14-18 coalescent plates). It is differentiated from *Sturisoma* by the irregular, numerous central abdominal plates without arrangement in defined series (vs. three well-arranged series of developed central abdominal plates); presence of dark spots on either, or all, dorsal-, pectoral-, pelvic, or anal-fins (vs. absence); and by having 15-18 plates on the median series plates (vs. 20-21 plates on the median series). Additionally, *Sturisomatichthys* presents the following osteological autapomorphies which diagnoses it within Farlowellini: exoccipital quadrangular and expanded, in ventral view (character 22:0); posterior process of palatine long, extending beyond anterior condyle of lateral ethmoid (character 47:0); pharyngeal plates completely toothed (character 107:2); presence of a fenestra between the transverse process of the Weberian apparatus and the transcapular ligament with a laminar process as only part of contact of the structures (character 123:1); more than eight dorsal-fin pterygiophores (character 133:2); posterior process of hemal spine of second preural centrum long (character 145:0); posterior process of cleithrum short, portion exposed with odontodes, narrow (character 155:1); and hypurapophysis long, projecting to second preural centrum (character 177:1).

Sexual dimorphism: Adult males of *Sturisomatichthys* show marked dimorphism related to the development of thin, short, and sometimes numerous odontodes on the sides of the head. The development of odontodes can also be perceptible on the first pectoral-fin ray, and along the caudal peduncle, although those odontodes are not as developed as those on the head. No sexual dimorphism was observed related to teeth cusps, urogenital pore, or thickening of the unbranched ray of the pectoral- and/or pelvic-fin.

Distribution: *Sturisomatichthys* is distributed in the Tuyra, Capeti, Aruza, and Bayano Rivers in the Pacific slope, Panama; Atrato, Sinú, Magdalena, Cauca, San Jorge, Catatumbo Rivers on the Caribbean slope in Colombia; Orinoco basin, Colombia; Maracaibo Lake basin in Venezuela; Truando, San Juan, Baudó, and Patía Rivers on the Pacific slope of Colombia; the Esmeraldas and Durango Rivers on the Pacific versant in northwestern Ecuador; and Upper Amazon, Colombia (Fig. 1,2,3).

Etymology: In their original description, Isbrücker & Nijssen (in Isbrücker, 1979: 91) included the etymology to be *Sturisoma*, from the German, *sturio* = sturgeon, plus the Greek, *soma* = body, and the Greek word “*ichthys*” which means “fish”, due to the similarity between the two genera.

Remarks: Isbrücker & Nijssen (in Isbrücker, 1979) included as the only character to diagnose *Sturisomatichthys* the absence of a rostrum, which differentiates it from *Sturisoma*. That character was included in Chapter 1, and it was found to be uninformative. As discussed in Chapter 1, both the absence and the presence of produced rostrum can be observed in *Sturisoma*, and thus, its absence is not diagnostic for *Sturisomatichthys*.

In the original description of *Sturisomatichthys* (Isbrücker, 1979), *S. caquetae* from the Caquetá River in Colombia, Amazon basin, was included as part of the genus, representing the only Cis Andean species of the genus. Covain et al. (2016) included most of the species belonging to *Sturisoma* and some *Sturisomatichthys* species, including its type species, in their molecular-based phylogeny of the Loricariinae. Those authors found strong support for the inclusion of the Trans-Andean species traditionally assigned to *Sturisoma* in *Sturisomatichthys*, a result that was corroborated in Chapter 1. Nevertheless, it was found that *S. caquetae* does belong to *Sturisomatichthys*, and *S. leightoni* is, in addition of being present at the Magdalena-Cauca basin, also distributed in the Orinoco basin, Colombia (see below).

As exposed by Covain & Fisch-Muller (2007) and Londoño-Burbano & Reis (2016), *Dasyloricaria* is the only strictly Trans Andean genus of the Loricariinae. Based on the results obtained in Chapter 1 and here, this is not the case for *Sturisomatichthys* as proposed by Covain et al. (2016). Nevertheless, the distribution and occurrence of some of the species of *Sturisomatichthys* (i.e. *S. dariensis* and *S. panamensis*) in the Tuyra and Capeti basin in the Pacific slope of Panama, and the Atrato River on the Pacific slope of Colombia, is the same as the distribution of *Dasyloricaria latiura* (Londoño-Burbano & Reis, 2016). This is also the case for *S. festivus*, which is present in the Catatumbo River in Colombia and the Maracaibo Lake basin in Venezuela, as is *D. filamentosa*. A clear biogeographical component is observed to explain the distribution of the species on both genera (see Discussion here, and Londoño-Burbano & Reis, 2016).

***Sturisomatichthys aureus* (Steindachner, 1900)**

Fig. 4 and 5.

Table 1.

Loricaria aurea Steindachner, 1900: 206 (type locality: Magdalena River at Bodega Central, Colombia; no type assigned); 1902: 138, pl.5, figs. 1-1a (more detailed description of the species; figures in dorsal and lateral view of a specimen). Neumann, 2006: 276 (remarks of holotype deposited at ZSM).

Sturisoma aureum (Steindachner, 1900) – Eigenmann, 1920a: 27 (present at upper Magdalena River, near Bogotá); 1922: 96 (resurrection from synonymy with *S. panamensis*; short description of the species). Fowler, 1942: 132 (distributed at Magdalena basin; also at Meta River following Eigenmann (1922)). Miles, 1947: 104, Fig. 68 (identification key of the Loricariidae; drawings of dorsal view, and ventral view of the head; distribution of the species; rejection of Regan's synonymy with *S. panamensis*). Dahl, 1971: 95 (present at Magdalena, San Jorge and Cesar Rivers; maximum size of 20cm TL). Isbrücker, 1980: 93 (species included in *Sturisoma*; no diagnosis); 1981a: 87 (listed as valid species of the genus *Sturisoma*). Román-Valencia, 1990: 205 (present at middle Atrato River). Isbrücker et al., 2001: 29, 32 (included in the catalog of the Loricariinae as valid in *Sturisoma*, German version). Isbrücker, 2002: 29 (included in the catalog of the Loricariinae as valid in *Sturisoma*, English version). Ferraris, 2003: 346 (genus and species distribution; synonymy; type material location; type as missing; maximum body size; common name in Colombia). Ghazzi, 2003: 223 (as *incertae sedis* within Loricariinae). Lasso et al., 2004: 129 (not distributed in Venezuela). Maldonado-Ocampo et al., 2006: 150 (distributed at Atrato river in Colombia; lot from ICNMHN). Mojica et al., 2006a: 32 (distributed at the Magdalena-Cauca Basin; catalog numbers at ICNMHN and IAvH); 2006b: 136 (distributed at Rancheria River, La Guajira, Colombia; catalog numbers at ICNMHN); Villa-Navarro et al., 2006: 13 (specimens in Colombian museums). Ferraris, 2007: 298-299 (type locality; distribution of the species). Maldonado-Ocampo et al., 2008: 195 (distribution of the species at Magdalena-Cauca basin, Pacific Slope Rivers, and Caribbean Slope Rivers; type destroyed in WWII, without citation of the source); 2013: 396 (present at Atrato and Baudó Rivers, Caribbean and Pacific versant of Colombia, respectively; specimens at ICNMHN).

Sturisomatichthys aureus (Steindachner, 1900) – Covain et al., 2016: 514 (valid as *Sturisomatichthys aureum*; phylogenetic relationships of the Loricariinae subfamily using molecular markers).

Neotype: ICNMHN XXXX (ex ICNMHN 2414). Colombia, Cesar department, La Jagua de Ibiricó municipality, Lower Magdalena basin, Sororia Creek tributary of Tucuy River, G. Galvis, 02/1996.

Non-types: CIUA 365. 1alc. Colombia, Cesar department, Lower Magdalena basin, Tucuy River, affluent of Calenturitas River. A. Montoya. 04/2006. CIUA 986. 1alc. Colombia, Antioquia department, Sonsón municipality, Middle Magdalena River basin, Samaná River. H. Agudelo. 25/07/2008. CIUA 1997. 1alc. Colombia, Santander department, Barrancabermeja municipality, Lower Magdalena basin, EL Llanito swamp, San Silvestre channel. Pelayo-Mantilla. 02/2011. ICNMHN 111. 2alc. Colombia, Chocó department, Amparraidó district, Baudó River, G. Dahl, 11/1959. ICNMHN 815. 1alc. Colombia, La Guajira department, Cerrejoncito Creek. T. Viel & E. Cordero, 03/23/1981. ICNMHN 817. 1alc. Colombia, La Guajira department, Ranchería River. M. Bozeman & G. Reub, 05/12/1980. ICNMHN 2414. 25alc. Same data as neotype. ICNMHN 8732. 5 alc. Colombia, La Guajira department, Oreganal district, El Cerrejón Mine, Ranchería River, downstream of Cerrejón Creek, I. Mojica & C. Castellanos, 21/02/2004. ICNMHN 8870. 4alc. Colombia, La Guajira department, Distracción municipality, Chorreras district, Ranchería River at El Cercado. I. Mojica & C. Castellanos, 18/02/2004. ICNMHN 7246. 2alc. Colombia, Caldas department, Norcasia municipality, Middle Magdalena River, El Jagual Creek, tributary of Manso River. C. Cipamocho et al. 09/2002. ICNMHN 8889. 13alc. Colombia, La Guajira department, Distracción municipality, Chorreras district, Ranchería River at El Cercado sector, I. Mojica & C. Castellanos, 18/02/2004. ICNMHN 9656. 4alc. Colombia, La Guajira department, Distracción municipality, Chorreras district, El Cercado Bridge, Ranchería River, C. Castellanos & P. Sanchez, 02/05/2004. ICNMHN 9685. 2alc. Colombia, La Guajira department, Fonseca district, Rancheria River. C. Castellanos, 05/05/2004. ICNMHN 9697. 9alc. Colombia, La Guajira department, Distracción municipality, Chorreras district, Paso Ancho sector, Ranchería River, C. Castellanos, 02/05/2004. ICNMHN 9842. 1alc. Colombia, La Guajira department, Barrancas district, La Quebrada Creek, tributary of Ranchería River. C. Castellanos 06/12/2003. ICNMHN 10820. 4alc. Colombia, La Guajira department, Distracción municipality, Chorreras district, El Cercado Bridge, Ranchería River, C. Castellanos & P. Sanchez, 27/10/2004. ICNMHN 11652. 2alc. Colombia, La Guajira department, Riohacha City, Oreganal district, Ranchería River, C. Castellanos & P. Sanchez, 03/2005. ICNMHN 18166. 4alc. Colombia, Cesar department, Pailitas municipality, Lower Magdalena River, Hondo Creek tributary of Tunuma channel, Bijao swamp, Corpobiotica, 11/09/2011. ICNMHN 18189. 8alc. Colombia, Cesar department, Pailitas district, Lower Magdalena River Raya Grande Creek, tributary to Tunuma channel, Bijao swamp, 09°00’07.7’’N 73°39’17.5’’W 62-93masl, Corpobiotica, 26/10/2011. ICNMHN 18408. 4alc. Colombia, Cesar department, Pelaya municipality, Lower Magdalena River, Sucio channel, Las Damas and Orisnó Creeks, tributaries of San Bernardo Swamp, 08°43’54.2’’N 73°40’50.5’’W 42-86masl, Corpobiotica, 30/08/2011. ICNMHN 18504. 14 alc. Colombia, Cesar department, Lower Magdalena River basin, La Gloria municipality, El Carmen district, Simaña River, 08°40’26,7’’N 73°38’02.4’’W 70masl. Corpobiotica, 05/09/2011. MPUJ 5796. 1alc. Colombia, Santander department, San Vicente de Chucurí municipality, Lower Magdalena River. 6°48’26.94’’N 73°43’24.04’’W 111masl. H. Luna-Berbesi, 2010. NRM 15150. 4alc, 1c&s. Colombia, Chocó department, Rio Baudó basin, Boca de Pepé, various tributaries and river close to village, -8°59’4’’N 77°3’W, S.O. Kullander & M.C. Silvergrip, 12/02/1989.

Diagnosis: *Sturisomatichthys aureus* is distinguished from its congeners by the possession of a transverse bar at the dorsal-fin origin, which is united to the dorsolateral stripe (vs. transverse bar absent or, when present, not united to dorsolateral stripe). From *S. caquetae*, *S. citurensis* and *S. tamanae* it is distinguished by the possession of a rostrum (vs. rostrum absent) and presence of dorsolateral stripe on the body, interrupted at caudal peduncle (vs. stripe absent). Furthermore it is distinguished by the cleithral width 10.5-12.8% in SL (vs. 8.3-9.6% in SL in *Sturisomatichthys* Baudó; 9.9-10.5% in SL in *S. dariensis*; 8.5-10.5% in SL in *S. frenatus*; 8.4-10.5% in SL in *S. panamensis*; and 7.7-9.2% in SL in *Sturisomatichthys* San Juan). It is distinguished by the possession of a big dark blotch on the pelvic and anal fins occupying almost the entire fin (vs. big dark blotch absent or inconspicuous in *S. dariensis* and *S. panamensis*), and the possession of a big dark blotch on the dorsal, pectoral, pelvic, and anal fins occupying almost the entire fin (vs. dark blotch absent in *S. leightoni*). By having more numerous premaxillary teeth, 47-69 (vs. 38-45 in *Sturisomatichthys* Baudó), and more numerous dentary teeth, 40-56 (29-36 in *Sturisomatichthys* Baudó and 26-39 in *Sturisomatichthys* San Juan). From *S. leightoni* by the absence of reticulations on predorsal, supraoccipital, and interorbital regions (vs. reticulations present). From *S. festivus,* it is distinguished by the absence of filaments on dorsal, pectoral, pelvic and anal fins (vs. filaments present).

Description: Morphometric data in Table 1. Body short and slender completely covered by dermal plates with small hyperthrophied odontodes, ill developed on sides of head, and paired fins. Dorsal profile of head straight from tip of snout to dorsal-fin base. Dorsal body profile slightly concave posterior to dorsal fin, nearly straight on last plates of caudal peduncle. Ventral body profile flat. Head and predorsal region broader than remainder of body; postdorsal region narrower towards caudal fin.

Head triangular in dorsal and ventral views. Rostrum, short and broad along its entire length. Ventral border of rostrum flat. Orbital rim circular, without notch, dorsolaterally placed on head. Sphenotic with short lateral expansion. Canal bearing plate long, well developed, not entirely in contact with anterior abdominal plates, anterior to branchiostegal membrane, reaching tip of rictal barbel. Upper lip covered with small, almost imperceptible plates; lower lip without such plates. Lower lip covered with small papillae, which could be rounded, or fringe-like extensions. Rictal barbel short and free from lip rim, not reaching anterior border of abdominal plates. Teeth slender, bifid, 47-69 on premaxilla, 40-56 on dentary; cusps strongly curved. Teeth on lower jaw less than twice the size than those on upper jaw.

First two predorsal plates with two low, inconspicuous ridges. Median series of lateral plates carinate, forming two longitudinal ill-developed keels; coalescent plates 14-18, beginning at 13-16 median plates. Six to nine straight lateral abdominal plates, between pectoral- and pelvic-fin origins. Preanal plate bordered anteriorly by three, well developed plates of similar size. Central abdominal plates unorganized; anterior abdominal plates smaller and more numerous than posterior ones.

Posterior margin of dorsal fin straight to slightly concave, unbranched and first branched rays longest; dorsal-fin rays i,7. Pectoral-fin i,6, unbranched and first branched rays longest, its tip reaching anterior third of pelvic fin. Pelvic-fin i,5, unbranched and first branched rays longest, its tip reaching little more than base of anal-fin. Anal-fin rays i,5; first branched ray longer. Posterior caudal-fin margin deeply concave, upper and lower ray bearing filamentous extensions.

Coloration in alcohol: Ground color of dorsum and head light or dark brown to pale yellow; ventrally yellow. Dorsolateral stripe present, starting on tip of snout. Stripe not continuous, interrupted at predorsal plates, and present again on caudal peduncle as discontinuous small stripe (Fig. 4). Broad transverse bar at origin of dorsal fin (Fig. 4). Several thin, brown, sinuous lines between dorsolateral stripes on snout, not continuing posterior to supraoccipital (Fig. 4). Dark band along first two branched rays of dorsal fin; other rays and membranes pale yellow. Dorsal-fin band with one to several white ocelli on distal tip, and just anterior to middle of fin (Fig. 5). Pectoral and pelvic fins with dark spot, larger than that on dorsal fin (Fig. 4), on first two to three rays on both fins, or spot occupying entire fin; several dark spots easily visible mainly on unbranched ray. Edges of caudal lobes with dark band with white ocellus on both upper and lower rays, with same distribution as those on dorsal fin (Fig. 4 and 5).

Sexual dimorphism: Males with numerous, thin and short hypertrophied odontodes on the sides of the head (Fig. 4). Less conspicuous hypertrophied odontodes can also be present on first ray of pectoral fin.

Distribution: *Sturisomatichthys aureus* occurs in the lower and middle Magdalena, Baudó, Cesar, Sinú, San Jorge, and Ranchería Rivers in Colombia (Fig. 1).

Remarks: Steindachner (1900) described *Sturisomatichthys aureus* originally as *Loricaria aurea*, from Bodega Central, Magdalena River, Colombia. The author presented a short description of the species focused on the general morphology and counts of lateral plates. Subsequently, Steindachner (1902) offered a second, more comprehensive description of his species, including measurements, general description of body shape, and some meristic data. The description highlighted that *S. aureus* had no sexual dimorphism on odontodes along the sides of the head, which, contrarily, were observed in the present study. Further, on the hyperthrophied odontodes, filaments on both upper and lower caudal-fin rays and curved teeth were also confirmed (see Description). It is worth noting that Steindachner also reported “The lateral keels on the anterior part of the trunk are weakly developed and unite on the right side of the body on the 13th plate, on the left, and on the 15th plate on the right…” (Steindachner, 1902: 139; our translation); also reported on Steindachner (1900: 207) as: “Both sides of the trunk [with plates of the median series until] the 14th or 15th plate. [When] plates already together, the simple side edge extends 17 plates” (our translation). Those characteristics were verified on non-type material, confirming that lower counts on median plates are diagnostic for *Sturisomatichthys* (see genus Diagnosis). In addition, the author fail to mention any kind of coloration pattern of the species, the only color remark being in the etymology of the species, in that: “The name of the species is chosen according to the golden glow spread over the whole body” (Steindachner, 1902: 139; our translation). Additionally, the author presented a drawing of a specimen in lateral and dorsal view, and again, not showing any kind of particular coloration (Steindachner, 1902, Plate V., figs. 1 and 1a). As described above, *S. aureus* do have dorsolateral stripe, although discontinuous on the caudal peduncle, as a diagnostic character, but showing external similarity with its sister species, *S. leightoni*. Finally, the ill-developed rostrum presented on the drawings was confirmed on non-type material, and furthermore, it was observed that, contrary to the rostrum of the type, the species could exhibit an even shorter or a longer rostrum.

Sturisomatichthys aureus has not been extensively studied despite being described at the beginning of the 20th Century. The studies including the species deal with short descriptions, few diagnostic characters to identify the species, and distribution (e.g. Regan, 1904; Eigenmann, 1920a, 1922; Miles, 1947; Dahl, 1971).

Regan (1904) was the first author to treat this species as *Oxyloricaria* (= *Sturisoma*), including it as a synonym of *O. panamensis*. The author stated that after examining the type of *Loricaria panamensis* (98 mm TL), and comparing it to the type of *L. aurea* (169 mm SL) collected at the Magdalena River basin, the latter was an adult of *L. panamensis*, described by Eigenmann & Eigenmann (1889; see remarks on *S. panamensis*). After that, Eigenmann (1922) included the species as *Sturisoma aureum*, following the synonymy between *Oxyloricaria* and *Sturisoma* proposed earlier (Eigenmann, 1910). Eigenmann (1922) cited the synonymy between *S. aureus* and *S. panamensis* proposed by Regan (1904), but resurrected *S. aureus* discussing that the species could be an intermediate between *S. panamensis* and *S. leightoni*. We follow Eigenmann (1922) in assuming *S. aureus* as a distinct species from *S. panamensis*. As seen in Chapter 1, seven autapomorphies were found that diagnose *S. aureus*: ventrolateral crest of mesethmoid well developed at the posterior margin (character 7:2); exoccipital fenestra between its ventral lamina and transcapular ligament absent (character 23:1); absence of autopalatine splint (character 51:0); anterior margin of ceratohyal smooth (character 90:3); ceratohyal not expanded (character 91:2); snout tip with plates, without thick layer of soft connective tissue (character 185:3); and rictal barbel longer that orbital diameter (character 191:2).

On two studies of the ichthyofauna of the Chocó region in Colombia, Maldonado-Ocampo et al. (2006, 2013) reported that *S. aureus* is present in the Atrato River basin, a river emptying in the Caribbean versant of Colombia. It was found here that the species is not present in that locality, but instead, the records of those authors belong to other species (see

Remarks on *S. panamensis*). Nevertheless, Maldonado-Ocampo et al. (2013) reported the species for the Baudó River, which could be either a record of *S. aureus* or *Sturisomatichthys* Baudó. On the other hand, Maldonado-Ocampo et al. (2008), in a species checklist of the ichthyofauna of Colombia, reported the species to be present at the Magdalena-Cauca basin, and in the Caribbean versant of Colombia. We agree with the report of the species being present at the Magdalena-Cauca basin, but disagree with the report that the species is present at the Caribbean versant, except for the report of the Magdalena-Cauca basin that belong to that versant in Colombia. Here we found that *S. aureus* is distributed in the Magdalena-Cauca basin, Baudó River, Sinú River, San Jorge, and Ranchería Rivers in Colombia (Fig. 1).

Sturisomatichthys aureus is sympatric with *Sturisomatichthys* Baudó, in the Baudó River, but several characters (see Diagnosis) can differentiate the species. On the other hand, *S. aureus* is also sympatric with *S. leightoni* in the middle portion of the Magdalena River. Both species are easily distinguished (see Diagnosis), and by their body size; while *S. aureus* can reach >200mm SL, *S. leightoni* never surpasses 120mm SL. In general, both species present different characteristics which, despite being sympatric, may allow them to occupy different niches and explore different type of resources. In any case, ecological studies of these species and in general of *Sturisomatichthys* are lacking.

Steindachner (1900, 1902) did not offer catalog number for the type specimen of *Loricaria aurea*, nor acronym of any museum. Isbrücker (1980) in his catalogue of the Loricariidae reports the holotype of *Loricaria aurea* as being the specimen illustrated by Steindachner (1902, pl. V., figs. 1-1a). That specimen is the only one included in Steindachner description, and it is assumed as the type of the species, although the author made no specific disclaimer regarding the specimen. Nevertheless, Neumann (2006) confirmed that the specimen used by Steindachner in the original description was deposited at ZMS, with the following information on the label: “Holotype (unique): ZSM [Old Collection; without registry of catalogue number], 16.9 cm SL, Rio Magdalena at Bodega Central (Colombia); leg: local fishermen; coll. Th. v. Bayern, 18.VI.1898.” and added that: “Holotype fixed by monotypy (ICZN Art. 73.1.2)” confirming the type status of the specimen.

According to Ferraris (2003, 2007), the holotype of *Loricaria aurea* is housed at the NMW, but no catalog number is included, and no explanation is given to demonstrate that the specimen is housed in Vienna and not in Munich. Later, Maldonado-Ocampo et al. (2008) reported the holotype as destroyed during WWII, but again no reference is included to back this statement. Nevertheless, Eschmeyer et al. (2017) also state that the type was destroyed during WWII: “Holotype (unique): ZSM [old collection] destroyed in WWII”. To clarify the situation of the possible non-existence of the holotype, a communication with Anja Palandacic (NMW) confirmed that the specimen was not housed at NMW, but in ZSM. Thus, and according to Dirk Neumann (ZSM, pers. com.): “The type of *Loricaria aurea* was collected by Princess Therese von Bayern and described by Steindachner. At the time of description, the specimen was still in the private collection of Princess Therese, which ZSM received after her death in 1925. Only one specimen from her fish collection apparently survived the war in ZSM, which is one of the two syntypes of *Pimelodella yuncensis*”. Thus, the holotype of *Loricaria aurea* was in fact destroyed during WWII and according to records on both NMW and ZSM there are not additional specimens that Steindachner could have used to describe the species. In this sense, a neotype is assigned to the species to contribute with the taxonomic stability of the taxon (ICZN Art. 75.3). Here we assign the specimen catalogued under ICNMHN XXXX (ex ICNMHN 2414), 151.0mm SL (Fig. 4), from Colombia, Cesar department, lower Magdalena basin, Sororia creek at Jagua de Ibiricó, which is near to the known type locality of the species (Bodega Central, a small town in the lower portion of the Magdalena River), as neotype for *S. aureus*.

Sturisomatichthys caquetae **(Fowler, 1945)**

Fig. 6.

Table 1.

Harttia caquetae Fowler, 1945: 126, Fig. 41-43 (type locality: Morelia, Rio Caquetá, Colombia; type (unique) ANSP 71719, length 90.0mm SL).

Sturisomatichthys caquetae (Fowler, 1945) – Isbrücker & Nijssen, in Isbrücker, 1979: 88 (original description of *Sturisomatichthys*); 2001: 32 (included in the catalog of the Loricariinae as valid in *Sturisomatichthys*, German version); 2002: 29 (included in the catalog of the Loricariinae as valid in *Sturisomatichthys*, English version). Ferraris, 2003: 347 (genus distribution; synonymy; type material location at ANSP 71719, maximum length 19.3 cm); 2007: 300 (type locality; distribution of the species).

Sturisoma caquetae (Fowler, 1945) - Covain et al., 2016: 514 (phylogenetic relationships of the Loricariinae subfamily using two mitochondrial and one nuclear markers; not included in phylogenetic analysis).

Diagnosis: *Sturisomatichthys caquetae* is diagnosed from its congeners by the absence of rostrum (vs. presence, except from *S. citurensis* and *S. tamanae*), absence of dorsolateral stripe (vs. dorsolateral stripe present, except from *S. citurensis* and *S. tamanae*) and absence of dark spot on dorsal-, pectoral-, pelvic-, and anal-fin occupying almost the entire fin (vs. presence, except *S. citurensis* and *S. leightoni*). It is diagnosed by the number of premaxillary teeth 33 (vs. 47-69 in *S. aureus*; 38-45 in *Sturisomatichthys* Baudó; 61-124 in *S. citurensis*; 37-55 in *S. festivus*; 36-50 in *S. frenatus*; 37-53 in *S. panamensis*; and 63-98 in *S. tamanae*), and dentary teeth 30 (vs. 40-56 in *S. aureus*; 63-100 in *S. citurensis*; 34-47 in *S. dariensis*; 33-42 in *S. festivus*; 31-46 in *S. frenatus*; 32-44 in *S. panamensis*; and 60-93 in *S. tamanae*). From *S. leightoni* is distinguished by more numerous and smaller central abdominal plates (vs. less numerous and bigger central abdominal plates), more than six transversal bars not restricted to caudal peduncle (vs. three to four transversal narrow bars restricted to caudal peduncle) and absence of dorsolateral discontinuous stripe on both sides of the snout (vs. presence). Additionally, it is distinguished by its head width 60.0% HL (vs. 70.1-80.4% in SL in *S. citurensis* and 74.9-83.5% in HL in *S. tamanae*) and lower lip width 29.5% in HL (vs. 33.0-43.9% in HL in *S. citurensis* and 34.3-53.9% in HL in *S. tamanae*). From *S. festivus,* it is distinguished by the absence of filaments on dorsal, pectoral, pelvic and anal fins (vs. filaments present).

Description: Morphometric data in Table 1. Both measurements and description taken from holotype. Body short and low, completely covered by dermal plates with few, short hyperthrophied odontodes, ill developed, but perceptible on sides of the head. Dorsal profile of head straight from tip of snout to predorsal region; slightly concave from that point to end of dorsal-fin base, and straight from there until caudal-fin origin. Ventral body profile flat.

Head triangular. Snout without rostrum. Orbital rim oval, without notch, dorsolaterally placed on head. Sphenotic without lateral expansion. Canal bearing plate broad and well developed, in contact with anterior abdominal plates, anterior to branchiostegal membrane, not reaching rictal barbel. Upper lip covered with small, almost imperceptible plates; lower lip without such plates. Lower lip covered with round, almost imperceptible small papillae, increasing in size towards dentaries. Rictal barbel extremely short, free from lip rim, never reaching anterior border of abdominal plates, nor surpassing posterior border of lower lip. Teeth slender, bifid, 33 on premaxilla and 30 on dentary; cusps slightly curved. Teeth in lower jaw somewhat larger than those in upper jaw.

First two predorsal plates without ridges; nuchal plate at least twice as broad than predorsal plates. Lateral plates carinate forming two longitudinal low, subtle keels; 14 coalescent plates, beginning at the 14th median plate. Eight straight lateral abdominal plates, between pectoral and pelvic-fin origin, longer than central abdominal plates. Preanal plate bordered anteriorly by five, well developed plates, the central one bigger than the rest, all of them in contact with the preanal plate. Central abdominal plates, between lateral abdominal plates, without any kind of arrangement. Anterior abdominal plates almost the same size as central abdominal plates, the most anterior ones enlarged, not square. Central abdominal plates similar to those observed on *S. citurensis* and *S. tamanae* (Fig. 6, 7 and 15).

Posterior margin of dorsal fin straight, unbranched ray longest; dorsal-fin rays i,7. Pectoral-fin i,6, unbranched ray longest (right fin, left broken), surpassing anterior third of pelvic fin, reaching almost half of pelvic fin. Pelvic-fin i,5, unbranched and first branched ray longest, its tip reaching a little more than origin of anal-fin. Anal-fin rays i,5; unbranched ray longer. Posterior caudal-fin margin deeply concave, filaments not observed on neither the upper nor lower caudal rays, due to damage. According to a drawing of the type in its original description (Fowler, 1945: 127, fig. 41-43) both upper and lower caudal rays with short filaments, not reaching half the SL. Dorsal, pectoral, pelvic and anal fins without filaments.

Coloration in alcohol: Based on both holotype, and holotype drawing by Fowler (1945:127, fig. 41-43). Ground color of dorsum and head pale brown, as well as ventrally. Longitudinal stripe on dorsal portion of body not visible, nor specified by Fowler (1945). Three to four visible narrow transversal stripes along caudal peduncle, first at base of dorsal fin, last about three plates anterior to origin of caudal fin; transversal stripe somewhat visible on holotype and included on drawings by Fowler (1945), which in his description reported eight transversal bars, being the one at dorsal-fin origin most distinct. Dark, big spots on membranes and rays of pectoral, pelvic and anal fins, scarce, not occupying the entire fins. Dorsal fin with a dark brown spot at distal tip of first two branched rays, and with conspicuous dark spots along the unbranched ray, this spot was not mentioned on the original description, nor the drawing of the type. Pectoral-, pelvic-, and anal-fin with spots along rays, without big spots nor stripe occupying the entire fin. Caudal fin the same pattern as pectoral-, pelvic-, and anal-fin.

Sexual dimorphism: The holotype shows a subtle dimorphism on the sides of the head, consisting of short, scarce hyperthrophied odontodes (Fig. 6).

Distribution: *Sturisomatichthys caquetae* occurs in Morelia, Caquetá River, Upper Amazon, Colombia (Fig. 2).

Remarks: Fowler (1945) described *Sturisomatichthys caquetae as Harttia caquetae*, from Morelia, Caquetá River in the Upper Amazon, in Colombia. The author focused his original description on body measurements, counts of plates and teeth, and some remarks on coloration. The species lack dorsolateral longitudinal stripe as most *Sturisomatichthys* species, but shows some characteristics similar to those observed on *S. leightoni*, consisting of transverse bars, beginning at base of dorsal fin (Fig. 6). On the other hand, the central abdominal plates are not arranged in rows, but instead occur as small, irregularly arranged plates such as those on *S. citurensis* and *S. tamanae* (Fig. 6, 7 and 15). In addition, low counts on both plates on the median series and coalescent plates agree with those found throughout the genus (see below). Thus, the species shows characters that diagnosed it as member of *Sturisomatichthys*.

Sturisomatichthys caquetae is a poorly known species. After its description, it was not included on any revision of the Loricariidae, until Isbrücker & Nijssen (in Isbrücker, 1979) included it as part of *Sturisomatichthys*, due to the absence of a produced rostrum. As shown above, *Sturisomatichthys* remained as an obscure group, restricted to four species until the study of Covain et al. (2016). In that study, the number of species was elevated from four to nine, and restricted to Trans-Andean species. Nevertheless, the authors did not include *S. caquetae* in their analysis, nor examined its holotype and, based on its Cis-Andean distribution, transferred it to *Sturisoma*.

Nevertheless, after examining the holotype, and comparing its characteristics to the remaining *Sturisomatichthys* (including two new species described in this study), we determined that *S. caquetae* belongs to the latter genus. Even though non-type material was not available for examination, we transfer the species back from *Sturisoma* to *Sturisomatichthys* based on the holotype. The most important similarity, and the one that allows transferring the species, is the low count on plates of the median series (14), which is diagnostic of *Sturisomatichthys* when compared to *Sturisoma* (more than 18 plates of the median series; see Diagnosis of the genus). Thus, *Sturisomatichthys* is not a fully Trans-Andean genus, as it will be discussed below (see Remarks on *S. leightoni*), and *S. caquetae* remains as the only fully Cis-Andean species of the genus.

It is worth noting that *S. caquetae* could be easily considered as a junior synonym to *Sturisoma brevirostre* (Eigenmann & Eigenmann, 1889) from the Içá River, Brazil, near Leticia, Colombia, type locality of *S. caquetae*. The Içá River is the same Putumayo River in Colombia, and receives the name Içá when crossing the Brazilian border; the Caquetá River is a tributary to the Putumayo River. The main character Eigenmann & Eigenmann (1889) relied upon for the description of *St. brevirostre* is the absence of a rostrum, which is also characteristic of *S. caquetae*. Non-type specimens of *St. brevirostre* were not available to the present study but, through the analysis of the holotype of both species (*S. caquetae*, ANSP 71719 and *St. brevirostre*, MCZ 8095), it was concluded that they belong to two different species. This differentiation is proposed mainly based on the count of plates of the median series and the array on central abdominal plates, which distinguish *Sturisomatichthys* from *Sturisoma*.

Throughout the present study, we found counts of plates (both median and coalescent) not to vary along the ontogeny of the specimens, and it is a constant character when it comes to identify species. The counts we observed for juvenile specimens are the same reported for adults. Both species are scarce to non-existent in visited museums, and collection in the type localities of both species and surrounding areas are in need. Thus, the inclusion of non-type specimens are extremely important to corroborate this hypothesis.

Material examined: ANSP 71719, 90.0mm SL, holotype. Colombia, Caquetá department, Morelia municipality, Upper Amazon basin, Caquetá River, Mr. Kjell von Sneidern.

***Sturisomatichthys citurensis* (Meek & Hildebrand, 1913)**

Fig. 7.

Table 1.

Oxyloricaria citurensis Meek & Hildebrand, 1913: 82 (type locality: Cupe river, Cituro, Tuyra river basin, Panama; type FMNH 7585, length 194mm [TL]; original description without specific remarks, focusing on measurements and coloration of the specimens); 1916: 219 (identification key for *Oxyloricaria*, including *O. panamensis*; ventral figure of one specimen; description of the species; comparison with *O. tamanae*). Ibarra & Stewart, 1987: 63 (type series at FMNH; holotype missing or mixed with paratypes; 150 paratypes reported from five different localities).

Sturisoma citurense (Meek & Hildebrand, 1913) – Eigenmann, 1922: 96, Plate XVI, Fig. 3 (citation of the original description; species distributed also at the Bayano river in Panama; type specimens examined by the author).

