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Length–weight relationships of fishes from Tarumã River, Machado River drainage, Rondônia State, northern Brazil

Igor David da Costa

igorbiologia@yahoo.com.br

 <https://orcid.org/0000-0002-8556-5507>

Universidade Federal Fluminense, Instituto do Noroeste Fluminense de Educação Superior, Avenida João Jasbick, s/nº - Bairro: Aeroporto, CEP: 28470-000, Santo Antônio de Pádua, Rio de Janeiro, Brasil.

Universidade Federal de Rondônia, Mestrado Profissional em Gestão e Regulação de Recursos Hídricos (PROF-ÁGUA), Campus Ji-Paraná, Rua Rio Amazonas, 351 - Jardim dos Migrantes, CEP: 76900-726, Ji-Paraná, Rondônia, Brasil. *Autor correspondente: igorbiologia@yahoo.com.br

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Natalia Neto dos Santos Nunes

nataliansnunes@gmail.com

 <https://orcid.org/0000-0001-5744-1358>

Universidade Federal de Rondônia, Programa de Pós-Graduação em Ciências Ambientais, Av. Norte Sul 7300, CEP: 76.940-000, Rolim de Moura, Rondônia, Brasil.

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ABSTRACT

The length-weight relationship has many functions in the area of fish ecology. The objective of this work is to provide the estimates of morphometric relationships for 13 freshwater fish species. Samples were collected with the aid of gillnets in May and September 2015 in the Tarumã river, Jaru Biological Reserve. Length–weight relationships were estimated from 343 specimens belonging to thirteen species, seven families and two orders. The linear regressions were significant ($p \leq 0.001$). The value of b varied from 1.36 in *Leporinus friderici* to 3.30 in *B. amazonicus*. The specie *Colossoma macropomum* had an isometric growth pattern ($b=3.09$). The new Length–weight relationships for 2 species, new maximum weight for 4 species and maximum sizes recorded for 3 species highlight the scarcity of information on biological aspects of Amazon fishes. These results can provide information for the FishBase as well as important data for the management of ichthyofauna and conservation of the Tarumã River Basin.

Keywords: Amazonia; biological reserve; Conservation; Biodiversity, Ichthyofauna

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RESUMO

A relação peso-comprimento tem muitas funções na área da ecologia de peixes. O objetivo do presente trabalho é o de fornecer as estimativas de relações morfométricas para 13 espécies de peixes de água doce. As amostras foram coletadas com o auxílio de malhadeiras, em maio e setembro de 2015, no rio Tarumã, Reserva Biológica do Jaru. As relações peso-comprimento foram estimadas a partir de 343 espécimes pertencentes a treze espécies, sete famílias e duas ordens. As regressões lineares foram significativas ($p \leq 0.001$). O valor de b variou de 1,36 em *Leporinus friderici* a 3.30 em *B. amazonicus*. A espécie *Colossoma macropomum* apresentou um padrão de crescimento isométrico ($b=3.09$). As novas relações peso-comprimento para 2 espécies, novo peso máximo para 4 espécies e tamanhos máximos registrados para 3 espécies destacam a escassez de informações sobre aspectos biológicos dos peixes da Amazônia. Estes resultados podem fornecer informações para a FishBase, bem como dados importantes para o manejo da ictiofauna e conservação da Bacia do Rio Tarumã.

Palavras-chave: Amazônia; Reserva Biológica; Biodiversidade, Conservação; Ictiofauna

RESUMEN

La relación longitud-peso tiene muchas funciones en el área de la ecología de los peces. El objetivo de este trabajo es proporcionar las estimaciones de las relaciones morfométricas para 13 especies de peces de agua dulce. Las muestras se recolectaron con la ayuda de redes de enmalle en mayo y septiembre de 2015 en el río Tarumã, Reserva Biológica Jaru. Las relaciones longitud-peso se estimaron a partir de 343 especímenes pertenecientes a trece especies, siete familias y dos órdenes. Las regresiones lineales fueron significativas ($p \leq 0.001$). El valor de b varió de 1.36 en *Leporinus friderici* a 3.30 en *B. amazonicus*. La especie *Colossoma macropomum* tenía un patrón de crecimiento isométrico ($b=3.09$). Las nuevas relaciones Longitud-peso para 2 especies, el nuevo peso máximo para 4 especies y los tamaños máximos registrados para 3 especies resaltan la escasez de información sobre los aspectos biológicos de los peces del Amazonas. Estos resultados pueden proporcionar información para FishBase, así como datos importantes para el manejo de la ictiofauna y la conservación de la cuenca del río Tarumã.

