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Short communication

Occurrence of *Pseudocorynopoma heterandria* Eigenmann, 1914 (Characidae) in Paraíba do Sul River Basin (Southeastern Brazil)

By F. L. K. Salgado, B. F. Terra, G. S. Camilo, E. O. da Silva and F. G. Araújo

Laboratório de Ecologia de Peixes, Universidade Federal Rural do Rio de Janeiro, Seropédica, RJ, Brazil

Introduction

Pseudocorynopoma heterandria Eigenmann, 1914 is a characid related to streams and lakes of clear waters in areas of low and medium altitude (Menezes et al., 2007). The original distribution of this species is in the coastal rivers of São Paulo and Paraná, Brazil (Reis et al., 2003), and has never been recorded below 23°S latitude. In this study we report the first record of *P. heterandria* in the Paraíba do Sul River (20°26′–23°38′S; 41°00′–46°30′W), which is located outside of its original area of occurrence. We compared morphometric characteristics of *P. heterandria* from the Paraíba do Sul River basin with the original description of Eigenmann (1914), since local environmental constraints may influence morphological divergence in this species. Additionally, we report for the first time the length–weight relationship (LWR) for this species.

Materials and methods

Twenty-six specimens were caught between 2008 and 2013 in the middle-upper reaches of the Paraíba do Sul River basin (Fig. 1). Thirteen were caught by electrofishing (AC generator – 900 W, 220 V, 1–2 A) and 13 were collected with gillnets (mesh size 15–50 mm) in the main channel of the Paraíba do Sul River (Table 1). The specimens were fixed in 10% formalin for 48 h, then transferred to 70% ethanol and deposited as voucher specimens in the Ichthyological Collection of the Laboratory of Fish Ecology of the Universidade Federal Rural do Rio de Janeiro (LEP-UFRRJ # 0982, 0983, 1066, 1306, 1135, 1434-1437; Fig. 2). All individuals were measured for total length (1 mm precision), and weighed with an electronic scale (0.01 g precision). Diagnostic features used for specimen identification were: (i) the dorsal fin nearer to the caudal fin base than the upper angle of gill opening; (ii) males with dorsal fin rays reaching the adipose fin tip: and (iii) anal fin lobed. Counts and measurements were gathered under a stereomicroscope and using digital calipers to the nearest tenth of a millimeter, following Fink and Weitzman (1974) for the pectoral-fin origin to the pelvic-fin origin distance, and from the pelvic-fin origin to the anal-fin origin distance. We also followed Garutti and Langeani (2009) for measuring the distance from the dorsal-fin origin to the adipose-fin origin, and for the body height.

The parameters of the LWR (a = a scaling constant and b = growth parameter) were estimated by linear regression analysis based on logarithms: Log (W) = Log (a) + b Log (L) where W is the weight of the fish (g), L is the total length (cm). Additionally, 95% confidence limits of b and the coefficient of determination r^2 were estimated.

Results

All specimens matched all *Pseudocorynopoma heterandria* descriptions. Standard length (SL) ranged from 27.0 mm to 58.9 m (mean = 48.0 ± 9.7 SD). Distance between the dorsal fin origin and the caudal fin base ranged from 36.9 to 41.6% SL (mean = 39.4 ± 1.3), and between the dorsal-fin origin and the adipose-fin origin ranged from 25.1 to 27.7% SL (mean = 26.6 ± 0.6). The dorsal fin length ranged from 20.2 to 22.9% SL (mean = 21.9 ± 0.7) (Table 2). The dorsal profile arched very little; the ventral profile greatly arched from chin to anal end; origin of the dorsal fin was closer to the caudal base than the operculum opening, almost reaching the adipose fin; males with anal fin strongly lobed anteriorly; lateral line complete, moderately decurved (Fig. 2). Maxillary with 0–2 teeth (Table 3). A linear regression was highly significant for this species ($P < 0.001$). The WLR parameter a was 0.02, and b was 3.11 (Confidence Interval 95% = 2.95–3.27). The coefficient of determination (r^2) was 0.98.

Discussion

This study reports the first occurrence of *P. heterandria* in the Paraíba do Sul River basin. The captured specimens match the general morphometric patterns described by Eigenmann (1914). Previous studies reported the ichthyofauna in different reaches of the Paraíba do Sul River (Araújo, 1996; Teixeira et al., 2005; Pinto and Araújo, 2007), but *P. heterandria* was not included in any of the lists. This is an indication of a lack of systematic reporting of new findings and evidence that there is a lack of regular fish inventory in these rivers. *P. heterandria* may have been in this river system for quite some years but was not recognized before the present study.

