ISSN 0065-1737 *Acta Zoológica Mexicana (n.s.) 25(1): 143-149 (2009)*

# MAMMALIAN PREY OF BARN OWL (*TYTO ALBA*) IN SOUTHEASTERN OAXACA, MÉXICO

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**Santos-Moreno, A. & A. M. Alfaro Espinosa**. 2009. Mammalian prey of barn owl (*Tyto alba*) in southeastern Oaxaca, Mexico, Acta Zool. Mex. (n. s.). 25(1): 143-149.

**ABSTRACT.** The analysis of pellet contents of Barn Owls from southeastern Oaxaca, Mexico, shows that mammals represent the main prey of this bird. We identified a minimum of 184 individuals from 2 orders, 3 families and 8 species of mammals. The greatest number of prey was from hispid cotton rat (*Sigmodon hispidus*), which represented 83.69% of the total individuals and 84.68% of the biomass of the sample. From the other 7 species included in the pellets, 3 were very uncommon species: the cozumelan golden bat (*Mimon cozumelae*), the false vampire bat (*Vampyrum spectrum*), and the Peter's climbing rat (*Tylomys nudicaudus*). Bats represented 2.17% of prey number and 0.799% of the total biomass estimated in the sample. Comparisons of these results with the estimated abundances by standard trapping methods show differences. These results corroborate a general pattern of barn owl opportunistic predation over the locally most abundant species and bats as rare prey.

**Key words**: Diet, Owl pellets, predation, small mammals, *Tylomys nudicaudus*.

**Santos-Moreno, A. y A. M. Alfaro Espinosa**. 2009. Mamíferos presas de la lechuza de campanario (*Tyto alba*) en el sureste de Oaxaca, México, Mexico, Acta Zool. Mex. (n. s.). 25(1): 143-149.

**RESUMEN.** Se analizó el contenido de regurgitaciones de una lechuza de campanario del sureste del estado de Oaxaca México. Se encontró que los mamíferos representan la presa principal de esta ave. Se identificaron restos de 184 individuos pertenecientes a dos órdenes, tres familias y ocho especies. La mayor cantidad de restos correspondieron a la rata de los cañaverales (*Sigmodon hispidus*), que representó el 83.69% de individuos y 84.68% de la biomasa contenidos en la muestra. De las otras siete especies, tres son raras: los murciélagos *Mimon cozumelae* y *Vampyrum spectrum* y la rata arborícola *Tylomys nudicaudus*. Los murciélagos representaron el 2.17% de las presas y el 0.799% de la biomasa total estimada en la muestra. Los resultados corroboran un patrón general de depredación oportunista sobre las especies localmente más abundantes.

**Palabras clave**: Dieta, depredación, pequeños mamíferos, *Tylomys nudicaudus*.

## INTRODUCTION

Owl pellet analysis serves two principle purposes. Foremost, pellet analysis serves as a nondestructive means of diet determination. Diet information obtained

can include prey species eaten, preferences of prey species, and estimates of contributions of prey biomass. Owl pellet analysis also is a useful method for gaining additional insight into small mammal communities and distributions (Bonvicino & Bezerra 2003). Occasionally, known distributional limits of small mammals can be altered on the basis of identifiable material found in owl pellets (Huebschman *et al*. 2000). The Barn Owl (*Tyto alba*) is the strigiform with the broadest worldwide distribution (Burton 1984), and its diet has been studied more extensively than any other bird of prey (Everett *et al*. 1992). In several countries the scientific literature about the diet of this species is widespread (e.g. Vernier 1994, Jaksic 1996, Pardiñas & Cirignoli 2002). Although in Mexico some studies exist about the diet of this species, they are restricted to the middle and northern parts of the country (e.g. Baker 1953, Baker & Alcorn 1953, Anderson & Long 1961, López-Forment *et al*. 1971, López-Forment & Urbano 1977, Anderson & Nelson 1980, Aragón *et al*. 2002, Álvarez-Castañeda *et al*. 2004), few publications exist for the tropical portion of the country. To our knowledge, the only published studies in Southeastern México are those of Monés (1968) in the state of Oaxaca, and Ramírez-Pulido & Sánchez Hernandez (1972) in the state of Guerrero, despite the fact that its great biological diversity is not matched even by other countries in Mesoamerica (Binford 1989, Ramamoorthy *et al.* 1993), so here we describe the diet composition of the Barn Owl from pellets in a locality at the northeastern part of the state.

