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Rediscovery of *Siphonops annulatus* (Mikan, 1820) (Amphibia: Gymnophiona: Siphonopidae) in the state of Pará, Brazil, with an updated geographic distribution map, and notes on size and variation

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ABSTRACT: *Siphonops annulatus* has a wide distribution in South America. Here we provide a new geographic distribution map for this species and two new records from the state of Pará, Brazil, from where it has not been reported since 1876. A specimen collected in the municipality of Senador José Porfírio is the largest specimen of *S. annulatus* ever recorded.

Caecilian amphibians (Gymnophiona) are distributed mainly across the wet tropics, but also occur in subtropical regions (Gower and Wilkinson 2005). The fossorial, semiaquatic or aquatic habit of the known species hamper the collection of specimens, although recent data shows that some species are much more abundant than has been assumed (Maciel and Hoogmoed 2011).

Siphonops annulatus (Mikan, 1820) is the caecilian with the largest distribution (Wilkinson *et al*. 2008), occurring throughout most of Cis-Andean South America. Although commonly documented in several localities over its distribution, this species was not found in the state of Pará since 1876 when Spengel received in Hamburg, Germany, some specimens of *S. annulatus* from "Pará", as the current municipality of Belém was named at that time (Spengel 1915).

Herein, we report two new localities for *Siphonops annulatus* in Pará. All specimens were collected in pitfall traps (collection permit numbers: 01/11; Process 02018.001265/2010-41-NUFAP/IBAMA and 1325/2011 SEMA/PA), and deposited in the collection of the Museu Paraense Emílio Goeldi, Belém. Two specimens (male MPEG 33733, 282 mm total length; male MPEG 33734, 220 mm total length) were collected in the municipality of Itaituba (06°19'12" S, 55°47'24" W, elevation 270 m) and a single specimen (Figure 1) in the municipality of Senador José Porfírio (male, MPEG 32559; 03°35'19" S, 51°57'00" W, elevation 165 m). The latter specimen measures 539 mm total length, greater than the previous reported maximum size of 450 mm for *S. annulatus* (Taylor 1968).

Both specimens from Itaituba have 79 annuli and the specimen from Senador José Porfírio has 91 annuli. This character ranges from 78–98 in *S. annulatus* (Taylor

FIGURE 1. Specimens of *Siphonops annulatus* from Pará, Brazil. Left: MPEG 33734, 220 mm total length, municipality of Itaituba (photo by AOM); Right: MPEG 32559, 539 mm total length, municipality of Senador José Porfírio (Photo by LOD).

1968), and presents a low geographic variation, even in a *ca.* 4000 km long distribution range; a similar condition is observed in other Neotropical caecilian species with wide distribution (Savage and Wake 2001; Maciel and Hoogmoed 2011).

Maciel and Hoogmoed (2011) present a geographic distribution map for *Siphonops annulatus*, which lacks some literature records. An updated map is in Figure 2, with locality descriptions and coordinates in Appendix 1. Two literature records were not considered by us: i) Borges-Nojosa and Cascon (2005) presented a record from Reserva Natural Serra das Almas, in the Brazilian state of Ceará; however, when visiting the collection of Universidade Federal do Ceará, AOM did not find any specimen that could be identified as *S. annulatus*. ii) Lima *et al.* (2006) present a photograph of two caecilians from Reserva Adolpho Ducke, state of Amazonas, one of them referred as *S. annulatus*; the specimen, however, appears to be a member of the genus *Caecilia*, not *Siphonops*. Thus, to the best of our knowledge, the occurrence of *S. annulatus* in Ceará, and in the Reserva Adolpho Ducke, remains unconfirmed.

The absence of records of *Siphonops annulatus* from the large open vegetation diagonal of Brazil, composed of the Caatinga, Cerrado, and Pantanal-Chaco morphoclimatic domains or biomes (sensu Ab'Sáber 1977), is noteworthy. This distribution pattern can be explained by the lack of collections in those regions or, more likely, by historical causes, but only a phylogeographic study of the species will elucidate this question.

