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1 **Completing the menu: addition of *Scinax cruentommus* and *Scinax* cf. *garbei***
2 **(Anura: Hylidae) to the diet of *Trachops cirrhosus* (Chiroptera: Phyllostomidae) in**
3 **Central Amazon**

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18 *Running title: Trachops cirrhosus predation on Scinax tree frogs*

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21

22 **Abstract.**

23 Chiropteran diversity peaks in the Neotropics where more than 100 bat species can be
24 found living sympatrically. Although Neotropical bats are known to feed on a diverse
25 array of food resources, information regarding their trophic ecology is scarce. To
26 contribute to a better understanding of trophic interactions between Neotropical bats and
27 their vertebrate prey, we report the predation of two treefrog species of the genus *Scinax*
28 by the fringe-lipped bat *Trachops cirrhosus*. These constitute the second and third
29 amphibian species to be added to the diet of *T. cirrhosus* in Central Amazon.

30

31 **Key words:** amphibians, bats, Brazil, Amazonia, diet, trophic interaction.

32 The Neotropical fringe-lipped bat (*Trachops cirrhosus*) is a medium-sized phyllostomid
33 bat (forearm length 55–65 mm) found in dry and moist forests extending from southern
34 Mexico to southern Brazil (Arita 1993, Williams & Genoways 2007). The species is
35 easily identified by its prominent cylindrical, papilla-like projections on the lips and
36 muzzle (Cramer et al. 2001, Williams & Genoways 2007). Together with the common
37 big-eared bat *Micronycteris microtis*, the stripe-headed round-eared bat *Tonatia*
38 *saurophila*, the greater spear-nosed bat *Phyllostomus hastatus*, the big-eared woolly bat
39 *Chrotopterus auritus*, the spectral bat *Vampyrum spectrum* and the two species of
40 bulldog bat - genus *Noctilio* – this is one of the few Neotropical bats known to capture
41 and prey on vertebrate species (Norberg & Fenton 1988, Simmons 2005, Altringham et
42 al. 2011, Santana et al. 2011).

43 Fringe-lipped bats are known mostly for their frog-eating habits, but are omnivorous
44 and feed mainly on insects (Bonato et al. 2004). In addition to anurans, these bats
45 consume a wide range of other small vertebrates such as lizards (Goodwin & Greenhall
46 1961, Pine & Anderson 1979, Whitaker & Findley 1980), birds (Bonato et al. 2004,
47 Rodrigues et al. 2004), and mammals (Peracchi et al. 1982, Arias et al. 1999, Ferrer et

48 al. 2000, Bonato et al. 2004), including other bats (Bonato & Facure 2000). Fruits
49 (Whitaker & Findley 1980, Humphrey et al. 1983, Bonato et al. 2004) and snails
50 (Bonato et al. 2004) have also been reported as minor constituents of the species' diet.

51 Interactions between *T. cirrhosus* and the Central American túngara frog *Engystomops*
52 (formerly *Physalaemus*) *pustulosus* have been extensively studied (Barclay et al. 1981,
53 Tuttle & Ryan 1981, Tuttle et al. 1982, Jones et al. 2013, Surlykke et al. 2013).

54 However, despite considerable literature on the evolutionary arms-race between both
55 species (e.g. Tuttle & Ryan 1981, Halfwerk et al. 2014), only two other anurans have
56 been described as *T. cirrhosus* prey, namely the Panama cross-banded treefrog *Smilisca*
57 *sila* (Nunes 1988) in Central America and the slender-legged treefrog *Osteocephalus*
58 *oophagus* in Central Amazon (Rocha et al. 2012). Bonato et al. (2004) analyzed the diet
59 of 102 *T. cirrhosus* individuals from the Brazilian Amazon and the Atlantic forests,
60 revealing that almost 20% of the remains in the bats' intestinal tracks belonged to
61 amphibian prey. However, remains could only be identified to Order level. A report of
62 the Manaus slender-legged treefrog *Osteocephalus taurinus* being captured by bats in
63 the Venezuelan Amazon may also be related to *T. cirrhosus*, however, the authors were
64 unable to identify the predator species in question (Amézquita & Hödl 2004). In this
65 study, we report two additional predation events of *T. cirrhosus* upon Central
66 Amazonian hylids.

