

First record of *Pseudophallus brasiliensis* (Syngnathiformes: Syngnathidae) from the state of Maranhão, Northeastern Brazil.

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Abstract

The present study fills knowledge gaps about the geographic distribution of *Pseudophallus brasiliensis*, registering it for the first time for a water system from the state of Maranhão, Northeastern Brazil. The present study is an example of the lack of knowledge on the composition of the state's ichthyofauna when compared to other regions of Brazil, especially on small sized species, which are generally not recorded in inventories conducted in the state. In order to fill the discontinuity of knowledge especially on small sized estuarine/marine fish species occurring in Maranhão, more collecting effort should be conducted, focusing and using methodologies appropriate for collecting these species. These kinds of collections are rarely conducted in Maranhão, which usually focus on species of commercial and fisheries importance.

Keywords. Ichthyology, Parnaíba River Delta, pipefish, *Pseudophallus mindii*, Syngnathinae.

Resumo

O presente estudo preenche lacunas de conhecimento em relação à distribuição geográfica de *Pseudophallus brasiliensis*, registrando a espécie pela primeira vez para um sistema hídrico do Estado do Maranhão, nordeste do Brasil. Este estudo é um exemplo da falta de conhecimento relacionado a composição da ictiofauna do Estado quando comparado a outras regiões do Brasil, especialmente em relação a espécies de pequeno porte, que geralmente não são registradas em inventários conduzidos no Estado. Com o objetivo de preencher esta descontinuidade do conhecimento em relação a espécies estuarinas/marinhas de peixes, de pequeno porte, que ocorrem no Maranhão, mais esforços de coleta devem ser realizados, focando e utilizando metodologias apropriadas para coletar esses peixes. Esses tipos de coletas são raramente realizadas no Maranhão, que geralmente focam em espécies de importância comercial e para pesca.

Palavras-chave. Delta do Parnaíba, Ictiologia, peixe cachimbo, *Pseudophallus mindii*, Syngnathinae.

Introduction

The family Syngnathidae (pipefishes, seahorses and seadragons), currently placed in the order Syngnathiformes, comprises about 320 valid species, distributed in two subfamilies: Nerophinae and Syngnathinae (Fricke et al. 2020a). Species of this family are widely distributed around the world, occurring in marine, estuarine, and freshwater environments (Nelson et al. 2016).

Pseudophallus Herald 1940, included in the subfamily Syngnathinae, currently comprises four valid species, of which only two are recorded for Brazil: *Pseudophallus brasiliensis* (Dawson 1974) and *Pseudophallus mindii* (Meek & Hildebrand 1923) (Menezes et al. 2003, Fricke et al. 2020b). Dawson described *P. brasiliensis* based on specimens from the Tocantins River basin (Dawson 1974, Fricke et

al. 2020b). Later, based on the examination of additional material, he considered that the differences between these two species, *P. brasiliensis* and *P. mindii*, are due to local population variations, considering *P. brasiliensis* a synonym of *P. mindii* (Dawson 1982, Ferraris, 2003). Menezes et al. (2003), in their catalog of marine fish species from Brazil, considered *P. brasiliensis* as a valid species, however, without presenting any justification for this taxonomic decision. Subsequent works, such as Kuitert (2009) and Hamilton et al. (2016) followed this decision made by Menezes et al. (2003), also considering *P. brasiliensis* as a valid species.

According to Fricke et al. (2020b), *P. brasiliensis* is widely distributed along the Southwestern Atlantic in the Brazilian coast, occurring in freshwater, brackish, and marine environments. However, this species was never recorded for any hydrographic system or area of the Maranhão state, including the estuarine portions, as well as its coastal region (see Martins-Juras et al. 1987, Garavello et al. 1998, Piorski 1998, Rocha & Rosa 2001, Castro 2001, Castro et al. 2002, Piorski et al. 2003, Araújo-Junior et al. 2005, Soares 2005, Piorski et al. 2007, Neta & Castro 2008, Castro et al. 2010, Barros et al. 2011, Martins & Oliveira 2011, Nunes et al. 2011, Sousa et al. 2011, Fraga et al. 2012, Almeida et al. 2013, Ribeiro et al. 2014, Lima et al. 2015, Matavelli et al. 2015, Ramos et al. 2014, Melo et al. 2016, Piorski et al. 2017, Brito et al. 2019a, Lima et al. 2019, Teixeira et al. 2019).

