Turk J Zool
31 (2007) 91-94

Food Preference of the Short-Eared Owl (*Asio flammeus*) and Barn Owl (*Tyto alba*) at Usta Muhammad, Baluchistan, Pakistan

Muhammad MUSHTAQ-UL-HASSAN[1,*], Rafia Rehana GHAZI[2], Noor-un NISA[2]

[1]Department of Zoology, Govt. College, Faisalabad, PAKISTAN

[2]Vertebrate Pest control Institute, Tropical Agricultural Research Centre, P.O. Box. 8401, Karachi University Campus, Karachi-75270, PAKISTAN

Received: 02.03.2006

Abstract: The dominant food-items eaten by the short-eared owl were rats and mice (91.9%). Shrews (2.0%), bats (1.3%), and birds (5.0%) jointly constituted only 8.2% of the owl's diet. Among rats and mice, the most intensively consumed rodent pest by the owl was *Millardia meltada* (43.9%), followed by *Mus musculus* (29.8%), *Tatera indica* (16.3%), and *Bandicota bengalensis* (1.8%). In the case of the barn owl, rats and mice represented 9.7% of their diet, followed by shrews (4.7%), birds (3.3%), and bats (0.4%). Among the rats and mice in their diet were *M. meltada* (46.3%), *T. indica* (3.5%), *Nesokia indica* (5.1%), *B. bengalensis* (2.2%), *Rattus rattus* (1.1%), and *M. musculus* (33.5%). Sub-adults of *M. meltada* were the most intensively eaten food item by the short-eared owl (50.8%) and barn owl (39.1%), whereas adults of *M. musculus* were the dominant prey age-category consumed by the short-eared owl (52.2%) and barn owl (66.0%).

Key Words: Diet, soft-furred field rat, house mouse, barn owl, short-eared owl

Introduction

Most owls are active at dusk or during the night, and some during the day. They feed chiefly on small vertebrates, especially rodents, but also on insects and worms. Indigestible parts of the prey (fur, feathers, bones, and chitin) are regurgitated; these boluses contain very tiny bones. Examination of owl boluses furnishes an excellent record of the small mammalian fauna within the owls' habitat (Moehlman, 2003). The present study aimed to determine which age categories of *Millardia meltada* (soft furred field rat) and *Mus musculus* (house mouse) were the most preferred food item by short-eared owls and barn owls from Usta Muhammad, Baluchistan, Pakistan.

Materials and Methods

Thesil Osta Muhammad, in Balochistan, is situated near the border of Sindh Province near Jacobabad, Larkana, and Sukhar Divisions. The main crops grown there are rice, wheat, and millet. The area was covered with thick, profuse bushes of Peelo and Khaggal trees. There were some old tombs and graveyards present in the area. Ten pairs of short-eared owl (*Asio falmmeus*), one horned owl (*Bubo bubo*), and at least 75 pairs of barn owl (*Tyto alba*) were seen in the study area. A total of 463 barn owl pellets and 416 short-eared owl pellets were collected from the ground of the nesting and roosting areas of the owls during February 2005 from Usta Muhammad, Balochistan. Pellets were stored in paper bags after recording the date of collection and locality. For analysis, the pellets were kept in an oven at 55 ºC overnight. The pellets were sorted for different prey items, such as skulls, bones, lower jaws, feathers, hairs, and insect remnants. All the remnants were packed in different bags.

Skulls, lower jaws, and bones were examined carefully to determine whether they belonged to mammals, birds, reptiles, or amphibians. In the case of mammals, skulls and teeth were used to identify the species of prey. To facilitate identification, reference skulls and teeth of most of the small mammals known to be present in the study area were made available in the laboratory for comparison.

* E-mail: drmushtaqulhassan@hotmail.com

Three hairs were randomly taken from the pellets that did not contain teeth and were washed in warm water, cleaned with alcohol, and dried on blotting paper. A thin film of commercial Panfix glue was spread over a slide and the hairs were placed on the film immediately thereafter. After about 2 min they were lifted from one end with forceps. Impressions of the cuticular covering of the hairs thus formed were examined under a high power microscope and compared with reference impressions of the hairs of known species of small mammals.

The pattern of wear on the occlusal surfaces of the molariform teeth of the soft-furred field rat (*M. meltada*) was found to provide definitive criteria for establishing 5 molar age classes following Iqbal (1975), viz. immature (the tubercles or the cusps show only slight wear, mainly through enamel), sub-adult (the worn areas are more extensive and the enamel is worn to expose dentine), adult (the worn areas are more extensive), middle-age adult (the extent of wear is so great that the tubercles or the rows of cusps are completely worn out, and the occlusal surface is flat and almost smooth, only ridges remain), and old adult (the crown surface is completely worn or there is no structure or pattern left on the occlusal surface).

