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CAMPUS DE SÃO JOSÉ DO RIO PRETO

Revisão Taxonômica de *Bryconamericus iheringii* (Boulenger, 1887) (Characiformes: Characidae)

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“Cada coisa tem sua hora

e cada hora seu caminho”

Rachel de Queiroz

“Morrer é quase nada,

horrível é não viver”

Vitor Hugo

“Podemos escolher o que

semear, mas somos

obrigados a colher aquilo

que plantamos”

Provérbio Chinês

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Apresentação

A presente dissertação está estruturada consoante as normas do Programa de Pós-Graduação em Biologia Animal da Universidade Estadual Paulista, Campus de São José do Rio Preto (artigo 29, § 1°).

A dissertação está organizada em três capítulos: o primeiro - Introdução Geral: O gênero *Bryconamericus* Eigenmann - traz um breve comentário sobre o atual conhecimento taxonômico e sistemático do gênero e não será submetido para publicação; o segundo - Taxonomic Revision of *Bryconamericus iheringii* (Boulenger, 1887) (Characiformes: Characidae) with description of a new species to the Upper rio Paraná basin in Brazil - contempla as análises das populações de *Bryconamericus iheringii* em suas áreas de distribuição e o reconhecimento de uma nova espécie do sistema do Alto rio Paraná; o terceiro - A new species of the Genus *Bryconamericus* Eigenmann (Characiformes: Characidae) from rio São Francisco and Upper rio Paraná basins - descreve uma nova espécie de *Bryconamericus* das drenagens dos rios São Francisco e Alto Paraná, analisada no material comparativo.

O segundo e terceiro capítulos estão estruturados em forma de artigo científico redigidos em inglês, sendo apresentados um resumo em português, as figuras e tabelas estão ao final de cada capítulo e serão encaminhados a Neotropical Ichthyology e Zootaxa, respectivamente.

Capítulo 1

Introdução Geral:

O Gênero *Bryconamericus* Eigenmann

O Gênero *Bryconamericus* na Família Characidae

Dentro da ordem Characiformes, a família Characidae constitui o grupo mais diverso e abundante de vertebrados atuais na região Neotropical, distribuído pelas Américas do Sul e Central, África, México e sudoeste do Texas. Estimativas de Nelson (1994) indicavam cerca de 170 gêneros e mais de 885 espécies. Quase dez anos depois, Reis *et al.* (2003) contabilizaram para Characidae 12 subfamílias, 88 gêneros *incertae sedis*, 952 espécies descritas e 400 espécies conhecidas, mas não descritas (num total de 1352 spp). Loricariidae, a maior família da Ordem Siluriformes, tem 673 spp descritas e 300 spp conhecidas, mas não descritas (num total de 973 spp). Além da alta diversidade, Characidae também é a mais complexa das famílias, abrangendo um grande número de subfamílias com características bastante distintas uma das outras, que chegam a receber o *status* de família por alguns autores (Britski *et al.*, 1999). O número de gêneros *incertae sedis* quanto ao *status* de subfamília dentro da família é elevado (88 gêneros e 620 espécies) e constitui um agrupamento bastante heterogêneo de peixes de pequeno a grande porte, muitos deles anteriormente incluídos em Tetragonopterinae (Lima *et al.*, 2003), que atualmente é composto por apenas duas espécies do gênero tipo: *Tetragonopterus argenteus* Cuvier, 1816 e *T. chalceus* Spix & Agassiz, 1829 (Reis, 2003).

Bryconamericus Eigenmann (in Eigenmann *et al.*, 1907), cuja espécie-tipo é *Bryconamericus exodon*, é um dos gêneros mais numerosos de Characidae, faz parte de um agrupamento hipoteticamente monofilético dentro da família (Malabarba & Weitzman, 2005) e conta com cerca de 68 espécies válidas; seus representantes são de porte reduzido e estão distribuídos na maioria dos rios das Américas do Sul e Central, da Costa Rica até a Argentina (Lima *et al.*, 2003; Froese & Pauly, 2005). A maior diversidade do gênero ocorre nas drenagens atlânticas do continente, em particular na

bacia Amazônica (Vari & Siebert, 1990). Segundo Géry (1977), é um dos gêneros menos diferenciados: as espécies são muito próximas umas das outras, divergindo apenas em detalhes mínimos, e os padrões de colorido são especialmente invariáveis: predominantemente prateados com mancha umeral e uma faixa lateral escura, prateada em vida, que se estende até os raios caudais medianos.

Definição do Gênero e Propostas de Agrupamentos

A atual definição do gênero consiste na combinação de caracteres propostos por Eigenmann (1927) e modificada por Vari & Siebert (1990): pré-maxilar com duas séries de dentes, a série interna com quatro dentes maiores que aqueles da série externa, série única no dentário, poucos dentes maxilares, uma maxila superior levemente curvada, ausência de escamas na nadadeira caudal, terceiro infraorbital amplo e em contato com pré-opérculo ao longo de suas margens ventral e posterior, rastros branquiais setiformes, linha lateral completa e a ausência de bolsa glandular na nadadeira caudal dos machos. Esta definição, assim como definições estabelecidas para muitos gêneros em Characidae provavelmente não delimita um grupo natural e conduz a questionamentos sobre o monofiletismo do gênero (Malabarba & Weitzman, 2003; Vari & Siebert, 1990; Malabarba & Malabarba, 1994; Malabarba & Kindel, 1995; Fink, 1976). Apesar de os autores serem unânimes em afirmar que o gênero não é natural e que não há nenhuma evidência de que dentro dessa definição corrente não possam estar alocadas espécies mais relacionadas filogeneticamente a outros gêneros dentro de Characidae, autores recentes (*e.g*. Vari & Siebert, 1990; Malabarba & Kindel, 1995; Braga, 1998; Román-Valencia, 2000; Azpelicueta & Almirón, 2001; Casciotta *et al.*, 2002; Azpelicueta *et al.*, 2003; Casciotta *et al.*, 2004; Langeani *et al.*, 2005) têm utilizado a definição para a descrição de novas espécies.

Géry (1977) divide o gênero em dois grupos artificiais, que podem ser formados de acordo com o comprimento da nadadeira anal, a qual é mais ou menos correlacionada com o número de escamas transversais: grupo *diaphanus,* com 15 a 25 raios totais na nadadeira anal e 4 a 6 escamas transversais acima da linha lateral; e grupo *peruanus*, no qual os raios da nadadeira anal são mais numerosos (geralmente 25- 43), assim como as escamas transversais (6- 9 acima da linha lateral). O próprio Géry assume a artificialidade de sua divisão, exemplificando *Bryconamericus thomasi* que pode ser atribuído tanto a um dos grupos, pelo número de raios anais, como a outro, pelo número de escamas transversais.

Malabarba & Weitzman (2003) incluem *Bryconamericus* em um grupo monofilético dentro de Characidae, o Clado A, pela posse de nadadeira dorsal com dois raios indivisos e oito raios ramificados, quatro dentes na série interna do pré-maxilar, características consideradas pelos autores como derivadas. Esse grupo inclui, além dos representantes da subfamília Glandulocaudinae, a maior parte dos caracídeos com boca ventral. Esse clado, segundo seus autores, é bastante similar à subtribo Hemibryconini de Géry (1966), a qual é considerada monofilética pelo autor, e seus representantes são caracterizados pela presença de quatro dentes na série interna do pré-maxilar, associada com um grande desenvolvimento do terceiro infra-orbital e, muito freqüentemente, à implantação irregular de dentes externos do pré-maxilar.

Bryconamericus como Grupo Monofilético

Román-Valencia (2000) considera *Bryconamericus* como um grupo válido e natural de Characidae se incluídos os gêneros *Knodus* e *Eretmobrycon* como sinônimos e considera também o gênero *Hemibrycon* como grupo-irmão de *Bryconamericus* sem

apresentar, porém, nenhuma evidência filogenética que suportasse sua hipótese (Román-Valencia, 2000 e 2003).

Malabarba & Weitzman (2003) afirmam que *Bryconamericus* no *sensu* atual, juntamente com outros grandes gêneros de Characidae (e.g. *Astyanax* Baird & Girard, *Hyphessobrycon* Durbin e *Hemigrammus* Gill) seja sem dúvida um grupo poli ou parafilético; e apesar de não haver evidências de relacionamento maior de algumas de suas espécies com outros gêneros, também não existem sinapomorfias para as espécies atribuídas ao gênero. O próprio Eigenmann (1927) comenta que há três ou quatro grupos no gênero *Bryconamericus* e estes podem ter derivado independentemente de diferentes espécies de *Astyanax* e *Hemibrycon*. Géry (1977) afirma em sua obra que as 30-40 espécies de *Bryconamericus* semelhantes às espécies de *Hemibrycon*, das quais provavelmente evoluíram (muitas das formas se parecem com juvenis de *Hemibrycon*), necessitam de revisão. Parece haver um consenso entre diversos autores, incluindo Eigenmann, quem propôs o gênero, de que há relativo parentesco entre *Bryconamericus* e *Hemibrycon*.

Situação Taxonômica de *Bryconamericus iheringii* (Boulenger, 1887)

Bryconamericus iheringii foi originalmente descrita por Boulenger (1887:172-173) como *Tetragonopterus iheringii*. A espécie apresenta grande semelhança morfológica com diversas espécies, como *B. eigenmanni*, *sensu* Malabarba & Kindel, 1995:684, *B. thomasi*, *sensu* Miquelarena & Aquino, 1995:567, *B. rubropictus*, *sensu* Braga, 2000:150, *B. sylvicola*, *sensu* Braga, 1998:27 e *B. ikaa*, *sensu* Casciotta *et al*., 2004:65 e possui como sinônimos *B. boops* Eigenmann, 1927 e *B. pliodus* (Cope, 1894). Adicionalmente, é uma espécie de ampla distribuição geográfica que ocorre em ambientes diversos da bacia do rio da Prata e sistema da Laguna dos Patos, em rios de

pequeno e grande porte, assim como em lagoas rasas e profundas (Casciotta *et al.*, 2002). Na divisão de Géry (1977), *B. iheringii* encaixa-se no grupo *diaphanus* (Miquelarena, Protogino, Filiberto & López, 2002).

Com base em evidências de que as populações de *B. iheringii* apresentam diferenças significativas pelo menos na altura do corpo (Langeani *et al.*, 2005), foi realizado o estudo das populações de *B. iheringii*, que culminou com a redescrição da espécie e também descrições de duas novas espécies: uma para a drenagem do Alto rio Paraná e outra para as drenagens do rio São Francisco e Alto rio Paraná.

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Capítulo 2

Taxonomic revision of *Bryconamericus iheringii* (Boulenger, 1887) (Characiformes: Characidae) with description of a new species from Upper rio Paraná basin in Brazil

Abstract

Bryconamericus iheringii (Boulenger, 1887) is widespread in the La Plata river basin and Laguna dos Patos System. There is evidence however that *Bryconamericus* population from Upper rio Paraná basin previously identified as *B. iheringii* is different from *B. iheringii* described from Laguna dos Patos System, type-locality of the species, at least at the body depth. In this work we have analyzed the populations assigned to *B. iheringii* using morphometric, meristic and osteological data. Populations of *B. iheringii* from Laguna dos Patos System, Uruguay and Iguaçu rivers have presented significant differences with the population from Upper rio Paraná basin in several characters including body depth, but mainly in the eye diameter and in the presence of bony hooks on anterior branches of branched rays of anal fin. A redescription for *B. iheringii* is presented as well as a description of a new species from Upper rio Paraná basin and both are diagnosed from other congeneric species from La Plata river, rio São Francisco, Brazilian coastal drainages, and Laguna dos Patos System.

Resumo

Bryconamericus iheringii (Boulenger, 1887) é amplamente distribuída na bacia do rio da Prata e Sistema da Laguna dos Patos. Entretanto, há evidências de que a população de *Bryconamericus* do Alto rio Paraná, anteriormente identificada como *B.iheringii* seja diferente de *B. iheringii* descrita do Sistema da Laguna dos Patos, localidade-tipo da espécie, pelo menos na altura do corpo. Neste trabalho foram analisadas populações atribuídas a *B. iheringii* usando dados morfométricos, merísticos e osteológicos. Populações de *B. iheringii* do Sistema da Laguna dos Patos, rios Uruguai e Iguaçu, apresentaram diferenças significativas com as populações do Alto rio Paraná em diversos caracteres incluindo a altura do corpo, mas principalmente no

diâmetro do olho e na presença de ganchos ósseos nos ramos anteriores dos raios ramificados da nadadeira anal. A redescrição de *B. iheringii* é apresentada, bem como a descrição da nova espécie da bacia do Alto rio Paraná e ambas são diagnosticadas de outras espécies do rio da Prata, rio São Francisco, drenagens litorâneas brasileiras e Sistema da Laguna dos Patos.

Key-words: Ostariophysi, Neotropica, La Plata river basin, South America.

Introduction

The Characidae family is one of the most diverse and numerous group of vertebrates in the Neotropical region (Lima *et al.*, 2003). Moreover its great diversity, the group also presents a great complexity and an elevated number of *incertae sedis* taxa.

Bryconamericus Eigenmann (*in* Eigenmann *et al.*, 1907) is one of the most speciose genera within Characidae, with about 68 small-sized species, popularly known as lambaris or piabas, and spread on the majority of South and Central America rivers and streams, from Costa Rica to Argentina (Lima *et al.,* 2003; Froese & Pauli, 2005).

The current definition of the genus consists of a combination of characters proposed by Eigenmann (1927) and modified by Vari & Siebert (1990): premaxilla with two rows of teeth, the inner with four teeth larger than those of outer row; dentary with a single row of teeth; few maxillary teeth; upper jaw gently curved; lack of scales on caudal fin; third infraorbital large, contacting preopercle along its ventral and posterior margins; setiform gill rakers; complete lateral line and absence of a glandular pouch on caudal fin of males. This definition does not delimit a natural group, and carries to questions about the monophyly of the genus (Vari & Siebert, 1990; Malabarba & Malabarba, 1994; Malabarba & Kindel, 1995; Malabarba & Weitzman, 2003; Silva, 2004). Despite the unanimity of those authors in assert the non-monophyly of the genus

and also the lack of evidence that within this current definition there are no species hypothesized as phylogenetically related to other genera in Characidae, recent authors (*e.g*. Vari & Siebert, 1990; Malabarba & Kindel, 1995; Braga, 1998; Román-Valencia, 2000; Azpelicueta & Almirón, 2001; Casciotta *et al.*, 2002; Miquelarena *et al.*, 2002; Azpelicueta *et al.*, 2003; Román-Valencia 2003; Casciotta *et al.*, 2004; Silva, 2004; Langeani *et al.*, 2005) continue to use this definition to assign new species to the genus.

Bryconamericus iheringii, originally described by Boulenger (1887:172-173) as *Tetragonopterus iheringii*, presents great morphological similarity with several other recent described species, e.g. *B. eigenmanni sensu* Malabarba & Kindel, 1995:684, *B. thomasi sensu* Miquelarena & Aquino, 1995:567, *B. rubropictus sensu* Braga, 2000:150, *B. sylvicola sensu* Braga, 1998:27, and *B. ikaa sensu* Casciotta *et al*., 2004:65; *B. boops* Eigenmann, 1927 and *B. pliodus* (Cope, 1894) have been considered junior synonyms. Additionally, it is a species with large geographical distribution occurring in different environments of La Plata river basin and Laguna dos Patos System, from large to small rivers and streams as well as in shallow and deep ponds (Casciotta *et al.*, 2002). Based on some evidences that populations of *B. iheringii* present significant differences (Langeani *et al.*, 2005), the present study aimed to analyze its populations, to redescribe the species and to describe the putative new species from Upper rio Paraná.

Material and Methods

Specimens examined belong to the following collections: Departamento de Zoologia de São José do Rio Preto, São José do Rio Preto, SP (DZSJRP); Instituto de Limnologia "Dr. Raul Ringuelet", Buenos Aires (ILPLA); Laboratório de Ictiologia de Ribeirão Preto, Universidade de São Paulo, Ribeirão Preto, SP (LIRP); Museu de Ciências e Tecnologia da Pontifícia Universidade Católica do Rio Grande do Sul, Porto

Alegre, RS (MCP); Museu Nacional do Rio de Janeiro, Rio de Janeiro, RJ (MNRJ); Museu de Zoologia da Universidade de São Paulo, São Paulo, SP (MZUSP), and Universidade Federal do Rio Grande do Sul, Porto Alegre, RS (UFRGS).

When comparative specimens were not available, we have used original descriptions of these species or taxonomic revisions. Comparisons with *B. agna* Azpelicueta & Almirón; *B. ecai* Silva, 2004; *B. eigenmanni* (Evermann & Kendall, 1906); *B. patriciae* Silva, 2004; *B. pyahu* Azpelicueta, Casciotta & Almirón, 2003, *B. rubropictus* (Berg, 1901); *B. sylvicola* Braga, 1998; *B. tenuis* Bizerril & Auraujo, 1992 and *B. uporas* Casciotta, Azpelicueta & Almirón, 2002 were based on Azpelicueta & Almirón (2001), Silva (2004), Azpelicueta *et al.* (2003), Miquelarena & Aquino (1999), Braga (1998, 2000), Bizerril & Auraujo (1992) and Casciotta *et al.* (2002). Other species compared were listed in Comparative Material.

Specimens from the entire area of distribution previously assigned to *B. iheringii* were analyzed. Measurements and counts were done, always as possible, at least on 30 specimens of each population.

Measurements and counts followed Vari & Siebert (1990) and Azpelicueta & Almirón (2001), except for distance between dorsal and anal fins and distance between dorsal and pectoral fins that followed Román-Valencia (2000). Specimens were measured and counted in the left side, unless this side was damaged. Each specimen received a label with a distinctive number. Measurements are straight-line distances taken point-to-point with digital calipers to 0.1mm precision and expressed as standard length percentages, except subunits of head, which are expressed as percentages of head length. Measurements: Standard length (SL), anterior tip of snout to hypural joint; Body depth, always taken on the dorsal fin origin; Predorsal length, anterior tip of snout to dorsal fin origin; Snout to pectoral fin insertion, anterior tip of snout to pectoral fin

insertion; Preventral distance, anterior tip of snout to pelvic fin insertion; Preanal length, anterior tip of snout to anal fin origin; Dorsal fin to hypural, dorsal fin origin to hypural joint; Dorsal-Anal, dorsal fin origin to anal fin origin; Dorsal-pectoral distance, dorsal fin origin to pectoral fin insertion; Dorsal base, distance between first and last dorsal fin rays; Pectoral length, longest pectoral fin ray length; Pelvic length, longest pelvic fin ray length; Anal base, distance between first and last rays of anal fin; Dorsal length, longest dorsal fin ray (s) length; Caudal peduncle depth, minor depth between dorsal and ventral edges of caudal peduncle; Head length (HL), anterior tip of snout to posterior margin of opercular flap; Pectoral-Pelvic distance, pectoral fin insertion to pelvic fin insertion; Pelvic-Anal distance, pelvic fin insertion to anal fin origin; Snout length, anterior tip of snout to anterior eye border; Orbital diameter, taken at the middle line between anterior and posterior bony margins of orbit; Head depth, taken on posterior tip of occipital process; Postorbital length, from the posterior margin of eye to border posterior of opercle; Caudal peduncle length, end of anal fin to caudal fin base; Upper jaw length, anterior tip of snout to posterior portion of maxillary bone; Interorbital width, minor distance between superior bony margins of the orbits.

Counts were made with the aid of a stereomicroscope and a dissection needle. Anal fin rays were counted following Miquelarena & Aquino (1995), considering the last ray, divided on its base, as a single element. In the species description unbranched rays are presented by lower-case roman numerals and branched rays by arabic numerals. Counts: Lateral line scales; scales between lateral line and dorsal fin; scales between lateral line and anal fin; scales between lateral line and pelvic fin; predorsal scales; dorsal fin rays; anal fin rays; pelvic fin rays; pectoral fin rays; scales of anal fin sheath; outer premaxillary teeth; maxillary teeth; dentary large teeth; dentary small teeth; scales around caudal peduncle; caudal fin rays. In *B. iheringii* redescription and

Bryconamericus sp. n. 1 description the mode of fin rays are presented between parentheses after range variation.

Osteological examination was made in 12 specimens cleared and stained following Potthoff (1984) to count tooth cusps, ribs, gill rakers, branchiostegal rays, vertebrae, procurrent rays and caudal-fin rays; and to describe bony hooks on pelvic and anal fins. Osteological nomenclature follows Weitzman (1962).

Body proportions and counts were submitted to statistical basic tests: minimum, maximum, mean and standard deviation for the morphometric data; mode, minimum and maximum for the meristic data.

Morphometric characters were analyzed by Size-independent Canonical Variates Analysis (CVA) using the software SAS 9.1.3 Box plot graphs and a similarity dendrogram among populations were made with software Past 1.32 (Hammer *et al.*, 2005). The similarity dendrogram resulted from estimate of Euclidean distance and was made from values of mean of populations' morphometric characters centroid. Kruskal Wallis statistical tests were made with software BioEstat 3 (Ayres *et al.*, 2003).

The examined material lists are arranged in the following order: museum acronym and number, number of observed specimens separated by bar from total number of specimens, standard length range, country, county, river or stream's name, drainage (when available), state, geographical coordinates (when available), collector (only to type-series) and date. County, river's name, drainage, state and collector are in vernacular. Order of localities is still arranged by drainages and within drainages in alphabetical order of museum and crescent order of registration number.

Bryconamericus iheringii (Boulenger, 1887)

Figs. 1-3.

Tetragonopterus iheringii Boulenger, 1887: 172. Type-locality: San Lorenzo, Rio Grande do Sul. Brazil, [Rio Grande do Sul, São Lourenço do Sul]. Lectotype: BMNH 1886.3.15.30, designated by Malabarba & Kindel (1995: 679).

Tetragonopterus fasciatus Steindachner (*non* Cuvier), 1869, 9, p.8, pl. 3, fig. 1 (Montevideo).

Astyanax iheringii (Evermann & Kendall (in part), 1906, 31, p. 82 (Rio Primero); Fowler, 1906, p. 347; Eigenmann & Ogle, 1907, 33, p. 19; Eigenmann, 1907, 4, p. 138.

Bryconamericus iheringii Eigenmann, 1910, 3, p. 434.

Tetragonopterus obscurus Eigenmann (*non* Hensel), 1894, 7, p. 635.

Tetragonopterus pliodus Cope, 1894: 90, pl. 5 (fig. 5). Type-locality: Rio Grande do Sul. Restricted to Laguna dos Patos system, Brazil by Malabarba (1989). Synonymized with *B. iheringii* by Eigenmann, 1927: 377. Lectotype: ANSP 21578, designated by Fowler (1906: 347).

Bryconamericus boops Eigenmann, 1908: 105. Type-locality: Maldonado (Uruguay). Holotype: MCZ 20700. Malabarba & Kindel, 1995: 684. (Considered holotype as abnormal specimen of *Bryconamericus iheringii*).

Bryconamericus iheringii. Eigenmann, 1927: 359, 360, 375, 377, pl. 75 figs. 9a, 9b, 10; pl. 90 figs. 3 and 4; 378, 379 (identification key, comparison with *B. cismontanus*, diagnosis and description, synonymy). Géry, 1977: 387 (identification key). Miquelarena, 1977: 137, 139 fig. 1c (caudal osteology). Miquelarena & Aramburú, 1983: 491, 493, 495, 496, 499, 507, 508, 511 (comparison with *Gymnocharacinus bergi* and osteology). Malabarba, 1989: 131 (synonym list of *B. iheringii*).

Malabarba & Malabarba, 1994: 23, 24 (examination of type series and recent collected specimens, close relationship with *Hypobrycon*). Bizerril & Peres-Neto, 1995: 22 (geographical distribution). Malabarba & Kindel, 1995: 679, 680, 681 tab. 2; 683 fig. 2; 682 (designation of lectotype and paralectotypes, senior synonym of *B. boops* and *B. pliodus*). Miquelarena & Aquino, 1995: 559, 560, 562 fig. 2; 565 fig. 4 and 5; 566, 567, 568 (morphological similarity with *B. thomasi*, geographic distribution, possible synonymy, sexual dimorphism, comparative species). Braga, 1998: 26, 27 (geographic distribution and comparison with *B. sylvicola*). Miquelarena & Aquino, 1999: 523, 524, 527, 529 (comparison with *B. eigenmanni*). Braga, 2000: 150 (misidentification of *B. rubropictus*). Azpelicueta & Almirón, 2001: 280, 281 (comparison with *B. agna*). Casciotta *et al.*, 2002: 161, 163, 164 (comparison with *B. uporas* and identification key). Miquelarena *et al.*, 2002: 74 (comparison with *B. mennii*). Azpelicueta *et al.*, 2003: 587 (comparison with *B. pyahu*). Casciotta *et al.*, 2004: 64, 65 (comparison with *B. ikaa*). Silva, 2004: 55, 56, 58, 59 (occurrence in South America as valid species and comparison with *B. ecai* and *B. patriciae*). Weitzman *et al.*, 2005: 345, 346 fig. 12 (plesiomorphic state of caudal squamation and its comparison with *Knodus meridae*). Langeani *et al.*, 2005: 389 (comparison with *B. turiuba* and difference between populations from Laguna dos Patos System and Alto Paraná basin).

Examined material: Iguaçu: DZSJRP 5452, 3, 33.2-37.7mm SL, Brazil, Volta Grande, riacho afluente do rio Preto, SC-422 (terra), rio Iguaçu, SC, 26º14'00"S 49º34'44"W, 31/ Oct/ 2002; DZSJRP 5461, 2, 37.5-44.0mm SL, Brazil, Porto Vitória, rio Espingarda, abaixo da cachoeira, BR-280 na entrada da cidade, rio Iguaçu, PR, 26º9'44"S 51º13'22"W, 1/ Nov/ 2002; MCP 13831, 35/ 459, 26-46.7mm SL, Brazil, Iguaçu, rio Iguaçu in Porto União, próximo a ponte férrea (sistema do alto rio Paraná),

SC, 26º14’00”S 51º04’00”W; MCP 14501, 1, 29.2mm SL, Brazil, Sudeste, rio Itajaí-Açu, próximo ao camping Paraíso (sistema costeiro), SC, 27º11’00”S 049º32’00”W, 22/ Feb/ 1991; **Uruguay:** MCP 10346, 8, 40.2-47.1mm SL, Uruguay, San José, Sudeste, Sierra Mahoma, 34º30’00”S 056º40’00”W, 11/ Dec/ 1982; MCP 19672, 15/ 61, 45.6-72.3mm SL, Brazil, rio Abaúna (afluente do rio Ligeiro - rio Uruguai), RS, 27º53’00”S 52º14’00”W; MCP 23167, 18, 29.4-52.1mm SL, Brazil, município de S. Francisco de Assis, rio Inhacunda in São Francisco de Assis a cerca de 500 metros acima da olaria, RS, 29º32’27”S 55º7’45”W, 08/ May/ 1999; MZUSP 41025, 40/ 45, 29.1-62.1mm SL, Brazil, rio Guarupá, estrada Uruguaiana-Guarai, limite dos municípios, rio Uruguai, RS, 22/ Jul/ 1986; **Laguna dos Patos System:** MCP 11188, 23, 20.9-46.2mm SL, Brazil, município de Jaguarão, rio Jaguarão na prainha próximo a foz do rio Telho (sistema leste do Rio Grande do Sul), RS, 32º31’S 53º27’W, 07/ Jan/ 1987; MCP 11492, 10/ 19, 37.1-47.6mm SL, Brazil, Mirim Oeste, arroio Xasqueiro, na estrada BR-116 entre Pelotas e Arroio Grande (sistema leste do Rio Grande do Sul), RS, 32º09’00” S 53º02’00”W; MCP 14590, 28/ 98, 22.1-47.2mm SL, Brazil, Patos Oeste, arroio da Viúva Tereza (ou arroio do Pinto, sistema leste do Rio Grande do Sul), RS, 31º22’00”S 51º58’00”W; MCP 15036, 15, 47.5-60.0mm SL, Brazil, município de Viamão, arroio do Fiúza, RS, 30º6’S 51º6’W; MCP 15840, 16, 33.2-69.6mm SL, Brazil, Guaíba, lago Guaíba na praia de Itapuã, próximo a foz do riacho Itapuã (Sistema da Laguna dos Patos), RS, 30º15’00”S 51º02’20”W; MCP 17352, 10/ 330, 46.6-55.8mm SL, Brazil, Minas do Leão, arroio Taquara, na fazenda da Lizete, estrada da Boa Vista, cerca de 5 km da estrada BR 290, drenagem Jacuí, RS, 30º9’S 52º2’W, 24/ Nov/ 1993; MCP 19293, 15/ 44, 32.2-48.1mm SL, Brazil, município de Barra do Ribeiro, lago Guaíba em Barra do Ribeiro, RS, 30º17’3”S 51º18’4”W, 05/ Oct/ 1996; MCP 20840, 6, 32.6-57.6mm SL, Brazil, município de Erval, Sanga afluente do arroio Arambaré (afluente do

rio Santa Maria - rio Piratini) entre Pedro Osório e Airosa Galvão, RS, 31º58'19"S 53º5'39"W, 15/ Nov/ 1997; MCP 23801, 5, 30.7-46.0mm SL, Brazil, município de Sentinela do Sul, arroio Faxinal, afluente do arroio Velhaco, na estrada de Cerro Grande do Sul para Camaquã, RS, 30º43'48"S 51º45'24"W, 26/ Jun/ 1999; MCP 25061, 20/ 57, 28.7-60.1mm SL, Brazil, município de Pedro Osório, arroio na estrada entre Pedro Osório e a localidade de Basílio (rio Piratini), RS, 31º53'43"S 52º53'30"W, 20/ Nov/ 1999; MCP 25155, 15, 34.1-45.3mm SL, Brazil, São Gonçalo, arroio a cerca de 10 km ao sul de Basílio na estrada entre Pedro Osório e a localidade de Basílio (rio Piratini), RS, 31º58'18"S 53º05'39"W; MCP 25889, 15/ 70, 28.6-63.2mm SL, Brazil, Camaquã, arroio da Cria, RS, 30º57'19"S 53º57'23"W; MCP 25935, 20/ 122, 36.3- 63.2mm SL, Brazil, Camaquã, arroio Hilário na estrada entre Caçapava do Sul e Lavras do Sul, RS, 30º46'03"S 053º48'23"W, 26/ Apr/ 2000; MCP 27264, 20/ 46, 34.4-70.2mm SL, Brazil, município de Candiota, arroio Candiota, logo a jusante da Usina Termoelétrica (CA04), RS, 31º34'36"S 53º40'22"W, 16/ Feb/ 2001; MCP 27307, 15/ 50, 37.6-50.5mm SL, Brazil, Jaguarão, arroio Candiota no passo do Cedro, próximo a confluência com o rio Jaguarão (CA07), RS, 31º49'57"S 53º51'19"W; MNRJ 11135, 24/ 204, 27.3-57.6mm SL, Brazil, Porto Alegre, estrada para Viamão Km 8 (Beco do Carvalho), 17/ Apr/ 1944; MNRJ 14299, 2, 30.5-61.8mm SL, Brazil, Caraá, rio dos Sinos, in Praia João Fernandes, cerca de 4 km NW de Vila Caraá, e 5 km a montante de Vila Rodolfo Tetour, RS, 12/ Jan/ 1995; MZUSP 18983, 17, 29.8-52.0mm SL, Brazil, rio Forqueta in Marquês de Souza, Município de Lajeado, RS, Expedição MZUSP-USNM, 07/ Dec/ 1979; MZUSP 25339, 18, 48.9-66.2mm SL, Brazil, Passo Fundo, rio Jacuí, Barragem de Ernestina, perto de Passo Fundo, RS, Expedição MZUSP/ USNM, 20/ Sep/ 1977; UFRGS 2540, 12, 22.2-48.4mm SL; Brazil, município de Camaquã, rio Camaquã, 5 km, RS, 01/ vi/ 1980.