Sturisomatichthys citurensis (Meek & Hildebrand, 1913) – Isbrücker, 1979: 88 (original description of *Sturisomatichthys*; included in the genus as *Sturisomatichthys citurensis*); 1980: 92 (included in *Sturisomatichthys* as a member of the Harttiina; no diagnosis); 2001: 32 (included in the catalog of the Loricariinae as valid in *Sturisomatichthys*, German version); 2002: 29 (included in the catalog of the Loricariinae as valid in *Sturisomatichthys*, English version). Ferraris, 2003: 347 (genus distribution; synonymy; type material location at FMNH 7585, 25cm SL; maximum body size). Covain & Fisch-Muller, 2007: 4 (specimen examined to describe

Sturisomatichthys (MHNG 2676.04, 152.3 mm of SL, Panama, Darien, Rio Chucunaque near the village La Alba, de Rham); observations regarding abdominal plates organization and size). Ferraris, 2007: 300 (type locality; distribution of the species). Covain et al., 2008: 988 (belonging to Sturisomina as sister group of *Farlowella platoryncha*; phylogenetic analysis using two mitochondrial markers). Rodriguez et al., 2011: 9 (belonging to Farlowellina as sister group of *Farlowella*; phylogenetic analysis using two mitochondrial and one nuclear markers). Covain et al., 2016: 514 (valid as *Sturisomatichthys citurensis*; phylogenetic relationships of the Loricariinae subfamily using two mitochondrial and one nuclear markers; appears as sister group to all *Sturisomatichthys*).

Diagnosis: *Sturisomatichthys citurensis* is distinguished from its congeners by the absence of rostrum (vs. presence, except *S. caquetae* and *S. tamanae*), absence of lateral-dorsal longitudinal stripe on both sides of body (vs. presence, except *S. caquetae* and *S. tamanae*), absence of dark spots occupying the entire or almost entire dorsal-, and pectoral-fin (vs. presence of dark spots on either of such fins, except *S. caquetae* and *S. tamanae*), and circular snout on dorsal and ventral view (vs. triangular snout). From *S. caquetae* it is distinguished by the number of premaxillary teeth 61-124 (vs. 33) and dentary teeth 63-100 (vs. 30). It is distinguished from *S. tamanae* by small spots on rays, never occupying the entire fin, nor entering the membranes (vs. a big dark spot occupying almost the entire dorsal-, pectoral-, and pelvic-fin) and small less numerous central abdominal plates (vs. small, more numerous central abdominal plates).

Description: Morphometric data in Table 1. Body slender, completely covered by dermal plates with small hyperthrophied odontodes, ill- or well-developed on sides of the head. Dorsal profile of head straight from tip of snout to supraoccipital plates; concave from that point to origin of dorsal fin. Dorsal body straight posterior to dorsal fin until origin of caudal fin. Ventral body profile flat. Head and predorsal region broader than remainder of body.

Head rounded. Rostrum absent; head short and broad its entire length. Orbital rim circular, without notch, dorsolaterally placed on head. Sphenotic with a thin, long lateral expansion. Canal bearing plate long, well developed, in contact with anterior abdominal plates, anterior to branchiostegal membrane, not reaching tip of rictal barbel. Upper lip covered with small, almost imperceptible plates; lower lip without such plates. Lower lip covered with small papillae, which could be rounded, or fringe-like extensions. Upper lip well developed, almost twice as broad as the lower lip, occupying almost the entire anterior ventral portion of the snout, with a straight posterior border without covering the premaxillary teeth (Fig. 7). Rictal barbel short and free from lip rim, not reaching anterior border of abdominal plates. Teeth slender, bifid, 61–124 on premaxilla, 63–100 on dentary; cusps slightly curved. Teeth in lower jaw somewhat larger than those in upper jaw.

Three predorsal plates, first two plates with two low, inconspicuous ridges, third predorsal plate twice as broad than the first two, also with inconspicuous ridge. Lateral plates carinate forming two longitudinal sharp keels; coalescent plates 13-17, beginning at 13-17 median plates. Six to 11 straight lateral abdominal plates, between pectoral and pelvic-fin origin. Preanal plate bordered anteriorly by four, well developed, and of similar size plates. Abdominal plates small and irregular, between lateral abdominal plates, unorganized; anterior abdominal plates smaller and more numerous than posterior ones.

Posterior margin of dorsal fin straight to slightly concave, unbranched ray longest; dorsal-fin rays i,7. Pectoral-fin i,6, unbranched ray longest, its tip reaching anterior third, or just the origin of pelvic fin. Pelvic-fin i,5, unbranched ray longest, its tip reaching little more than the base of anal-fin. Anal-fin rays i,5; first branched ray longer. Posterior caudal-fin margin deeply concave, absence of filaments on both upper and lower rays, maybe due to damage.

Coloration in alcohol: Ground color of dorsum and head dark brown, both dorsally and ventrally, becoming darker on the ventral portion from half of the abdomen posteriorly. No dorsolateral stripe (characteristic of some *Sturisomatichthys* species). There is no indication of a dark stripe or spots on membranes of pectoral and pelvic fins; membranes pale yellow. Dorsal, pectoral, pelvic and anal fins, with conspicuous and somewhat big brown spots along rays, without entering on membranes. Pigmentation on edges of caudal lobes are poorly visible, although a darker pigmentation, not well defined as spots or stripe, is observed along all of its rays and membrane.

Sexual dimorphism: Males showing developed but short hypertrophied odontodes along sides of head (Fig. 7). Odontodes absent from fin rays.

Distribution: *Sturisomatichthys citurensis* occurs in the Bayano, Capeti, Chucunaque, Cituro, and Tuyra River, Panama, and Atrato River basin in Colombia (Fig. 3).

Remarks: There were no taxonomic novelties involving the species, until Isbrücker & Nijssen (in Isbrücker, 1979), described *Sturisomatichthys*. The authors included *S. citurensis* in the genus, along with *S. leightoni* as the type species, and additionally, *S. tamanae* and *S. caquetae*. The authors did not comment on the species individually, and *Sturisomatichthys* was diagnosed only by the absence of a rostrum; that character was found to be phylogenetically uninformative in the present study (Covain et al., 2008; Chapter 1 and discussion here). As mentioned above, *S. tamanae* is, morphologically (and phylogenetically), more closely related to *S. citurensis*. Both species show lack of a rostrum, although as it was observed by Meek & Hildebrand (1916): "[*S. citurensis* presents] head without ridges; snout not produced, broadly obtuse", which is also different from what it was observed here on *S. tamanae* (Figs. 7 and 15). In *S. citurensis*, the anterior border of the head is rounded and short, contrary to the triangular format in *S. tamanae*. Head morphology in this species is characteristic within the genus, and can be useful to diagnose it from its congeners (see Diagnose and identification key). According to Ibarra & Stewart (1987), the type series of *S. citurensis* is composed by the holotype (FMNH 7585), and 150 paratypes, from five different localities. In this study, 55 paratypes were examined and it was possible to verify those characters and the ones included in the original description, as well as in non-type material, across the samples of several populations of the species.

Covain & Fisch-Muller (2007), on a study of the taxonomy of the Loricariinae, discussed the characteristics of *Sturisomatichthys*. They highlighted that *S. citurensis* is morphologically divergent from its congeners in "having an abdominal plate cover consisting of small platelet without any particular organization". According to the authors, this could differentiate this species from the others; this characteristic was found to be useful as a diagnostic character for *Sturisomatichthys* when compared to *Sturisoma*. The size of the plates present in *S. citurensis* is similar to those observed in *S. caquetae* and *S. tamanae* (Figs. 6, 7 and 15). Covain & Fisch-Muller (2007) also pointed out the fact that the other species (three others at the time) do have a short snout, and that they could be more closely related to *Farlowella*, specifically the *F. curtirostra* group that possesses a short and broader snout. However, the authors also assumed that the weakness of the diagnosis of *Sturisomatichthys* could lead to a synonymy with *Sturisoma*. As discussed in Chapter 1, both genera are valid, although *Sturisomatichthys* comprises all of the Trans-Andean species of *Sturisoma sensu lato*, plus the Cis-Andean *S. caquetae*, and *Sturisoma* all the Cis-Andean (see Discussion).

As proposed by Covain et al. (2016) and on Chapter 1, *Sturisomatichthys citurensis* appear as the sister group of the remaining of *Sturisomatichthys* (Fig. 1 on Chapter 1; fig. 3 on Covain et al., 2016). Although it belongs to the genus, the morphology of the species indeed differs from that of its congeners. In addition, *S. tamanae* was included in the analysis of Chapter 1 and appeared as the sister species of *S. citurensis*. That clade is supported by the following synapomorphies within *Sturisomatichthys*: mesethmoid cornua absent (character 1:1); mesethmoid process anterior to mesethmoid disk, well-developed, separated from mesethmoid disk (character 4:3); canal-bearing cheek plate placed ventral-laterally on head (character 37:1); process on posteroventral lamina of bone of dentary present, relatively distant from main body of dentary (character 55:0); metapterigoyd as an inverted triangle, with a pointed anterodorsal process (character 72:2); anterior process of metapterigoyd absent (character 73:0); synchondrial junction between hyomandibular and cranium including only sphenotic and prootic (character 82:1); reduced contribution of the compound pterotic to the junction between hyomandibular and cranium (character 85:1); length of transverse process of first dorsal-fin pterygiophore relative to second dorsal-fin pterygiophore, shorter (character 137:0); and central buccal papillae absent (character 192:0).

Finally, several populations of both species were analyzed (Appendix III on Chapter 1), and by means of the analysis of five molecular markers it was concluded that *S. citurensis* is widely spread on the Pacific versant of Panama in the Bayano, Chucunaque, Cituro and Tuyra River basins.

Material examined: FMNH 29500-29536; 29542-29559 (paratypes, all mixed in several lots). 55alc, 146.2-211.7mm SL. Panama, Darien Province, Tuyra River basin, Cupe River at Cituro, S.E. Meek & S.F. Hildebrand, 1912. STRI 1881. 2alc. Panama, Darien Province, Tuira River, Capeti River. 08°03’27’’N 77°34’52’’W, 03/26/1995. STRI 8369. 2alc. Panama, Chucunaque River. 08°17’46’’N 77°45’18’’W. 02/17/2013. USNM 78361. 6alc. Panama, Canal Zone, Darien Province at Aruza, Aruza River, S.E. Meek & S.F. Hildebrand, 27/02/1913. USNM 78364. 7alc. Panama, Darien Province, Chepo district, Mamon River, S.E. Meek & S.F. Hildebrand, 21/03/1911. USNM 78365. 1alc, 1c&s. Panama, Darien Province, Rio Tuyra at Marrigante, S.E. Meek & S.F. Hildebrand, 09/03/1912. USNM 78366. 1alc. Panama, Darien Province, Capeti River, S.E. Meek & S.F. Hildebrand, 05/03/1912. USNM 78367. 3 of 13alc. Panama, Darien Province, Boca de Cupe district, Tuyra River, S.E. Meek & S.F. Hildebrand, 28/02/1912. USNM 78368. 18 of 30alc. Panama, Darien Province, Yape River, S.E. Meek & S.F. Hildebrand, 06/03/1912. USNM 293596. 1 of 5alc. Panama, Darien Province, Pirre River above El Real (above Tidal Zone, Rio Tuyra drainage, Pacific drainage), J.G. Lundberg, B. Chernoff & L. Mcdade, 16/02/1985. USNM 316292. 1alc. Panama, Darien Province, El Real de Santamaría district, Pirra River 3-5 miles above El Real, Battelle Memorial Institute, Pacific Northwest National Laboratory, 08/09/1967. USNM 341994. 1alc. Colombia, Chocó department, Prado district, creek emptying on Prado River, 10min helicopter flight from Prado district, H.G. Loftin, 01/08/1967. USNM 342003. 2alc. Colombia, Chocó department, Riosucio municipality, Nercua River tributary of Truando and Atrato Rivers, unnamed creek into Upper Necua River, 28/08/1967. ZMA 119.125 3alc. Panamá, Sábalo River tributary of Sambú River, H.J. Mayland, 01-30/09/1983. ZMA 139.628. 1alc. Panamá, Bayano district, Majé River, R.H. Goodyear, 21/03/1974. ZMA 140.798. 1alc. Panamá, Bayano district, Castrigandi River, R.H. Goodyear, 17/06/1974.

Sturisomatichthys dariensis **(Meek & Hildebrand, 1913)**

Fig. 8.

Table 2.

Oxyloricaria dariensis Meek & Hildebrand, 1913: 81-82 (type locality: Tuyra river, Boca de Cupe, Panama; type FMNH 7584, length 245mm [TL]; original description without specific remarks, focusing on measurements, counts and coloration of the specimens); 1916: 262 (synonym of *Oxyloricaria panamensis*). Eigenmann, 1922: 95 (synonym of *Oxyloricaria panamensis*). Miles, 1947: 115 (synonym of *Oxyloricaria panamensis*). Ibarra & Stewart, 1987: 63 (type series at FMNH; holotype missing or mixed with paratypes; 39 paratypes reported from seven different localities).

Sturisoma dariense (Meek & Hildebrand, 1913) – Isbrücker, 1979: 88 (valid as *Sturisoma dariense*); 1980: 94 (included in *Sturisoma* as a member of the Harttiina; no diagnosis); 2001: 32 (included in the catalog of the Loricariinae as valid in *Sturisoma*, German version); 2002: 29 (included in the catalog of the Loricariinae as valid in *Sturisoma*, English version). Ferraris, 2003: 346 (genus distribution; synonymy; type material location at FMNH 7584, 25.4cm SL; maximum body size); 2007: 299 (type locality; distribution of the species). Ghazzi, 2003: 182 (synonym of *S. panamense*); 2005: 564 (paratype used for comparison with *S. kneri*).

Sturisomatichthys dariensis (Meek & Hildebrand, 1913) – Covain et al., 2016: 514 (valid as *Sturisomatichthys dariense*; phylogenetic relationships of the Loricariinae subfamily using two mitochondrial and one nuclear markers).

Diagnosis: *Sturisomatichthys dariensis* is distinguished from *S. caquetae*, *S. citurensis* and *S. tamanae* by the presence of rostrum (vs. rostrum absent) and the presence of dorsolateral stripe (vs. dorsolateral stripe absent). By the number of premaxillary teeth 54-61 (vs. 38-45 in *Sturisomatichthys* Baudó; 36-50 in *S. frenatus*; 24-50 in *S. leightoni*; 37-53 in *S. panamensis*) and the number of coalescent plates 16-17 (vs. 13-16 in *S. leightoni*). Furthermore, it is distinguished from *S. aureus* by absence of transverse bar at origin of dorsal fin (vs. transverse bar present) and absence of dark spot on pectoral, pelvic, and anal fin (vs. dark spot present). From *S. panamensis* is distinguished by absence of big dark spot on pectoral fin (vs. presence) and presence of reticulations on supraoccipital, interorbital and predorsal region (vs. absence of reticulations). By its cleithral width 9.9-10.5% in SL (vs. 10.5-12.8% in SL in *S. aureus*; 8.3-9.6% in SL *Sturisomatichthys* Baudó; 7.7-9.2% in SL in *Sturisomatichthys* San Juan). From *S. festivus*, it is distinguished by the absence of filaments on dorsal, pectoral, pelvic and anal fins (vs. filaments present).

Description: Morphometric data in Table 2. Body short and slender, completely covered by dermal plates with small hyperthrophied odontodes, ill developed on sides of the head, and paired fins. Dorsal profile of head straight from tip of snout to supraoccipital; concave from that point to dorsal-fin base, and straight after that point until caudal fin origin. Dorsal body profile slightly concave posterior to dorsal fin, nearly straight on last plates of caudal peduncle. Ventral body profile flat. Head and predorsal region broader than remainder of body; postdorsal region narrower towards caudal fin.

Head triangular and pointed. Rostrum present, short and somewhat broad on its entire length. Ventral border of rostrum flat. Orbital rim circular, without notch, dorsolaterally placed on head. Sphenotic with a short lateral expansion. Canal bearing plate long, well developed, in contact with anterior abdominal plates, anterior to branchiostegal membrane, reaching tip, or a third of rictal barbel. Upper lip covered with small, almost imperceptible plates; lower lip without such plates. Lower lip covered with round small papillae. Rictal barbel short, although more developed than observed on congeners, and free from lip rim, not reaching anterior border of abdominal plates but reaching the canal-bearing plate. Teeth slender, bifid, 54-61 on premaxilla, 34-47 on dentary; cusps slightly curved. Teeth in lower jaw somewhat larger than those in upper jaw.

First two predorsal plates with two low, inconspicuous ridges; nuchal plate at least twice as broad than predorsal plates. Lateral plates carinate forming two longitudinal sharp keels; 16-17 coalescent plates, beginning at 14-15 median plates. Seven to nine straight, very broad lateral abdominal plates, between pectoral and pelvic-fin origin. Preanal plate bordered anteriorly by three, well developed, and of similar size plates; anterior most plate could not be in contact with the preanal plate. Central abdominal plates, between lateral abdominal plates, irregularly arranged; anterior abdominal plates smaller and more numerous than posterior ones.

Posterior margin of dorsal fin slightly concave, unbranched ray longest; dorsal-fin rays i,7. Pectoral-fin i,6, unbranched ray longest, surpassing anterior third of pelvic fin, reaching almost half of the latter. Pelvic-fin i,5, unbranched ray longest, its tip reaching more than anterior third of the length of anal-fin. Anal-fin rays i,5; unbranched ray longer. Posterior caudal-fin margin shallowly concave, absence of filaments on both upper and lower rays, maybe due to damage.

Coloration in alcohol: Ground color of dorsum and head dark or pale brown, ventrally, yellow. Dorsolateral stripe on both sides of body. Stripe broader just at posterior border of orbital rim, until 9th-10th median plate (Fig. 8), it becomes less conspicuous and thin towards caudal peduncle. A remnant of the stripe can or cannot be present on ventral side of the rostrum (Fig. 8). Dark, big spots on membranes and rays of pectoral fins. Dorsal fin with a dark brown band along the first two branched rays, and with conspicuous dark spots along the unbranched ray. Anal fin hyaline. Caudal fin with dark bands along first two or three branched rays, both upper and lower, and connected at the base of the fin forming a V-shaped pattern. Dark brown spots on edges of caudal lobes.

Sexual dimorphism: The specimens examined did not show any kind of sexual dimorphism, this might be due to the time of collection of the specimens, or group samples consisting only of females or sexually immature males. Moreover, it was observed enlargement of the first dorsal-, pectoral-, and pelvic-fin ray.

Distribution: *Sturisomatichthys dariensis* occurs in the Tuyra and Capeti rivers in the Pacific slope of Panama (Fig. 1).

Remarks: Meek & Hildebrand (1913) described *Sturisomatichthys dariensis* mainly based on body and head proportions. Nevertheless, the authors did describe the coloration of the species, mentioning the presence of dorsolateral longitudinal stripe on the sides of body (Fig. 8). Even though both *S. dariensis* and *S. citurensis* are sympatric in the Tuyra and Cupe River basins, and small tributaries in the Pacific slope in Panama (Fig. 1 and 3), they can be differentiated by *S. dariensis* having 34-47 dentary teeth (vs. 63-100); presence of a rostrum (vs. rostrum absent); presence of dorsolateral longitudinal stripe (vs. stripe absent);

conspicuous and numerous spots on rays and membranes on dorsal and pectoral fins (vs. few and light spots on fins).

Meek & Hildebrand (1916) proposed *Sturisomatichthys dariensis* as a synonym of *S. panamensis*. The authors stated “A study of specimens from Colombia and Ecuador along with our specimens shows that there are quite a number of synonyms under this species [namely *S. panamensis*]. The fact that the lateral keels in the young are not completely united while in the adult they are, in part at least accounts for the numerous names that have been proposed”. Eigenmann (1922), Miles (1947), and Dahl (1971) followed this synonymy. Isbrücker (1979) assumed *S. dariensis* as valid and as belonging of *Sturisoma*, but did not elaborate on the reason for the resurrection of the species. In several studies dealing with the classification of the Loricariinae (and the Loricariidae), *S. dariensis* continued to be assumed as valid (e.g. Isbrücker, 1980, 2001, 2002; Ferraris 2003, 2007; Covain & Fisch-Muller, 2007; Covain et al., 2016).

On the other hand, Ghazzi (2003) followed the synonymy of *S. dariensis* with *S. panamensis* proposed by Meek & Hildebrand (1916). The author stated that when compared the juvenile paratypes of *S. dariensis* and the holotype of *S. panamensis* (90.7mm SL) examined in her study, the specimens were really similar, and decided to assume them as part of the same species. According to Ghazzi (2003) there is only one species of the genus in the Tuyra River basin in Panama (i.e. *S. panamensis*), a fact that was not corroborated here. According to the material examined here, there are three *Sturisomatichthys* species in that basin: *S. citurensis*, *S. dariensis*, and *S. panamensis* (Fig. 1 and 3). In addition to characters of external morphology (see Diagnosis and Identification Key), *Sturisomatichthys dariensis* can be diagnosed from *S. panamensis* by the following autapomorphies: reduced participation of the frontal with the dorsal border of the orbit rim (character 18:1); absence of exoccipital fenestra between its ventral lamina and transcapular ligament (23:1); parietal branch terminal exit on the supraoccipital (character 44:3); palatine rod-shaped (character 50:0); process on posteroventral lamina of bone of dentary present, close to main body of dentary (character 55:1); third basibranchial bone vestigial (character 98:0); anterior margin of cleithrum rounded, slightly curved and convex at symphysis level (character 150:4); posterior orientation of the vertical borders of the cleitrhum related to the transversal axis of the body, straight, on the same axis as body (character 160:1); hypurapophysis relatively elongate, keel-shaped (character 176:0); well-developed odontodes on males on several portions of head and body, they do not appear more developed on a specific region (character 187:1); and rictal barbel longer that orbit diameter (character 191:2).

According to Ibarra & Stewart (1987), there are 39 paratypes from seven different localities as part of the type series of *S. dariensis*. The holotype (FMNH 7584) is reported to be missing, which was corroborated from the records of the FMNH collection website. A designation of a lectotype is not included here due to the high number of paratypes deposited at the FMNH that are not only juveniles and are a good sample for the ontogenetic variation of the species, as for the distribution of the species across localities in the Pacific versant in Panama.

Material examined: STRI 8386. 1alc. Panama, Darien Province, Chucunaque River basin, Tupisa River, 08°12’4.6’’N 82°41’2.4’’W, 02/18/2013. USNM 78373. 2alc. Panama, Darien Province, Yape River, S.E. Meek & S.F. Hildebrand, 06/03/1912. USNM 293273. 1c&s. Panama, Darien Province, Rio Tuyra 2-3km above Pinogana (Pacific), 08°06’N 77°47’W, W.C. Starnes, J. Martinez, M. Stiassny & R. Bouchard, 19/02/1985.

***Sturisomatichthys festivus* (Myers, 1942)**

Figs. 9 and 10.

Table 2.

Sturisoma festivum Myers, 1942: 100 (type locality: Rio Monay, 35km. north of Trujillo, Motatan system, Maracaibo basin, Venezuela; type SU 36505, length 169mm SL; nine paratypes from the same locality; original description). Schultz, 1944: 337 (distributed at Maracaibo Lake basin; identification key for the *Sturisoma* of the Maracaibo Lake basin). Böhlke, 1953: 46 (citation of type series). Isbrücker, 1980: 94 (included in *Sturisoma* as a member of the Harttiina; no diagnosis; reference to Böhlke, 1953 regarding the use of *Hypostomus pusarum* for citation of the type series). Ferraris & Vari, 1992: 31 (two paratypes at USNM reporting SL; remarks of the former SU number and presence of the holotype in that collection). Galvis et al., 1997: 97 (common name; short description; habitat; distributed only at Maracaibo Lake Basin; photo of a live specimen in lateral view). Isbrücker, 2001: 32 (included in the catalog of the Loricariinae as valid in *Sturisoma*, German version); 2002: 29 (included in the catalog of the Loricariinae as valid in *Sturisoma*, English version). Ferraris, 2003: 347 (genus distribution; synonymy; type material location at SU 36505, 16.9cm SL). Ghazzi, 2003: 193 (belonging to a new genus and no to *Sturisoma*). Lasso et al., 2004: 129 (as junior synonym of *Sturisoma kneri* (De Filippi, 1940)). Ghazzi, 2005: 564 (paratypes used for comparison with *S. kneri*). Ferraris, 2007: 299 (type locality; distribution of the species). Ortega-Lara et al., 2012: 91 (common name; specimens in Colombian and Venezuelan museums). DoNascimiento, 2016: 534 (corrigendum of Lasso et al., 2004, where the species was omitted; type locality based on Ferarris, 2007).

Sturisomatichthys festivus (Myers, 1942) – Covain et al., 2016: 514 (valid as *Sturisomatichthys festivum*; phylogenetic relationships of the Loricariinae subfamily using two mitochondrial and one nuclear markers; appears as sister group to all *Sturisomatichthys*).

Diagnosis: *Sturisomatichthys festivus* is diagnosed from its congeners by the presence of long filaments, generally exceeding or more than half than SL, on leading ray of all fins, including upper and lower rays on caudal fin (vs. absence of filaments, or presence only on pectoral and/or caudal fin), and dorsolateral stripe not continuing on caudal peduncle (vs. absence of dorsolateral stripe, or when present, continuing onto caudal peduncle as continuous or discontinuous stripe). From *S. caquetae*, *S. citurensis* and *S. tamanae* is distinguished by the presence of a rostrum (vs. rostrum absent) and presence of dorsolateral stripe (vs. dorsolateral stripe absent).

Description: Morphometric data in Table 2. Body short and tall, completely covered by dermal plates with small hyperthrophied odontodes, ill developed, but perceptible on sides of the head. Dorsal profile of head straight from tip of snout to origin of dorsal fin; concave from that point to caudal-fin origin. Ventral body profile flat. Head and predorsal region broader than remainder of body; postdorsal region narrower towards caudal fin.

Head triangular. Rostrum present, short and broad on its entire length. Ventral border of rostrum flat. Orbital rim circular, without notch, dorsolaterally placed on head. Sphenotic with a short lateral expansion. Canal bearing plate broad and well developed, in contact with anterior abdominal plates, anterior to branchiostegal membrane, not reaching rictal barbel. Upper lip covered with small, almost imperceptible plates; lower lip without such plates. Lower lip covered with round, almost imperceptible small papillae. Rictal barbel short, free from lip rim, never reaching anterior border of abdominal plates, nor surpassing posterior border of lower lip. Teeth slender, bifid, 37-55 on premaxilla, 33-42 on dentary; cusps slightly curved. Teeth in lower jaw somewhat larger than those in upper jaw.

First two predorsal plates with two low, inconspicuous ridges; nuchal plate at least twice as large than predorsal plates. Additional to being bigger, the third predorsal plate presents a noticeable developing, which gives the appearance of a higher depth of the body on this species (Fig. 9 and 10). Lateral plates carinate forming two longitudinal sharp keels; 16-18 coalescent plates, beginning at 14-15 median plates. Seven to eight straight lateral abdominal plates, between pectoral and pelvic-fin origin, which presents a similar size than central abdominal plates. Preanal plate bordered anteriorly by three, well developed, and of similar size plates; anterior most plate could not be in contact with preanal plate. Central abdominal plates, between lateral abdominal plates, roughly in irregular rows; anterior abdominal plates smaller and more numerous than posterior ones. Central abdominal plates are expanded and rectangular when compared to those present on species of *Sturisomatichthys* (Fig. 9 and 10).

Posterior margin of dorsal fin straight, unbranched ray longest; dorsal-fin rays i,7. Pectoral-fin i,6, unbranched ray longest, surpassing anterior third of pelvic fin, reaching, sometimes, more than half of the latter or even until its more distal tip. Pelvic-fin i,5, unbranched ray longest, its tip reaching half the length of anal-fin. Anal-fin rays i,5; unbranched ray longer. Posterior caudal-fin margin deeply concave, filament observed only on upper ray, but it was not observed on lower ray maybe due to damage. Additional to this, on dorsal, pectoral, pelvic and anal fin, the unbranched ray shows a prolongation, not as long as the filaments present on the caudal fin, but which significantly modify the totally extension of each fin.

Coloration in alcohol: Ground color of dorsum and head pale brown or yellow, as well as ventrally. Dorsolateral stripe on both sides of body. Stripe broader at anterior border of the first predorsal plate, until origin of dorsal fin (Fig. 10), it becomes less conspicuous and thin towards caudal peduncle. A remnant of the dark color of the stripe can or cannot be present on ventral side of the rostrum, but not separated as observed on both sides of the body, but as a single dark spot, occupying the entire ventral area of the rostrum (Fig. 10). Dark, big spots on membranes and rays of pectoral, pelvic and anal fins, which do not occupy the entire fin. Dorsal fin with a dark brown band along the first two branched rays, and with conspicuous dark spots along the unbranched ray. Caudal fin with dark bands along first two or three branched rays, both upper and lower, and connected at the base of the fin forming a V-shaped pattern. Dark brown spots on edges of caudal lobes.

Sexual dimorphism: The specimens examined show sexual dimorphism on the sides of the head, consisting of short hyperthrophied odontodes on males (Fig. 10).

Distribution: *Sturisomatichthys festivus* occurs in the Maracaibo Lake basin in Venezuela, and Catatumbo River in Colombia (Fig. 1).

Remarks: Myers (1942) described *S. festivus* from the Monay River, Motatan System in the Maracaibo Lake Basin, Venezuela. The description highlights the fact that the species presents, on both juvenile and adult males and females, filamentous extensions on the first ray of all fins (Fig. 10). The author also mentions the presence of dorsolateral longitudinal stripe (Fig. 10); nevertheless, Myers (1942) stated that the coloration was only observed in one juvenile specimen, but we confirmed the stripe to be present in adults as well. Finally, the author compared *S. festivus* to *S. panamensis* and *S. frenatus* (assuming the latter as synonym of the former), but differentiating both species by means of corporal proportions and the fact that *S. festivus* has filamentous extensions on the fins. As seen in Chapter 1, the three species mentioned above are valid, being *S. festivus* sister to *S. kneri*, and *S. panamensis* sister to the clade formed by *S. aureus* and *S. leightoni* (see Fig. 1 in Chapter

1). In fact, Lasso et al. (2004) stated that *S. festivus* is a synonym of *S. kneri*, based on non-published data by Provenzano.

As mentioned above, both *S. festivus* and *S. kneri* are valid, with *S. festivus* having the following autapomorphies: exoccipital lamina thin, extended ventrally in contact with the trasncapular ligament along its entire ventral border (character 21:2); lateral line complete, but not entering the supracaudal plates (character 46:1); autopalatine splint absent (character 51:0); posterior articulation of the hyomandibular with compound pterotic, only synchondrial (character 84:0); anterior process of first epibranchial relatively elongate and triangular in shape (character 109:1); restricted contact between dorsal fin pterygiophores between second and third pterygiophore, all others in complete contact (character 134:2); transverse process of first dorsal-fin pterygiophore longer relative to second dorsal-fin pterygiophore (character 137:2); posterior process of hemal spine of second preural centrum, short (character 145:1); contact of basypterigia to connecting cartilage or symphysis as suture anterior to cartilage (character 164:2); second ural apophysis as a single structure (character 179:0); dorsal plates rectangular, without keel formed by odontodes (character 196:0); long filament at distal tip of dorsal and pectoral fin, unbranched ray, present (character 205:1) ; pelvic-fin surpass more than half length of anal-fin (character 206:2). Both species are sympatric in the Maracaibo Lake Basin, but can be easily differentiated, additionally, by external characters (see Diagnoses and Identification Key).

The taxonomic history of the species is not extensive. Since its description, it has always been assumed as valid and belonging to *Sturisoma*, until the study of Covain et al. (2016) which placed it in *Sturisomatichthys*. Both paratypes cited by Ferraris & Vari (1992) deposited at the USNM were examined in this study. When compared to non-type material, all of the characters offered by Myers (1942) are present across the samples.

Material examined: AUM 22138. 8alc. Venezuela, Zulia state, Lake Maracaibo basin, Escalante River basin, Onia River at El Padre Channel on road from highway 2 to town of KM 35, 8.76161°N -71.76314°E(?). Armbruster, Hardman, Evans, Thomas, 19/12/1999. AUM 22148. 1alc. Venezuela, Zulia state, Escalante River, Lake Maracaibo basin, Chamita River on road from highway 2 to town of Blanco channel, 8.91263°N -71.82938°E(?), Hardman, Armbruster, Evans, Thomas, 19/12/1999. AUM 22184. 3alc. Venezuela, Zulia state, Lake Maracaibo basin, Catatumbo River basin, Zulia River, channel North of highway 6 bridge near Tachira-Zulia state line on small road that corsses creek. 8.5025°N -72.34361°E(?), Hardman, Evans, Thomas, Armbruster, 20/12/1999. CAS 136506. 4alc, paratypes. Venezuela, Trujillo state, Lake Maracaibo basin, Monay River, 35km north of Trujillo, F.F. Bond, 14/03/1938. CAS 168512. 1c&s. Venezuela, Lake Maracaibo basin, Motatan River, no date information. USNM130637. 2alc, paratypes. Venezuela, Trujillo state, Lake Maracaibo basin, Monay River, 35km north of Trujillo, F.F. Bond, 14/03/1938. CAS 168512. 1alc. Venezuela, Trujillo state, Motatán municipality, Motatan River, F.F. Bond, 15/03/1938.

Sturisomatichthys frenatus **(Boulenger, 1902)**

Figs. 11 and 12.

Tables 3

Loricaria frenata Boulenger, 1902: 69-70 (type locality: San Javier, Salidero and Durango river, Pacific slope of Ecuador; without designation of types). Meek & Hildebrand, 1916: 261 (junior synonym of *Oxyloricaria panamensis*).

Oxyloricaria frenata (Boulenger, 1902) – Regan, 1904: 302, Plate VXIII, Fig. 2 (description of the species; report of eight specimens from northwestern Ecuador used for the original description; total length of bigger specimen, 250mm TL; drawings of lateral view, and ventral and dorsal view of anterior portion of the body). Meek & Hildebrand, 1916: 262 (junior synonym of *Oxyloricaria panamensis*).

Sturisoma frenatum (Boulenger, 1902) – Eigenmann, 1910: 416 (identification key for *Sturisoma*; valid as *Sturisoma frenatum*; reference to Regan, 1904). Isbrücker, 1979: 113 (designation of lectotype for the species: BMNH 1901.8.3:29, male, 236mm SL); 1980: 94 (included in *Sturisoma* as a member of the Harttiina; no diagnosis; reference to Regan (1904) regarding specimens from the original description, and Isbrücker (1979) where is stated that the paralectotype is from Salidero, as well as two paralectotypes, two from St. Javier, and three from Durango river); 1981: 88 (as valid in *Sturisoma*); 2001: 32 (included in the catalog of the Loricariinae as valid in *Sturisoma*, German version); 2002: 29 (included in the catalog of the Loricariinae as valid in *Sturisoma*, English version). Ferraris, 2003: 347 (distribution; synonymy; type material location; maximum size; common name in Ecuador); 2007: 299 (type locality; distribution of the species). Ghazzi, 2003: 188 (belonging to a new genus and no to *Sturisoma*); 2005: 564 (type series used for comparison with *S. kneri*).

Sturisomatichthys frenatus (Boulenger, 1902) – Covain et al., 2016: 514 (valid as *Sturisomatichthys frenatum*; phylogenetic relationships of the Loricariinae subfamily using two mitochondrial and one nuclear markers; appears as sister to *S. dariensis*).

Diagnosis: *Sturisomatichthys frenatus* is distinguished from its congeners by the presence of a longitudinal dark stripe on the first two to three dorsal fin rays, reaching their distal tip, and extending to the base of remaining rays (vs. absence of stripe, or stripe not reaching distal tip of rays and restricted to first two dorsal fin rays, nor extended to the base of remaining rays) and pelvic and anal fin with dark spots occupying the entire fin (vs. absence, or light spot not occupying the entire fin). Moreover, it is distinguished from *S. caquetae*, *S. citurensis* and *S. tamanae* by presence of a rostrum (vs. rostrum absent) and presence of dorsolateral stripe (vs. dorsolateral stripe absent).