In a recent collection expedition conducted in April 2016, two specimens of this species were collected in a coastal river basin discharging at the Parnaíba River Delta, located in the east of Maranhão, Northeastern Brazil. The Parnaíba River Delta comprises about 85 islands within an area of 2,700 km². This Brazilian deltaic formation includes a variety of ecosystems, such as mangroves, sandy beaches, salt marshes, estuaries, and sandy banks, but its biodiversity is still poorly known and underestimated (Guzzi 2012; Melo et al. 2014; Guimarães-Costa et al. 2019).

Material and methods

Two specimens of *P. brasiliensis* (fig. 1) were captured with a manual trail-net (2m long, 1.8m high; mesh size 2mm) and euthanized in a buffered solution of ethyl-3-amino-benzoate-methanesulfonate (MS-222) at a concentration of 250 mg/l until completely ceasing opercular movements, according to animal welfare laws and guidelines (Close et al. 1996, 1997, Leary et al. 2013). One specimen was fixed in formalin 10%, and left for 15 days, after which it was transferred to 70% ethanol. The other specimen was fixed directly in pure alcohol. The collections were authorized by IBAMA through the documents N° 42415 and 51540.

Counts were made according to Dawson (1974) and were only taken from the specimen fixed in formalin 10%. The voucher specimens are deposited in the Coleção Ictiológica do Centro de Ciências Agrárias e Ambientais, from the Universidade Federal do Maranhão (CICCAA), and Coleção de Peixes da Universidade Federal do Maranhão (CPUFMA). Some additional estuarine species were also examined and are listed in the co-faunal material section.

Results

New record. Brazil: Maranhão State: Tutóia Municipality: CICCAA 00125 (1), 99.7 mm SL. stream Buritizinho under bridge at Balneário Rio Buriti, Barro Duro River basin, road (MA-034) at Barro Duro location. 02°54'00.6"S - 42°18'48.2"W. Coll.: E. Guimarães & F. Ottoni, 07.Apr.2016 | CICCAA 00164 (1), 81.5 mm SL. same collecting site and date.

Identification. The specimens herein examined were identified as *P. brasiliensis* due to the presence of diagnostic characters as proposed by Dawson (1974) for the genus and species. Meristic data of the specimen herein examined are presented in table 1. The specimens herein examined possess 13 trunk rings, differing from the two species of the genus occurring in the Pacific Ocean, which possess 14 trunk rings. In addition, the specimens also possess 30 dorsal fin rays, and do not possess a postorbital bar or stripe on snout, whereas *P. mindii* possess a postorbital blotch and stripe on snout, and 33-41 dorsal-fin rays (see Dawson 1974:410 - Provisional key to the genus *Pseudophallus*).

Ecological notes. The locality where the specimens of *P. brasiliensis* were collected, Buritizinho stream, a tributary of the Barro Duro River basin, is an estuarine shallow clear water stream with a sandy bottom and abundant aquatic vegetation. The Barro Duro River discharges at the Parnaíba River Delta (Fig. 2), in the eastern coast of Maranhão state, Northeastern Brazil. The species were collected in the aquatic vegetation on the river bank. In this same collection expedition along the

Barro Duro River system, other estuarine fish species could also be found: *Dormitator maculatus* (Bloch 1792) and *Eleotris pisonis* (Gmelin 1789) (see co-faunal material).



fig. 1. Preserved specimen of *P. brasiliensis*: CICCAA 00164, 81.5 mm SL. Tutóia municipality, Barro Duro River basin, Maranhão state, Northeastern Brazil.

fig. 2. Map with the collecting site of the pipefish *P. brasiliensis* in the state of Maranhão, Northeastern Brazil.

