Oecologia Australis
24(1):223-234, 2020
https://doi.org/10.4257/oeco.2020.2401.22

FIRST RECORD OF *Sturnira tildae* DE LA TORRE, 1859 (CHIROPTERA, PHYLLOSTOMIDAE) FOR THE STATE OF PERNAMBUCO, BRAZIL

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Abstract: Here we present a new record of *Sturnira tildae* in Pernambuco state, Brazil, based on a capture of a pregnant female in an anthropized environment. This finding expands the known distribution for the species in the northern Atlantic Forest. The species nearest record is about 500 km far from our collection locality. Dental and morphometric characteristics were used to identify the species. These features were compared with those of *S. lilium* with whom the species has morphological similarities. *Sturnira tildae* was identified based on its spatulate internal upper incisor teeth, and the lower first and second molars with low lingual cusps and shallow notches. The forearm size of the captured specimen (greater than 45 mm) was also used for identification of *S. tildae*.

Keywords: Atlantic Forest; bat; distribution; morphology; range extension.

Approximately a quarter of the mammal species of the world are bats (Simmons 2005). In the tropical portion of the Neotropics, the diversity of bats can reach 50 % of the mammalian fauna richness (Timm 1994). Brazil is the second country with the highest number of bat species, with 182 species, distributed in nine families and 69 genera (Nogueira *et al.* 2018). Many recent studies have updated the list of Brazilian bat species (*e.g.* Feijó *et al.* 2015, Gregorin *et al.* 2016, Velazco *et al.* 2017, Pavan *et al.* 2018) and reported an increase in geographic distribution for several species in the country (Rocha *et al.* 2017, Lima *et al.* 2018, Nunes *et al.* 2018). Bats of the genus *Sturnira* (Chiroptera, Phyllostomidae) are endemic to the New World and comprise 19 species (Velazco & Patterson 2013, 2019), four of which occur in Brazil: *S. lilium* (Geoffroy 1810), *S. giannae* Velazco & Patterson, 2019, *S. magna* De La Torre, 1966, and *S. tildae* De La Torre, 1959 (Nogueira *et al.* 2014). *Sturnira tildae* is an important disperser of seeds and occurs in the eastern portion of Colombia, southern Venezuela, Guianas, Peru, Bolivia,

Trinidad and Brazil (Simmons 2005). In Brazil, the species has been recorded in the Amazon, Atlantic Forest, Cerrado and Caatinga biomes (Paglia *et al.* 2012).

Externally, *S. tildae* does not have facial stripes, has a mask of dark hairs around the eyes, the uropatagium and calcar are much reduced, and the tail is absent. The pelage coloration is usually orange, ranging from yellowish to brownish (Reis *et al.* 2013). In areas where it occurs in sympatry, it differs from *S. lilium* by dental and morphometric characteristics (Simmons & Voss 1988).

Here we present a new record of *S. tildae* in northeastern Brazil, which expands its geographic distribution. Bats were collected in 10 nights of sampling, between August and November 2016, at the Technology Institute of Pernambuco (8°05'27.7"S, 34°55'41.1'W), located in Recife, Pernambuco state. It is inside an urban area, with a mixture of ombrophilous dense Atlantic Forest and exotic vegetation. The climate in the area is warm and humid with an annual temperature average of 26 °C, with a higher incidence of rainfall between March and August (INMET 2019).

Five mist nets (12 m x 2.5 m) were used in each sampling night. The nets were set from 17h00-00h00 and checked for bats at 20-min intervals. Collections occurred on nights of a new moon and no rain. The captures were authorized by the SISBIO (license nº 20383-1) and by the Animal Ethics Committee of the Federal Rural University of Pernambuco (license nº 067/2015). External and cranial measurements (in mm) were taken using a digital caliper with a capacity of 20 cm and precision of 0.05 mm. The specimen of *S. tildae* was fixed in 10 % formalin and preserved in 70 % ethanol (Papavero 1994). The skull was removed and cleaned according to Pacheco (2004). The following external and cranial measurements were recorded according to Nogueira *et al.* (2008) and Velazco *et al.* (2010): body length, forearm length, ear length, skull length, condylobasal length, postorbital constriction, breadth across upper molar, braincase breadth, zygomatic breadth and maxillary toothrow length. The body mass was verified with a high precision balance (EK5055, max 5 kg, precision of 0.1 g). The specimen was deposited in the Collection of Mammals of the Federal University of Pernambuco, under the number UFPE 3642.