Description: Morphometric data in Table 3. Body short and low, completely covered by dermal plates with small hyperthrophied odontodes, ill developed, not visible on sides of the head nor paired fins. Dorsal profile of head slightly concave from tip of snout to interorbital portion, straight from that point to origin of dorsal fin; concave from that point to caudal-fin origin. Ventral body profile flat. Head and predorsal region broader than remainder of body; postdorsal region narrower towards caudal fin.

Head triangular, elongated. Rostrum present. Ventral border of rostrum flat. Orbital rim circular, without notch, dorsolaterally placed on head. Sphenotic with a short lateral expansion. Canal bearing plate broad and well developed, in contact with anterior abdominal plates, anterior to branchiostegal membrane, not reaching the rictal barbel. Upper lip covered with small, almost imperceptible plates; lower lip without such plates. Lower lip covered with round, almost imperceptible small papillae. Posterior border of lower lip irregular, with small papillae present along its entire border. Rictal barbel extremely short, free from lip rim, never reaching anterior border of abdominal plates, nor surpassing posterior border of lower lip. Teeth slender, bifid, 36-50 on premaxilla, 31-46 on dentary; cusps slightly curved. Teeth in lower jaw larger than those in upper jaw.

First two predorsal plates with two low, inconspicuous ridges; nuchal plate bigger than pre-dorsal plates. Lateral plates carinate forming two longitudinal weak keels; 16-18 coalescent plates, beginning at 14-17 median plates. Six to nine straight lateral abdominal plates, between pectoral and pelvic-fin origin, longer than central abdominal plates. Preanal plate bordered anteriorly by five or six, well developed, and of similar size, all of them in contact with the preanal plate. Central abdominal plates, between lateral abdominal plates, roughly in irregular rows, irregular and similar in size and shape as the anterior and posterior ones. Anterior abdominal plates of similar size and number as posterior ones.

Posterior margin of dorsal fin straight, unbranched and first and second branched rays longest; dorsal-fin rays i,7. Pectoral-fin i,6, unbranched ray longest, reaching anterior third or a little more of pelvic fin. Pelvic-fin i,5, unbranched ray longest, its tip reaching anterior third of the anal-fin. Anal-fin rays i,5; unbranched ray longest. Posterior caudal-fin margin deeply concave, filaments not observed on neither upper nor lower ray maybe due to damage.

Coloration in alcohol: Ground color of dorsum and head pale or dark brown; pale yellow ventrally. Dorsolateral stripe on both sides of body. Stripe broader just after to posterior border of orbital rim, until two plates posterior to origin of dorsal fin (Fig. 11 and 12), it becomes less conspicuous and thin towards caudal peduncle. A remnant of the dark color of the stripe can or cannot be present on ventral side of the rostrum, separated as observed on both sides of the body (Fig. 12). Dark, big spot on pectoral-, pelvic- and anal-fin, its longitude decreases from the first to the last ray on each fin (Fig. 11 and 12). Dorsal fin with a dark brown band along the first two branched rays, without conspicuous dark spots along the unbranched ray. Caudal fin with dark stripe along first two or three branched rays, both upper and lower, and connected at the base of the fin forming a V-shaped pattern. Presence of two or three white ocellus at distal portions of the two or three first upper and lower caudal rays (Fig. 12). Dark brown spots absent on edges of caudal lobes.

Sexual dimorphism: The specimens examined show sexual dimorphism on the sides of the head, as stated by Boulenger (1902) (Fig. 11).

Distribution: *Sturisomatichthys frenatus* occurs in Pacific slopes of Ecuador, in the Esmeraldas River, San Javier, Salidero, and Durango River, and the Patia River in Colombia (Fig. 2).

Remarks: The original description offered by Boulenger (1902) highlights general aspects of the species, initially described as *Loricaria frenata*. The author referred to the dorsolateral longitudinal stripe on the sides of the head, which was corroborated on both type and non-type material (Figs. 11 and 12). Additionally, Boulenger (1902) also included the dark spots on the fins, which are present on some of the species of *Sturisomatichthys* (see Identification Key).

Regan (1904) transferred the species to *Oxyloricaria*, and made another description including eight of the specimens used by Boulenger (1902) on the original description. That second description is similar to the original one, and Regan included no additional characters. Nevertheless, Eigenmann (1910) proposed *Oxyloricaria* as a junior synonym of *Sturisoma*, and assumed *S. frenatus* as valid and belonging to that genus. On the contrary, Meek & Hildebrand (1916) did not follow Eigenmann's synonymy, and continued to assume *Oxyloricaria* as valid; the authors included *S. frenatus* as a junior synonym of *S. panamensis*. Eigenmann (1922) did not consider the species as valid, without giving any specific reason, and included the species as a synonym of *Sturisoma panamense*.

The original description offered by Boulenger (1902) indicates several specimens from St. Javier, Salidero and Durango River, northwester Ecuador, Pacific versant. Nevertheless, the author indicated no holotype. Isbrücker (1979) designated a lectotype for the species (BMNH 1901.8.3), and assumed *S. frenatus* as valid and belonging to *Sturisoma*. The type series was examined here, and even though the specimens were collected more than 100 years ago, the typical coloration on the fins and general characteristics offered by Boulenger (1902), are still visible (Fig. 11).

The taxonomic story of the species is brief, and only its placement in *Oxyloricaria* and the synonymization with *S. panamensis* are relevant. As seen in Chapter 1, there is evidence to consider the species valid and distinct from *S. panamensis*. In addition to the external characteristics included in the Diagnosis and the identification key, *S. frenatus* presents the following autapomorphies within *Sturisomatichthys*: quadrate short on its posterior border, elongate (character 76:2); reduced contribution of the compound pterotic to the junction between hyomandibular and cranium (character 85:1); suspensory elongated, rectangular (character 88:1); absence of transverse process on fifth (character 138:1) and sixth dorsal fin pterygiophores (character 139:1); and dark band on dorsal fin, occupying almost the entire fin (character 215:2).

The species was found to be distributed only in the Pacific versant of northwestern Ecuador and southwestern Colombia (Fig. 2), contrary to the distribution of Eigenmann (1922) which included the Atrato (northwestern Colombia) and Tuyra basins (Pacific versant of Panama). Finally, this is the first formal record of *Sturisomatichthys frenatus* in the Patia River, southwestern Colombia contrary to Ortega-Lara et al. (2006a) who did not assume the species to be present at that basin.

Material examined: BMNH 1901.8.3.29, 232.4mm SL, lectotype. Ecuador, Salidero, NW Ecuador, elevation 350 feet, Rosenberg. BMNH 1901.6.27:23-4. 2alc, 179.9 and 227.8mm SL, paralectotypes. Same date as lectotype. BMNH 1901.8.3:30-31. 2alc, 226.4 and 228.5mm SL, paralectotypes. Same data as lectotype. CAS 13642. 2alc. Colombia, Nariño department, Patia River basin, Magui River. A. Henn, 04-05/04/1945. CAS 13643. 3alc. Colombia, Nariño department, Patia River between Magui River and Telembi River. A. Henn, 05/04/1945. MHNG 2674.055. 1alc. Ecuador, Esmeraldas state, Bogotá River at Carondelet. C. Weber & M. Caicedo, 05/02/1992. USNM 288089. 2alc. Ecuador, Esmeraldas state, Bogota River, Sabalera estuary, 600mts. near campament La Chiquita, road to Ricaurte. R. Barriga & C. Mina, 20/11/1985. USNM 341993. 2 of 3alc, 1c&s. Colombia, Nariño department, Teresita district, Salado River, H.G. Loftin & Dean, 08/02/1968.

***Sturisomatichthys kneri* (Ghazzi, 2005)**

Sturisoma kneri Ghazzi, 2005: 559, Fig. 1 (type locality: Lago de Maracaibo, Venezuela; MZUT 764, 265.6mm SL; original description). Ferraris, 2007: 299 (type locality; distribution of the species).

Loricaria kneri De Filippi, 1940 – Isbrücker, 1981a:88 (listed as nominal species in *Loricaria*); 2001: 29 (name listed as valid in *Sturisoma*, German version); 2002: 22 (name listed as valid in *Sturisoma*, English version).

Loricaria kneri De Filippi, in Tortonese, 1940: 137 – (type locality: ‘‘Lago di Maracaibo,’’ Venezuela; name unavailable); Eschmeyer, 1998 (name unavailable, listed in type catalog).

Sturisoma kneri (De Filippi, in Tortonese, 1940) – Isbrücker, 1979: 88 (unavailable name used in new combination); 1980: 94 (included in *Sturisoma* as a member of the Harttiina; no diagnosis); 1981b: 88 (transferred from *Loricaria* to *Sturisoma*).

Sturisomatichthys kneri (Ghazzi, 2005) – Covain et al., 2016: 514 (valid as *Sturisomatichthys kneri*; phylogenetic relationships of the Loricariinae subfamily using two mitochondrial and one nuclear markers; not included in phylogenetic analysis).

Diagnosis: *Sturisomatichthys kneri* is distinguished from *S. caquetae*, *S. citurensis* and *S. tamanae* by the presence of a rostrum (vs. rostrum absent) and presence of dorsolateral stripe (vs. absence of dorsolateral stripe). By the remaining congeners it is distinguished by the number of premaxillary teeth (21-35 vs. 47-69 in *S. aureus*; 38-45 in *Sturisomatichthys* Baudó; 54-61 in *S. dariensis*; 37-55 in *S. festivus*; 36-50 in *S. frenatus*; 37-53 in *S. panamensis*) and dentary teeth (21-30 vs. 40-56 in *S. aureus*; 34-47 in *S. dariensis*; 33-42 in *S. festivus*; 31-46 in *S. frenatus*; 32-44 in *S. panamensis*). From *S. leightoni* is distinguished by the presence of continuous dorsolateral stripe (vs. discontinuous dorsolateral stripe) and interorbital distance (32.7-36.7% in HL vs. 25.4-32.6% in HL). From *S. festivus,* it is distinguished by the absence of filaments on dorsal, pectoral, pelvic and anal fins (vs. filaments present).

Description: The reader is referred to the original description of the species (in Ghazzi, 2005) for morphometrics and meristics. Since the description and diagnosis of the species is recent, it will not be redescribed here. The diagnostic characters used here for the species were observed from a c&s paratype (see material examined for the species), and characters of external morphology provided by Ghazzi (2005) in the original description.

Distribution: *Sturisomatichthys kneri* occurs in the Maracaibo Lake in Venezuela (Fig. 1).

Remarks: Ghazzi (2005) redescribed *Sturisoma kneri* and assumed the name *Loricaria kneri* as unavailable. The author retained the specific epithet of the species and its holotype to maintain taxonomic stability for the taxon (Ghazzi, 2005: 559), and included it in *Sturisoma* to make the new name available. Ghazzi stated that even though Isbrücker (1980, 1981b, 2001) treated the name *Sturisoma kneri* as valid, this merely citation is not enough (Article 11.5.2 of the ICZN, 1999). Thus, the validation of the name had to be done by the redescription and diagnosis of the species within the genus.

As shown in Chapter 1 *Sturisomatichthys kneri* is the sister species to *S. festivus*. As stated in the remarks of the latter, Lasso et al. (2004), based on unpublished data by Provenzano, assumed *S. kneri* to be the senior synonym of *S. festivus*. In addition to external characters (see Identification key), *S. kneri* presents the following autapomorphies: mesethmoid disk laminar shaped, circular in lateral view (character 5:2); ventrolateral crest of mesethmoid well-developed on its posterior margin (character 7:2); basioccipital without suture with transcapular ligament, exoccipital between both structures (character 19:0); exoccipital rectangular and narrow in ventral view (character 22:1); canal of last infraorbital with two exits, ventrolateral and dorsal (character 40:1); lateral flange of palatine present and incomplete (character 48:1); coronoid process of dentary, absent (character 53:3); posterior process of second epibranchial large and laminar (character 113:3); aortic canal reaching ninth to eleventh vertebrae (character 127:2); cleithra anterolateral process, large and anterior (character 157:2); fenestra between symphysis of coracoids and cleithra rounded (character 161:1); cartilage between bony symphysis of basypterygia as a long rectangle, with anterior and posterior long sutures (character 165:2); and pectoral-fin hyaline (character 216:0).

The only know specimens belonging to *S. kneri* are those included as type series in the original description (n=5). No additional material was available for its inclusion in this study. Thus, data included in the diagnosis presented here and comparison with congeners of *Sturisomatichthys* to be included in their diagnosis and identification key was taken from the original description by Ghazzi (2005).

Material examined: MCNG 33535. 1c&s, paratype. Venezuela, Zulia state, Lake Maracaibo basin, Urumana Creek, Cataneja farm, Goajira, C. Lilyestron et al., 23/03/1973.

Sturisomatichthys leightoni (Regan, 1912)

Fig. 13.

Table 3.

Oxyloricaria leightoni Regan, 1912: 669, Plate LXXVII, Fig. 2 (type locality: Honda, Colombia; no types assigned; original description without specific remarks, focusing on measurements and coloration of the specimens; two specimens of 55mm and 65mm TL).

Sturisoma leightoni (Regan, 1912) – Eigenmann, 1920b: 11 (as distributed at the San Juan River); 1922: 96, Plate XVI, Figs. 1 and 2 (as distributed on the upper Magdalena, San Juan river and east of Bogota in Colombia; a total of 94 specimens from IUM and CM, from the upper Magdalena, one of them from the San Juan river, which probably is a *S. tamanae* specimen; specimens from Cumaral, Meta, Colombia which the author reported to be "slightly different" from the rest). Fowler, 1942: 132 (distributed at the San Juan, Cauca, Meta and Magdalena Rivers, following Regan (1912)). Miles, 1947: 114 (identification key of the Loricariidae; distribution of the species; reproduction of the distribution proposed by Regan (1912)). Dahl, 1971: 95 (present at upper Cauca and Magdalena; maximum size 18cm of TL; identification key for *Sturisoma* along with *S. aureus* and *S. panamensis*). Román-Valencia, 1995: 14 (distributed at La Vieja River, upper Cauca, Colombia). Lasso et al., 2004: 129 (not distributed in Venezuela).

Sturisomatichthys leightoni (Regan, 1912) – Isbrücker, 1979: 88 (original description of *Sturisomatichthys*; designation as type species of the genus; designation of lectotype for the species: BMNH 1909.7.23:45, 57mm SL); 1980: 92-93 (included in *Sturisomatichthys* as a member of the Harttiina; no diagnosis; reference of Isbrücker (1979) for the designation of lectotype); 2001: 32 (included in the catalog of the Loricariinae as valid in *Sturisomatichthys*, German version); 2002: 29 (included in the catalog of the Loricariinae as valid in *Sturisomatichthys*, English version). Ferraris, 2003: 347 (distribution; synonymy; type material location; maximum size; common name in Colombia). Maldonado-Ocampo et al., 2005: 138, Figs. 124 and 135 (common names; reproduction of the original description; biology and ecology of the species from previous reports; distribution from previous reports; localities from previous reports; specimens in Colombian museums; drawing in lateral view; distribution map). Mojica et al., 2006a: 32 (distributed in the Magdalena-Cauca Basin; catalog numbers in Colombian museums). Ortega-Lara et al., 2006b: 48 (distributed in the Cauca basin in Colombia; specimens in Colombian museums). Villa-Navarro et al., 2006: 14 (distributed in the Magdalena basin in Colombia; specimens in Colombian museums). Maldonado-Ocampo et al., 2008: 195 (distributed in the Magdalena and Pacific basins in Colombia; citation of type series). Covain & Fisch-Muller, 2007: 37 (type species of *Sturisomatichthys*; citation of lectotype; remarks about the genus). Ferraris, 2007: 300 (type locality; distribution of the species). Covain et al., 2016: 503 (valid as *Sturisomatichthys leightoni*; phylogenetic relationships of the Loricariinae subfamily using two mitochondrial and one nuclear markers; appears as sister group to all *Sturisomatichthys*).

Diagnosis: *Sturisomatichthys leightoni* is diagnosed from its congeners by having discontinuous, ill-marked and thin dorsolateral stripe (vs. continuous, well-marked and broad dorsolateral stripe; except *S. caquetae, S. citurensis* and *S. tamanae*). It is distinguished from *S. caquetae*, *S. citurensis* and *S. tamanae* by the presence of rostrum (vs. absence of rostrum). It can be distinguished by the number of coalescent plates (13-16 vs. 16-17 in *S. dariensis*; 16-18 in *S. festivus*; 16-18 in *S. frenatus*; and 16-19 *Sturisomatichthys* San Juan). It is distinguished by its cleithral width 11.0-14.1% in SL (vs. 8.3-9.6% in SL in *Sturisomatichthys* Baudó; 8.5-10.5% in SL in *S. frenatus*; 8.4-10.5% in SL in *S. panamensis*; and 7.7-9.2% in SL in *Sturisomatichthys* San Juan). Furthermore, it is distinguished from *S. aureus* by the absence of a big dark spot on dorsal, pectoral, pelvic, and anal fin occupying almost the entire fin (vs. presence) and presence of reticulations on predorsal, supraoccipital and interorbital region (vs. absence). From *S. panamensis* it is distinguished by the absence of a dark spot on pectoral fin, and stripe along first two rays of dorsal fin (vs. presence) and presence of reticulations on supraoccipital, interorbital and predorsal region (vs. absence of reticulations). From *S. festivus,* it is distinguished by the absence of filaments on dorsal, pectoral, pelvic and anal fins (vs. filaments present).

Description: Morphometric data in Table 3. Body short and low, completely covered by dermal plates with small-developed hyperthrophied odontodes visible on both sides of the head, but not on paired fins. Dorsal profile of head straight from tip of snout to origin of dorsal fin; concave from that point to caudal-fin origin. Ventral body profile flat. Head and predorsal region broader than remainder of body.

Head triangular. Rostrum present. Ventral border of rostrum flat. Orbital rim circular, without notch, dorsolaterally placed on head. Sphenotic with a reduced, almost absent lateral expansion. Canal bearing plate broad and well developed, in contact with anterior abdominal plates, anterior to branchiostegal membrane, not reaching rictal barbel. Upper lip covered with small, almost imperceptible plates; lower lip without such plates. Lower lip covered with round, almost imperceptible small papillae. Posterior border of lower lip irregular, with small papillae present along its entire border. Rictal barbel extremely short, free from lip rim, never reaching anterior border of abdominal plates, nor surpassing posterior border of lower lip. Teeth slender, bifid, 24-50 on premaxilla, 22-44 on dentary; cusps slightly curved. Teeth in lower jaw larger than those in upper jaw.

First two predorsal plates with two low, inconspicuous ridges; third predorsal plate the same size than predorsal plates. Lateral plates carinate forming two longitudinal keels; 13-16 coalescent plates, beginning at 13-17 median plates. Five to eight straight lateral abdominal plates, between pectoral and pelvic-fin origin, longer than central abdominal plates. Preanal plate bordered anteriorly by three, somewhat developed, and of similar size plates all of them in contact with the preanal plate. Central abdominal plates, between lateral abdominal plates, without any kind or organization; anterior abdominal plates smaller and more numerous than the posterior ones. Central abdominal plates are numerous and irregular, smaller than the anterior and posterior ones.

Posterior margin of dorsal fin straight, unbranched and first and second branched rays longest; dorsal-fin rays i,7. Pectoral-fin i,6, unbranched ray longest, barely reaching origin of pelvic fin. Pelvic-fin i,5, unbranched ray longest, its tip reaching origin of the anal-fin. Anal-fin rays i,5; unbranched ray longest. Posterior caudal-fin margin deeply concave, short filaments, less than half the SL, on both upper and lower ray.

Coloration in alcohol: Ground color of dorsum, head and ventrally, dark brown. Dorsolateral stripe observed on both sides of the snout (Fig. 13). Posterior to the orbits stripe not as visible, yet present and discontinuous. A dark, narrow stripe at beginning of the dorsal fin (Fig. 13), as a continuation of the dorsolateral stripe present on snout. Dorsolateral stripe somewhat visible along caudal peduncle, but not as visible as on other congeners. All fins with dark and visible spots, no longitudinal bands (Fig. 13). Dorsal fin with a short band on the distal tip of first two branched rays (Fig. 13).

Sexual dimorphism: Small groups of thin and short hyperthrophied odontodes on the sides of the head, and along the plates of the caudal peduncle (Fig. 13).

Distribution: *Sturisomatichthys leightoni* occurs in the Magdalena-Cauca and Orinoco basins in Colombia (Fig. 3).

Remarks: Regan (1912) described *Oxyloricaria leightoni* from Honda, a city in the upper portion of the Magdalena River, Colombia; the author gave no specific location of the collection of the types. In the description, the author cited two juvenile specimens (55mm and 65mm TL) that were examined here. Despite their juvenile state, the specimens show the characteristics presented by adults regarding coloration of body and fins, the only difference being the presence of short odontodes on the sides of the head in sexually mature adult males (Fig. 13). Even though the specimens were collected in 1909 (Regan, 1912), they are fairly well preserved, and we were able to identify the characteristics cited in the original description.

Even though Eigenmann (1910) proposed *Oxyloricaria* as a junior synonym of *Sturisoma*, Regan (1912) originally described the species as *Oxyloricaria* ignoring the taxonomic arrangement of Eigenmann. Nevertheless, Eigenmann (1920a) refers to the species as *Sturisoma leightoni*, and mentions its presence in the Magdalena-Cauca basin on both sides of the eastern cordillera, taking Bogotá as a reference. In that same year, Eigenmann (1920b), in a study of the fishes of the rivers of the western cordillera in Colombia (San Juan, Atrato, Patía and Dagua Rivers), recognized the species as occurring in the San Juan River, and as doubtfully occurring in the Atrato River; both records being rejected here. Shortly after that, Eigenmann (1922) offered records of the species from the upper Cauca and Magdalena basins, San Juan River, and Meta River, in Curamal, Colombia. The author made a remark regarding those last specimens, stating that: “The specimen from Curamal in Eastern Colombia differs slightly in having the fins a little shorter and the spines of the males shorter” (Eigenmann, 1922: 96). We examined the specimens included by Eigenmann (1922; CAS 77279, three specimens, and CAS 77280, two specimens). Apolinario Maria collected both lots in February 1917, in Cumaral, Meta department, Colombia. This locality is just on the eastern border of the eastern Cordillera of the Andes, and thus, considered as cis-Andean. The five specimens analyzed have all characters that identify *S. leightoni*, and the character discussed by Eigenmann (1922) regarding “fins a little shorter and the spines of the males shorter” was not found to be adequate for a separation of *S. leightoni* as a distinct species from populations from Cumaral. This locality belongs to the Orinoco basin, on one of its western-most points, which constitutes a new record for *S. leightoni* in that basin, and a cis-Andean locality for the species, being the only species of *Sturisomatichthys* present in that basin (Fig. 3). As it was discussed above, according to Covain et al. (2016) *Sturisomatichthys* is a strictly Trans-Andean genus within the Loricariinae. Nevertheless, through this record, and the fact that *Sturisomatichthys caquetae* is a valid species belonging to the genus (see above) distributed in the Upper Amazon basin, the genus is recognized as both cis- and trans-Andean, making *Dasyloricaria* the only strictly Trans-Andean genus in the subfamily.

Subsequent studies to that of Eigenmann (1922) listed the species as occurring, additionally to the Magdalena-Cauca basin, in the Pacific and Eastern drainages in Colombia (i.e. Fowler, 1942; Miles, 1947; Dahl, 1971; Zúñiga et al., 2004; Maldonado-Ocampo et al., 2005, 2008; Ortega-Lara et al., 2006a), a fact that was not corroborated in the present study. Here, it was found that *S. leightoni* occurs in the Magdalena-Cauca and Orinoco basin and not on western drainages (Fig. 3).

Isbrücker & Nijssen (in Isbrücker, 1979) described the genus *Sturisomatichthys* assigning *S. leightoni* as the type species. The authors included as diagnostic the absence of a rostrum, which differentiates it from *Sturisoma* (Isbrücker, 1979: 91); however, that character was shown to be uninformative (see Chapter 1, and Discussion here). In that same study, a lectotype was assigned for the species (BMNH 1909.7.23:45). The type series was examined in this study (see Material Examined), and the juvenile state of the three individuals was verified. One of the paralectotypes has less than 30mm SL and it was not included in Table 3, but the characters were identified, as in the lectotype and the other paralectotype.

Sturisomatichthys leightoni is sympatric with *S. aureus* in the middle portion of the Magdalena River, and they appeared as sister species to each other (Chapter 1). *Sturisomatichthys leightoni* presents the following autapomorphies: sphenotic lateral process reduced (character 8:1); basioccipital sutured to ossified transcapular ligament, exoccipital excluded (character 19:1); compound pterotic perforations large (character 29:1); posterior process of palatine short, not extending beyond anterior condyle of lateral ethmoid (character 47:1); cup-shaped portion of premaxilla relative to cup shaped portion of dentary, smaller (character 52:2); coronoid process of dentary large, with large robust area (character 53:1); process on posteroventral lamina of bone of dentary present, relatively distant from main body of dentary (character 55:0); absence of condyle on the articulation of metapterygoid and lateral ethmoid (character 70:0); anterior process of first epibranchial relatively elongated and triangular in shape (character 109:1); no contact of connecting bone with pterygiophores (character 130:2); type of articulation between proximal portion of dorsal fin spine and second dorsal-fin pterygiophore through a circular hollow structure (character 136:2); and similar length of cleithrum symphysis relative to coracoid symphysis (character 156:0).

Material examined: ANSP 84178. 1alc. Colombia, Tolima department, Honda municipality, Upper Magdalena River. C. Miles, 1940. BMNH 1909.7.23.45, 57.1mm SL, lectotype. Colombia, Honda municipality, Magdalena River, alt. 300-400 feet. B. Leighton, 1909. BMNH 1909.7.23.46-47. 2alc, 29.0 and 47.4mm SL, paralectotypes. Colombia, Honda municipality, Magdalena River, alt. 300-400 feet. B. Leighton, 1909. CAS 77232. 7alc. Colombia, Cundinamarca department, Girardot municipality, Magdalena River basin, C.H. Eigenmann, 01/02/1912. CAS 77279. 3alc. Colombia, Meta department, Cumaral municipality, Orinoco River basin, Carneceria cannel, two days from Villavicencio city, A. Maria, no date information. CAS 77280. 2alc. Colombia, Meta department, Cumaral municipality, Orinoco River basin, Los Llanos, northeast of Villavicencio city, A. Maria, 02/1917. CIUA 232. 1alc. Colombia, Caldas and Antioquia departments, Magdalena River basin, La Miel River. U. Jaramillo & A. Arango. 01/09/2004. CIUA. 401. 2alc. Colombia, Antioquia department, Bolombolo and Venecia municipalities, Lower Cauca River basin. L. Ochoa and A. Montoya. 08/2006. CIUA 402. 8alc. Colombia, Valle del Cauca department, Cartago City, Upper Cauca basin, La Vieja River. L. Ochoa & A. Montoya.

08/2006. CIUA 921. 5 alc. Colombia, Caldas, Victoria, Magdalena basin, Guarinó River, Quebrada Casanguillas. 11/2007. M.I. Rios. CIUA 987. 5alc. Colombia, Caldas department, Victoria municipality, Magdalena River basin, Guarinó River, Bocatoma Creek. M.I. Rios. 10/2007. CIUA 1059. 3alc. Colombia, Caldas department, Victoria municipality, Magdalena River basin, Guarinó River, Bocatoma Creek. M.I. Rios. 10/2007. CIUA 1920. 1alc. Colombia, Santander department, Betulia municipality, Magdalena River basin, Sogamoso River, at La Paz Bridge. Pelayo-Mantilla. 09/2010. CIUA 3162. 1alc. Colombia, Antioquia department, Lower Cauca River, Middle Tenche River. J.D. Marín. 11/04/2002. CIUA 3608. 4alc. Colombia, Caldas, Chinchiná municipality, Cauca River, before discharge of San Francisco dam. 05°3’43’’N 75°43’51’’W 851masl. J.G. Ospina-Pabón. 04/03/2015. CIUA 3818. 1alc. Colombia, Caldas department, Chinchiná municipality, Cauca River basin, before discharge of San Francisco dam. 05°3’6’’N 75°44’29’’W 861masl. J.G. Ospina-Pabón. 03/03/2015. CIUA 3826. 1alc. Colombia, Caldas department, Chinchiná municipality, Cauca River, before discharge of San Francisco dam. 05°3’3’’N 75°44’37’’W 855masl. J.G. Ospina-Pabón. 03/03/2015. CIUA 3858. 2alc. Colombia, Caldas department, Supia municipality, Supia River, near mouth at Cauca River. 05°22’41’’N 75°36’55’’W 748masl. J.G. Ospina-Pabón. 10/03/2015. CIUA 3917. 2 alc. Colombia, Caldas department, Belalcazar municipality, Magdalena River Basin, Risaralda River, El Zancudo path. 04°05’27’’N 75°51’21’’ 932masl. J.G. Ospina-Pabón. 07/12/2014. CIUA 3920. 1alc. Colombia, Caldas department, Anserma municipality, El Tablazo path, Risaralda River. 05°09’6’’N 75°49’54’’W 1031masl. J.G. Ospina-Pabón. 05/12/2014. CIUA 3992. 10alc. Colombia, Caldas department, Viterbo municipality, Magdalena River basin, Guarne River tributary of Risaralda River. 05°05’29’’N 75°52’04’’W 986masl. J.G. Ospina-Pabón. 06/12/2014. CIUA 4800. 1alc. Colombia, Antioquia department, Pueblorrico municipality, Cauca River basin, San Juan River, PCH La Cristalina project, at discharge of dam. 05°24’25’’N 75°53’11’’. J. Yepes. 28/06/2016. CIUA 4839. 7alc. Colombia, Caldas department, La Dorada municipality, Magdalena River basin, Doña Juana River. 05°30’3’’N 74°41’14’’W. A. Loaiza et al. 20/09/2016. CIUA 4899. 2 of 6alc. Colombia, Caldas, Magdalena River basin, Purnio River. 05°20’57’’N 74°50’41’’W. A. Loaiza et al. 19/09/2016. FMNH 55131. 30alc. Colombia, Tolima department, Honda municipality, Upper Magdalena, Bernal Creek. C.H. Eigenmann, 1912. FMNH 55132. 6alc .Colombia, Girardot municipality. C.H. Eigenmann, 1912. FMNH 55134. 4alc. Colombia, Gabi (?). C.H. Eigenmann, 1912. FMNH 55136. 6alc, 1c&s. Colombia, Paila municipality. C.H. Eigenmann, 1912. ICNMHN 5290. 5alc. Colombia, Boyacá, Puerto Romero, middle Magdalena River, La Fiebre Creek, serranía de los Quinchas. Mojica et al., 05/03/2000. ICNMHN 6497. 48alc. Colombia, Boyacá, middle Magdalena River, Puerto Boyacá, Puerto Romero, Las Quinchas, La Fiebre Creek. I. Mojica & C.I. Cipamacho, Abril 2001. ICNMHN 15672. 1alc. Colombia, Caldas, Norcasia, La Miel River, upstream from mouth of Manso River, Magdalena River basin. P. Sanchez, 30/01/2006. ICNMHN 16160. 3alc. Colombia, Caldas, Norcasia, Magdalena River basin, La Miel River, downstream from mouth of Manso River. L. Mesa & P. Sanchez, 28/03/2006. ICNMHN 16175. 4alc. Colombia, Antioquia, San Miguel, Magdalena River basin, La Miel River. L. Mesa & P. Sanchez, 27/03/2006. ICNMHN 17733. 1alc. Colombia, Santander, El Carmen de Chucuri, El Topón farm, middle Magdalena, Topón River, main channel of river. 250msnm. 6°45’45’’N 73°34’56’’W. Mojica, I. et al. 16/03/2011. IUQ 51. 1alc. Colombia, Valle del Cauca department, Cauca-Magdalena basin, Upper Cauca River, San Pablo Creek, tributary of La Paila River, 4°21’N y 76°3’W, J.L. Jimenez & M. Cardona, 13/09/1996. IUQ 54. 1alc. Colombia, Quindío department, Alambrada district, Upper Cauca River, Los Kingos River tributary of La Vieja River, 4°24’06’’N 75°52’13’’W 1205 masl, C. Román Valencia & A. Muñoz, 25/07/1996. IUQ 58. 2alc. Colombia, Quindío department, Quimbaya municipality, La Española district, Playa Azul farm, Upper Cauca River, Roble River, Universidad del Quindío Biology students, 11/111995. IUQ 61. 2alc. Valle del Cauca department, Upper Cauca River, San Pablo Creek tributary of La Paila River, 4°21’N 76°3’W, M. Cardona & J. Jimenez, 15/09/1996. IUQ 100. 3alc. Colombia, Quindío department, Quimbaya municipality, Puerto Alejandría district, Upper Cauca River, La Vieja River, C. Román-V & Y. Palacios, 12/10/1991. IUQ 146. 6alc. Colombia, Quindío department, Maravelez district, Upper Cauca River, La Vieja River, C. Román-V, 21/01/1992. IUQ 157. 2alc. Colombia, Valle del Cauca department, road via Sevilla municipality, La India farm, La Paila River tributary of Cauca River, C. Román-V, 09/03/1994. IUQ 158. 2alc. Colombia, Valle del Cauca department, road via Sevilla municipality, La India farm, La Paila River tributary of Cauca River, J. Jimenez et al., 10/03/1994. IUQ 216. 8alc. Colombia, Quindío department, Puerto Alejandría district, Upper Cauca River, La Vieja River, C. Román-V, 03/10/1991. IUQ 286. 7alc. Colombia, Valle del Cauca department, road to Sevilla municipality, La India farm, Upper Cauca River, Totoro Creek tributary of Cauca River, G. Ayala et al., 10/03/1994. IUQ 672. 5alc. Colombia, Quindío department, La Tebaida municipality, La Argentina district, Upper Cauca River, La Vieja River, C. Román-V, 25/03/1991. IUQ 829. 3alc. Colombia, Quindío department, Maravelez district, Upper Cauca River, 24°25’01’’N 75°48’41’’W 1074masl, R. García & A. Botero, 16/07/2004. IUQ 1555. 1alc. Colombia, Quindío department, Upper Cauca River, La Vieja River, C. Román-V, no date information. IUQ 1674. 4alc. Colombia, Valle del Cauca department, road via Zarzal municipality, Upper Cauca River, Las Cañas creek tributary of Cauca River, C. Román-V, J. Vanegas-Ríos, A. Londoño-Burbano, 06/08/2007. IUQ 1776. 1alc. Colombia, Quindío department, Quimbaya municipality, Ocaso natural reserve, Upper Cauca River, Roble River at Playa Azul sector, 4°35’68’’N 75° 52’81’’W, C. García, R., García, A. Londoño-Burbano and limnology students, 19/08/2007. IUQ 1812. 5alc. Colombia, Quindío department, Quimbaya municipality, Ocaso natural reserve, Upper Cauca River, Roble River, 100mts of Playa Azul sector, 4°35’68’’N 75° 52’81’’W, C. García, R., García, A. Londoño-Burbano and limnology students, 19/08/2007. IUQ 1857. 8alc. Colombia, Quindío department, Quimbaya municipality, Ocaso natural reserve, Upper Cauca River, Roble River, near Playa Azul sector, 04°35’68’’N 72°52’81’’W, C. García & A. Londoño-Burbano, 26/10/2007. IUQ 2739. 1alc. Colombia, Valle del Cauca department, San Antonio de Piedras municipality, Upper Cauca River, Portugal de Piedras River, 4°03’45’’N 76°18’45’’W 944masl, C. García-A et al., 03/10/2009. IUQ 2740. Colombia, Valle del Cauca department, San Antonio de Piedras municipality, Upper Cauca River, Portugal de Piedras River, 4°03’45’’N 76°18’46’’W 945masl, C. García-A et al., 21/10/2009. IUQ 3087. 1 alc. Colombia, Quindío department, Upper Cauca River, Boquia creerk tributary of Quindío River, 03/20/1987. IUQ 3089. 4 of 5alc. Colombia, Quindío department, La Tebaida municipality, Upper Cauca River, Espejo River, 07/10/1986. IUQ 3091. 1 of 2alc. Colombia, Quindío department, Upper Cauca River, Boquia creerk tributary of Quindío River, 03/20/1987. MCP 41758. 1alc. Colombia, Cauca department, Buenos Aires municipality, Cauca River, Zanjón Bagazal River at Lomitas. P. Lehmann, 1998. MPUJ

7862. 2alc. 81-86.5mm SL. Colombia, Cundinamarca, Villeta, Villeta River, Dulce River upstream. 4°59''02''N 74°54'52,2''W 850masl. G.A. Ballen. 30/06/2012. MPUJ 7865. 2alc. 86.5-90.3mm SL. Colombia, Cundinamarca, Villeta, Villeta River, road Bogotá-Villeta. 05°04'00,8''N 74°27'01,6''W, 687masl. G.A. Ballen, 01/07/2012. MPUJ 7868. 19alc. 49.5-80.5mm SL. Colombia, Cundinamarca, Villeta, Villeta River, between Dulce River and Namay Creek. 4°59'31.5''N 74°29'11.0''W 1200masl. G.A. Ballen. 02/07/2012. USNM 121256. 1alc. Colombia, Tolima department, Upper Magdalena River, Luisa River, N. Maria, no date information. ZMA 139.631. 1alc. Colombia, Honda department, Upper Magdalena. C. Miles, no date information.