67 Observations were made on 22 May 2013 at the Florestal reserve of the Biological
68 Dynamics of Forest Fragments Project (BDFFP), located ~80 km north of Manaus
69 (2°23'18.65"S, 59°50'57.84"W), Central Amazon, Brazil. The reserve is located in an
70 area of *terra firme* rainforest characterized by high levels of tree species richness (often
71 exceeding 280 species ha⁻¹) (Oliveira & Mori 1999) and a forest canopy height between
72 30 and 37 m, with emergent trees reaching 55 m (Mesquita et al. 1999). Rainfall

73 annually ranges from 1900 to 3500 mm, with a dry season spanning the months of June
74 through October (Laurance et al. 2011). Bats were sampled using 14 ground-level mist
75 nets (12 x 2.5 m, 16-mm mesh, ECOTONE, Poland) stretched along 2 perpendicular
76 transects roughly 100 m long, and 3 canopy-mist nets (3 x 12 m, 16-mm mesh,
77 ECOTONE, Poland). Nets were opened at 06:00 pm, deployed for six hours and visited
78 approximately every 20 minutes.

79 At 10:20 pm an adult male *T. cirrhosus* (forearm 61.6 mm; weight 39.5.6 g) was
80 captured in a ground-mist net with a treefrog in its mouth. After disentangling the bat,
81 the frog was collected and identified as a juvenile of *Scinax* cf. *garbei* (SVL 20 mm;
82 Fig. 1.A). Soon after, at 11:00 pm, a second *T. cirrhosus*, a lactating female (forearm
83 63.5 mm; weight 36.2 g), was also captured in a nearby mist-net with another hylid,
84 identified as an adult of *Scinax cruentommus* (SVL 30 mm; Fig. 1.B). Both bats were
85 marked with subcutaneous PIT-tag transponders (PIT-tag codes: male = 00071A3730;
86 female = 000708BEDE) and released soon after being captured. Treefrogs were
87 deposited at the herpetology collection of the National Institute of Amazonian Research
88 (INPA) in Manaus, Amazonas, Brazil (*Scinax* cf. *garbei* catalogue number INPA-H
89 34283; *S. cruentommus* catalogue number INPA-H 34284). During the night of the
90 reported events, mist-netting was conducted in close proximity (~100 m) to a shallow
91 temporary pond, located under dense tree canopy and from which intense amphibian
92 vocal activity could be heard. Within 3 hours (from 9:00 pm to 12:00 pm) a total of 5 *T.*
93 *cirrhosus* were mist-netted, a number unmatched in any equal time period during 3
94 years of field-work in the area (culminating in the capture of more than 7 000 bats).
95 *Scinax* treefrogs occur in nearly all tropical and subtropical habitats from southern
96 Mexico to eastern Argentina and represent the second largest genus within the
97 subfamily Hylinae (Faivovich 2002), harbouring more than 110 species (Frost 2015).

98 Post-metamorphic *Scinax* species have been reported as prey of several vertebrate
99 (Toledo et al. 2007) and invertebrate (Toledo et al. 2005) *taxa*. However, to date no
100 trophic interaction between a mammal species and *Scinax* spp. has been reported.

101 The fringe-lipped bat is one of the most common gleaner bat species within Central
102 Amazon, yet despite being locally abundant, knowledge of its feeding habits is
103 extremely scarce. The events here reported add two new prey species to the diet of *T.*
104 *cirrhosus* and contribute to a better understanding of resource use and partitioning
105 among tropical chiropteran species.

106

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116

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- 200

201 **Figure caption page**

202

203 **Figure 1** – Remains of the *Scinax* cf. *garbei* (INPA-H 34283) (A) and *Scinax*
204 *cruentommus* (INPA-H 34284) (B) individuals preyed on by *Trachops cirrhosus* at the
205 Florestal reserve of the Biological Dynamics of Forest Fragments Project. Arrows point
206 to teeth mark bites.