Diagnosis: *Bryconamericus iheringii* can be recognized from all other species of the genus in La Plata river basin and adjacent drainages by the exclusive combination of the following characters: higher body depth (26.7-38.8% of SL), greater predorsal distance (50.1-58.0% of SL) and greater snout-anal fin distance (60.5-70.6% of SL), longer pelvic fin (14.4-19.3% of SL), short anal fin base (19.0-28.5% of SL), short snout (17.5-24.5% of HL), greater orbital diameter (30.3-40.8% of HL), short caudal peduncle (12.1-18.1% of SL), anal fin with 14-21 branched rays, presence of bony hooks on pelvic and anal fins of mature males, hooks restricted to posterior branches of branched rays of anal fin and subterminal mouth. Additional diagnostic characters are presented in discussion.

Description: morphometric values on Table 1. Body high and laterally compressed. Greatest body depth anterior to dorsal fin origin, rarely on dorsal fin origin. Dorsal profile of head from tip of upper lip to posterior nostril strongly convex, straight from this point to rear of head, slightly concave in larger specimens (up to 60.0 mm); slightly convex from tip of supraoccipital process to dorsal fin origin; almost straight from end of dorsal fin base to first caudal-fin rays; predorsal and dorsal regions of body rounded in transverse section.

Head ventral profile slightly convex from lower lip to vertical passing at posterior limit of maxilla, convex from this point to anal fin origin; prepelvic region rounded in transverse section, flattened next to pelvic insertion; base of anal fin straight; caudal peduncle almost straight, slightly concave ventrally.

Subterminal mouth extending to inferior margin of orbit; upper jaw distinctly longer than lower jaw; short maxillary extending almost to the core of orbit, but never reaching it; anterior and posterior nostrils very close, separated by membrane; anterior

opening circular and posterior half-moon shaped. Eye large, its diameter larger than snout length.

Fontanel well developed, conspicuous in alcohol preserved specimens; supraorbital absent; orbitosphenoid ventral process present in some specimens and absent in others; rhinosphenoid varying from completely ossified to totally cartilaginous; gill rakers in first arch 6-8 + 0-1 + 5-8 in seven cleared and stained specimens; 4 branchiostegal rays; infraorbital series with six bones, third largest and sixth smallest; first and second infraorbitals merged in one specimen; 4-6 supraneurals, most simple, some forked and rarely with lateral expansions; 12-14 ribs, 16-18 precaudal (including the four of Weber apparatus) vertebrae and 18 or 19 caudal; 11-15 superior procurrent rays and 9-13 inferior.

Premaxilla with two rows of teeth; outer row with three to six (mode = 4) tri, tetra or pentacuspid aligned teeth (few specimens with slightly non-aligned teeth); inner row always with four tri or pentacuspid teeth, larger than those of outer row, symphysial tooth narrower. Maxilla with one to six (mode = 3) tri or pentacuspid teeth reducing gradually in size posteriorly. Dentary with a single row of four or five (mode = 5) larger teeth, usually pentacuspid and rarely tricuspid, followed by one to six (mode = 4) smaller teeth, anterior tricuspid or pentacuspid, more commonly tricuspid, posterior teeth tricuspid or unicuspid (fig. 4).

Cycloid scales regularly imbricated. Lateral line slightly curved, with 32-40 (37 in lectotype; mode = 36) perforated scales; four to six (six on lectotype; mode = 5) scales on transverse series between dorsal fin origin and lateral line; three to five (mode = 4) scales on transverse series between pelvic fin origin and lateral line; four to six (mode = 5) scales on transversal series between anal fin origin to lateral line; 9-17 (12 in lectotype; mode = 12) scales along mid-dorsal line between supraoccipital process tip

and dorsal fin origin, usually in a regular series; 5-15 scales on anal fin sheath (mode = 8); 12 (1), 13 (16), 14 (holotype and 124), 15 (12), 16 (1) scales around caudal peduncle.

Dorsal fin rays i-iii, 7-8: i, 8 (3), iii, 8 (2) and ii, 8 (lectotype + 418). Posterior margin of dorsal fin straight, first unbranched ray about half-length of second unbranched ray and the first branched ray, these two the longest. Dorsal fin originating posteriorly of the median portion of body (predorsal distance 50.1-58% of SL), always posterior to the vertical through the pelvic fin insertion.

Anal fin rays i-iv, 11-21: i, 14 (1), ii, 19 (3), ii, 18 (1), ii, 20 (1), iii, 14 (1), iii, 15 (13), iii, 16 (70), iii, 17 (lectotype + 147), iii, 18 (106), iii, 19 (57), iii, 20 (9), iii, 21 (4), iv, 14 (1), iv, 15 (2), iv, 17 (2), and iv, 19 (1). Anal fin hooks on last unbranched ray and first to nine anterior branched rays; a pair of hooks per ray segment, located in the median portion of third to last segment, some on the inferior third of segment; hook's length not exceeding its width (ray width before first ramification); hooks on branched rays only on posterior branches. Anal fin margin distinctly concave anteriorly and straight posteriorly. Last unbranched ray and three anterior branched anal fin rays the longest and equal sized.

Pectoral fin rays i, 10-13: i, 10 (38), i, 11 (lectotype + 153), i, 12 (219), and i, 13 (29). Tip of pectoral fin usually not reaching pelvic fin insertion.

Pelvic rays i-ii, 5-9: i, 5 (2), i, 6 (4), i, 7 (lectotype + 195), i, 8 (12), ii, 7 (26), ii, 8 (3), and ii, 9 (1). A single series of pelvic hooks on three, six or all seven branched rays; six anterior rays with large hooks, larger than those of anal fin. Tip of pelvic fin reaching (83 specimens) or not (340 specimens) anal fin origin.

Adipose fin anterior portion around vertical through the base of last ray of anal fin. Caudal rays i, 8-9 superior and i, 8 inferior: i, 8 and i, 8 in one specimen, i,9 and i, 8

in lectotype and five cleared and stained specimens. Caudal fin forked, scaled only at base, rounded lobes with the same size.

Coloration in alcohol: Overall coloration yellowish or pale yellow; dorsal region dark brown, with more intense pigmentation; a dark mid-dorsal line; silvery body below superior third of body and opercle; silvery/dark longitudinal stripe starting on the head, on the first humeral spot or second humeral spot, very fine anteriorly and wide next to caudal peduncle, rarely with same thickness, extending to end of median caudal rays or just to caudal peduncle; anterior humeral spot dark, conspicuous and vertically elongated, aligned with fourth or fifth scales of lateral line; chromatophore concentration posterior to humeral spot, forming a second diffuse and triangular humeral spot; dorsal, anal and caudal fins slightly pigmented; pectoral and pelvic fins hyaline; first ray of dorsal, anal and caudal fins white in some specimens; chromatophores on margin of scales giving a reticulate pattern, more evident on dorsal region; chromatophores concentrated on dorsal portion of head, posterior part of opercle, above the anal fin, and above lateral line, usually absent on ventral region; caudal peduncle spot usually absent or diffuse, triangular in some populations.

Distribution: *B. iheringii* occurs on Laguna dos Patos System, Uruguay river and Iguaçu river basins.

Bryconamericus sp. n. 1

Fig. 5

Type-series: Holotype: DZSJRP 8318 (formerly DZSJRP 7900), 44.7mm SL, Brazil, Piracicaba, Bairro Costa Pinto, córrego Barro Frio, Baixo Corumbataí, P. Gerhard, SP, 05/ Nov/ 2003.

Paratypes: DZSJRP 3317, 27, 33.1-45.7mm SL, Brazil, Itatinga, ribeirão dos Veados, rio Paranapanema próximo à represa de Jurumirim, SP, R.J. de Castro, 1997; DZSJRP 3318, 74/ 98, 36.0-46.9mm SL, Brazil, Itatinga, Ribeirão dos Veados, rio Paranapanema, próximo à represa de Jurumirim, SP, R.J. de Castro, 1997; DZSJRP 3319, 13/ 15, 31.2-42.4mm SL, Brazil, Itatinga, ribeirão dos Veados, rio Paranapanema próximo à represa de Jurumirim, SP, R.J. de Castro, 1997; DZSJRP 3320, 9/ 15, 33.5-41.0mm SL, Brazil, Itatinga, ribeirão dos Veados, rio Paranapanema próximo à represa de Jurumirim, SP, R.J. de Castro, 1997; DZSJRP 3321, 10, 33.1-47.0mm SL, Brazil, Itatinga, ribeirão dos Veados, rio Paranapanema próximo à represa de Jurumirim, SP, R.J. de Castro, 1997; DZSJRP 7900, 38, 28.9-48.3mm SL, Brazil, Piracicaba, Bairro Costa Pinto, córrego Barro Frio, Baixo Corumbataí, P. Gerhard, SP, 05/ Sep/ 2003; DZSJRP 7901, 4, 41.5-45.1mm SL, Brazil, Rio Claro, Fazenda S. José - Haras, afluente da margem esquerda do ribeirão Claro, P. Gerhard, 29/ Jul/ 2004; DZSJRP 7902, 83/ 111, 24.8-54.3mm SL, Brazil, Corumbataí, Sítio Águas Claras, afluente do córrego do Jacú, P. Gerhard, 22/ Jan/ 2004; DZSJRP 7903, 24/ 25, 40.8-54.1mm SL, Brazil, Rio Claro, Bairro da Assistência, córrego dos Gonçalves, P. Gerhard, 09/ Jul/ 2003; MZUSP 64770, 1, 50.3mm SL, Brazil, Capão Bonito, ribeirão Taquaral na SP 139, Parque Estadual de Carlos Botelho; MZUSP 64773, 2, 46.5-54.8mm SL, Brazil, São Miguel Arcanjo, rio Taquaral na SP-139, Parque Estadual de Carlos Botelho, SP.

Diagnosis: *Bryconamericus* sp. n. 1 can be differentiated from all other species of genus by a unique combination of characters: a relatively high body (26.6-33.5% of SL), greater predorsal distance (50.8-57.9% of SL), greater snout-anal fin distance (61.2-69.1% of SL), greater dorsal fin-anal fin distance (29.0-35.6% of SL), longer pelvic fin (14.6-19.4% of SL), shorter anal fin base (19.4-27.2% of SL), orbital diameter relatively small (25.5-34.0% of HL), shorter upper jaw (26.5-35.5% of HL), outer row of

premaxillary teeth aligned, subterminal mouth, anal fin with 15-19 branched rays and presence of bony hooks on anterior and posterior branches of anal fin in males. More detailed diagnosis on discussion section.

Description: morphometric values on Table 2. Body high and laterally compressed. Greatest body depth anteriorly to dorsal fin origin and rarely on dorsal fin origin. Dorsal profile of head from tip of upper lip to posterior nostril strongly convex, straight from this point to rear of head; slightly convex from tip of supraoccipital process to dorsal fin origin; approximately straight from end of dorsal fin base to end of caudal peduncle; predorsal and post dorsal regions rounded in transverse section.

Head ventral profile slightly convex from lower lip to vertical passing at posterior limit of maxilla, convex from this point to anal fin origin; preventral region rounded in transverse section, flattened next to pelvic insertion; anal fin base straight; caudal peduncle approximately straight or slightly concave ventrally.

Mouth subterminal extending to inferior margin of orbit; upper jaw distinctly longer than lower jaw; short maxillary extending almost to orbit core, never reaching it; anterior and posterior nostrils very close, separated by membrane; anterior opening circular and posterior half-moon shaped; eye relatively small, orbit diameter slightly longer than snout length.

Fontanel well developed, conspicuous in alcohol preserved specimens; supraorbital absent; ventral process on orbitosphenoid bone present in some specimens, absent in others; rhinosphenoid completely or partially ossified; gill rakers on first arch: 5-7 + 1 + 4-6 in five cleared and stained specimens; 4 branchiostegal rays; infraorbital series with six bones, third largest and sixth smallest; 5-6 supraneurals, most simple, some with lateral expansions; 13 ribs, 17 precaudal (including four vertebrae of Weber apparatus) vertebrae and 18-19 caudal; 10-12 dorsal procurrent rays and 9-11 ventral.

Premaxilla with two tooth rows; outer row with two to six (five in holotype; mode = 4) tricuspid aligned teeth; inner row always with four tricuspid or pentacuspid teeth, usually first and rarely two anterior teeth tricuspid, symphysial tooth narrower, inner row teeth larger than those of outer row. Maxilla with two to six (five in holotype; mode = 4) tricuspid teeth, more posterior teeth tricuspid or unicuspid. Dentary with a single row of four or five (five in holotype; mode = 5) larger tricuspid or pentacuspid teeth, followed by two to eight (four in holotype; mode = 4) smaller unicuspid or tricuspid teeth, rarely pentacuspid; more posterior ones usually unicuspid teeth (fig. 6).

Cycloid scales regularly imbricated. Lateral line slightly curved, with 32-39 (36 in holotype; mode = 36) perforated scales; five or six (five in holotype; mode = 5) scales in transverse series between dorsal fin and lateral line; four or five (four in holotype; mode = 4) scales in transverse series between pelvic fin and lateral line; four or five (five in holotype; mode = 5) scales in transverse series between anal fin and lateral line; 10-17 (12 in holotype; mode = 12) scales along mid-dorsal line between supraoccipital process and dorsal fin origin, not always forming regular series; anal-fin sheath with 4-11 (8 in holotype; mode = 7) scales; 13-14 (14 in holotype; mode = 14) scales around caudal peduncle, 13 in three specimens and 14 in 61 specimens.

Dorsal-fin rays i-ii, 8-9: i, 8 (1), ii, 9 (1), and ii, 8 (holotype + 279); dorsal fin not reaching adipose fin when adpressed. Posterior margin of dorsal fin straight; first unbranched ray about half-length of second unbranched and first branched rays, these two the longest ones. Dorsal fin originating posteriorly to median portion of body (predorsal distance 50.8-57.9% of SL), always posterior to the vertical at pelvic-fin insertion.

Anal-fin rays ii-iv, 13-19: ii, 15 (2), ii, 16 (1), ii, 17 (3), iii, 15 (9), iii, 16 (50), iii, 17 (129), iii, 18 (holotype + 76), and iii, 19 (12). Anal fin margin distinctly concave

anteriorly and straight posteriorly. Last unbranched ray and three anterior branched rays the longest and equally sized. Males with a pair of bony hooks per segment (from second to last) on last unbranched ray and 5-12 anterior branched rays; hook length exceeds or not its width before first ramification; hooks on anterior and posterior branches. Anterior branches with hooks on the six anterior rays, one to four hooks in pairs or single, smaller and less numerous than in posterior branches (Fig. 7).

Pectoral-fin rays i, 10-13: i, 10 (41), i, 11 (177), i, 12 (holotype + 62), and i, 13 (1). Tip of pectoral fin not reaching pelvic insertion.

Pelvic-fin rays i-ii, 4-8: i, 4 (1), i, 6 (2), i, 7 (holotype + 244), ii, 6 (1), ii, 7 (32), and ii, 8 (1). Tip of pelvic fin can reach (holotype and 37 specimens) or not (244 specimens) anal fin origin. Bony hooks on unbranched ray (one specimen) and all seven branched rays in single series and on anterior and posterior branches (one per segment); more conspicuous than anal fin hooks.

Adipose fin present, its origin located near vertical at last anal-fin ray base. Caudal-fin rays i, 9 superior and i, 8 inferior; caudal fin forked, scaled only at base, rounded lobes with same size.

Coloration in alcohol: Body yellowish, dorsal region dark brown with more intense pigmentation; ventral region and opercle silvery; scale margins with concentrated chromatophores, giving a reticulate pattern to the body; humeral spot dark vertically elongated, wider on upper portion, and narrow ventrally with diffuse border; a second humeral spot very diffuse, formed by chromatophore concentration; dark/silvery longitudinal stripe extending from second humeral spot to the end of median caudal fin rays, stripe more thickened on caudal peduncle; dorsal, pectoral, anal, and caudal with scattered chromatophores; tip of adipose fin with dark color.

Distribution: *Bryconamericus* sp. n. 1 is known only from upper rio Paraná drainage, on rio Paranapanema and Tietê tributaries (Fig. 8).

Ecological notes: According to Castro (1999), *Bryconamericus* sp. n. 1 occurs on sandy and/or slimy bottom in semi-lentic environments, with depth ranging from 1.0 to 3.0 m. Marginal vegetation presents plant species typical of swamps and flooded regions as Cyperaceae (*Fimbrisytlis diphylla*) Poaceae, and Xyridaceae (*Xyris* sp.), totally submerged plants of Haloraceae family, and grasses partially or entirely covered by water. Dissolved oxygen values vary from 5.25 to 9.03 mg/l and pH from 5.28 to 7.94. Species collected with *B.* sp. n. 1 were: *Astyanax altiparanae* Garutti & Britski, 2000; *Astyanax fasciatus* (Cuvier, 1819); *Astyanax eigenmanniorum* (Cope, 1894); *Bryconamericus stramineus* Eigenmann, 1908; *Hyphessobrycon anisitsi* (Eigenmann, 1907); *Odontostilbe* sp.; *Piabina argentea* Reinhardt, 1867; *Oligosarcus paranensis* Menezes & Géry, 1983; *Characidium zebra* Eigenmann, 1909; *Cheirodon stenodon* Eigenmann, 1915; *Serrasalmus spilopleura* Kner, 1858; *Salminus hilarii* Valenciennes, 1850; *Cyphocharax modestus* (Fernández-Yépez, 1948); *Steindachnerina insculpta* (Fernández-Yépez, 1948); *Apareiodon piracicabae* (Eigenmann, 1907); *Hoplias malabaricus* (Block, 1794); *Leporinus elongatus* Valenciennes, 1850; *L. friderici* (Bloch, 1794); *L. obtusidens* (Valenciennes, 1836); *L. octofasciatus* Steindachner, 1915; *L. striatus* Kner, 1858; *Schizodon nasutus* Kner, 1858; *Pimelodus maculatus* Lacepède, 1803; *Geophagus brasiliensis* (Quoy & Gaimard, 1824); *Gymnotus carapo* Linnaeus, 1758; and *Synbranchus marmoratus* Bloch, 1795.

Discussion

We here confirm *B. iheringii* as a valid species, presenting differentiation from its congeners (fig. 9 and annex box plot): higher body depth (26.7-39.1% versus 20.4-

25.7 in *B. stramineus*, 23.9-27.9 in *B. lambari* and 21.1-23.8 in *B. exodon*); greater predorsal length (50.1-58.0% versus 46.6-50.5 in *B. uporas*) and snout-anal fin distance (60.5-70.6% versus 55.0-60.9 in *B. uporas*); pelvic fin longer (14.4-19.3% versus 11.7-14.4 in *B. stramineus*, 13.0-14.7 in *B. ornaticeps*, 11.0-14.4 in *B. patriciae* and 12.6-14.3 in *B. exodon*); anal-fin base shorter (19.0-28.5% versus 28.4-31.8 in *B. exodon* and 28.0-33.7 in *B. sylvicola*); shorter snout length (17.5-24.5% versus 26.8-32.4 in *B. ecai*) greater orbit diameter (30.3-40.8% versus 25.5-34.0 in *B*. sp. n. 1, 21.9-30.7 in *B. eigenmanni*, 23.6-29.3 in *B*. sp. n. 2 and 26.1-30.7 in *B. ornaticeps*); shorter caudal peduncle (12.1-18.1% versus 18.0-22.9 in *B. ornaticeps*); shorter upper jaw length (25.2-34.9% versus 35.8-46.3 in *B. stramineus*, 34.1-41.0 in *B. agna*, 35.6-39.5 in *B. ornaticeps*, 34.9-39.1 in *B. microcephalus* and 35.8-40.8 in *B. exodon*); anal fin with 14-21 branched rays versus 12-13 in *B. tenuis*; presence of bony hooks on pelvic and anal fins of males versus absent in *B. mennii*, *B. pyahu*, *B. turiuba* and *B.* sp. n. 2; hooks only at posterior branches of anal fin branched rays versus present in *B.* sp. n. 1; mouth subterminal versus terminal in *B. rubropictus*, *B.* sp. 3 and *B. thomasi*; dorsal tip of the ascending process of the premaxilla curved, blunt and stout versus slender and acute in *B. ikaa* (Casciotta *et al.*, 2004).

Furthermore, obtained results allowed the recognition of upper rio Paraná populations as a distinct species from those assigned to *Bryconamericus iheringii* through the Canonical Variated Analysis scores projection and by the significant difference ($p < 0.05$ in Kruskal-Wallis tests) of the Orbital diameter (figs. 10, 11 and 12). Based on these results, a new framing was made, considering only *Bryconamericus* sp. n. 1 (from upper rio Paraná basin) and *Bryconamericus iheringii* (populations from Laguna dos Patos System, Uruguay, and Iguaçu basins). *Bryconamericus* sp. n. 1 is separated from *B. iheringii* on the first axis, but still presenting some intersection.

Distinctive characters to this separation, in order of importance, were greater values for *B. iheringii* populations relative to orbital diameter, dorsal fin-anal fin distance, body depth, dorsal fin length, and dorsal fin-pectoral fin distance, also smaller values of post orbital, upper jaw, caudal peduncle, snout, head lengths and snout-pectoral fin distance (fig. 10 and 11, Table 3). Uruguay and Iguaçu populations are a little bit separated from Laguna dos Patos System on second axis, but there is a high overlapping degree between these populations. Characters promoting this displacement were greater anal-fin base and dorsal-fin lengths of Uruguay and Iguaçu populations and greater pectoral fin-pelvic fin and snout-anal fin distances of Laguna dos Patos System population (fig. 10 and Table 3).

By the estimation of Euclidean distance (fig. 13), the population of Laguna dos Patos System, type-locality of *Bryconamericus iheringii*, is more similar to Uruguay population (both are very close geographically), these two populations, by their turn, are more related to Iguaçu population. The results here obtained depict those results obtained on Canonical Analysis. Confirming the initial proposal of this work, the populations from upper rio Paraná basin present a higher level of differentiation when compared with other populations of *Bryconamericus iheringii*, and are described as new.

As exposed before, the most significant difference between then was orbit diameter: 25.5-34.0% of HL (mean 29.6%) versus 30.3-40.2% (mean 35.5%); the maximum proportion in orbit diameter of *Bryconamericus* sp. n. 1 (34.0% of HL) is smaller than the mean (35.5% of HL) of this character to *B. iheringii*. The smaller diameter of the orbit is worthy of note; despite little overlapping values due to fishes ontogeny, where smaller specimens present eyes proportionally larger decreasing in size with growing. *Bryconamericus* sp. n. 1 specimens are by mean smaller (37.0mm SL,

maximum 54.8mm SL) than *B. iheringii* specimens (mean 41.9mm SL, maximum 72.3mm SL), and tend to present smaller eyes as they grow.

Furthermore, the means of the majority of morphometrics characters are significantly different, in conformity with statistical Kruskal Wallis tests ($p < 0.05$ on measurements depicted by box plot graphs -see appendix). From 25 morphometric proportions (except standard length), only three (predorsal, dorsal fin-hypural distances and pelvic length) were not significantly different between *Bryconamericus* sp. n. 1 and *Bryconamericus iheringii.* The new species from upper rio Paraná basin also presents bony hooks on anterior and posterior branches of anal fin of males while *B. iheringii* specimens present hooks only on posterior branches of anal fin, same condition of some other species on the genus, as reported for *Bryconamericus ikaa* (Casciotta *et al.*, 2004: 63), *Bryconamericus sylvicola* (Braga, 1998:26), *Bryconamericus agna* (Azpelicueta & Almirón, 2001: 277), and *Bryconamericus lambari* (Malabarba & Kindel, 1995: 682).

Bryconamericus sp. n. 1 is easily diagnosed from other species of genus by: higher body (26.6-33.5% versus 20.4-25.7 in *B. stramineus*, 23.1-27.1 in *B. microcephalus* and 21.1-23.8 in *B. exodon*); greater predorsal distance (50.8-57.9% versus 47.3-50.3 in *B. agna* and 46.6-50.5 in *B. uporas*); greater snout-pectoral fin distance (24.0-28.6% versus 22.7-24.7 in *B. ornaticeps*); greater snout-anal fin distance (61.2-69.1% versus 56.8-62.0 in *B. turiuba* and 58.8-62.2 in *B. mennii*); greater dorsal fin-anal fin distance (29.0-35.6% versus 26.1-29.6 in *B. ornaticeps*, 25.9-29.6 in *B. microcephalus* and 22.8-25.2 in *B. exodon*); pelvic fin longer (14.6-19.4% versus 12.2-14.9 in *B. turiuba*, 11.7-14.2 in *B. stramineus*, 13.0-14.7 in *B. ornaticeps*, 11.0-14.4 in *B. patriciae* and 12.6-14.3 in *B. exodon*); shorter anal-fin base (19.4-27.2% versus 28.4-31.8 in *B. exodon* and 28.0-33.7 in *B. sylvicola*); smaller orbital diameter (25.5-34.0% versus 33.3-38.2 in *B. ikaa*, 36.0-44.2 in *B. lambari* and 33.7-37.3 in *B. exodon*); longer

caudal peduncle (13.4-8.8% versus 11.4-13.1 in *B. ecai*) shorter upper jaw (26.5-35.5% versus 35.8-46.3 in *B. stramineus*, 35.6-39.5 in *B. ornaticeps*, and 35.8-40.8 in *B. exodon*); outer row of premaxillary teeth aligned (versus non-aligned in *B. exodon*, *B. microcephalus*, *B. mennii*, *Bryconamericus* sp. 2, *B. stramineus*, *B. thomasi*, and *B. turiuba*); pelvic fin equal in males and females, versus with sexual dimorphism in *B. eigenmanni*; mouth subterminal, versus terminal in *B. rubropictus* and *B. thomasi*; bony hooks on pelvic and anal fins of males, versus absent in *B. pyahu*, *B. mennii*, *B. turiuba*, and *B.* sp. n. 2; branched rays on anal fin 15-19 versus 12-13 in *B. tenuis*.