***Sturisomatichthys panamensis* (Eigenmann & Eigenmann, 1889)**

Fig. 14.

Table 4.

Loricaria panamensis Eigenmann & Eigenmann, 1889: 34-35 (type locality: Panama; type MCZ 8126, unique; length .95m (?) SL). Eigenmann & Eigenmann, 1890: 365-366 (reported as closely related to *Sturisoma rostratum*; reproduction of the original description).

Oxyloricaria panamensis (Eigenmann & Eigenmann, 1889) – Regan, 1904: 301-302 (*Sturisomatichthys aureus* as junior synonym; distributed in the Magdalena river and Panama; holotype reported to be 98mm TL). Meek & Hildebrand, 1916: 229 (distributed at the Bayano and Tuyra rivers, Panama, Atlantic and Pacific slopes in Colombia, and southern Ecuador; key to *Oxyloricaria* (= *Sturisoma*); description of the species; *Sturisomatichthys aureus*, *S. dariensis* and *S. frenatus* as junior synonyms of the species).

Sturisoma panamense (Eigenmann & Eigenmann, 1889) – Eigenmann, 1910: 416 (identification key for *Sturisoma*; valid as *Sturisoma panamense*; reference to Regan, 1904). Regan, 1913: 470 (species as valid in *Sturisoma*; without description). Eigenmann, 1920b: 11 (species distributed at the Atrato, Dagua, San Juan and lower Patía Rivers in Colombia); 1920c: 14 (distributed at Chepo, Tuyra and Atrato Rivers); 1922: 94-95 (synonymies; same distribution as in Eigenmann 1920b,c). Miles, 1947: 114 (identification key for *Sturisoma*; synonymies including *S. frenatus* and *S. dariensis*; distributed at lower Magdalena, San Juan and Patia, Colombia, Bayano and Tuyra, Panama, and Northwest Ecuador). Dahl, 1955: 17 (distributed at the Sinu river, Colombia); 1971: 94 (as present at lower, middle and upper Magdalena, upper and middle Sinú River; maximum size of 20cm TL; identification key of *Sturisoma* along with *S. aureus* and *S. leightoni*). Isbrücker, 1980: 95 (included in *Sturisoma* as a member of the Harttiina; no diagnosis); 1981a: 88 (as valid in *Sturisoma*); Román-Valencia, 1990: 205 (present at middle Atrato River). Isbrücker, 2001: 32 (included in the catalog of the Loricariinae as valid in *Sturisoma*, German version); 2002: 29 (included in the catalog of the Loricariinae as valid in *Sturisoma*, English version).

Ferraris, 2003: 347 (genus distribution in Pacific slope rivers of Panama, Colombia, and Ecuador, Caribbean slope rivers of Colombia; synonymies; type material location at MCZ 8126, 26cm SL; common names in Colombia and Ecuador). Ghazzi, 2003: 182 (belonging to a new genus and no to *Sturisoma*); 2005: 564 (holotype used for comparison with *S. kneri*). Maldonado-Ocampo et al., 2005: 29, Figs. 123 and 134 (synonyms; common names in Colombia; reproduction of the original description, in Spanish; records of biology and ecology of the species; distribution and distribution map; specimens in Colombian museums); 2006: 150 (distributed at Atrato river in Colombia, specimens at Colombian museums). Mojica et al., 2006a (distributed at Magdalena-Cauca Basin; catalog numbers in Colombian museums). Ortega-Lara et al., 2006a: 182 (as distributed at the Patia river, Colombia; specimens in Colombian museums). Ferraris, 2007: 299 (type locality; distribution of the species). Maldonado-Ocampo et al., 2008: 195 (distributed at the Magdalena-Cauca basin, and Caribbean and Pacific slopes in Colombia; specimens in Colombian Museums); 2013: 396 (present at Atrato and León river basins in the Caribbean slope, and Baudó, San Juan, Anchicayá, Dagua and Patia river basin in the Pacific slope, in Colombia; specimens in Colombian museums).

Sturisoma panamensis (Eigenmann & Eigenmann, 1889) - Fowler, 1942: 132 (distributed at the Patía, Magüí, Telembí, San Juan, Condoto, Atrato, Certeguí and Magdalena Rivers, following Regan (1913)).

Sturisomatichthys panamensis (Eigenmann & Eigenmann, 1889) – Covain et al., 2016: 514 (valid as *Sturisomatichthys panamense*; phylogenetic relationships of the Loricariinae subfamily using two mitochondrial and one nuclear markers; appears as sister group to all *Sturisomatichthys*).

Diagnosis: *Sturisomatichthys panamensis* is distinguished from *S. caquetae, S. citurensis* and *S. tamanae* by presence of a rostrum (vs. rostrum absent), presence of dorsolateral stripe from tip of the snout to caudal peduncle (vs. dorsolateral stripe absent), and number of dentary teeth (32-44 vs. 30, 63-100, and 60-93, respectively). From *S. dariensis, S. leightoni* and *Sturisomatichthys* San Juan it is distinguished by absence of reticulations on supraoccipital, interorbital and predorsal region (vs. presence of reticulations). Furthermore it is distinguished from *S. aureus* by inconspicuous spots on pelvic-, and anal-fin (vs. presence of dark spot on both fins) and absence of transversal bar at origin of dorsal fin, which is united to lateral-dorsal longitudinal stripe on both sides of the body (vs. presence). From *Sturisomatichthys* Baudó is distinguished by fewer and smaller central abdominal plates (vs. more numerous and bigger central abdominal plates). From *S. dariensis* it is distinguished by presence of a big dark spot on pectoral fin (vs. absence). From *S. festivus,* it is distinguished by the absence of filaments on dorsal, pectoral, pelvic and anal fins (vs. filaments present). From *S. frenatus* can be differentiated by the absence of dark spots on pelvic and anal fin (vs. presence of dark spots on all fins, occupying the entire fins) and stripe on first two rays on dorsal fin do not reaches distal tip of rays (vs. stripe reaches distal tip of first two dorsal-fin rays). From *S. leightoni* by presence of dark spot on pectoral fin, and stripe along first two rays of dorsal fin (vs. absence) and continuous dorsolateral stripe (vs. discontinuous dorsolateral stripe).

Description: Morphometric data in Table 4. Body elongate, completely covered by dermal plates with small, short hyperthrophied odontodes, perceptible on sides of the head. Dorsal profile of head slightly concave from tip of snout to interorbital point; straight from that point to dorsal fin origin. Behind the origin of dorsal fin until origin of caudal fin, slightly concave. Ventral body profile flat. Head and predorsal region broader than remainder of body; postdorsal region narrower towards caudal fin.

Head triangular, pointed; rostrum present, broad on its entire length. Ventral border of rostrum flat. Orbital rim circular, without notch, dorsolaterally placed on head. Sphenotic with a short lateral expansion. Canal bearing plate well developed, in contact with anterior abdominal plates, anterior to branchiostegal membrane reaching distal tip of rictal barbel. Upper lip covered with small, almost imperceptible plates; lower lip without such plates. Lower lip covered with round, almost imperceptible small papillae. Rictal barbel short, free from lip rim, not reaching anterior border of abdominal plates, nor surpassing posterior border of lower lip. Teeth slender, bifid, 37-53 on premaxilla, 32-44 on dentary; cusps slightly curved. Teeth in lower jaw larger than those in upper jaw.

First two predorsal plates with two low, inconspicuous ridges; third predorsal more than twice as broad than predorsal plates. Similar to that observed in *S. festivus,* the third predorsal plate presents a noticeable developing, not as high as in the latter, which gives the appearance of a deeper body on this species (Fig. 14). Median plates carinate forming two longitudinal sharp keels; 15-19 coalescent plates, beginning at 13-17 median plates. Seven to nine straight ventral lateral plates, between pectoral and pelvic-fin origin, larger than central abdominal plates. Preanal plate bordered anteriorly by three, well developed, and of similar size plates; anterior most plate could not be in contact with the preanal plate. Central abdominal plates, between lateral abdominal plates, roughly in irregular, ill-defined rows; irregular, not as small as seen in other congeners (Fig. 14). Anterior abdominal plates smaller and more numerous than posterior ones.

Posterior margin of dorsal fin straight, unbranched and first branched ray longest; dorsal-fin rays i,7. Pectoral-fin i,6, unbranched ray longest, surpassing a little of the anterior third of pelvic fin. Pelvic-fin i,5, unbranched ray longest, its tip reaching little more of anterior third of anal-fin. Anal-fin rays i,5; unbranched ray longest. Posterior caudal-fin margin deeply concave, long filaments, almost reaching half the SL on some specimens, on both upper and lower caudal rays. Additional to this, on the pectoral fin, unbranched ray with a prolongation, not as long as the filaments present on the caudal fin on some *Sturisomatichthys* species, but which can significantly modify the total extension of the fin.

Coloration in alcohol: Ground color of dorsum and head pale brown or yellow, as well as ventrally. Dorsolateral stripe on both sides of body. Stripe broader at anterior border of the first predorsal plate, until origin of dorsal fin (Fig. 14), it becomes less conspicuous and thin towards caudal peduncle. Even though dorsolateral stripe are broader on the anterior portion of the body, its width seems to be reduced when compared to congeners (Fig. 14). A remnant of the dark color of the stripe can or cannot be present on ventral side of the rostrum, separated as observed on both sides of the body. Dark, big spots on membranes and rays of pectoral fins. Dorsal fin with a dark brown band along the first two branched rays, and with conspicuous dark spots along the unbranched ray, not reaching its distal tips. It was observed on some specimens one to several white ocelli just anterior to the middle of the fin. Caudal fin with dark bands along first two or three branched rays, both upper and lower. Dark brown spots on edges of caudal lobes.

Sexual dimorphism: The specimens examined showed a subtle sexual dimorphism consisting of short hyperthrophied odontodes on the sides of the head of males (Fig. 14).

Distribution: *Sturisomatichthys panamensis* occurs in the Aruza, Capeti, and Tuyra Rivers in the Pacific versant, Panama, and the Atrato, Sinú, and Truando Rivers in the Caribbean versant, Colombia (Fig. 1).

Remarks: *Sturisomatichthys panamensis* has been proposed as senior synonym of several *Sturisomatichthys* species. Described by Eigenmann & Eigenmann (1889), the authors only included "Panama" as the type locality of the species. Their description is complete and include proportions, general aspects of coloration, and plates and teeth counts. Nevertheless, the holotype, the only type specimen, is a juvenile of 95mm SL (Eigenmann & Eigenmann, 1889) and this could have been one of the reasons for it to be assumed as a synonym to several others. In the original description, Eigenmann & Eigenmann (1890) pointed out that the species could be related to *Loricaria rostrata* (= *Sturisoma rostratum*).

Regan (1904) transferred the species to *Oxyloricaria*, and included *St. rostratum* and *S. aureus* as junior synonyms of *S. panamensis*. The author discussed the fact that after examining the type of *S. panamensis*, remained no doubt as about its conspecificity with *S. aureus*, and thus, the species was distributed in the Magdalena River as well; the author did not elaborate regarding the synonym with *St. rostratum*. In a study of the fishes from Panama, Meek & Hildebrand (1916) included the species, still as *O. panamensis*, ignoring the synonym of *Oxyloricaria* with *Sturisoma* proposed by Eigenmann (1910). The authors included *St. rostratum, S. aureus*, *S. frenatus*, and *S. dariensis* as junior synonyms of *S. panamensis*, without any specific justification for this action, and extended the distribution of the species to the Pacific slope of Panama, both slopes of Colombia, and south to Ecuador.

Eigenmann (1920b,c) included the species, as *Sturisoma panamense*, as distributed in the Chepo and Tuyra Rivers belonging to the Pacific slope of Panama, the Atrato River, Caribbean slope of Colombia, and the Dagua, San Juan, and lower Patía Rivers, Pacific versant of Colombia. A little after that, Eigenmann (1922) followed the same synonymies proposed by Meek & Hildebrand (1916) for *S. panamensis*, with the exception of *S. aureus* which was assumed as valid by the author, and did not include the Magdalena River as part of the distribution of *S. panamensis*. In the same way, Miles (1947) followed the taxonomic actions proposed by Eigenmann. Fowler (1942) also cited the species as present along the Pacific slope of Colombia at the Patía, Magüí, Telembí, San Juan, and Condoto Rivers, and the Caribbean slope at the Atrato, Certeguí, and Magdalena Rivers, in Colombia. Dahl (1955) was the first author to report the species as distributed at the Sinú River, on the Caribbean slope of Colombia, and referred to the similarity of the species with *S. tamanae*, differing, according to the author, only on the counts of the lateral plates, but assumes both species as valid. Román-Valencia (1990) and Maldonado-Ocampo et al. (2006) also included the Atrato River in the distribution of the species. Ortega-Lara et al. (2006a) listed the species as present in the Patía River, but did not comment on the synonymies of the species. On the other hand, and in addition to records of distribution of *S. panamensis* in localities of northwestern Colombia, Maldonado-Ocampo et al. (2005, 2008) and Mojica et al. (2006a) reported the species, using records of Colombian museums, in the upper Cauca and Magdalena River. Maldonado-Ocampo et al. (2013) included *S. panamensis* as present in the San Juan River, Colombian Pacific, which is rejected in this study. The specimens cited by the authors were not examined here (see Remarks on *S. tamanae* and *Sturisomatichthys* San Juan), but it is suggested that they do not belong to *S. panamensis*.

It was found here that *S. panamensis* is distributed in the Aruza, Capeti, and Tuyra Rivers in the Pacific versant, Panama, and the Atrato, Sinú, and Truando Rivers in the Caribbean versant, Colombia. This agrees only partially with the distribution described by some authors, rejecting the presence of the species in the Magdalena-Cauca basin, Magüí, Telembí, Certeguí, San Juan, Patía, and Dagua Rivers.

As seen on Chapter 1, *S. panamensis* was recovered as a valid species, as well as *S. dariensis*, *S. frenatus*, *S. aureus*, and *St. rostratum*. The synonymies proposed by Eigenmann & Eigenmann (1889, 1890), Regan (1904), Meek & Hildebrand (1916), Eigenmann (1922), Miles (1947), and Dahl (1971) are rejected here. Even though the external morphology, and particularly the coloration of the three *Sturisomatichthys* species are similar (Fig. 4, 8 and 12), *S. panamensis* presents the following autapomorphies within *Sturisomatichthys*: contact of lateral ethmoid with metapterygoid only by means of anterior and posterior tips (character 12:1); lateral processes of basioccipital small, shorter than basioccipital height, not expanded ventrally (character 20:1); ventral lamina of exoccipital thin, extended ventrally in contact with transcapular ligament along its entire ventral extension (character 21:2); exposed surface of preopercle small, 1/3 or less than size of second infraorbital (character 35:1); canal on canal-bearing plate from its dorsal to its ventral border (character 39:1); second epibranchial posterior process large, laminar (character 113:3); contact between 4th vertebra parapophyses and compound pterotic through suture (character 124:1); posterior process of basypterygia lanceolate (character 168:2); and hypurapophysis short, not projecting to second preural centrum (character 177:0). In addition to external characters which diagnose the species (see Diagnosis and Identification key).

Externally, *S. panamensis* is similar to *S. frenatus*, especially regarding the coloration of dorsal and pectoral fins (Fig. 12 and 14). *Sturisomatichthys panamensis* has a dark band on the first branched dorsal rays, but these do not extend beyond those rays nor reaches the distal tips of the rays, contrary to *S. frenatus*. The spots on the pectoral fin are less conspicuous in *S. panamensis*, and pelvic and anal fins do not present a visible spot, contrary to *S. frenatus* (see also Diagnosis and Identification key). Additionally, *S. panamensis* is sister to the clade formed by *S. aureus* + *S. leightoni*, which biogeographically makes sense (see Chapter 1). Both *S. aureus* and *S. leightoni* are distributed in the Magdalena River, while *S. panamensis* occurs in the Atrato and Tuyra Rivers (among others). As discussed by Schaefer (2011) the uplifting of the central and western versants of the Andes isolated the Magdalena-Cauca basin from the western basins such as the Atrato, San Juan, Patía, Baudó (Colombia) and Tuyra (Panama) basins (see also Londoño-Burbano & Reis, 2016). This shows a close relationship among populations distributed in the western drainages, on both the Pacific and Caribbean slope, and the Magdalena-Cauca basin, which is the case for other groups of the Loricariinae (see Discussion).

Material examined: CIUA 4324. 2alc. Colombia, Antioquia department, Murindó municipality, Atrato River basin, Campo Alegre district. 06°51’34’’N 76°49’69’’W, A. Loaiza et al. 09/09/2015. CIUA 4355. 1alc. Colombia, Antioquia department, Murindó municipality, Tadía district, Atrato River basin, 06°51’34’’N 76°49’09’’W, A. Loaiza et al. 19/08/2015. CIUA 4357. 2alc. Colombia, Antioquia department, Vigía del Fuerte municipality, Buchadó district, Guaguandó swamp, 06°24’13’’N 76°45’6’’W, A. Loaiza et al. 13/08/2015. CIUA 4501. 3 of 5 alc. Colombia, Antioquia department, Murindó municipality, Atrato River basin, Campo Alegre district, 06°51’34’’N 76°49’09’’W. A. Loaiza et al. 13/10/2015. CIUA 4627. 2alc. Colombia, Antioquia department, Vigía del Fuerte municipality, Buchadó district, Atrato River basin, 06°25’32’’N 76°45’48’’W, A. Loaiza et al. 12/03/2016. CIUA 4784. 4 of 6alc. Colombia, Antioquia department, Atrato River, Vigia del Fuerte municipality, Buchado district, Loaiza et al. 05/06/2015. NRM 36778. 1alc. Colombia, Córdoba department, Sinú River, Tierralta municipality, unnamed Creek emptying about 300mts downstream Urrá Hydropower Station. Anka et al., 1997. USNM 78370. 4 of 11alc. Panama, Darien Province, Capeti River, S.E. Meek & S.F. Hildebrand, 5/03/1912. USNM 78371. 7alc. Panama, Darien Province, Aruza River, Aruza sector at Darien Province, Meek, S.E. Meek & S.F. Hildebrand, 27/02/1912. USNM 78372. 12 of 16alc. Panama, Darien Province, Tuyra River at Boca De Cupe, S.E. Meek & S.F. Hildebrand, 28/02/1912. USNM 79145. 3 of 5alc. Panama, Darien Province, Tuyra River at Marrigante. S.E. Meek & S.F. Hildebrand, 9/03/1912. USNM 293412. 10 of 14alc, 1c&s. Panama, Darien Province, Tuira River between Calle Larga and Pinogana, above El Real, Pacific slope, J. Lundberg et al., 18/02/1985. USNM 316293. 9alc. Colombia, Chocó department, Truando River, Creek of Upper Nercua River, Large tributary of Truando River, H.G. Loftin & Fowler, 28/08/1967. USNM 316295. 4alc. Colombia, Chocó deparment, Prado district, Creek of Parado River, about 10min helicopter flight from Village of Parado. H.G. Loftin, 31/058/1967. USNM 341993. 2 of 3alc. Colombia, Chocó department, Salado River near Teresita. H.G. Loftin & Dean, 8/02/1968.

Sturisomatichthys tamanae (Regan, 1912)

Fig. 15.

Table 4.

Oxyloricaria tamanae Regan, 1912: 669, Plate LXXVII, Figs. 1,1a and 1b (type locality: Rio Tamana, Rio San Juan, Chocó, S.W. Colombia; no type designation; two specimens, one male one female, 225mm and 200mm in TL; original description).

Sturisoma tamanae (Regan, 1912) – Regan, 1913: 470 (species as valid in *Sturisoma*; without description). Eigenmann, 1920b: 11 (species distributed at the San Juan River in Colombia); 1922: 95 (specimens from Istmina, Puerto Negria and the San Juan basin, Colombia). Fowler, 1942: 132 (distributed at the Tamaná, Condoto and San Juan Rivers, following Regan (1913) and Eigenmann (1922)).

Sturisomatichthys tamanae (Regan, 1912) - Isbrücker, 1979: 88, Fig. 5-7 (original description of *Sturisomatichthys*; species belonging to *Sturisomatichthys*; designation of lectotype (BMNH 1910.7.11: 133) female (?), 179.5mm SL); 1980: 93 (included in *Sturisomatichthys* as a member of the Harttiina; no diagnosis; reference of Isbrücker

(1979) for designation of lectotype); 2001: 32 (included in the catalog of the Loricariinae as valid in *Sturisomatichthys*, German version); 2002: 29 (included in the catalog of the Loricariinae as valid in *Sturisomatichthys*, English version). Ferraris, 2003: 347 (genus distribution; synonymy; type material location at BMNH). Maldonado-Ocampo et al., 2006: 150 (distributed at the Atrato river in Colombia; specimens at IAvH-P). Ferraris, 2007: 300 (type locality; distribution of the species). Maldonado-Ocampo et al., 2008: 195 (as distributed at Magdalena-Cauca basin, and Caribbean and Pacific slopes in Colombia; citation of number lots of type series in BMNH); 2013: 28 (distributed at Atrato, San Juan and Baudó rivers in Colombia; citation of type series at BMNH; specimens at IAvH-P and IMCN in Colombia). Covain et al., 2016: 514 (valid as *Sturisomatichthys tamanae*; phylogenetic relationships of the Loricariinae subfamily using two mitochondrial and one nuclear markers; not included in analysis).

Diagnosis: *Sturisomatichthys tamanae* can be distinguished from its congeners by the presence of a broad, almost square spot at origin of dorsal fin, occupying almost the entire base of that fin (vs. absence of such spot), by the absence of dorsolateral stripe from tip of snout to caudal peduncle (vs. presence of dorsolateral stripe, except *S. caquetae* and *S. citurensis*) and absence of rostrum (vs. presence of rostrum, except *S. caquetae* and *S. citurensis*). It is distinguished by the number of premaxillary teeth (60-93 vs. 40-56 in *S. aureus*; 38-45 in *Sturisomatichthys* Baudó; 33 in *S. caquetae*; and 54-61 in *S. dariensis*) and dentary teeth (60-93 vs. 28-36 in *Sturisomatichthys* Baudó; 30 in *S. caquetae*; 34-47 in *S. dariensis*; 33-42 in *S. festivus*; 31-46 in *S. frenatus*; 22-44 in *S. leightoni*; 32-44 in *S. panamensis*; and 26-39 in *Sturisomatichthys* San Juan). Moreover, it is distinguished from *S. caquetae* by snout length (58.4-64.7% in HL vs. 56.0% in HL). Is distinguished from *S. citurensis* by a big dark spot occupying almost the entire dorsal, pectoral, pelvic, and anal fin (vs. small spots on rays, never occupying the entire fin, nor entering the membranes), triangular snout (vs. rounded snout), and small more numerous central abdominal plates (vs. small, less numerous central abdominal plates).

Description: Morphometric data in Table 4. Body short and somewhat tall, completely covered by dermal plates with well-developed and numerous hyperthrophied odontodes on sides of head of males (Fig. 15). Dorsal profile of head straight from tip of snout to origin of dorsal fin; concave from that point to caudal-fin origin. Ventral body profile flat. Head and predorsal region broader than remainder of body; postdorsal region narrower towards caudal fin.

Head triangular and short; in males, when sexually mature, the snout appears to be shorter (Fig. 15). Rostrum absent. Orbital rim circular, without notch, dorsolaterally placed on head. Sphenotic with a thin and long lateral expansion. Canal bearing plate broad and well developed, in contact with anterior abdominal plates, anterior to branchiostegal membrane, not reaching rictal barbel. Upper lip covered with small, almost imperceptible plates; lower lip without such plates. Lower lip covered with round small papillae, some almost imperceptible and others well developed. Rictal barbel extremely short, free from lip rim, never reaching anterior border of abdominal plates, nor surpassing posterior border of lower lip. Teeth slender, bifid, 63-98 on premaxilla, 60-93 on dentary; cusps slightly curved. Teeth in lower jaw larger than those in upper jaw.

First two predorsal plates with two low, inconspicuous ridges; third predorsal plate the same width and size than predorsal plates plates. On third predorsal plate an inconspicuous developing of the depth of the body, not as developed as seen in *S. festivus* (Fig. 10). Median plates carinate forming two longitudinal sharp keels; 16-19 coalescent plates, beginning at 13-15 median plates. Six to nine straight lateral abdominal plates, between pectoral and pelvic fin origin, longer than central abdominal plates. Preanal plate bordered anteriorly by three, well developed, and of similar size plates; anterior most plate in contact with the preanal plate at its most posterior tip. Central abdominal plates, between lateral abdominal plates, without a defined arrangement, as small, irregular plates (Fig. 15). Anterior abdominal plates smaller and more numerous than posterior ones.

Posterior margin of dorsal fin straight, unbranched ray longest; dorsal-fin rays i,7. Pectoral-fin i,6, unbranched ray longest, surpassing a little of anterior third of pelvic fin. Pelvic-fin i,5, unbranched ray longest, its tip reaching anterior third of the anal fin. Anal-fin rays i,5; unbranched ray longest. Posterior caudal-fin margin deeply concave, filaments on upper and lower caudal fin rays. On pectoral fin, unbranched ray shows a short but noticeable prolongation, not as long filament, but which can modify the totally extension of the fin.

Coloration in alcohol: Ground color of dorsum and head dark brown or grey; pale brown or yellow ventrally. Dorsolateral stripe absent. Anterior portion of body darker, not as stripe, but as a continuous spot from tip of the snout until two or three plates posterior to dorsal fin origin (Fig. 15). A dark band on dorsal fin, along first two branched rays. When dorsal fin band present, there are one to several white ocelli on the distal tip, and just anterior to the middle of the fin (Fig. 15). Dark, big spots from base but not reaching distal tips on membranes and rays of pectoral- and pelvic-fins, its longitude decreases from the first to the last ray on each fin, similar but not as conspicuous as seen in *S. frenatus.* Well-developed and dark spots along unbranched ray of all fins. Caudal fin with dark spot at the base (Fig. 15). Dark brown bands on edges of caudal lobes, absent.

Sexual dimorphism: The specimens examined show a well-developed sexual dimorphism consisting of short and numerous odontodes on the sides of the head, on males (Fig. 15).

Distribution: *Sturisomatichthys tamanae* occurs in the Atrato, San Juan, and Baudó rivers, in the Pacific slope of Colombia (Fig. 3).

Remarks: As shown by Regan (1912) in the original description of *S. tamanae,* males of this species show a marked sexual dimorphism (Fig. 15). Related to this characteristic, males appear to have a shorter and broader snout and head (Fig. 15; Regan, 1912: fig. 1a and 1b) when compared to females. In addition, as seen here on non-type material, and pointed out in the original description, *S. tamanae* lack dorsolateral stripe characteristic of most *Sturisomatichthys* species. That characteristic is shared with *S. caquetae* and *S. citurensis*, and with the latter, higher counts of teeth on both premaxilla (63-98 and 61-124) and dentary (60-93 and 63-100), both species appearing as sister to each other (Chapter 1). Nevertheless, *S. tamanae* presents the following autapomorphies that differentiates it from *S. citurensis* (see also Diagnosis and Identification key): cup-shaped portion of premaxilla relative to cup shaped portion of dentary smaller (character 52:2); and absence of dorsal-fin spinelet (character 132:1).

Contrary to *S. leightoni*, Regan (1913) did assume the synonymy of *Oxyloricaria* and *Sturisoma* proposed by Eigenmann (1910) and referred to *Sturisoma tamanae* as present in the San Juan River, as did Eigenmann (1920b, 1922), Fowler (1942), and Ferraris (2003, 2007); a record that is corroborated here. On the other hand, Maldonado-Ocampo et al. (2008, 2013), additionally to reporting the species to be distributed at the San Juan River, suggested that it occurs in the Magdalena-Cauca basin, which is not corroborated here. The material included by Maldonado-Ocampo et al. (2013) was not examined, and could not be attributed to neither *S. tamanae* nor to *Sturisomatichthys* San Juan (see also Remarks on *Sturisomatichthys* San Juan). Maldonado-Ocampo et al. (2006, 2013) listed the species as present in the Atrato and Baudó Rivers, which is confirmed here. Thus, we conclude that *S. tamanae* is distributed on both the Pacific and Caribbean versants of Colombia (Fig. 3).

Isbrücker (1979) assigned as the lectotype for *S. tamanae* a specimen of 177mm SL, indicating that it could be a female. That specimen was examined and confirmed as a female when compared to the male paralectotype. In fact, the author shows three figures of the species (see fig. 5, 6, and 7 in Isbrücker, 1979) where the sexual dimorphism of males is shown in detail, corroborating the gender of the lectotype.

Material examined: ANSP 198426. 1alc. Colombia, Chocó department, San Juan River basin, O. Lucanus, 2015. BMNH 1910.7.11.133, 177.0mm SL, lectotype. Colombia, Chocó department, Tamana River, San Juan River system, Rosenberg, 1910. BMNH 1910.7.11.134, 203.1mm SL, paralectotype. Same data as lectotype. CAS 67414. 2 of 15alc, 1c&s. Colombia, Chocó department, Istmina municipality, San Juan River basin, A.W. Henn &C. Wilson, 1913. CAS 77238. 6alc. Colombia, Chocó department, Puerto Negria and Istmina municipalities, C.H. Eigenmann, 14-20/03/1912. CIUA 4628. 1alc. Colombia, Antioquia department, Vigía del Fuerte municipality, Buchadó path, Atrato River basin. 06°25’32’’N 76°45’48’’W. A. Loaiza et al. 12/03/2016. CIUA 4788. 6alc. Colombia, Antioquia department, Murindó municipality, Atrato River basin, Campo Alegre path. 06°51’29’’N 76°49’09’’W. A. Loaiza et al. 16/07/2015. FMNH 55120. 4 of 8alc. Colombia, Puerto Negria, C.H. Eigenmann, 1912. FMNH 58332. 1alc. Colombia. C.E. Wilson, 1913. FMNH 59507. 2alc. Colombia. C.H. Eigenmann, 1912. USNM 167894. 1alc. Colombia, Chocó department, Istmina municipality, San Juan River, C.H. Eigenmann. ZMA 115.842 1alc. Colombia, Chocó department, San Juan River at Condoto. 1913.

Sturisomatichthys Baudó n. sp.

Fig. 16.

Table 5.

Holotype: MPUJ XXXX (ex NRM 15155), 199.0mm SL. Colombia, Chocó department, Baudó River drainage, Boca de Pepé, various tributaries and river close to village, -8°59'4''N 77°3'W, S.O. Kullander & M.C. Silvergrip, 12/02/1989.

Paratypes: NRM 15155. 12alc, 1c&s, 129.4-179.7mm SL, paratypes. Same data as holotype.

Diagnosis: *Sturisomatichthys* Baudó is distinguished from *S. caquetae*, *S. citurensis* and *S. tamanae* by possessing a rostrum (vs. rostrum absent) and dorsolateral stripe from tip of snout to caudal peduncle (vs. dorsolateral stripe absent). By the cleithral width 8.3-9.6% in SL (vs. 10.5-12.8% in SL in *S. aureus*; 9.9-10.5% in SL in *S. dariensis*; 10.3-11.7% in SL in *S. festivus*; and 11.0-14.1% in SL in *S. leightoni*). By the number of premaxillary, 38-45 (vs. 47-69 in *S. aureus*; 54-61 in *S. dariensis*) and dentary teeth, 28-36 (vs. 40-56 in *S. aureus*). From *S. festivus*, it is distinguished by the absence of filaments on dorsal, pectoral, pelvic and anal fins (vs. filaments present). From *S. frenatus* by the absence of dark spots on pelvic-, and anal-fin (vs. presence). From *S. leightoni* by continuous, well-marked and broad dorsolateral stripe (vs. discontinuous and thin dorsolateral stripe), and presence of large dark spot on pectoral fin, occupying almost the entire fin (vs. spot absent). It is distinguished from *S. panamensis* by more numerous and bigger central abdominal plates (vs. fewer and smaller central abdominal plates). Moreover, from *Sturisomatichthys* San Juan is distinguished by the absence of light brown spots, which do not occupy the entire pelvic and anal fin (vs. presence of large light spots on both fins), and absence of dark reticulations on the predorsal, supraoccipital, and interorbital region (vs. presence of dark reticulations).

Description: Morphometric data in Table 5. Body long, slender and somewhat depressed, completely covered by dermal plates with short, scarce, developed hyperthrophied odontodes on sides of the head of males (Fig. 16). Dorsal profile of head slightly concave from tip of snout to anterior border of supraoccipital; straight from that point to origin of dorsal fin. Concave posterior of dorsal fin to caudal-fin origin. Ventral body profile flat. Postdorsal region narrower towards caudal fin.

Head triangular and long in dorsal and ventral view. Rostrum narrow, slender. Ventral border of rostrum flat. Orbital rim circular, without notch, dorsolaterally placed on head. Sphenotic without lateral expansion. Canal bearing plate broad and well developed, in contact with anterior abdominal plates, anterior to branchiostegal membrane, not reaching rictal barbel. Upper lip covered with small, almost imperceptible plates; lower lip without such plates. Lower lip covered with round, small papillae, increasing in size toward anterior border of lower lip. Rictal barbel short, free from lip rim, never reaching anterior border of abdominal plates, nor surpassing posterior border of lower lip. Teeth slender, bifid, 38-45 on premaxilla, 28-36 on dentary; cusps slightly curved. Teeth in lower jaw somewhat larger than those in upper jaw.

Predorsal plates with low ridges, more pronounced on sexually dimorphic males; nuchal plate at least twice as broad than pre-dorsal plates. Lateral plates carinate forming two longitudinal smooth keels, strong on dimorphic males, more developed on caudal peduncle; 15-18 coalescent plates, beginning at 14-16 median plates. Seven to eight lateral abdominal plates, angled, between pectoral and pelvic-fin origin, larger than central abdominal plates. Preanal plate bordered anteriorly by three, well developed plates; anterior most plate always in contact with preanal plate, and bigger than other two plates. Central abdominal plates, between lateral abdominal plates, not arranged in rows; anterior abdominal plates more numerous than posterior ones, and the most anterior ones longer than the rest (Fig. 16)

Posterior margin of dorsal fin straight, unbranched ray longest; dorsal-fin rays i,7. Pectoral-fin i,6, unbranched ray longest, reaching anterior third of pelvic fin. Pelvic-fin i,5, unbranched ray longest, its tip surpassing a third of anal-fin. Anal-fin rays i,5; unbranched ray longer. Posterior caudal-fin margin deeply concave, with filaments on lower unbranched ray. Unbranched ray on dorsal, pectoral, pelvic and anal fins show a short prolongation, not as long as the filaments present on the caudal fin.

