Food habits of the Barn Owl (Tyto alba) in a steppe area of Tunisia

Article *in* Journal of Arid Environments · June 2006

DOI: 10.1016/j.jaridenv.2005.10.007

2 authors, including:

Giovanni Leonardi
Osservatorio Natura
16 PUBLICATIONS **82** CITATIONS

SEE PROFILE

ELSEVIER

Journal of Arid Environments 65 (2006) 677–681

Journal of Arid Environments

www.elsevier.com/locate/jnlabr/yjare

Short communication

Food habits of the Barn Owl (*Tyto alba*) in a steppe area of Tunisia

G. Leonardi[a], G.L. Dell'Arte[b,*,1]

[a]*Istituto Nazionale per la Fauna Selvatica (INFS), Via Ca Fornacetta, 9, I-40064 Ozzano dell'Emilia, Bologna, Italy*

[b]*Section of Ecology, Department of Biology, University of Turku, FIN-20014 Turku, Finland*

Received 18 May 2005; received in revised form 8 October 2005; accepted 13 October 2005
Available online 28 November 2005

Abstract

The diet of the Barn Owl (*Tyto alba*) is well known in different habitats but a lack of data persists for arid and subarid environments. We provide preliminary information on food selection of barn owls in Tunisia by the analysis of the composition of pellets. The diet consists largely of rodents and the three-toed Jerboa (*Jaculus jaculus*) that accounted for more than 50% of total prey biomass. Results suggest that barn owls show a nonrandom tendency toward rodent species especially small and young individuals.

Keywords: *Tyto alba*; Prey choice; Diet; Gerbils; Jerboas; Small mammals

1. Introduction

Several papers described the feeding ecology of the Barn Owl (*Tyto alba*) in warm and dry regions of southern Europe and the Middle East (see Taylor, 1994 for a review). Few papers have focused on the diet of the North African populations, especially in steppe environments (Brosset, 1956; Goodman, 1986; Boukhamza, 1989). In these open habitats with xerophytic vegetation, the Barn Owl hunts almost only small mammals, mainly

*Corresponding author. Tel.: +39 338 1368 076.
E-mail addresses: areleo@yahoo.com (G. Leonardi), gresydel@yahoo.it (G.L. Dell'Arte).
[1]Present address: Via Orchidea 4, I-95123 Catania, Italy.

0140-1963/$ - see front matter
doi:10.1016/j.jaridenv.2005.10.007

jerboas and gerbils, and occasionally insects, amphibians, reptiles and birds (Taylor, 1994; Roulin, 2002).

Previous studies showed that some prey species occurred in a pellet more often than expected by chance (Roulin, 2002). Prey size is an obvious limiting factor in pellet production (Andrews, 1990) but pellet composition can reflect habitat related prey-assemblage (Roulin, 2002). For instance, desert rodents avoid risks of predation by use of covered patches and measured rates of owl predation could reflect their patterns of habitat partitioning (Kotler et al., 1991). Nevertheless, Barn Owls can predate non-random towards young (Barta, 1983; Garde and Escala, 1993) and substandard individuals (Vargas et al., 1988).

The aims of this study were to provide preliminary information on the diet of Barn Owls in a steppe habitat of North Africa. Also, we try to examine their food selection by the analysis of pellet compositions (Yom-Tov and Wool, 1997).

2. Study area and methods

The study site was in the National Park of Bou-Hedma in the Governorate of Sidi Bouzid, central-southern Tunisia (33°30′N, 9°38′E). Scattered small groups of *Acacia raddiana* trees and low bushes and shrubs dominate the plain, while rocky cliffs appear bare (Le Houerou, 1969). We collected pellets in August 2000 at two roost sites found by areas of whitewash. We identified and counted mammals from skulls, dentaries and post-cranial bones through keys and tables in Bernard (1970) and Mendelssohn and Yom-Tov (1987). Where possible, mandibular lengths provided information on age of rodent prey (Mendelssohn and Yom-Tov, 1987). In general, prey remains determined from pellet analysis matched closely with real diet but sometimes birds deliver beheaded prey (Raczynski and Ruprecht, 1974). This may vary individually or regionally (Taylor, 1994) and in our study area more than 75% of 146 prey had complete mandibles (Yom-Tov and Wool, 1997). The biomass, calculated by multiplying the number of individuals found in pellets by the mean body mass was expressed as a percentage of total biomass consumed. The mean weight and body length of prey originate from literature (mammals) and from beaks, sternum and humerus bones (birds) (Bernard, 1969; Morris and Burgis, 1988; Le Berre, 1990). The exoskeleton, leg and head capsule remains identified insect prey.