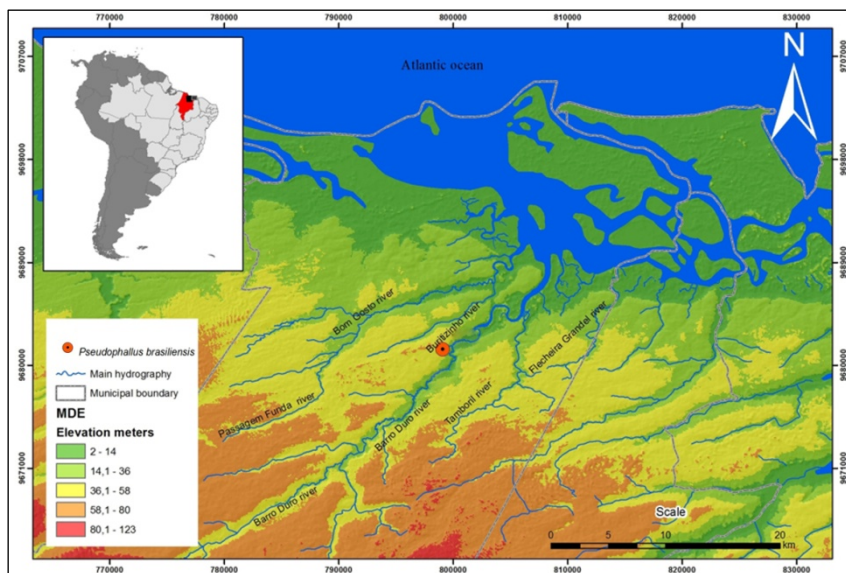


table 1. Meristic data of *Pseudophallus brasiliensis*.

Counts according to Dawson (1974)	CICCAA 00164	original description
based on quantity of specimens	1	8
dorsal-fin rays	30	28-31
pectoral-fin rays	15	13-15
caudal fin-rays	10	10
trunk rings	13	13
tail rings	32	31-32
total rings	45	44-45

Discussion

The present study fills knowledge gaps about the geographic distribution of *Pseudophallus brasiliensis*, registering it for the first time for a water system from the Maranhão state, Northeastern Brazil. The fish fauna inhabiting the river systems of this state, including estuarine portions, as well as marine coastal regions, remain poorly known and scarcely studied, mainly in relation to small sized fish species (Guimarães et al. 2017b, Guimarães et al. 2018), despite recent efforts to sample and inventory this area (e.g. Martins-Juras et al. 1987, Garavello et al. 1998, Piorski 1998, Rocha & Rosa 2001, Castro 2001, Castro et al. 2002, Piorski et al. 2003, Araújo-Junior et al. 2005, Soares 2005, Piorski et al. 2007, Neta & Castro 2008, Castro et al. 2010, Barros et al. 2011, Martins & Oliveira 2011, Nunes et al. 2011, Sousa et al. 2011, Fraga et al. 2012, Almeida et al. 2013, Ramos et al. 2014, Ribeiro et al. 2014, Lima et al. 2015, Matavelli et al. 2015, Melo et al. 2016, Piorski et al. 2017, Brito et al. 2019a, Lima et al. 2019, Teixeira et al. 2019). The present study is an example of the lack of knowledge on the composition of the state's ichthyofauna when compared to other regions of Brazil,

especially on small sized species, which are generally not recorded in inventories conducted in the state.

In order to fill the gap of knowledge especially on small sized estuarine/marine fish species occurring in Maranhão, collecting effort should be conducted focusing and using methodologies appropriate for collecting them (e.g. Guimarães et al. 2017a,b, Brito et al. 2019b, Bragança et al. 2019). These specialized collections are rarely conducted in Maranhão, which usually have its collections and surveys, including those in marine and estuarine habits, using gill net, corking nets, and longlines, that are not efficient to capture small sized fish species, focusing on larger fish species, especially with commercial and fisheries importance (Guimarães et al. 2017b). Thus, the ichthyofaunal diversity in the Maranhão state is probably being sub estimated regarding small size species.

Co-faunal Material

all from Brazil, Maranhão state:

Dormitator maculatus: CICCAA 00171 (2), 48.6-51.3 mm SL. Tutóia Municipality, stream Buritizinho under bridge at Balneário Rio Buriti, Barro Duro River basin, road (MA-034) at Barro Duro location. 02°54'00.6"S - 42°18'48.2"W. coll.: F. Ottoni & E. Guimarães, 07.Apr.2016

Eleotris pisonis: CICCAA 00108 (2), 29.6-34.5 mm SL. Tutóia Municipality, stream Buritizinho under bridge at Balneário Rio Buriti, Barro Duro River basin, road (MA-034) at Barro Duro location. 02°54'00.6"S - 42°18'48.2"W. coll.: F. Ottoni & E. Guimarães, 07.Apr.2016 | CICCAA 00126 (4), 30.8-15.3 mm SL. Barro Duro River, Barro Duro location. 02°52'48,5"S – 42°18'27,1"W. Coll.: F. Ottoni & E. Guimarães, 07.Apr.2016 | CICCAA 00167 (3), 35.8-73.9 mm SL. same collecting site and date from the lot mentioned above

Microphis lineatus (Kaup 1856): CPUFMA 121123 (5), 113.1-137.6 mm SL. Rosário Municipality, Itapecuru River. 02°59'58.1"S - 44°14'32.3"W. coll.: N. Piorski, 03.Nov.2012.

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