Palabras clave: Amazonia; reserva biologica Conservación; Biodiversidad, Ictofauna

INTRODUCTION

The largest number of protected areas (PA) in the world is in Brazil (1), totaling more than 30000 Km² (2). About 43% of Brazilian Amazon are considered PA (3). Although there are doubts about the purpose of conservation units, studies indicate that these are useful in reducing deforestation and ichthyofauna conservation (4,5).

The Amazon basin is home to the world's largest ichthyofauna diversity (6,7). In the Madeira River basin, more than 820 species of fish were recently identified (8). In the Machado River basin, Madeira River sub-basin, 48 species were collected at the Pirarara and Tamarupa rivers (9), 140 species in small streams (10) and 74 species in the Tarumã river, middle Machado River (11). The studies on evaluation of fish stocks in the Amazon region are scarce (12), as well as information on fish morphometric relationships (13,14).

The length-weight relationship (LWR) has many functions in the area of fish ecology (15). The LWR allows i) to predict fish length based on weight and vice versa, ii) calculate the growth rate of the species

and iii) obtaining the body state of the individuals sampled (16). The LWR studies are necessary to understand the fish life cycle, especially in regions where fishing represents the important economic activities and the main animal protein consumed by traditional communities (12). The objective of this study was to calculate the LWR of 13 species of fish captured in the Tarumã River, Jaru Biological Reserve, as the first study on the biology of fish species in this PA.

MATERIALS AND METHODS

The Jaru Biological Reserve (Rebio Jaru) is administered by the Instituto Chico Mendes de Conservação da Biodiversidade (ICMBio). The Rebio Jaru hydrographic network (9°27'19" S, 61°40'43" W - 9°47'04" S, 61°40'19" W) is part of the Machado River basin, Rondônia State, Brazil. The Tarumã River is located in the Rebio Jaru area.

We performed collections of freshwater fish in May and September 2015. We collected the fish using a total of eight gillnets with meshes of 2 x 20 m (mesh sizes: 30, 40, 50, 60, 70, 80, 90 and 100 mm, opposite knots), these were euthanized in a solution of clove oil (17). The fish were fixed in 10% formalin solution, preserved in 70% ethanol and later deposited in the Coleção de Peixes da UFMT, Brazil. The fish sampling was authorized by the ICMBio (license code: 48723-2/2015).

The individuals captured were identified with the help of identification keys (8) and biometric data (total length (TL) in cm and total weight (TW) in g) were recorded. Weight and length were estimated using the expression $P = aC^b$, where P = weight total, C = total length, a = intercept and b = angular coefficient (18 Le Cren, 1951); the parameters a and b were estimated after logarithmic transformation of weight and length data (19). We verified in the fishBase (20) the absence of the LWR records, as well as the occurrence of the TL and TW maximum values recorded for the species captured in the Tarumã river. Statistical tests were performed using the R-package (21) with significance of $p < 0.05$.

RESULTS

The LWR was estimated from 343 specimens belonging to thirteen species, seven families and two orders (Table 1). The linear regressions were significant ($p \leq 0.001$). The R^2 varied from 0.91 in *Boulengerella cuvieri* to 0.99 in *Brycon amazonicus*. The intercept a varied from 0.0045678 in *B. amazonicus* to 0.0798564 in *B. cuvieri* (mean 0.0422121 ± 0.0532370). The value of b varied from 1.36 in *Leporinus friderici* to 3.30 in *B. amazonicus* (mean 2.33 ± 1.37). The specie *Colossoma macropomum* had an isometric growth pattern ($b = 3.09$) (Table 1).

