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New records of *Hippocampus patagonicus* Piacentino & Luzzatto, 2004 (Teleostei: Syngnathidae) from the coast of Paraná, southern Brazil

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Abstract: The seahorse *Hippocampus patagonicus* (Teleostei: Syngnathidae) is the southernmost occurring species of its genus in the South Atlantic Ocean. Its distribution seems to be restricted to the Southwestern Atlantic, along the coasts of Argentina and Brazil. Herein we report the incidental capture of six individuals as bycatch in the shrimp trawl fishery off the coast of Paraná, southern Brazil. Additional information on the geographic distribution of *H. patagonicus*, together with its ecology and life history, is important for conservation of this threatened species. These data can promote the development of appropriate management and conservation strategies for populations along the Brazilian coast.

Key words: distribution; Gasterosteiformes; bycatch; Southwestern Atlantic; threatened species

The Syngnathidae is a family of teleost fishes which includes seahorses, pipefishes, pipehorses and seadragons (Scales 2010). Seahorses (genus *Hippocampus* Rafinesque, 1810) are well known for their highly specialized body morphology, including synapomorphic characters such as the prehensile tail, the position of the horse-like head at a right angle to the trunk, and a brood pouch in males, where the embryonic development occurs (male pregnancy) (Linton and Soloff 1964; Stolting and Wilson 2007; Ripley 2009). Seahorses generally inhabit shallow, coastal waters in tropical and temperate regions with preference for seagrass and macroalgal beds, coral reefs, mangroves and sponge gardens (Foster and Vincent 2004; Lourie et al. 2004).

There are currently 54 valid species of seahorses (Froese and Pauly 2015), but the taxonomy of the group remains unsettled. To date, only three species of seahorses have been recorded from Brazil: *Hippocampus erectus* Perry, 1810, *Hippocampus reidi* Ginsburg, 1933, and *Hippocampus patagonicus* Piacentino & Luzzatto, 2004 (Silveira et al. 2014). Among Brazilian seahorses, only *H. erectus* is listed as vulnerable (VU) to extinction by the IUCN (2015) based on the ongoing population declines and habitat degradation. Recently all three species were included in the Brazilian list of threatened fauna (MMA 2014).

Seahorse populations are threatened throughout their ranges as a result of overfishing, bycatch, aquarium trade, exploitation for medicinal purposes and habitat loss (Dias et al. 2002; Baum et al. 2003; Scales 2010). Seahorses are particularly vulnerable to human-induced disturbance because they have low mobility, patchy spatial distribution, small home ranges, and complex social and reproductive behavior (Foster and Vincent 2004; Lourie et al. 2004).

Hippocampus patagonicus was described by Piacentino and Luzzatto (2004), with the type locality at San Antonio Bay (Patagonia) in Argentina. Its distribution seems to be restricted to the coasts of Argentina and Brazil (Piacentino and Luzzatto 2004; Boehm et al. 2013; González et al. 2014; Silveira et al. 2014), and this the southernmost occurring species of its genus in the Southwestern Atlantic Ocean. Previous records of *H. patagonicus* in Brazil were provided by Boehm et al. (2013), Silveira et al. (2014) and Anderson et al. (2015).

This study was carried out to provide recent records of *H. patagonicus* from the coast of Paraná, Southern