Identification of the *S. tildae* was based on qualitative and quantitative characters according to De La Torre (1959), Marinkelle & Cadena (1971), Simmons & Voss (1998), and Reis *et al.* (2013). Measurements of the external and cranial characters of this specimen were compared with those of *S. lilium* from Brazil (Taddei 1975), Trinidad (Goodwin & Greenhall 1964), French Guiana (Simmons & Voss 1998), and Mexico (Goodwin & MacDougall 1969). In order to update the knowledge about the geographical distribution of *S. tildae*, bibliographic surveys were carried out in books, articles, monographs, dissertations, and theses. The keywords used were *Sturnira*, *Sturnira tildae*, and *S. tildae*.

A total of 117 bats were captured in the present study (Table 1). A single female specimen of *S. tildae*, pregnant (by palpation), non-nursing, was collected on October 09, 2016. The captured specimen had brown pelage coloration, dark hairs

Table 1. Species and abundance of bats captured at the Technology Institute of Pernambuco, Recife, Brazil, between August and November 2016.

Taxon	N
Family Phyllostomidae	
Subfamily Carolliinae	
Carollia perspicillata (Linnaeus, 1758)	21
Subfamily Glossophaginae	
Glossophaga soricina (Pallas, 1766)	7
Subfamily Phyllostominae	
Phyllostomus discolor (Wagner, 1843)	4

Table 1. Continued on next page...

Table 1. ...Continued

Taxon	N
Subfamily Stenodermatinae	
Artibeus lituratus (Olfers, 1818)	15
A. obscurus (Schinz, 1821)	51
A. planirostris (Spix, 1823)	10
Sturnira lilium (E. Geoffroy, 1810)	5
S. tildae De La Torre, 1959	1
Platyrrhinus lineatus (E. Geoffroy, 1810)	3

around the eyes, hairs from the ventral region lighter than the dorsal, very short calcar, and no tail (Figure 1). The skull is long, with a small braincase and broad, high rostrum. The specimen was identified as *S. tildae* based on its spatulate internal upper incisor teeth, and the lower first and second molars with low lingual cusps and shallow notches (Marinkelle & Cadena 1971, Simmons & Voss 1998, Reis *et al.* 2013, Figure 2).

The external and cranial measurements (forearm length, cranial length, condylobasal length, postorbital constriction, zygomatic breadth, and maxillary toothrow length) as well as the body mass of the captured specimen are according with the description of *S. tildae* by De La Torre (1959), and by Marinkelle & Cadena (1971), Simmons & Voss (1998) and Reis *et al.* (2013) (Table 2). The forearm length is an important taxonomic character used to differentiate *S. tildae* from *S. lilium*. The first species has a forearm length of more than 45 mm while in *S. lilium* this measure does not exceed this value (Taddei 1975, Gannon *et al.* 1989, Simmons & Voss 1998, Reis *et al.* 2013).

This is the fifth record of *S. tildae* in the Northeast region of Brazil and the first in the Pernambuco state. The nearest historical record is about 500 km to the west from Chapada do Araripe, Ceará, in the Caatinga biome (Novaes & Laurindo 2014). The other records in the Northeast region of the country are all from the Atlantic Forest biome of the Bahia state, more than 850 km to the south (Faria 2006, Faria & Baugarten 2007, Table 3 and Figure 3).

Figure 1. *Sturnira tildae* (female, UFPE 3642) captured in Recife, Pernambuco state, Brazil.