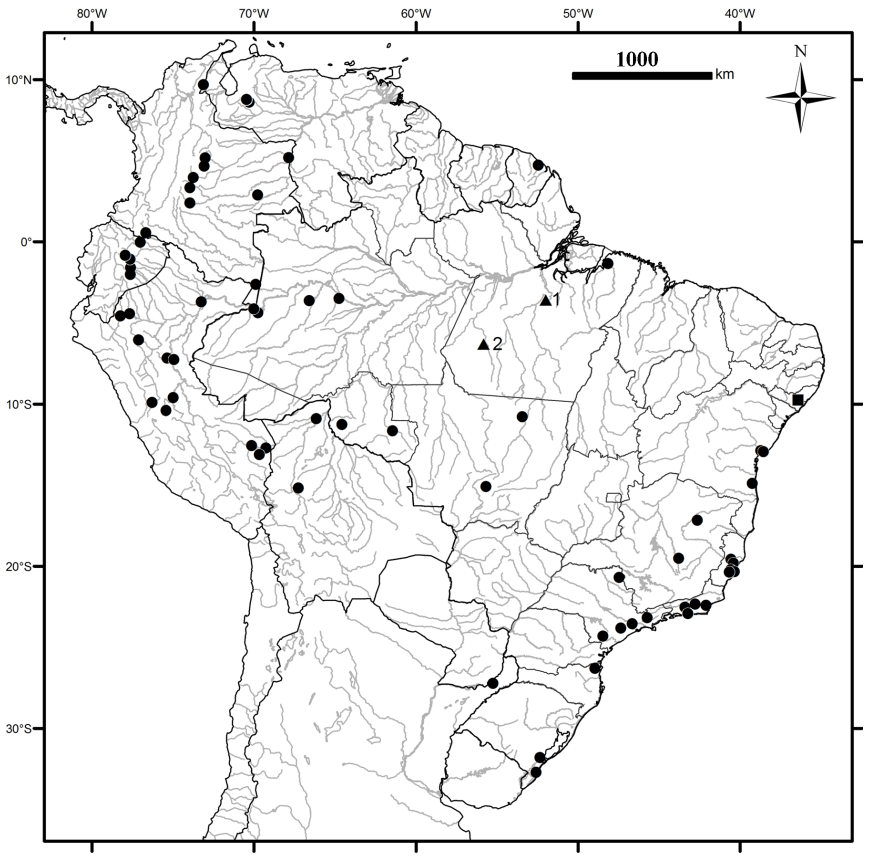

Figure 2. Geographic distribution map of *Siphonops annulatus*. Circles = literature records. Triangle 1 = Senador José Porfírio, Pará, Brazil; triangle 2 = Itaituba, Pará, Brazil. The record from Alagoas, although shown on the map (Square), lacks specific locality data (see Table 1).

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Appendix 1. Locality records of *Siphonops annulatus*, based on literature data and two new records.

LOCALITY	MUNICIPALITY / CITY	STATE / DEPARTMENT	COUNTRY	LATITUDE DECIMAL	LONGITUDE DECIMAL	LATITUDE DMS	LONGITUDE DMS	REFERENCE
	San Ignacio	Missiones	Argentina	-27.25	-55.33	27°15' S	55°20' W	Taylor 1968
	Riberalta	El Beni	Bolivia	-10.98	-66.10	10°59' S	66°06' W	Dunn 1942; De la Riva 1990
Upper Rio Beni		La Paz	Bolivia	-15.20	-67.22	15°12' S	67°13' W	Dunn 1942; Taylor 1968; De la Riva 1990
		Alagoas	Brazil	Not specified	Not specified	Not specified	Not specified	Silva *et al.* 2006
	Juruá	Amazonas	Brazil	-3.48	-66.07	03°28'51" S	66°04'08" W	Maciel and Hoogmoed 2011
Lagoa Japaranão, near Tefé		Amazonas	Brazil	-3.50	-64.70	03°30' S	64°42' W	Dunn 1942; Taylor 1968
	Tabatinga	Amazonas	Brazil	-4.25	-69.94	04°15'10" S	69°56'16" W	Dunn 1942
Isla Itaparica	Itaparica	Bahia	Brazil	-12.88	-38.67	12°53' S	38°40' W	González Fernández 2006;
	Salvador	Bahia	Brazil	-12.97	-38.51	12°58' S	38°30' W	Freitas and Silva 2007
	Ilhéus	Bahia	Brazil	-14.79	-39.04	14°47'20" S	39°02'56" W	Wilkinson *et al.* 2008
Rio Doce		Espírito Santo	Brazil	Not specified	Not specified	Not specified	Not specified	Dunn 1942
	Ibiraçu [Pau Gigante]	Espírito Santo	Brazil	-19.83	-40.37	19°49'55" S	40°22'12" W	Dunn 1942
	Santa Teresa	Espírito Santo	Brazil	-19.94	-40.60	19°56'09" S	40°36'00" W	Dunn 1942
Reserva Biológica Duas Bocas	Cariacica	Espírito Santo	Brazil	-20.23	-40.54	20°14'04" S	40°32'07" W	Tonini *et al.* 2010
	Vitória	Espírito Santo	Brazil	-20.32	-40.34	20°19'08" S	40°20'16" W	Ferreira *et al.* 2010
	Domingos Martins	Espírito Santo	Brazil	-20.36	-40.66	20°21'46" S	40°39'32" W	Zhang and Wake 2009
	Parque do Xingu	Mato Grosso	Brazil	-10.56	-53.46	10°33'48" S	53°27'50" W	Faria and Mott 2011

Appendix 1. Continued.