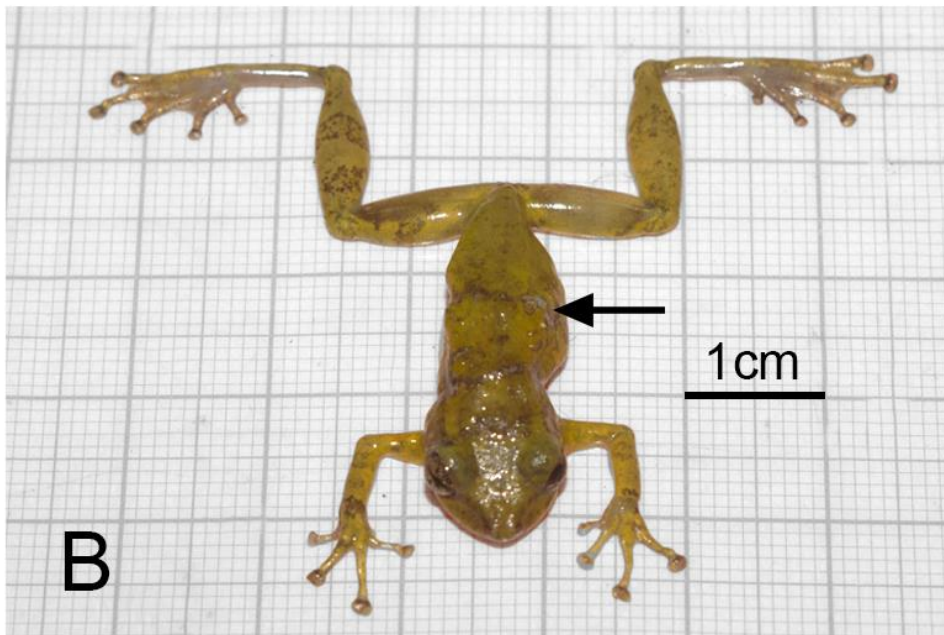
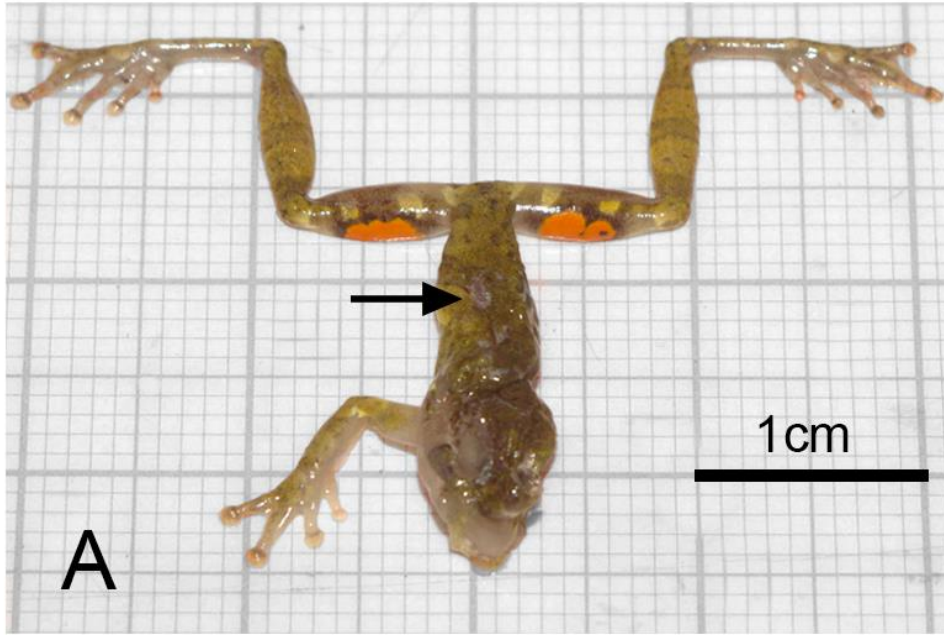
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208 **Figures**

209

210 **Figure 1**



211