Comparative Material

Bryconamericus exodon Eigenmann 1907: MZUSP 28026, 16/ 98, 38.0-44.0mm SL, Brazil, Poconé, rio Cuiabá (viveiro de pássaros), MT, 15-16/ Sep/ 1977. *Bryconamericus ikaa*: MNRJ 27296, 6/ 10, 32.2-51.2mm SL, Brazil, Porto União, rio Iguaçu, SC, 21-23/ Apr/ 1944. *Bryconamericus lambari*: MCP 26057, 20/ 60, 45.6-56.7mm SL, Brazil, Dois Irmãos, arroio Feitoria na Picada Verão (afluente do rio Cadeia -rio Caí), RS, 29º34'37"S 51º1'39"W, 26/ Jun/ 2000; MCP 15449, 1, 45.9mm SL, Brazil, Dois Irmãos, arroio afluente do arroio Feitoria, sob a ponte da avenida Sapiranga, RS, 29º35'S 51º6'W, 04/ Dec/ 1991. *Bryconamericus mennii*: ILPLA 1164, 1, 43.2mm SL, Argentina, Departamento Cainguás, Misiones province, Cuña-Pirú creek, 27º10'S 54º57'W, 29/ Nov/ 1999; ILPLA 1165, 1, 54.1mm SL, Argentina, Departamento Cainguás, Misiones province, Cuña-Pirú creek, 27º10'S 54º57'W, 30/ Nov/ 1999; ILPLA 1166, 4, 38.8-52.1mm SL, Argentina, Departamento Cainguás, Misiones province, Cuña-Pirú creek, 27º10'S 54º57'W, 01/ Dec/ 1999. *Bryconamericus microcephalus*: DZSJRP 4411, 11/ 20, 46.4-63.6mm SL, Brazil, Iporanga, rio Betari, afluente do rio Ribeira de Iguape, SP, 24/ Jan/ 1996; MZUSP 64775, 2, 45.7-48.4mm SL, Brazil, São Miguel Arcanjo, rio Taquaral, na SP-139, Parque Estadual Carlos

Botelho, SP, 27/ Nov/ 2000; MZUSP 64777, 1, 50.3mm SL, Brazil, Sete Barras, rio Ipiranga, na Fazenda Brasban, SP, 28/ Nov/ 2000; MZUSP 64778, 1, 51.0mm SL, Brazil, São Miguel Arcanjo, rio Taquaral, na SP-139, Parque Estadual Carlos Botelho, SP, 27/ Nov/ 2000; MZUSP 64779, 1/ 2, 48.0mm SL, Brazil, São Miguel Arcanjo, rio Taquaral, na SP-139, Parque Estadual Carlos Botelho, SP, 27/ Nov/ 2000. *Bryconamericus ornaticeps*: MNRJ 19993, 16/ 62 (1 d), 39.8-58.4mm SL, Brazil, município de Cachoeiras de Macacu, Boca do Mato, descendo pela estrada de Boca do Mato, junto a RJ 116, na segunda ponte sobre o rio Macacu, RJ, 22º25'30"S 42º37'0"W, 20/ Oct/ 1999. *Bryconamericus* sp. 2: DZSJRP 2899, 2, 45.1-49.2mm SL, Brazil, Pará de Minas, riacho afluente Pará (S. Francisco), na vicinal de terra para Meireles da BR 262, à esquerda sentido N. Serrana, MG, 14/ Aug/ 1998; DZSJRP 2994, 6, 32.7-41.4mm SL, Brazil, Sacramento, riacho afluente do rio Araguari ou das Velhas, rio Paranaíba, estrada para Araxá, MG, 13/ Aug/ 1998; DZSJRP 8319, 39.6mm SL, Brazil, São Roque de Minas, Fazenda Casca D'Anta, rio São Francisco, MG, 20º30'0"S 46º50'0"W, 31/Dec/ 1995; LIRP 0632, 107/ 529, 36.2-46.3mm SL, Brazil, São Roque de Minas, Fazenda Casca D'Anta, rio São Francisco, MG, 20º30'0"S 46º50'0"W, 31/ Dec/ 1995. *Bryconamericus stramineus*: DZSJRP 2816, 1, 41.0mm SL, Brazil, rio Pará na BR-262, entre Nova Serrana e Pará de Minas, São Francisco, MG, 14/ Aug/ 1998; DZSJRP 4052, 3/ 8, 45.7-48.9mm SL, Brazil, Turiúba, ribeirão Santa Bárbara, corredeira, SP, 7/ Jul/ 2000; DZSJRP 5075, 5/ 131, 43.7-46.6mm SL, Brazil, Iturama, ponte sobre o rio Grande, na UHE de Água Vermelha, MG, 29/ Jan/ 2002; MZUSP 18641, 4/ 15, 41.6-48.8mm SL, Brazil, córrego Pipiripau, perto de Planaltina, DF, 19/ Jan/ 1976. *Bryconamericus thomasi*: MZUSP 26054, 55.8mm SL, Peru, Ucayali, rio Huipora, Est. Pucallpa-Huánuco, Depto. Ucayali, 26/ Jun/ 1979. *Bryconamericus turiuba*: DZSJRP 3836, 5/ 13, 49.3-53.2mm SL, Brazil, Turiúba, ribeirão Santa Bárbara

(corredeira), afluente do rio Tietê, SP, 20º57'59"S 50º1'6"W, 11/ Feb/ 2000; DZSJRP 3992, 5/ 10, 46.4-50.4mm SL, Brazil, Turiúba, ribeirão Santa Bárbara (corredeira), afluente do rio Tietê, SP, 20º57'59"S 50º1'6"W, 29/ Jun/ 2000; DZSJRP 5266, 5/ 30, 43.2-47.5mm SL, Brazil, Catalão, córrego da Anta Gorda, junto à ponte na estrada de terra, drenagem do rio Paranaíba, GO, 17º52'55"S 47º37'1"W, 25/ Apr/ 2002; DZSJRP 5534, 16/ 50, 40.7-58.5mm SL, Brazil, Uberaba, ribeirão Lajeado, às margens da BR-262, afluente direto do rio Grande, MG, 19º45'48"S 47º48'8"W, 20/ May/ 2003; DZSJRP 5555, 6/ 14, 34.9-38.7mm SL, Brazil, Uberaba, rio Uberaba, estrada Uberaba-Almeida Campos e Nova Ponte, rio Grande, MG, 19º39'40"S 47º49'23"W, 21/ Jul/ 2003; DZSJRP 5602, 2, 34.8-39.6mm SL, Brazil, Cristianópolis, ribeirão Gameleira, GO020 (BR-352), rio Paranaíba, GO, 17º10'19"S 48º43'36"W, 22/ May/ 2003; DZSJRP 5618, 1/ 6, 48.8mm SL, Brazil, Bela Vista de Goiás, riacho Campo Alegre, drenagem do Corumbá, rio Paranaíba, GO, 17º9'9"S 48º44'0"W, 22/ Jul/ 2003; DZSJRP 5651, 9, 29.8-48.3mm SL, Brazil, Montividiu, córrego Formosa, km 177 da GO174, entre Amorinópolis e Montividiu, GO, 17º9'37"S 51º9'34"W, 24/ May/ 2003; DZSJRP 6494, 2/ 4, 52.2-52.3mm SL, Brazil, Bela Vista de Goiás, córrego do Salteador, fazenda Arapuca (pai do Daniel), afluente do córrego Arapuca, rio Paranaíba, GO, 17º4'37"S 48º43'19"W, 29/ Apr/ 2004; DZSJRP 6507, 3/ 12, 49.1-56.3mm SL, Brazil, Bela Vista de Goiás, riacho Capoeira Grande, fazenda Arapuca (Alcides), afluente do córrego Arapuca, rio Paranaíba, GO, 17º3'48"S 48º44'1"W, 29/ Apr/ 2004; DZSJRP 6647, 1, 48.2mm SL, Brazil, Uberlândia, rio Araguari sob a ponte do Pau Furado, 150 km da foz no Paranaíba, MG, 18º47'50"S 48º8'50"W; DZSJRP 6861, 2/ 39, 41.3-50.1mm SL, Brazil, Bela Vista de Goiás, córrego Arapuquinha, rio Corumbá, drenagem do rio Paranaíba, fazenda Arapuca, 17 km da GO020, GO, 17º5'13"S 48º46'3"W, 24/ Jul/ 2004; DZSJRP 6988, 9/ 34, 47.3-51.8, Brazil, Bela Vista de Goiás,

córrego dos Macacos, rio Corumbá, drenagem do Paranaíba, GO020, km 78, GO, 17º4'39"S 48º43'20"W, 1/ Nov/ 2004; DZSJRP 7050, 2/ 24, 48.3-50.7m SL, Brazil, Bela Vista de Goiás, córrego sem nome, rio Corumbá, drenagem do Paranaíba, GO020, km 78, GO, 17º5'27"S 48º44'40"W, 6/ Feb/ 2005.

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Table 1. Morphometric data of *Bryconamericus iheringii* (Laguna dos Patos System n = 281; Uruguay basin n = 82; and Iguaçu basin n = 61). S.D. = standard deviation. Standard length and Head length in mm.

Character	Lectotype	Low-High	Mean	S. D.
1. Standard length	64.7	21.0-72.3	42.0	10.3
Percents of Standard length				
2. Body depth	39.1	26.7-38.8	32.9	2.2
3. Predorsal length	54.6	51.1-58.0	54.0	1.5
4. Snout to pectoral fin insertion	-	22.1-28.4	25.3	1.3
5. Preventral distance	47.0	44.2-52.9	48.8	1.6
6. Preanal length	-	60.5-70.6	65.8	1.7
7. Dorsal fin to hypural	-	47.8-57.8	52.6	1.8
8. Dorsal-Anal distance	-	29.0-40.4	35.5	2.1
9. Dorsal-Pectoral distance	-	35.4-43.1	39.1	1.6
10. Dorsal-fin base	-	10.1-14.9	12.5	0.9
11. Pectoral-fin length	22.1	19.9-25.1	22.5	1.1
12. Pelvic-fin length	16.5	14.5-19.3	17.0	0.9
13. Anal-fin base	24.4	19.0-28.5	23.4	1.7
14. Dorsal-fin length	25.0	21.5-29.8	25.4	1.5
15. Caudal peduncle depth	12.9	9.4-12.9	11.0	0.7
16. Head length	24.1	22.1-30.6	26.4	1.4
17. Pectoral-Pelvic distance	-	20.4-28.4	24.8	1.3
18. Pelvic Anal distance	-	15.3-21.6	18.5	1.1
19. Caudal peduncle length	14.5	12.1-18.1	14.9	1.1
Percents of Head length				
20. Snout length	-	17.5-24.5	21.0	1.5
21. Orbital diameter	35.6	30.3-40.2	35.5	2.2
22. Head depth	-	75.7-103.3	89.6	5.6
23. Postorbital length	-	35.8-48.7	42.5	2.5
24. Upper jaw length	32.4	25.2-34.9	29.9	1.9
25. Interorbital width	33.4	23.8-34.0	28.5	1.9

Table 2. Morphometric data of of *Bryconamericus* sp. n. 1(n = 282). Range includes holotype values. S.D. = standard deviation. Standard length and Head length in mm.

Character	Holotype	Low-High	Mean	S. D.
1. Standard length	44.7	24.8-54.8	37.0	6.5
Percents of Standard length				
2. Body depth	31.5	26.6-33.6	27.9	1.6
3. Predorsal length	53.9	50.8-57.9	54.4	1.3
4. Snout to pectoral fin insertion	26.2	24.0-28.6	26.3	1.0
5. Preventral distance	47.9	45.6-51.8	48.7	1.3
6. Preanal length	62.9	61.2-69.1	65.3	1.6
7. Dorsal fin to hypural	54.6	50.0-56.3	52.6	1.3
8. Dorsal-Anal distance	33.3	29.0-35.6	32.4	1.4
9. Dorsal-Pectoral distance	37.6	33.5-40.6	37.0	1.5
10. Dorsal-fin base	11.6	10.8-13.6	12.2	0.5
11. Pectoral-fin length	21.7	19.0-24.5	21.7	1.0
12. Pelvic-fin length	17.2	14.6-19.5	17.0	0.9
13. Anal-fin base	25.7	19.4-27.2	23.1	1.4
14. Dorsal-fin length	24.4	21.2-27.8	24.5	1.4
15. Caudal peduncle depth	10.7	9.2-11.6	10.5	0.5
16. Head length	27.5	24.6-30.0	27.5	1.0
17. Pectoral-Pelvic distance	23.3	20.7-27.4	23.9	1.3
18. Pelvic-Anal distance	17.0	14.2-20.6	17.6	1.3
19. Caudal peduncle length	18.3	13.4-18.8	16.2	1.0
Percents of Head length				
20. Snout length	21.1	18.6-25.8	22.1	1.2
21. Orbital diameter	30.1	25.6-34.0	29.6	1.7
22. Head depth	83.7	74.7-93.8	83.4	3.9
23. Postorbital length	44.7	39.8-50.0	44.8	1.9
24. Upper jaw length	32.5	26.5-35.5	31.1	1.6
25. Interorbital width	27.6	24.4-31.2	27.5	1.3

Table 3. Eigenvalues and associated probability (p) of first (Can 1) and second (Can 2) axis of Canonical Variates Analysis of combined populations of *Bryconamericus* sp. n. 1 and *Bryconamericus iheringii* from Iguaçu, Uruguay and Laguna dos Patos System.

Character	Can 1	p	Can 2	p
1. Standard length	-0.33822	0.0001	-0.10153	0.0071
2. Body depth	0.73995	0.0001	-0.07018	0.0631
3. Predorsal distance	-0.21922	0.0001	0.09078	0.0161
4. Snout to pectoral insertion	-0.47871	0.0001	0.21115	0.0001
5. Preventral distance	-0.09817	0.0092	-0.36343	0.0001
6. Preanal length	-0.06304	0.0951	-0.42215	0.0001
7. Dorsal fin to hypural	-0.31715	0.0001	-0.18487	0.0001
8. Dorsal-Anal distance	0.74311	0.0001	-0.12083	0.0001
9. Dorsal-Pectoral distance	0.39271	0.0001	0.01941	0.6077
10. Dorsal-fin base	-0.06336	0.0935	0.02381	0.5287
11. Pectoral-fin length	0.33000	0.0001	0.35163	0.0001
12. Pelvic-fin length	-0.02769	0.4639	0.42919	0.0001
13. Anal-fin base	-0.02777	0.4626	0.67110	0.0001
14. Dorsal-fin length	0.40746	0.0001	0.51050	0.0001
15. Caudal peduncle depth	0.20682	0.0001	-0.28186	0.0001
16. Head length	-0.50160	0.0001	0.11085	0.0033
17. Pectoral-Pelvic distance	0.15441	0.0001	-0.59947	0.0001
18. Pelvic-Anal distance	0.17757	0.0001	-0.29010	0.0001
19. Snout length	-0.59040	0.0001	-0.00425	0.9105
20. Orbital diameter	0.86227	0.0001	-0.04768	0.2070
21. Head depth	0.17667	0.0001	0.06039	0.1099
22. Postorbital length	-0.70617	0.0001	0.03078	0.4155
23. Caudal peduncle length	-0.59975	0.0001	-0.11997	0.0014
24. Upper jaw length	-0.63481	0.0001	-0.17526	0.0001
25. Interorbital width	-0.20133	0.0001	-0.10533	0.0052

Fig. 1: *Bryconamericus iheringii* Laguna dos Patos System, MCP 20840 54.2 mm SL.

Fig. 2: *Bryconamericus iheringii* Uruguay basin, MCP 10.346, 44.6 mm SL.

Fig. 3: *Bryconamericus iheringii* Iguaçu basin, MCP 25600, 42,9 mm SL.

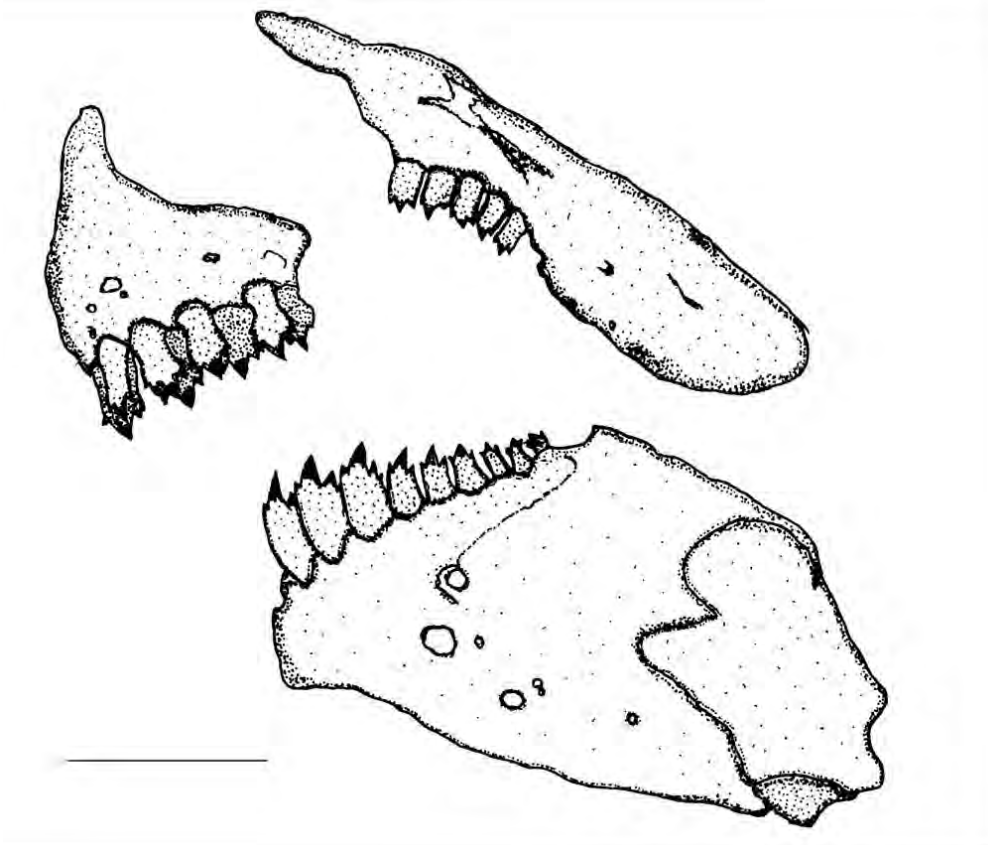

Fig. 4: Premaxilla, maxilla and dentary of *Bryconamericus iheringii*, MCP 23167.

Lateral view, left side. Bar scale represents 1 mm.

Fig. 5: *Bryconamericus* sp. n. 1, DZSJRP 8318, Holotype, 44.7mm SL, Brazil, Piracicaba, Bairro Costa Pinto, córrego Barro Frio, Baixo Corumbataí, P. Gerhard, SP, 05/ Sep/ 2003.

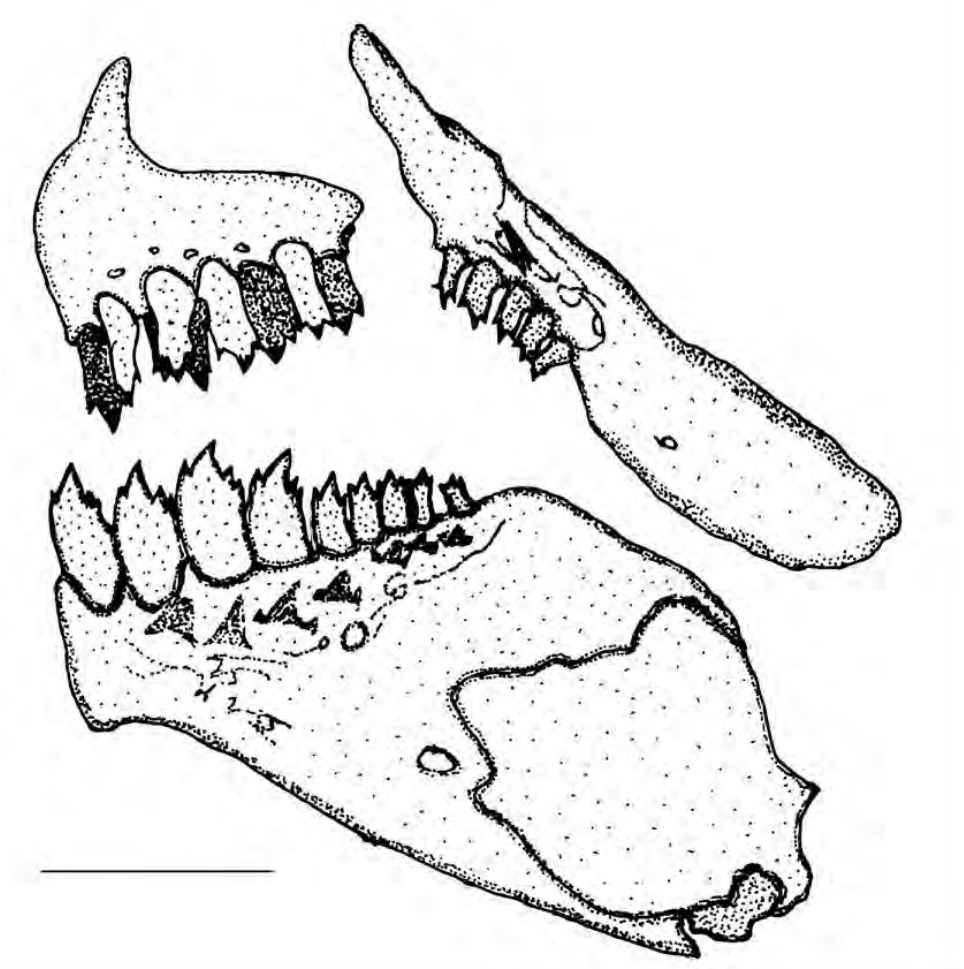

Fig. 6: Premaxilla, maxilla and dentary of *Bryconamericus* sp. n. 1, DZSJRP 7902. Lateral view, left side. Bar scale represents 1 mm.

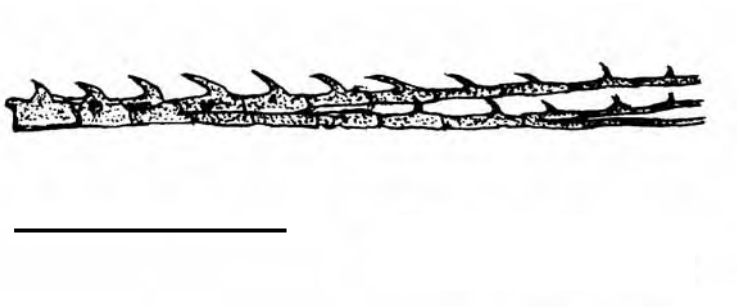

Fig. 7: Bony hooks on anal fin of *Bryconamericus* sp. n. 1, DZSJRP 7902. Lateral view, left side. Bar scale represents 1 mm.

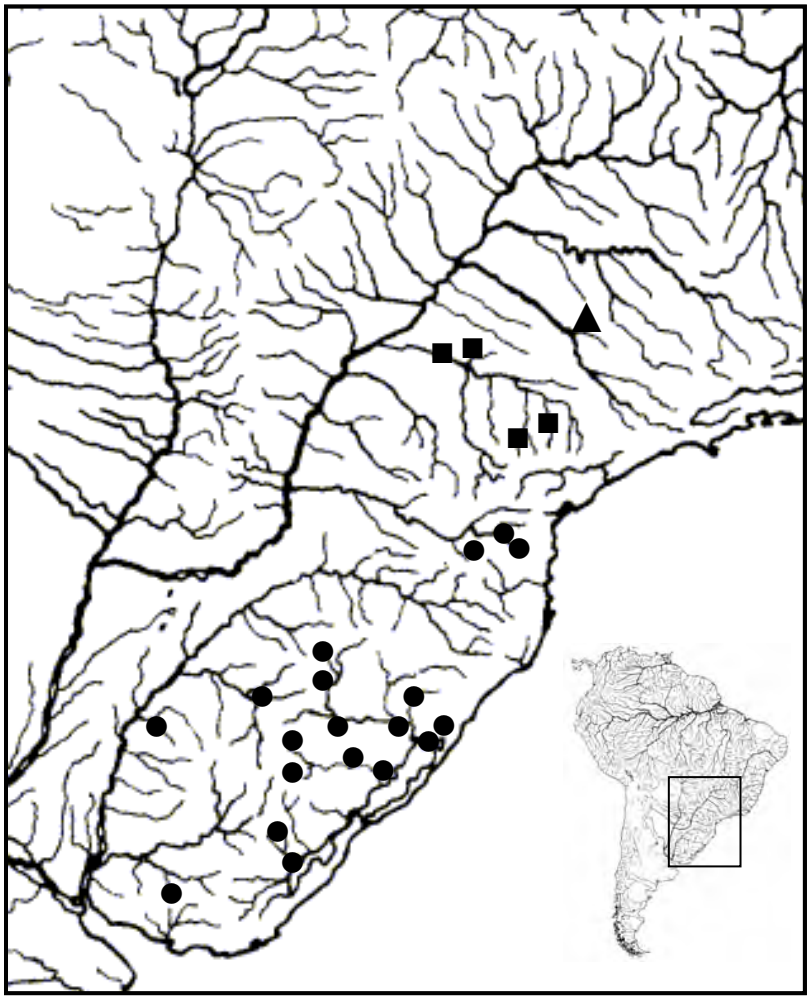

Fig. 8: Geographic Distribution of *Bryconamericus iheringii* (●) and *Bryconamericus* sp. n. 1 (■), type-locality (▲).

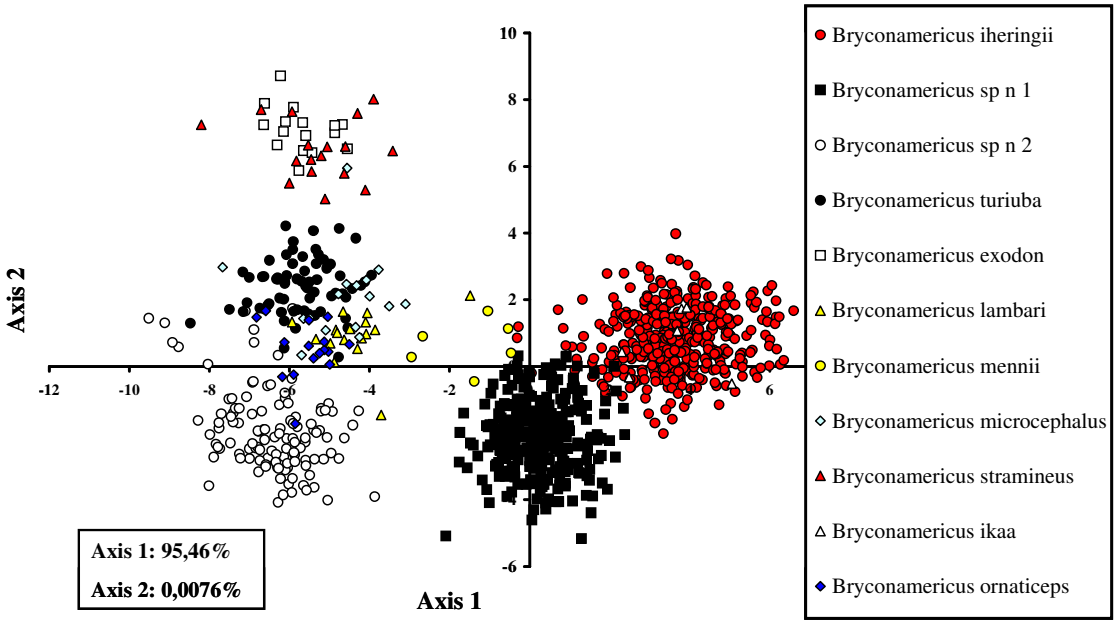

Fig. 9: Projection of Size-independent Canonical Variates Analysis scores (CVA) of morphometric data from *B. iheringii* and Comparative Species.

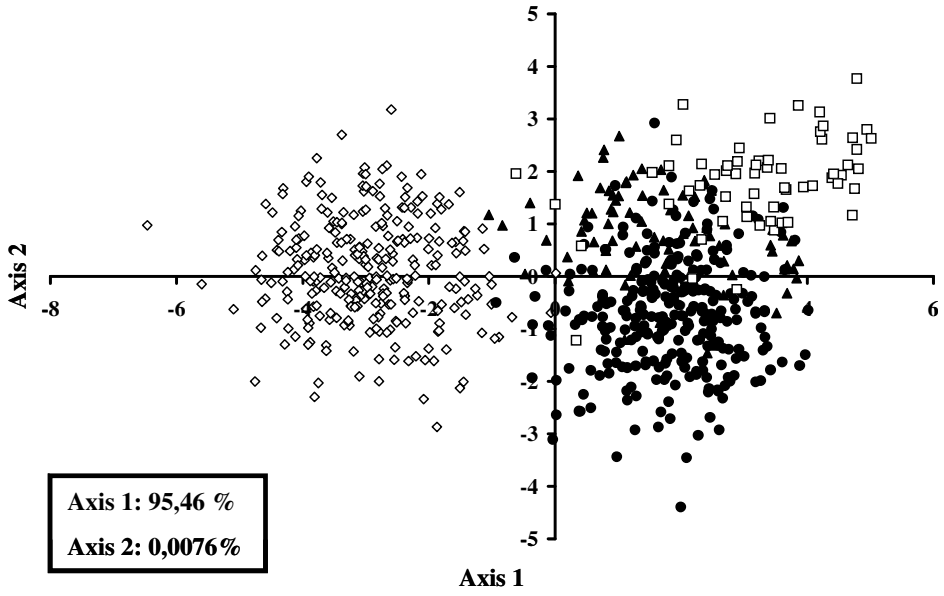

Fig. 10: Projection of Size-independent Canonical Variates Analysis scores (CVA) of morphometric data from *B. iheringii*: ◊ Upper rio Paraná, ● Laguna dos Patos, ▲ Uruguay and □ Iguaçu.

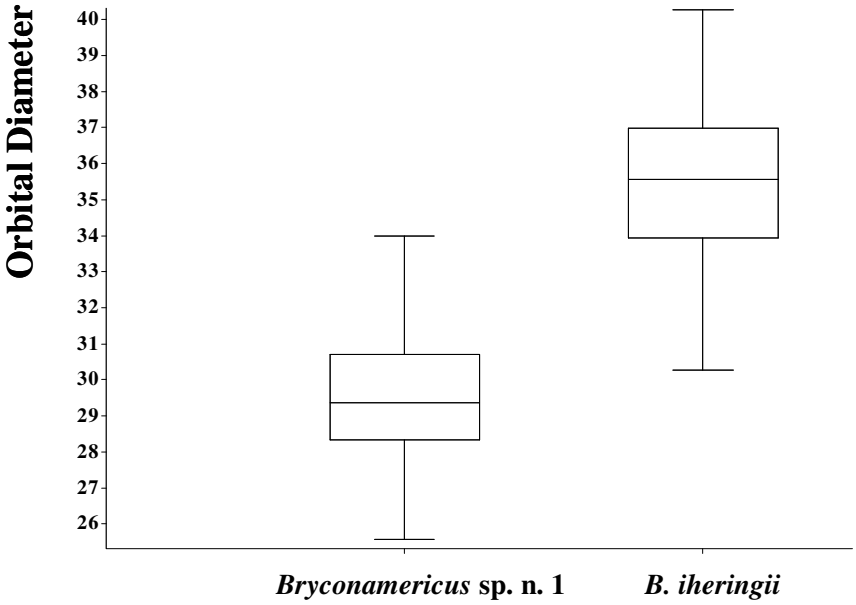

Fig. 11: Box plot of orbital diameter in HL. Kruskal-Wallis tests: $p < 0.05$ and $H = 472.2599$.