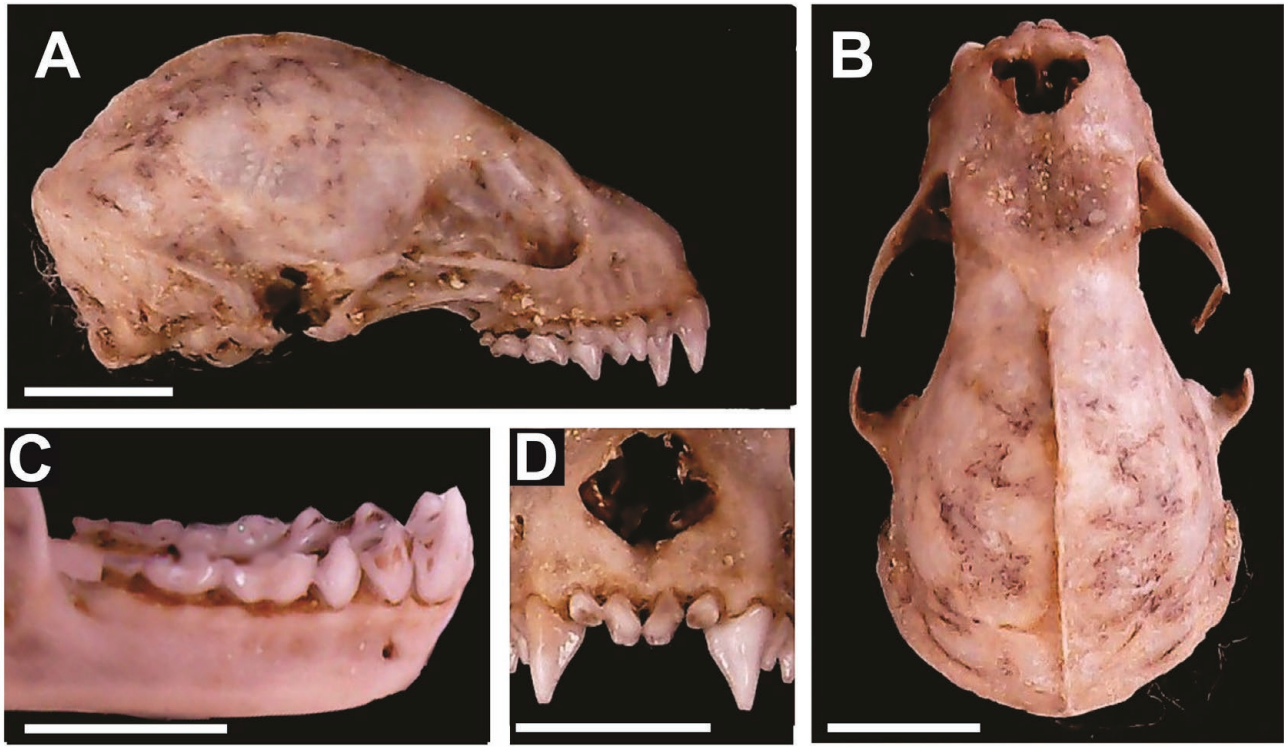

Figure 2. Lateral (A) and dorsal perspective (B) of skull, lower jaw (C) and upper incisors (D) of female *Sturnira tildae* (UFPE 3642) captured in Recife, Pernambuco state, Brazil. Bars = 5 mm.

Table 2. External and craniodental measurements (in millimeters), and body mass (in grams) for *Sturnira tildae* (female, UFPE 3642) from Recife, Pernambuco state, Brazil. Including mean values observed for *S. tildae* females from Trinidad (De La Torre 1959), French Guiana (Simmons & Voss 1998) and Colombia (Marinkelle & Cadena 1971), and means for *S. lilium* females from Brazil (São Paulo, Taddei 1975), Trinidad (Goodwin & Greenhall 1964), French Guiana (Simmons & Voss 1998) and Mexico (Goodwin & MacDougall 1969).

Measurements	*Sturnira tildae*				*Sturnira lilium*			
	Brazil, Pernambuco (UFPE 3642)	**Trinidad**	**French Guiana**	**Colombia**	**Brazil, São Paulo**	**Trinidad**	**French Guiana**	**Mexico**
External	N = 1	N = 1	N = 13	N = 60	N = 20	N = 3	N = 19	N = 5
Total length	66.5		69.8		61.62		64.5	
Forearm length	45.9	54.1	46.1	47.4	42.42	41.67	41.9	39.76
Ear length	15.5		18.1	15.2	16.10		16.4	
Body mass	26.3		22.5			16.1	19.3	
Craniodental	N = 1	N = 1	N = 5	N = 50	N = 15	N = 3	N = 11	N = 5
Cranial length	23.6	23.3	22.76	23.7	22.11	21.8	21.77	21.34
Condylobasal length	22.6	21.1	21.26	22.3	20.01	20.37	20.05	19.36

Table 2. Continued on next page...