To estimate mean weight of prey (MWP), we multiplied each prey item by its average weight (Table 1), summed the products and divided the sum by the total number of prey. We assigned a weight of 1 g to each insect prey species. Food-niche breadth (FNB) was calculated using Levins' (1968) equation: $B = 1/\sum P_i j^2$, where p_i is the proportion of prey in different categories (mainly species). We standardized this measure of niche breath on a scale of 0–1 (FNBs). Analyses of prey choice were performed by contingency tables in SYSTAT 9.0 statistical software (1998 SPSS Inc., Chicago, USA) for Pearson's chi-square test and *G*-test (see Table 2).

3. Results and discussion

We identified 146 prey items from 120 pellets (Table 1). The mean number of ingested items per pellet was 1.4 ± 0.6 ($\pm$S.D., range = 1–6) and the average pellet size was $4.2 \pm 1.2 \times 2.3 \pm 0.5$ mm ($\pm$S.D., $n = 93$). The Barn Owl in the Bou-Hedma National Park feeds largely on small mammals but occasionally exploits other food resources (Table 1;

Table 1
Frequency of species recovered from pellets of the Barn Owl in the Bou Hedma National Park

Prey	Mean weight (g)	*N*	%	*B*%	Range
Reptiles					
Snake undetermined[a]	200	1	0.7		0–1
Birds					
Crested Lark, *Galerida cristata*	45	1	0.7	0.5	0–1
Anthus sp.	20	1	0.7	0.2	0–1
Oenanthe sp.	26	1	0.7	0.3	0–1
Mammals					
Greater Gerbil, *Gerbillus pyramidum*[b]	43	33	22.6	14.4	0–4
Three-toed Jerboa, *Jaculus jaculus*[b]	122	40	27.4	50.2	0–2
Libyan Jird, *Meriones libycus*	100	19	13	19.5	0–1
Fat-tailed Sand Rat, *Pachyuromys duprasi*[b]	30	33	22.6	10.1	0–2
Fat Sand Rat, *Psammomys obesus*[b]	142	3	2	4.4	0–1
Lesser White-toothed Shrew, *Crocidura suaveolens*	4	5	3.4	0.5	0–2
Insects					
Unidentified Coleoptera	1	5	3.4		0–3
Coleopters Tenebrionidae	1	2	1.4		0–1
Unidentified Orthoptera	1	2	1.4		0–2
Total		146	100	100	

N = number of prey, % = calculated over the total number of prey, and *B*% = percent of total prey mass consumed.

[a]Probably from genus *Coluber* sp. reported in the plain area of the park (Blanc and Snane, 1980).

[b]Prey weight obtained from specimens captured in Bou-Hedma (Bernard, 1969, 1970).

Table 2
Observed frequencies and age of rodent prey species in owl pellets

Prey species	Adults	Young	Pellets with one prey	Pellets with two prey
Gerbillus pyramidum	10	23	9	7
Jaculus jaculus	15	25	13	14
Meriones libycus	14	5	14	3
Pachyuromys duprasi	12	21	18	5
Psammomys obesus	2	1	3	0

Yom-Tov and Wool, 1997). The standardized food-niche breath (FNBs) was low (0.33) and the mean prey weight (MPW) was 68 g less than measured optimal prey weight (80–100 g; Yom-Tov and Wool, 1997). Prey weights ranged from a low of 1 g for insects to a high 200 g for an unidentified snake (Table 1). The prey list includes six mammal species (five rodents and one insectivore, 91.7%), three birds (2.1%), insects (6.2%) and reptiles (0.7%) (Table 1). Rodents made up most of the diet and were mainly nocturnal (83%,

Jaculus jaculus, *Gerbillus pyramidum* and *Pachyuromys duprasi*) but also diurnal (17%, *Meriones libycus* and *Psammomys obesus*) ($n = 128$; Bernard, 1969; Le Berre, 1990). The heaviest nocturnal prey, *J. jaculus*, accounted for more than 50% of the total biomass (Table 1). Small–medium size prey consists of shrews (3.5%) and passerines birds of open habitats (2%). As in other steppe-like environments, reptiles and insects comprised a very low percentage of the Barn Owl's diet (Table 1; Bellocq, 2000).

Predation on rodent species reveal a bias towards small individuals, which are mainly young prey ($G_4 = 11.254$, $p < 0.01$; $n = 128$; Table 2). This tendency was obvious on *G. pyramidum*, *J. jaculus* and *P. duprasi* (65% juveniles; $n = 106$) and to a lesser extent on *M. libycus* (16%; $n = 19$). Most pellets contained only a single prey item (64.5%) whereas two pellets containing remains of three species and another two pellets with remains of four preys. The frequencies of rodents in pellets containing a single prey item gave a significant deviation from expectation ($\chi^2 = 11.1$, $p < 0.02$; $n = 56$; Table 2) towards medium–large species and their young (*J. Jaculus* and *P. duprasi*). When we grouped the pellets containing two mammal prey species into three weight classes (1) < 50 g (2) 51–105 g and (3) > 106 g, significantly fewer contained large individuals ($\chi^2 = 7.1$; $p < 0.05$; $n = 29$). Results suggest that barn owls in Bou-Hedma show a nonrandom tendency toward rodent species (Table 1), especially small and young individuals (Table 2). In August, prey populations have a high part of young animals and also small prey species, such as the Fat-tailed Sand Rat, which increase during favourable periods (Bernard, 1969). Nevertheless, prey availability could not affect prey choice by barn owls (Kulczycki, 1964; Saint-Girons, 1965) and the contents of pellets do not represent the proportions of prey species in the field (Yom-Tov and Wool, 1997). Also, even if Barn Owls do hunt at random, the contents of the pellets biased towards the larger prey as in our results (Yom-Tov and Wool, 1997) limited only by pellet size (Andrews, 1990).