Coloration in alcohol: Ground color of dorsum and head pale or dark brown; yellow ventrally. Ill-defined dorsolateral stripe on both sides of body. Stripe broader at anterior border of the first predorsal plate, until origin of dorsal fin, it becomes less conspicuous and thin towards caudal peduncle (Fig. 16). On dorsal portion of head, several thin, brown, sinuous lines between dorsolateral stripe on snout to anterior border of first predorsal plate (Fig. 16). A remnant of the dark color of the stripe can be present on ventral side of the rostrum, not separated as observed on both sides of the body, but as a consistent dark blotch (Fig. 16). Small spots on rays of dorsal, pectoral, pelvic and anal fins. Dorsal- and pectoral-fin with a dark brown stripe along the first two branched rays, and with conspicuous dark spots along the unbranched ray. Caudal fin with dark bands along first two or three branched rays, both upper and lower, and connected at the base of the fin forming a V-shaped pattern. Dark brown spots on edges of caudal lobes.

Sexual dimorphism: The specimens examined show a subtle dimorphism on the sides of the head, consisting of scarce and short hyperthrophied odontodes on males (Fig. 16).

Distribution: *Sturisomatichthys* Baudó n.sp. is known from the Baudó River basin, Pacific versant, in Colombia (Fig. 1).

Remarks: *Sturisomatichthys* Baudó is sympatric with *S. aureus* and *S. tamanae* in the Baudó River, in Colombia. The presence of dorsolateral longitudinal stripe in *Sturisomatichthys* Baudó, along with several other characters, distinguish the species from *S. tamanae* (see Diagnosis and below). Regarding *S. aureus,* Steindachner (1900, 1902) did not describe any coloration pattern in his original description. In fact, the drawing presented by Steindachner (1902, Figs. 1 and 1a) show no evidence of the dorsolateral stripe characteristic of some *Sturisomatichthys* species. This could be due to the poor preservation of color in the specimens collected in 1898 (see Remarks on *S. aureus*). Nevertheless, and as it was shown above, the species possess such dorsolateral stripe.

Sturisomatichthys **San Juan n. sp.**

Fig. 17.

Table 5.

Holotype: IAvH-P XXXX (ex CAS 77225), 190.3mm SL. Colombia, Chocó department, San Juan River, Condoto River, an upper Eastern tributary of San Juan River. C. Wilson, 1913.

Paratypes: CAS XXXX (ex CAS 67414). 5alc, 1c&s, 114.7-165.7mm SL. Colombia, Chocó department, Istmina municipality, San Juan River basin. A.W. Henn & C. Wilson, 1913. CAS 77224. 1alc, 145.2mm SL. Colombia, Chocó department, San Juan River, Tado district, Tado River emptying into San Juan River, elevation 316 feet, C. Wilson, 1913. CAS 77225. 2alc, 131.0 and 145.1mm SL. Same data as holotype. CAS 77226. 8alc, 142.8-194.0mm SL. Colombia, Puerto Negria and Istmina municipalities, C.H. Eigenmann, 14-20/03/1912. FMNH 58333. 3alc, 144.6-175.8mm SL. Colombia, Chocó department, Condoto municipality, San Juan River basin, Latitude 5.09449 Longitude -76.6505, C.E. Wilson, 1913. NRM 10683. 1 of 2alc, 185.9mm SL. Colombia, Chocó department, San Juan River, headwaters, G. Gerring, 1939.

Diagnosis: *Sturisomatichthys* San Juan can be diagnosed from *S. caquetae, S. citurensis* and *S. tamanae* by presence of dorsolateral stripe (vs. dorsolateral stripe absent) and presence of a rostrum (vs. rostrum absent). By its cleithral width (7.7-9.2% in SL vs. 10.5-12.8% in SL in *S. aureus*; 9.9-10.5% in SL in *S. dariensis*; 10.3-11.7% in SL in *S. festivus*; 11.0-14.1% in SL in *S. leightoni*). Head width (48.1-57.5% in HL vs. 60.4-79.6% in HL in *S. aureus*; 65.3-73.7% in HL in *S. festivus*; 58.4-75.0% in HL in *S. leightoni*). From *Sturisomatichthys* Baudó and *S. panamensis* by the presence of dark reticulations on the predorsal, supraoccipital, and interorbital region (vs. absence of dark reticulations). Furthermore, it is distinguished from *Sturisomatichthys* Baudó by the presence of light brown spots, which do not occupy the entire pelvic and anal fin (vs. absence of large spots on both fins). From *S. leightoni* is distinguished by the number of coalescent plates (16-19 vs. 13-16), a shorter caudal peduncle depth (1.1-1.3% in SL vs. 1.3-2.1% in SL), continuous dorsolateral stripe (vs. discontinuous dorsolateral stripe) and light spots occupying almost the entire pectoral and pelvic fins (vs. absence of light spots on such fins). From *S. frenatus* is distinguished by presence of light brown spots, which do not occupy the entire dorsal, pectoral, pelvic and anal fin (presence of a dark spot occupying the entire upper mentioned fins). From *S. aureus* it is distinguished by the absence of a transverse bar at the dorsal-fin origin united to the dorsolateral stripe (vs. presence of transverse bar united to dorsolateral stripe) and number of dentary teeth (40-56 vs. 26-39). From *S. festivus,* it is distinguished by the absence of filaments on dorsal, pectoral, pelvic and anal fins (vs. filaments present).

Description: Morphometric data in Table 5. Body long, slender and depressed, completely covered by dermal plates with small hyperthrophied odontodes on sides of the head of males (Fig. 17). Dorsal profile of head slightly concave from tip of snout to anterior border of supraoccipital; straight from that point to origin of dorsal fin. Concave posterior of dorsal fin to caudal-fin origin. Ventral body profile flat. Postdorsal region narrower towards caudal fin.

Head triangular and long. Rostrum present, slender. Ventral border of rostrum flat. Orbital rim circular, without notch, dorsolaterally placed on head. Sphenotic without lateral expansion. Canal bearing plate broad and well developed, in contact with anterior abdominal plates, anterior to branchiostegal membrane, not reaching rictal barbel. Upper lip covered with small, almost imperceptible plates; lower lip without such plates. Lower lip covered with round, small papillae, increasing in size toward anterior border of lower lip. Rictal barbel short, free from lip rim, never reaching anterior border of abdominal plates, nor surpassing posterior border of lower lip. Teeth slender, bifid, 30-55 on premaxilla, 26-39 on dentary; cusps slightly curved. Teeth in lower jaw larger than those in upper jaw.

First two predorsal plates without ridges; nuchal plate at least twice as broad than predorsal plates. Third predorsal plate without noticeable developing in height. Lateral plates carinate forming two longitudinal ill-developed keels; 16-19 coalescent plates, beginning at 14-16 median plates. Six to nine lateral-abdominal plates, angled, between pectoral and pelvic-fin origin, larger than central abdominal plates. Preanal plate bordered anteriorly by three, well-developed plates; anterior most plate could not be in contact with the preanal plate, and is bigger than the other two plates. Central abdominal plates, between lateral abdominal plates, without arrangement; anterior abdominal plates more numerous than posterior ones, and the most anterior ones are longer than the rest (Fig. 17).

Posterior margin of dorsal fin straight, unbranched and first branched rays longest; dorsal-fin rays i,7. Pectoral-fin i,6, unbranched ray longest, surpassing anterior third of pelvic fin. Pelvic-fin i,5, unbranched ray longest, its tip surpassing anterior third of anal-fin. Anal-fin rays i,5; unbranched and first branched rays longest. Posterior caudal-fin margin deeply concave, with filaments on both upper and lower unbranched rays. Unbranched ray on dorsal, pectoral, pelvic and anal fins show a short prolongation, not as long as the filaments present on caudal fin.

Coloration in alcohol: Ground color of dorsum and head pale or dark brown; yellow ventrally. Dorsolateral stripe on both sides of body. Stripe broader at anterior border of the first predorsal plate, until origin of dorsal fin (Fig. 17), it becomes less conspicuous and thin towards caudal peduncle. A remnant of the dark color of the stripe can be present on ventral side of the rostrum, separated as observed on both sides of the body (Fig. 17). Light, big spots on pectoral, pelvic and anal fins. Dorsal fin with dark brown band along first two branched rays, and with conspicuous dark spots along the unbranched ray. Caudal fin with dark bands along first two or three branched rays, both upper and lower, and connected at the base of the fin forming a V-shaped pattern. Dark brown spots on edges of caudal lobes.

Sexual dimorphism: The specimens examined show sexual dimorphism consisting of short hyperthrophied odontodes on the sides of the head of males (Fig. 17).

Distribution: *Sturisomatichthys* San Juan n.sp. occurs in the San Juan River basin, at Condoto and Tado River, in Colombia (Fig. 1).

Remarks: *Sturisomatichthys* San Juan is sympatric with *S. tamanae*. Both species can be easily differentiated externally by the presence of a rostrum on *Sturisomatichthys* San Juan (vs. rostrum absent), as well as for the presence of dorsolateral stripe on the sides of the body (vs. stripe absent) (Figs. 15 and 17). Moreover, the following body proportions are useful for their differentiation: shorter cleithral width (7.7-9.2% in SL vs. 10.9-13.4% in SL), narrower head (48.1-57.5% in HL vs. 74.9-83.5% in HL), and lower lip (24.9-31.9% in HL vs. 34.3-53.9% in HL), and fewer dentary teeth (26-39 vs. 60-93). The following are osteological autapomoprhies found to differentiate *Sturisomatichthys* San Juan: posterior process of autopalatine short, not extending beyond anterior condyle of lateral ethmoid (character 47:1); length of cup-shaped portion of premaxilla relative to cup shaped portion of dentary, similar (character 52:0); posterior border of hyomandibular articulating with compound pterotic, synchondrial only (character 84:0); reduced contribution of compound pterotic to the joint between hyomandibular and cranium (character 85:1); second basibranchial bone elongated (character 99:0); fifth ceratobranchial, trapezoidal (character 104:1); connecting bone not in contact with dorsal pterygiophores (character 130:2); and premaxillary teeth straight (character 194:2).

The new species is only known from the San Juan River basin in Colombia. There is only one report that could be related to additional specimens other than the type series of the species (Maldonado-Ocampo et al., 2013). As pointed out above and below (see Remarks on *S. panamensis* and *S. tamanae*), the authors included material from Colombian museums as belonging to *S. panamensis*. Nevertheless, that material was not examined and could belong either to the new species or to *S. tamanae*. In any case, the distribution of the new species independent from the identity of that material remains restricted to the San Juan basin.

DISCUSSION

Isbrücker & Nijssen (in Isbrücker, 1979) described *Sturisomatichthys* as related to *Sturisoma*, diagnosing the genera by the absence of a rostrum on the former. As seen on

Chapter 1 and the Diagnosis of *Sturisomatichthys* above, that character is not informative. It was observed that the rostrum could be present or absent on some *Sturisoma* and *Sturisomatichthys* species. For instance, *S. caquetae, S. citurensis*, and *S. tamanae* lack an enlarged rostrum, as well as *Sturisoma brevirostre*; the remaining species on both genera do have an enlarged rostrum, which development varies between species.

One character that was not mentioned or analyzed by Isbrücker & Nijssen (in Isbrücker, 1979), is the type of covering of the abdominal plates. *Sturisoma* species have the abdomen totally covered by big, square central abdominal plates, arranged on three vertical well-defined series (Fig. 18A). On the other hand, *Sturisomatichthys* species have the abdomen totally covered by small to medium, irregular, central abdominal plates, which are not arranged in clear series (Fig. 18B). Even on juveniles of species of both genera, those arrangements can be seen. In addition, the anterior abdominal plates of *Sturisomatichthys* are not as enlarged as those in *Sturisoma*. Those plates are generally of similar size as the central abdominal plates on *Sturisomatichthys*, and generally reach the posterior border of the lower lip. On the contrary, *Sturisoma* has more enlarged anterior abdominal plates, generally not reaching the posterior border of the lower lip, and with a small naked area on the cleithrum (Fig. 18).

Originally, *Sturisomatichthys* was composed by three Trans-Andean (*S. citurensis*, *S. leightoni* and *S. tamanae*), and one Cis-Andean species (*Sturisomatichthys caquetae*). Covain et al. (2016) proposed *Sturisomatichthys* to be composed only by Trans-Andean species, transferring *S. caquetae* to *Sturisoma.* As discussed on Chapter 1, six species previously included in *Sturisoma* (*S. aureus*, *S. dariensis*, *S. festivus*, *S. frenatus*, *S. kneri*, and *S. panamensis*) are proposed as *Sturisomatichthys* in order to maintain the monophyletic nature of both *Sturisoma* and *Sturisomatichthys* (see Discussion on Chapter 1; Covain et al., 2016), what renders *Sturisomatichthys* strictly Trans-Andean. Nevertheless, as discussed above not only *S. caquetae* is a member of *Sturisomatichthys*, and fully Cis-Andean, but also there are populations of *S. leightoni* present in the Orinoco basin, at Cumaral, Meta, Colombia (Fig. 3), which was already been suggested by Eigenmann (1922). Through the transfer of *S. caquetae* back from *Sturisoma* to *Sturisomatichthys* and the confirmation of the specimens collected by A. Maria and studied by Eigenmann (1922) as *S. leightoni* from the Orinoco basin, *Dasyloricaria* remains as the only strictly Trans-Andean genus in Loricariinae (Covain & Fisch-Muller, 2007; Londoño-Burbano & Reis, 2016).

Ghazzi (2003) carried out a morphological-based phylogenetic analysis of *Sturisoma*. One of the main results discussed by that author is the inclusion of the trans-Andean species previously included in *Sturisoma,* in her proposed new genus called "'Trans' new genus". Ghazzi (2003) included *S. leightoni* in her analysis, and found the species as sister to her new genus. Because of that result, Ghazzi did not include her new species, and Tran-Andean species of *Sturisoma sensu lato* in *Sturisomatichthys* itself, and proposed a new genus. The author diagnosed the new genus by the presence of dorsolateral longitudinal stripe, assuming those as unique for the new genus. As discussed above (see remarks on *S. leightoni*), the type species of *Sturisomatichthys* do present those dorsolateral longitudinal stripe, although, in a somewhat different format than its congeners (Fig. 13). In addition, the same kind of stripe are also present in *Farlowella* and some *Sturisoma* species, rendering that character uninformative for a genus diagnosis. Moreover, and as it was shown in Chapter 1 and the Diagnosis for *Sturisomatichthys*, there are phylogenetically informative synapomorphies to maintain the species proposed by Ghazzi to belong to her new genus (i.e. *S. festivus, S. frenatus* and *S. panamensis*) as part of *Sturisomatichthys.* Therefore, we disagree with the creation of a new genus, but instead, propose the inclusion of the species in *Sturisomatichthys*, corroborating Covain et al. (2016). Ghazzi (2003) also pointed out to the fact that *S. leightoni* lacked a rostrum, which, according to her and the original description of *Sturisomatichthys* (in Isbrücker, 1979), are diagnostic of the genus, and according to Ghazzi, also differentiated *Sturisomatichthys* from her ""Trans" new genus". Nevertheless, as mentioned above, that character is variable between *Sturisoma* and *Sturisomatichthys*, and thus, not useful to diagnose neither of those genera. Two aspects highlighted by Ghazzi (2003) while defining her new genus deserve mention. The first is related to the inclusion of *S. kneri* in *Sturisoma*, and not in her new genus. This taxonomic decision disagree with her diagnosis of the new genus, since *S. kneri* also possesses dorsolateral longitudinal stripe (Ghazzi, 2005), the main character used to diagnose the new genus; the inclusion of *S. kneri* in *Sturisomatichthys* was corroborated on Chapter 1. On the other hand, Ghazzi (2003) discussed that the position of *S. kneri* as part of *Sturisoma* was not fully resolved (see fig. 42 in Ghazzi, 2003), thus reinforcing our hypothesis for the species to belong to *Sturisomatichthys*. The second issue is related to *S. aureus*, as Ghazzi had no access to any material identified as that species. She discusses that because of the absence of the holotype of the species (see Remarks on *S. aureus*) it was impossible to unequivocally identify specimens as *S. aureus*. In any case, Ghazzi (2003) assumed the species to belong to her new genus (here, *Sturisomatichthys*), but considering it as *incertae sedis*. We were able to identify specimens as *S. aureus* after the translation of the only two available descriptions of the species (Steindachner, 1900; 1902), and based on the localities described by the author, and subsequent inclusion of the species on distribution lists (see References for *S. aureus*). The inclusion of *S. aureus* as part of *Sturisomatichthys*, and as sister group of *S. leightoni* is well supported, and several synapomorphies were identified for that clade, demonstrating the species is part of *Sturisomatichthys* (see Chapter 1), and not *incetae sedis* as suggested by Ghazzi (2003).

As described by Schaefer (2011), the collision of the Panama-Choco island arc with the northwestern margin of the South American plate from 12 to 6 Ma was primarily responsible for the uplift of the Eastern Cordillera. The narrow Cauca-Patia graben separates the Western and Central cordilleras, while the broader and elongate Magdalena Valley separates the Central and Eastern cordilleras. To the north and continuing into the Caribbean Sea, the Eastern Cordillera diverges to form the low Serrania de Perijá range to the west and the higher Mérida Andes to the east of Lago Maracaibo. This series of events illustrate the formation of the diverse ecosystems present in northern South America. Due to the orogenic formations, and modifications in the direction of the drainages and separation of most of them, new niches were available for the already existing populations. Furthermore, the barriers generated with the uplifting of the cordilleras, resulted in isolation of those populations, and again, created new opportunities for diversification, which is likely what occurred for the populations of *Sturisomatichthys* species.

The north-south orientation of the cordilleras forms a natural barrier to the prevailing atmospheric circulation patterns, thereby creating major climatic and ecological differentiation and complex variety of ecosystems between cis- and trans-Andean regions

(Schaefer, 2011). This distinction of the ecosystems west and east to the central and western cordilleras, could be of great importance to the biogeographical component observed for *Sturisomatichthys*. Ecological studies involving the genus are in need to support this statement.

Schaefer (2011) stated that the association of the Andean Maracaibo with the Orinoco is greater, rather than with the Magdalena and northern Pacific faunas. This is observed for several species-level phylogenies involving cis-/trans-Andean fish clades which are congruent with the geological pattern of drainage basin evolution associated with the history of Andean orogeny, and agree with the distribution of *Sturisomatichthys* proposed here. Nevertheless, Albert et al. (2006) discussed that the relation between taxa of the Maracaibo is greater with that of the Magdalena. This also applies for *Sturisomatichthys*, since there are several representatives on both basins. As in *Dasyloricaria* (see Londoño-Burbano & Reis, 2016) the species of *Sturisomatichthys* present in drainages of the Maracaibo (*S. festivus* and *S. kneri*) are more closely related to the species present in the Pacific drainages (i.e. *Sturisomatichthys* Baudó, n. sp., *S. frenatus*, and *Sturisomatichthys* San Juan, n. sp.; see Chapter 1). Nevertheless, that same species present in the Maracaibo Lake basin, are not closely related to the ones in the Magdalena-Cauca basin (i.e. *S. aureus* and *S. leightoni*; see Chapter 1). Thus, ecological characteristics, or even distributional ones (e.g. populations of *Sturisomatichthys* already present in that drainages before the uplifting of the cordilleras) could explain the differences between the groups explored by Albert et al. (2006) and the ones proposed here for *Sturisomatichthys*.

The Magdalena and Cauca basins are generally considered as a single drainage. Nevertheless, although the Cauca River is a tributary of the Magdalena River, and consequently is included within the latter basin in most classifications, Schaefer (2011) regarded it as a separate and distinct biogeographic unit because the two hydrosheds are indeed distinct at higher elevations and in their headwater regions, separated by the Cordillera Central. This could explain the absence of *S. aureus* from the Cauca basin. That species is distributed in the lower Magdalena basin, but no records were found on any of the Cauca localities. *Sturisomatichthys aureus* is possibly restricted to lower elevations, characteristic of the lower Magdalena portion, contrary to its sister species, *S. leightoni*.

The latter is present on both the Magdalena and Cauca basins, and this could be related to ecological characteristics of the species, that could be related to the SL of its adult individuals. As discussed above (see Remarks on *S. aureus*) individuals of *S. aureus* can reach to >200mm SL, while *S. leightoni* do not surpass 120mm SL, and thus, allows the latter to explore different, and perhaps, more diverse resources.

According to Rodriguez-Olarte et al. (2011), the Trans-Andean fish fauna has high species richness and endemism, and an ancestral relationship with the Amazon and Orinoco biotas, and for some families and genera represents the northern limit of their distributions, as is the case for *Sturisomatichthys*. The authors continue by estimating that among Pacific drainages, the San Juan has the highest number of species (95 spp., 10 endemic), and in Caribbean drainages those with the most species were the Magdalena (159 spp., 66 endemic), Atrato (120 spp., 19 endemic), and Maracaibo (115 spp., 48 endemic), all located in humid regions. Within *Sturisomatichthys*, that assumption is met, since there are two species present in the San Juan River (one of them, endemic), two in the Magdalena River (one of them, endemic), two in the Atrato, and one in the Maracaibo Basin (endemic).

As noted above, there are similarities among trans-Andean drainages regarding the presence of *Sturisomatichthys* species. There is evidence that before the uplift of the Darien mountain range, the Atrato River emptied into the Tuyra Gulf on the Pacific slope of Panama (Rodriguez-Olarte et al., 2011). This is suggested by the large size of the Tuyra River delta, which is disproportionate for a river of its size. This also would explain the high proportion of species shared between the Atrato and the Pacific drainages (Rodriguez-Olarte et al., 2011). This is the case for *S. citurensis* and *S. panamensis*, which are present on both the Atrato and the Tuyra Rivers. A relation regarding ichthyofaunal similarities between those basins, specific of the Loricariinae, is also the case for *Dasyloricaria*, in which *D. latiura* (Eigenmann & Vance, 1912) is present in both drainages (Londoño-Burbano & Reis, 2016). Nevertheless, Rodriguez-Olarte et al. (2011) also commented that the fish fauna of the Tuyra province has a low similarity with that of the Atrato, suggesting rapid speciation and/or extinction associated with the orogeny of the mountains separating these basins. This is not the case for *Sturisomatichthys*, although we agree that a rapid speciation could be occurring on both Rivers, especially the Tuyra River, suggested as a refuge from the diversity point of view. There are three *Sturisomatichthys* species present in that River, *S. citurensis*, *S. dariensis*, and *S. panamensis*. This is a single example of the great diversity housed in that drainage, due to a possible unique internal structure and conditions that resulted from the orogenic history of the Pacific of Panama, which led to the current geographical composition of that area. In addition, as pointed out by Rodriguez-Olarte et al. (2011), a few other possible refugia can be detected, such as the Atrato of northern Colombia, where precipitation is among the highest recorded for the world and produces the highest discharge of water for all rivers. A similar situation exists in the watersheds of the nearby Darién region of Panama; this supports the idea that the unique pattern of this area plays a key role in such great diversity in such a small region.

Identification key for the species of *Sturisomatichthys*

1. Absence of enlarged rostrum; absence of dorsolateral stripe on sides of body; numerous, small and irregularly arranged central abdominal plates; absence of stripe along first two or three rays of dorsal fin……………………………………………………………………….2

1’ Presence of enlarged rostrum; presence of dorsolateral stripe on sides of body; few, big and roughly arranged in longitudinal series central abdominal plates; presence of stripe along first two or three rays of dorsal fin……………………………………….…..….4

2. Absence of transverse bars along dorsum; more than 60 premaxillary teeth; more than 60 dentary teeth; snout 56.4-66.7% of HL……………….……………………………………..3

2’ Presence of transverse bars along dorsum; less than 34 premaxillary teeth: less than 31 dentary teeth; snout 56.0% of HL……………………………….*Sturisomatichthys caquetae*
(Morelia, Caquetá River, Colombia)

3. Absence of big dark spot occupying almost entire dorsal, pectoral, pelvic, and anal fins; presence of small spots on rays; round snout…..……………….*Sturisomatichthys citurensis*

(Capeti, Tuyra and Bayano River, Panama, and Atrato River basin, Colombia)

3’ Presence of big dark spot occupying almost entire dorsal, pectoral, pelvic, and anal fins; absence of small spots on rays; triangular snout……….........…*Sturisomatichthys tamanae*

(Atrato, San Juan and Baudó River, Pacific slope, Colombia)

4. Absence of a big dark blotch on pectoral-fin, occupying or almost occupying entire fin; presence of small spots restricted to rays and/or membranes on pectoral fin; discontinuous or inconspicuous dorsolateral longitudinal stripe on sides of body.………………………..5

4’ Presence of a big dark blotch on pectoral-fin, occupying or almost occupying entire fin; absence of small spots restricted to rays and/or membranes on pectoral fin; continuous and conspicuous dorsolateral longitudinal stripe on sides of body…………………………….……6

5. Conspicuous and discontinuous dorsolateral stripe on sides of body; narrow transverse bar at origin of dorsal fin, not occupying more than two rows of plates; small central abdominal plates without arrangement in series; interorbital distance 25.4-32.6% in HL…………………………………………………………..*Sturisomatichthys leightoni*

(Magdalena-Cauca and Orinoco basin, Colombia)

5’ Inconspicuous but continuous dorsolateral longitudinal stripe on sides of body; absence of transversal bar at origin of dorsal fin; bigger central abdominal plates, roughly arranged in series; interorbital distance 32.7-36.7% in HL……………………*Sturisomatichthys kneri*

(Maracaibo Lake drainage, Venezuela)

6. Pelvic and anal fins without big brown spots occupying or almost occupying entire fin...7

6’ Pelvic and anal fins with big brown spots, dark or inconspicuous, occupying or almost occupying entire fin……………………………………………………………………….8

7. Enlarged spots on rays of pelvic and anal fins; dorsolateral stripe not extending onto caudal peduncle; long filaments on dorsal, pectoral, pelvic, and anal fins; body depth at dorsal-fin origin 12.0-14.7% in SL; cleithral width 10.3-11.7% in SL; head width 65.3-73.7% in HL; interorbital distance 33.3-40.2% in HL; orbital diameter 11.7-16.0% in HL; lower-lip width 30.9-34.5% in HL……………………………..*Sturisomatichthys festivus*
(Maracaibo Lake drainage, Venezuela, and Catatumbo River, Colombia)

7’ Small, almost imperceptible spots on rays of pelvic and anal fins; dorsolateral stripe extending onto caudal peduncle; absence of long filaments on dorsal, pectoral, pelvic, and anal fins; body depth at dorsal-fin origin 9.6-11.5% in SL; cleithral width vs. 8.3-9.6% in SL; head width 50.2-54.3% in HL; interorbital distance 25.1-31.6% in HL; orbital diameter vs. 9.9-11.3% in HL; lower-lip width 24.6-26.6% in HL……*Sturisomatichthys* Baudó n.sp.
(Baudó River, Pacific slope, Colombia)

8. Pectoral fin with longitudinal band extending to almost all rays; pelvic fin visibly surpassing origin of anal fin, reaching to anterior third of fin or slightly surpassing it; dorsal plates semitrapezoidal…………………………..………………………………………...9

8’ Pectoral fin with longitudinal band restricted to first two to three rays; pelvic fin barely surpassing origin of anal fin, or reaching to anterior third of fin; dorsal plates irregular or rectangular……………………………………………………………………………….10

9. Presence of longitudinal dark stripe on first two or three dorsal-fin rays, reaching their distal tip and extending to base of remaining rays; dorsal-fin length 22.2-27.1% in SL; anal-fin length 17.2-20.5% in SL; premaxillary teeth 36-50…………*Sturisomatichthys frenatus*
(Esmeraldas, San Javier, Salidero, and Durango River, Ecuador, and Patia River, Colombia, Pacific slope)

9’ Presence of longitudinal dark stripe on first two or three dorsal-fin rays, not reaching their distal tip nor extending to base of remaining rays; dorsal-fin length 28.5-30.8% in SL; anal-fin length 20.8-24.0% in SL; premaxillary teeth 54-61….. *Sturisomatichthys dariensis*
(Tuyra and Capeti Rivers, Pacific slope, Panama)

10. Absence of dark bar at dorsal-fin origin; dorsolateral stripe continuous along its entire length; cleithral width 7.7-10.5% in SL……………………………………………………11

10’ Presence of broad, dark bar at dorsal-fin origin, occupying more than two rows of plates, and united to dorsolateral stripe; dorsolateral stripe discontinuous when entering caudal peduncle; cleithral width 10.5-12.8% in SL………………..*Sturisomatichthys aureus*
(Lower and middle Magdalena basin, Baudó, Cesar, Sinú, San Jorge, and Ranchería River, Colombia)

11. Absence of dark reticulations on predorsal, supraoccipital, and interorbital region; leading ray on pelvic fins produced, longer than other rays; pelvic fin reaching anterior third or a little beyond of anal fin..…………………………...*Sturisomatichthys panamensis*
(Aruza, Capeti, and Tuyra River, Pacific slope, Panama, and Atrato, Sinú, and Truando River, Caribbean slope, Colombia)

11’ Presence of dark reticulations on predorsal, supraoccipital, and interorbital region; leading ray on pelvic fins not produced, same size as other rays; pelvic fin reaching only origin of anal fin..*Sturisomatichthys* San Juan n. sp.
(San Juan River, Pacific slope, Colombia)

TABLE 1. MORPHOMETRICS AND MERISTICS OF *Sturisomatichthys aureus*, *S. caquetae* AND *S. citurensis*. MORPHOMETRIC VALUES AS PERCENTS OF STANDARD LENGTH (SL) AND HEAD LENGTH (HL). SD= STANDARD DEVIATION.

	***S. aureus* n=51**				***S. caquetae***	***S. citurensis* n=102**			
	Min	**Max**	**Mean**	**SD**	**Holotype**	**Min**	**Max**	**Mean**	**SD**
Standard length (mm)	109,3	202.4	138		90.0	95.2	225.4	174.2	
Head length	16.7	22.5	20.9	1.3	22.2	16.8	21.1	18.8	0.8
Predorsal lenght	26.2	33.2	30.9	1.6	32.7	29.4	33.8	31.5	0.9
Abdominal length	11.0	13.9	12.2	0.7	14.4	13.8	18.0	15.8	0.7
Trunk length	11.2	17.4	14.5	1.3	14.4	13.2	17.5	15.4	0.7
Dorsal-fin length	22.1	31.0	27.7	2.1	-	18.8	28.5	23.8	1.9
Pectoral-fin length	17.6	23.5	20.8	1.6	-	16.5	21.5	19.5	1.1
Pelvic-fin length	13.6	22.3	16.7	1.3	15.9	15.1	20.9	17.8	1.2
Anal-fin length	16.7	22.8	20.1	1.4	18.8	16.6	21.3	19.0	1.0
Head depth at supraoccipital tip	8.0	10.5	9.4	0.7	8.4	7.6	10.8	9.0	0.6
Body depth at dorsal-fin origin	9.0	13.1	11.6	1.0	9.8	8.1	12.2	10.7	0.7
Caudal peduncle depth	1.1	2.0	1.5	0.2	1.3	1.1	2.0	1.5	0.1
Cleithral width	10.5	12.8	11.8	0.6	11.2	10.2	14.3	12.0	0.6
Body width at dorsal-fin origin	10.9	13.9	12.5	0.7	13.6	10.9	15.7	13.8	0.8
Body width at anal-fin origin	9.6	12.3	10.7	0.7	10.9	10.1	14.2	12.2	0.8
Body width at caudal-fin origin	1.5	2.8	2.2	0.4	2.4	1.8	2.7	2.2	0.2
Head width	60.4	79.6	64.9	4.5	60.0	70.1	80.4	75.5	2.5
Interorbital distance	23.9	33.2	30.9	1.8	28.0	25.7	35.5	30.9	1.8
Orbital diameter	11.5	17.9	15.0	1.3	13.5	11.8	16.7	14.2	1.1
Snout length	53.4	64.8	61.4	2.0	56.0	56.4	66.7	61.5	2.0
Dentary length	8.7	15.0	11.5	1.3	12.5	11.0	19.0	16.0	1.7
Lower-lip width	27.9	41.9	34.4	2.9	29.5	33.0	43.9	40.3	2.5
Plates on median series	13	16	14		14	13	17	14	
Coalescent plates	14	18	16		14	13	17	15	
Ventrolateral thoracic plates	6	9	7		7	6	11	9	
Premaxillary teeth	47	69	57		33	61	124	107	
Dentary teeth	40	56	42		30	63	100	78	
Dorsal-fin rays	i,7	i,7	i,7		i,7	i,7	i,7	i,7	
Pectoral-fin rays	i,6	i,6	i,6		i,6	i,6	i,6	i,6	
Pelvic-fin rays	i,5	i,5	i,5		i,5	i,5	i,5	i,5	
Anal-fin rays	i,5	i,5	i,5		i,5	i,5	i,5	i,5	
Caudal-fin rays	i,12,i	i,12,i	i,12,i		i,12,i	i,12,i	i,12,i	i,12,i	

TABLE 2. MORPHOMETRICS AND MERISTICS OF *Sturisomatichthys dariensis* AND *S. festivus*. VALUES AS PERCENTS OF STANDARD LENGTH (SL) AND HEAD LENGTH (HL). SD= STANDARD DEVIATION.

	***S. dariensis* n=4**				***S. festivus* n=10**			
	Min	**Max**	**Mean**	**SD**	**Min**	**Max**	**Mean**	**SD**
Standard length (mm)	169.5	209.3	104		115.7	183.8	159.7	
Head length	20.0	20.4	20.2	0.2	18.3	20.4	18.9	0.6
Predorsal lenght	30.1	31.2	30.9	0.5	28.4	31.4	30.2	1.0
Abdominal length	11.8	12.6	12.0	0.3	9.9	11.3	10.7	0.5
Trunk length	12.9	15.4	14.0	1.0	13.4	15.7	14.7	0.8
Dorsal-fin length	28.5	30.8	29.9	1.2	36.5	42.7	40.1	3.1
Pectoral-fin length	20.5	22.3	21.6	0.8	24.6	39.3	32.6	5.4
Pelvic-fin length	15.9	17.9	17.0	0.8	17.5	21.5	19.7	1.1
Anal-fin length	20.8	24.0	22.8	1.5	24.8	33.5	32.1	3.7
Head depth at supraoccipital tip	7.6	9.0	8.2	0.6	8.6	10.3	9.5	0.5
Body depth at dorsal-fin origin	10.1	11.2	10.7	0.5	12.0	14.7	13.2	0.9
Caudal peduncle depth	1.2	1.3	1.3	0.1	1.3	1.7	1.4	0.2
Cleithral width	9.9	10.5	9.9	0.3	10.3	11.7	10.9	0.4
Body width at dorsal-fin origin	10.4	11.8	11.3	0.7	11.1	13.0	12.1	0.5
Body width at anal-fin origin	9.0	10.0	9.8	0.5	10.5	12.5	11.5	0.6
Body width at caudal-fin origin	2.2	2.6	2.4	0.2	2.2	3.1	2.7	0.3
Head width	57.4	62.4	59.2	2.4	65.3	73.7	69.3	2.7
Interorbital distance	26.9	30.3	29.3	1.4	33.3	40.2	37.2	2.4
Orbital diameter	11.5	13.5	11.8	0.9	11.7	16.0	13.6	1.1
Snout length	61.7	63.2	62.5	0.6	60.7	66.4	63.9	1.8
Dentary length	9.1	11.7	10.9	1.1	9.5	14.2	11.1	1.3
Lower-lip width	27.1	28.5	27.6	0.6	30.9	34.5	32.4	1.2
Plates on median series	14	15	15		14	15	15	
Coalescent plates	16	17	17		16	18	17	
Lateral abdominal plates	7	9	7		7	8	7	
Premaxillary teeth	54	61	54		37	55	39	
Dentary teeth	34	47	41		33	42	39	
Dorsal-fin rays	i,7	i,7	i,7		i,7	i,7	i,7	
Pectoral-fin rays	i,6	i,6	i,6		i,6	i,6	i,6	
Pelvic-fin rays	i,5	i,5	i,5		i,5	i,5	i,5	
Anal-fin rays	i,5	i,5	i,5		i,5	i,5	i,5	
Caudal-fin rays	i,12,i	i,12,i	i,12,i		i,12,i	i,12,i	i,12,i	

TABLE 3. MORPHOMETRICS AND MERISTICS OF *Sturisomatichthys frenatus* AND S. *leightoni*. VALUES AS PERCENTS OF STANDARD LENGTH (SL) AND HEAD LENGTH (HL). SD= STANDARD DEVIATION.