Table 2. ...Continued

Measurements	*Sturnira tildae*				*Sturnira lilium*			
	Brazil, Pernambuco (UFPE 3642)	**Trinidad**	**French Guiana**	**Colombia**	**Brazil, São Paulo**	**Trinidad**	**French Guiana**	**Mexico**
Postorbital constriction	6.5	6.3	6.16	6.6	5.95		5.79	5.56
Breadth across upper molars	7.9	8.1	8.21	8.4	8.13		8	
Braincase breadth	10.2		10.8	10	10.41	10.17	10.18	9.76
Zygomatic breadth	14.9	13.9	14.15	14.6	13.86	12.73	13.42	13.12
Maxillary toothrow length	7.6	7.1	6.87	7.1	6.40	6.57	6.46	6.32

Sturnira tildae has been mainly observed in preserved environments (Miretzki *et al.* 2006), but the locality where it was captured in our field survey has anthropic alterations, being a small forest fragment inserted in the urban area of Recife. According to Reis *et al.* (2013) there is also a possibility for capturing *S. tildae* in anthropized environments.

In the present study, we observed higher abundance of *S. lillium* compared to *S. tildae* (Table 1), a pattern that is maintained throughout the Atlantic Forest (Faria 2006, Faria & Baumgarten 2007, Brito 2011, Carvalho *et al.* 2013, Luz *et al.* 2013, Pires & Cademartori 2018). In the Atlantic Forest of Northeast Brazil (present study, Faria 2006, Faria & Baumgarten 2007) the abundance of *S. lillium* is lower than in the southern portion of this biome (Passos *et al.* 2003, Esbérard *et al.* 2006, Brito 2011, Carvalho *et al.* 2013, Luz *et al.* 2013, Souza *et al.* 2015). Here we observed *S. tildae* with relative

Table 3. Location records of *Sturnira tildae* in Brazil. Codes refer to numbers indicated in the Figure 3.

Code	Latitude/ Longitude	Locality/State	Reference
1	1º36'02"N/52º28'59"W	Serra do Navio/Amapá	Martins *et al.* (2006)
2	1°16'57"N/51°35'03"W	Ferreira Gomes/Amapá	Martins *et al.* (2006)
3	1º10'05"N/49º3351"W	Cutias/Amapá	Martins *et al.* (2011)
4	0°15'55"N/53°06'01"W	Almeirim/Amapá	Martins *et al.* (2006)
5	0°00'00"N/51°00'00"W	Macapá/Amapá	Martins *et al.* (2011)
6	2°15'07"S/62°37'55"W	Novo Airão/Amazonas	Barnett *et al.* (2006)
7	2º24'04"S/59º43'07"W	Preto da Eva/Amazonas	Bernard (2002)
8	2°37′02"S/64°36′54"W	Maraã/Amazonas	Pereira *et al.* (2009)
9	2°55'09"S/59°52'59"W	Manaus/Amazonas	Capaverde (2015)
10	3°10'10"S/67°23'01"W	Jutaí/Amazonas	Santos (2017)
11	3°05'07"S/59°57'12"W	Manaus/Amazonas	Neves (2017)
12	8°12'17"S/63°52'57"W	Canutama/Amazonas	Silva & Bobrowiec (2015)
13	1º09'01"S/49°37'51"W	Anajás/Pará	Marques-Aguiar *et al.* (2002)

Table 3. Continued on next page...