LOCALITY	MUNICIPALITY / CITY	STATE / DEPARTMENT	COUNTRY	LATITUDE DECIMAL	LONGITUDE DECIMAL	LATITUDE DMS	LONGITUDE DMS	REFERENCE
	Campo Novo dos Parecis	Mato Grosso	Brazil	-13.71	-57.99	13°42'36" S	57°59'33" W	Faria and Mott 2011
Mendez, on Rio Jequitinhonha		Minas Gerais	Brazil	Not found	Not found	Not found	Not found	Dunn 1942
Estação Ambiental de Peti	São Gonçalo do Rio Abaixo and Santa Bárbara	Minas Gerais	Brazil	-19.87	-43.35	19°52' S	43°21' W	Bertoluci *et al.* 2009
	Minas Novas	Minas Gerais	Brazil	-17.20	-42.61	17°12' S	42°36' W	Feio and Caramaschi 1995
	Belém	Pará	Brazil	-1.46	-48.50	01°27'21" S	48°30'14" W	Spengel 1915
	Senador José Porfírio	**Pará**	**Brazil**	**-3.59**	**-51.95**	**03°35'19" S**	**51°57'00" W**	**This study**
	Itaituba	**Pará**	**Brazil**	**-6.32**	**-55.79**	**06°19'12" S**	**55°47'24" W**	**This study**
	Nova Friburgo	Rio de Janeiro	Brazil	-22.28	-42.52	22°16'55" S	42°31'51" W	Dunn 1942
Serra de Macaé	Macaé	Rio de Janeiro	Brazil	-22.37	-41.78	22°22'15" S	41°47'13" W	Dunn 1942
	Teresópolis	Rio de Janeiro	Brazil	-22.41	-42.95	22°24'43" S	42°57'57" W	Dunn 1942; Taylor 1968
	Petrópolis	Rio de Janeiro	Brazil	-22.51	-43.17	22°30'18" S	43°10'44" W	Dunn 1942
	Rio de Janeiro	Rio de Janeiro	Brazil	-22.90	-43.21	22°54'10" S	43°12'28" W	Taylor 1968
	Pelotas	Rio Grande do Sul	Brazil	-31.77	-52.34	31°46'19" S	52°20'34" W	Dunn 1942
Estação Ecológica de Taim	Rio Grande and Santa Vitória do Palmar	Rio Grande do Sul	Brazil	-32.72	-52.58	32°43'22" S	52°34'37" W	Gayer *et al.* 1988
	Guajará-Mirim	Rondônia	Brazil	-10.78	-65.33	10°46'58" S	65°20'20" W	Maciel and Hoogmoed 2011
	Espigão d'Oeste	Rondônia	Brazil	-11.53	-61.00	11°31'30" S	61°00'46" W	Maciel and Hoogmoed 2011
	Joinville	Santa Catarina	Brazil	-26.30	-48.83	26°18'14" S	48°50'45" W	Dunn 1942
	Franca	São Paulo	Brazil	-20.54	-47.40	20°32'20" S	47°24'03" W	Dunn 1942
	Taubaté	São Paulo	Brazil	-23.03	-45.56	23°01'33" S	45°33'18" W	Dunn 1942
	São Paulo	São Paulo	Brazil	-23.55	-46.64	23°32'52" S	46°38'09" W	Malagoli 2008
	Tapiraí and Piedade	São Paulo	Brazil	-23.82	-47.33	23°49' S	47°20' W	Condez *et al.* 2009
Parque Estadual Turístico do Alto Ribeira (PETAR)	Apiaí and Iopranga	São Paulo	Brazil	-24.28	-48.45	24°17' S	48°27' W	Araujo *et al.* 2010
	Leticia	Amazonas	Colombia	-4.15	-69.95	04°09' S	69°57' W	Lynch 1999
	Tarapacá	Amazonas	Colombia	-2.87	-69.73	02°52' S	69°44 ' W	Lynch 1999
	Aguazul	Casanare	Colombia	5.20	-72.55	05°12' N	72°33' W	Lynch 1999
Guaicaramo	Paratebueno	Cundinamarca	Colombia	4.67	-73.07	04°40' N	73°04' W	Dunn 1942
	Villavicencio	Meta	Colombia	4.15	-73.62	04°09' N	73°37' W	Dunn 1942; Taylor 1968; Lynch 1999
Río Ocoa	ca. 5 km E. Villavicencio	Meta	Colombia	4.13	-73.25	04°08' N	73°15' W	Lynch 1999
	Acacias	Meta	Colombia	3.98	-73.77	03°59' N	73°46' W	Lynch 2006
	Cubarral	Meta	Colombia	3.78	-73.85	03°47' N	73°51' W	Lynch 1999
	Mesetas	Meta	Colombia	3.38	-74.04	03°22' N	74°02' W	Lynch 1999
	La Maracena	Meta	Colombia	2.75	-73.92	02°45' N	73°55' W	Lynch 1999
	Puerto Asís	Putamayo	Colombia	0.50	-76.52	00°30' N	76°31' W	Taylor 1968; Lynch 1999
Parque Nacional Natural El Tuparro		Vichada	Colombia	5.32	-68.47	05°19' N	68°28' W	Lynch 1999
	Tena	Napo	Ecuador	-0.99	-77.82	00°59' S	77°46' W	Hedges *et al.* 1993
	Santa Cecilia	Napo	Ecuador	0.05	-76.98	00°03' N	76°59' W	Duellman 1978
Estacíon Biológica Jatun Sasha		Napo	Ecuador	-1.07	-77.62	01°04' S	77°37' W	Vigle 2008
	Sarayacu	Pastaza	Ecuador	-1.73	-77.48	01°44' S	77°29' W	Dunn 1942
Rio Pastaza			Ecuador	-2.01	-77.63	02°01' S	77°38' W	Dunn 1942

