

Dietary Distinctive Features of Tawny Owl, *Strix aluco* (Linn 1758) and Barn Owl, *Tyto alba* (Scopoli 1759) in Gardens of Algerian Sahel, El Harrach, Jardin D'essai Du Hamma

Saida Tergou,^{1*} Mohamed Boukhemza,² Faiza Marniche,³ Amel Milla³ and Salaheddine Doumandji¹

¹Department of Agricultural and Forest Zoology, Agronomic National School Superior of El Harrach, Algeria

²University Mouloud Mammeri Tizi Ouzou, Algeria

³National School Superior of Veterinary, El Harrach, Algiers, Algeria

Abstract.- Diet of tawny owl *Strix aluco* was studied in gardens of National Agronomical Institute of El Harrach during 1996 and 1997, and that of barn owl *Tyto alba* in Jardin d'Essai of Hamma in 1997. In total 601 regurgitated pellets, 527 of tawny owl and 74 of barn owl, were analyzed. Five types of prey items included: arthropods, amphibians, reptiles, birds and small mammals. Birds were consumed the most (37.8%) by tawny owl, and the amphibians (37.5%) by the barn owl. Common wall gecko or moorish gecko, *Tarentola mauritanica* (16.8%) was the most frequently preyed by tawny owl and Mediterranean painted frog, *Discoglossus pictus* (34.9%) by barn owl.

Key words: Tawny, owl *Strix aluco*, barn owl, *Tyto alba*, regurgitated pellets.

INTRODUCTION

Diet of birds of prey has been extensively investigated throughout Europe. Diet of barn owl *Tyto alba* (Scopoli; 1769) and tawny owl, *Strix aluco* Linn. has been studied in the wild by Guerin (1932), Baudvin (1983), Henry and Perthuis (1986), Sorgo (1992). Diet of barn owl has been the object of several studies throughout the world including Algeria viz., Gubany *et al.* (1992) in western Nebraska; Sahores and Trejo (2004) near Patagonia (Argentina); Littles *et al.* (2007) in South of Texas and Platt *et al.* (2009) in North of Belize, Central America. In Algeria diet of barn owl has been reported by Ochando (1985), Boukhemza (1989) in Plateau de Belfort, Baziz *et al.* (2000, 1997, 2001) and Sekour *et al.* (2003, 2010) in Les Hauts Plateaux. Rodents are the main prey of barn owl in Ain Oussera (Hamani *et al.*, 1997) as reported by Baziz *et al.* (2000) from areas near Boughzoul's dam to the extent of 63.8% of the diet, and by Benbouzid *et al.* (2000) and Sekour *et al.* (2002) from natural reserve of Mergueb to the extent of 85.3% of the diet. Aulagnier *et al.* (1999) reported that diet of barn owl in Morocco mostly included

small mammals like *Mus spretus*, *Gerbillus campestris* and *Gerbillus magrebi*. In Yahmoll North of Syria the barn owl widely selected small mammals like *Microtus socialis* and *Mus musculus* (Shehab and Al Charabi, 2006).

Diet of tawny owl has been sparsely studied (Doumandji *et al.*, 1994, 1997; Tergou *et al.*, 1997, Idouhar Saadi, 2002). Hamdine *et al.* (1999) have compared the diets from areas in El Harrach and Boukhalifa. However, important aspects remain still under darkness. The present study was aimed at studying the diet of two nocturnal birds of prey in two suburban environments next to each other; and makes an inventory of the micro fauna of the two regions.

Algiers Sahel of the Algiers region (36°36' to 36°46' N, 2°24' to 3° 20'E) comprises of the hills range that separates the western part of Mediterranean Mitidja plain (Glangeaud, 1932). The first study site 36°43'N and 3° 08' E is a park situated in El Harrach region, a suburban environment between Plateau de Belfort (Hacen Badi) and the Eastern part of Mitidja. The site is situated at 50 m altitude and spreads about 16 ha including 10 ha area in the Northern part and six (6) acres in the south occupied by pedagogic buildings spread and alternated with green areas, including lawns and green areas planted with trees (ash *Fraxinus excelsior*, eucalyptus *Eucalyptus*

* Corresponding author: tergoulina@yahoo.com
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camaldulensis, oak seen *Quercus faginea*, mulberry *Morus nigra* and *M. alba*; shrubs (false pepper plant *Schinus molle*, *Washingtonia robusta*, *W. filifera* and *Tipa tipuana*) and other herbaceous flora like *Tipa tipuana* (Fabaceae). Lawns are planted with different kinds of grasses like *Stenotaphrum americana*. Situated at the far end of Algiers Bay, the Jardin d'essai spreads its 30 ha in amphitheatre from immediate surroundings of sea-side to the hill of Bois des Arcades hill 36°43'N and 3°05' E (Carra and Gueit, 1952). The altitude varies from 10 to 100 meters, up to the woodland located on the hill of Bois des Arcades. The climate of the area is categorized as the sub humid bioclimatic stage with warm winters.