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Code	Latitude/ Longitude	Locality/State	Reference
14	1º13'09"S/48°16'49"W	Santa Bárbara do Pará/Pará	Fonseca (2006)
15	1º16'11"S/49°21'05"W	Muaná/Pará	Marques-Aguiar *et al.* (2002)
16	2°30′09"S/54°57′17"W	Santarém/Pará	Bernard & Fenton (2002)
17	3º36'11"S/55º44'47"W	Aveiro/Pará	Presley *et al.* (2008)
18	7°41′18"S/51°52′02"W	Ourilândia do Norte/Pará	Peters *et al.* (2006)
19	7º27'11"S/73º40'47"W	Mâncio Lima/Acre	Nogueira *et al.* (2004)
20	10°10'10"S/68°30′09"W	Rio Branco/Acre	Santos *et al.* (2017)
21	10º03'55"S/67º36'51"W	Senador Guiomard/Acre	Silva (2016)
22	7°42′10"S/47°19′'06"W	Goiatins/Tocantins	Maas *et al.* (2018)
23	8°30'11"S/48°27′44"W	Colinas do Tocantins/ Tocantins	Maas *et al.* (2018)
24	10º30'06"S/46º10'16"W	Mateiros/Tocantins	Gregorin *et al.* (2011)
25	7°21'51"S/39°20'11"W	Barbalha/Ceará	Novaes & Laurindo (2014)
26	**8°05'27.7"S/34°55'41.1"W**	**Recife/Pernambuco**	**This Study**
27	14°47'11"S/39°04'07"W	Ilhéus/Bahia	Faria & Baugarten (2007)
28	15°17'18"S/39°15'11"W	Una/Bahia	Faria (2006)
29	9°04'07"S/60°36'44"W	Colniza/Mato Grosso	Pinto (2008)
30	12°48'48"S/51°46'12"W	Ribeirão Cascalheira/Mato Grosso	Pine *et al.* (1970)
31	13º43'26"S/47º50'13"W	Cavalcante/Goiás	Oliveira (2000)
32	17°51'57"S/51°43'21"W	Jataí/Goiás	Pina *et al.* (2013)
33	20°26'21"S/54°38'15"W	Campo Grande/Mato Grosso do Sul	Jesus *et al.* (2015)
34	19°39'08"S/40°07'17"W	Aracruz/Espírito Santo	Peracchi & Albuquerque (1993)
35	22°25'21"S/42°45'47"W	Cachoeiras de Macacu/Rio de Janeiro	Souza *et al* (2015)
36	22°22'22"S/44°35'56"W	Itatiaia/Rio de Janeiro	Luz *et al.* (2013)
37	22°49'28"S/43°31'08"W	Rio de Janeiro/Rio de Janeiro	Menezes *et al.* (2015)
38	22°59'10"S/44°06'21"W	Mangaratiba/Rio de Janeiro	Luz *et al.* (2011)
39	23°10'05"S/44°12'03"W	Angra dos Reis/Rio de Janeiro	Esbérard *et al.* (2006)
40	22º20'28"S/47º50'34"W	Pirassununga/São Paulo	Muylaert *et al.* (2014)
41	23º20'47"S/46º29'01"W	Mairiporã/São Paulo	Bertola *et al.* (2005)
42	23°22'22"S/45°50'26"W	Ubatuba/São Paulo	Garbino (2016)
43	23°44'41"S/46°02'07"W	Bertioga/São Paulo	Garbino (2016)
44	24°09'18"S/48°36'21"W	Guapiara/São Paulo	Passos *et al.* (2003)
45	24º17'55"S/47º00'09"W	Peruíbe/São Paulo	Gimenez & Ferrarezzi (2004)
46	24º33'52"S/48º40'49"W	Iporanga/São Paulo	Garbino (2016)
47	24°13'27"S/48°04'46"W	Sete Barras/São Paulo	Garbino (2016)
48	24°41'13"S/48°00'01"W	Jacupiranga/São Paulo	Garbino (2016)
49	24°42'04"S/47°52'21"W	Pariquera-Açu/São Paulo	Garbino (2016)
50	25º03'15"S/47º52'41"W	Cananéia/São Paulo	Garbino (2016)
51	25º10'06"S/48º18'17"W	Guaraqueçaba/Paraná	Munster (2008)
52	25º27'17"S/48º54'49"W	Morretes/Paraná	Brito (2011)

Table 3. Continued on next page...

Table 3. ...Continued

Code	Latitude/ Longitude	Locality/State	Reference
53	25°25'07"S/48°54'57"W	Morretes/Paraná	Miretzki *et al.* (2002)
54	27°01'17"S/49°01'06"W	Blumenau/Santa Catarina	Althoff (2007)
55	28°28'43"S/49°15'09"W	Pedras Grandes/Santa Catarina	Carvalho *et al.* (2013)
56	28°37'03"S/49°01'11"W	Jaguaruna/Santa Catarina	Bôlla *et al.* (2017)

frequency below 1 %, similar to the results recorded throughout the Brazilian Atlantic Forest (Esbérard *et al.* 2006, Faria 2006, Faria & Baumgarten 2007, Luz *et al.* 2011, Carvalho *et al.* 2013; Luz *et al.* 2013, Menezes *et al.* 2015, Souza *et al.* 2015).

