



NEW DISTRIBUTION RECORD OF CYNOPOECILINE KILLIFISH *Cynopoecilus fulgens* COSTA 2002 FOR THE MAMPITUBA RIVER BASIN, SOUTHERN BRAZIL

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Abstract: The natural distribution of the aplocheiloid killifish *Cynopoecilus fulgens* Costa 2002 is expanded here with specimens collected in the Mampituba River basin in the of Santa Catarina State, Brazil. This record expands its geographical distribution within the Atlantic Forest coastal drainages of southern Brazil.

Keywords: Aplocheilidae; Atlantic forest; Cyprinodontiformes; Neotropic; threatened species.

The Neotropical genus *Cynopoecilus* Regan 1912 (Cyprinodontiformes, Aplocheilidae) is a clade of internal fertilizing annual fish, member of the subfamily Cynolebiasinae (Costa *et al.* 2016), distributed between Santa Catarina State (Southern Brazil) and eastern Uruguay (Costa 2002, Ferrer *et al.* 2014, Costa *et al.* 2016). All species of this genus are small-sized forest-dwelling fish that inhabit temporary ponds and flooded areas formed during rainy seasons (Costa 2002, Volcan *et al.* 2015).

The genus *Cynopoecilus* is characterized by the morphological apparatus of the male's anal fin, forming an inseminating structure, and also by the unique color pattern (Costa 1995). According to Costa (2016), synapomorphies that support the monophyly of the genus are: constriction on median portion of autopalatine; autopalatine nearly straight in lateral view; teeth on second pharyngobranchial; minute accessory caudal fin cartilages; series of seven to ten small unbranched rays connected to first two developed anal-fin proximal radials to

form an inseminating fan; genital opening situated in broad transverse aperture in males; iridescent color marks restricted to lateral midline of body; broad dark reddish chocolate brown to black stripe on lateral midline of body; iris yellow in both sexes.

Costa (2016) divided *Cynopoecilus* into two subgenus on the basis of morphological data: *Poecilopanchax* Costa 2016, including only *Cynopoecilus notabilis* Ferrer, Wingert and Malabarba 2014, a species restricted to temporary channels within dense semi-deciduous seasonal forest in Laguna dos Patos drainage, southern Brazil; and *Cynopoecilus* Regan 1912, including *C. melanotaenia* (Regan 1912), *C. intimus* Costa 2002, *C. nigrovittatus* Costa 2002, *C. fulgens* Costa 2002, and *C. feltrini* Costa, Amorim and Mattos 2016, species found between the Tubarão River basin and the Patos-Mirim lagoon system in southern Brazil and also adjacent areas of Uruguay. Costa (2016) also considered *C. multipapillatus* Costa 2002 as junior synonym of *C. fulgens*.

The killifish *C. fulgens* has its distribution known for the coastal plains adjacent to the Patos lagoon (Figure 1), Rio Grande do Sul State (Costa 2002, Costa *et al.* 2016), where it occurs in temporary pools and swamps, and feeds mainly on microcrustaceans and autochthonous insects (Keppeler *et al.* 2013, Dias *et al.* 2017). Herein we report new sites of occurrence of *Cynopoecilus fulgens* in the Mampituba River basin, increasing the known localities for this threatened killifish species.

Sampling with dip nets were conducted in June 2018 in the city of Balneário Arroio do Silva, Santa Catarina State, Southern Brazil. Sampling authorization n° 9784/2017 was emitted by the Foundation for the Environment of the Santa Catarina State (FATMA). The study site comprises seasonal ponds and wetlands in remaining areas of Atlantic Forest Restinga formations (sandbanks) in the Mampituba River basin, heavily impacted by urban development (Figure 2).

Captured specimens were first anesthetized with eugenol solution and then fixed in 10% formalin solution for 48 hours, washed in running water and preserved in 70% ethanol. Twenty-four individuals were identified as *C. fulgens* following the diagnosis proposed by Costa (2002) (Figure 3). Voucher specimens analyzed were deposited in the ichthyological collections of the Universidade Federal do Rio de Janeiro (UFRJ) and Museu de História Natural Capão da Imbuia (MHNCI) (Table 1).

Morphometric measurements were made according to Costa (1988, 1995) using a digital caliper and recorded to the nearest 0.1 mm, under a dissecting microscope, only for 12 specimens stored in the collection of Museu de História Natural Capão da Imbuia. Measurements were presented as percentages of standard length (SL), except for those related to head morphology, expressed as percentages of head length.