Similarly, 4 age classes were defined following Rana (1975), i.e. immature (the upper third molar (M^3) was not completely erupted), sub-adult (M^3 had reached the occlusal level and the upper molars showed some wear, mainly through the enamel), adult (wear on all the molars was extensive and cusp rows became confluent, up to varying degrees), and old adult (worn areas and the cusp rows became much more extensive, and they merged into one another; in these specimens the cusps were completely worn out and crowns presented as a flat surface). An attempt was also made to know whether the estimated age of *M. meltada* and *M. musculus* based on the wear pattern of teeth was congruent with tooth row or mandibular length (mm) as measured with a dial caliper (0.0.254 mm).

For the analysis of the mandibular measurement data, simple statistics and one-way analysis of variance was employed. Duncan's (1955) multiple range test was applied to the variables that showed significant interform variation, following Steel and Torrie (1980).

Results and Discussion

The dominant food items eaten by the short-eared owl were rats and mice (91.9%). Shrews (2.0%), bats (1.2%), and birds (5.0%) jointly constituted only 8.2% of the owl's diet. Among rats and mice, the most intensively consumed were *Millardia meltada* (43.9%), followed by *Mus musculus* (29.8%), *Tatera indica* (16.3%), and *Bandicota bengalensis* (1.8%) (Table 1).

Table 1. Relative abundance (%) of various vertebrate prey found in the pellets of short-eared owls (*A. flammeus*) and barn owls (*T. alba*).

Prey	% Relative abundance (N)	
	Short-eared owl*	Barn owl**
Shrews	2.0 (12)	4.7 (23)
Bats	1.2 (7)	0.4 (2)
Rats and mice	91.9 (552)	91.7 (451)
Millardia meltada	43.9 (264)	46.3 (228)
Tatera indica	16.3 (98)	3.5 (17)
Bandicota bengalensis	1.8 (11)	2.2 (11)
Nesokia indica	---	5.1 (25)
Rattus rattus	---	1.0 (5)
Mus musculus	29.8 (179)	33.5 (165)
Birds	5.00 (30)	3.3 (16)

* Number of pellets = 416
**Number of pellets = 463

Small mammals constituted 96.7% of the barn owl's diet, whereas birds accounted for 3.3%. Among small mammals, rats and mice formed 91.7% of the diet, while shrews and bats comprised 4.7% and 0.4%, respectively. Among the rats and mice in their diet were *M. meltada* (46.3%), *T. indica* (3.5%), *Nesokia indica* (5.1%), *B. bengalensis* (2.2%), *Rattus rattus* (1.0%), and *M. musculus* (33.5%) (Table 1).

Baker and Brooks (1981, 1982), Colvin and Spaudling (1983), Machniak and Feldhamer (1993), Palmer (1982), Roberts and Bowman (1986), and Walsh and Sleeman (1988) studied the diet of the short-eared owl in various parts of the world. Similarly, the diet of the barn owl was studied by Glue (1975), Buckley and Goldsmith (1975), Herrera and Jaksic (1980), Zamarano et al. (1986), and De Bruijn (1980). Mahmood-ul-Hassan et al. (2000) studied the diet of the barn owl in central Punjab (Pakistan).

These studies show that the diet of the owl varied in various parts of the world according to the habitat and local fauna. Those stated that one prey species has gained dominance in the diet of the owl; the reason being the size of the prey. Prey population density and behavior, together, determine the diet of owls. Moreover, 2 species with equal densities might not be preyed upon with the same intensity because of the differences in their behaviors. One that is easily caught will be consumed more frequently. Similarly, 2 species having different body masses may each have a different acceptability. The one that is less acceptable, but is available with significantly little effort, may be the most frequently hunted species. Thus, the owl might trade off for the food source that is most cost effective in terms of energy.

In the present study, 181 lower jaws of *M. meltada* were identified from the pellets of short-eared owls. Among them, 9.9% were immature, 50.8% were sub-adults, 24.9% were adults, 11.0% were middle-age adults, and 3.3% were old adults (Table 2). The most dominant age category eaten by the owls were sub-adult (Table 2). The consumption rates by barn owls of immature, sub-adults, adults, middle-age adults, and old adults *M. meltada*, based on 192 identified lower jaws, were 1.6%, 39.0%, 32.3%, 17.2%, and 9.9%, respectively (Table 2). Adult, middle-age adult, and old adult collectively constituted 59.41% of the diet.

The second dominant species eaten by barn owls during the present study was *M. musculus*. The consumption rates, based on 94 lower tooth rows, were sub-adults (12.8%), adults (66.0%), and old adults (21.2%) (Table 3). In total, 92 lower jaws of *M. musculus* were recorded from the short-eared owl pellets and, among them, 31.5% were sub-adults, 52.2% were adults, and 16.3% were old adults (Table 3). Adult *M. musculus* was the preferred age category.

In the present study, sub-adults of *M. meltada* and adults of *M. musculus* were consumed the most intensively by the short-eared owl and barn owl. The presence of large rats and mice in the diet of the owls showed that relatively large prey-types may have been more conspicuous, in both a visual and an auditory sense (Derting and Cranford, 1989). Moreover, such differential vulnerability may result from predator preference (i.e. different attack probabilities) or from behavioral or morphological differences between prey species (i.e. different escape probabilities). Differential vulnerabilities may also occur within prey species (Longland and Jenkins, 1987).