The difficulty in identifying *S. tildae* occurs due to its morphological similarities with *S. lilium* (Simmons & Voss 1998). It is very possible that the similarity of the external morphology between these species and the overlapping in their geographic

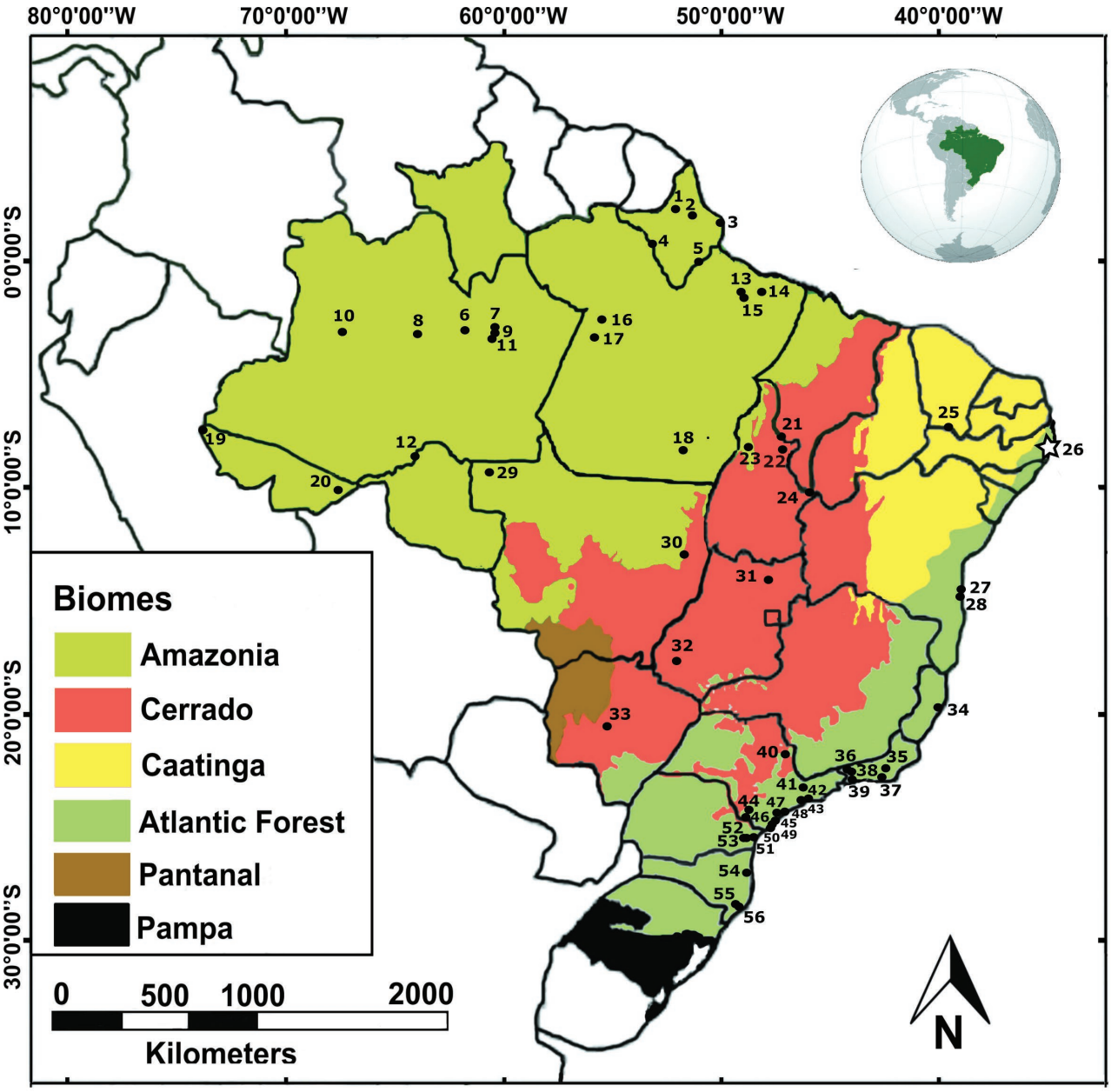

Figure 3. Geographic distribution of *Sturnira tildae* in Brazil and the new record (star) in Recife, Pernambuco state. The numbers refer to the codes in Table 3.

distributions (Sampaio *et al.* 2016, Velazco & Patterson 2017) can lead to identification errors. In this way, it is recommended that mammalogists pay great attention in the identification of *Sturnira* genus, mainly when individuals are captured, identified and released in the field.

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Submitted: 22 May 2019
Accepted: 22 October 2019
Published online: 01 November 2019
Associate Editor: Alexandra Bezerra