SCIENTIFIC COMMUNICATION

Fruits as unusual food items of the carnivorous bat *Chrotopterus auritus* (Mammalia, Phyllostomidae) from southeastern Brazil

Wilson Uieda [1]; Therys M. Sato [2]; Maria C. de Carvalho [3] & Vinícius Bonato [4]

[1] *Departamento de Zoologia, Instituto de Biociências, Universidade Estadual Paulista. 18618-000 Botucatu, São Paulo. E-mail: wuieda@ibb.unesp.br*

[2] *Programa de Pós-graduação em Zoologia, Departamento de Zoologia, Universidade Federal do Paraná. Caixa Postal 19020, 81531-980 Curitiba, Paraná, Brasil.E-mail: therysbio@yahoo.com.br*

[3] *Programa de Pós-graduação em Botânica, Instituto de Biociências. 18618-000 Botucatu, São Paulo, Brasil. E-mail: mccarvalho3@hotmail.com*

[4] *Museu de História Natural, Universidade Estadual de Campinas. 13083-970 Campinas, São Paulo, Brasil. E-mail: vinibonato@yahoo.com.br*

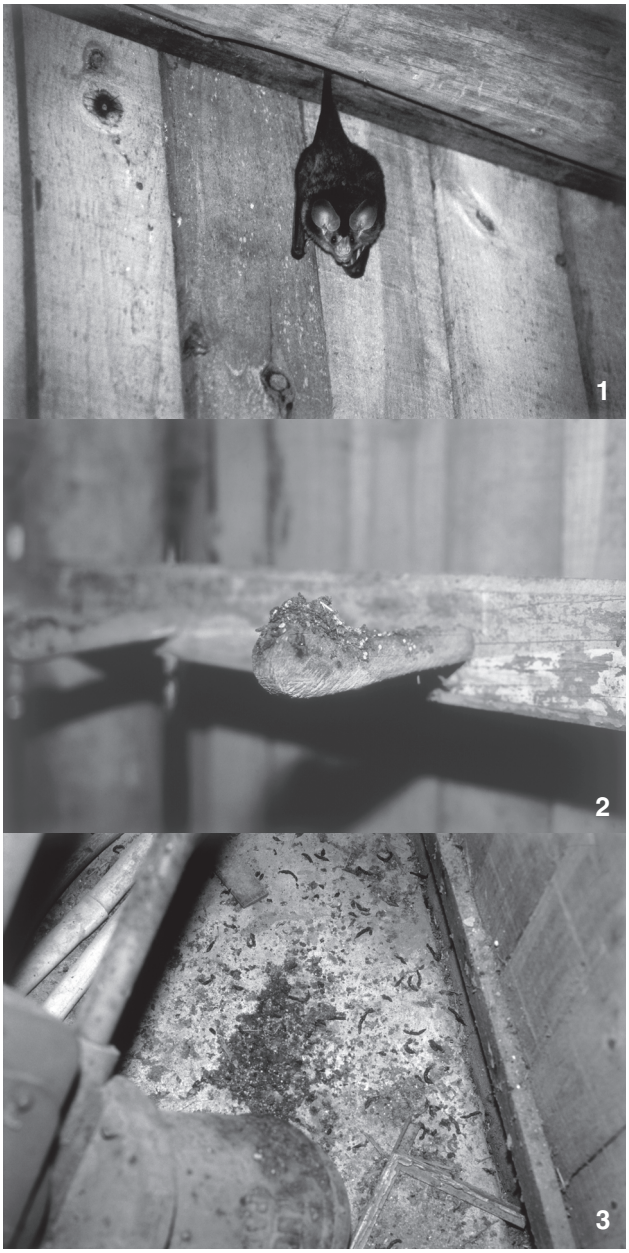
ABSTRACT. We record here the occurrence of seeds of several plant species in feces found inside the day roost of *Chrotoperus auritus*, at the Estação Experimental de Itirapina, State of São Paulo, Southeastern Brazil, in July 2001. The roost was used by only one adult female, non pregnant, during about a month. In the feces, fur of rodent (Muridae), bone fragments, fragments of Scarabaeidae and other beetles and insects, leaves (not determined) and many seeds of Piperaceae (*Piper* sp.), Urticaceae (*Cecropia* sp.) and Solanaceae (*Solanum* spp. and *Cestrum* sp.) were found. In the gut content, insect fragments, fur of rodent (Muridae) and plant remains were found. It was discussed why this carnivorous bat would be consuming plant items.
KEY WORDS. Carnivory; feeding habits; frugivory; Phyllostominae; São Paulo State.