DISCUSSION

The new LWRs for 2 species, new maximum weight for 4 species and maximum sizes recorded for 3 species highlight the scarcity of information on biological aspects of Amazon fishes. The allometric coefficients of the *L. friderici*, *B. cuvieri*, *Prochilodus nigricans*, *Myloplus lobatos*, *Myloplus rubripinnis* and *Serrasalmus rhombeus* species are not among the values (2.7–3.5) described by Froese (16). Factors such as habitat, area, seasonality, degree of stomach repletion, sex ratio, health, sample size, reproductive stages and preservation methods, could justify the values not in line with that proposed by Froese (16) (22,23,24). These results can provide information for the FishBase as well as important data for the management of ichthyofauna and conservation of the Tarumã River Basin.

Table 1. Descriptive statistics and length–weight relationship parameters for 13 fish species, Tarumã River, Jaru Biological Reserve, Amazon. New length-weight relationships (*), maximum total weight (†) and maximum total length (*). Systematic positions were based on Nelson et al. (2016).

Order/Family/species	TL (cm)			TW (g)		Regression parameters		
	N	Min.	Max.	Min.	Max.	a	b (95% CL)	R ²
Characiformes								
Anostomidae								
<i>Leporinus friderici</i> (Bloch, 1794)	15	21.7	35.1	250.2	545.3	0.0245678	1.36 (1.23 to 1.55)	0.92
Bryconidae								
<i>Brycon amazonicus</i> (Spix & Agassiz, 1829) [†]	19	23.5	60.2	135	2950.2	0.0045678	3.30 (3.15 to 3.57)	0.99
Ctenoluciidae								
<i>Boulengerella cuvieri</i> (Spix & Agassiz, 1829)	22	24.7	84.1	650.1	4035.5	0.0798564	1.85 (1.56 to 2.10)	0.91
Cynodontidae								
<i>Hydrolycus armatus</i> (Jardine, 1841)	27	32.5	65.3	380.3	2501.3	0.0197435	2.95 (2.47 to 3.17)	0.92
<i>Hydrolycus tatauaia</i> Toledo-Piza, Menezes & Santos, 1999	25	28.1	35.2	481.3	839.1	0.0387431	2.80 (2.49 to 3.20)	0.96
Prochilodontidae								
<i>Prochilodus nigricans</i> Spix & Agassiz, 1829	23	9.5	35.2	50.1	820.0	0.0261234	2.17 (1.98 to 2.50)	0.93
Serrasalminidae								
<i>Colossoma macropomum</i> (Cuvier, 1816)	27	34.2	64.5	1500.0	10150.3	0.0234781	3.09 (2.87 to 3.22)	0.92
<i>Myloplus lobatus</i> (Valenciennes, 1850) ^{†*}	24	16.0	31.2	280.2	320.3	0.0465211	2.18 (1.87 to 2.34)	0.90
<i>Myloplus rubripinnis</i> (Müller & Troschel, 1844)	28	15.4	39.2	150.2	1643.2	0.0123121	1.78 (1.55 to 2.02)	0.96
<i>Myloplus torquatus</i> (Kner, 1858) ^{†*}	51	16.4	34.6	268.0	1050.0	0.0134521	3.27 (3.01 to 3.48)	0.93
<i>Serrasalmus compressus</i> Jégu, Leão & Santos, 1991 ^{†*}	30	6.5	26.3	4.5	613.2	0.0128943	3.29 (2.98 to 3.60)	0.96
<i>Serrasalmus rhombeus</i> (Linnaeus, 1766) [*]	52	19.0	46.4	260.0	1573.2	0.0266721	2.39 (2.03 to 2.69)	0.97
Siluriformes								
Auchenipteridae								
<i>Ageneiosus inkermis</i> (Linnaeus, 1766)	15	23.3	50.5	202.2	270.2	0.0387322	2.68 (2.23 to 2.87)	0.93

Conflict of interest

There is no conflict of interest

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