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URBAN BATS: ASPECTS OF ECOLOGY AND HEALTH

HENRIQUE ORTÊNCIO FILHO
Professor Adjunto do Departamento de Ciências,
Universidade Estadual de Maringá, Campus Goioerê,
Paraná e Coordenador do GEEMEA
(Grupo de Estudos em Ecologia de Mamíferos e Educação Ambiental).
Av. Reitor Zeferino Vaz, s/n 87360-000, Goioerê, Paraná, Brasil

Abstract Of the 1,120 chiropteran species identified worldwide, 172 occur in Brazil; among them 47 are recorded in urban environments, most compounded by insectivorous bats. These animals have used the resources furnished direct or indirectly by humans, as food and shelter. Their incoming in buildings, the emitted vocalization and the odor, besides the fear are the main factors that generate nuisance by the population that, for historical issues and lack of information, pursue these animals. Several pathogens are associated with bats, as viruses, bacteria, protozoan, fungi, among others. The most important diseases are rabies and histoplasmosis, which still need further researches in Brazil.
Key Words Chiropterans, fungi, baceria

Bats are animals surrounded by myths and legends (Hill and Smith, 1992). Several factors contribute for this, especially nocturnal activity and hematophagous habits (Hill and Smith, 1992; Fenton, 1992), present in three from the 1,120 described species worldwide (Reis et al., 2011). These facts have stimulated the minds of several civilizations and people, which associated the bats to bad things like darkness, death and evil spirits, a situation that unfortunately holds true today (Reis et al., 2007). In antiquity, bats were also important ingredients in witchcraft (Yalden and Morris, 1975). Blood, heart, hair among other body parts were considered powerful elements that, together with other products, could empower people and heal rheumatism (Hill and Smith, 1992). Feces, currently used as fertilizer, were considered great healing in medicine (Yalden and Morris, 1975).

In recent centuries, the impacts caused by human action, especially resulting from processes of urbanization and economic growth, have generated habitat fragmentation, consequently, the most fragile biota components tend to disappear due to the new environmental conditions established. This interference produces impacts whose intensity is directly proportional to the degree of environmental diversity, original features and vulnerability of involved species. In relation to bats, presently, the main threats are: deforestation and pesticide use (Reis et al., 2007).

Depending on the flight, these animals tend, under impact conditions, to move to different areas and explore the environments in a complex way (Almansa et al., 1982), thus playing important roles within ecosystems, working in the maintenance of several ecological processes (Eisenberg, 1989), as pollinators, seed dispersers (Van Der Pjil, 1957) and natural controllers of insect populations (Goodwin and Greenhall, 1961).

Several bat species have adapted to environmental conditions imposed by the human action and now live in urban ecosystems, using the resources furnished direct or indirectly by man (Uieda et al., 1995). In some cities the diversity is considered high (Reis et al., 2002) which favors the accidental encounters with humans (Peracchi et al., 2006). The lights in the cities tend to attract insects that in turn attract insectivorous bats, main group found in urban areas (Lee and Mccracken, 2002) totaling around 75% of the occupations of artificial shelters (Esbérard, 2003). Otherwise, frugivorous bats also frequent in cities usually occupy natural shelters, as hollow trees, foliage, caves, among others (Reis et al., 2002) and are most commonly found during the search for fruit. In urban areas, tree-lined streets may function as biological corridors forming connecting lines between urban parks Fernández-Juricic 2000).

Table 1. List of species with occurrence registered in urban and/or peri-urban area by the Centers for Zoonosis Control (CCZ) of the cities of Brasília/Federal District, São Paulo/São Paulo State, Curitiba/Paraná State and Porto Alegre/Rio Grande do Sul State, by the Center for Health Surveillance (CEVS/SES/RS) in Porto Alegre and Veterinary Research Institute Desidério Finamor (IPVDF/SCT/RS) in Eldorado do Sul/ Rio Grande do Sul State, Pacheco et al. (2008) and Bernardi et al. (2009). Presenting here the diet (F- phytophagous; I- insectivorous; H- hematophagou; P- piscivorous; and O- omnivorous); area of occurrence (Ur- urban; Pe- peri-urban); frequency status (SR- No record; RA- Rare; PC- uncommon; and CO- common); main types of shelter (1- Uninhabited buildings; 2- Sparsely attended rooms; 3- Coverage with slab/lining; 4- Coverage without slab/lining; 5- Attic; 6- Eaves coverage; 7- Chimney; 8- Ventilation duct; 9- Frame for blinders; 10- Air conditioner; 11- Expansion joint; 12- Diverse spaces; 13- Elevator shaft; 14- Technical floor ; 15- Basement; 16- Garage; 17- Stormwater gallery; 18- Foliage; 19-Hollow in trees; 20- No shelter record); and number of individuals in the registered colonies, SD – No Data.