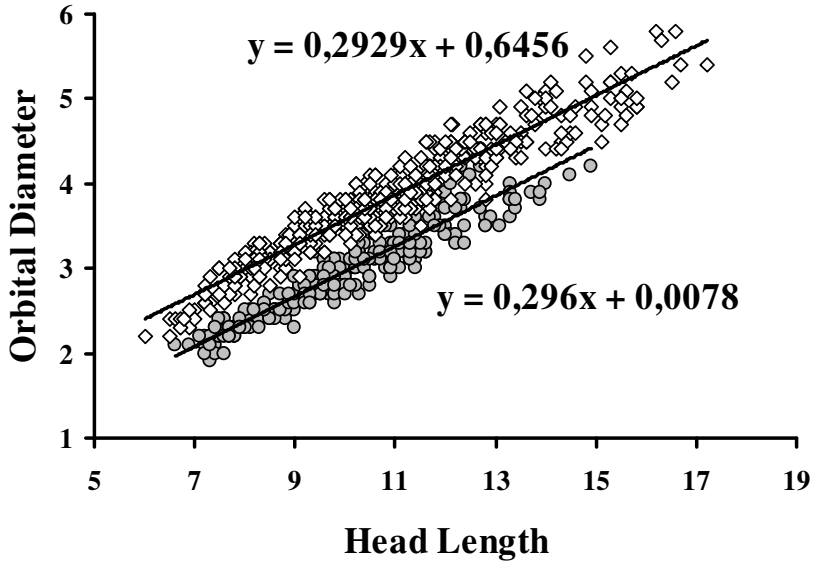

Fig. 12: Regression for Orbital Diameter in Head Length between *B. iheringii* (white diamonds) and *B.* sp. n. 1 (gray circles).

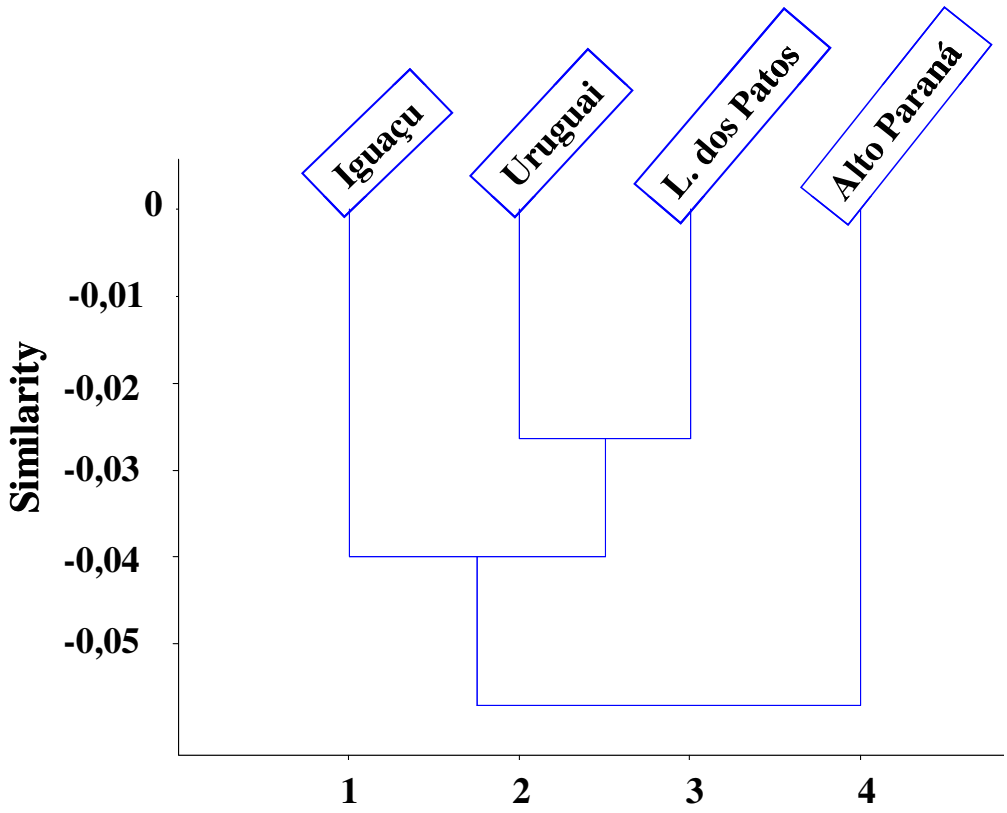

Fig. 13: Similarity dendrogram of analyzed populations. Similarity Measure: Euclidean Distance. Algorithm: Single Linkage.

A new species of the Genus *Bryconamericus* Eigenmann (Characiformes: Characidae) from rio São Francisco and Upper rio Paraná basins

Abstract

Bryconamericus sp. n. 2 is described to rio São Francisco and upper rio Paraná basins. The new species can be easily recognized from other congeneric species by the following combination of features: body depth 23.2–27.6% of SL; predorsal distance 51.1–55.9% of SL; dorsal-anal distance 24.0–30.2% of SL; dorsal-pectoral distance 31.9–37.9% of SL; head length 27.7–30.8% of SL; head depth 72.3–80.9% of head's length (HL); postorbital length 44.4–50.0% of HL; upper jaw length 30.4–35.4% of HL; mature males lacking bony hooks on pelvic and anal-fin rays; only five infraorbital bones; and a fourth infraorbital triangular. In rio São Francisco basin there is only one valid species: *Bryconamericus stramineus* Eigenmann, 1908, that is notably different in color pattern from the species described herein. Other species described from La Plata River, Laguna dos Patos System and Brazilian coastal rivers are compared with the new species.

Resumo

Bryconamericus sp. n. 2 é descrita para as drenagens dos rios São Francisco e Alto Paraná. A nova espécie pode ser facilmente reconhecida de seus congêneres pela seguinte combinação de caracteres: altura do corpo 23.2–27.6% do CP; distância pré-dorsal 51.1–55.9% do CP; distância dorsal-anal 24.0–30.2% do CP; distância dorsal-peitoral 31.9–37.9% do CP; comprimento da cabeça 27.7–30.8% do CP; altura da cabeça 72.3–80.9% do comprimento da cabeça (CC); comprimento pós-orbital 44.4–50.0% do CC; comprimento da maxila superior 30.4–35.4% do CC; machos maduros sem ganchos ósseos nas nadadeiras pélvica e anal; apenas cinco ossos infraorbitais; e um quarto infraorbital triangular. Na bacia do rio São Francisco ocorre apenas uma espécie válida: *Bryconamericus stramineus* Eigenmann, 1908, que é notavelmente diferente pelo padrão de colorido da espécie aqui descrita. Outras espécies descritas

para as drenagens do rio da Prata, Sistema da Laguna dos Patos e rios costeiros brasileiros são comparados com a nova espécie.

Key words: Ostariophysi, new taxon, Neotropica, infraorbital series, *Piabina*

Introduction

Bryconamericus Eigenmann (In Eigenmann *et al.*, 1907) is one of the most speciose genera of Characidae, with about 68 valid species; its representatives are small-sized and widespreaded on South and Central America, from Costa Rica to Argentina (Lima *et al.*, 2003; Froese & Pauly, 2005). They are predominantly silvery in life with a humeral spot and a dark lateral stripe that extends to the middle caudal rays (Géry, 1977).

The present definition of the genus consists of a combination of characters presented by Eigenmann (1927) and modified by Vari & Siebert (1990): two rows of teeth on the premaxilla, the inner series with four teeth larger than those of outer row; single row of teeth on dentary; few maxillary teeth; a gently curved upper jaw; lack of scales on caudal fin; third infraorbital large with its ventral and posterior margins contacting preopercle; gill rakers setiform; lateral line complete and absence of glandular pouch on caudal fin of males. This definition, as for many genera in Characidae, does not delimit a natural assemblage and has led questions about the monophyly of the genus (Malabarba & Weitzman, 2003; Vari & Siebert, 1990; Malabarba & Malabarba, 1994; Malabarba & Kindel, 1995).

Only one species of *Bryconamericus* is known for the rio São Francisco basin: *Bryconamericus stramineus*, that is also widespreaded on La Plata river basin (Lima *et al.*, 2003). A new species is described to São Francisco and Upper Paraná drainages.

Material and Methods

Specimens examined belong to the following collections: Departamento de Zoologia de São José do Rio Preto, São José do Rio Preto, SP (DZSJRP); Instituto de Limnologia "Dr. Raul Ringuelet", Buenos Aires (ILPLA); Laboratório de Ictiologia de Ribeirão Preto, Universidade de São Paulo, Ribeirão Preto, SP (LIRP); Museu de Ciências e Tecnologia da Pontifícia Universidade Católica do Rio Grande do Sul, Porto Alegre, RS (MCP); Museu Nacional do Rio de Janeiro, Rio de Janeiro, RJ (MNRJ); Museu de Zoologia da Universidade de São Paulo, São Paulo, SP (MZUSP) and Departamento de Zoologia, Universidade Federal do Rio Grande do Sul, Porto Alegre, RS (UFRGS).

In cases that specimens for comparisons were not available original descriptions or recent taxonomic revisions have been used, as for *B. agna* Azpelicueta & Almirón; *B. ecai* Silva, 2004; *B. eigenmanni* (Evermann & Kendall, 1906); *B. patriciae* Silva, 2004; *B. pyahu* Azpelicueta, Casciotta & Almirón, 2003, *B. rubropictus* (Berg, 1901); *B. sylvicola* Braga, 1998; *B. tenuis* Bizerril & Auraujo, 1992 and *B. uporas* Casciotta, Azpelicueta & Almirón, 2002, that were based on Azpelicueta & Almirón (2001), Silva (2004), Azpelicueta *et al.* (2003), Miquelarena & Aquino (1999), Braga (1998, 2000), Bizerril & Auraujo (1992) and Casciotta *et al.* (2002). Other comparisons were based on specimens listed in Comparative Material.

Measurements and counts followed Vari & Siebert (1990) and Azpelicueta & Almirón (2001), except for distance between dorsal and anal fins and distance between dorsal and pectoral fins that followed Román-Valencia (2000). Specimens were measured and counted on the left side, unless this side was damaged. Each examined specimen has received a label with a distinctive number. Measurements are straight-line distances taken point to point with digital calipers to 0.1mm precision and expressed as

standard length percentages, except subunits of head, which are expressed as percentages of head length. Measurements: Standard length (SL), anterior tip of snout to hypural joint; Body depth, always taken on the dorsal-fin origin; Predorsal length, anterior tip of snout to dorsal-fin origin; Snout to pectoral-fin insertion, anterior tip of snout to pectoral-fin insertion; Preventral distance, anterior tip of snout to pelvic-fin insertion; Preanal length, anterior tip of snout to anal-fin origin; Dorsal fin to hypural, dorsal-fin origin to hypural joint; Dorsal-Anal distance, dorsal-fin origin to anal-fin origin; Dorsal-Pectoral distance, dorsal fin origin to pectoral fin insertion; Dorsal-fin base, distance between first and last dorsal fin rays; Pectoral-fin length, longest pectoral fin ray length; Pelvic-fin length, longest pelvic fin ray length; Anal-fin base, distance between first and last rays of anal fin; Dorsal-fin length, longest dorsal fin ray (s) length; Caudal peduncle depth, minor depth between dorsal and ventral edges of caudal peduncle; Head length (HL), anterior tip of snout to posterior margin of opercular flap; Pectoral-Pelvic distance, pectoral fin insertion to pelvic fin insertion; Pelvic-Anal distance, pelvic fin insertion to anal fin origin; Snout length, anterior tip of snout to anterior eye border; Orbital diameter, taken at the middle line between anterior and posterior bony margins of orbit; Head depth, taken on posterior tip of occipital process; Postorbital length, from the posterior margin of eye to posterior border of opercle; Caudal peduncle length, end of anal-fin to caudal-fin base; Upper jaw length, anterior tip of snout to posterior portion of maxillary bone; Interorbital width, minor distance between superior bony margins of the orbits.

Counts were made with the aid of a stereomicroscope and a dissection needle. Anal-fin rays were counted following Miquelarena & Aquino (1995), considering the last ray, divided on its base, as a single element. In species description unbranched rays are presented by lower-case roman numerals and branched rays by arabic numerals.

Counts: Lateral line scales; scales between lateral line and dorsal fin; scales between lateral line and anal fin; scales between lateral line and pelvic fin; predorsal scales; dorsal-fin rays; anal-fin rays; pelvic-fin rays; pectoral-fin rays; scales of anal-fin sheath; outer premaxillary teeth; maxillary teeth; dentary large teeth; dentary small teeth; scales around caudal peduncle; caudal-fin rays.

Osteological examination was made in 8 cleared and stained specimens following Potthoff (1984) to count teeth cusps, ribs, gill rakers, branchiostegal rays, vertebral, procurrent rays and caudal rays. Osteological nomenclature follows Weitzman (1962).

Body proportions and counts were submitted to statistical basic tests: minimum, maximum, mean and standard deviation for morphometric data; mode, minimum and maximum for meristic data.

Morphometric characters were analyzed by Size-independent Canonical Variates Analysis (CVA) with the software SAS 9.1.

The examined material lists are arranged by the following order: museum acronym and number, number of observed specimens separated by bar from total number of individuals, standard length range, country, county, river or stream, drainage (when available), state, geographical coordinates (when available), collector (only on type series) and date. County, river, drainage, state and collector are on vernacular. Material is still arranged by drainages and within drainages in alphabetical order of museum and crescent order of registration number.

Bryconamericus sp. n. 2

Fig. 01

Bryconamericus sp: Casatti & Castro, 1998: p. 232, 233, 235, 237, figs. 3c (representative specimen of *Bryconamericus* sp. n. 2, MZUSP 50736, 38,5 mm SL), 5 (diagram showing spatial distributions of resident fish species during their activity periods), 8 (percent composition of the diets of resident species, including *Bryconamericus* sp. n. 2), 9 (specimen of *Bryconamericus* sp. n. 2 feeding on water surface), 10 (specimen grazing on bottom rock algae attached), tab. 2 (occurrence of the species on study site located at rio São Francisco basin; feeding behavior and activity description by sub aquatic observation).

Holotype: DZSJRP 8319 (formerly LIRP 0632), 39.6mm SL, Brazil, São Roque de Minas, Fazenda Casca D'Anta, rio São Francisco, MG, 20º30'0"S 46º50'0"W, L. Casatti *et al.*, 31/ Dec/ 1995.

Paratypes: All from rio São Francisco and upper rio Paraná drainages in Brazil: upper rio Paraná: DZSJRP 2994, 6, 32.7–41.4mm SL, Brazil, Sacramento, riacho afluente do rio Araguari ou das Velhas, rio Paranaíba, estrada para Araxá, MG, F.Langeani & J.I.Montoya-Burgos, 13/ Aug/ 1998; rio São Francisco basin: DZSJRP 2899, 2, 45.1–49.2mm SL, Brazil, Pará de Minas, riacho afluente Pará (S. Francisco), na vicinal de terra para Meireles da BR 262, a esquerda sentido N. Serrana, MG, F.Langeani & J.I.Montoya-Burgos, 14/ Aug/ 1998; LIRP 0632, 107/ 529, 36.2–46.3mm SL, Brazil, São Roque de Minas, Fazenda Casca D'Anta, rio São Francisco, MG, 20º30'0"S 46º50'0"W, L.Casatti *et al*., 31/ Dec/ 1995.

Diagnosis: *Bryconamericus* sp. n. 2 can be readily distinguished from congeners by the following characters combination: shallow body (23.2–27.6% of SL); long predorsal distance (51.1–55.9% of SL); short dorsal fin-anal fin distance (24.0–30.2% of SL);

short dorsal fin-pectoral fin distance (31.9–37.9% of SL); long head (27.7–30.8% of SL); shallow head (72.3–80.9% of HL); long caudal peduncle (15.5–21.3% of SL); subterminal mouth, 14–20 branched rays in anal fin; absence of bony hooks on pelvic and anal fins of males; a dark dorsal stripe extending from supraoccipital spine to the caudal peduncle with a gap at the adipose fin base; infraorbital series with five bones; and a triangular fourth infraorbital bone.

Description: Morphometric data in Table 1. Body elongated and laterally compressed. Greatest body depth little ahead to dorsal-fin origin, approximately at vertical through tip of pectoral fin. Dorsal profile of head strongly convex from tip of snout to posterior nostril; straight from this point to rear of head; slightly convex from tip of supraoccipital process to dorsal-fin origin; nearly straight from end of dorsal-fin to adipose fin; slightly concave from adipose fin to end of caudal peduncle; predorsal and post dorsal regions transversely rounded.

Ventral profile of head slightly convex posterior from margin of lower lip to vertical at posterior limit of maxilla; convex (convexity more pronounced at pectoral region) from this point to anal-fin origin; anal-fin base straight; caudal peduncle with slight concavity at ventral face; preventral region rounded at transverse section and flattened next pelvic-fin insertion.

Mouth subterminal, opening above horizontal line passing at inferior margin of orbit; upper jaw discreetly longer than lower jaw; maxillary short, passing at anterior orbit margin, but never reaching its core; anterior and posterior nostrils very close, separated by membrane; anterior opening smaller and circular, posterior opening larger and comma or half-moon shaped; eye diameter larger than snout length.

Fontanels well developed and conspicuous in alcohol preserved specimens; supraorbital absent; orbitosphenoid without ventral process; orbitosphenoid and

rhinosphenoid joined by cartilage; rhinosphenoid completely cartilaginous, partially ossified or completely ossified; gill rakers in the first arch: 4–6 + 0–1 + 6–7 + 1–2, some branched at base; 4 branchiostegal rays; infraorbital series with 5 bones (6 in one specimen), the third largest and first smallest (fourth infraorbital was smallest in one specimen, the sixth was smallest in one specimen); 5–7 supraneural bones with variable shapes, simple or with lateral expansion, including curved ones; 12–14 ribs; vertebrae: 16–18 precaudal (including the four vertebrae in Weber apparatus) and 21–23 caudal; procurrent rays: 11–13 dorsal and 10–13 ventral.

Premaxilla with two rows of teeth; outer row with three to five tricuspid teeth not-aligned (four in holotype; mode = 4), 31 individuals including holotype with first and forth teeth more anteriorly positioned, 16 individuals first, third and fifth teeth more anterior, 5 individuals only first tooth anterior, 3 individuals first and third teeth anterior, 2 individuals first and fifth anterior, 2 individuals second and fourth teeth anterior and 1 specimen with first, fourth and fifth teeth anterior; inner row always with four tricuspid teeth, larger than outer ones. Maxilla with two to four tricuspid or more rarely conical teeth (three in holotype; mode = 3), anterior teeth larger. Dentary with a single row, three to five tricuspid and larger teeth (four in holotype; mode = 4) followed by two to six tricuspid or conical smaller teeth (three in holotype; mode = 4) (Fig. 2).

Cycloid scales regularly imbricated. Lateral line slightly curved anteriorly with 34–42 (41 in holotype; mode = 40) perforated scales; four or five (five in holotype; mode = 5) scales in transverse series between dorsal fin origin and lateral line; three to five (four in holotype; mode = 4) scales in transverse series between pelvic fin origin and lateral line; four or five (four in holotype; mode = 4) scales in transverse series between anal fin origin and lateral line; 9–13 (11 in holotype; mode = 12) mid-dorsal scales between supraoccipital process and dorsal-fin origin, usually in a regular series;

one to six scales (three in holotype; mode = 3) in anal-fin sheath; 13–14 scales around caudal peduncle, 13 in one specimen and 14 in 35 specimens.

Dorsal-fin rays ii–iii, 8: ii, 8 in holotype and in 115 specimens and iii, 8 in one specimen. Posterior margin of dorsal fin straight; length of first unbranched ray about half-length of second unbranched ray plus three anterior branched rays longest. Tip of dorsal fin not reaching adipose fin when adpressed. Dorsal-fin origin posterior to median portion of body (predorsal distance 51.0–56.4% of SL) and posterior to vertical passing through pelvic fin insertion.

Anal-fin rays ii–iii, 14–20: ii, 15 (6), ii, 17 (7), ii, 18 (5), ii, 19 (2), iii, 14 (1), iii, 15 (9), iii, 16 (holotype and 29), iii, 17 (37), iii, 18 (11), iii, 19 (1) and iii, 20 (2). Anal fin margin distinctly concave anteriorly and straight posteriorly. Last unbranched ray and first and second or first to third anterior branched rays longest and with similar length; other rays smaller and reducing progressively in size. Bony hooks absent in pelvic and anal fins of males.

Pectoral-fin rays i, 10–13: i, 10 (7), i, 11 (78), i, 12 (holotype and 26), i, 13 (5). Pectoral-fin tip not reaching pelvic-fin insertion.

Pelvic-fin rays i, 5–8: i, 5 (1), i, 6 (4), i, 7 (holotype and 83) and i, 8 (2); tip of pelvic fin can reach (holotype and 54 specimens) or not (62 specimens) anal-fin origin.

Anterior portion of adipose fin near vertical through last anal fin ray base. Caudal fin forked, scaled at base only; lobes with rounded tips and equally sized; superior caudal rays i, 9 and inferior i, 8–9: i, 8 in seven specimens and i, 9 in one specimen.

Distribution: *Bryconamericus* sp. n. 2 is known from rio São Francisco basin and upper rio Paraná system (Fig. 3).

Coloration in life: dorsal portion and region above anal-fin base greenish, ventral portion whitish or silvery; upper third of body with reticulated pattern; silvery longitudinal stripe extending from head to caudal peduncle, stripe thicker anteriorly and narrower posteriorly, dilated and dark colored on caudal peduncle; humeral spot dark, vertically elongated diffuse and narrow at bottom, wider at top; concentration of chromatophores behind eye and above anal-fin base giving a slightly dark tone; dorsal and anal fins with few chromatophores on rays; pectoral and pelvic fin without apparent pigmentation; adipose fin without pigmentation; caudal-fin lobes with dark lobes as the median caudal fin rays; yellowish spot on caudal peduncle reaching base of caudal fin rays (based on recently collected specimen photograph of Casatti & Castro, 1998).

Coloration in alcohol: Overall coloration yellowish; dorsal region dark brown, with a conspicuous mid-dorsal stripe, darker than dorsal region; upper portion of body with dark chromatophores forming a reticulate pattern; ventral region with few chromatophores; dark longitudinal stripe extending from head to caudal peduncle (in some specimens dark stripe begins after humeral spot) wider at humeral region, thiner towards posterior and becoming dilated at peduncle; humeral spot vertically elongate with diffuse borders, narrower at inferior portion, resembling in some specimens a inverted triangle; chromatophores scattered through opercle, between head and humeral spot and immediately above anal-fin base; pectoral and pelvic fins without pigmentation, dorsal and anal fins slightly pigmented and caudal fin with more intense pigmentation; adipose-fin base without pigmentation.

Ecological Notes: *Bryconamericus* sp. n. 2 is a nektonic and diurnal species that occupies marginal portions of the riffles, actively swimming in the water column, most of the time swimming downstream of the rocks. At night remains motionless among submerged roots of grasses (Poaceae) or sheltered in holes in the banks of the riffles

(current speed near 0 $m.s^{-1}$). Predominance of sandy or rocky, gravelly substrate and slow to medium current (0.3–1.7 $m.s^{-1}$); depth varying from 0.5–1.2 m; current speed from 0.2 to 0.4 $m.s^{-1}$; dissolved oxygen concentration from 8.9 to 21.7 $mg.l^{-1}$. Diet omnivore, consisting by autochthonous items such algae (diatoms, filamentous Cyanophyta, *Spyrogyra*), dipteran larvae (Chironomidae, Ceratopogonidae, Simulidae), ephemeropteran nymphs (Baetidae, Leptophlebiidae), and trichopteran larvae; and allochthonous such vascular plants fragments and terrestrial insects (Formicidae, Diptera, Coleoptera). The species presents a drift feeding, collecting food items carried by the current and sometimes trimmed the submerged roots of Poaceae (browsing) or algae attached to rocks (grazing). When collecting items carried by the current, the fishes swim upstream orientated, either in the middle of the water column, or at the margin or downstream from rocks partially or totally submerged. Species collected with *Bryconamericus* sp. n. 2 were: *Astyanax rivularis* (Lütken, 1874); *Bryconamericus stramineus* Eigenmann, 1908; *Characidium fasciatum* Travassos, 1956; *Characidium zebra* Eigenmann, 1909; *Apareiodon* cf. *ibitiensis* Campos, 1944; *A.* cf. *piracicabae* (Eigenmann, 1907); *Parodon hilarii* Reinhardt, 1866; *Cetopsorhamdia iheringii* Schubart & Gomes, 1959; *Imparfinis minutus* (Lütken, 1875); *Rhamdia quelen* (Quoy & Gairmard, 1824); *Trichomycterus* sp.; *Microlepidogaster* sp.; *Harttia* sp. and *Hypostomus garmani* (Regan, 1904) (taken from Casatti & Castro, 1998).

Discussion

Bryconamericus sp. n. 2 is readily separated from its congeners, with exception of *B. turiuba* Langeani, Lucena, Pedrini & Tarelho-Pereira, 2005, by possessing a dark dorsal stripe from supraoccipital spine to caudal peduncle with a gap at the adipose fin base; from *B. turiuba*, it is separated by shorter upper jaw length, number of infraorbital

bones, and a triangular fourth infraorbital (30.4–35.4% versus 34.2–41.2). Furthermore, *Bryconamericus* sp. n. 2 is easily recognized by: body depth 23.2–27.6% of SL (versus 28.3–37.0 in *B. rubropictus*, 28.7–33.0 in *B. eigenmanni*, 33.1–36.9 in *B. ecai*, 28.0–34.5 in *B. pyahu*, 36.1–40.7 in *B. sylvicola*, 34.1–39.8 in *B. agna* and 28.9–32.2 in *B. uporas*); greater predorsal distance (51.1–55.9% versus 47.9–51.3 in *B. ornaticeps* Bizerril & Peres-Neto, 1995); shorter dorsal fin-anal fin distance (24.0–30.2% versus 35.4–43.1% *B. ikaa* Casciotta, Almirón & Azpelicueta, 2004); shorter dorsal fin-pectoral fin distance (31.9–37.9% versus 37.9–42.8% *B. ikaa*); shorter anal-fin base (21.9–26.4% versus 28.4–31.8% in *B. exodon* Eigenmann, 1907); greater head length (27.7–30.8% versus 22.2–24.5% in *B. stramineus*, 34.3–27.6 in *B. patriciae*, 22.6–24.7 in *B. ecai*, 23.9–26.6% in *B. ornaticeps*, 24.1–26.4% in *B. microcephalus* Ribeiro, 1908, 24.8–26.9% in *B. mennii* Miquelarena, Protogino, Filiberto & López, 2002, 23.5–26.8% in *B. lambari* Malabarba & Kindel, 1995 and 23.1–25.9% in *B. exodon*); greater pectoral fin-pelvic fin distance (22.6–26.5% versus 19.7–22.5% in *B. exodon*); smaller eye diameter [23.6–29.3% versus 30.3–40.2% in *B. iheringii* (Boulenger, 1887)]; shallow head (72.3–80.9% versus 81.0–87.1% in *B. microcephalus*, 91.4–98.0% in *B. mennii*, 82.4–94.4% in *B. lambari* and 86.5–94.7% in *B. ikaa*); greater post orbital length (44.4–50.0% versus 34.4–44.5% in *B. stramineus*, 39.3–43.2% in *B. ikaa* and 36.5–41.9% in *B. exodon*); longer caudal peduncle (15.5–21.3% versus 11.5–14.7% in *B. exodon*); shorter upper jaw (30.4–35.4% versus 35.8–46.3% in *B. stramineus*, 35.6–39.5% in *B. ornaticeps* 34.2–41.2 in *B. turiuba* and 35.8–40.8% in *B. exodon*); narrower interorbital width (24.1–28.3 versus 30.2–36.6% in *B. exodon*); subterminal mouth (versus terminal in *B. rubropictus* and *B. thomasi* Fowler, 1940); more branched anal-fin rays (14–20 versus 12–13 in *B. tenuis*); absence of bony hooks on pelvic and anal fins of males (present in *B. agna*, *B. exodon*, *B. stramineus, B. thomasi, B. ecai, B.*

patriciae, B. eigenmanni, B. sylvicola, B. ornaticeps, B. tenuis, B. ikaa, B. rubropictus, B. lambari, B. microcephalus, B. iheringii and *Bryconamericus* sp. n. 1).

The Size-independent Canonical Variates Analysis (Fig. 4 and Table 2) shows a significant separation of new species from its congeners, despite of little overlapping with *Bryconamericus mennii*, *Bryconamericus microcephalus*, *Bryconamericus ornaticeps*, and *Bryconamericus turiuba*. The separation of *Bryconamericus* sp. n. 2 on axis 1 by *Bryconamericus* sp. n. 1, *B. iheringii*, *B. ikaa*, and *B. mennii* were promoted by lower values of caudal peduncle length and upper jaw length; and on axis 2 *Bryconamericus* sp. n. 2 is separated from *B. exodon*, *B. stramineus*, *B. turiuba*, *B. microcephalus*, *B. ornaticeps*, and *B. lambari* by lower values of postorbital length and head length.