Pseudocorynopoma heterandria has been found in clear waters and does not correspond to the water characteristics

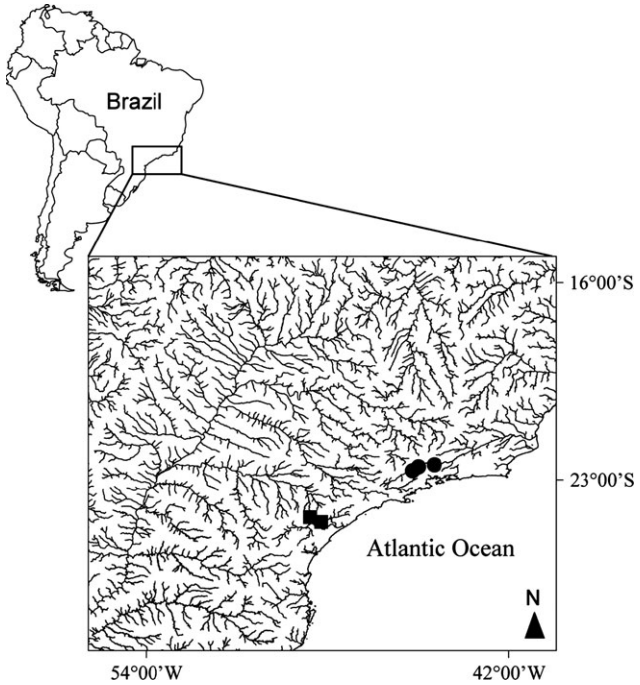

Fig. 1. Distribution of *Pseudocorynopoma heterandria*. Squares = Ribeira do Iguape River basin, as part of native fauna-holotype and paratypes; circles = middle reaches of Paraíba do Sul River basin, new localities

Table 1
Locale, geographic coordinates, number (n), sample data and type of gear (EF = Electrofishing; GN = Gillnet) of *Pseudocorynopoma heterandria*, Paraíba do Sul River basin

River/Stream	Coordinates	n	Sample date (day/month/year)	Gear
Morro Grande Stream	22°33′47″S; 44°50′31″W	7	03/02/2013	EF
		1	24/11/2009	EF
Claro Stream	22°34′26″S; 44°53′00″W	1	26/11/2009	EF
São Roque Stream	22°32′57″S; 44°27′28″W	2	25/11/2009	EF
Entupido Stream	22°30′00″S;	1	10/12/2008	EF
	44°45′00″W	1	06/12/2013	GN
Paraíba do Sul River	22°34′03″S; 44°55′10″W	1	16/01/2013	GN
	22°34′03″S; 44°55′10″W	9	26/10/2012	GN
	22°34′01″S; 44°55′08″W	3	25/08/2008	GN

Fig. 2. Male *Pseudocorynopoma heterandria* specimen, Morro Grande stream, Lavrinhas, SP. LEP-UFRRJ # 1066