Taxa	Dieta	Area		Status de Frequência				Abrigos				Colônias
		Ur	Pe	DF	SP	PR	RS	DF	SP	PR	RS	
Emballonuridae												
Diclidurus scutatus	I	x		SR	RA	SR	SR		20			SD
Peropteryx macrotis	I	x		PC	SR	SR	SR	5,8,14				1 a 12
Phyllostomidae												
Desmodontinae												
Desmodus rotundus	H		x	RA	PC	RA	RA	17	15,17	20	19	2 a 24
Glossophaginae												
Anoura caudifera	F		x	RA	RA	SR	RA	17	1, 2		1	2 a 20
Anoura geoffroyi	N		x	SR	RA	SR	SR		20			SD
Glossophaga soricina	F	x	x	CO	CO	RA	RA	1,2,5,8,14,15,17	1,2,3,4,5,8,13,15,16,17	5,12,17	2,3,4,12,14,15,18	1 a 100
Lonchophylla dekeyseri	F	x		RA	SR	SR	SR	20				SD
Phyllostominae												
Mimon bennettii	I	x	x	SR	SR	RA	SR			20		SD
Phyllostomus discolor	O	x		RA	SR	SR	SR	20				SD
Phyllostomus hastatus	O	x	x	RA	SR	RA	SR	11		20		3 a 10
Carolliinae												
Carollia perspicillata	F	x	x	RA	PC	RA	SR	1,17	1,2	20		2 a 40
Stenodermatinae												
Artibeus fimbriatus	F	x	x	SR	RA	RA	RA		20	20	18	1 a 30
Artibeus lituratus	F	x	x	CO	CO	CO	PC	18	18	15,16,18	18	1 a 25
Artibeus obscurus	F		x	SR	SR	RA	SR			20		5 a 8
Artibeus planirostris	F	x	x	RA	RA	RA	SR	20	20	20		SD
Chiroderma doriae	F	x		SR	RA	SR	SR		20			SD
Platyrrhinus lineatus	F	x	x	PC	CO	RA	SR	1,4,6,18	1,4,6,18	14		1 a 22
Pygodema bilabiatum	F		x	SR	RA	RA	SR		20	20		SD
Sturnira lilium	F	x	x	RA	PC	RA	RA	20	20	2,10,12	18	1 a 35
Noctilionidae												
Noctilio leporinus	P		x	SR	SR	RA	RA			17	19	1 a 60
Molossidae												
Cynomops abrasus	I	x	x	RA	RA	RA	SR	19	20	12		7
Cynomops planirostris	I	x		PC	RA	SR	SR	3,12	20			4 a 75
Eumops auripendulus	I	x	x	RA	PC	RA	SR	3	3	6		1 a 3
Eumops bonariensis	I		x	SR	SR	RA	SR			20		SD
Eumops glaucinus	I	x	x	PC	RA	RA	SR	3,11,12	3,11	20		1 a 6
Eumops hansae	I		x	SR	SR	RA	SR			20		SD
Eumops maurus	I	x		SR	RA	SR	SR		20			SD
Eumops perotis	I	x	x	RA	RA	RA	SR	20	20	20		SD
Molossops temminckii	I	x	x	RA	SR	RA	SR	20		20		SD
Molossus molossus	I	x	x	CO	CO	PC	PC	3,4,5,7,8,9,10,11,12	3,4,5,9,12	3,4,5,11,12,14	3,5,11,12,13,15,16	1 a 50
Molossus rufus	I	x	x	SR	PC	CO	RA		3	3,4,7,12,14,16	3,4,12,13	1 a 250
Nyctinomops aurispinosus	I	x	x	RA	RA	RA	SR	11, 12	20	2,3,12		1 a 3
Nyctinomops laticaudatus	I	x	x	CO	CO	RA	SR	3,11,12	20	20		3 a 3.000
Nyctinomops macrotis	I	x		RA	CO	SR	SR	20	11			9
Promops nasutus	I	x	x	RA	RA	RA	RA	3	20	12	1,2,3,4,7	1 a 12
Tadarida brasiliensis	I	x	x	SR	CO	CO	CO		9,11,12	2,3,5,6,11,12,14	1,3,5,7,8,9,10,11,13,14,16	1 a 10.000
Vespertilionidae												
Eptesicus brasiliensis	I	x	x	RA	RA	RA	RA	3	20	1	20	1 a 30
Eptesicus diminutus	I		x	SR	SR	RA	SR			20		SD
Eptesicus furinalis	I	x	x	SR	RA	RA	RA		20	20	11	1 a 20
Histiotus velatus	I		x	RA	PC	RA	RA	3	3	3,4,5	1,3,4,11,12,15,16,18	1 a 40
Lasiurus blossevillii	I	x	x	RA	RA	RA	RA	18	20	18	18	1 a 4
Lasiurus cinereus	I	x	x	SR	RA	RA	RA		20	2,16	18	1 a 5
Lasiurus ega	I	x	x	RA	RA	RA	RA	18	20	20	12, 18	Solitário
Myotis albescens	I	x	x	SR	RA	SR	RA		20		15	2 a 20
Myotis levis	I	x	x	SR	RA	RA	RA		20	20	1,3,4	1 a 14
Myotis ruber	I		x	SR	SR	RA	SR			20		SD
Myotis nigricans	I	x	x	RA	PC	RA	RA	20	3,4,12	20	1,3,4,7	1 a 10