As an additional feature with the distinctive characters commented above, *Bryconamericus* sp. n. 2 presents a triangular fourth infraorbital bone, versus a rectangular fourth infraorbital in other species of *Bryconamericus* (e.g. *B. iheringii*, *B. exodon*, *B. stramineus*, *B. turiuba*, and the type-species of genus *B. exodon*; Figs. 5 and 6). The shape of fourth infraorbital in *Bryconamericus* sp. n. 2 resembles that in *Piabina argentea* Reinhardt, 1867. In *P. argentea*, however, the fourth infraorbital is more elongated and infraorbital series has six bones, versus five on new species. Furthermore, *Bryconamericus* sp. n. 2 does not possess the characters presented by Vari & Harold (2001) for *Creagrutus-Piabina* clade (dentigerous surface of premaxilla triangular from ventral view; ligament between posteroventral corner of premaxilla and anterior surface of maxilla well developed; anterior terminus of dentary dentition distinctly posterior of anterior terminus of premaxillary dentition; ectopterigoid and quadrate not in contact; dorsal articular surface of hyomandibular asymmetrical -hyomandibula with dorsolateral buttress; anterior portion of mesethmoid expanded ventrally into a

relatively large and transversally flattened vertical plate; hyomandibular fossa visible laterally as a consequence of the reorientation of that portion of the sphenotic; distal portion of the lateral surface of the sphenotic spine variously elaborated posteriorly; opening delimited by scapula, coracoid, and cleithrum anterior to scapular foramen lacking; two or three epurals present; anterior portion of laterosensory canal segment in first infraorbital reaching or extending beyond anterior margin of bone; posterior portion of first infraorbital overlapping the anterior portion of the second infraorbital; opening in supraorbital canal for communication with laterosensory canal in the sixth infraorbital entirely in frontal; fourth infraorbital approximately triangular and excluded from posterior margin of infraorbital series in medium-to large sized-individuals; scapula lacking the narrow ring-like process forming the anterior border of the scapular foramen; maxilla with anterior process thick and posterior portion robust; maxilla with distinct flexion in region where it extends past the posterior limit of premaxilla; primordial ligament variably rotund in cross section and attaching primarily to distal one-half of maxilla; distinct ligament extending between anterodorsal tip of the maxilla and the dorsal surface of premaxilla; ligament extending between midventral portion of ascending process of and dorsal surface of premaxilla present; anguloarticular horizontally foreshortened; mesopterygoid and metapterygoid separated; quadrate with variably developed vertical ridge or process extending dorsally from the main body of quadrate in, and posterior to, the region where the posterodorsal process contacts the anteroventral process of the metapteygoid; anterior margin of hyomandibula anteriorly expanded and extending over posterodorsal region of metapterygoid; temporal foramen absent; ventrolateral extension of mesocoracoid contacting the dorsolateral margin of scapula through a small intervening cartilage; anterior portion of latersensory canal segment in first infraorbital reaching or extending beyond anterior margin of bone;

posterior portion of the first infraorbital overlapping the anterior portion of second infraorbital; scapula lacking narrow ring-like process forming anterior border of scapular foramen), reason why we prefer assign the new species to *Bryconamericus*.

The situation of new species described here is similar to that reported by Vari & Siebert (1990) to *Bryconamericus pectinatus* Vari & Siebert, where authors have faced with a choice of expand the definition of *Bryconamericus* to include the new species or propose a new monotypic genus to assign the new species; as did Fink (1976) to *Eretmobrycon bayano* Fink and Malabarba & Malabarba (1994) to *Hypobrycon maromba* Malabarba & Malabarba. Considering that *Bryconamericus* is not a natural group (Vari & Siebert, 1990; Malabarba & Kindel, 1995; Casciotta *et al.*, 2002; Román-Valencia, 2000; Azpelicueta & Almirón, 2001; Casciotta *et al.*, 2004; Azpelicueta *et al.*, 2003; Braga, 1998) but the new species has features currently considered diagnostic to the genus, we prefer assign the new species to *Bryconamericus*, instead of proposing a new monotypic genus with mixed features between *Bryconamericus* and *Piabina*.

The presence of *Bryconamericus* sp. n. 2 on the upper rio Paraná System in a watershed region between Paranaíba and rio das Velhas basins (Fig. 3, northern point) leads to questioning about the distribution of this species. Moreira-Filho & Buckup (2005) reported the presence of species originally belonging to upper rio Paraná system (e.g. *Leporinus octofasciatus* Steindachner, 1915) on São Francisco drainage, after the construction of transposition canals connecting rio Piumhi (formerly part of upper rio Paraná basin) to córrego Água Limpa (rio São Francisco basin), what has forced two faunas to coexist due interconnection of watersheds. The authors also discuss the possibility that some species originally from São Francisco drainage may have reached rio Grande (upper rio Paraná basin) during construction of these transposition canals prior to final closing of Capitólio dam. We think that is not the case for *Bryconamericus*

sp. n. 2, that occurs very near this region of transposition between rio Grande and rio São Francisco, but in the rio Araguari (Paranaíba drainage). In this case we are probably facing a natural event of a stream captured between rio São Francisco and upper rio Paraná.

Comparative Material

Bryconamericus exodon Eigenmann 1907: MZUSP 28026, 16/ 98, 38.0–44.0mm SL, Brazil, Poconé, rio Cuiabá (viveiro de pássaros), MT, 15–16/ Sep/ 1977. *Bryconamericus iheringii* (Boulenger, 1887): DZSJRP 5452, 3, 33.2–37.7mm SL, Brazil, Volta Grande, riacho afluente do rio Preto, SC-422 (terra), rio Iguaçu, SC, 26º14'00"S 49º34'44"W, 31/ Oct/ 2002; DZSJRP 5461, 2, 37.5–44.0mm SL, Brazil, Porto Vitória, rio Espingarda, abaixo da cachoeira, BR-280 na entrada da cidade, rio Iguaçu, PR, 26º9'44"S 51º13'22"W, 1/ Nov/ 2002; MCP 13831, 35/ 459, 26–46.7mm SL, Brazil, Iguaçu, rio Iguaçu in Porto União, próximo a ponte férrea (sistema do alto rio Paraná), SC, 26º14'00"S 51º04'00"W; MCP 14501, 1, 29.2mm SL, Brazil, Sudeste, rio Itajaí-Açu, próximo ao camping Paraíso (sistema costeiro), SC, 27º11'00"S 49º32'00"W, 22/ Feb/ 1991; MCP 10346, 8, 40.2–47.1mm SL, Uruguay, San José, Sudeste, Sierra Mahoma, 34º30'00"S 056º40'00"W, 11/ Dec/ 1982; MCP 19672, 15/ 61, 45.6–72.3mm SL, Brazil, rio Abaúna (afluente do rio Ligeiro - rio Uruguai), RS, 27º53'00"S 52º14'00"W; MCP 23167, 18, 29.4–52.1mm SL, Brazil, município de S. Francisco de Assis, Rio Inhacunda in São Francisco de Assis a cerca de 500 metros acima da olaria, RS, 29º32'27"S 55º7'45"W, 08/ May/ 1999; MZUSP 41025, 40/ 45, 29.1–62.1mm SL, Brazil, Rio Guarupá, estrada Uruguaiana-Guaraí, limite dos municípios, rio Uruguai, RS, Reis, 22/ Jul/ 1986; MCP 11188, 23, 20.9–46.2mm SL, Brazil, município de Jaguarão, Rio Jaguarão na prainha próximo a foz do rio Telho (sistema leste do Rio Grande do Sul), RS, 32º31'S 53º27'W, 07/ Jan/ 1987; MCP

11492, 10/ 19, 37.1–47.6mm SL, Brazil, Mirim Oeste, arroio Xasqueiro, na estrada BR-116 entre Pelotas e Arroio Grande (sistema leste do Rio Grande do Sul), RS, 32º09'00" S 53º02'00"W; MCP 14590, 28/ 98, 22.1–47.2mm SL, Brazil, Patos Oeste, arroio da Viúva Tereza (ou arroio do Pinto, sistema leste do Rio Grande do Sul), RS, 31º22'00"S 51º58'00"W; MCP 15036, 15, 47.5–60.0mm SL, Brazil, município de Viamão, arroio do Fiúza, RS, 30º6'S 51º6'W; MCP 15840, 16, 33.2–69.6mm SL, Brazil, Guaíba, lago Guaíba na praia de Itapuã, próximo a foz do riacho Itapuã (Sistema da Laguna dos Patos), RS, 30º15'00"S 51º02'20"W; MCP 17352, 10/ 330, 46.6–55.8mm SL, Brazil, Minas do Leão, arroio Taquara, na fazenda da Lizete, estrada da Boa Vista, cerca de 5 km da estrada BR 290, drenagem Jacuí, RS, 30º9'S 52º2'W, 24/ Nov/ 1993; MCP 19293, 15/ 44, 32.2–48.1mm SL, Brazil, município de Barra do Ribeiro, lago Guaíba na Barra do Ribeiro, RS, 30º17'3"S 51º18'4"W, 05/ Oct/ 1996; MCP 20840, 6, 32.6–57.6mm SL, Brazil, município de Erval, Sanga afluente do arroio Arambaré (afluente rio Santa Maria - rio Piratini) entre Pedro Osório e Airosa Galvão, RS, 31º58'19"S 53º5'39"W, 15/ Nov/ 1997; MCP 23801, 5, 30.7–46.0mm SL, Brazil, município de Sentinela do Sul, arroio Faxinal, afluente do arroio Velhaco, na estrada de Cerro Grande do Sul para Camaquã, RS, 30º43'48"S 51º45'24"W, 26/ Jun/ 1999; MCP 25061, 20/ 57, 28.7–60.1mm SL, Brazil, município de Pedro Osório, Arroio na estrada entre Pedro Osório e a localidade de Basílio (rio Piratini), RS, 31º53'43"S 52º53'30"W, 20/ Nov/ 1999; MCP 25155, 15, 34.1–45.3mm SL, Brazil, São Gonçalo, arroio a cerca de 10 km ao sul de Basílio na estrada entre Pedro Osório e a localidade de Basílio (rio Piratini), RS, 31º58'18"S 53º05'39"W; MCP 25889, 15/ 70, 28.6–63.2mm SL, Brazil, Camaquã, arroio da Cria, RS, 30º57'19"S 53º57'23"W; MCP 25935, 20/ 122, 36.3– 63.2mm SL, Brazil, Camaquã, arroio Hilário na estrada entre Caçapava do Sul e Lavras do Sul, RS, 30º46'03"S 053º48'23"W, 26/ Apr/ 2000; MCP 27264, 20/ 46, 34.4–70.2mm SL,

Brazil, município de Candiota, arroio Candiota, logo a jusante da Usina Termoelétrica (CA04), RS, 31º34'36"S 53º40'22"W, 16/ Feb/ 2001; MCP 27307, 15/ 50, 37.6–50.5mm SL, Brazil, Jaguarão, arroio Candiota no passo do Cedro, próximo a confluência com o rio Jaguarão (CA07), RS, 31º49'57"S 53º51'19"W; MNRJ 11135, 24/ 204, 27.3–57.6mm SL, Brazil, Porto Alegre, estrada para Viamão Km 8 (Beco do Carvalho), RS, 17/ Apr/ 1944; MNRJ 14299, 2, 30.5–61.8mm SL, Brazil, Caraá, rio dos Sinos, na Praia João Fernandes, cerca de 4 km NW de Vila Caraá, e 5 km a montante de Vila Rodolfo Tetour, RS, 12/ Jan/ 1995; MZUSP 18983, 17, 29.8–52.0mm SL, Brazil, Município de Lajeado, rio Forqueta em Marquês de Souza, RS, 07/ Dec/ 1979; MZUSP 25339, 18, 48.9–66.2mm SL, Brazil, Passo Fundo, rio Jacuí, Barragem de Ernestina, perto de Passo Fundo, RS, 20/ Sep/ 1977; UFRGS 2540, 12, 22.2–48.4mm SL, Brazil, município de Camaquã, rio Camaquã, 5 km, RS, 01/ Jun/ 1980. *Bryconamericus ikaa*: MNRJ 27296, 6/ 10, 32.2–51.2mm SL, Brazil, Porto União, rio Iguaçu, SC, 21–23/ Apr/ 1944. *Bryconamericus lambari*: MCP 26057, 20/ 60, 45.6–56.7mm SL, Brazil, Dois Irmãos, arroio Feitoria na Picada Verão (afluente do rio Cadeia - rio Caí), RS, 29º34'37"S 51º1'39"W, 26/ Jun/ 2000; MCP 15449, 1, 45.9mm SL, Brazil, Dois Irmãos, arroio afluente do arroio Feitoria, sob a ponte da avenida Sapiranga, RS, 29º35'S 51º6'W, 04/ Dec/ 1991. *Bryconamericus mennii*: ILPLA 1164, 1, 43.2mm SL, Argentina, Departamento Cainguás, Misiones province, Cuña-Pirú creek, 27º10'S 54º57'W, 29/ Nov/ 1999; ILPLA 1165, 1, 54.1mm SL, Argentina, Departamento Cainguás, Misiones province, Cuña-Pirú creek, 27º10'S 54º57'W, 30/ Nov/ 1999; ILPLA 1166, 4, 38.8–52.1mm SL, Argentina, Departamento Cainguás, Misiones province, Cuña-Pirú creek, 27º10'S 54º57'W, 01/ Dec/ 1999. *Bryconamericus microcephalus*: DZSJRP 4411, 11/ 20, 46.4–63.6mm SL, Brazil, Iporanga, rio Betari, afluente do rio Ribeira de Iguape, SP, 24/ Jan/ 1996; MZUSP 64775, 2, 45.7–48.4mm

SL, Brazil, São Miguel Arcanjo, rio Taquaral, na SP-139, Parque Estadual Carlos Botelho, SP, 27/ Nov/ 2000; MZUSP 64777, 1, 50.3mm SL, Brazil, Sete Barras, rio Ipiranga, na Fazenda Brasban, SP, 28/ Nov/ 2000; MZUSP 64778, 1, 51.0mm SL, Brazil, São Miguel Arcanjo, rio Taquaral, na SP-139, Parque Estadual Carlos Botelho, SP, 27/ Nov/ 2000; MZUSP 64779, 1/ 2, 48.0mm SL, Brazil, São Miguel Arcanjo, rio Taquaral, na SP-139, Parque Estadual Carlos Botelho, SP, 27/ Nov/ 2000. *Bryconamericus ornaticeps*: MNRJ 19993, 16/ 62 (1 d), 39.8–58.4mm SL, Brazil, município de Cachoeiras de Macacu, Boca do Mato, descendo pela estrada de Boca do Mato, junto a RJ 116, na segunda ponte sobre o rio Macacu, RJ, 22º25'30"S 42º37'0"W, 20/ Oct/ 1999. *Bryconamericus* sp. 1: DZSJRP 3317, 27, 33.1–45.7mm SL, Brazil, Itatinga, ribeirão dos Veados, rio Paranapanema próximo à represa de Jurumirim, SP, 1997; DZSJRP 3318, 74/ 98, 36.0–46.9mm SL, Brazil, Itatinga, ribeirão dos Veados, rio Paranapanema, próximo à represa de Jurumirim, SP, 1997; DZSJRP 3319, 13/ 15, 31.2–42.4mm SL, Brazil, Itatinga, ribeirão dos Veados, rio Paranapanema próximo à represa de Jurumirim, SP, 1997; DZSJRP 3320, 9/ 15, 33.5–41.0mm SL, Brazil, Itatinga, ribeirão dos Veados, rio Paranapanema próximo à represa de Jurumirim, SP, 1997; DZSJRP 3321, 10, 33.1–47.0mm SL, Brazil, Itatinga, ribeirão dos Veados, rio Paranapanema próximo à represa de Jurumirim, SP, 1997; DZSJRP 7900, 38, 28.9–48.3mm SL, Brazil, Piracicaba, Bairro Costa Pinto, córrego Barro Frio, Baixo Corumbataí, SP, 05/ Sep/ 2003; DZSJRP 7901, 4, 41.5–45.1mm SL, Brazil, Rio Claro, Fazenda S. José - Haras, afluente da margem esquerda do ribeirão Claro, 29/ Jul/ 2004; DZSJRP 7902, 83/ 111, 24.8–54.3mm SL, Brazil, Corumbataí, Sítio Águas Claras, afluente do córrego do Jacú, 22/ Jan/ 2004; DZSJRP 7903, 24/ 25, 40.8–54.1mm SL, Brazil, Rio Claro, Bairro da Assistência, córrego dos Gonçalves, 09/ Jul/ 2003; DZSJRP 8318, 1, 44.7mm SL, Brazil, Piracicaba, Bairro Costa Pinto, córrego Barro Frio, Baixo

Corumbataí, SP, 05/ Sep/ 2003; MZUSP 64770, 1, 50.3mm SL, Brazil, Capão Bonito, ribeirão Taquaral na SP 139, Parque Estadual de Carlos Botelho; MZUSP 64773, 2, 46.5–54.8mm SL, Brazil, São Miguel Arcanjo, rio Taquaral na SP - 139, Parque Estadual de Carlos Botelho, SP. *Bryconamericus stramineus*: DZSJRP 2816, 1, 41.0mm SL, Brazil, rio Pará na BR 262, entre Nova Serrana e Pará de Minas, São Francisco, 14/ Aug/ 1998; DZSJRP 4052, 3/ 8, 45.7–48.9mm SL, Brazil, Turiúba, ribeirão Santa Bárbara, corredeira, SP, 7/ Jul/ 2000; DZSJRP 5075, 5/ 131, 43.7–46,6mm SL, Brazil, Iturama, ponte sobre o rio Grande, na UHE de Água Vermelha, MG, 29/ Jan/ 2002; MZUSP 18641, 4/ 15, 41.6–48.8mm SL, Brazil, córrego Pipiripau, perto de Planaltina, DF, 19/ Jan/ 1976. *Bryconamericus thomasi*: MZUSP 26054, 1, 55.8mm SL, Peru, Ucayali, rio Huipora, Est. Pucallpa–Huánuco, Depto. Ucayali, 26/ Jun/ 1979. *Bryconamericus turiuba*: DZSJRP 3836, 5/ 13, 49.3–53.2mm SL, Brazil, Turiúba, ribeirão Santa Bárbara (corredeira), afluente do rio Tietê, SP, 20º57'59"S 50º1'6"W, 11/ Feb/ 2000; DZSJRP 3992, 5/ 10, 46.4–50.4mm SL, Brazil, Turiúba, ribeirão Santa Bárbara (corredeira), afluente do rio Tietê, SP, 20º57'59"S 50º1'6"W, 29/ Jun/ 2000; DZSJRP 5266, 5/ 30, 43.2–47.5mm SL, Brazil, Catalão, córrego da Anta Gorda, junto à ponte na estrada de terra, drenagem do rio Paranaíba, GO, 17º52'55"S 47º37'1"W, 25/ Apr/ 2002; DZSJRP 5534, 16/ 50, 40.7–58.5mm SL, Brazil, Uberaba, ribeirão Lajeado, às margens da BR 262, afluente direto do rio Grande, MG, 19º45'48"S 47º48'8"W, 20/ May/ 2003; DZSJRP 5555, 6/ 14, 34.9–38.7mm SL, Brazil, Uberaba, rio Uberaba, estrada Uberaba-Almeida Campos e Nova Ponte, rio Grande, MG, 19º39'40"S 47º49'23"W, 21/ Jul/ 2003; DZSJRP 5602, 2, 34.8–39.6mm SL, Brazil, Cristianópolis, ribeirão Gameleira, GO020 (BR-352), rio Paranaíba, GO, 17º10'19"S 48º43'36"W, 22/ May/ 2003; DZSJRP 5618, 1/ 6, 48.8mm SL, Brazil, Bela Vista de Goiás, riacho Campo Alegre, drenagem do Corumbá, rio Paranaíba, GO, 17º9'9"S 48º44'0"W, 22/

Jul/ 2003; DZSJRP 5651, 9, 29.8–48.3mm SL, Brazil, Montividiu, córrego Formosa, km 177 da GO 174, entre Amorinópolis e Montividiu, GO, 17º9'37"S 51º9'34"W, 24/ May/ 2003; DZSJRP 6494, 2/ 4, 52.2–52.3mm SL, Brazil, Bela Vista de Goiás, córrego do Salteador, fazenda Arapuca (pai do Daniel), afluente do rio Arapuca, rio Paranaíba, GO, 17º4'37"S 48º43'19"W, 29/ Apr/ 2004; DZSJRP 6507, 3/ 12, 49.1–56.3mm SL, Brazil, Bela Vista de Goiás, riacho Capoeira Grande, fazenda Arapuca (Alcides), afluente do rio Arapuca, rio Paranaíba, GO, 17º3'48"S 48º44'1"W, 29/ Apr/ 2004; DZSJRP 6647, 1, 48.2mm SL, Brazil, Uberlândia, rio Araguari sob a ponte do Pau Furado, 150 km da foz no Paranaíba, MG, 18º47'50"S 48º8'50"W; DZSJRP 6861, 2/ 39, 41.3–50.1mm SL, Brazil, Bela Vista de Goiás, córrego Arapuquinha, rio Corumbá, drenagem do rio Paranaíba, fazenda Arapuca, 17 km da GO 020, GO, 17º5'13"S 48º46'3"W, 24/ Jul/ 2004; DZSJRP 6988, 9/ 34, 47.3–51.8mm SL, Brazil, Bela Vista de Goiás, córrego dos Macacos, rio Corumbá, drenagem do Paranaíba, GO 020, km 78, GO, 17º4'39"S 48º43'20"W, 1/ Nov/ 2004; DZSJRP 7050, 2/ 24, 48.3–50.7mm SL, Brazil, Bela Vista de Goiás, córrego sem nome, rio Corumbá, drenagem do Paranaíba, GO 020, km 78, GO, 17º5'27"S 48º44'40"W, 6/ Feb/ 2005.

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Table 1. Morphometric data of *Bryconamericus* sp. n. 2 (n = 117). Range includes holotype. S.D. = Standard deviation. Standard length and Head length in mm.

Character	Holotype	Low-High	Mean	S. D.
1. Standard length	39.6	30.7–48.4	38.0	3.8
Percents of Standard length				
2. Body depth	27.0	23.2–27.6	25.8	0.9
3. Predorsal length	53.3	51.1–55.9	53.4	1.2
4. Snout to pectoral-fin insertion	26.0	24.1–28.4	26.0	0.7
5. Preventral distance	50.0	46.2–51.7	48.8	1.2
6. Preanal length	62.6	59.7–64.4	61.8	1.3
7. Dorsal fin to hypural	53.3	49.2–54.1	52.0	1.0
8. Dorsal-Anal distance	27.8	24.0–30.2	27.4	1.0
9. Dorsal-Pectoral distance	35.8	31.9–37.9	35.3	1.2
10. Dorsal-fin base	13.4	11.4–15.1	13.1	0.6
11. Pectoral-fin length	20.9	18.8–22.7	20.7	0.9
12. Pelvic-fin length	15.6	12.1–16.3	14.4	0.7
13. Anal-fin base	23.7	21.9–26.4	24.1	1.0
14. Dorsal-fin length	22.7	19.8–24.3	22.2	1.1
15. Caudal peduncle depth	10.6	9.2–11.2	10.3	0.5
16. Head length	29.5	27.7–30.8	29.0	0.7
17. Pectoral-Pelvic distance	24.0	22.6–26.5	24.5	1.1
18. Pelvic-Anal distance	15.6	12.4–16.3	14.4	0.9
19. Caudal peduncle length	17.9	15.5–21.3	18.2	1.1
Percents of Head length				
20. Snout length	23.1	20.0–24.2	22.0	1.0
21. Orbital diameter	26.5	23.6–29.3	26.6	1.2
22. Head depth	77.8	72.3–80.9	76.5	2.0
23. Postorbital length	47.9	44.4–50.0	47.6	1.5
24. Upper jaw length	32.5	30.4–35.4	32.8	1.4
25. Interorbital width	25.6	24.1–28.3	26.3	0.9

Table 2. Eigenvalues and associated probability (p) of first (Can 1) and second (Can 2) axis of Canonical Variates Analysis of combined populations of *Bryconamericus* sp. n. 2 and comparative species.

Character	Can 1	p	Can 2	p
1. Standard length	-0.72064	0.0001	0.41994	0.0001
2. Body depth	0.91405	0.0001	-0.07735	0.0140
3. Predorsal distance	-0.13204	0.0001	-0.02256	0.4741
4. Snout to pectoral insertion	-0.33183	0.0001	-0.24490	0.0001
5. Preventral distance	-0.20631	0.0001	-0.06377	0.0428
6. Preanal length	0.46647	0.0001	-0.05727	0.0690
7. Dorsal fin to hypural	-0.48416	0.0001	0.17438	0.0001
8. Dorsal-Anal distance	0.95083	0.0001	-0.08932	0.0045
9. Dorsal-Pectoral distance	0.43896	0.0001	0.35240	0.0001
10. Dorsal-fin base	-0.53536	0.0001	0.08863	0.0048
11. Pectoral-fin length	0.47402	0.0001	0.01054	0.7380
12. Pelvic-fin length	0.75813	0.0001	-0.29622	0.0001
13. Anal-fin base	-0.50102	0.0001	0.47376	0.0001
14. Dorsal-fin length	0.65108	0.0001	-0.00063	0.9840
15. Caudal peduncle depth	0.23058	0.0001	-0.09264	0.0032
16. Head length	-0.64911	0.0001	-0.40789	0.0001
17. Pectoral-Pelvic distance	-0.08598	0.0063	0.05308	0.0919
18. Pelvic-Anal distance	0.71362	0.0001	0.03241	0.3037
19. Snout length	-0.61056	0.0001	-0.29190	0.0001
20. Orbital diameter	0.55437	0.0001	0.60195	0.0001
21. Head depth	0.26110	0.0001	0.03273	0.2989
22. Postorbital length	-0.63797	0.0001	-0.58329	0.0001
23. Caudal peduncle length	-0.74844	0.0001	-0.20284	0.0001
24. Upper jaw length	-0.88689	0.0001	0.15432	0.0001
25. Interorbital width	-0.47191	0.0001	0.22060	0.0001

Fig. 1: DZSJRP 8319 (formerly LIRP 0632), 39.6mm SL, Brazil, São Roque de Minas, Fazenda Casca D'Anta, rio São Francisco, MG, 20º30'0"S 46º50'0"W, L. Casatti *et al.*, 31/Dec/ 1995.

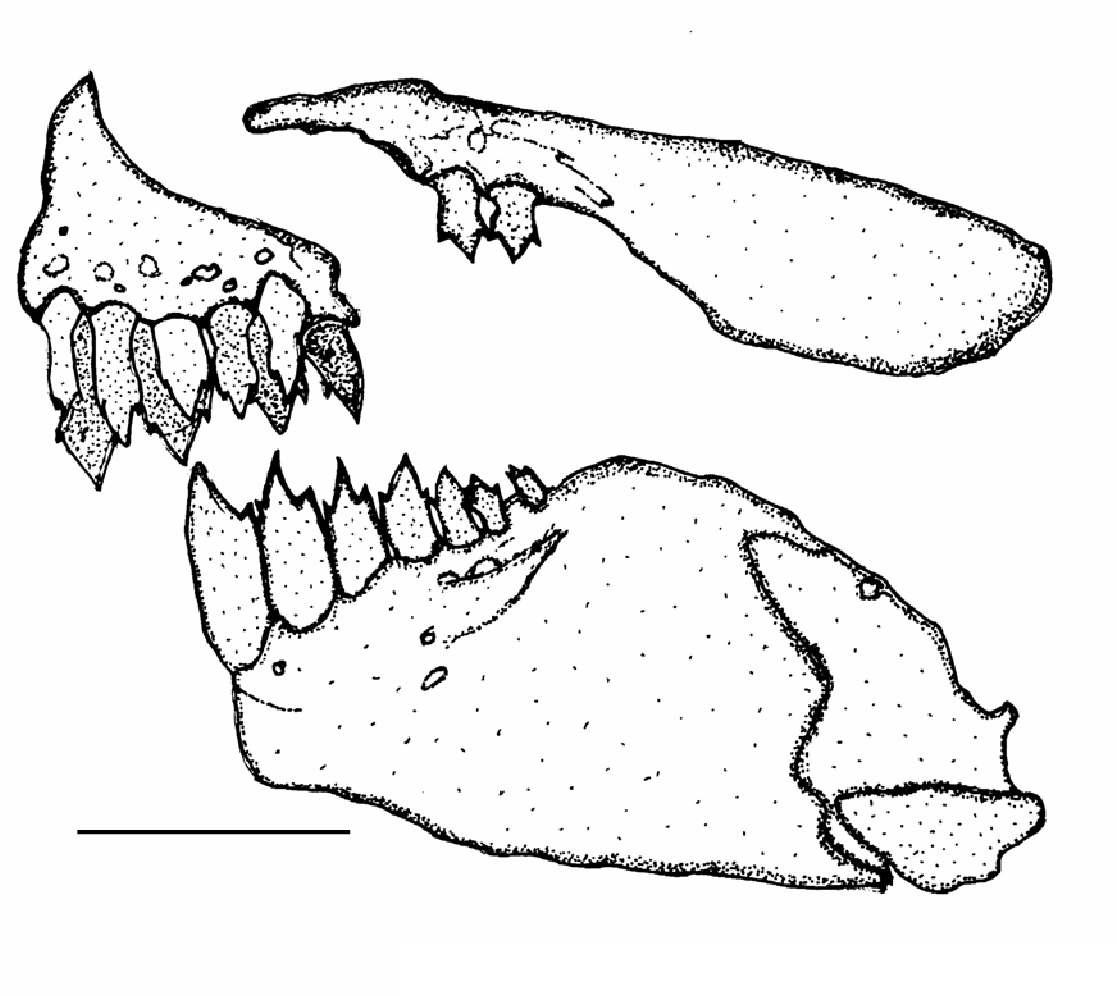

Fig. 2: Premaxilla, maxilla and dentary of *Bryconamericus* sp. n. 2, LIRP 0632. Lateral view, left side. Bar scale represents 1 mm.