Table 2
Morphometrics of *Pseudocorynopoma heterandria*

Character	Range	M ± SD	CV
Standard length (mm SL)	27.0–58.9	48.0 ± 9.7	–
Head length (mm SL)	6.3–13.5	10.8 ± 2.2	–
Percentages of standard length			
Head length	21.7–23.6	22.6 ± 0.5	0.02
Depth at dorsal-fin origin (body height)	38.0–41.8	39.4 ± 1.2	0.03
Snout to anal-fin origin	60.3–65.9	62.5 ± 1.8	0.03
Snout to dorsal-fin origin	59.8–65.9	63.4 ± 1.8	0.03
Snout to pelvic-fin origin	44.1–49.5	46.2 ± 1.5	0.03
Snout to pectoral-fin origin	24.5–27.9	26.2 ± 0.8	0.03
Eye to dorsal-fin origin	49.0–55.7	52.1 ± 1.6	0.03
Dorsal-fin origin to caudal-fin origin	36.9–41.6	39.4 ± 1.3	0.03
Dorsal-fin origin to pectoral-fin origin	44.3–49.9	46.6 ± 1.6	0.03
Dorsal-fin origin to anal-fin origin	31.3–34.8	33.2 ± 1.1	0.03
Dorsal-fin origin to adipose-fin origin	25.1–27.7	26.6 ± 0.6	0.02
Anal-fin origin to adipose-fin origin	40.1–42.9	41.3 ± 0.8	0.02
Pectoral-fin origin to pelvic-fin origin	21.0–22.9	21.9 ± 0.6	0.03
Pelvic-fin origin to anal-fin origin	15.8–17.9	16.6 ± 0.5	0.03
Pectoral-fin length	29.2–32.7	30.5 ± 0.9	0.03
Pelvic-fin length	13.0–14.4	13.6 ± 0.4	0.03
Dorsal-fin length	20.2–22.9	21.9 ± 0.7	0.03
Anal-fin base length	32.1–35.9	34.0 ± 1.1	0.03
Dorsal-fin base length	9.1–9.9	9.5 ± 0.2	0.03
Caudal peduncle height	9.0–9.6	9.4 ± 0.2	0.03
Caudal peduncle length	10.2–11.3	10.6 ± 0.3	0.03
Percentages of head length			
Head height	77.7–86.4	82,2 ± 2.2	0.03
Interorbital width	28.5–31.9	29.9 ± 0.8	0.03
Eye diameter	28.1–30.8	29.5 ± 0.9	0.03
Upper jaw length	36.2–39.7	37.9 ± 0.9	0.03
Snout length	26.0–28.9	27.3 ± 0.9	0.03

M, mean; SD, standard deviation; CV, coefficient of variation. Number of specimens = 26.

of Paraíba do Sul River. However, this species was also collected in the Morro Grande, Claro e Entupido streams, where the water is clearer than in the Paraiba do Sul River. There is also a possibility that this species escaped from one of many fish farm sites along the river margins in the middle-upper reaches of the main river. Many species are being raised and sold in these farms as live bait for sport fishing or for ornamental purposes. The *P. heterandria* small body size, and its peaceful and gregarious behavior favor small farm culture. There are several major ecological effects associated with non-native fish introductions, including predation, habitat degradation, increased competition for resources, hybridization, and disease transmission (Gozlan et al., 2010; Cucherousset and Olden, 2011). Therefore, concerns should be raised because of unpredictable results that non-native species can cause in areas where they have been introduced.

LWR parameters obtained for this species match with Fishbase (Froese and Pauly, 2000) estimations based on all

Table 3
Meristics of *Pseudocorynopoma heterandria*

Character	Range	M ± SD	Number of cuspids
Scales and rays			
Lateral line series	36–40	38.1 ± 1.2	–
Above lateral line series	6–6	6.0 ± 0.0	–
Below lateral line series	5–6	5.0 ± 0.1	–
Predorsal series	16–19	17.2 ± 1.1	–
Base-anal series	10–13	12.3 ± 0.6	–
Caudal peduncle series	16	16 ± 0.0	–
Pectoral-fin rays	1 + 9–12	1 + 10.1 ± 0.5	–
Pelvic-fin rays	1 + 4–6	1 + 5.0 ± 0.6	–
Dorsal-fin rays	2 + 7–9	2 + 7.3 ± 0.7	–
Anal-fin rays	5–6 + 29–35	5–6 ± 0.3 + 32.5 ± 1.6–2	–
Caudal-fin rays	2 + 16	2 + 16 ± 0.0	–
Dentition			
Dentary-bone large teeth	5–7	5.3 ± 0.6	3–6
Dentary-bone small teeth	5–10	7.1 ± 1.4	1
Premaxillary-bone external teeth series	3	3.0 ± 0.0	3
Premaxillary-bone internal teeth series	6–8	6.9 ± 0.4	3–5
Maxillary-bone teeth	0–2	1.6 ± 0.7	3

M, mean; SD, standard deviation.
Number of specimens = 26.

LWR estimates for the same body shape ($a = 0.01$, range = 0.002–0.04; $b = 3.04$, range 2.81–3.27). Even with the low number of specimens and temporal range of 5 years, this information is an improvement over the existing gaps in data.

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Author's address: F. Gerson Araújo, Laboratório de Ecologia de Peixes, Universidade Federal Rural do Rio de Janeiro, BR 465, Km 7, 23.890-00, Seropédica, RJ, Brazil.
E-mail: gerson@ufrrj.br