Of the 172 bat species identified in Brazil (Reis et al., 2011), 47 (28%) have been already recorded in urban environments (Table 1) and just a few are common or uncommon, however they coexist with several rare species (Pacheco et al., 2010). The presence of bats in urban housing has caused discomfort to the population due to the following factors: the incoming of bats in the buildings; the visualization in their diurnal and nocturnal shelters; the emitted vocalizations; the stench derived from the presence of colonies and; the accumulation close to a food source. Moreover, undesirable situations may occur between bats and humans and their pets and with this increase the risk of disease transmission, if the bat is infected (Pacheco et al., 2010).

Several pathogens have already been isolated in bats or deposits of feces, but little has been studied about the role of these microorganisms and bats as possible transmitting agents. Beyond being potential transmitter of rabies, these animals participate in the epidemiological chain of several zoonoses, such as viral: arboviruses (yellow fever, equine encephalitis); bacterial: salmonellosis, brucellosis, shigellosis, borreliosis, etc.; fungal: histoplasmosis, cryptococcosis, sporotrichosis, etc.; Rickettsiae; Protozoans: leishmaniasis and malaria; Ectoparasites: mites and bed bugs (Harmani et al., 2003). According to the same authors the most important and better studied diseases that are associated with this group are rabies and histoplasmosis.

At present, there is little available information in Brazil about zoonoses involving bats, besides the lack of data about which species can generate more concern in the health area (Pacheco et al., 2010). Regarding rabies, in agreement with these authors, in general, official documents of health agencies tend to separate the bats into only two groups: 'hematophagous' and 'non-hematophagous', hindering the understanding on the role of each species in the disease eco-epidemiology, as well as the developing of effective strategies for their monitoring and controlling. Bats can transmit this disease by biting, licking, or scratching, since salivary glands have a higher degree of infectivity (Elkhoury et al., 2001).

Concerning histoplasmosis, some bat species can act as active disseminators of the microorganism in the environment (Holff and Bigler, 1981). The accumulation of feces in shelters, with temperature ranging from 22 ºC to 40 ºC, and moisture from 67% and 87%, favor the growth of *H. capsulatum*. The disease transmission occurs through the inhalation of microorganism spores in indoor environments, as house linings (Silva, 2001).

Due to the factors already mentioned, bats are still subject of discrimination and persecution, however although rarely practiced, in Brazil there is legislation that assures protection to these animals, according to the Article 1 of Law number 5197, from 03rd January, 1967, which supports any kind of wildlife (Brasil, 1967). Legal protection of bats already exist in other countries, as: Australia, Bulgaria, Czech Republic, Denmark, Germany, Finland, Hungary, Italy, Mexico, Poland, Russia, Yugoslavia and the United States (Reis et al., 2007).

As measures to minimize the bottlenecks involving bats in urban areas, we recommend: the establishment of an environmental education program to be applied at different levels of education, emphasizing the importance of these mammals, as well as possible problems related to the contact with these animals; an effective program of research and control of zoonoses, based on preventive campaigns, such as pets vaccination, mainly with respect to rabies, as well as the monitoring of bat populations in these areas.

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