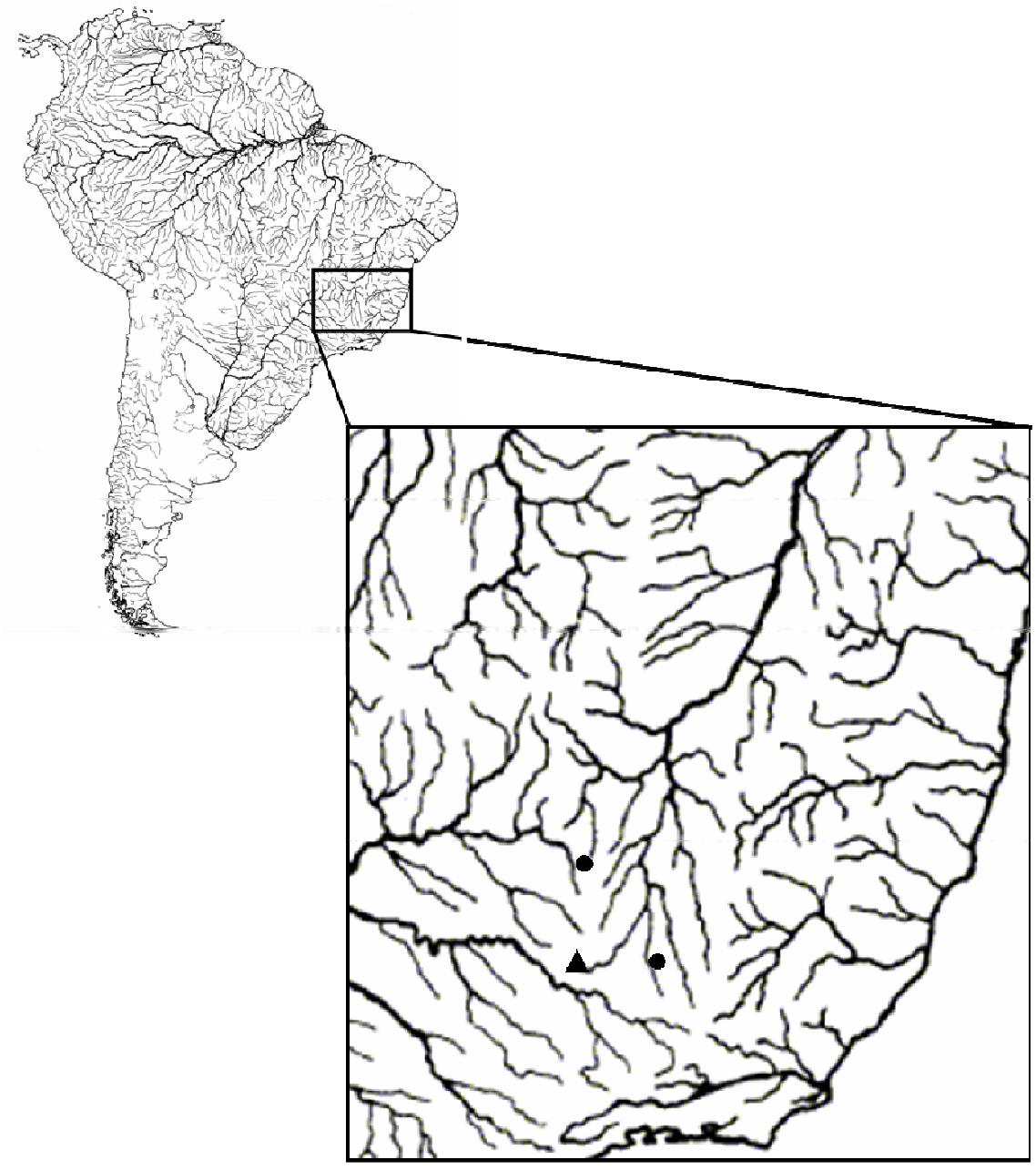

Fig. 3: Distribution of *Bryconamericus* sp. n. 2. Triangle represents the type-locality and northern point are upper rio Paraná specimens.

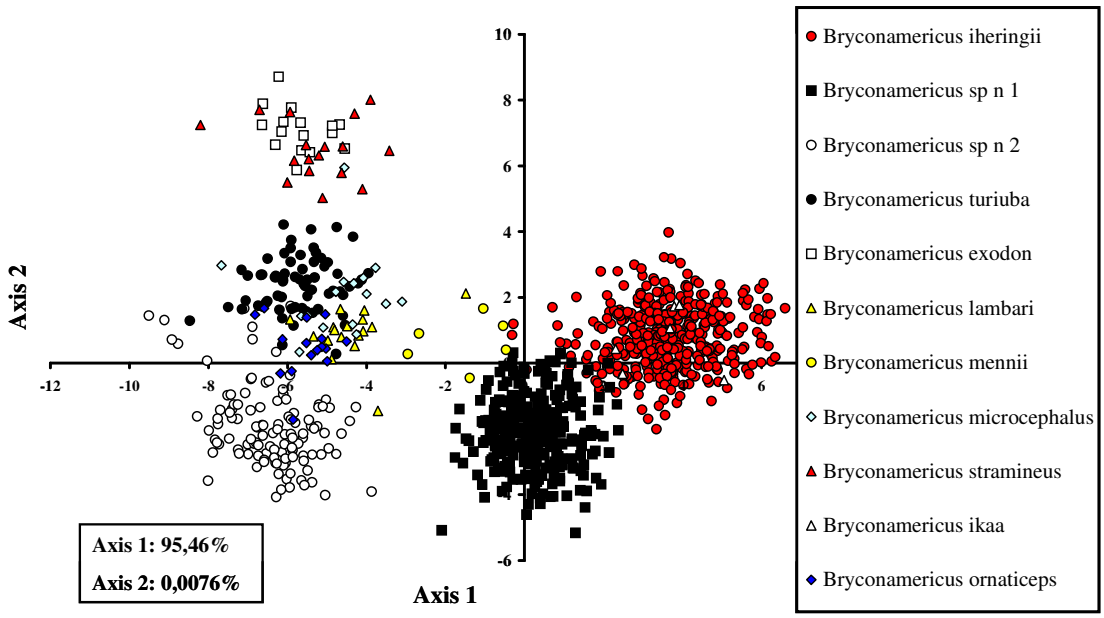

Fig. 4: Projection of Size-independent Canonical Variates Analysis scores of *Bryconamericus* sp. n. 2 versus Comparative species.

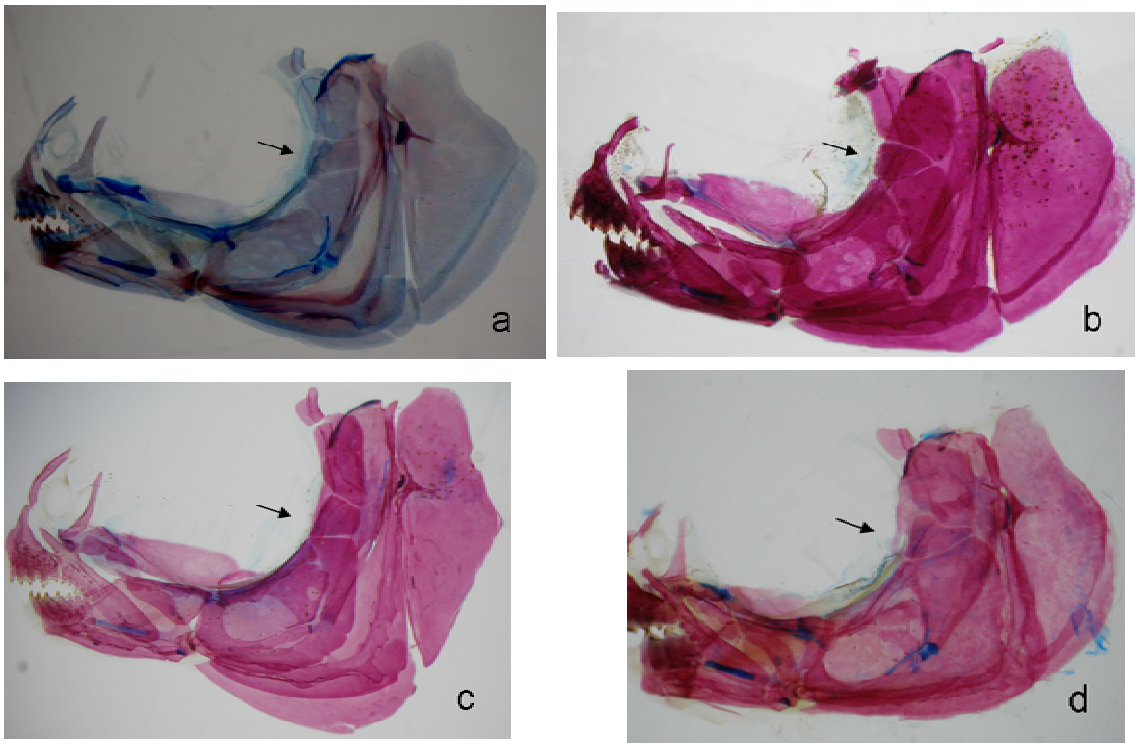

Fig. 5: Infraorbital series and suspensorium: **a.** *Bryconamericus* sp. n. 1, DZSJRP 3318; **b.** *Bryconamericus* sp. n. 2 LIRP 0632; **c.** *Bryconamericus iheringii*, MCP 23167, and **d.** *Piabina argentea*, DZSJRP 0443.

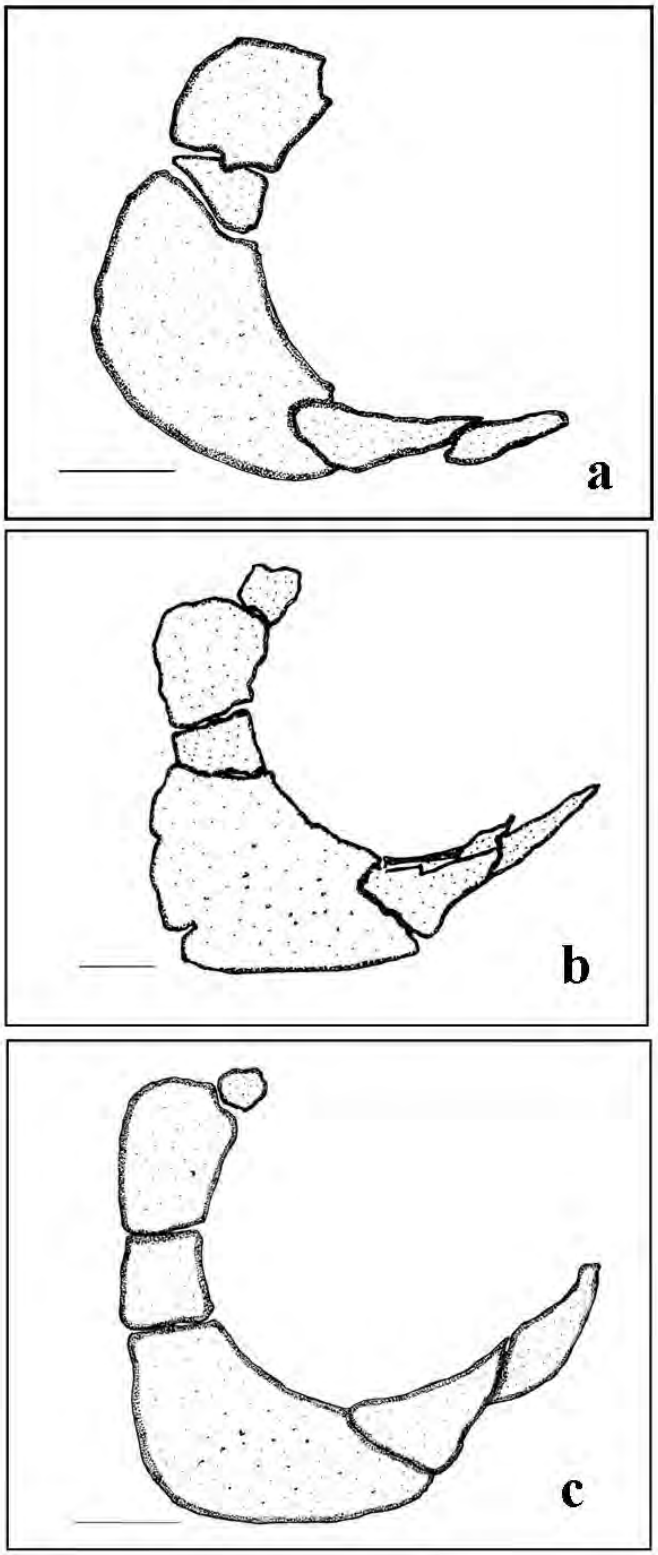

Fig. 6: Infraorbital series of *Bryconamericus* sp. n. 2, LIRP 0632 (a); *Bryconamericus turiuba*, DZSJRP 3914 (b); and *Bryconamericus exodon*, MZUSP 28026 (c). Scale bar represents 1 mm.

Appendix

Box plot graphs from 1 to 20 depict proportion differences in percentages between *Bryconamericus* sp. n. 1 and *Bryconamericus iheringii*. Figures from 21 to 43 depict differences among *Bryconamericus* sp. n. 1, *Bryconamericus* sp. n. 2, *B. iheringii*, and the Comparative Material.

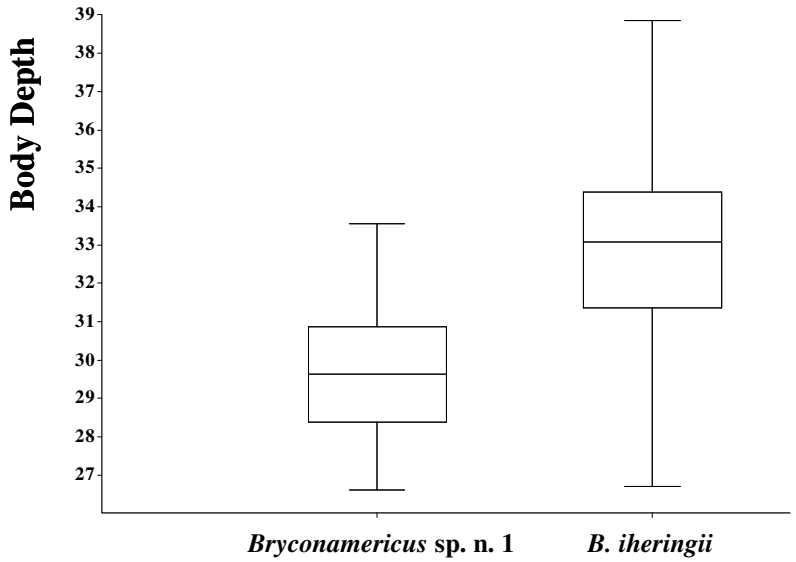

Fig. 1: Box plot of Body depth in SL. Kruskal-Wallis tests $p < 0.05$ and $H = 284.9441$.

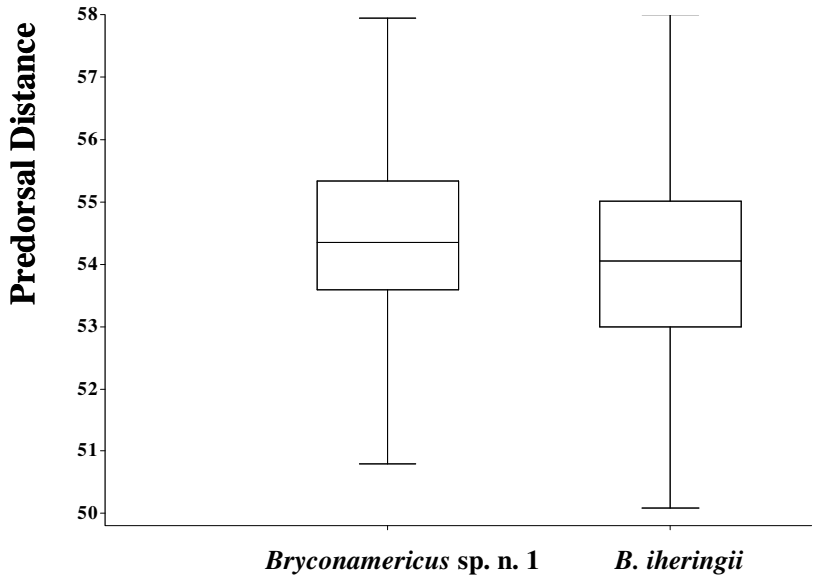

Fig. 2: Box plot of predorsal distance in SL. Kruskal-Wallis tests $p < 0.05$ and $H = 10.6065$.

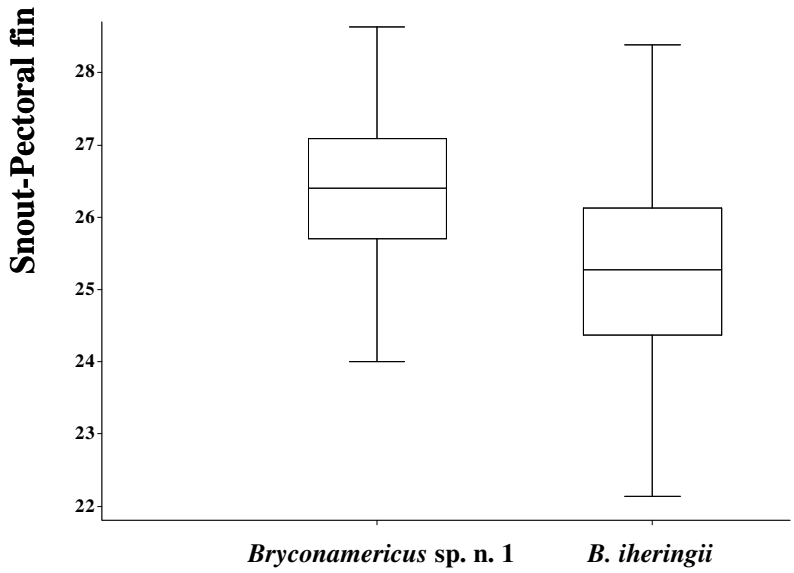

Fig. 3: Box plot of Snout-Pectoral fin distance in SL. Kruskal-Wallis tests $p < 0.05$ and $H = 109.0847$.

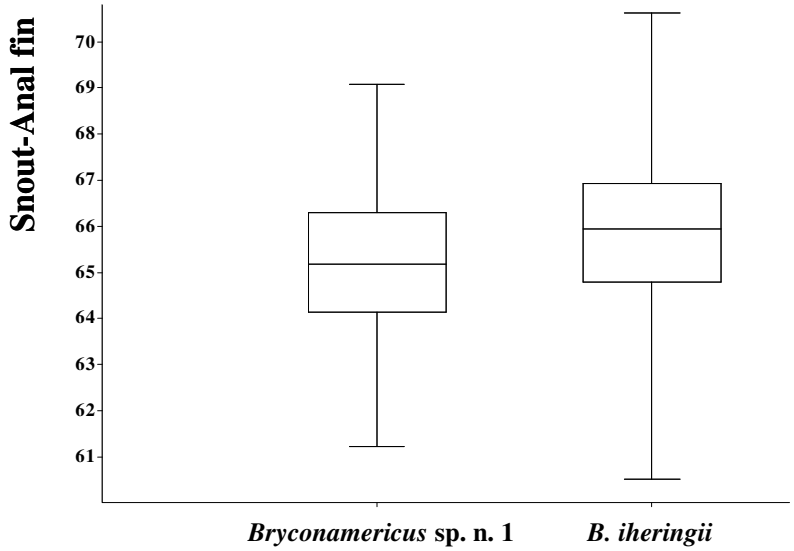

Fig. 4: Box plot of Snout-Anal fin distance in SL. Kruskal-Wallis tests: $p < 0.05$ and $H = 20.8328$.

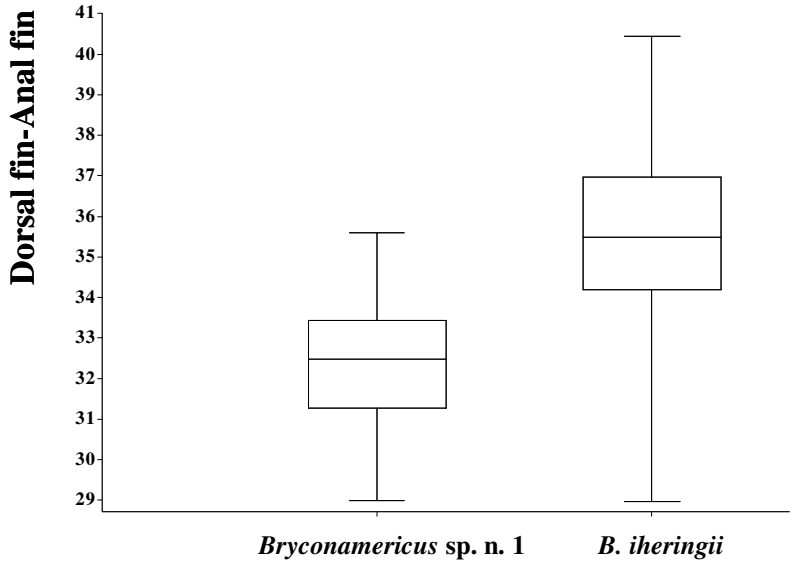

Fig 5: Box plot of Dorsal fin-Anal fin distance in SL. Kruskal-Wallis tests: $p < 0.05$ and $H = 317.5722$.

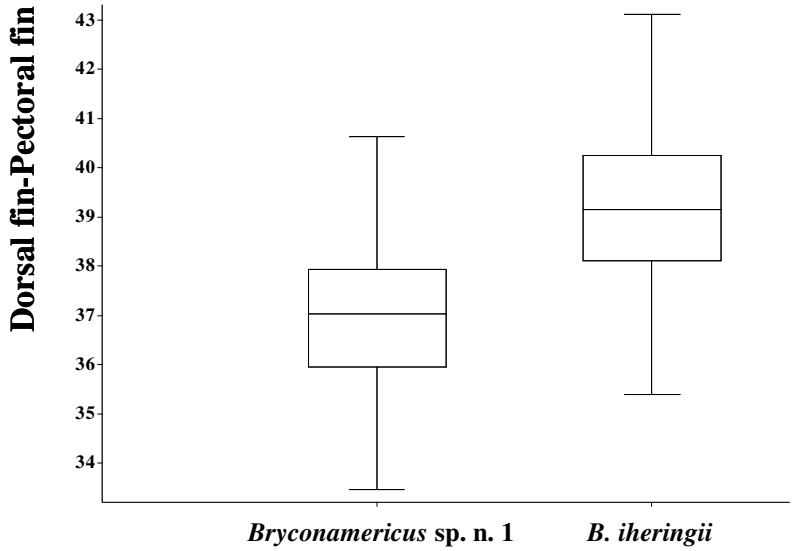

Fig 6: Box plot of Dorsal fin-Pectoral fin distance in SL. Kruskal-Wallis tests: $p < 0.05$ and $H = 224.6253$.

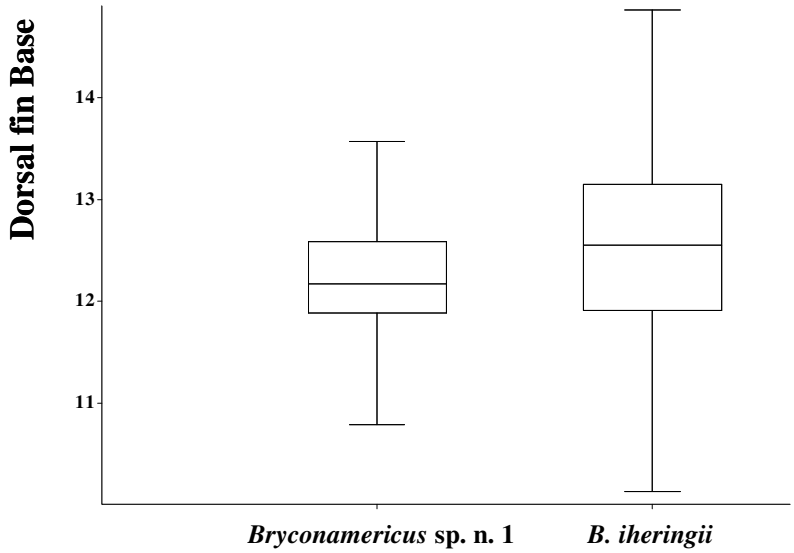

Fig. 7: Box plot of Dorsal-fin base in SL. Kruskal-Wallis tests: $p < 0.05$ and $H = 18.7795$.

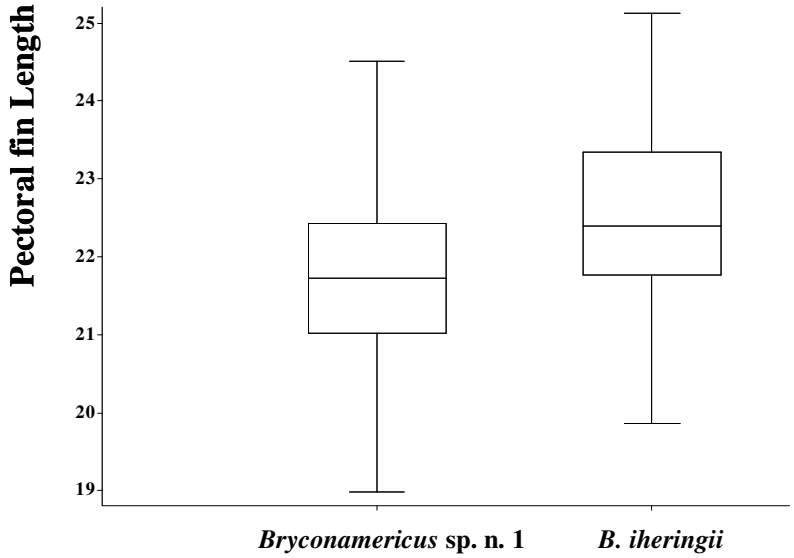

Fig 8: Box plot of Pectoral-fin length in SL. Kruskal-Wallis tests: $p < 0.05$ and $H = 61.4988$.

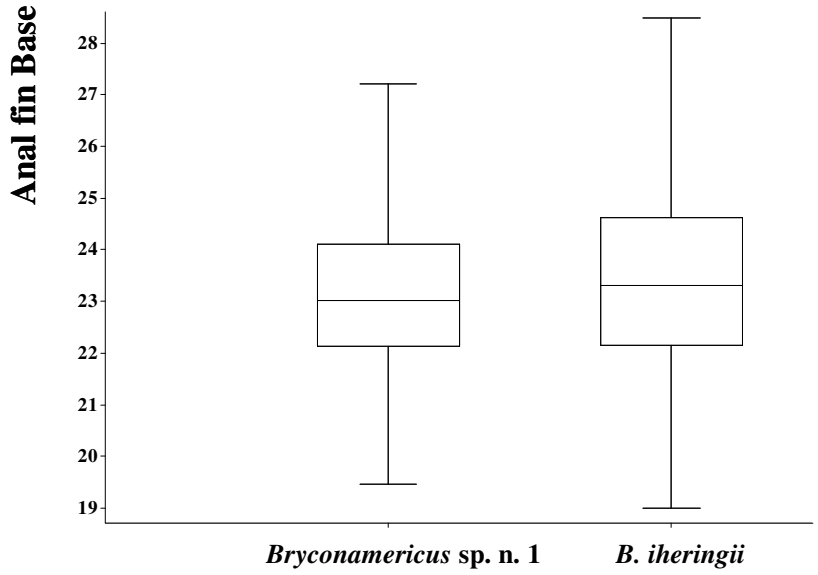

Fig. 9: Box plot of Anal-fin base in SL. Kruskal-Wallis tests: $p < 0.05$ and $H = 4.2234$.

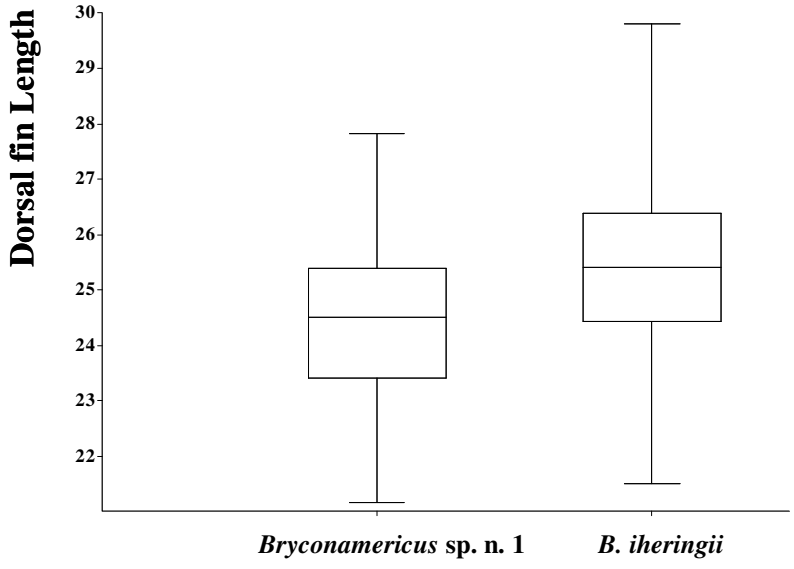

Fig. 10: Box plot of Dorsal-fin length in SL. Kruskal-Wallis tests: $p < 0.05$ and $H = 52.0832$.

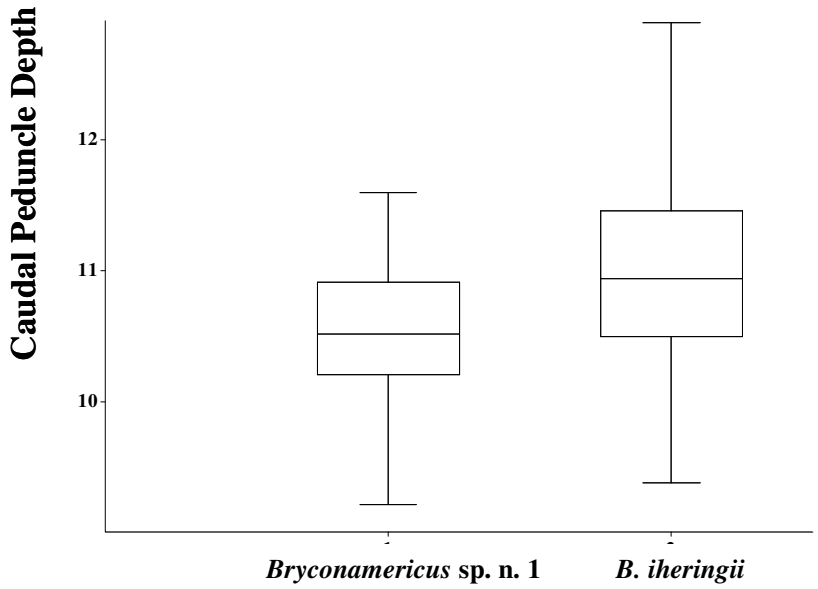

Fig. 11: Box plot of Caudal peduncle depth in SL. Kruskal-Wallis tests: $p < 0.05$ and $H = 61.6139$.