RESUMO. **Frutos como item alimentar não habitual do morcego carnívoro *Chrotopterus auritus* (Mammalia, Phyllostomidae) da região sudeste do Brasil.** Relatamos aqui a ocorrência de sementes de diversas espécies de plantas em fezes encontradas num abrigo diurno de *C. auritus*, localizado na Estação Experimental de Itirapina, São Paulo, em julho de 2001. O abrigo era utilizado por apenas uma fêmea adulta não grávida durante cerca de um mês. Nas fezes, foram encontrados pêlos de roedor (Muridae), fragmentos de ossos, fragmentos de Scarabaeidae e de outros Coleópteros e insetos, folhas (não identificáveis) e muitas sementes de Piperaceae (*Piper* sp.), Urticaceae (*Cecropia* sp.) e Solanaceae (*Solanum* spp. e *Cestrum* sp.). No trato digestivo foram encontrados fragmentos de insetos, pêlos de roedores (Muridae) e restos de vegetais. Discute-se porque esse morcego carnívoro poderia estar consumindo itens vegetais.
PALAVRAS-CHAVE. Carnivoria; hábito alimentar; frugivoria; Phyllostominae; São Paulo.

The word carnivory is used to describe the feeding habits of the bats that usually feed on small terrestrial vertebrates (Norberg & Fenton 1988). The carnivorous feeding habit has already been recorded in the families Megadermatidae, Nycteridae, Phyllostomidae, Hipposideridae and Vespertilionidae (Norberg & Fenton 1988, Bonato *et al*. 2004), but only the first three families have species with predominant carnivorous habits. In the family Phyllostomidae, the carnivorous species are *Vampyrum spectrum* (Linnaeus, 1758), *Trachops cirrhosus* (Spix, 1823) and *Chrotopterus auritus* (Peters, 1856), but all of them have a broad diet which can also include insects, fruits and other food items (French 1997). Peters's Woolly False Vampire bat, *C. auritus,* is considered one of the species with the narrowest carnivorous habit, feeding in the wild on frogs (Sazima 1978, Medellín 1989, Bonato *et al*. 2004), lizards (Sazima 1978, Medellín 1989, Bonato *et al*. 2004), birds (Peracchi & Albuquerque 1976, Sazima 1978, Medellín 1989, Bonato *et al*. 2004), opossums (McCarthy 1987, Medellin 1989, Bonato *et al*. 2004), mice (Sazima 1978, Uieda *et al*. 1980, McCarthy 1987, Medellín 1989, Bonato *et al.* 2004) and bats (Acosta y Lara 1951, Medellín 1989, Bonato *et al*. 2004, Bordignon 2005). In captivity conditions, *C. auritus* from Rio de Janeiro fed basically on rats and mice and occasionally on bats,

but they refused to feed on insects and fruits (Peracchi & Albuquerque 1976, Peracchi *et al*. 2006). Taddei (1983) also did not observe *C. auritus* feeding on fruits in São Paulo. The consumption of insects by this species in the wild is relatively well known (Medellin 1989, Kalko *et al*. 1996, Bonato *et al*. 2004, Giannini & Kalko 2005), but fruits and other plant parts have already been mentioned by only two studies (Ruschi 1953, Bonato *et al*. 2004). The former found seeds of Solanaceae and fruit fragments together with feces of *C. auritus* inside a cave in the State of Espírito Santo. The second author found plant fragments (not identified) on the gut content of a bat from Municipality of Santa Rita do Passa Quatro, State of São Paulo. The additional data came from Chapada Diamantina, the Municipality of Ituaçu, State of Bahia, Northeastern Brazil. There, Edilson P. Gouvea (personal communication) captured in three different occasions two specimens of the Peters's Woolly false vampire bat carrying a fruit of *Syagrus coronata* (Arecaceae). The bat from this region fed mainly on rodents and birds, but could complement its diet with some fruits (E.P. Gouvea, personal communication). Because no additional information was produced until the 7th decade of the 20th century, the information of Ruschi (1953) was considered equivocal by Gardner (1977). This author suggested that those seeds and rests of fruits found in the gut content could have belonged to birds preyed and eaten by *C. auritus* from Espírito Santo. We are describing here the second Brazilian record of seeds of at least five plant species, in feces of *C. auritus*, captured in State of São Paulo. This species is one of the largest bats of the New World with a broad geographic distribution that ranges from Mexico and Guyana to south of Brazil and north of Argentina (Peracchi *et al*. 2006). Groups of *C. auritus* are small ranging from one to seven individuals that harbor in caves, hollow trees, mines and abandoned buildings (Medellin 1989, Peracchi *et al*. 2006).