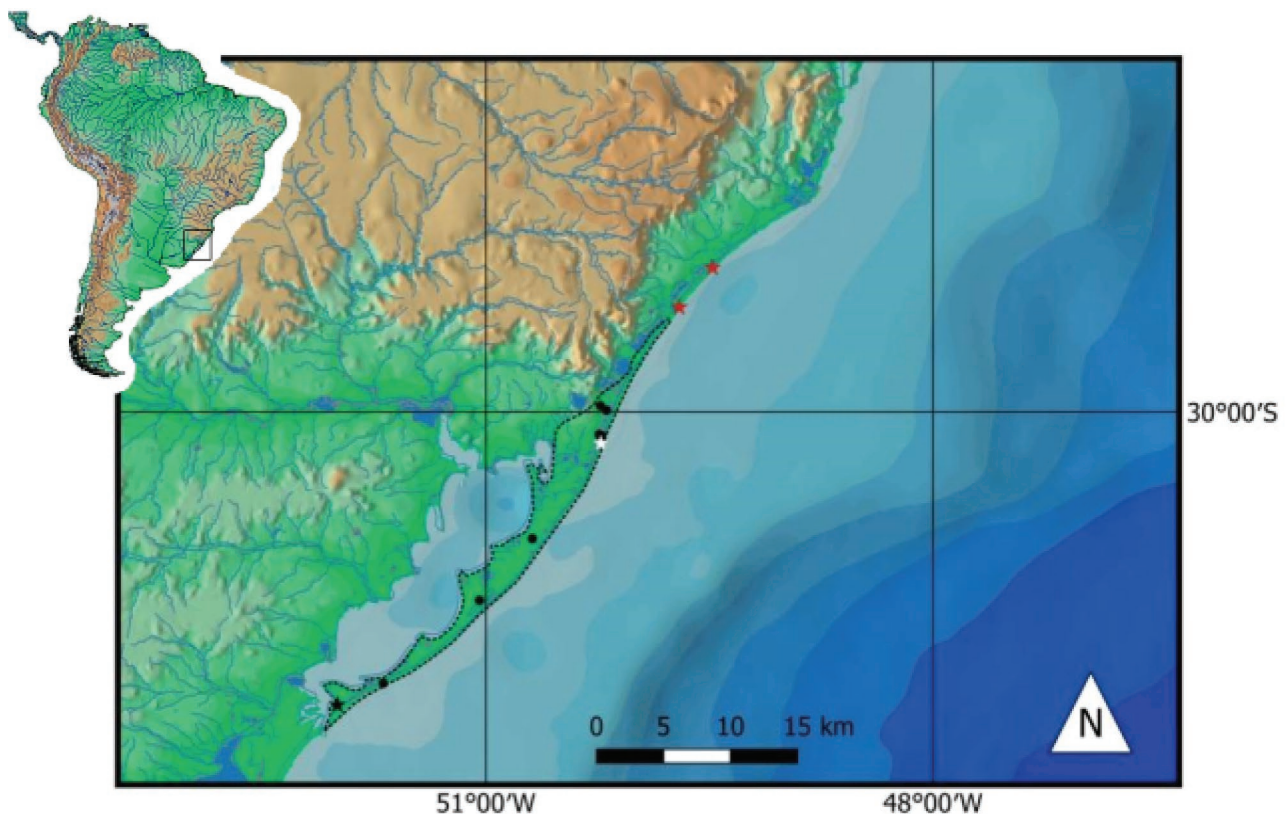


Figure 1. Geographical distribution (dashed line) of *Cynopoecilus fulgens* in Rio Grande do Sul State, southern Brazil (based on Costa *et al.* 2016). Black dots represent the material examined (collection sites) in Costa (2002) and Costa (2016). Stars represent type localities (black star = *C. fulgens*; white star = *C. multipapillatus*). Red stars represent the new records at Mampituba River basin.



Figure 2. Aquatic biotopes (seasonal ponds and flooded areas) where *Cynopoecilus fulgens* was registered in the municipalities of Passos de Torres (above) and Balneário Arroio do Silva (below) in Santa Catarina State, southern Brazil.

The updated distribution map of *C. fulgens* (Figure 3) was based on data from two literature reviews on this species (Costa 2002, 2016, Costa *et al.* 2016), information under the catalogue numbers UFRJ 11834 and 11835, the present record (UFRJ 11912, MHNCI 12694) and also with information obtained from the SpeciesLink database (CRIA 2018).

Costa (2002) distinguished *C. fulgens* from all other species of the group by the male's caudal fin with the presence of dark spots all along its extension, irregular dark brown marks on the back right under the male's dorsal fin, dorsal profile of the head lightly concave in adult males, dark reddish-brown lateral stripes on side of male's body, 11-15 supra-orbital neuromasts and one to

three neuromasts by scale on the lateral line. In addition, *C. fulgens* can be distinguished from *C. feltrinii* by having E-scales medially separated by an interspace (*vs.* E-scale medially overlapped) (Costa *et al.* 2016). All these features were observed in the specimens analyzed. Morphometric measurements obtained were presented on Table 2, and compared to the ones showed by Costa (2002) in the original description. Two females and one male exhibited an extreme reduction of pelvic fins length (Figure 4).

These new records expand the geographical distribution of *C. fulgens* in temporary ponds and flooded areas within the Atlantic Forest coastal drainages of southern Brazil. The threatened status of *C. fulgens* has not been assessed for the IUCN Red List, however it was included in the Brazilian

Table 1. Vouchers of *Cynopoecilus fulgens* obtained in the Mampituba River Basin in the Santa Catarina State, Southern Brazil.