	***S. frenatus* n=15**				***S. leightoni* n=63**			
	Min	**Max**	**Mean**	**SD**	**Min**	**Max**	**Mean**	**SD**
Standard length (mm)	163.8	239.7	200.4		47.4	128	98.8	
Head length	19.1	23.1	20.6	0.9	20.1	24.2	22.2	0.9
Predorsal lenght	30.5	32.3	31.3	0.5	30.6	36.9	33.6	1.3
Abdominal length	10.2	12.9	12.2	0.7	12.1	15.0	13.5	0.8
Trunk length	13.8	15.7	15.1	0.6	13.3	18.4	15.8	1.1
Dorsal-fin length	22.2	27.1	24.6	1.4	20.7	27.3	24.4	1.4
Pectoral-fin length	17.4	23.3	19.2	1.3	17.0	22.9	20.2	1.3
Pelvic-fin length	14.4	17.2	15.8	0.7	15.0	19.6	17.0	1.1
Anal-fin length	17.2	20.5	19.5	1.0	15.9	20.2	18.6	1.0
Head depth at supraoccipital tip	8.0	9.3	8.6	0.3	7.0	12.2	10.3	1.0
Body depth at dorsal-fin origin	9.8	12.6	10.7	0.7	9.3	13.9	11.6	1.1
Caudal peduncle depth	1.0	1.7	1.3	0.2	1.3	2.1	1.5	0.2
Cleithral width	8.5	10.5	9.7	0.5	11.0	14.1	12.6	0.7
Body width at dorsal-fin origin	10.7	13.0	11.8	0.7	11.0	16.1	13.0	1.3
Body width at anal-fin origin	9.6	10.7	10.1	0.3	9.3	12.4	11.0	0.7
Body width at caudal-fin origin	1.9	2.5	2.1	0.2	1.6	3.0	2.4	0.3
Head width	48.4	62.3	59.5	3.8	58.4	75.0	68.2	3.2
Interorbital distance	25.8	33.3	30.3	2.0	25.4	32.6	29.9	1.4
Orbital diameter	9.6	13.8	11.6	1.0	10.9	16.6	13.3	1.2
Snout length	55.9	68.0	62.7	3.0	53.5	61.8	58.3	2.0
Dentary length	8.6	11.7	10.7	1.0	7.9	16.4	11.6	1.6
Lower-lip width	25.1	33.6	28.3	2.7	26.2	37.5	33.8	2.6
Plates on median series	14	17	16		13	17	15	
Coalescent plates	16	18	16		13	16	14	
Lateral abdominal plates	7	9	8		5	8	7	
Premaxillary teeth	36	50	41		24	50	30	
Dentary teeth	31	46	35		22	44	29	
Dorsal-fin rays	i,7	i,7	i,7		i,7	i,7	i,7	
Pectoral-fin rays	i,6	i,6	i,6		i,6	i,6	i,6	
Pelvic-fin rays	i,5	i,5	i,5		i,5	i,5	i,5	
Anal-fin rays	i,5	i,5	i,5		i,5	i,5	i,5	
Caudal-fin rays	i,12,i	i,12,i	i,12,i		i,12,i	i,12,i	i,12,i	

TABLE 4. MORPHOMETRICS AND MERISTICS OF *Sturisomatichthys panamensis* AND *S. tamanae*. VALUES AS PERCENTAGES OF STANDARD LENGTH (SL) AND HEAD LENGTH (HL). SD= STANDARD DEVIATION.

	***S. panamensis* n=56**				***S. tamanae* n=27**			
	Min	**Max**	**Mean**	**SD**	**Min**	**Max**	**Mean**	**SD**
Standard length (mm)	102.3	251	191		104	237.4	183.1	
Head length	19.0	21.6	20.3	0.7	16.6	19.7	18.2	0.7
Predorsal lenght	29.1	32.3	30.9	0.7	26.7	30.0	28.5	0.8
Abdominal length	9.3	12.5	11.4	0.7	12.1	14.7	13.5	0.8
Trunk length	12.4	16.2	14.3	0.9	12.2	16.4	13.4	1.0
Dorsal-fin length	26.5	35.0	30.0	2.4	23.3	33.4	26.8	2.6
Pectoral-fin length	19.3	26.1	21.3	1.4	18.8	23.2	21.0	1.3
Pelvic-fin length	14.9	20.1	16.5	1.0	15.4	18.4	16.6	0.8
Anal-fin length	18.0	24.7	22.1	1.6	18.3	22.0	20.7	1.1
Head depth at supraoccipital tip	6.8	9.8	8.6	0.6	7.8	10.3	9.0	0.5
Body depth at dorsal-fin origin	8.0	12.1	10.8	0.8	8.8	13.0	11.2	1.0
Caudal peduncle depth	1.0	1.8	1.3	0.1	1.3	1.7	1.4	0.3
Cleithral width	8.4	10.5	9.5	0.6	10.9	13.4	12.5	0.6
Body width at dorsal-fin origin	9.4	13.0	11.2	1.0	11.1	14.9	13.5	0.9
Body width at anal-fin origin	8.4	11.2	9.8	0.7	9.5	12.5	11.4	0.7
Body width at caudal-fin origin	1.5	2.7	2.2	0.3	1.2	2.4	2.0	0.3
Head width	50.0	63.1	56.8	3.5	74.9	83.5	80.0	2.3
Interorbital distance	25.6	34.1	28.7	1.9	28.4	33.8	30.6	1.2
Orbital diameter	11.1	15.3	12.5	1.1	13.0	17.4	14.9	1.1
Snout length	60.4	66.9	62.7	1.6	58.4	64.7	60.7	1.3
Dentary length	7.5	13.7	10.6	1.2	12.1	16.9	14.5	1.1
Lower-lip width	21.6	30.5	27.9	1.7	34.3	53.9	43.8	4.3
Plates on median series	13	17	15		13	15	14	
Coalescent plates	15	19	17		16	19	17	
Lateral abdominal plates	7	9	8		6	9	8	
Premaxillary teeth	37	53	42		63	98	65	
Dentary teeth	32	44	37		60	93	63	
Dorsal-fin rays	i,7	i,7	i,7		i,7	i,7	i,7	
Pectoral-fin rays	i,6	i,6	i,6		i,6	i,6	i,6	
Pelvic-fin rays	i,5	i,5	i,5		i,5	i,5	i,5	
Anal-fin rays	i,5	i,5	i,5		i,5	i,5	i,5	
Caudal-fin rays	i,12,i	i,12,i	i,12,i		i,12,i	i,12,i	i,12,i	

TABLE 5. MORPHOMETRICS AND MERISTICS OF *Sturisomatichthys* Baudó AND *Sturisomatichthys* San Juan. VALUES AS PERCENTS OF STANDARD LENGTH (SL) AND HEAD LENGTH (HL). SD= STANDARD DEVIATION.

	***Sturisomatichthys* Baudó n=9**				***Sturisomatichthys* San Juan n=20**			
	Min	**Max**	**Mean**	**SD**	**Min**	**Max**	**Mean**	**SD**
Standard length (mm)	129.4	199	159.9		114.7	194	157.9	
Head length	19.9	20.9	20.5	0.3	18.3	20.6	19.4	0.7
Predorsal lenght	29.4	32.3	31.1	0.9	28.3	31.8	29.9	1.0
Abdominal length	10.5	11.9	11.0	0.5	10.7	13.0	11.6	0.6
Trunk length	13.4	15.9	13.9	0.9	12.5	15.1	13.6	0.8
Dorsal-fin length	26.1	30.3	29.3	1.7	26.6	31.1	29.2	1.4
Pectoral-fin length	18.7	21.9	20.1	1.2	17.8	21.7	19.9	1.0
Pelvic-fin length	14.8	17.1	15.6	0.8	14.8	17.6	15.9	0.7
Anal-fin length	16.7	21.7	20.0	1.6	17.7	22.8	20.4	1.2
Head depth at supraoccipital tip	7.6	9.0	8.3	0.5	7.1	9.0	8.0	0.5
Body depth at dorsal-fin origin	9.6	11.5	10.4	0.7	8.7	10.8	10.0	0.6
Caudal peduncle depth	1.1	1.4	1.3	0.1	1.1	1.3	1.2	0.1
Cleithral width	8.3	9.6	9.1	0.4	7.7	9.2	8.5	0.4
Body width at dorsal-fin origin	9.8	12.4	11.0	0.8	9.3	11.3	10.4	0.6
Body width at anal-fin origin	8.3	10.6	9.3	0.7	7.8	9.9	9.1	0.5
Body width at caudal-fin origin	2.0	2.4	2.2	0.1	1.8	2.3	2.1	0.1
Head width	50.2	54.3	52.3	1.4	48.1	57.5	54.1	2.3
Interorbital distance	25.1	31.6	28.4	2.0	27.0	33.1	29.6	1.7
Orbital diameter	9.9	11.3	11.1	0.6	10.0	13.5	11.8	0.9
Snout length	60.4	64.8	63.7	1.3	56.6	64.4	62.9	1.7
Dentary length	7.6	9.8	9.2	0.7	9.1	11.9	10.3	0.8
Lower-lip width	24.6	26.6	25.9	0.7	24.9	31.9	29.4	1.8
Plates on median series	14	16	15		14	16	15	
Coalescent plates	15	18	17		16	19	17	
Lateral abdominal plates	7	8	8		6	9	8	
Premaxillary teeth	38	45	42		30	55	40	
Dentary teeth	28	36	33		26	39	32	
Dorsal-fin rays	i,7	i,7	i,7		i,7	i,7	i,7	
Pectoral-fin rays	i,6	i,6	i,6		i,6	i,6	i,6	
Pelvic-fin rays	i,5	i,5	i,5		i,5	i,5	i,5	
Anal-fin rays	i,5	i,5	i,5		i,5	i,5	i,5	
Caudal-fin rays	i,12,i	i,12,i	i,12,i		i,12,i	i,12,i	i,12,i	

Comparative material examined: ***Aposturisoma myriodon*****:** MHNG 2710.035. 2 of 17alc, 1c&s. Peru, Ucayali department, Ucayali River basin, Huacamayo River, no date information. ***Cteniloricaria napova*****:** MHNG 2704.030. 6alc, paratypes. Suriname, Sipaliwini district, Savannah in trio Amerindian territory at the Suriname-Brazil border, Four Brothers Mountains in a tributary of the Paru de Oeste River, gift of the trio tribe in Sipaliwini, 20-21/10/2007. MPEG 34190. 1alc. Brazil, Pará state, Óbidos municipality, Trombetas River basin, Erepecuru River (also known as Cuminá, or Paru de Oeste), 0°57’S 55°30’W, F. Silva & L. Peixoto, 22/04/2008. ***Cteniloricaria platystoma*****:** AUM 37942. 1alc. Guyana, Essequibo River basin, Region 10 Upper Demerara-Berbice, Essequibo River at Kurukupari, east bank, M.H. Sabaj et al., 17/11/2003. AUM 38822. 4alc. Guyana, Essequibo River basin, Region 9 Upper Takutu and Essequibo River, Kuyuwini River at Kuyuwini Landing, J.W. Armbruster et al., 14/11/2003. AUM 39038. 4alc. Guyana, Essequibo River basin, Region 9 Upper Takutu and Essequibo, Essequibo River at Yukanopito Falls, 44.5km southwest mouth of Kuyuwini River, J.W. Armbruster et al., 09/11/2003. AUM 39055. 11alc. Guyana, Essequibo River basin, Region 9 Upper Takutu and essequibo River, Essequibo River at Kassi-Attae Rapids, 5.5 km SE mouth of Kuyuwini River, J.W. Armbruster et al., 10/11/2003. AUM 44325. 1alc. Guyana, Essquibo River basin, Region 8, Essequibo River, at Kurukapari Falls, upstream from Iwokrama, L.S. de Souza et al., 23/11/2003. AUM 45341. 12alc. Guyana, Essequibo River basin, Region 8 Potaro-Siparuni, Essequibo River, in rapids, L.S. de Souza et al., 05/12/2005. AUM 45352. 11alc. Guyana, Essequibo River basin, Region 8 Potaro-Siparuni, Essequibo River, side channel in rapids, L.S. de Souza et al., 05/12/2005. AUM 48174. 8alc, 1c&s. Guyana, Rupununi-Essequibo River drainage, Region 8 Potaro-Siapruni, Burro Burro River, at Suraima, L.S. de Souza et al., 12/11/2003. ***Farlowella acus*****:** ANSP 130038. 55alc, 1c&s. Venezuela, Carabobo state, Vigirima River tributary of Guacara River, about 10 km NNW of Guacara, on dirt road which joins unpaved road, 10°24'N 67° 55'W, N.R. Foster et al., 30/11/1966. ***Farlowella amazona*****:** MCP 15183. 1alc. Brazil, Pará state, Itaituba municipality, Tapajós River basin, at Piracuna neighborhood, Itaituba, 04°16'00"S 055°59'00"W, C.A.S. Lucena, 11/12/1991. MCP 29737. 1alc. Brazil, Amazonas state, Tefé municipality, Solimoes River basin, Lake Tefé at headwaters of Lake, 03°34'35"S 064°59'19"W, W. Crampton, 29/11/1999. MCP 45943. 2alc, 1c&s. Brazil, Mato Grosso do Sul state, Novo Horizonte do Sul municipality, Upper Paraná River, Guiraí River, tributary of Ivinhema River, between Naviraí and Ivinhema, M. Rocha, 16/12/2010. MCP 45946. 1alc. Brazil, Mato Grosso do Sul state, Angélica municipality, Upper Paraná River basin, creek at dirt road between Angélica and Ipezal, tributary of Ivinhema River, M. Rocha, 17/12/2010. UF 126180. 1alc. Peru, Loreto province, Amazon River basin, Pacaya River at Lake Tomana, 5.2000000°S 74.3000000°W, J. Albert et al., 21/09/2002. UFRGS 15494. 2alc. Brazil, Mato Grosso state, Amazon River basin, Araguaia River, Porto Alegre do Norte municipality, small stream 9.6km from Porto do Luiz at road, 11°15'42"S 51°36'18"W, V.R. Lampert & S.L. Schrerer, 05/07/2011. ***Farlowella curtirostra*****:** UF 30767. 4alc. Venezuela, Tachira state, Lake Maracaibo basin, Orope River at bridge between La Fria & La Honda, at km marker 817, 3645970°N 72.3109860°W, D.C. Taphorn et al., 15/03/1981. UF 30778. 4alc. Venezuela, Merida state, Lake Maracaibo basin, Chama River just north of El Vigia on the road to Merida, 6114210°N 71.6321880°W, D.C. Taphorn et al., 15/03/1981. USNM 121081. 3alc, 1c&s. Venezuela, Trujillo state, Lake Maracaibo basin, Motatan River system at San Pedro River, L.P. Schultz, 20/03/1942.

Farlowella hahni*:** MCP 10982. 3alc. Argentina, Santa Fé province, Santa Fé municipality, Lower Parana basin, 31°35'00"S 060°41'00"W, S. Martinez & G.M. Achenbach, 15/03/1976. MCP 16461. 1alc, 1c&s. Argentina, Santa Fé state, Santa Fé municipality, Parana River basin, GMA, no date information. ***Farlowella hasemani*:** MCP 28864. 1alc. Brazil, Acre state, Rio Branco municipality, Purus River basin, stream at BR-364 highway, between Rio Brando and Porto Velho municipalities, ntext to Rio Branco, tributary of Acre River, 10°00'48"S 067°41'44"W, E. Pereira & P. Lucinda, 06/08/2001. MCP 28938. 1alc. Brazil, Acre state, Sena Madureira municipality, Purus river basin, Cassipin Creek, at BR-364 highway, 38km southwest from Sena Madureira, tributary of Antimari River, 09°16'42"S 068°29'44"W, L.R. Malabarba et al., 08/08/2001. MCP 35515. 1alc. Brazil, Acre state, Rio Branco municipality, Purus River state, Rola Creek, left margin of Acre River, 10°02'50"S 068°18'39"W, L. Juno et al., 22/06/2003. MCP 36605. 3alc. Brazil, Rondônia state, Nova Mamoré municipality, Madeira River basin, Piriquita Creek at BR-425 highway between BR-364 highway and Guajará-Mirim, about 48km from BR-364 highway, 10°06'34"S 065°17'25"W, A. Cardoso et al., 25/07/2004. MCP 36606. 3alc. Brazil, Acre state, Sena Madureira municipality, Purus River basin, creek tributary of Coatis River, between Sena Madureira and Coatis River, at BR-364 highway, 09°12'11"S 068°32'30"W, R.E. Reis et al., 21/07/2004. MCP 36609. 2alc. Brazil, Acre state, Sena Madureira municipality, Purus River basin, Antimari River, between Rio Branco and Sena Madureira, at BR-364 highway, 09°29'27"S 068°21'29"W, R.E. Reis et al., 20/07/2004. MCP 36611. 1alc. Brazil, Mato Grosso state, Lacerda municipality, Madeira River basin, Papagaio River, about 119km north of Guaporé River, at BR-174 highway, 14°18'36"S 059°40'02"W, R.E. Reis et al., 12/07/2004. MCP 36612. 6alc. Brazil, Acre state, Xapuri municipality, Madeira River basin, Iná River, tributary of Xipamanu River, at Uberaba farm about 6km from BR-317 highway, 10°44'13"S 068°11'16"W, R.E. Reis et al., 22/07/2004. MCP 36618. 5alc. Brazil, Rondônia state, Jaci Paraná municipality, Madeira River basin, creek without name tributary of Madeira River, at BR-364 highway about 51km southwest from Jaci Paraná, 09°28'41"S 064°46'23"W, F. Langeani et al., 19/07/2004. MCP 36624. 1alc. Brazil, Amazonas state, Humaitá municipality, Madeira River basin, Vinte e Dois Creek, Recanto do Sanari, about 20km from Humaitá, 07°35'36"S 063°10'27"W, P. Buckup et al., 27/07/2004. MCP 36626. 5alc, 1c&s. Brazil, Acre state, Brasiléia municipality, Purus River basin, Entrocamento Creek, about 5km east from Brasiléia, at BR-317 highway, 11°01'40"S 068°41'46"W, R.E. Reis et al., 23/07/2004. MCP 36627. 1alc. Brazil, Acre state, Xapuri municipality, Purus River basin, creek tributary of Acre River, about 5km from BR-317 highway, 10°39'47"S 068°22'17"W, A. Cardoso et al., 22/07/2004. ***Farlowella henriquei*:** MCP 41983. 4alc. Brazil, Goiás state, Montes Claros de Goiás municipality, Tocantins River basin, Varginha Creek, at tributaries of Claro River basin, tributary of Araguaia River, 15°57'52"S 051°18'40"W, G.A. Pereira, 05/06/2007. MCP 41991. 2alc. Brazil, Goiás state, Montes Claros de Goiás municipality, Tocantins River basin, Água da Pedra Creek, at tributaries of Claro River basin, tributary of Araguaia River, 16°00'44"S 051°22'28"W, G.A. Pereira, 05/06/2007. MCP 41992. 3alc, 1c&s. Brazil, Goiás state, Montes Claros de Goiás municipality, Tocantins River basin, Água Limpa Creek, at tributaries of Claro River basin, tributary of Araguaia River, 15°57'52"S 051°18'40"W, G.A. Pereira, 27/02/2007. ***Farlowella isbruckeri*:** MCP 36601. 2alc, 1c&s. Brazil, Mato Grosso state, Nova Lacerda municipality, Madeira River basin, Retiro Creek, tributary of Guaporé River, at BR-174 highway, 14°48'07"S 059°19'24"W, V. Bertaco et al., 12/07/2004. ***Farlowella jauruensis**:** MCP 36625. 2alc, 1c&s. Brazil, Rondônia state, Ji-Paraná municipality, Madeira River basin, small tributary of right margin of Machado River, about 8km South of bridge on BR-364 highway at Ji-Paraná, 10°57'08"S 061°55'15"W, P. Buckup et al., 15/07/2004. MCP 36588. 2alc. Brazil, Mato Grosso state, Mirassol d`Oeste municipality, Paraguay River basin, small river tributary of Caeté River, tributary of Jauru River at BR-174 highway about 72km northwest from Paraguay River, 15°49'34"S 058°11'45"W, R.E. Reis et al., 11/07/2004. ***Farlowella knerii*****:** FMNH 99143. 6alc, 1c&s. Ecuador, Napo province, Amazon River basin, Capihuara Creek, tributary of Payamino River, Latitude -0.5 Longitude -77.2417, D.J. Stewart, 13/11/1983. ANSP 130436. 1alc. Ecuador, Napo province, Amazon River basin, Conejo River at Santa Cecilia, 0°6'N 76°51'W, W.G. Saul & J.D. Lynch, 24/06/1974. ***Farlowella mariaelenae*****:** ANSP 128623. 16alc. Colombia, Meta department, Villavicencio municipality, Orinoco River basin, Negro River just downstream from main Villavicencio-Puerto Lopez highway at La Balsa, east side of river, Humea-Meta drainage, 4°4'N 73°4'W, J.E. Bohlke et al., 01/03/1972. UF 26129. 11alc. Colombia, Meta department, Puerto Gaitan municipality, Orinoco River basin, Manacacias River at Puerto Gaitan, 4.3121020°N 72.0754570°W, H. Boschung et al., 07/01/1973. UF 33642. 4alc. Colombia, Meta department, Orinoco River basin, Guejor River at village of Ballastrata 2.5 km southwest of Vistahermosa, 3.1047440°N 73.7732640°W, H. Boschung et al., 10/01/1973. UF 80348. 3alc. Venezuela, Portuguesa state, Orinoco River basin, Guanare River on Las Garcitas, near Laguna Chiriguare, 8.5555556°N 68.6666667°W, D.C. Taphorn et al., 03/04/1984. USNM 349392. 11alc, 1c&s. Venezuela, Portuguesa state, Guanare municipality, Orinoco River basin, Portuguesa River, just Upstream of highway 5, 11km northwest of Guanare, J.W. Arbruster & O. Leon, 28/02/1998. ***Farlowella nattereri*****:** AUM 27707. 2alc. Venezuela, Portuguesa state, Apure-Orinoco River system, Portuguesa River, just upstream of hwy 5, 11 km WNW of Guanare, J.W. Armbruster & O. León, 25/02/1998. MCP 29715. 1alc, 1c&s. Brazil, Amazonas state, Alvarães municipality, Solimões River basin at Içé island, 03°16'00"S 064°41'00"W, W. Crampton, 03/09/1999. MCP 29718. 1alc. Brazil, Amazonas state, Alvarães municipality, Solimões River system, Caborini beach across Caborini community, opposite to mouth of Lake Mamirauá, at confluence of Solimões-Japurá Rivers, 03°09'08"S 064°47'01"W, W. Crampton, 10/02/2001. MCP 36599. 1alc. Brazil, Mato Grosso state, Nova Lacerda municipality, Madeira River basin, Galera River, tributary of Guaporé River, at Galera balneary, 14°28'59"S 059°35'07"W, V. Bertaco et al., 12/07/2004. MCP 36600. 1alc. Brazil, Mato Grosso state, Nova Lacerda municipality, Madeira River basin, Papagaio River about 119km north of Guaporé River, at BR-174 highway, 14°18'36"S 059°40'02"W, R.E. Reis et al., 12/07/2004. USNM 319342. 3alc. Peru, Madre de Dios Region, Manu Province, Amazon River basin, Madre de Dios River, Manu National Park, at Pakitza guard post, Pachija Stream upstream from the Mouth, H. Ortega, 11/05/1991. ***Farlowella oxyrryncha*****:** MCP 22489. 3alc. Brazil, Pará state, São Domingos do Capim municipality, Amazonas River basin, São Joaquim Creek at road between São Domingos do Capim and BR-10 highway Belém-Brasília, tributary of Guamá River, 01°45'22"S 047°40'57"W, R.E. Reis et al., 21/07/1998. MCP 44240. 6alc, 1c&s. Peru, Ucayali province, Pucallpa district, Ucayali River basin, Cashibo channel, Yarinacocha, 08°16'52"S 074°37'50"W, T.P. Carvalho et al., 28/07/2009. ***Farlowella paraguayensis*****:** FMNH 108585. 11alc, 1c&s. Brazil, Mato Grosso state, Corguinho municipality, lagoon next to Chacara da Portela Creek, Latitude -19.8111 Longitude -

54.8442, N. Menezes et al., 26/08/1998. ***Farlowella platorynchus*:** FMNH 111528. 1alc, 1c&s. Peru, Loreto province, Amazon River basin, Yanayacu River, about 6-7km above mouth in Rio Amazonas, Latitude -4.3333 Longitude -73.25, B. Chernoff et al., 29/08/1988. MCP 22493. 1alc. Brazil, Pará state, Santa Luzia do Pará municipality, Norte River basin, river tributary of Peritoró River, at road Pará/ Maranhão (BR-316 highway), tributary of Piriá River, 01°35'24"S 046°50'24"W, R.E. Reis et al., 23/07/1998. MCP 29677. 1alc. Brazil, Amazonas state, Alvarães municipality, Solimões River basin at Prego island, opposite to downtown Alvarães, 03°12'38"S 064°47'23"W, W. Crampton, 18/09/1999. MHNG 2550.012. 2 of 4alc. Brazil, Pará state, Amazonas River basin, Guama River at about 20km downstream from Ourém, R. Stawikowski, 22/09/1990. UF 33089, paratypes. 2alc. Peru, Loreto province, Amazon River basin, within 30mi of Iquitos; Auigon, Manati, Itaya, and/or Neuse Rivers, 3.7418890°S 73.2396690°W, 1960. ***Farlowella reticulata*:** AUM 36208. 4alc. Guyana, Rupununi-Essequibo drainage, Region 9 Upper Takutu and Essequibo River, Rupununi River 3.7 km SSE Massara, J.W. Armbruster et al., 27/10/2002. AUM 36210. 10alc, 1c&s. Guyana, Rupununi-Essequibo drainage, Region 9 Upper Takutu and Essequibo River, Takutu River - Rio Branco - Rio Negro - Rio Amazonas, Yuora River, tributary of the Ireng River, 6.7 km NE Karasabai, J.W. Armbruster et al., 31/10/2002. AUM 48169. 4alc. Guyana, Rupununi-Essequibo River drainage, Region 8 Potaro-Siapruni, Burro Burro River, at Suraima, L.S. de Souza et al., 23/11/2007. ***Farlowella rugosa*:** AUM 47750. 3alc. Guyana, Branco-Negro River basin, Region 9 Upper Takutu and Essequibo Rivers, Takutu River, Garlic landing, beach N of Lethem, L.S. de Souza et al., 17/11/2007. AUM 48805. 10alc, 1c&s. Guyana, Rupununi-Essequibo River drainage, Region 9 Upper Takutu and Essequibo Rivers, Rupununi River, at Massara landing, L.S. de Souza et al., 22/11/2007. AUM 49837. 12alc. Guyana, Essequibo River basin, Region 9 Upper Takutu and Essequibo Rivers, Rupununi River, at Massara landing, L.S.de Souza et al., 06/11/2007. MCP 29647. 3alc. Brazil, Amazonas state, Tefé municipality, Solimoes River basin, Repartimento Creek, 1.5km downstream from Agrovila road, 03°24'28"S 064°44'10"W, W. Crampton, 25/02/1999. ***Farlowella schreitmuelleri*:** FMNH 106985. 2alc, 1c&s. Bolivia, Pando province, Garape Preto, small river at bridge and above on road to Cobija, Latitude -11.2414 Longitude -68.9925, B. Chernoff et al., 07/09/1996. ***Farlowella smithi*:** MCP 22490. 4alc. Brazil, Pará state, Concórdia do Pará municipality, Amazonas River basin, Bujarú Creek, about 20km southeast from Acará, at road Acará-Concórdia do Pará, 01°59'35"S 048°02'07"W, R.E. Reis et al., 19/07/1998. MCP 22491. 6alc, 1c&s. Brazil, Pará state, Castanhal municipality, Apeú Creek, at Belém-Brasília BR-010 highway, tributary of Guamá River, 01°18'06"S 047°59'11"W, R.E. Reis et al., 21/07/1998. MCP 22492. 3alc. Brazil, Pará state, São Miguel do Guamá municipality, Amazonas River basin, creek at road between São Miguel do Guamá e Ourém, about 10km from São Miguel do Guamá, tributary of Guamá River, 01°33'18"S 047°25'41"W, R.E. Reis et al., 22/07/1998. MCP 36623. 7alc. Brazil, Rondônia state, Porto Velho municipality, Madeira River basin, Taquarás Creek at BR-425 highway, between BR-364 highway and Guajará-Mirim, about 27km from BR-364 highway, 09°57'43"S 065°17'45"W, A. Cardoso et al., 25/07/2004. MCP 36628. 2alc, 1c&s. Brazil, Acre state, Xapuri municipality, Purus River basin, creek tributaru of Acre River, about 33km from Xapuri at BR-317 highway towards Brasiléia, 10°57'02"S 068°35'09"W, A. Cardoso et al., 23/07/2004. MCP 36629. Brazil, Acre state, Brasiléa municipality, Purus River basin, small creek tributary of Sal-Cinza Creek, Xapuri River basin, 10°48'10"S