The bat was collected around 09:00h inside a room of an abandoned ranch at the Estação Experimental de Itirapina (22º14'31"S, 47º50'11"W, 744 m high), Municipality of Itirapina, State of São Paulo. This ranch was surrounded by *Eucalyptus*, *Pinus* and orange plantations, besides several fragments of typical Cerrado vegetation. The lone bat (Fig. 1) was hanging on the inner side of a wooden wall of 2 m^2 in area and was caught using a hand net in July 2001. It was a non-pregnant adult female (weight = 82 g, right forearm = 87.0 mm and left forearm = 85.5 mm), that was immediately sacrificed for the study of stomach content. No other bat was found in this room. On the wooden wall, on the coat-hanger under the bat's perch (Fig. 2) and on the ground (Fig. 3), we found the feces accumulations that indicated the use of the roost by just one bat for more than a month. The specimen was preserved in alcohol 70% and deposited in the Zoological Collection of the Unesp/Botucatu. Fecal samples collected from the ground and the wall were kept for posterior identification. The analyses of these samples were done in the Departamento de Zoologia at the UNESP/Botucatu, in the Departamento de Botânica and in the Museu de História Natural at the UNICAMP/Campinas.



Figures 1-3. An adult female of *Chrotopterus auritus* hanging on a wall of the room (day roost) of an abandoned ranch at the Estação Experimental de Itirapina, in July 2001 (1). Note the aspect of feces accumulation with many seeds and other items, observe on the coat-hanger (2) and the ground of room (3). Photos: W. Ueda.

At least, five species of plants were used by the Peters's Woolly False Vampire bat (Tab. I). The many seeds of Solanaceae, Piperaceae and Urticaceae in the feces of this bat suggest that their consumption was not occasional; on the con-

Table I. Plant and animal items found in feces and gut content of an adult female of *Chrotopterus auritus* captured at the Estação Experimental de Itirapina, São Paulo. The bat was collected in July 2001.

Items found	
In feces	In gut content
Seeds	Fragments of insects
Piper sp. - Piperaceae	Fur of rodents - Muridae
Cecropia sp. - Cecropiaceae	Plant remains
Solanum spp.- Solanaceae	
Cestrum sp. - Solanaceae	
Others	
Fur of rodents - Muridae	
Bones fragments	
Beetles fragments -Scarabaeidae	
Fragments of other beetles and insects	
Non-identified leaves	

trary, the fruits could have been consumed for several and consecutive nights. According to field technicians of the Estação Experimental de Itirapina, this bat was using the room of the abandoned ranch for near a month. *Solanum*, *Piper* and *Cecropia* are known as pioneer plants (Reis & Guillaumet 1983, Fleming 1988, Lobova *et al*. 2003) and are frequently found in disturbed areas, such as of the Estação Experimental de Itirapina. These plants present shrub and arboreal shape with fruits that appear on or under the foliage. This exposure must facilitate the coming and going flights of *C. auritus* to get the fruit. This is similar to the way in which typical frugivorous bats such as *Sturnira lilium* and *Artibeus lituratus* obtain their fruits. Seeds of Solanaceae were also found by Ruschi (1953) in feces of *C. auritus* from Espírito Santo. The presence of other items in feces and in the gut content does not disagree with the references found in the literature. Although birds are frequently cited as a food item of *C. auritus*, no evidence on the use of this type of prey was found in the present study.

Our data suggest that, despite its morphological and physiological adaptations and several studies indicating basically carnivorous habits (see Norberg & Fenton 1988, Medellín 1989), in some situations, such as the scarcity of food, *C. auritus* could ingest parts of plants. On the other hand, unpublished data shows that there is not scarcity of rodents at the Estação Experimental de Itirapina, the main item known in the diet of *C. auritus* (Medellin 1989, Bonato *et al*. 2004). An alternative hypothesis we can consider is that the fruit consumption by the Itirapina bat was just an individual variation in *C. auritus*. This hypothesis could also be true to individuals from Espírito Santo (Ruschi 1953) and from Bahia (E.P. Gouvea, personal communication).

ACKNOWLEDGEMENTS

To Edilson P. Gouvea for the unpublished data of *C. auritus* from State of Bahia; to the technicians of the Estação Experimental de Itirapina and to Fabio Falcão for their helping in the field activities; to João Semir, by seeds identification; to CNPq for the PIBIC grants to the second and third authors, to Instituto Florestal, for the authorization to develop the study at Estação Experimental de Itirapina; to IBAMA-São Paulo (process 02027003937/46) for license to collect and transport bats to the UNESP/Botucatu; and to Ethical Committee in Animal Experimentation of the UNESP/Botucatu (protocol 82/01).