## MATERIAL AND METHODS

We conducted a mammal inventory in 2005 at several localities in the Distrito de Choapam, located in the southeast of the state of Oaxaca, in southwestern México. In August we collected pellets of Barn Owl in a cave at Ejido Plan de San Luís, in the Municipio Santiago Jocotepec (17° 46’ 34” N, 95° 57’ 35.5” W), at an elevation of 80 m. Dominant vegetation around the cave is evergreen tropical forest. All the bone material was washed, cleaned, identified and deposited at the Colección de Referencia in the Laboratorio de Ecología Animal of the Centro Interdisciplinario de Investigación para el Desarrollo Integral Regional, Instituto Politécnico Nacional, Unidad Oaxaca (catalogue numbers 491 to 648).

To estimate the importance of each prey in the diet of the Barn Owl, we estimated the percentage of biomass contribution of each species multiplying the minimum number of individuals by the weight of each species as reported by Ceballos & Oliva (2005). When these authors showed weight as a range, we used the mid-point value of the range. Classification and common names are from Wilson & Reeder (2005). Additionally we present results of abundance of mammals based on limited trapping carried out in the same locality (only for mammal species also recorded in pellets). Although we do not know the accumulation time of pellets, and our survey is not

synchronous with this, we think that this comparison can be of some use in understanding the selectivity of Barn Owl predation. A complete list and analysis of the recorded mammal diversity by means of trapping is presented in Alfaro *et al*. (2006).

## RESULTS

A minimum of 185 individuals were identified, all were mammals, with the exception of 1 unidentified bird humerus, so our description and discussion focuses on mammals. The 184 mammalian items represents 2 orders, 8 species and 3 families (Table 1). Although both bats and rodents were represented by 4 species each, only 1 individual represented each one of the bat species, and in all they represent only 2.172% of total individuals and 0.799% of the total estimated biomass of the sample. Numerically, rodents represent 97.81% of the prey and 99.19% of the total estimated biomass from the sample.

**Table 1.** Minimum number of individuals (N), availability (as a recorded by trapping), average individual weight (in g). percentage from the total (% N), and total biomass (in g), by species of prey find in pellets of Barn Owl from Ejido Plan de San Luís, Oaxaca, México.

| Species | N | Availability | Average weight | % N | % Biomass |
|---|---|---|---|---|---|
| *Sigmodon hispidus* | 154 | 2 | 167.5 | 83.69 | 84.6 |
| *Tylomys nudicaudus* | 13 | 1 | 310.5 | 7.06 | 13.2 |
| *Oryzomys chapmani* | 9 | 0 | 24 | 4.89 | 0.70 |
| *Liomys irroratus* | 4 | 0 | 42 | 2.17 | 0.55 |
| *Micronycteris microtis* | 1 | 0 | 6.25 | 0.54 | 0.02 |
| *Mimon cozumelae* | 1 | 0 | 35 | 0.54 | 0.11 |
| *Vampyrum spectrum* | 1 | 0 | 158 | 0.54 | 0.51 |
| *Artibeus jamaicensis* | 1 | 59 | 45 | 0.54 | 0.14 |

The main prey was the hispid cotton rat (*Sigmodon hispidus*), which represented 83.6% of total individuals, followed by the Peter's climbing rat (*Tylomys nudicaudus*) with 7.1%. The other prey, in order of abundance were the rice rat (*Oryzomys chapmani*) (4.91%), Mexican spiny pocket mouse (*Liomys irroratus*) (2.18%), and by 1 specimen (0.54 %) of each of the following 4 species: Cozumelan golden bat (*Mimon cozumelae*), Jamaican fruit-eating bat (*Artibeus jamaicensis*), common big-eared bat (*Micronycteris microtis*), and the false vampire bat (*Vampyrum spectrum*). This last specimen represents the first recorded finding of this species in Oaxaca (Alfaro *et al*. 2005).

In a field survey of mammals in this zone by trapping, we collected in mist nets 14 bat species; from this, only the Jamaican fruit-eating bat was found in Barn Owl pellets (Table 1). Conversely, of the 4 species present in the pellets (Table 1), 3 were not caught in the mist nets. Rodents depicted the same pattern: trapping showed 2 species not recorded in pellets, including the most abundant species, the Mexican deer mouse (*Peromyscus mexicanus*), and pellets included 2 species not recorded by trapping. Although Peter´s climbing rat and hispid cotton rat were represented in trapping and pellets, they showed inverse abundance patterns: we captured only one specimen of the former, and two of the latter.