Table 2. Average mandibular length (mm) in *M. meltada* collected from the pellets of short-eared owls and barn owls.

Age Category	Short-eared owl Mean ± SD (n)	Barn owl Mean ± SD (n)
Immature	15.8 ± 1.29 (18) C	16.1 ± 0.64 (3) BC
Sub-Adult	16.7 ± 1.37 (92) B	16.0 ± 1.03 (75) C
Adult	16.3 ± 1.02 (45) B	16.4 ± 1.16 (62) B
Middle-Age Adult	16.3 ± 1.42 (20) B	17.00 ± 1.11 (33) AB
Old Adult	18.2 ± 0.22 (6) A	17.7 ± 0.89 (19) A

Same letters show statistically significant variations at 0.5.

Table 3. Average lower tooth row length (mm) and mandibular length (mm) in *M. musculus* collected from the pellets of short-eared owls and barn owls.

Age Category	Lower tooth row length Mean ± SD (n)		Mandibular length Mean ± SD (n)	
	Short-eared owl	Barn owl	Short-eared owl	Barn owl
Sub-Adult	2.9 ± 0.17(30)	2.7 ± 0.19 (12) B	9.6 ± 0.63 (29) C	9.2 ± 0.28 (10) C
Adult	2.9 ± 0.28(47)	2.9 ± 0.18 (62)AB	10.1 ± 0.72 (48) B	10.00 ± 0.56 (57) B
Old Adult	2.9 ± 0.12(12)	3.0 ± 0.16 (20)A	10.7 ± 0.70 (15) A	10.4 ± 0.66 (20) A

Same letters show statistically significant variations at 0.5.

References

Baker, J.A. and Brooks, R.J. 1981. Raptor and vole populations at an airport. J. Wildl. Manage. 45: 390-396.

Baker, J.A. and Brooks, R.J. 1982. Impact of raptor predation on a declining vole population. J. Mammal. 63: 297-260.

Buckley, J. and Goldsmith, J. 1975. The prey of barn owl (*Tyto alba*) in East Norfolk. Mammal. Rev., 5: 13-16.

Colvin, B.A. and Spaudling, S.R. 1983. Winter foraging behaviour of short-eared owls. Am. Midl. Nat. 111: 124-128.

DeBruijin, O. 1980. Feeding ecology of the barn owl (*Tyto alba*) in the Netherlands. Limosa. 52: 91-154.

Derting, T.L. and Cranford, J.A. 1989. Physical and behavioral correlates of prey vulnerability to barn owl *(Tyto alba)* predation. Am. Midl. Nat. 121: 11-20.

Duncan, DB. 1955. Multiple range and multiple F-test. Biometrics. 11: 1-42.

Glue, D. E. 1975. Harvest mice as barn owl (*Tyto alba*) prey in the British Isles. Mammal. Rev. 1: 9-12.

Herrera, C.M. and Jaksic, F.M. 1980. Feeding ecology of the barn owl (*Tyto alba*) in central Chile and Southern Spain: A Comparative Study. Auk. 97: 760-767.

Iqbal, H.M. 1975. Evaluation of the degree of tooth wear and morphometric changes as a criterion of determining age groups in soft-furred field rat (*Millardia meltada*). M.Sc. Thesis Dept. Zool. Univ. of Agri. Lyallpur. 60 pp.

Longland, W.S. and Jenkins, S.H. 1987. Sex and age affect vulnerability of desert rodents to owl predation. J. Mammal.68: 746-754.

Machniak, A. and Feldhamer, G. 1993. Feeding habits of short-eared owl over wintering in Southern Illinois. Trans. Ill State Acad. Sci. 86: 79-82.

Mahmood-ul-Hassan, M., Beg, M.A. and Ali, H. 2000. Diet of the barn owl (*Tyto alba*) in central Punjab (Pakistan). Pak J Zool. 32: 33-39.

Moehlman, P.D. 2003. Grizmek's Animal Life Encyclopedia. Mammals IV. Detroit, The Gale Group, Inc. 15.

Palmer, M.J. 1982. Short-eared owl apparently feeding on snail. Br. Birds. 75: 131.

Rana, S.A. 1975. A comparative study of the breeding cycle, reproduction, population structure and abundance of Mus spp. in Lyallpur district and vicinity. M.Sc. Thesis. Dept. Zool. Univ. of Agri. Lyallpur. 55 pp.

Roberts, J.L. and Bowman N. 1986. Diet and ecology of short-eared owl (*Asio flammeus*) breeding on Welsh Heather Moor. Bird Study. 33: 12-17.

Steel, R.G.D. and Torrie, T.H. 1980. Principles and Procedures of Statistics. McGraw-Hill Book Company, Inc. New York.

Walsh, P.M. and Sleeman, D.M. 1988 Avian prey of a wintering short-eared owl population in south-west Ireland. Ir. Birds. 3: 589-95.

Zamarano, E., Palomo, J.L., Antuniz, A. and Vargas, J.M. 1986. Criteria of selective predation by *Bubo bubo* and *Tyto alba* upon *Rattus*. Ardeola. 33: 1-9.