Appendix 1. Continued.

LOCALITY	MUNICIPALITY / CITY	STATE / DEPARTMENT	COUNTRY	LATITUDE DECIMAL	LONGITUDE DECIMAL	LATITUDE DMS	LONGITUDE DMS	REFERENCE
	Cayenne		French Guiana	4.92	-52.32	04°55' N	52°19' W	Dunn 1942
Mouth of Santiago, upper Maranon		Amazonas	Peru	-4.45	-77.63	04°27' S	77°38' W	Dunn 1942
Rio Cenipa, upper Maranon		Amazonas	Peru	-4.58	-78.20	04°35' S	78°12' W	Dunn 1942
lower Río Llullapichis		Huanuco	Peru	-9.62	-74.95	09°37' S	74°57' W	Schlüter *et al.* 2004
	Huanuco	Huanuco	Peru	-9.92	-76.23	09°55' S	76°14' W	Taylor 1968
	Iquitos	Loreto	Peru	-3.72	-73.20	03°43' S	73°12' W	Dunn 1942
Rio Itaya	San Antonio	Loreto	Peru	-3.78	-73.23	03°47' S	73°14' W	Dunn 1942
Pampa Hermosa, middle Ucayali, mouth of Cushatabay	Ucayali	Loreto	Peru	-7.17	-75.30	07°10' S	75°18' W	Dunn 1942
East of Contamana [Contamna], Brazil frontier	Ucayali	Loreto	Peru	-7.25	-74.90	07°15' S	74°54' W	Dunn 1942
Los Amigos Research Center		Madre de Dios	Peru	-12.57	-70.10	12°34' S	70°06' W	Von May *et al.* 2009
	Puerto Maldonado	Madre de Dios	Peru	-12.60	-69.18	12°36' S	69°11' W	De la Riva *et al.* 2000
Tambopata Research Center	Tambopata	Madre de Dios	Peru	-13.15	-69.62	13°08'43" S	69°37'02" W	Doan and Arriaga 2002
Pozuzo	Oxapampa	Pasco	Peru	-10.11	-75.53	10°07'01" S	75°32'11" W	Lehr 2001
	Moyobamba [Moyabamba]	San Martín	Peru	-6.05	-76.97	06°03' S	76°58' W	Dunn 1942
	Barinitas	Barinas	Venezuela	8.75	-70.42	08°45' N	70°25' W	Barrío-Amorós and Rodríguez 2010
	Barinas	Barina [Zamora]	Venezuela	8.63	-70.20	08°38' N	70°12' W	Dunn 1942