069°23'44"W, R.E. Reis et al., 23/07/2004. MCP 36592. 1alc. Brazil, Mato Grosso state, Ponte e Lacerda municipality, Madeira River basin, river tributary of Guaporé River, at BR-174 highway, between Pontes e Lacerda e Comodoro municipalities, V. Bertaco et al., 12/07/2004. ***Farlowella venezuelensis*****:** USNM 163179. 2alc, 1c&s. Venezuela, Monagas state, Caicara municipality, Guarapiche River, F.D. Smith, 05/1952. ***Farlowella vittata*****:** AUM 27727. 12alc, 1c&s. Venezuela, Portuguesa state, Apure-Orinoco River system, Las Marias channel, at town of Quebrada Seca, approximately 45 min. upstream by car from Hwy.5, 22 km NNW of Guanare, J.W. Armbruster & O. León, 28/02/1998. AUM 35263. 2alc. Venezuela, Apure-Orinoco River system, C.A. Layman, no date information. AUM 56693. 3alc. Venezuela, Amazonas state, Ventuari-Orinoco River system, Guapuche River, 105.49 km east of San Fernando de Atabapo, first rapids 20 minutes by boat from mouth, N.K. Lujan et al., 02/04/2005. MCP 17688. 2alc. Venezuela, Cojedes state, Orinoco River basin, Camaruco stream, 09°39'40"N 068°44'50"E, no date information. ***Farlowella*** **sp.:** MCP 36617. 2alc. Brazil, Acre state, Sena Madureira municipality, Purus River basin, river tributary of Iaco River, about 8km from Sena Madureira at BR-364 highway, 09°07'22"S 068°36'10"W, A. Cardoso et al., 21/07/2004. UFRGS 14282. 3alc. Brazil, Manaus state, Amazon River basin, Negro River, left margin of Negro River, next to Lua beach, L.R. Malabarba et al., 10/06/2008. UFRGS 14285. 1alc. Brazil, Manaus state, Amazon River basin, Negro River, left margin of Negro River, at Tarumã Mirim Creek, L.R. Malabarba et al., 10/06/2008. USNM 225903. 4alc. Suriname, Nickerie district, Woodland stream about 1/2 km inland of Camp Mataway, R.P. Vari, 12/09/1980. USNM 301641. 15alc. Peru, Madre de Dios Region, Manu province, Amazon River basin, Madre de Dior River, at Manu National Park at Pakitza guard post and vicinity, H. Ortega, 18/10/1987. ***Harttia carvalhoi*****:** MCP 18055. 10alc, 1c&s. Brazil, Minas Gerais state, Frei Inocêncio municipality, Leste River basin, Suaçuí River, tributary of Doce River, on bridge of BR-116 highway at Frei Inocêncio, 18°34'21"S 041°54'42"W, R.E. Reis et al., 18/01/1995. MCP 20096. 6alc. Brazil, São Paulo state, Arapei municipality, Paraiba River basin, stream tributary of Bananal River, SP66 highway, at Km-301 about 12km southwest from Bananal, 22°40'39"S 044°24'03"W, J. Pezzi et al., 17/01/1997. MCP 20097. 1alc. Brazil, São Paulo state, Silveiras municipality, Paraiba River basin, Macacos River at Bairro dos Macacos, tributary of Paraitinga River, 22°49'09"S 044°50'23"W, J. Pezzi et al., 16/01/1997. MCP 20101. 7alc. Brazil, São Paulo state, Arapei municipality, Paraiba River basin, stream tributary of Bananal River, about 6km northeast at road Arapei-Santana do Bom Sucesso, at SP66 highway, 22°40'32"S 044°24'36"W, J. Pessi et al., 17/01/1997. MCP 20127. 17alc. Brazil, São Paulo state, Silveiras municipality, Paraiba River basin, Macaquinho Creek tributary of Paraitinga River, about 5km northwest of Bairro dos Macacos, 22°50'47"S 044°50'30"W, J. Pezzi et al., 16/01/1997. MCP 20131. 3alc. Brazil, São Paulo state, Cruzeiro municipality, Paraiba River basin, Brejetuba River, approximately 6km northwest of road Piquete-Cruzeiro at Alegre meadow, 22°34'05"S 045°02'17"W, J. Pezzi et al., 15/01/1997. MCP 43296. 1alc. Brazil, São Paulo state, Cunha municipality, Paraiba River basin, Jacuí Creek, 23°02'26"S 044°56'06"W, C.E. Lopes et.al., 25/06/2005. MCP 47770. 17alc. Brazil, Minas Gerais state, Ouro Branco municipality, Doce River basin, Garcia River, 20°29'50"S 043°36'55"W, C. Leal & D. Carvalho, 02/07/2006. ***Harttia dissidens*****:** MCP 44329. 6alc. Brazil, Pará state, Santarém municipality, Tapajós River basin between Santarém and Itaituba municipalities, 02°25'00"S 054°45'00"W, L.M. Sousa & J.L. Birindelli, 2001. MNHG 2538.081. 1 of 5alc. Brazil, Pará state, Tapajós River basin, Credo waterfalls between Vila Nova and Urua municipalities, S. Fisch-Muller, R. Stawikowski, P. Ludwig, C. Schaefer & B. Kilian, 28/09/1992. MNRJ 35543. 20alc, 1c&s. Brazil, Pará state, Ruropolis municipality, Tapajos River basin, Tamber stream, tributary of Cupari River, 4°7’26’’S 54°57’32’’W 102masl, P.A. Buckup, C. Zawadski, L. Fries, 09/27/2008. MNRJ 35546. 6alc. Brazil, Pará state, Tapajos River basin, bridge over small stream at Transmazonica highway, about 52km from Ruropolis municipality towards Itaituba, 4°7’52’’S 55°13’42’’W 35masl, M. Britto, J. Birindelli, J. Maldonado, 09/27/2008. MNRJ 35549. 4alc. Brazil, Pará state, Itaituba municipality, Tapajos River basin, bridge over small stream at highway BR-163, about 12km from Transamazonica highway, 4°26’18’’S 55°49’41’’W 36masl, M. Britto, J. Birindelli & C. Chamon, 09/28/2008. ***Harttia duriventris*:** MNRJ 35554. 2alc. Brazil, Pará state, Iriri River drainage, waterfall of Curua River, above first fall, approximately 54km from Castelo do Sonhos, at BR-163 highway towards Cuiaba city, 8°44’10’’S 54°57’47’’W, M. Britto et al., 10/01/2008. MZUSP 34229. 11alc, 1c&s. Brazil, Pará state, Tocantins River basin, Itacaiunas River, Serra dos Carajas, 5°52'S 50°32'W, M. Goulding, 04/1983. MZUSP 106199. 25alc. Brazil, Pará state, Marabá municipality, Tapirapé River, Cachoeirinha camp at base of Bacaba of REBIO, 5°32'2.0" S 50°40'4.0"W, no date information. ***Harttia fluminensis*:** FMNH 116944. 22alc, 1c&s. Suriname, Rapids of Sidonkrutu, Latitude 4.5308 Longitude -56.5156, J.H. Mol et al., 09/03/2004. ***Harttia fowleri*:** MHNG 2682.038. 1alc, 1c&s of 13alc. French Guiana, St. Georges-Oyapok, Oyapok River basin, downstream of creek opposite to Roche-Mon-Père at about 1h. canoe downstream of Camopi and 15 min. downstream of Sikini Creek, 03°16'56.3"N 52°12'36.6"W 52masl, S. Fisch-Muller et al., 06/11/2006. ***Harttia garavelloi*:** MCP 49356. 18alc. Brazil, Minas Gerais state, Itaramandiba municipality, Jequitinhonha River basin, Itangua River, tributary of Aracuai River, road Itaramandiba-Sen. Modestino, approximately 30km from Itaramandiba, Latitude -17.910556, Longitude -43.118611. R.E. Reis, E.H.L. Pereira, P. Lehmann, 27/07/2015. MCP 49370. 3alc. Brazil, Minas Gerais state, Carmesia municipality, Doce River basin, Axupe stream, road Terra Quente Carmesia and Morro do Pilar, 6.5km West from Carmesia, Latitude -19.096111, Longitude -43.185833. R.E. Reis, E.H.L. Pereira, P. Lehmann, 20/07/2015. MNRJ 12142. 3alc. Brazil, Minas Gerais state, Minas Novas municipality, São Francisco River basin, Fanado River, bridge at Minas Nova city, 17°15’-32768S 42°35’-32768W, G.B. Santos & A.S. Soares, 16/10/1987. MZUSP 94432. 3alc, 1c&s. Brazil, Minas Gerais state, Minas Novas municipality, São Francisco River basin, Fanado River at Minas Novas, on bridge at exit from Minas Novas to Turmalina, 17°13'14.0"S 42°35'46.0"W, 12/04/2007. ***Harttia gracilis*:** MNRJ 12143. 3alc. Brazil, Minas Gerais state, Fortaleza de Minas municipality, small river tributary of São Joao River, next to road Minas – Perobas, Z.C.V. Vasconcelos & F. Langeani, 16/01/1986. MZUSP 99678. 28alc, 1c&s. Brazil, São Paulo state, São Bento do Sapucaí municipality, Ribeirao do Lajeado River, tributary of Sapucaí River at San José da Rosa, SP-42 highway near of SP-52 highway at São Bento do Sapucaí, 22°47'9.0"S 45°41'17.0"W, O. Oyakawa et al., 30/05/2008. UFRGS 11358. 3alc. Brazil, Goiás state, Nova Roma municipality, Upper Tocantins River basin, Kavanca creek at Kavanca farm, tributary of Paranã River, 13.6927778°S 46.9625000° W, V. Bertaco et al., 09/09/2009. UFRGS 11246. 7alc. Brazil, Goiás state, Nova Roma municipality, Upper Tocantins River basin, Kavanca creek at Kavanca farm, tributary of Paranã River, 13.6927778°S 46.9625000° W, V. Bertaco et al., 09/09/2009. ***Harttia guianensis*:** ANSP 187328. 24alc. Suriname, Sipalawini district, Marowijne drainage, Lawa River, base camp ca. 8 km south-southwest of Anapaike/Kawemhakan (airstrip), 3°19'31"N 54°3'48"W, J. Lundberg et al., 18-22/04/2007. MHNG 2643.030. 1 of 13alc. French Guayana, Sinnamary municipality, small waterfall at the mouth of the heart of Maroni Creek, 05°03'40"N 52°56'50"W, P.Y. Le Bail et al., 15/10/1982. MHNG 2643.033. 1c&s. French Guyana, Approuague River, no date information. USNM 409775. 9alc. Suriname, downstream waterfall in right tributary of Upper Paloemeu River, Latitude 2.45586 Longitude -55.6263, J.H. Mol & K. Wan Tong You, 11/03/2012. ***Harttia kronei*:** MCP 20148. 25alc, 1c&s. Brazil, Paraná state, Rio Branco do Sul municipality, Ribeira River basin, Piedade River at road Rio Branco do Sul – Açungui, about 26km NW of Rio Branco do Sul, 25°00'42"S 049°20'20"W, R.E. Reis et al., 09/01/1997. MCP 34593. 1alc. Brazil, Paraná state, Campina Grande do Sul municipality, Ribeira River basin, do Cerne River, 25°17'57"S 049°32'53"W, W. Boeger et al., 15/07/2003. MCP 42440. 4alc. Brazil, São Paulo state, Iporanga municipality, Ribeira River basin, Betari River (or tributary), at Bairro da Serra between Iporanga and Apiaí municipalities, 24°33'45"S 048°40'06"W, T.P. Carvalho et al., 06/01/2008. ***Harttia leiopleura*:** MCP 32529. 5alc. Brazil, Minas Gerais state, Brumadinho municipality, São Francisco River basin, stream tributary of Paraopeba River, 20°05'56"S 044°01'07"W, L.F. Salvador, Jr., no date information. MNRJ 12140, paratypes. 3 of 12alc. Brazil, Minas Gerais state, Nova Lima municipality, das Velhas River basin, creek tributary to stream da Mutuca, 20°60’-32768’’S 43°55’-2768’’W, O.T. Oyakawa et al., 05/05/1987. MZUSP 109426. 9alc, 1c&s. Brazil, Minas Gerais state, Ouro Preto municipality, São Francisco River basin, da Prata River, tributary of das Velhas River, 20°23'36.0"S 43°54'28.0"W, no date information. ***Harttia longipinna*:** MCP 16686. 2alc. Brazil, Minas Gerais, Abaeté municipality, São Francisco River basin, Marmelada River at road between Pompeu and Frei Orlando municipalities, 19°03'00"S 045°12'00"W, R.E. Reis et al., 12/07/1993. MCP 24232. 2alc, 1c&s. Brazil, Mato Grosso state, São Francisco River basin, at São Francisco River. MCP 34232. 3alc. Brazil, Minas Gerais state, Nova Lima municipality, São Francisco River basin, Caetezinho Creek, das Velhas River system, 20°03'07"S 043°56'41"W, B.P. Nogueira & G.A. Pereira, 11/06/2003. MZUSP 58523. 10alc. Brazil, Bahia state, São Francisco River basin, no date information. ***Harttia loricariformis*:** MCP 11707. 1alc, 1c&s. Brazil, Rio de Janeiro state, Barra do Piraí district, Paraiba River basin, at Paraiba do Sul River at road between Piraí and Vassouras municipalities, 22°28'00"S 043°49'00"W, L.R. Malabarba et al., 01/02/1987. MCP 13778. 2alc. Brazil, Espirito Santo state, Leste River basin, river tributary of Itaperimim River next to road between Castelo and Muniz Freire municipalities, at bridge of São Joao, 20°33'00"S 041°15'00"W, C.A.S. Lucena et al., 05/09/1989. MCP 27339. 4alc. Brazil, Espirito Santo state, Itaguaçú municipality, Leste River basin, Santa Joana River at Itaguaçú, tributary of Doce River, 19°33'40"S 040°45'25"W, R.L. Teixeira, 30/11/2000. MCP 27699. 7alc. Brazil, Espirito Santo state, Muniz Freire municipality, Leste River basin, Santo Antonio Creek, system of Itapemirim River, 20°24'58"S 041°26'08"W, R.L. Teixeira, 08/03/2001. MCP 29485. 3alc. Brazil, Espirito Santo state, Muniz Freire municipality, Leste River basin, Boa Vista Creek, 20°27'00"S 041°25'00"W, R.L. Teixeira, 19/09/2001. MCP 29502. 9alc. Brazil, Espirito Santo, Muniz Freire municipality, Leste River basin, Barra de São Simao Creek, 20°27'00"S 041°25'00"W, R.L. Teixeira, 20/09/2001. MCP 31309. 7alc. Brazil, Espirito Santo state, Itaguaçú municipality, Leste River basin, Santa Joana River, Cosar farm at Itaguaçú, 19°48'00"S 040°52'00"W, R.L. Teixeira & P.S. Miller, 28/07/2001. MCP 31321.

4alc. Brazil, Espirito Santo, Itarana municipality, Leste River basin, Limoeiro Creek, at Praça Oito, tributary of Doce River, 19°55'00"S 040°50'00"W, R.L. Teixeira & P.S. Miller, 18/10/2000. MCP 31329. 4alc. Brazil, Espirito Santo state, Itaguaçú municipality, Leste River basin, Santa Joana River at Coser farm at Itaguaçú, 19°44'07"S 040°50'42"W, R.L. Teixeira & P.S. Miller, 08/09/2001. MCP 34356. 17alc. Brazil, Espirito Santo state, Muniz Freire municipality, Leste River basin, Santo Antonio Creek, Itapemirim River drainage, 20°24'58"S 041°26'08"W, R.L. Teixeira, 10/09/2002. MCP 34387. 2alc. Brazil, Espirito Santo state, Munz Freire municipality, Leste River basin, Rico stream at Itaperimim River basin, 20°27'00"S 041°24'00"W, R.L. Teixeira, 09/03/2002. MCP 34409. 1alc. Brazil, Espirito Santo state, Mimoso do Sul municipality, Leste River basin, das Flores River, Itabapoana River drainage, 21°04'00"S 041°22'00"W, R.L. Teixeira & G.I. Almeida, 03/12/2002. MCP 41799. 11alc. Brazil, Espirito Santo state, Santa Teresa municipality, Leste River basin, Valsugana Velha Creek, 19°58'50"S 040°32'08"W, R.L. Teixeira, 08/08/2002. MCP 41805. 2alc. Brazil, Espirito Santo state, Muniz Freire municipality, Leste River basin, Noa Vista Creek, 20°27'00"S 041°25'00"W, R.L. Teixeira, 20/09/2001. MCP 41823. 7alc. Brazil, Espirito Santo state, Muniz Freire municipality, Leste River basin, Boa Vista Creek, Itaperimim River drainage, 20°27'00"S 041°24'00"W, R.L. Teixeira & G.I. Almeida, 19/01/2001. MCP 42441. 1alc. Brazil, São Paulo state, Pindamonhangaba municipality, Paraiba River basin, Ribeirão Grande River, at Ribeirão Grande at road of Nova Gokula Hare Krishna temple, 22°46'23"S 045°27'33"W, T.P. Carvalho et al., 07/01/2008. MCP 44893. 4alc. Brazil, Espirito Santo state, Leste River basin, Santo Antonio Creek towards Menino Jesus, tributary of Itapemirim River, 20°24'57"S 041°26'08"W, R.E. Reis et al., 24/01/2010. MCP 45764. 3alc. Brazil, Minas Gerais state, Augusto de Lima municipality, São Francisco River basin, Curimataí River, das Velhas River system, 17°59'33"S 044°10'48"W, F.A. Sampaio, et al., 24/05/2009. UFRGS 18816. 4alc. Brazil, Rio de Janeiro state, Teresópolis municipality, river downstream from Venda Nova, at road next to BR-492 highway, 22°18'12.02" S 42°52'11.89"W, P.C. Silva et al., 09/01/2014. ***Harttia novalimensis*:** MCP 34204. 36alc. Brazil, Minas Gerais state, Nova Lima municipality, São Francisco River basin, Caetezinho creek, system of das Velhas River basin, 20°03'07"S 043°56'41"W, B.P. Nogueira & G.A. Pereira, 11/06/2003. MCP 34210. 5alc. Brazil, Minas Gerais state, Nova Lima municipality, São Francisco River basin, dos Cristais River, das Velhas River system, 19°59'43"S 043°55'25"W, B.P. Nogueira & G.A. Pereira, 14/12/2001. MCP 46615. 8alc. Brazil, Minas Gerais state, Nova Lima municipality, Sudeste River basin, Mutuca stream, tributary of Doce River, 20°00'52"S 043°58'16"W, B.P.Maia et al., 2008. MNRJ 23962. 21alc, 1c&s. Brazil, São Paulo state, Campos do Jordao municipality, Sapuca River, dos tabacos neighborhood at limits of Campos do Jordao e Piranguss municipalities, 35°46’S 45°28’33’’W, P. Buckup et al., 05/30/2002. ***Harttia punctata*:** MCP 15857. 1alc, 1c&s. Brazil, Goiás state, Uruaçu municipality, Tocantins-Maranhão System, Tocantins River basin, Passa Três River, approximately 2km north of Uruaçu at road Belém-Brasilia (BR-153), 14°30'21"S 049°09'13"W, R..E. Reis et al., 18/07/1992. MCP 45591. 2alc. Brazil, Goiás state, Nova Roma municipality, Tocantins River basin, das Pedras I River, 13°36'55"S 047°04'02"W, F.L.T. Garro, 29/07/2008. MCP 45607. 1alc. Brazil, Goiás state, Rianópolis municipality, Tocantins River basin, das Almas River, 15°29'49"S 049°31'08"W, F.L.T. Garro, 14/08/2008. MNRJ 12640. 13alc. Brazil, Goiás state, Niquelandia municipality, Maranhao-Tocantins System, Tocantins River basin, Indaial

River, tributary at left flank of Maranhao River, Upper Tocantins, 14°12’-32768S 48°37’-32768W, G.W. Nunan & D.F. Moraes Jr, 09/10/1985. MNRJ 12654. 3alc. Brazil, Goiás state, Uruaçu municipality, Maranhao-Tocantins System, Tocantins River basin, Macaco River, tributary at left flank of Maranhao River, Upper Tocantins, 14°21’30’’S 49°5’-32768 W, G.W. Nunan & D.F. Moraes Jr, 07/10/1985. MZUSP 88561. 31alc, 1c&s. Brazil, Goiás state, Minacu municipality, Serra da Mesa hydroelectric, O, Oyakawa, 12/2005. ***Harttia rhombocephala*****:** MCP 16007. 3alc, 1c&s. Brazil, Goiás state, Niquelândia municipality, Tocantins River basin, Arara River 500mts from mouth of Maranhao River at Rosariana, 14°01'00"S 048°25'00"W, R.E. Reis et al., 14/07/1992. ***Harttia surinamensis*****:** FMNH 116942. 4alc, 1c&s. Suriname, Rapids of Midden Coppename River, Latitude 4.2147 Longitude -56.5983, J.H. Mol et al., 02/03/2004. ***Harttia torrenticola*****:** MNRJ 12144, paratypes. 2 of 20alc, 1c&s. Brazil, Minas Gerais state, Moeda municipality, Paraopeba River system, stream tributary of Paraopeba River, Pedra Vermelha at Km10 of BR-040 highway, below waterfalls, O.T. Oyakawa & J.C. Oliveira, 02/08/1987. ***Harttia trombetensis*****:** MHNG 2551.071. 4alc, 1c&s. Brazil, Pará state, Cachoeira Porteira municipality, Trombetas River basin, left margin at 5mts downstream from fall, B. Killian & C. Seidel, no date information. ***Harttia* sp.:** MCP 28334. 4alc. Brazil, Minas Gerais, Claro de Minas municipality, São Francisco River basin, Pirapitinga River on road Guarda-Mor/Vazante, Claro River system, 17°56'39"S 046°58'08"W, C.A.S. Lucena et al., 25/01/2001. MCP 42424. 1alc. Brazil, Minas Gerais state, Mariana municipality, São Francisco River basin, das Velhas River at São Bartolomeu, 20°18'42"S 043°34'45"W, T.P. Carvalho et al., 12/01/2008. MCP 42477. 1alc. Brazil, São Paulo state, Silveiras municipality, Paraiba River basin, small river near to Bairro dos Macacos, 22°48'30"S 044°50'10"W, T.P. Carvalho et al., 08/01/2008. MCP 44911. 1alc. Brazil, Minas Gerais, Cardeal Mota municipality, São Francisco River basin, Parauninha River tributary of Parauna River, on road Santana do Riacho – Cardeal Mota, 19°16'57"S 043°37'55"W, R.E. Reis et al, 19/01/2010. MCP 45140. 1alc. Brazil, Minas Gerais state, Jabuticatubas municipality, São Francisco River basin, Jabuticatubas River tributary of das Velhas River, 19°28'25"S 043°52'26"W, C. Leal & D. Carvalho, 11/12/2009. MCP 45603. 1alc. Brazil, Goiás state, Formosa municipality, Tocantins River basin, Itiquira small stream, 15°19'27"S 047°25'27"W, F.L.T.Garro, 05/08/2008. USNM 226183. 1alc. Suriname, Nickerie District, Interconnected Rock Pools Near Camp Hydro, Latitude 3.7, Longitude -57.97, L.R. Parenti et al., 17/09/1980. USNM 226184. 2alc. Suriname, Nickerie District, pool in front of Camp Hydro, R.P. Vari et al., 17/09/1980. USNM 320262. 2alc. Brazil, Espirito Santo state, tributary of Itapemirim River on road Castelo-Muniz Freire at Sao Joao, C.A.S. Lucena, J.F. Pezzi, E.H.L. Pereira & P.V. Azevedo, 05/09/1989. USNM 403857. 1alc. Guyana, Cuyuni-Mazaruni state, Cuyuni River, braided channel about 15km upstream from Devil's Hole on Cuyuni River, Latitude 6.79711, Longitude -59.9928, B. L. Sidlauskas, D. Bloom, W.M. Bronaugh, 01/02/2011. USNM 403859. 1 alc. Guyana, Cuyuni-Mazaruni state, mud flats, sand bars, rocks & wooded shores, including isolated pools in near dry channel crossing island in middle of Cuyuni River about 15km upstream from Waikuni Mountains in vicinity of mouth of Toropaur River, Latitude 6.69186, Longitude -59.5772, B.L. Sidlauskas, W.M. Bronaugh, D. Bloom, M. Clementson & M. Adams, 02/2011. USNM 403868. 1alc. Guyana, Cuyuni-Mazaruni state, Braided channel about 15km upstream from Devil's Hole on Cuyuni River, Latitude 6.79711 Longitude -59.9928, B.L. Sidlauskas, D. Bloom & W.M. Bronaugh, 01/02/2011. ***Harttiella***

crassicauda**:** AUM 50392. 28alc. Suriname, Sipaliwini district, Marowijne (Maroni) River, Paramaka Creek, unnamed tributary of Creek in SUR 09-05, 5km northeast of Suralco base camp, J.W. Armbruster et al., 12/09/2009. AUM 50401. 30alc. Suriname, Sipaliwini district, Marowijne (Maroni) River, Paramaka Creek, unnamed tributary, 7.25km east of Suralco base camp, Nassau Mountain, J.W. Armbruster et al., 13/09/2009. AUM 50837. 23alc, 1c&s. Suriname, Sipaliwini district, Marowijne (Maroni) River, Paramaka Creek, Ijskreek from road on top of plateau to near base of waterfall after edge, to 3.5 km northeast of Suralco Base Camp, Nassau Mountain, J.W. Armbruster et al., 09/09/2009. AUM 51734. 12alc. Suriname, Sipaliwini district, Marowijne (Maroni) River, Paramaka Creek, unnamed stream next to Trail 5 creek, 4.2km northeast from Suralco Base Camp, Nassau Mountain, J.L. Wiley et al., 09/12/2010. MHNG 2674.053. 3alc. Suriname, Maroni River, Paramaka Creek, Nassau Mountains, J.H. Mol et al., 02/11/2005. USNM 390676. 7alc. Suriname, Marowijne River drainage, Nassau Mountains, Ijskreek, central upper branch of Paramaka Creek, J.H. Mol et al., 05/11/2005. ***Harttiella intermedia*****:** MHNG 2713.087. 2alc, paratypes. French Guiana, Sinnamary River basin, tabular Mountain of trinité massif, Crique grand Leblond, 4°36’35’’N -53°21’33’’W 320masl, Tostain & Ravet, 06/10/2009. ***Harttiella janmoli*****:** MHNG 2695.059. 36alc, paratypes. French Guiana, Maroni River basin, Kotika Mountain, 3°57’16’’N -54°10’50’’W 515 masl, Tostain, 05/09/2007. ***Harttiella longicauda*****:** MHNG 2699.070. 23alc, paratypes. French Guiana, Trinité Mountains, Mana River basin, in a tributary of Crique Baboune, Crique aya around 100mts in front of Aya Camp, 4°36’11’’N -53°25’04’’W 122masl, Montoya-Burgos & Melki, 28/11-04/12/2007. MHNG 2723.042. 2 of 27alc, 1c&s. French Guyana, Approuague River, Cascade Creek & Dam Creek, Arataï River, J.I. Montoya-Burgos & Y. Surjet, 19/11/2010. ***Harttiella lucifer*****:** MHNG 2721.088. 4alc, paratypes. French Guiana, Mana River basin, Lucifer Mountains, West of Crique Cascade, 4°47’44.7’’N- 53°55’49.4’’W 450masl, Montoya-Burgos & Fischer, 10/02/ 2010. MHNG 2721.091. 3alc, paratypes. French Guiana, Mana River basin, headwater of a creek in Lucifer massif flowing toward Citron, 4°45’54’’N- 53°56’14.9’’W 365masl, Montoya-Burgos & Fischer, 11/02/2010. MHNG 2712.085. 4alc, paratypes. French Guiana, Maroni River basin, Galbao Mountains in a tributary of Crique Limonade, 3°35’56.6’’N -53°15’12.6’’W 202masl, Tostain, 18/03/2008. ***Harttiella parva*****:** MHNG 2723.093. 3alc, paratypes. French Guiana, Maroni River drainage, Atachi Bakka Mountains, Gaucher, 06/2009. ***Harttiella pilosa*****:** MHNG 2724.004, holotype. French Guiana, Tortue Mountains, orapu River drainage in Crique grillon at the ONF camp, Covain et al., 8 Nov. 2006. MHNG 2682.055. 4alc, paratypes. Same data as holotype. MHNG 2724.002. 1alc, paratype. French guiana, tortue Mountains, Orapu River drainage in Crique grillon at the ONF camp, Vigouroux et al., 07/11/2003. ***Lamontichthys avacanoeiro*****:** MNRJ 18553, paratypes. 6alc, 1c&s. Brazil, Goiás state, Tocantins River basin, pools below U.H.E. Serra da Mesa, D.F. Moraes et al., 1996. MNRJ 23643. 2alc. Brazil, Goiás state, Niquelandia municipality, Tocantins River basin, Trairas River, D.F. Moraes et al., 08/12/1996. ***Lamontichthys filamentosus*****:** AUM 45589. 7alc, 1c&s. Peru, Amazonas Province, Amazonas River basin, Marañón River, pongo above Borja, 35.5km northeast of Juan Velasco (Sta Maria de Nieva), N.K. Lujan et al., 06/08/2006. AUM 45599. 5alc. Peru, Amazonas Province, Amazonas River basin, Marañón River, pongo above Borja, 35.5km northeast of Juan Velasco (Sta Maria de Nieva), N.K. Lujan et al., 06/08/2006. AUM 45636. 3alc. Peru, Amazonas Province, Amazonas River basin, Marañón River, pongo Renema, H. Ortega, 11/08/2006. MCP 36571. 1alc. Brazil, Acre state, Sena Madureira municipality, Purus River basin, Antimari River, between Rio Branco and Sena Madureira, at BR-364 highway, 09°29'27"S 068°21'29"W, R.E. Reis et al., 20/07/2004. ***Lamontichthys llanero*****:** AUM 22108. 1alc, 1c&s. Venezuela, Portuguesa state, Apure-Orinoco River system, Portuguesa River at highway 5 at bridge, J.W. Armbruster et al., 17/12/1999. AUM 22791. 3alc. Venezuela, Portuguesa state, Apure-Orinoco River system, Portuguesa River at highway 5 at bridge, J.W. Armbruster et al., 31/12/1999. AUM 22809. 2alc. Venezuela, Portuguesa state, Apure-Orinoco River system, Portuguesa River, at Guanare River just downstream of Guanarito, north shore across from beach, J.W. Armbruster et al., 01/01/2000. AUM 41077. 1alc. Venezuela, Portuguesa state, Apure-Orinoco River system, Portuguesa River, 10km northeast of Guanare, 4km from de Guanare via Acarigua, M.H.Sabaj et al., 29/03/2004. ***Lamontichthys parakana*****:** MNRJ 13300. 6alc, 1c&s. Brazil, Goiás state, Minaçu/Cavalcante municipality, Tocantins River basin, at future location of dam of Serra da Mesa hydroelectric, 13°50'-32768''S 48°19'-32768''W, D.F. Moraes et al., 24-31/07/1988. ***Metaloricaria nijsseni*****:** MHNG 2674.008. 1 of 5alc. Suriname, Sipaliwini district, station 3, Gran Rio to Awaradam rapids, 03°50'40.1"N 55°36'50.8"W, J.I. Montoya-Burgos et al., 29/10/2005. MHNG 2674.025. 1 of 8alc. Suriname, Sipaliwini district, station 2, Gran Rio to Kossindo, Cajana, J.I. Montoya-Burgos et al., 29/10/2005. ROM 98120. 8alc, 1c&s. Suriname, Nickerie district, Nickerie River, H. López-Fernández et al., 11/12/2014. ***Metaloricaria paucidens*****:** ANSP 187327. 1alc. Suriname, Sipalawini district, Lawa River, Marowijne drainage, large cataract complex in side channel west of base camp (SUR 07-01), about 8km southwest of Anapaike, 3°19'52"N 54°4'20"W, M. Sabaj et al., 21-24/04/2007. MHNG 2756.042. 1alc. French Guiana, Maripasoula district, Vicinity of Antecum Pata, Maroni River basin, 3.0008333 -54.0833333, S. Fisch-Muller et al., 19/10/2000. ROM 97928. 1alc, 1c&s. Suriname, Marowijne River, 4.65385 -54.43175, H. López-Fernández et al., 10/2014. ***Pterosturisoma microps*****:** MCP 33231. 1alc. Brazil, Amazonas state, Alvarães municipality, Solimoes River basin, Caborini beach at confluence of Japurá-Solimões Rivers, 03°19'08"S 064°47'04"W, W. Crampton, 19/02/2001.MHNG 2677.072. 1 of 4alc. Peru, Amazonas River basin, aquarium trade. MZUSP 79909. 1c&s, Brazil, Amazonas state, Amazonas River basin, Solimões River below rio Içá, 8.4mts below Paraná do Jarimirim, -3°10'43''S 67°55'38''W, J.P. Friel et al., 21/11/2993. ***Sturisoma barbatum*****:** MCP 36446. 2alc, 1c&s. Brazil, Rondonia state, Ji-Paraná municipality, Madeira River basin, Machado River. MCP 36451. 1alc. Brazil, Mato Grosso state, Madeira River basin, Guaporé River, next to bridge of road from Pontes de Lacerda to Vila Bela da Santíssima Trinidade. ***Sturisoma brevirostre*****:** MCZ 8095**,** holotype. Brazil, Amazonas state, Amazonas River basin, Iça River, tributary of Solimões River. ***Sturisoma guentheri*****:** MNRJ 29226. 1alc. Brazil, Goiás state, Tocantins River basin, downstream from hydroelectric dam UHE Serra da Mesa, between Porto Garimpo and Preto River. MNRJ 30345. 1alc. Brazil, Goiás state, Tocantins River basin, left margin of reservoir of UHE Serra da Mesa, bank of Palmeirinha River (upper Tocantins). USNM 177200. 6alc. Ecuador, Napo-Pastaza Province at Chichertoa, near mouth of Bobonaza River. USNM 301647. 1alc. Peru, Amazonas state, Amazonas River basin, Madre de Dios region, Manu National Park, Pakitza and vicinity. USNM 324250, 3alc, 1c&s. Peru, Amazonas state, Amazonas River basin, Madre de Dios Region, Manu, Pakitza, Martin Pescador Creek. ***Sturisoma lyra*****:** MCP 35514. 2alc. Brazil, Acre state, Rio Branco municipality, Purus River basin, Riozinho do Rola (left flank of Acre River). USNM 94656. 4alc, 2c&s. Brazil, Acre state, Purus River basin, vicinity of mouth of Macauhan River, tributary of Yaco River, which flows into the Purus River. MZUSP 26747. 1alc. Peru, Ucayali province, Amazonas River basin, Ucayali River. ROM 55682, 2alc. Peru, Ucayali province, Amazon River basin, Ucayali River basin, Yarina Cocha. ROM 55683. 1alc. Peru, Ucayali province, Amazon River basin, Ucayali River basin, Yarina Cocha. ***Sturisoma monopelte*****:** AUM 35790. 2alc. Guyana, Rupununi-Essequibo drainage, Rupununi River at Massara's landing 1.1km NE Massara, region 9 (Up. Takutu – Up. Essequibo). AUM 44571. 3alc. Guyana, Takutu River, Branco – Negro drainage, Ireng River, upstream of Good Hope, region 9 (Up. Takutu – Up. Essequibo). AUM 44839. 3alc. Guyana, Essequibo River, Rupununi River, at Yukupari, region 9 (Up. Takutu – Up. Essequibo). AUM 47893. 9alc, 1c&s. Guyana, Essequibo River drainage, Rupununi River, at Yupukari, sidewater bay, region 9 (Up. Takutu – Up. Essequibo). AUM 48057. 2alc. Guyana, Branco-Negro-Amazonas drainage, Takutu River, at sand beach, region 9 (Up. Takutu – Up. Essequibo). ***Sturisoma nigrirostrum*****:** ANSP 199936. 1alc, 1c&s. Peru, Loreto province, Amazon River basin, Nanay River, just downstream of sandy beach (Las Camelias) along left bank, 7km W of Iquitos. ***Sturisoma robustum*****:** MCP 15812. 8alc, 1c&s. Brazil, Mato Grosso state, Cáceres municipality, Paraguay River basin in Cáceres. MCP 28835. 6alc. Brazil, Acre state, Bujari municipality, Purus River basin, Antimari Creek, on route of highway BR-364, 58km SE of Sena Madureira. ***Sturisoma rostratum*****:** CAS 42736. 2alc. Peru, Loreto province, Amazon River basin, Morona River. CAS 42737. 2alc. Peru, Ucayali province, Amazon River basin, Ucayali River. CAS 42738. 1alc. Peru, Ucayali province, Amazon River basin, Cashiboya Lake, a cutoff lake of Ucayali River (connected to River by channel) above Contamana. CAS 42739. 1alc. Peru, Ucayali province, Amazon River basin, Ucayali River. MCP 30625. 1alc. Brazil, Amazonas state, Solimões River basin, Alencar vile, 1km South of Boca do Mamirauá Community, system of Lake Mamirauá. MCP 36445. 8alc, 1c&s. Brazil, Rondonia state, Ji-Paraná municipality, Miolo Creek, 15km NW from Ji-Paraná on BR-364 highway. MCP 40202. 1alc. Brazil, Mato Grosso state, Araguaia River, Crisostomo River, on route of highway BR-158 between Vila Rica and Confresa. MCP 41986. 1alc. Brazil, Goiás state, Tocantins River basin, Araguaia River at Roncador, in basins afluents of Claro River. MNRJ 35784. 3alc. Brazil, Itaituba municipality, Capitua Creek, Tapajos River basin tributary, Transamazonica route. USNM 167893. 2alc. Peru, Yurimaguas district, Amazonas River basin, Huallaga River. ***Sturisoma tenuirostre*****:** ANSP 198951. 4alc. Venezuela, Apure state, Orinoco River basin, Apure River, just downstream of Puente María Nieves, San Fernando de Apure. UF 80349. 3alc. Venezuela, Portuguesa state, Orinoco River basin, Guanare River on Las Garcitas, near Laguna Chinguare. UF 80406. 1alc. Venezuela, Portuguesa state, Orinoco River basin, isolated well in Cano of Laguna La Chiva. USNM 258266. 2alc. Venezuela, Guarico state, Orinoco River basin, Guarico River at Flores Moradas Ranch, 3-4km east of road from Calabozo to San Fernando. USNM 258280. 4alc, 1c&s. Venezuela, Apure state, Orinoco River basin, main channel of Apure River in region of San Fernando de Apure. ***Sturisoma* Madre de Dios n.sp.:** MUSM 58700 (ex ROM 64044), holotype. Peru, Amazonas state, Madre de Dios River basin, Picaflor Creek, at Pakitza guard post, Castanel Trail #12 to Caña Brava Trail #16, 11°49'60"S 71°20'59"W, H. Ortega, 21/04/1991. CAS 78922. 1alc, paratype. Peru, Amazonas state, Manu province, Madre de Dios River basin, Mariposa Creek, 150 m upstream from mouth (flowing into Madre de Dios River), T. Iwamoto & J. K. Edelbrock, 29/05/1983. MUSM 58769 (ex USNM 263921), 2alc, paratypes. Peru, Amazonas state, Manu province, Madre de Dios River basin, shore of isla about 15km downstream of junction of Tambopata and Madre de Dios rivers, 12°30’S 69°08’50’’W, R.P. Vari, H. Ortega, & S.L. Jewett, 25/08/1983. ROM 64044, 1c&s, paratype. same data as holotype. ROM 64045, 2alc, paratypes. Peru, Amazonas state, Manu province, Madre de Dios River basin, Fortaleza Creek, at Pakitza guard post, Manu River, 11°49’60”S 71°20’59”W, H. Ortega, 22/04/1991. ROM 83889, 1alc, paratype. Peru, Amazonas state, Manu province, Madre de Dios River basin, Fortaleza Creek, at Pakitza guard post, Manu River, 11°49’60”S W 71°20’59”W, H. Ortega & M.E. Guevara, 05/10/1991. ROM 83891, 4alc, paratypes. Peru, Amazonas state, Manu province, Madre de Dios River basin, Fortaleza Creek, at Pakitza guard post, Manu River, 11°49’60”S 71°20’59”W, H. Ortega & M.E. Guevara, 05/10/1991. USNM 263920. 3alc, paratypes. Peru, Amazonas state, Manu province, Madre de Dios River basin, Tambopata River, opposite boat landing for Explorer’s Inn, 12°50’S 69°18’W, H. Ortega & R.P. Vari, 21/08/1983. USNM 302650, 2alc, paratypes. Peru, Amazonas state, Manu province, Madre de Dios River basin, at Pakitza vigilante post, Manu River, 11°49’60’’S 71°20’59’’W, H. Ortega, 10/09/1988. USNM 302651. 1alc, paratype. Peru, Amazonas state, Manu province, Madre de Dios River basin, Pachija Creek, Manu River, at and above mouth, H. Ortega *et al*., 12/09/1988. USNM 319296. 4alc, paratypes. Peru, Amazonas state, Manu province, Madre de Dios River basin, Manu National Park, at Pakitza guard post, Picaflor Creek at the mouth of the River Manu, H. Ortega, 24/04/1991. USNM 319297. 1alc, paratype. Peru, Amazonas state, Manu province, Madre de Dios River basin, Manu National Park, at Pakitza guard post, Manu River, close to Pachija mouth, H. Ortega & W. Valles, 10/05/1991. USNM 319346. 4alc, paratypes. Peru, Amazonas state, Manu province, Madre de Dios River basin, Manu National Park, at Pakitza guard post, Fortaleza Creek, 15’ upstream from the mouth at Manu River, H. Ortega & W. Valles, 09/05/1991. USNM 319348. 2alc, paratypes. Same data as holotype. USNM 319349. 2alc, paratypes. Peru, Amazonas state, Manu province, Madre de Dios River basin, Manu National Park, Pakitza, Cocha Chica, H. Ortega *et al*., 19/04/1991. USNM 319351. 3alc, paratypes. Peru, Amazonas state, Manu province, Madre de Dios River basin, Manu National Park, at Pakitza guard post, Fortaleza Creek, H. Ortega & W. Valles, 22/04/1991. ***Acestridium scutatum*:** MCP 37785. 9alc, 2c&s, paratypes. Brazil, Amazonas state, Humaitá municipality, Madeira River basin, Traíra River about 35km east from Madeira River via dirt road, 07°35'33"S 062°44'45"W, R.E. Reis et al., 27/07/2004. ***Ancistrus brevipinnis*:** MCP 20039. 7alc. Brazil, Rio Grande do Sul state, Sapiranga municipality, Jacui River basin, Feitoria Creek, 29°34'00"S 051°00'00"W, D. Jacobus et al., 23/11/1996. MCP 21449. 12alc, 1c&s. Brazil, Rio Grande do Sul, Tapera municipality, Jacui River basin, Colorado River at Ibirubá-Tapera road, 28°38'49"S 052°55'28"W, R.E. Reis et al., 12/10/1998. ***Chaetostoma breve*:** AUM 46515. 40alc, 1c&s. Peru, Amazonas province, Amazonas River basin, Marañón River basin, Utcubamba River, 23km southeast of Bagua Chica, N.K. Lujan et al., 12/08/2006. ***Crossoloricaria* sp.:** MCP 36580. 1alc, 1c&s. Brazil, Mato Grosso, Nova Lacerda municipality, Madeira River basin, Galera River, tributary of Guaporé River at Galera balneary, 14°28'59"S 059°35'07"W, V. Bertaco et al., 12/07/2004. ***Dasyloricaria filamentosa*:** CP-UCO 1359. 6alc, 1 c&s, Colombia, Cesar department, El Paso district, Magdalena River basin, Cesar River, no date information. FMNH 55113, 2alc. Colombia, Soplaviento municipality, Magdalena River basin. FMNH 55114. 1alc. Colombia, Bolivar department, Calamar municipality, Magdalena River basin. FMNH 55116. 1alc, holotype of *Loricaria filamentosa seminuda*. Colombia, Girardot municipality, Magdalena River basin. IAvH-P 3086. 1 of 4alc. Colombia, Norte de Santander department, San Calixto municipality, Catatumbo River basin, Zulia River. IAvH-P 3845, 5alc. Colombia, Boyacá department, Puerto Boyacá municipality, Magdalena River basin, Palagua Creek. IAvH-P 3846. 7alc. Colombia, Boyacá department, Puerto Boyacá municipality, Magdalena River basin, Velasquez Creek. IAvH-P 12938. 7alc. Colombia, Boyacá department, Puerto Boyacá municipality, Magdalena River basin, Palagua and Velasquez creeks. ***Dasyloricaria latiura*****:** CAS 13187. 3 of 6alc. Colombia, Chocó department, Boca de Certegui district, Atrato River basin. CIUA 226. 1alc. Colombia, Chocó department, Atrato River basin, last cienaga of Tumaradó. FMNH 124472, lectotype. Colombia, Chocó department, Boca de Certegui district, Atrato River basin. FMNH 55115. 6alc, paralectotypes. Same data as lectotype. IAvH-P 6770. 3alc. Colombia, Chocó department, Lloró municipality, Atrato River basin, Capá River. USNM 293296. 1 c&s, Panama, Darien province, Tuyra River basin, ½ km above Boca de Cupe. USNM 293575. 1alc. Panama, Darién province, Tuyra River basin, Pucuro River above confluence with Tuyra River. ***Dasyloricaria paucisquama*****:** MPUJ 6019, holotype. Colombia, Caldas department, La Dorada municipality, La Española farm at Zona El Gigante, Magdalena River basin, Purrio River, 5°21’N 74°48’W 243masl, S. Prada et al., 30/10/2009. CP-UCO 143. 1c&s, paratype. Colombia, Antioquia department, Magdalena River basin, southern Samaná River, tributary to La Miel River in Butantan, 5°41’N 74°46’W 189masl, U. Jaramillo, 31/01/2006. MCP 46920. 1alc, paratype. Same data as holotype. MPUJ 5189. 1alc, paratype. Colombia, Caldas department, La Victoria district, La Española farm at Zona El Gigante, Magdalena River basin, Purrio River, 5°22’N 74°47’W 226masl, S. Prada et al., 25/02/2010. ***Hemiloricaria lanceolata*****:** MCP 36454. 10alc, 2c&s. Brazil, Mato grosso state, Nova Lacerda municipality, Madeira River basin, Retiro Creek trobutary of Guaporé River at BR-174 highway, 14°48'07"S 059°19'24"W, V. Bertaco et al., 12/07/2004. ***Hemiodontichthys acipenserinus*****:** MCP 21975. 6alc, 1c&s. Brazil, Maranhão state, Santa Inês municipality, Norte River basin, Pindaré River, West from Santa Ines at Pará- Maranhão BR-316 highway, tributary of Mearim River, 03°39'36"S 045°27'59"W, R.E. Reis et al., 24/07/1998. MCP 29792. 5alc. Brazil, Amazonas state, Alvarães municipality, Solimoes River basin, Paraná Maiana, station A, 2.5km from Boca do Mamirauá community, system of Lake Mamirauá, 03°06'44"S 064°47'32"W, W. Crampton, 12/11/1999. ***Hemipsilichthys gobio*****:** MCP 19780, 7alc, 2c&s. Brazil, São Paulo state, Silveiras municipality, Paraiba River basin, Macaquinho Creek, tributary of Paraitinga River, about 5km northwest from Bairro dos Macacos, 22°50'47"S 044°50'30"W, J. Pezzi et al., 16/01/1997. ***Hisonotus laevior*****:** MCP 34779. 8alc. Brazil, Rio Grande do Sul state, Pedro Osório municipality, São Goncalo Channel, Mata Olho Stream, at road between Pedro Osório and Basílio, 31°54'56"S 053°00'16"W, R.E. Reis et al., 15/11/2003. MCP 37684. 56alc, 4c&s. Brazil, Rio Grande do Sul state, Pedro Osório municipality, São Gonçalo River, Arambaré Creek, about 5km South from Vila Brasílio, at road towards Pedro Osório, 31°51'51"S 052°49'24"W, R.E. Reis et al, 22/04/2005. ***Limatulichthys griseus*****:** MCP 21987. 12alc, 1c&s. Brazil, Pará state, Ourém municipality, Amazonas River basin, Guamá River at Tupinambá at road between São Miguel do Guamá and Ourem, 01°35'07"S 047°15'21"W, R.E. Reis et al., 22/07/1998. MCP 46169. 1alc. Brazil, Roraima state, Negro River, Cocó Creek, road between Caroebe and Entre Rios, 00°51'22"N 059°37'02"W, T.P. Carvalho et al., 26/01/2011. ***Loricaria* sp.:** MCP 36565. 5alc, 1c&s. Brazil, Mato Grosso state, Pontes e Lacerda municipality, Madeira River basin, Bugre