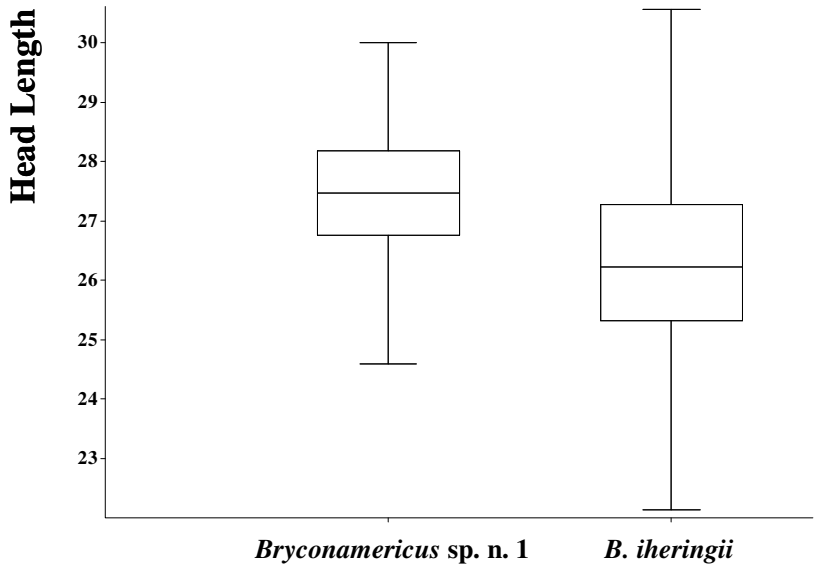

Fig. 12: Box plot of Head length in SL. Kruskal-Wallis tests: $p < 0.05$ and $H = 114.5455$.

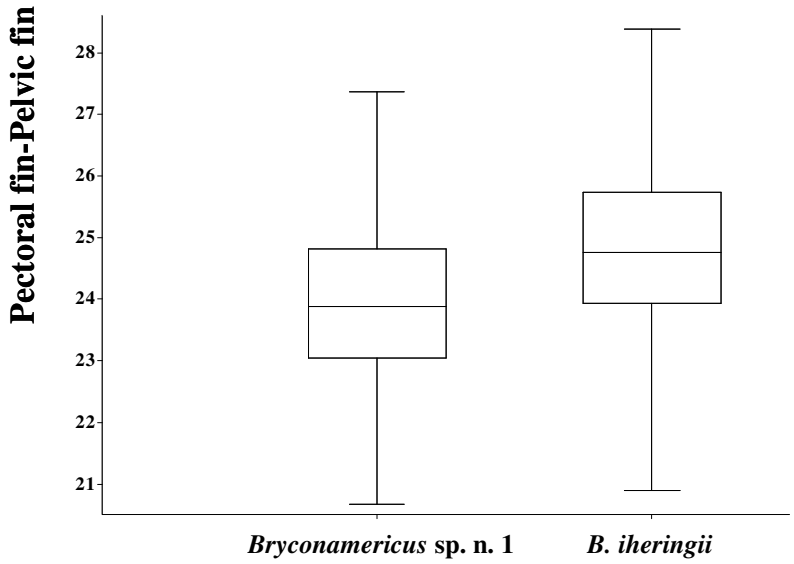

Fig. 13: Box plot of Pectoral fin-Pelvic fin distance in SL. Kruskal-Wallis tests: $p < 0.05$ $H = 65.1144$.

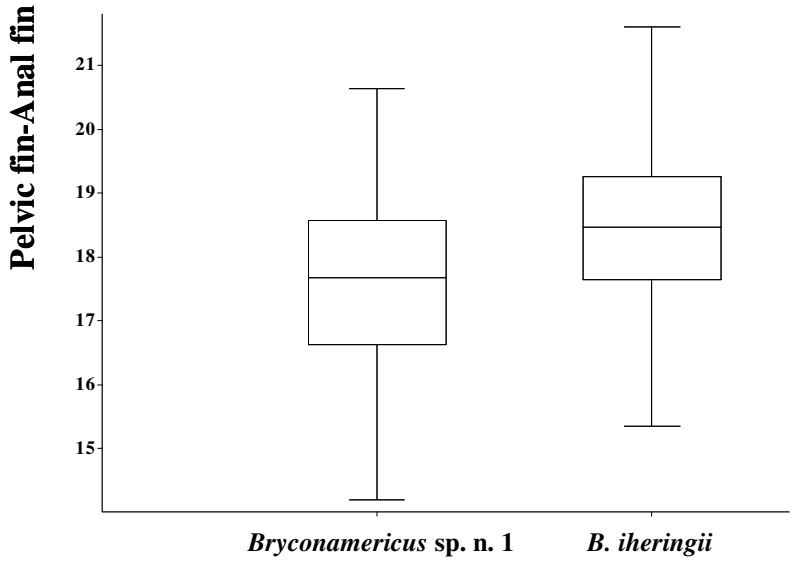

Fig. 14: Box plot of Pelvic fin-Anal fin distance in SL. Kruskal-Wallis tests: $p < 0.05$ and $H = 65.1743$.

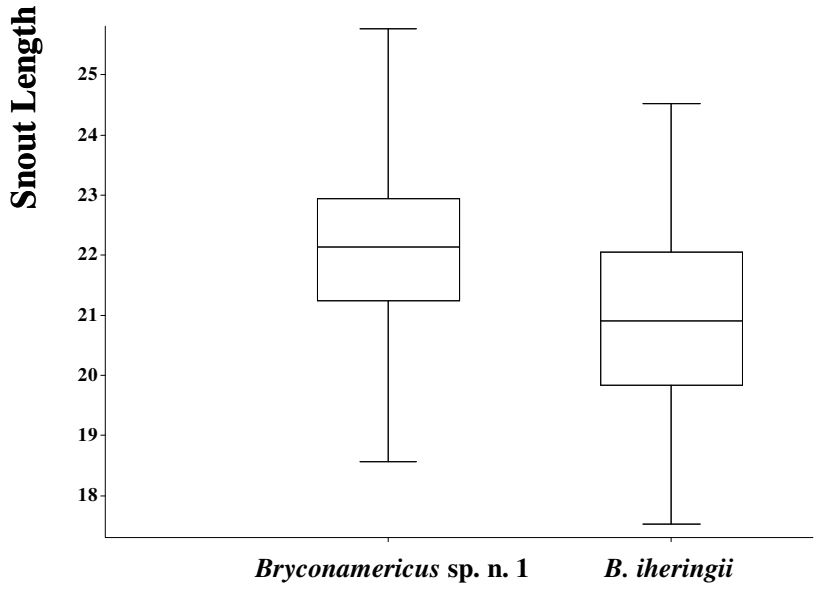

Fig. 15: Box plot of Snout length in HL. Kruskal-Wallis tests: $p < 0.05$ and $H = 95.9990$.

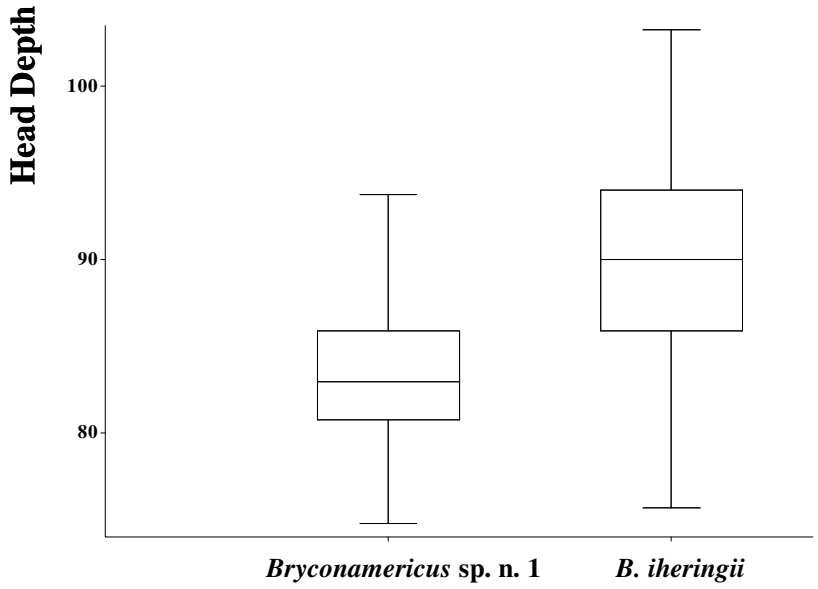

Fig. 16: Box plot of Head depth in HL. Kruskal-Wallis tests: $p < 0.05$ $H = 194.3448$.

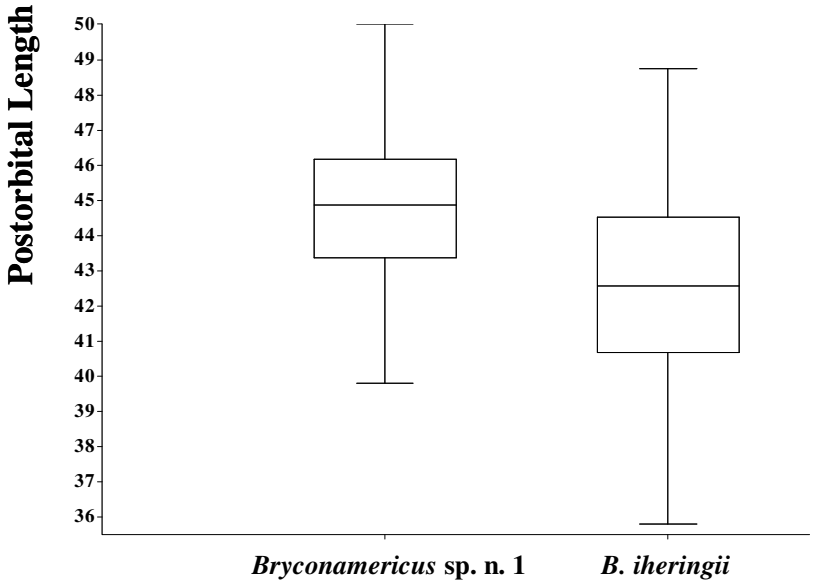

Fig. 17: Box plot of Postorbital length in HL. Kruskal-Wallis: $p < 0.05$ H = 129.7555.

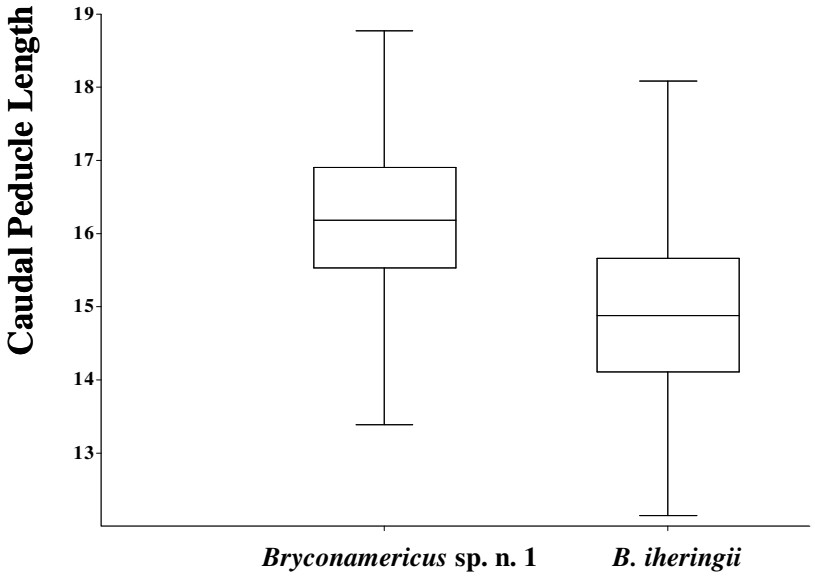

Fig. 18: Box plot of Caudal peduncle length in SL. Kruskal-Wallis tests: $p < 0.05$ H = 172.5471.

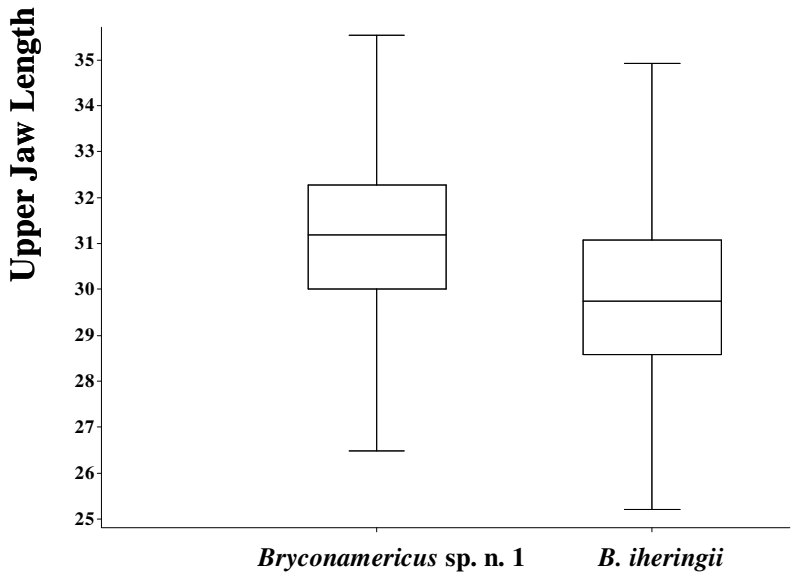

Fig. 19: Box plot of Upper jaw length in HL. Kruskal-Wallis tests: $p < 0.05$ and $H = 77.1183$.

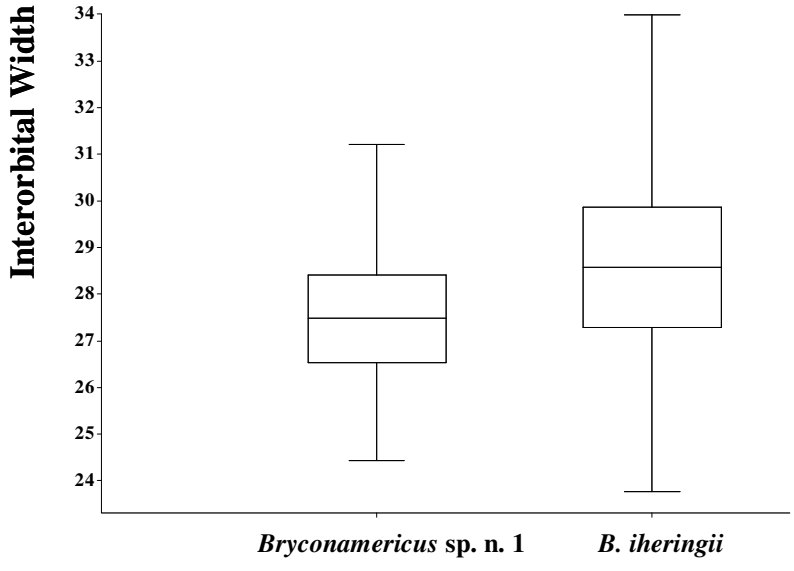

Fig. 20: Box plot of Interorbital width in HL. Kruskal-Wallis tests: $p < 0.05$ and $H = 64.3743$.

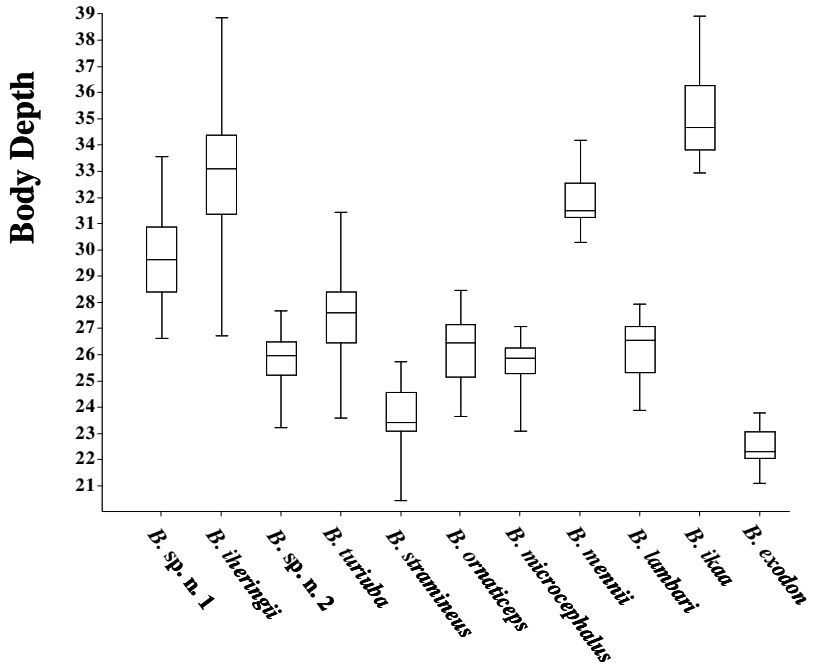

Fig. 21: Box plot of Body depth in SL for *Bryconamericus* sp. n. 1, *Bryconamericus* sp. n. 2, and *Bryconamericus iheringii* comparing with other congeners.

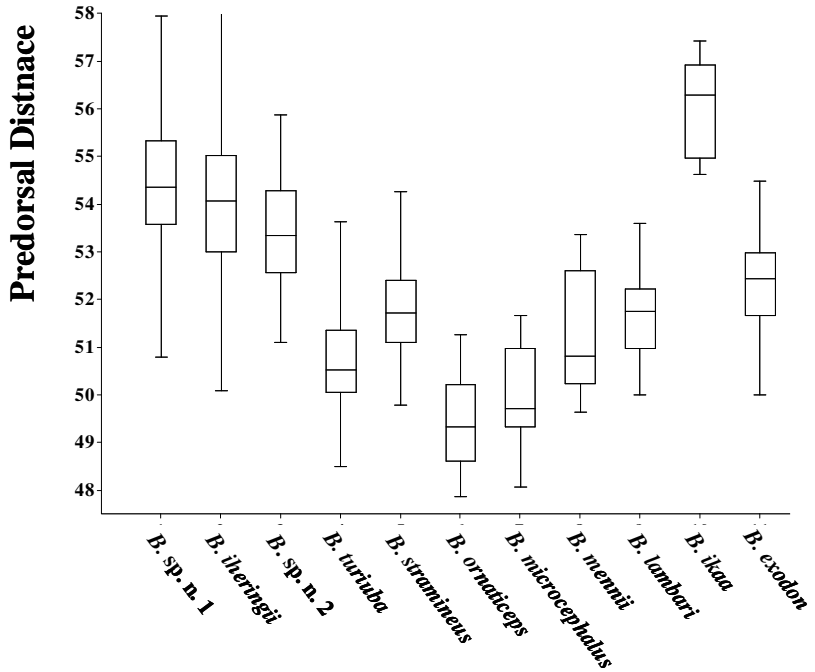

Fig. 22: Box plot of Predorsal distance in SL for *Bryconamericus* sp. n. 1, *Bryconamericus* sp. n. 2, and *Bryconamericus iheringii* comparing with other congeners.

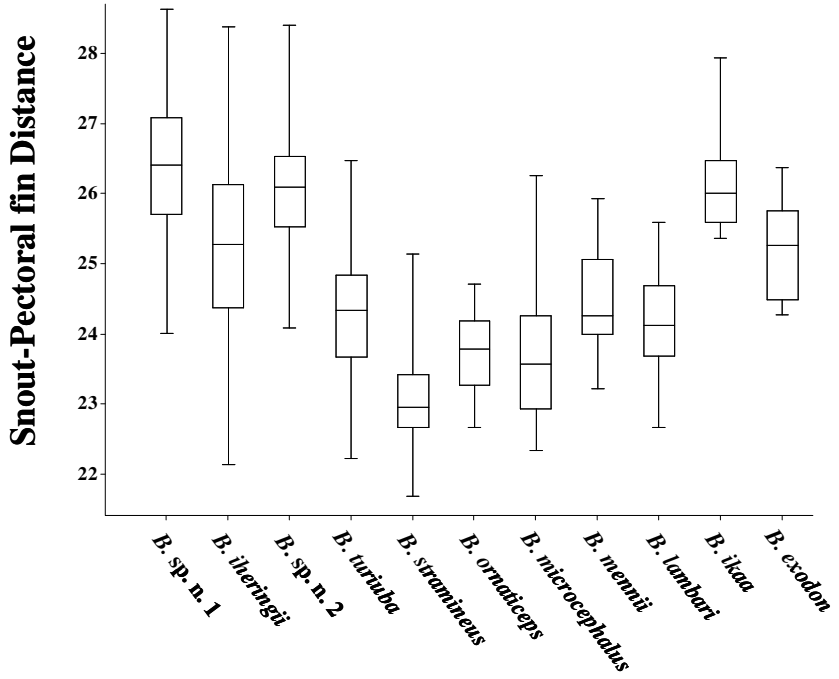

Fig. 23: Box plot of Snout-Pectoral fin distance in SL for *Bryconamericus* sp. n. 1, *Bryconamericus* sp. n. 2, and *Bryconamericus iheringii* comparing with other congeners.

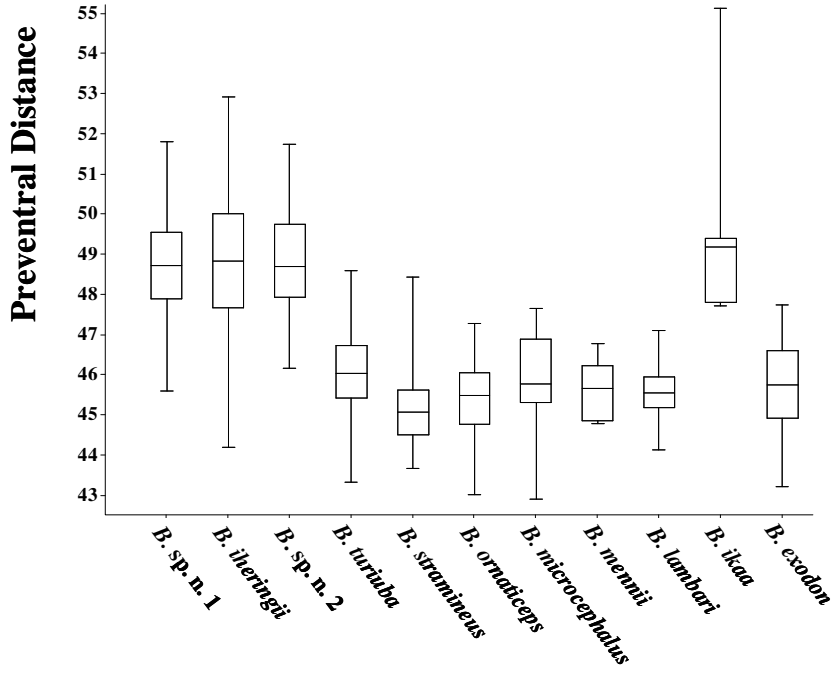

Fig. 24: Box plot of Preventral distance in SL for *Bryconamericus* sp. n. 1, *Bryconamericus* sp. n. 2, and *Bryconamericus iheringii* comparing with other congeners.

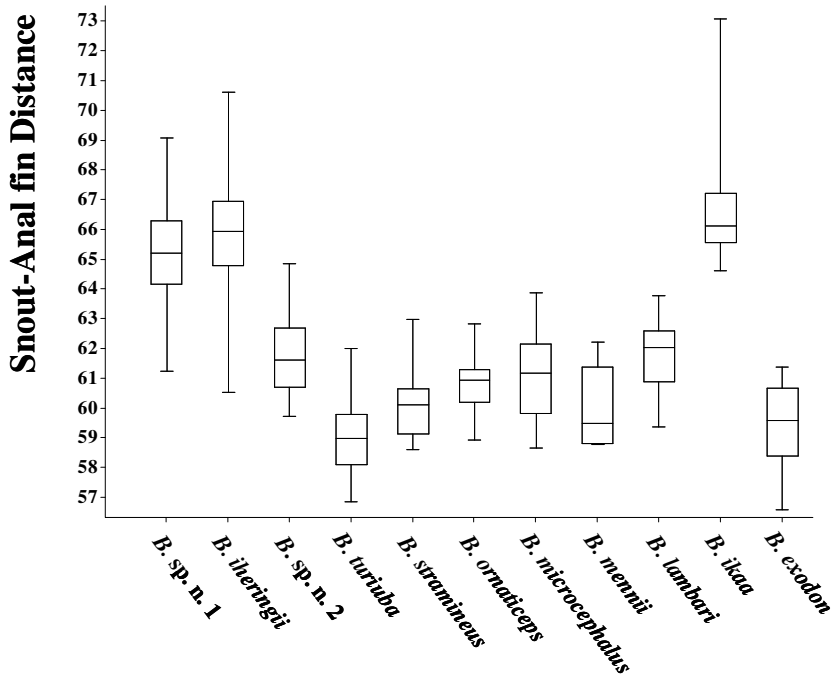

Fig. 25: Box plot of Snout-Anal fin distance in SL for *Bryconamericus* sp. n. 1, *Bryconamericus* sp. n. 2, and *Bryconamericus iheringii* comparing with other congeners.

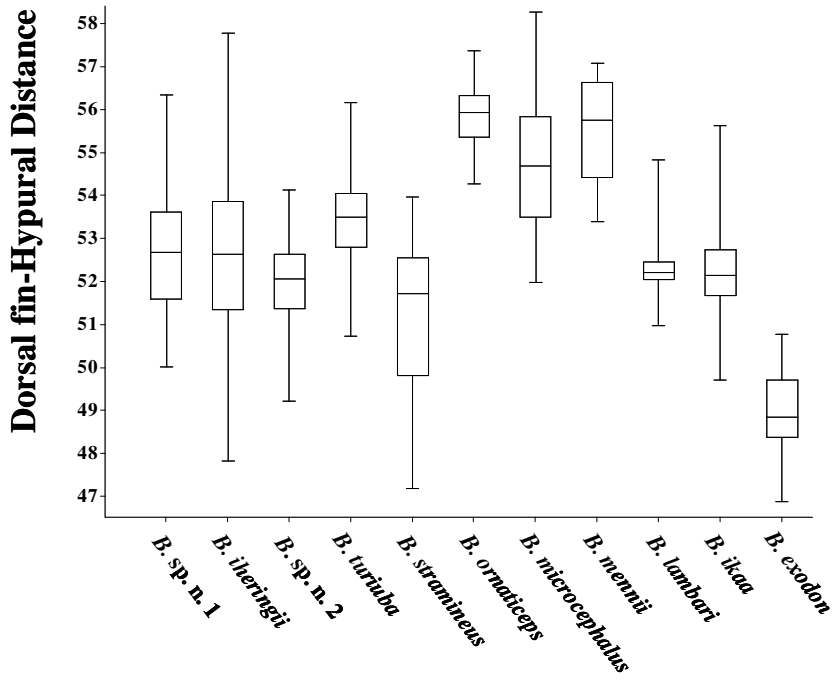

Fig. 26: Box plot of Dorsal fin-Hypural distance in SL for *Bryconamericus* sp. n. 1, *Bryconamericus* sp. n. 2, and *Bryconamericus iheringii* comparing with other congeners.

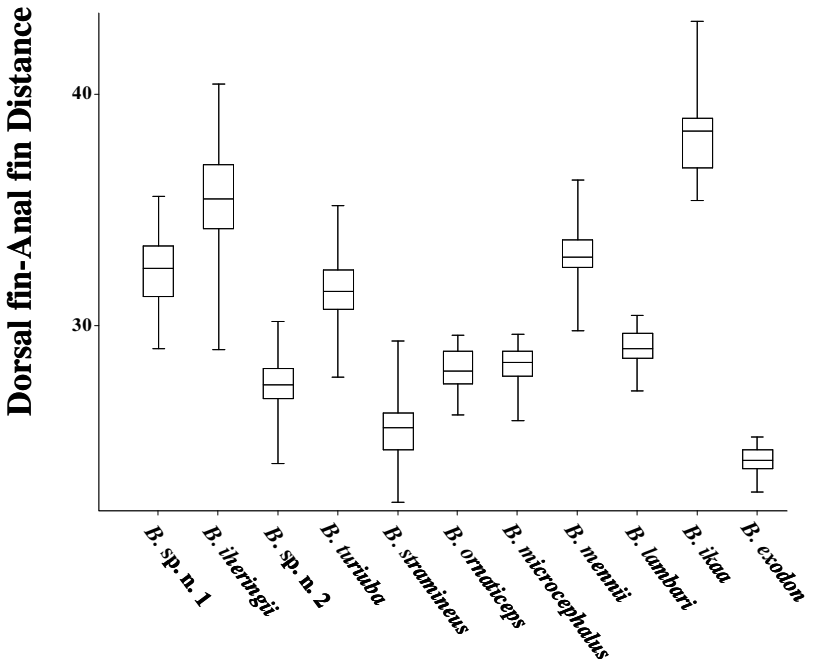

Fig. 27: Box plot of Dorsal fin-Anal fin distance in SL for *Bryconamericus* sp. n. 1, *Bryconamericus* sp. n. 2, and *Bryconamericus iheringii* comparing with other congeners.

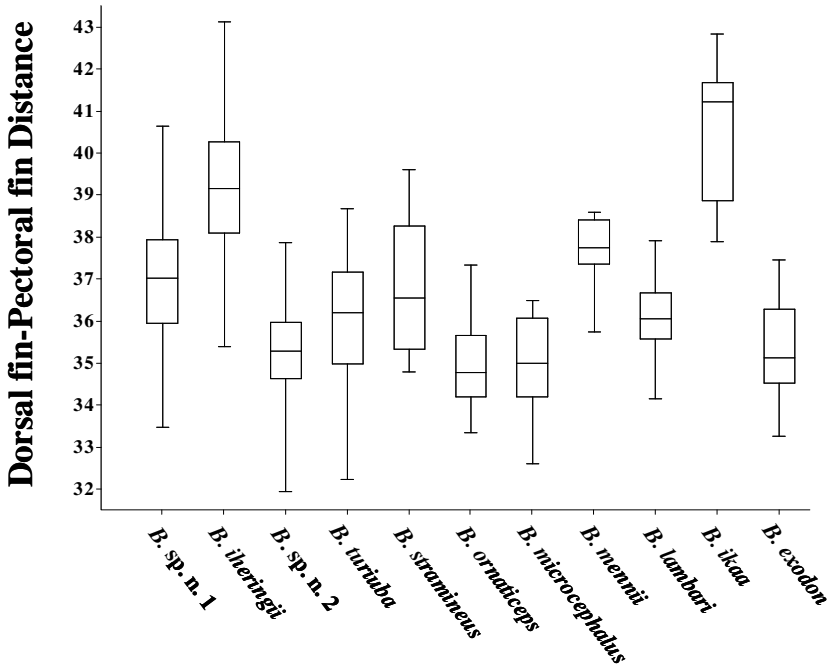

Fig. 28: Box plot of Dorsal fin-Pectoral fin distance in SL for *Bryconamericus* sp. n. 1, *Bryconamericus* sp. n. 2, and *Bryconamericus iheringii* comparing with other congeners.