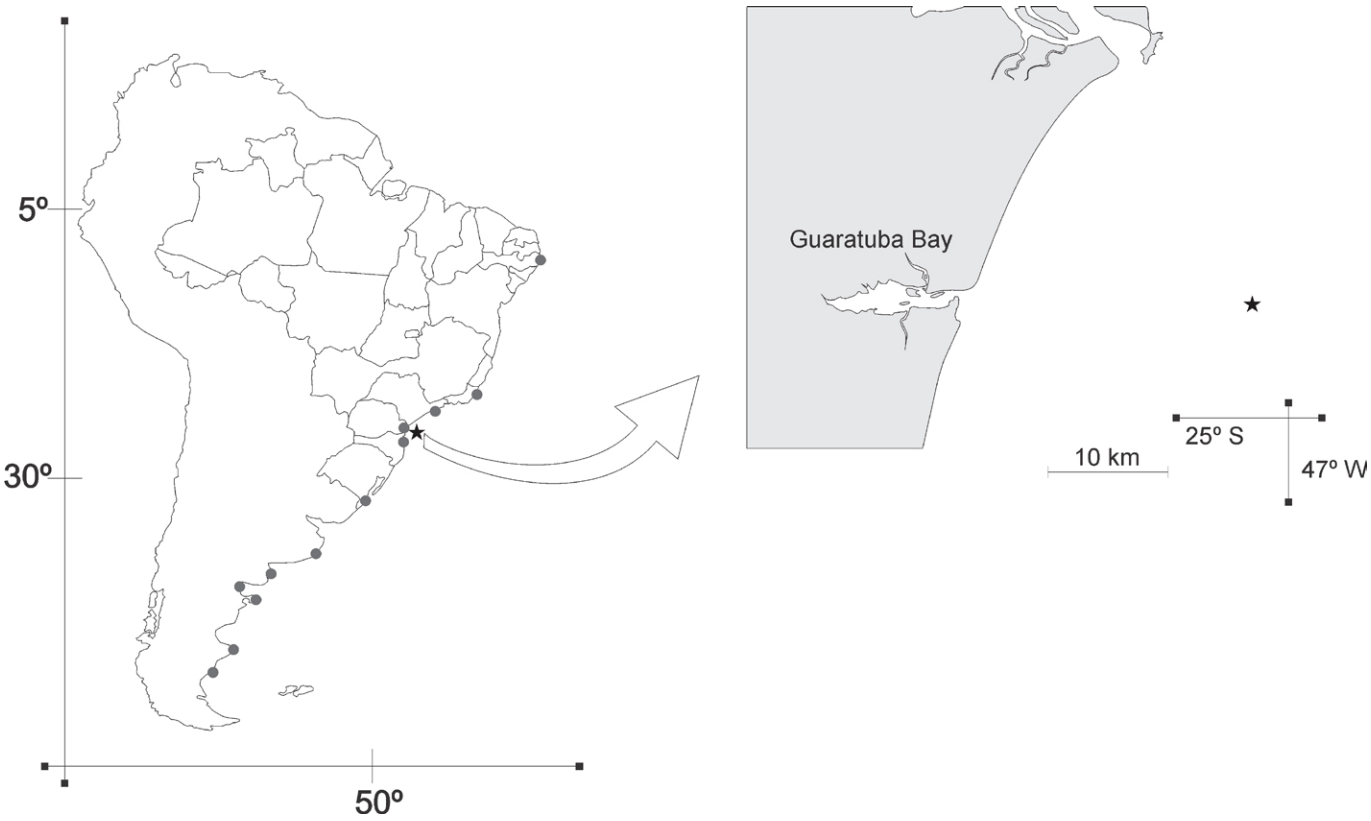

Figure 1. Distribution records of *Hippocampus patagonicus* in the Atlantic coast of South America. Gray circles represent literature records from Piacentino and Luzzatto (2004), Piacentino (2008), Silveira et al. (2014), and Anderson et al. (2015). Black star, new records provided by this study.

Brazil. Specimens were obtained during monitoring of artisanal fish landings at Guaratuba Bay, Southern Brazil. Guaratuba Bay, which is connected to the Atlantic Ocean by an opening 500 m wide, extends 15 km inland (Chaves and Vendel 1997).

Seahorses were incidentally captured as bycatch in the shrimp trawl fishery operating along the coast of Guaratuba Bay (25°57′54.07″ S, 047°49′58.61″ W) in 28 August 2014 (permit SISBIO 10.320-1) (Figure 1). After capture, individuals were fixed in 70% ethanol and deposited in the fish collection of the Capão da Imbuia Natural History Museum (MHNCI 12651).

To identify the specimens, morphological characters, counts and measurements were taken following Piacentino and Luzzatto (2004), Lourie et al. (2004), González et al. (2014) and Silveira et al. (2014). Measurements to the nearest 0.01 mm were made using a digital caliper.

Meristic and morphometric characters of the specimens (height range: 97–123 mm, two males and four females) are presented in Table 1. Variation in the overall body shape, fin-rays counts, proportion of snout length *versus* head length, and the number of body, dorsal and tail rings, distinguished all specimens from

Table 1. Meristic and morphometric (mm) characters of *Hippocampus patagonicus* (MHNCI 12.651) collected from Paraná coast, Brazil.