## DISCUSSION

Although birds, reptiles, insects, and even plants have been reported as common prey of the Barn Owl (Alvarez-Castañeda *et al*. 2004, Aliaga-Rossel & Tarifa 2005), in this study they were missing, with the exception of the remains of 1 bird, illustrating a known bias: pellets over-represent mammalian prey and under-represent avian prey (Redpath *et al.* 2001). A probable explanation may be the high abundance of hispid cotton rat. This species typically shows high populational densities, and in many cases is a pest (Ramirez *et al*. 2005), mainly in the region's sugarcane crops. Also its habits: being mainly active during the day, but may also be active at night if the population is large; being fairly easy to observe in the wild and is readily trapped (Reid 1997), make this species an important prey for avian predators (Korschgen & Stuart 1972), including the Barn Owl. Some authors suggested that utilization of cotton rat by avian predators resulted in decreased use of other prey (Raun 1960, Korschgen & Stuart 1972).

Although mammals are the main prey of Barn Owl in this study, bat remains were also scarcely present in the pellets (Table 1). The same pattern has been found in other studies. For example, in the Pantanal, Brazil, mammals represented 98.81% of prey of Barn Owl, but bats represented only 1.64%, from seven species, with a maximum frequency of 2 individuals per species (Escarlate-Tavares & Pessõa 2005). In Estado de México, México, bats were represented by 5 species and 2.6% of all individuals, so the percentages of biomass found in our study (2.172% of total individuals or 0.799% of total biomass) agree with reports in a wide variety of sites, although in Tequisistlán, Oaxaca, bats represents 11.31% of prey, including 5 species, with the long-nosed bat (*Leptonycteris sp.*) as the third most abundant species, representing 8.37% (17 individuals) of prey (Monés 1968). To our knowledge only one published case documented predation mainly of bats by the Barn Owl, in Merrihew Cave, Kansas (Twente 1954), although this may be due to a high probability of bat capture when they emerge from the cave roosting sites, and a small sample size (6 pellets).

The remains of relatively large-sized prey, for example pocket gophers (Álvarez-Castañeda *et al.* 2004), woodrats (Monés 1968), rabbits (Price 1942), hares (Andrade *et al*. 2002), and even ringtail (Morales Hernández 1997) are commonly reported in studies of Barn Owl diet, but these items are scarce. To our knowledge, the only other case of predation mainly over large-sized species by Barn Owl is one reported by Aliaga-Rossel & Tarifa (2005), in which *Cavia*, a rodent even larger than Peter´s climbing rat (average adult weight 445 g), represent 56.54% of prey.

Although the geographic range of Peter's climbing rat extends from Central Guerrero and Central Veracruz, Mexico, south to South Nicaragua, excluding Yucatan Peninsula (Musser & Carleton 2005), the only other reported raptor bird that preys on this species is the Spectacled Owl *(Pulsatrix perspicillata)* (Gómez de Silva *et al*. 1997), which consumed it in great proportions (43.7% of prey) at Cerro de Oro, Municipio San Juan Bautista Tuxtepec, Oaxaca, locality near to Ejido Plan de San Luís. This is the largest owl in the New World humid tropical forests (Stiles & Skutch 1989), and can prey on larger mammals than the Barn Owl can. In Tequisistlán, hispid cotton rat was also the main prey of Barn Owl, but Peter's climbing rat remains were not found in pellets (Monés 1968), although the presence of the species has been documented in the zone (Goodwin 1969).

Significant differences can exist between inventories based on analysis of Barn Owl pellet contents and those derived from conventional trapping methods (Gubanyi *et al*. 1992, Yom-Tov & Wool 1997, Andrade *et al*. 2002, Escarlate-Tavares & Pessôa 2005), this difference is observed at Ejido Plan de San Luís, and in conjunction they can provide complete estimates of species richness (Bonvicino & Bezerra 2003).

The essential features that determine the predation pattern of the Barn Owl in different parts of its range seem to be the statistical distribution of mammalian prey sizes available, the relative abundance of this prey and the configuration of the assemblage of syntopic owls (Jaksic *et al*. 1982).

**ACKNOWLEDGMENTS**. This work was sponsored by the Instituto Politécnico Nacional of México (grants CGPI-20060322 and SIP-20070826). ECOPRODES association invited to us to working in the zone. R. G. Contreras, E. Abad, M. Perez, A. Perez, and J. L. García provided valuable assistance. We thank A. Allen and two reviwers offering valuable suggestions to improve the manuscript.

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*Recibido: 22 de octubre de 2007*
*Aceptado: 4 de noviembre de 2008*