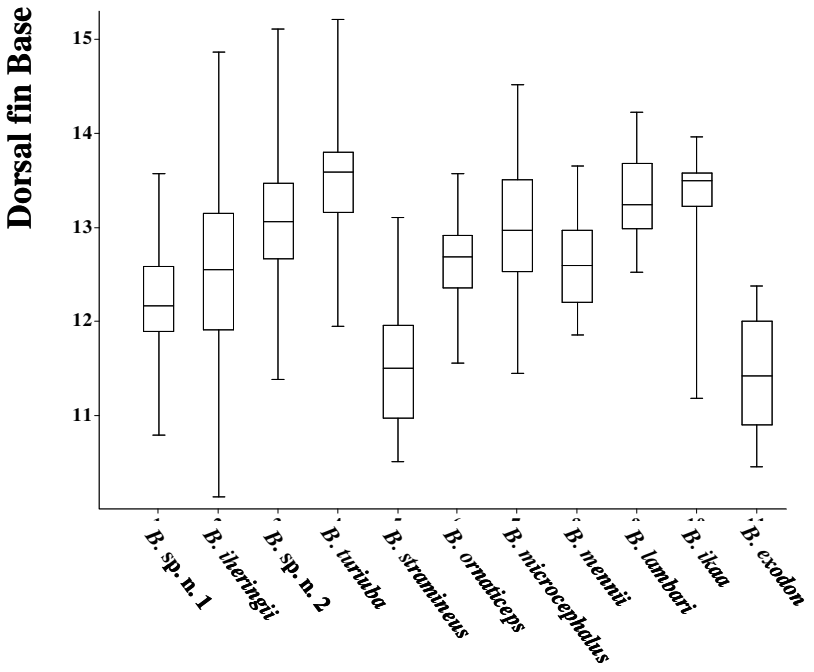

Fig. 29: Box plot of Dorsal-fin length in SL for *Bryconamericus* sp. n. 1, *Bryconamericus* sp. n. 2, and *Bryconamericus iheringii* comparing with other congeners.

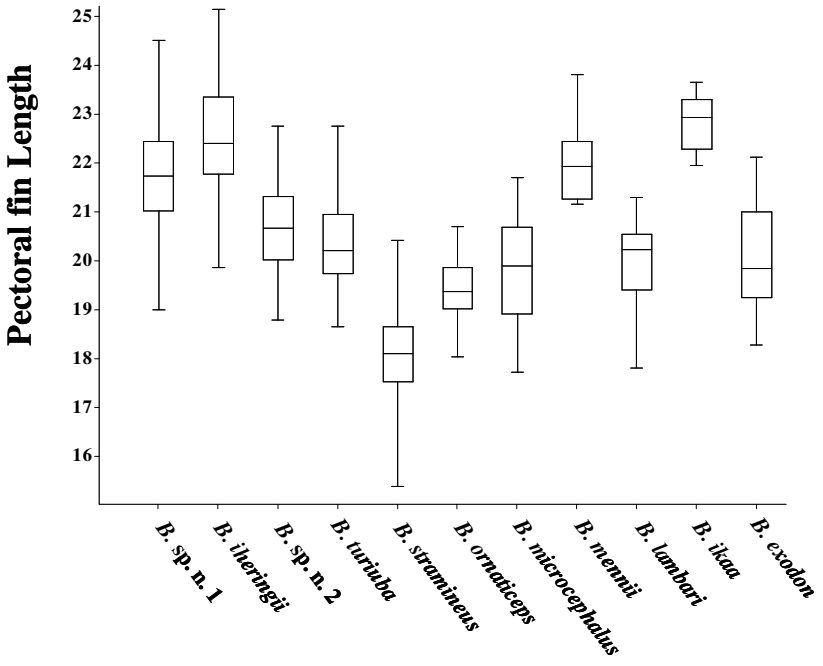

Fig. 30: Box plot of Pelvic-fin length in SL for *Bryconamericus* sp. n. 1, *Bryconamericus* sp. n. 2, and *Bryconamericus iheringii* comparing with other congeners.

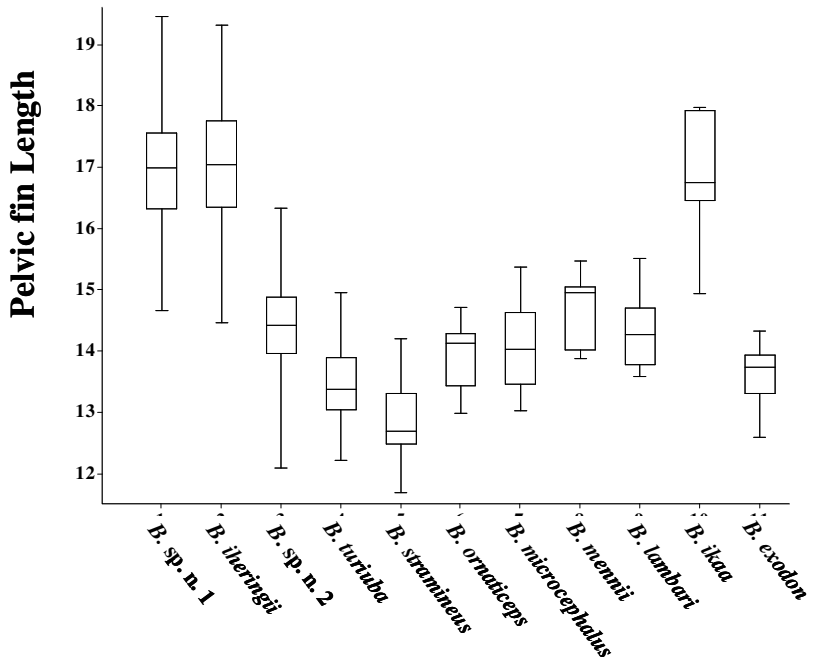

Fig. 31: Box plot of Pelvic-fin length in SL for *Bryconamericus* sp. n. 1, *Bryconamericus* sp. n. 2, and *Bryconamericus iheringii* comparing with other congeners.

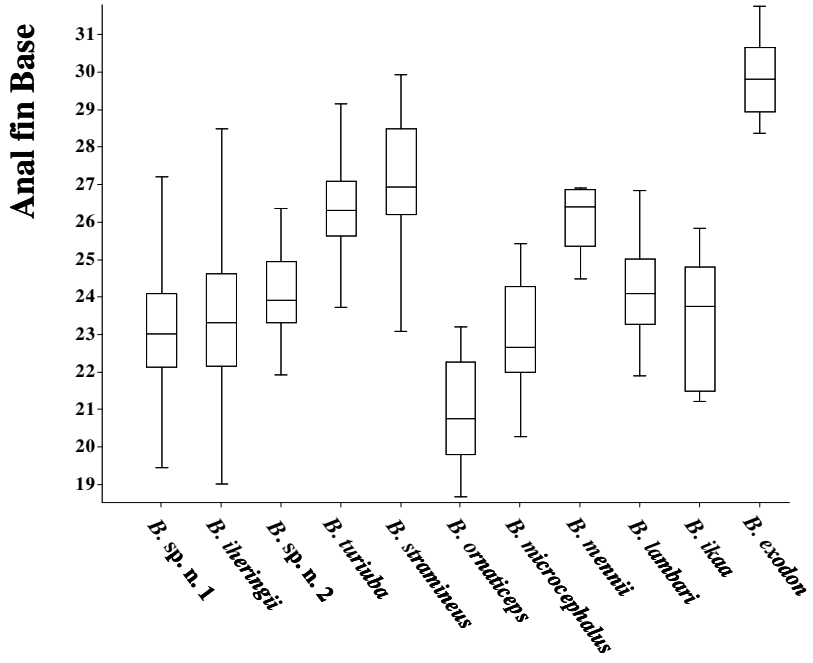

Fig. 32: Box plot of Anal-fin base in SL for *Bryconamericus* sp. n. 1, *Bryconamericus* sp. n. 2, and *Bryconamericus iheringii* comparing with other congeners.

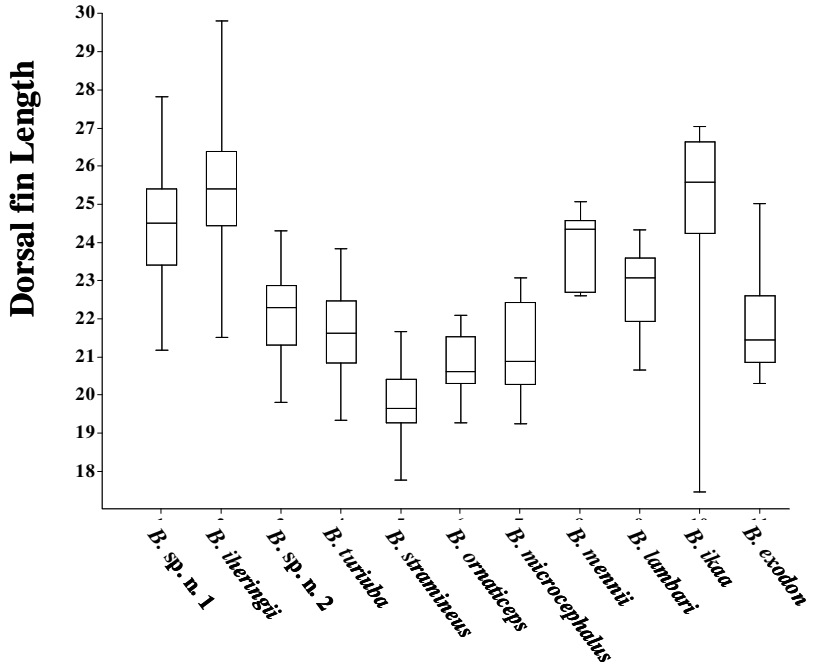

Fig. 33: Box plot of Dorsal-fin length in SL for *Bryconamericus* sp. n. 1, *Bryconamericus* sp. n. 2, and *Bryconamericus iheringii* comparing with other congeners.

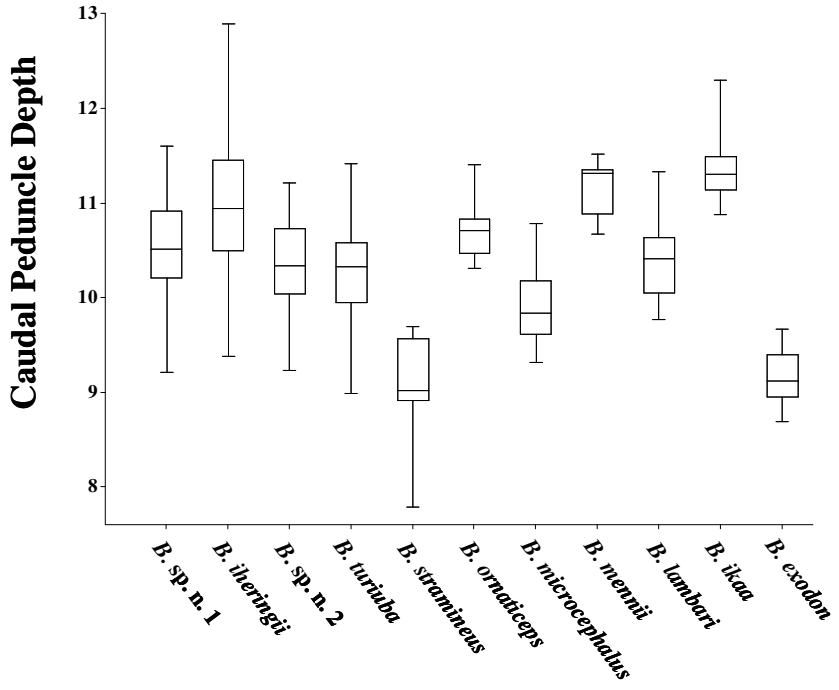

Fig. 34: Box plot of Caudal peduncle depth in SL for *Bryconamericus* sp. n. 1, *Bryconamericus* sp. n. 2, and *Bryconamericus iheringii* comparing with other congeners.

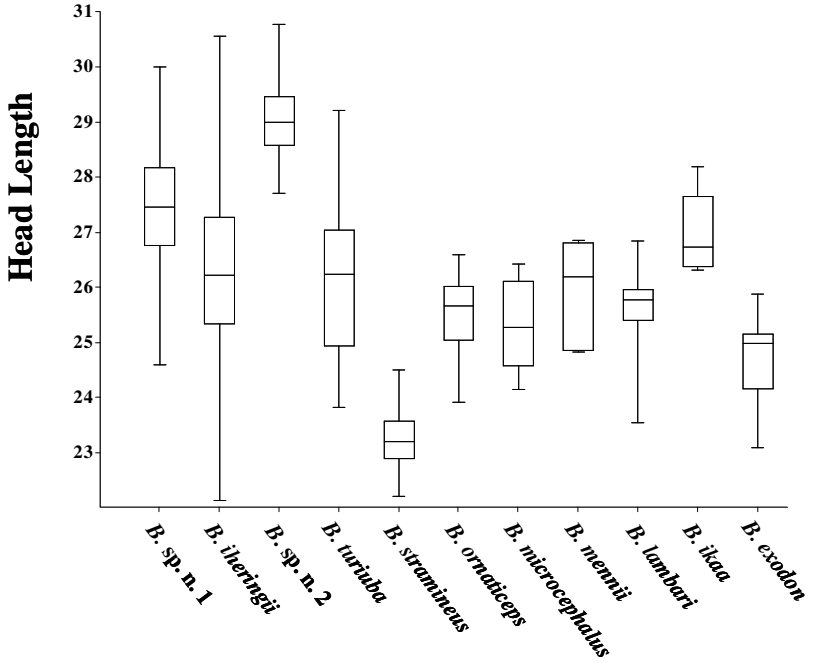

Fig. 35: Box plot of Head length in SL for *Bryconamericus* sp. n. 1, *Bryconamericus* sp. n. 2, and *Bryconamericus iheringii* comparing with other congeners.

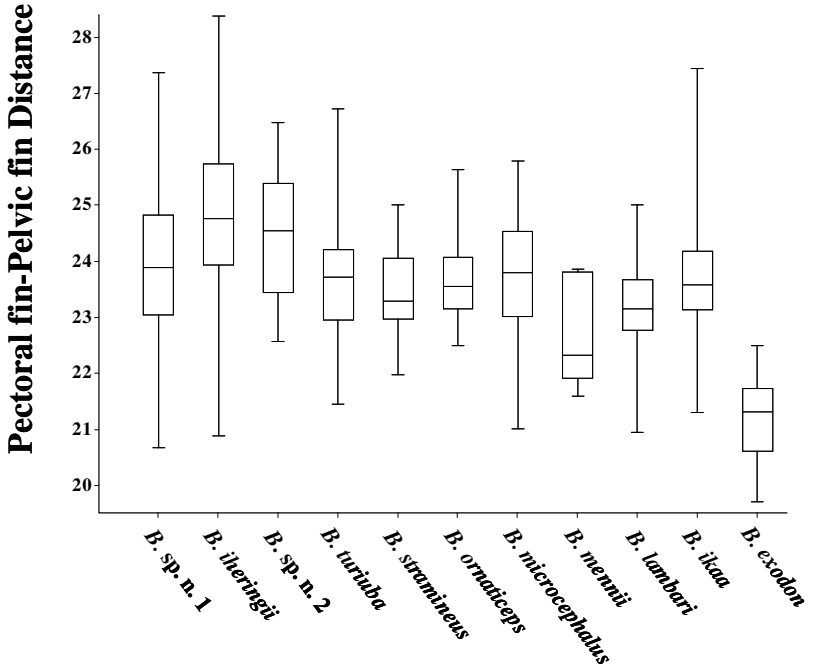

Fig. 36: Box plot of Pectoral fin-Pelvic fin distance in SL for *Bryconamericus* sp. n. 1, *Bryconamericus* sp. n. 2, and *Bryconamericus iheringii* comparing with other congeners.

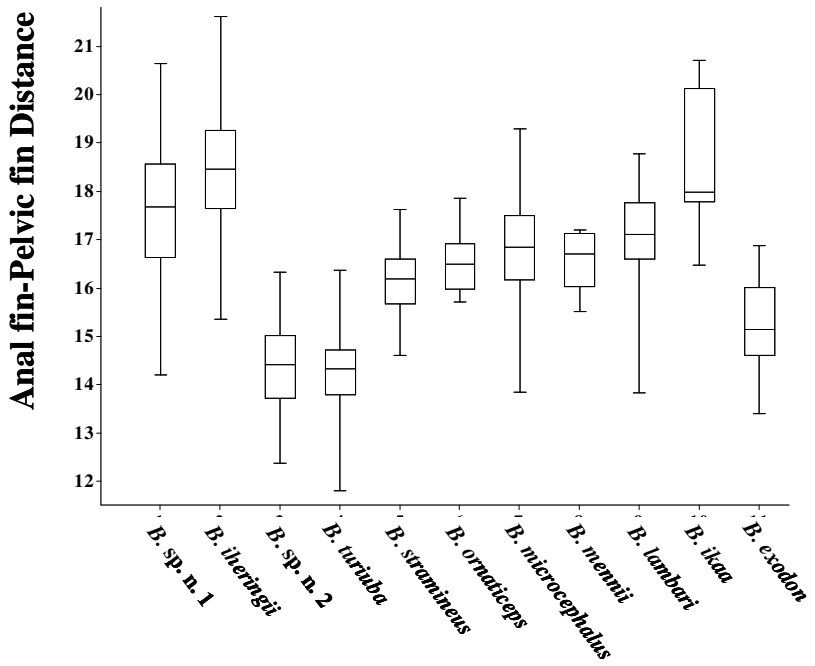

Fig. 37: Box plot of Predorsal distance in SL for *Bryconamericus* sp. n. 1, *Bryconamericus* sp. n. 2, and *Bryconamericus iheringii* comparing with other congeners.

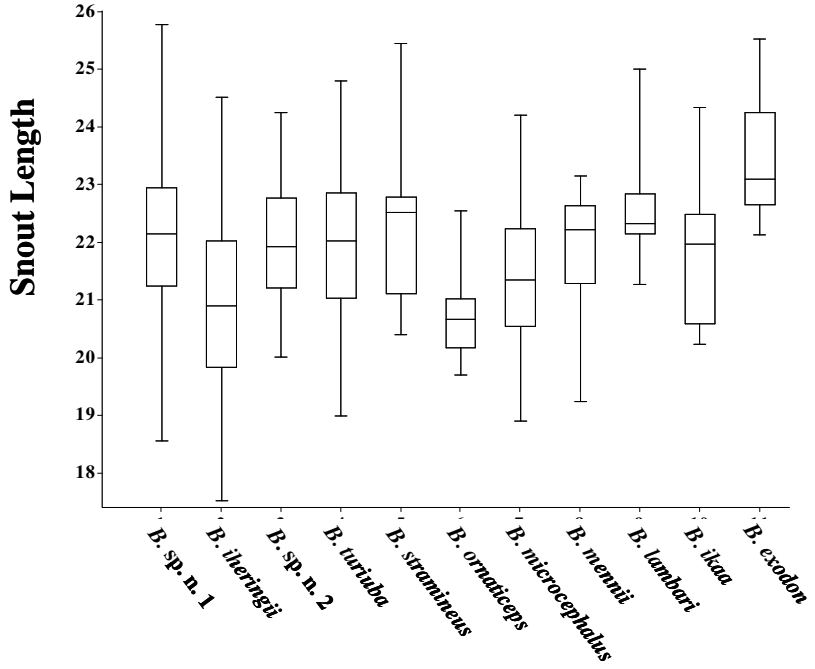

Fig. 38: Box plot of Snout length in HL for *Bryconamericus* sp. n. 1, *Bryconamericus* sp. n. 2, and *Bryconamericus iheringii* comparing with other congeners.

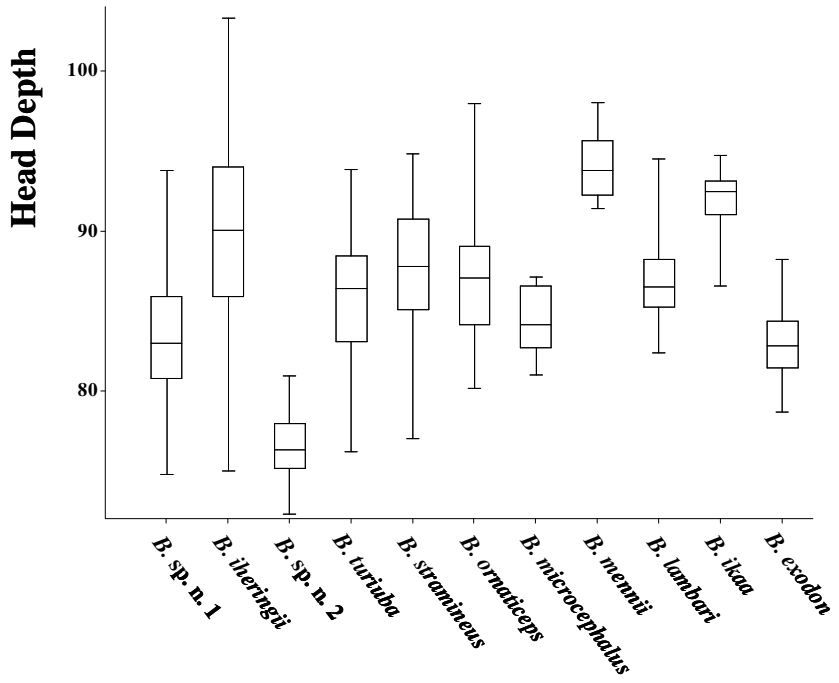

Fig. 39: Box plot of Head depth in HL for *Bryconamericus* sp. n. 1, *Bryconamericus* sp. n. 2, and *Bryconamericus iheringii* comparing with other congeners.

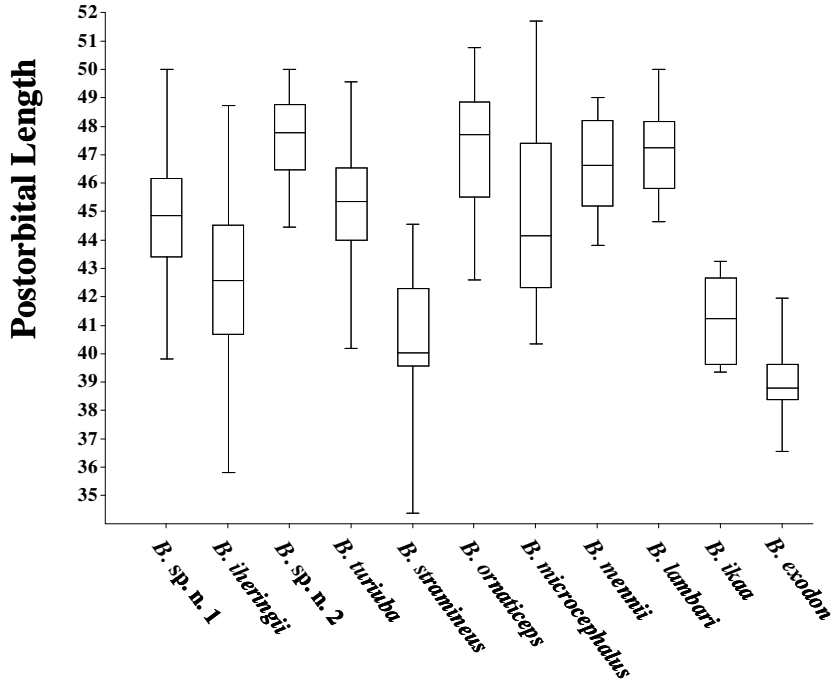

Fig. 40: Box plot of Postorbital length in HL for *Bryconamericus* sp. n. 1, *Bryconamericus* sp. n. 2, and *Bryconamericus iheringii* comparing with other congeners.

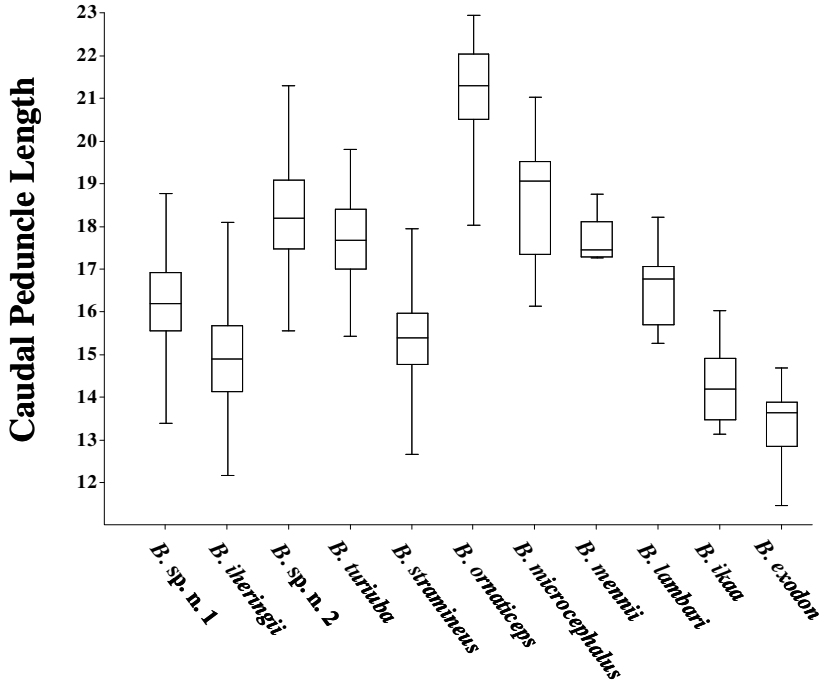

Fig. 41: Box plot of Caudal peduncle length in SL for *Bryconamericus* sp. n. 1, *Bryconamericus* sp. n. 2, and *Bryconamericus iheringii* comparing with other congeners.

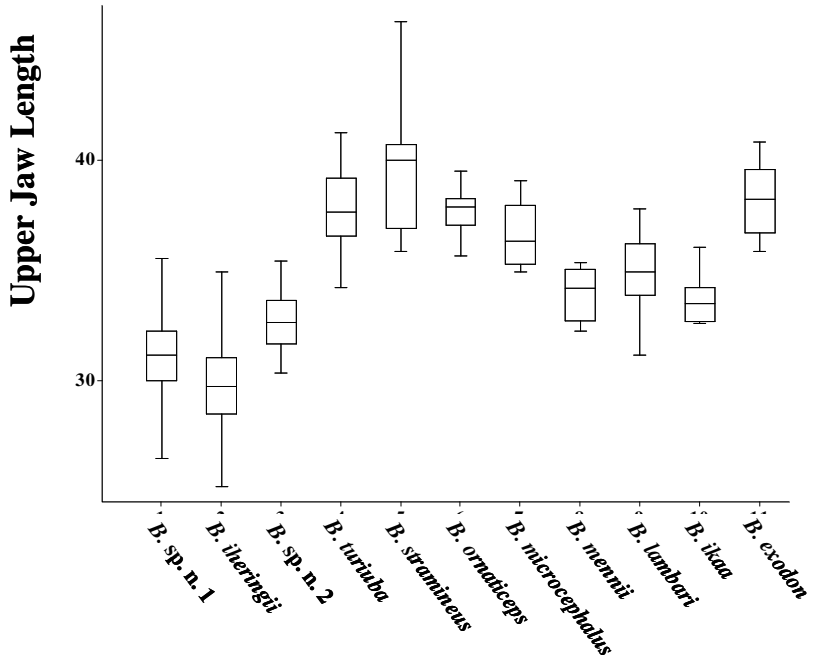

Fig. 42: Box plot of Upper jaw length in HL for *Bryconamericus* sp. n. 1, *Bryconamericus* sp. n. 2, and *Bryconamericus iheringii* comparing with other congeners.

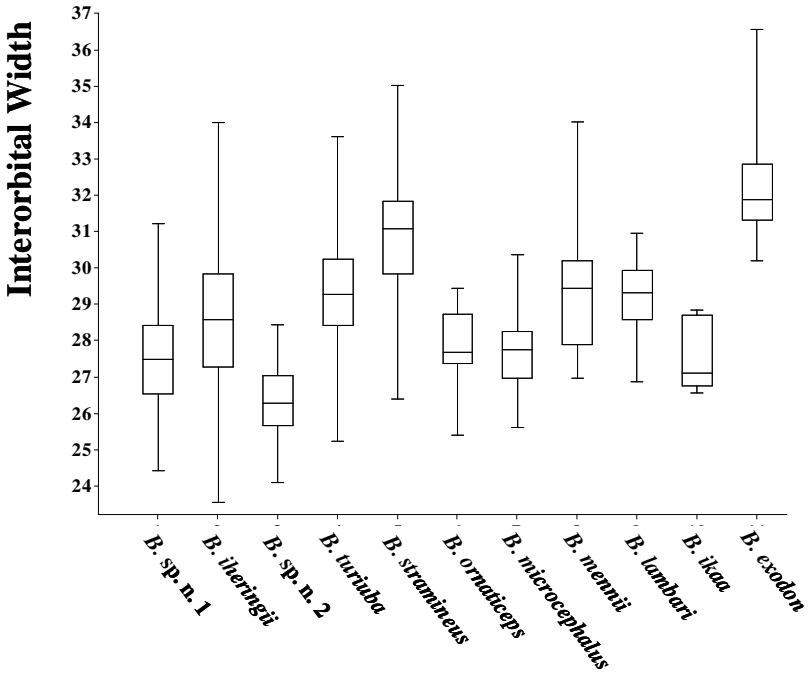

Fig. 43: Box plot of Interorbital width in HL for *Bryconamericus* sp. n. 1, *Bryconamericus* sp. n. 2, and *Bryconamericus iheringii* comparing with other congeners.