Catalog number	Municipality	Geographic coordinates
UFRJ 11912	Balneário Arroio do Silva	29°2'3.35"S, 49°28'47.05"W
MHNCI 12694	Balneário Arroio do Silva	29°2'3.35"S, 49°28'47.05"W



Figura 3. Male of *Cynopoecilus fulgens* registered in the municipality of Passo de Torres, Santa Catarina State, Southern Brasil. Photo by Caio Feltrin.

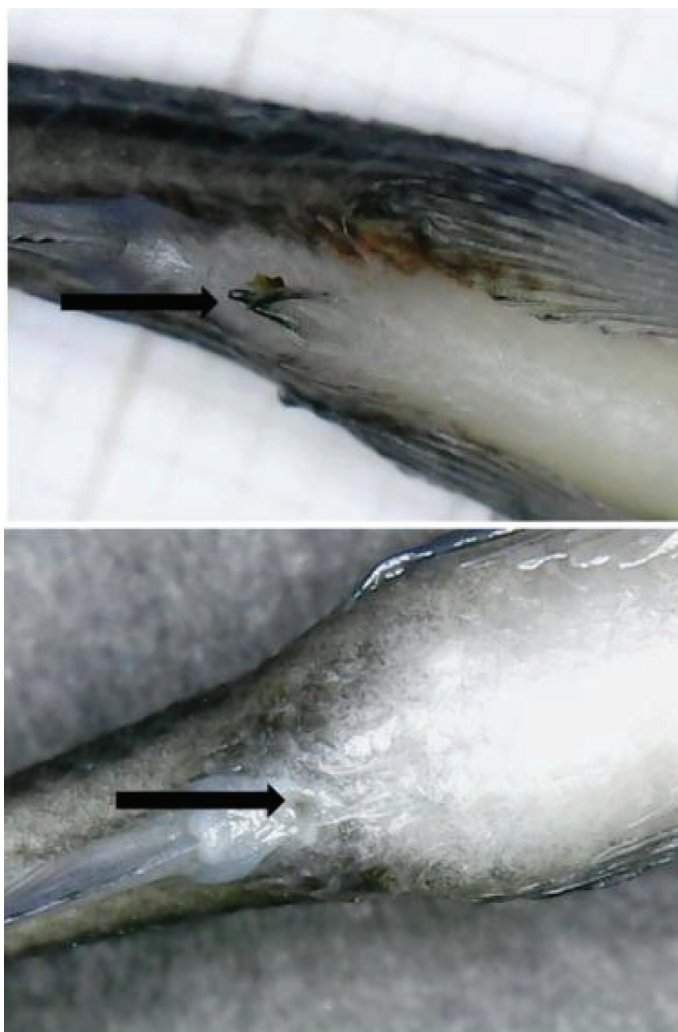


Figure 4. Ventral view of *Cynopoecilus fulgens*, showing the extreme reduction of pelvic fins in a male (above) and female (below) examined (MHNCI 12694).

Table 2. Morphometric data of 12 individuals of *Cynopoecilus fulgens* (MHNCI 12694) obtained in the Mampituba River Basin in the Santa Catarina State, Southern Brazil.

	Range			
	Males	Costa (2002)	Females	Costa (2002)
SL (mm)	20.10-23.70	30.1-38.9	14.30-18.00	21.3-29.3
Percent of standard length				
Body depth	19.90-24.30	27.5-29.5	20.98-22.78	29.0-27.2
Depth of caudal peduncle	9.96-11.98	12.9-15.1	11.19-12.78	12.6-13.6
Predorsal length	51.74-58.72	52.6-57.9	53.85-61.11	60.4-63.5
Prepelvic length	29.90-50.20	46.7-50.6	44.10	52.2-55.0
Length of dorsal fin	20.50-26.70	28.5-30.4	22.90-27.20	25.2-28.3
Length of anal fin	20.80-25.30	24.6-28.7	21.50-24.50	20.4-21.7
Length of pelvic fin	3.10-6.30	5.6-7.0	4.70	5.6-7.4
Length of pectoral fin	16.90-20.80	16.1-18.5	16.10-20.00	18.2-20.3
Length of caudal fin	19.00-25.40	27.3-32.8	23.10-26.70	30.3-34.0
Head length	24.70-28.40	26.4-28.4	24.50-28.90	27.2-29.2
Percent of head length				
Head depth	60,70-68,90	71.9-77.1	71,20-74,30	70.2-78.7
Head width	57,90-64,30	66.5-69.1	67,30-68,60	69.7-73.9
Eye diameter	33,30-42,60	31.5-33.8	40,00-44,20	33.1-35.9
Snout length	7,00-15,80	13.1-14.2	5,70-14,00	12.6-14.9
Lower jaw length	17,50-31,50	24.4-25.9	14,30-26,90	19.8-24.0

Red List of Threatened Fauna (ICMBio 2018) and it is also considered vulnerable in the list of threatened fauna of the Rio Grande do Sul State (Volcan *et al.* 2015). In fact, the great majority of killifish deserves particular attention with respect to their conservation status due to their high degree of endemism and the fact that several species are usually registered in non-protected areas of the Atlantic Forest coastal drainages, one of the most threatened biomes in the world (Costa 2009, 2012, Volcan *et al.* 2015).

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