Acknowledgements

We acknowledge the Directorate of Forests of Tunisia and Prof. S. Nouira of the University of El-Manar for their kind help, and thank Prof. A. Petralia, Head of the Tunisia-Italy Universities exchange programme, G. Zolfino, P. Di Giuseppe and O. Hatzofe. A Roulin and W. Whitford provided helpful comments on the manuscript.

References

Andrews, P., 1990. Owls, Caves and Fossils. University of Chicago Press, Chicago.

Barta, Z., 1983. Die Vertreter der Gattung Rattus Fischer in den Gewöllen der Schleiereule (*Tyto alba*) aus dem Böhmischen Mittelgebirge (CSSR). Faunistische Abhandlungen 11, 63–66.

Bellocq, M.I., 2000. A review of the trophic ecology of the Barn Owl in Argentina. Journal of Raptor Research 34, 108–119.

Bernard, J., 1969. Les mammiferes de Tunisie et des regions voisines, les rongeurs. Bulletin de la Faculté d'Agronomie de Tunis 24–25, 38–160.

Bernard, J., 1970. Clef de determination des Rongeurs de Tunisie. Archives de l'Institut Pasteur de Tunis 47, 267–307.

Blanc, P., Snane, M.H., 1980. Les reptiles et les batraciens de la region de Bou Hedma. Bulletin de la Société des Sciences Naturelles de Tunisie 15, 3–10.

Boukhamza, M., 1989. Données sur le régime alimentaire de la chouette effraie (*Tyto alba*) dans la banlieue suburbaine d'Alger. Aves 26, 234–236.

Brosset, M., 1956. Le régime alimentaire de l'Effraye *Tyto alba* au Maroc Oriental. Alauda 24, 303–305.

Garde, J.M., Escala, M.C., 1993. Depredacion y seleccion intraespecifica de la lechuza comun (*Tyto alba*) sobre la rata de agua (*Arvicola sapidus*). Ardeola 40, 173–175.
Goodman, S.M., 1986. The prey of barn owls (*Tyto alba*) inhabiting the ancient temple complex of Karnak, Egypt. Ostrich 57, 109.
Kotler, B.P., Brown, J.S., Hasson, O., 1991. Factors affecting gerbil foraging behavior and rates of owl predation. Ecology 72, 2249–2260.
Kulczycki, A., 1964. Badania nad skladem pokarmu sow z Beskidu Niskiego. Acta Zoologica Cracoviensia 9, 1–29.
Le Berre, M., 1990. Faune du Sahara, vol. 2: Mammiferes. Lechevalier-Raymond Chabaud, Paris.
Le Houerou, H.N., 1969. La végétation de la Tunisie steppique. Annales de l'Institut National de la Recherche Agronomique de Tunisie 42, 1–624.
Levins, R., 1968. Evolution in Changing Environments. Princeton University Press, Princeton.
Mendelssohn, H., Yom-Tov, Y., 1987. Plants and Animals of the Land of Israel. Appendix, vol. 7: Mammals, Skull and Body Measurements and Plates. Ministry of Defence and SPNI, Israel.
Morris, P.A., Burgis, M.J., 1988. A method for estimating total body weight of avian prey items in the diet of Owls. Bird Study 35, 147–152.
Raczynski, J., Ruprecht, A.L., 1974. The effect of digestion on the osteological composition of owl pellets. Acta Ornithologica 14, 25–37.
Roulin, A., 2002. Barn Owl, *Tyto alba*. Birds of Western Palearctic Update 4, 115–138.
Saint-Girons, M.C., 1965. Notes sur les mammifères de France IV. Prélévements exercés sur des populations de petits mammifères par la Chouette effraie *Tyto alba* (Région de Lyon). Mammalia 29, 42–53.
Taylor, I., 1994. Barn Owls: Predator–Prey Relationships and Conservation. Cambridge University Press, Cambridge.
Vargas, J.M., Palomo, L.J., Palmquist, P., 1988. Predacion y seleccion interspecifica de la lechuza comun (*Tyto alba*) sobre el raton moruno (*Mus spretus*). Ardeola 35, 109–123.
Yom-Tov, Y., Wool, D., 1997. Do the contents of Barn Owl pellets accurately represent the proportion of prey species in the field. Condor 99, 972–976.