River, about 42km north of Guaporé River on BR-174 highway, 14°51'35"S 059°17'57"W, R.E. Reis et al., 12/07/2004. ***Loricariichthys anus*:** MCP 11221. 2alc, 1c&s. Brazil, Rio Grande do Sul state, Cidrera municipality, Cidrera Lagoon, rod Cidrera-Porto Alegre, coastal system, 30°13'00"S 050°15'00"W, E.H.L Pereira et al., 28/03/1987. ***Loricariichthys platymetopon*:** MCP 36443. 7alc, 1c&s. Brazil, Mato Grosso state, Poconé municipality, Paraguay River basin, channel on Transpanteneira road towards Porto Manga, about 16km from Poconé, 16°20'59"S 056°38'41"W, J. Pezzi et al., 10/07/2004. ***Neoplecostomus microps*:** MCP 42432. 5alc, 1c&s. Brazil, São Paulo state, Pindamonhangaba municipality, Paraiba River basin, Ribeirão Grande River, at Ribeirão Grande on road of Nova Gokula Hare Krishna Temple, 22°46'23"S 045°27'33"W, T.P. Carvalho et al., 07/01/2008. ***Pareiorhaphis calmoni*:** MCP 17276. 15alc, 1c&s. Brazil, Santa Catarina, Aguas Mornas municipality, Sudeste River basin, Teresópolis River, tributary of Cubatao River, 27°45'00"S 048°56'00"W, C.A.S. Lucena et al., 16/10/1993. MCP 41275. 18alc. Brazil, Santa Catarina state, Águas Mornas municipality, Sudeste River basin, Cubatão River next to Queçabas, at road Águas Mornas- João Bonifácio, 27°43'35"S 048°53'57"W, R.E. Reis et al., 02/02/2007. ***Parotocinclus maculicauda*:** MCP 29086. 17alc, 2c&s. Brazil, Santa Cataina state, Itajaí municipality, Sudeste River basin, creek tributary of do Meio River, about 5km from BR-486 highway towards do Meio River, 26°57'00"S 048°43'00"W, V.A. Bertaco & V.C. Baumbach, 21/02/2002. MCP 44205. 8alc. Brazil, Rio de Janeiro state, Japeri municipality, Leste River basin, São Pedro River at Jaceruba, tributary of Guandu River, 22°36'33"S 043°34'08"W, J. Pezzi da Silva, 2009. ***Pterygoplichthys lituratus*:** MCP 35757. 2alc, 1c&s. Brazil, Mato Grosso state, Pontes e Lacerda municipality, Madeira River basin, river tributary of Guaporé River at BR-174 highway, between Pontes e Lacerda and Comodoro municipalitites, 14°55'15"S 059°17'29"W, A. Cardoso & R.E. Reis, 12/07/2004. ***Rineloricaria cadeae*:** MCP 25920. 30alc, 1c&s. Brazil, Rio Grande do Sul state, Lavras do Sul municipality, Camaqua River basin, Mantiqueira Creek, 30°54'24"S 053°58'06"W, C.A.S. Lucena et al., 26/04/2000. MCP 34728. 13alc. Brazil, Rio Grande do Sul state, Herval municipality, São Goncalo River, Arambaré Creek at road from Pedro Orsório to Herval, 31°58'37"S 053°06'15"W, R.E. Reis et al., 15/11/2003. ***Rineloricaria quadrensis*:** MCP 11039. 40alc, 1c&s. Brazil, Santa Catarina state, Gravatal municipality, Sudeste River basin, Capivari River at road Gravatal-Armazém, 28°17'00"S 049°02'00"W, C.A.S. Lucena et al., 10/12/1986. MCP 13598. 3alc. Brazil, Rio Grande do Sul state, Maquiné municipality, Tramandaí River, Maquiné River next to Maquiné, 29°40'00"S 050°11'00"W, S.O. Kullander et al., 01/10/1989. ***Spatuloricaria puganensis*:** AUM 45638. 7alc, 1c&s. Peru, Amazonas province, Amazonas River basin, Marañón River, pongo Renema, purchased at Bagua Chica fish market, H. Ortega, 11/08/2006.

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FIGURES

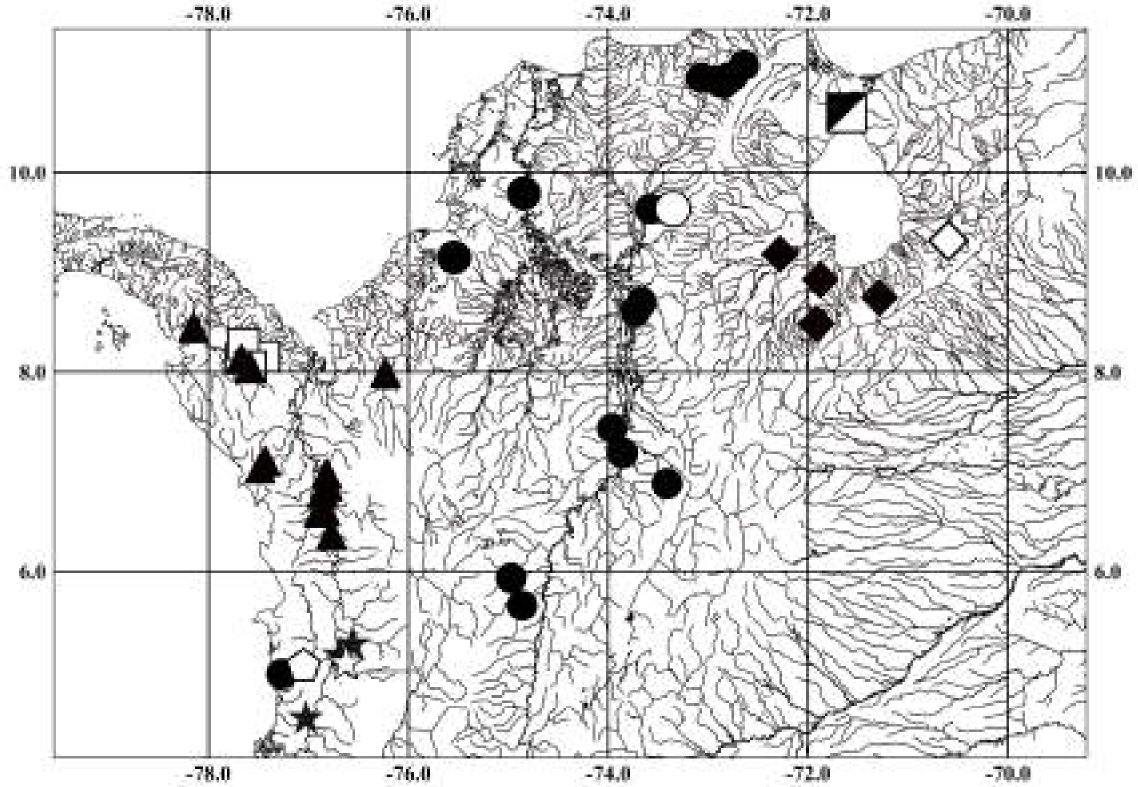

Fig. 1. Map of Northwestern South America, including Colombia, Ecuador, Panama and Venezuela. Showing the distribution of *Sturisomatichthys aureus* (circles); *S. dariensis* (white squares); *S. festivus* (diamonds); *S. kneri* (half white-half black square); *S. panamensis* (triangles); *Sturisomatichthys* Baudó (polygon); *Sturisomatichthys* San Juan (star). White symbols showing type localitiy of each species. Each symbol can represent more than one locality.

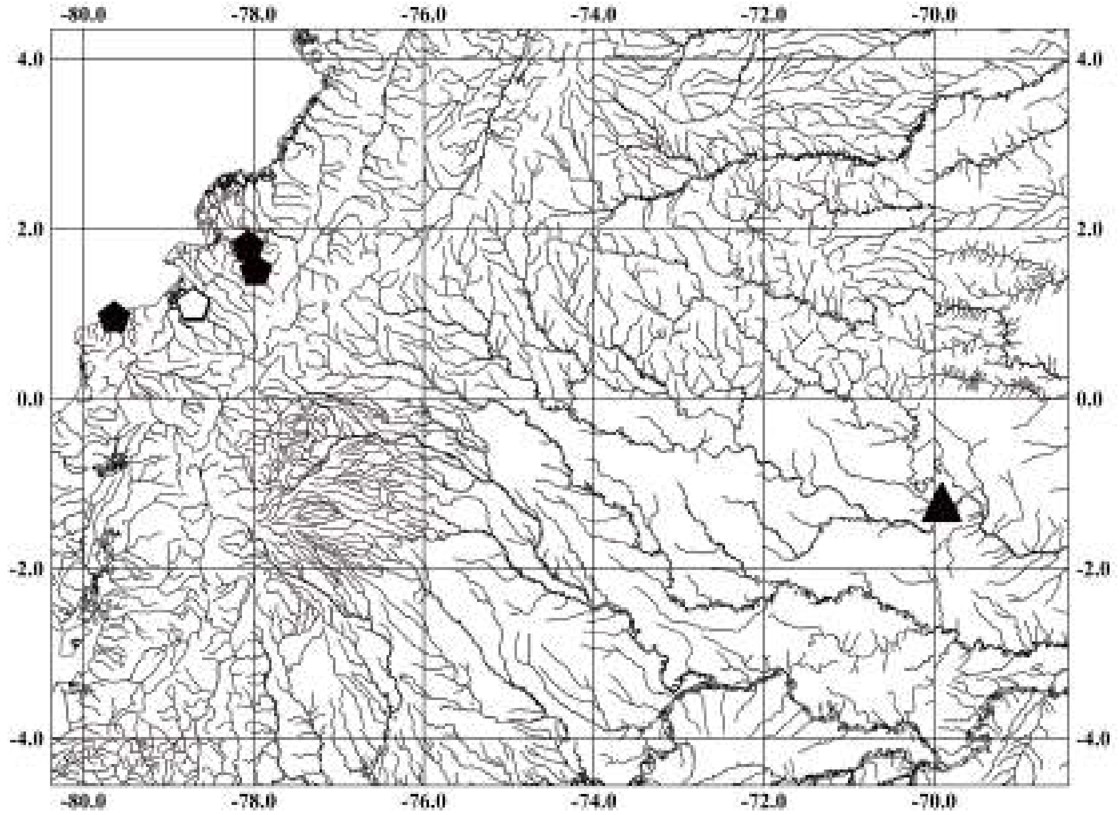

Fig. 2. Map of Northwestern South America, including Colombia, Ecuador, and part of Northern Brazil on its political boarder with Colombia. Showing the distribution of *Sturisomatichthys caquetae* (triangle; type locality); and *S. frenatus* (polygon; white polygon is type locality). Each symbol can represent more than one locality.

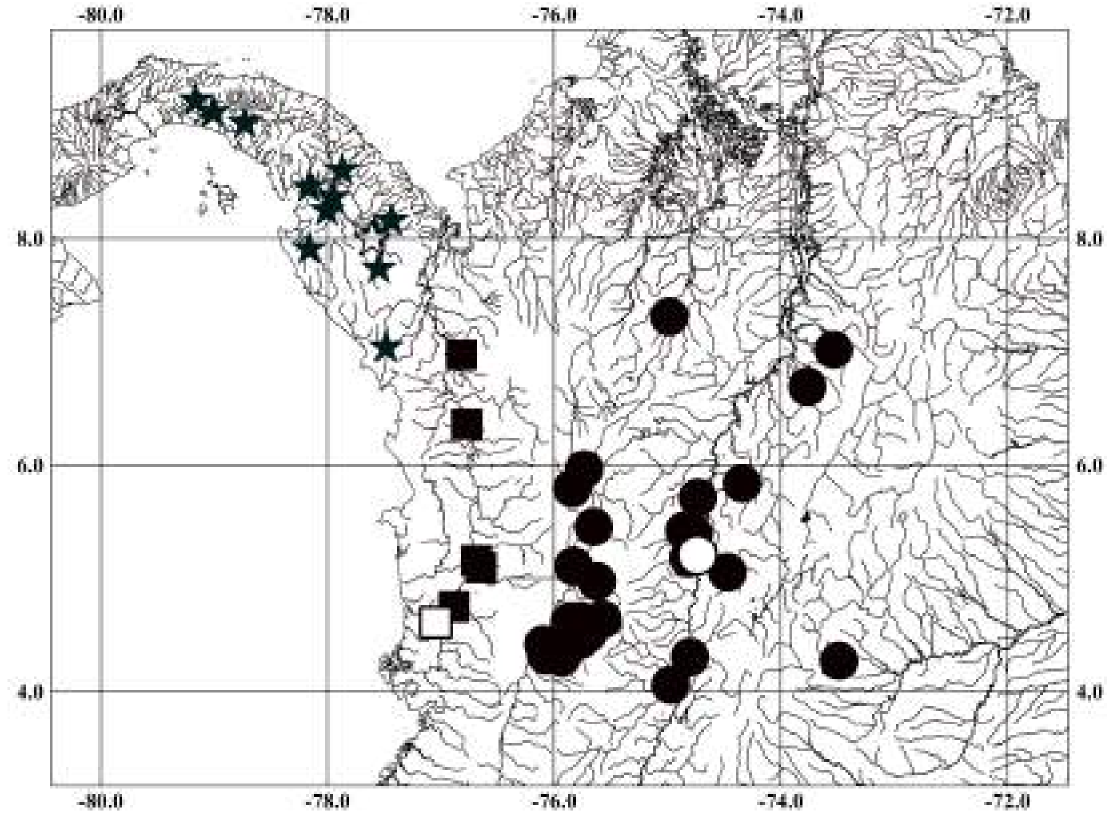

Fig. 3. Map of Northwestern South America, including Colombia, Ecuador, Panama and Venezuela. Showing the distribution of *Sturisomatichthys citurensis* (stars); *S. leightoni* (circles); and *S. tamanae* (squares). White symbols showing type localitiy of each species. Each symbol can represent more than one locality.

Fig. 4. *Sturisomatichthys aureus*, neotype, ICNMHN XXXX, 151.0mm SL. Colombia, Cesar department, La Jagua de Ibiricó municipality, Lower Magdalena basin, Sororia Creek tributary of Tucuy River. Photo by Henry Agudelo (ICNMHN).

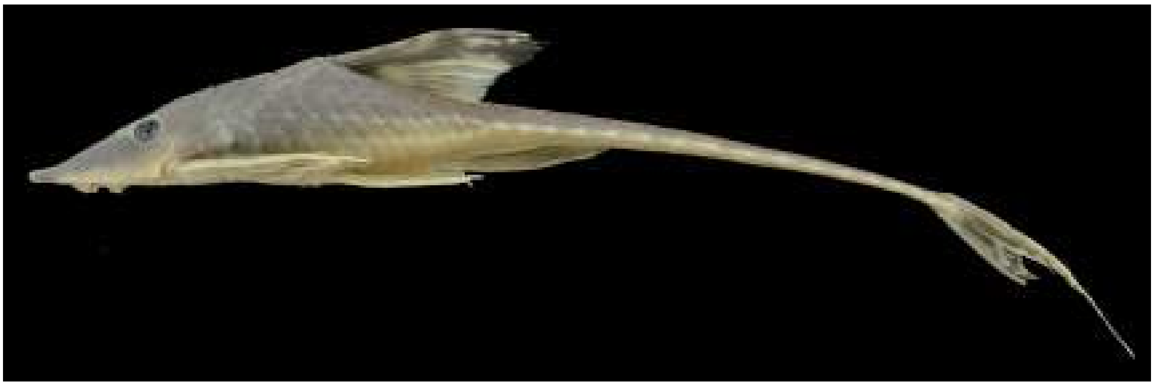

Fig. 5. *Sturisomatichthys aureus*, ICNMHN 9842, 160.8mm SL. Colombia, La Guajira department, Barrancas district, La Quebrada Creek, tributary of Ranchería River. Showing white ocelli on dorsal fin. Photo by Henry Agudelo (ICNMHN).

Fig. 6. *Sturisomatichthys caquetae*, holotype of *Harttia caquetae*, ANSP 71719, 90.0mm SL. Colombia, Caquetá department, Morelia municipality, Upper Amazon basin, Caquetá River. Photo by Kyle Luckenbill, ACSI Inventory Image Base.

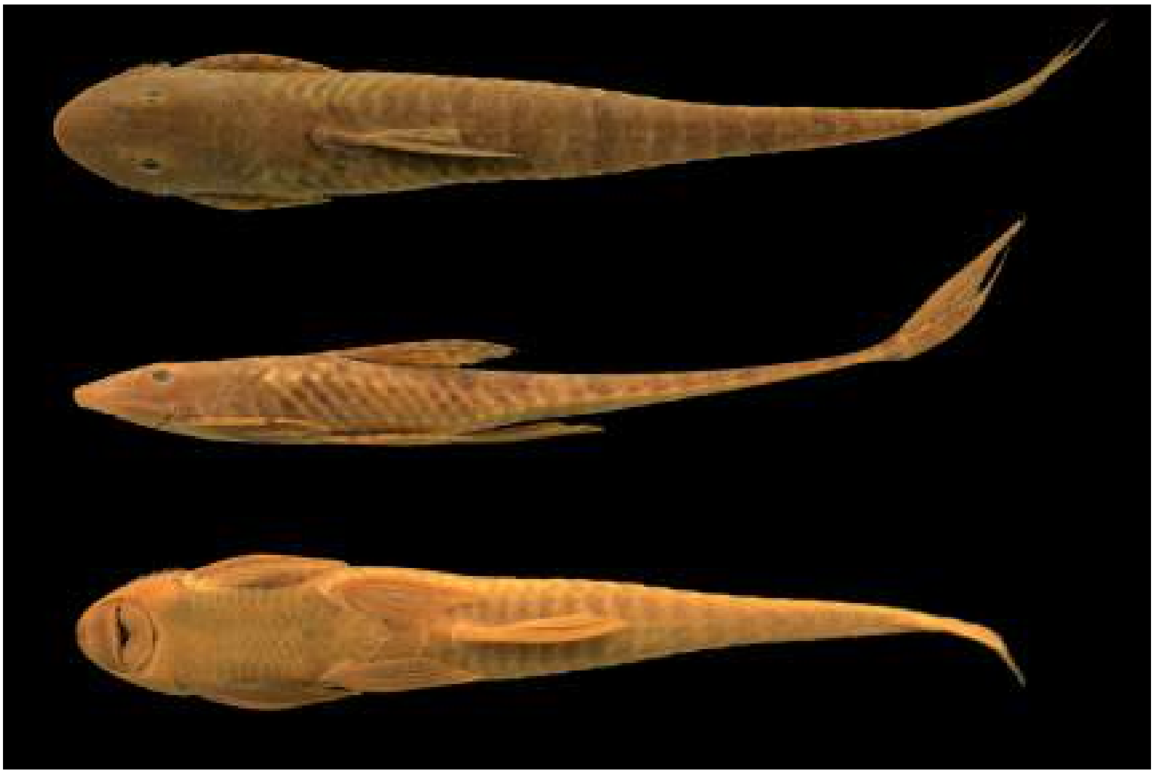

Fig. 7. *Sturisomatichthys citurensis*, USNM 78361, 196.3mm SL. Panama, Canal Zone, Darien Province at Aruza, Aruza River.

Fig. 8. *Sturisomatichthys dariensis*, STRI 8386, 206.0mm SL. Panama, Darien Province, Chucunaque River basin, Tupisa River, 08°12’4.6’’N 82°41’2.4’’W.

Fig. 9. *Sturisomatichthys festivus*, paratype of *Sturisoma festivum*, USNM 130637, 160.0mm SL. Venezuela, Trujillo state, Lake Maracaibo basin, Monay River, 35km north of Trujillo.

Fig. 10. *Sturisomatichthys festivus*, AUM 22138, 161.3mm SL. Venezuela, Zulia state, Lake Maracaibo basin, Escalante River basin, Onia River at El Padre Channel on road from highway 2 to town of Km35, 8.76161°N -71.76314°E(?).

Fig. 11. *Sturisomatichthys frenatus*, lectotype of *Loricaria frenata*, BMNH 1901.8.3.29, 232.4mm SL. Ecuador, Salidero, NW Ecuador, elevation 350 feet.

Fig. 12. *Sturisomatichthys frenatus*, MHNG 2674.055, 198.5mm SL. Ecuador, Esmeraldas state, Bogotá River at Carondelet.

Fig. 13. *Sturisomatichthys leightoni*, IUQ 2739, 87.6mm SL. Colombia, Valle del Cauca department, San Antonio de Piedras municipality, Upper Cauca River, Portugal de Piedras River, 4°03’45’’N 76°18’45’’W 944masl. Photo by Aura María Bastidas Quintero (IUQ).

Fig. 14. *Sturisomatichthys panamensis*, USNM 293412, 207.4mm SL. Panama, Darien Province, Tuira River between Calle Larga and Pinogana, above El Real, Pacific slope.

Fig. 15. *Sturisomatichthys tamanae,* CAS 77238, 211.4mm SL. Colombia, Chocó department, Puerto Negria and Istmina municipalities.

Fig. 16. *Sturisomatichthys* Baudó, holotype, NRM XXXX, 199.0mm SL. Colombia, Chocó department, Baudó River drainage, Boca de Pepé, various tributaries and river close to village, -8°59’4’’N 77°3’W.

Fig. 17. *Sturisomatichthys* San Juan, holotype, CAS XXXX, 190.3mm SL. Colombia, Chocó department, San Juan River, Condoto River, an upper Eastern tributary of San Juan River.

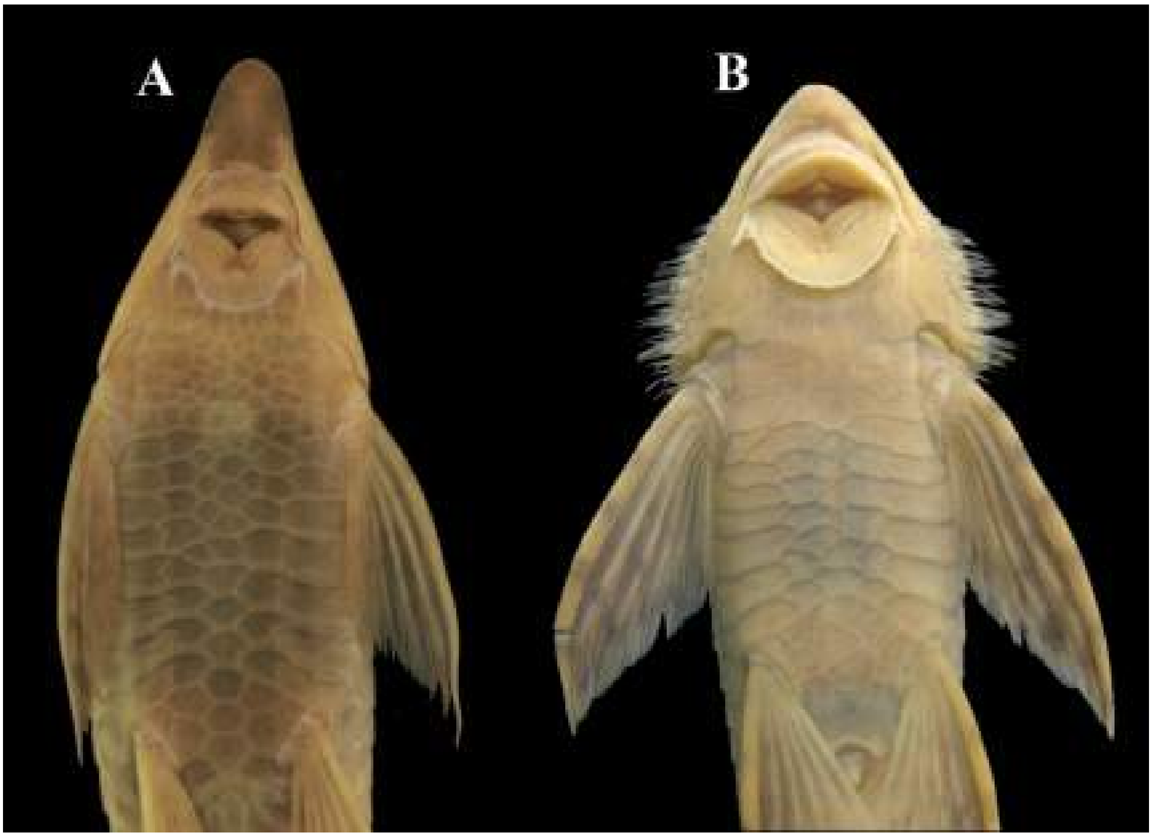

Fig. 18. Anterior ventral view of A. *Sturisoma* Madre de Dios, MUSM 58700,187.6 mm SL. Peru, Amazonas, Madre de Dios River basin, Picaflor Creek, at Pakitza guard post, Castanel Trail #12 to Caña Brava Trail #16. 11°49’60”S 71°20’59”W, and B. *Sturisomatichthys leightoni*, IUQ 2739, 87.6mm SL. Colombia, Valle del Cauca department, San Antonio de Piedras municipality, Upper Cauca River, Portugal de Piedras River, 4°03’45’’N 76°18’45’’W 944masl. Photo by Aura María Bastidas Quintero (IUQ). Showing difference regarding central abdominal plate organization between both genera.

CONCLUSÕES GERAIS

O presente estudo contribui ao conhecimento da sistemática da subfamília Loricariinae, especificamente aqueles gêneros alocados historicamente nas tribos Harttiini e Farlowellini. Num contexto filogenético tanto evidência morfológica como molecular de um total de 100 espécies de cascudos foram estudadas. Caracteres morfológicos tradicionais foram testados dentro deste grupo, ademais de serem propostos vários caracteres novos que ajudaram alcançar uma hipótese em relação a composição das tribos. Adicionalmente, novas sequencias de DNA para marcadores tanto nucleares como mitocondriais para a subfamília Loricariinae foram gerados, e serão incluídos no servidor GenBank em breve para o livre acesso de pesquisadores. A presente análise foi realizada usando a metodologia Cladística sob uma abordagem de Evidência Total, ademais de uma análise de Inferência Bayesiana. Estas análises apresentaram a tribo Harttiini *sensu* Isbrücker como parafilética, e é proposta aqui estar composta por *Harttia*, *Harttiella* e *Cteniloricaria*. Adicionalmente, Farlowellini é proposta estar constituído por *Farlowella*, *Lamontichthys*, *Pterosturisoma*, *Sturisoma* e *Sturisomatichthys*. *Aposturisoma*, gênero monotípico, é proposto como sinônimo junior de *Farlowella*, e uma nova combinação da sua espécie é proposta como *Farlowella myriodon*. As relações intraespecíficas dos gêneros propostos como validos em este estudo foram resolvidas. *Harttia* apresenta um clado de espécies das Guianas que pode resultar num grupo diferenciado de *Harttia* como um novo gênero, mas essa mudança taxonômica não foi proposta no presente estudo. As relações intraespecíficas de *Sturisoma* não foram totalmente resolvidas. Apesar do gênero ser encontrado como monofilético, suas relações intraespecíficas ainda precisam de mais estudo. *Sturisomatichthys* inclui suas espécies *sensu stricto* ademais das espécies transandinas de *Sturisoma sensu lato*, enquanto *Sturisoma* está constituído por espécies cisandinas *sensu lato*. No caso de *Sturisomatichthys citurensis* e *S. tamanae*, aparecem como um clado bem resolvido e como parte de *Sturisomatichthys*, mas podem constituir um grupo diferente do gênero, uma mudança taxonômica das espécies não foi proposta aqui. Loricariinae é aqui proposta estar conformada pelas tribos Harttiini, Farlowellini, Loricariini e Metaloricariini, sendo uma nova classificação da subfamília. Chaves de identificação para os gêneros de Harttiini e Farlowellini foram construidas.

Adicionalmente, uma revisão taxonômica de *Sturisomatichthys* é apresentada. *Sturisomatichthys* abrange 12 espécies válidas: *Sturisomatichthys aureus*, *S. caquetae*, *S. citurensis*, *S. dariensis*, *S. festivus*, *S. frenatus*, *S. kneri*, *S. leightoni*, *S. panamensis*, *S. tamanae*. Além disso, duas novas espécies são descritas, *Sturisomatichthys* Baudó n.sp. do rio Baudó, no noroeste da Colômbia, pertencente à vertente Caribe do continente, e *Sturisomatichthys* San Juan n.sp. da bacia do rio San Juan, no oeste da Colômbia, na vertente do Pacífico. *Sturisomatichthys caquetae*, do rio Morelia, alto Amazonas, é transferida de *Sturisoma* e *S. leightoni* foi encontrada estar distribuída, além da bacia Magdalena-Cauca, na bacia do rio Orinoco. Assim, descobriu-se que *Sturisomatichthys* é distribuído em drenagens trans e cis-andinas. Um neotipo é designado para *S. aureus*, do baixo rio Magdalena, localidade tipo da espécie. Foram encontrados novos registros de localidades na região noroeste da América do Sul para o gênero. Redescrições e comentários taxonômicos de todas as espécies válidas, assim como mapas com a distribuição do gênero e uma chave de identificação das espécies, foram fornecidos.

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Tables (numbered in Arabic) must each appear with a short heading beginning "Table x" and be double-spaced, use bold font and title capitalization, and have no associated graphics or vertical lines. Tables must be numbered consecutively in the order of their reference in the text; citation style is "(Table 1)". Tables must not be submitted as images. Word or Excel files are preferred.

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