REFERENCES

Acosta y Lara, E.F. 1951. Notas ecológicas sobre algunos quirópteros del Brasil. **Comunicaciones Zoologicas del Museo de Historia Natural de Montevideo 3**: 1-2.

Bonato, V.; K.G. Facure & W. Uieda 2004. Food habits of bats of Subfamily Vampyrinae in Brazil. **Journal of Mammalogy 85** (4): 708-713.

Bordignon, M.O. 2005. Predação de morcegos por *Chrotopterus auritus* (Peters) (Mammalia, Chiroptera) no pantanal de Mato Grosso do Sul, Brasil. **Revista Brasileira de Zoologia 22** (4): 1207-1208.

Fleming, T.H. 1988. **The Short-tailed fruit bat, a study in plant-animal interactions.** Chicago, University of Chicago Press, 365p.

French, B. 1997. False vampires and other carnivores. **Bats 15** (2): 11-14.

Gardner, A.L. 1977. Feeding habits, p. 293-350. *In*: R.J. Baker; J.K. Jones Jr & D.C. Carter (Eds). Biology of bats of the New World Family Phylllostomatidae. Part II. **Special Publications of Museum, Texas Tech University 13**: 1-364.

Giannini, N.P. & E.K.V. Kalko. 2005. The guild structure of animalivorous leaf-nosed bats of Barro Colorado Island, Panama, revisited. **Acta Chiropterologica 7** (1): 131-146.

Kalko, E.K.V.; C.O. Handley Jr & D. Handley. 1996. Organization, diversity, and long-term dynamics of a Neotropical bat community, p. 503-553. *In*: M.L. Cody & J.A. Smallwood (Eds). **Long-term studies of vertebrate communities.** San Diego, Academic Press, 597p.

Lobova, T.A.; S.A. Mori; F. Blanchard; H. Peckham & P. Charles-Dominique. 2003. *Cecropia* as a food resource for bats in French Guiana and the significance of fruit structure in seed dispersal and longevity. **American Journal of Botany, Saint Louis 90** (3): 388-403.

McCarthy, T.J. 1987. Additional mammalian prey of the carnivorous bats, *Chrotopterus auritus* and *Vampyrum spectrum*. **Bat Research News 28** (1-2): 1-3.

Medellin, R.A. 1989. *Chrotopterus auritus*. **Mammalian Species 343**: 1-5.

Norberg, U.M. & M.B.Fenton. 1988. Carnivorous bats? **Biological Journal of the Linnean Society 33**: 383-394.

Peracchi, A.L. & S.T. Albuquerque. 1976. Sobre os hábitos alimentares de *Chrotopterus auritus australis* Thomas, 1905 (Mammalia, Chiroptera, Phyllostomidae). **Revista Brasileira de Biologia 36** (1): 179-184.

Peracchi, A.L.; I.P. Lima; N.R. Reis; M.R. Nogueira & H.Ortêncio-Filho. 2006. Ordem Chiroptera, p. 153-230. *In*: N.R. Reis; A.L. Peracchi; W.A. Pedro & I.P. Lima (Eds). **Mamíferos do Brasil.** Londrina, Edição dos Editores, 437p.

Reis, N.R. dos & J. Guillaumet. 1983. Lês chauves-souris frugivores de la région de Manaus et leur role dans la dissémination dês espèces végétales. **Revue d'Ecologie la Terre et la Vie 38**:147-169.

Ruschi, A. 1953. Algumas observações sobre alimentação dos quirópteros, *Phyllostomus hastatus hastatus* (Pallas); *Molossus rufus* E. Geoffroy, *Chrotopterus auritus australis* (Thomas) e *Noctilio leporinus leporinus* (Linnaeus). **Boletim do Museu de Biologia Professor Mello-Leitão 14**:1-5.

Sazima, I. 1978. Vertebrates as food items of the woolly false vampire, *Chrotopterus auritus*. **Journal of Mammalogy 59** (3): 617-618.

Taddei, V.A. 1983. Morcegos, algumas considerações sistemáticas e biológicas. **Boletim Técnico da Cati 172**: 1-31.

Ueda, W.; I. Sazima & A. Storti-Filho.1980. Aspectos da biologia do morcego *Furipterus horrens* (Mammalia, Chiroptera, Furipteridae). **Revista Brasileira de Biologia 40** (1): 59-66.

Received in 26.I.2007; accepted in 17.VI.2007.