Characters	(1)	(2)	(3)	(4)	(5)	(6)
Sex	Male	Male	Female	Female	Female	Female
Coloration	Grey	Brown	Yellow	Yellow	Yellow	Yellow
Height	115.0	109.0	97.0	123.0	121.0	113.0
Coronet height	5.60	5.75	6.55	7.60	6.14	6.72
Head length	20.92	20.0	18.15	23.25	20.90	19.50
Trunk length	30.70	31.50	32.75	40.90	38.63	36.50
Tail length	85.64	83.0	69.15	89.44	83.35	78.86
Snout length	5.80	7.12	6.15	7.32	5.34	6.20
Orbital diameter	3.70	2.90	2.78	3.65	3.63	2.64
Dorsal fin length	12.0	10.0	8.29	11.15	10.67	10.0
Pectoral fin length	4.12	3.65	3.46	4.15	4.42	3.60
Number of trunk rings	11	11	11	11	11	11
Number of tail rings	36	36	38	35	35	35
Number of dorsal fin rays	17	16	17	16	16	17
Number of pectoral fin rays	15	13	14	14	12	13

Figure 2. Individuals of *Hippocampus patagonicus* (MHNCI 12651) registered as bycatch in the shrimp trawl fishery in the coast of Paraná, southern Brazil. Recently fixed specimens (2, 3 and 6).

other species of the genus *Hippocampus*. All specimens closely resemble the description of *H. patagonicus* provided by Piacentino and Luzzatto (2004), González et al. (2014) and Silveira et al. (2014) (Figure 2), and counts and measurements were consistent with those reported by these authors (Table 2). Most of the characters provided by Piacentino and Luzzatto (2004) in the original description agree with those from the material examined. However, some differences in the following characters were observed (original description *versus* material examined herein): number of pectoral fin rays (12–14 *versus* 12–15), height range (21–103 *versus* 97–123 mm), proportion of snout/head length (2.43-3.47 *versus* 2.81–3.91), number of tail rings (37–41 *versus* 35–38), and number of dorsal fin rays (16–19 *versus* 16–17). All measurements were similar to those reported by Silveira et al. (2014) and González et al. (2014).

The seahorse *H. patagonicus* seems to have a limited and uneven distribution in Brazil, known only from a few records from the states of Pernambuco, Rio de Janeiro, São Paulo, Paraná, Santa Catarina and Rio Grande do Sul (Anderson et al. 2015, Silveira et al. 2014; present study). Although it is well documented that seahorses, as a general rule, have high levels of site fidelity and small home ranges (Foster and Vincent 2004), the isolated and sparse populations of this species along the Brazilian coast might be consequence of long-distance migration, as described by Boehm et al. (2013) and Luzzatto et al. (2014).

Table 2. Comparison of meristic and morphometric (mm) data of *Hippocampus patagonicus* provided by Piacentino and Luzzatto (2004), Silveira et al. (2014), González et al. (2014), and the material examined herein. N= number of specimens, Ht range= Height range recorded, HL/SnL= snout length *versus* head length, TrR=Trunk rings, TaR=Tail rings, PF= Pectoral fin rays, DF= Dorsal fin rays.

Reference	N	Ht range	HL/SnL	TrR	TaR	PF	DF
Piacentino and Luzzatto (2004)	22	21-103	2.43-3.47	11	37-41	12-14	16-19
Silveira et al. 2014	59	32-144	2.85-3.9	11	34-37	13-15	16-19
González et al. 2014	143	21-154	0.32-0.42*	11	35-38	13-15	16-18
This study	6	97-123	2.81-3.91	11	35-38	12-15	16-17

* Calculated by the authors.

Regardless of their resilient bony structure, unique life history, and behavior of seahorses make them particularly vulnerable to habitat loss and overexploitation (Foster and Vincent 2004). Seahorses are often obtained by small-scale fisheries in developing countries and are particularly vulnerable to shrimp-trawl fisheries (bycatch) (Baum et al. 2003), because they are generally strongly site-associated and slow moving species (Meeuwig et al. 2006). They usually do not survive when taken as bycatch in trawling operations (Davis 2002). Furthermore, the lack of species-specific data on fisheries is critical to their proper assessment and conservation. In fact, when fishing records are available, they are unfortunately grouped into generic categories (e.g., seahorses), which obscure species information in fishery statistics (Baum and Vincent 2005).

Further research on seahorse identification and distribution is needed to provide a clear understanding of species systematics, considering the fact that the taxonomy of this charismatic group of fish has been subject of much controversy during recent years. In addition, according to Rosa (2005), in order to conserve seahorse populations in Brazil, trade regulations need to be revised and enforced, public awareness and education programs should be promoted, and research on population parameters and ecology should be stimulated, along with the definition of protected areas, where fishing is prohibited or strictly regulated.

Our results provide additional information on the geographic distribution of *H. patagonicus* in Brazil, and additional research into the ecology and life history of this species will be important in developing appropriate conservation strategies along the Brazilian coast. For instance, the correlation between the distribution of this species and coastal preservation status can be assessed to provide useful information for conservation tactics in order to formulate any plan to conserve seahorse's species in Brazil.

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