Due to the immediate proximity of the sea to Jardin d'essai of Hamma thermal oscillations are experienced. There is only a little difference between the minimum and maximum temperatures. The dense vegetation cover also reinforces regulatory action of the sea. For that reason temperature does not drop below 2°C and rarely rises above 35°C except during sirocco weather (Carra and Gueit, 1952). The 25 year average rainfall recorded at Algiers from 1913 to 1938 is 762 mm (Seltzer, 1946). Rainy season is spread from September to March and the dry season from April to August. Annual average minimum and maximum temperatures are 11°C and 26°C respectively. The Jardin d'Essai of Hamma is located in sub-humid bioclimatic zone with warm winters. The Jardin d'Essai of Hamma supports luxuriant vegetation in two distinctive parts, the English garden and the French garden. The former consists of many diversified structures, including plots, tracks, and sinuous paths with dense vegetation that conceals dense spots but checked with in a discreet manner. Main paths are edged with trees such as *Ficus macrophylla*, *Washingtonia filifera*, *Arecastrum (Cocos romanzoffianum* and *Dracaena draco*).

The vegetation cover is less diversified in the French Garden however it is arranged in a regular shape and symmetrical paths. Jardin d'Essai of Hamma has four ornamental lakes, it is characterized by succession of plots which are either open, semi open or distinctly closed. Seasonal vegetation varies locally. A part of the garden is

occupied by residential buildings. The vegetation diversity provides good habitat conditions for all animal groups. Birds of prey, belonging to the families Tytonidae and Strigidae to which barn owl and tawny owl respectively belong to, at the top of the food chain, are attracted to the area where there is plenty of food available.

METHODOLOGY

The regurgitated pellets of tawny owl were recovered from the nests in parasol pine or stone pine *Pinus pinea* trees that are their day time abode, from January 1996 to December 1997. Pellets of barn owl were removed from the ground under groups of *Washingtonia filifera* shrubs in Jardin d'Essai of Hamma from January 1997 to December 1997 from two main localities viz., i) west of the French Garden near yuccas paths and ii) the experimental nursery in the north of English Garden

The regurgitated pellets were stored in paper cornets on which collection date and location were recorded. The pellets of barn owl tapered at one or both the ends. For analysis the pellets were immersed in water in Petri boxes for 10 min. Bones and sclerosis fragments recovered from the pellets were separated by morphological categories. Invertebrate preys were identified by comparing with the invertebrate specimens collected at the Insectariums and collection keys prepared at the National Agronomic Institute of El-Harrach.

Vertebrate preys were identified by using determination keys prepared by Cuisin (1989) for birds; Grasse and Dekeyser (1955), d'Osborne and Helmy (1980), d'Orsini *et al.* (1982), d'Aulagnier and Thevenot (1986) and Barreau *et al.* (1991) for rodents; Aulagnier and Thevenot (1986) for insectivorous rodents and birds. The number of Invertebrate preys was estimated by counting the number of mandibles, heads, thorax, wing-sheaths and cerque. One individual corresponds to the presence of 6 femurs, 6 tibias, 1 head, 1 thorax, 2 wing-sheaths, 2 mandibles, or 2 cerque one on the right, the other on the left. Systematically, each piece found was measured to evaluate the size of the prey and its biomass. The number of Vertebrate preys was based on the estimates of the fore-crane and jaws or mandibles. When the latter were absent,

long bones were taken as reference. In mammals number of femurs, of peroneotibius, of humerus, of cubitus and of radius was taken. In case of birds, femurs, tibias, tarso-metatarsals, humerus, cubitus, radius and metacarpus were used. Frontal, humerus and femur are reference bones for recognition of reptiles. For estimation, a frontal bone corresponds to one individual. On the other hand, it is essential to have 2 semi-jaws (upper or lower), 2 femurs, 2 radius or 2 cubitus to correspond to one individual.

The following diversity indices were calculated: (1) Relative abundance (RA, %) which is the ratio of number of prey-species (IN) to total number of individuals, all species taken together (N) (Zaïme and Gautier, 1989); (2) Biomass or rate in weight (B) which is ratio of individual weight of a determined prey-species (IW) to total weight of various preys (P) (Vivien, 1973). Relative biomass brings out prey-species which supply to predator more dietary material. B (%) is biomass, and IW is the total weight of prey items

RESULTS

Diet spectrum of tawny owl and barn owl

Analysis of 527 regurgitated pellets of tawny owl allowed identifying 2472 preys of five categories *viz.*, arthropods, amphibians, reptiles, birds and small mammals. tawny owl consumed 1276 preys in 1996. The birds were the most represented category followed by arthropods, small mammals and amphibians (Fig. 1A,B).

During 1997 barn owl consumed 272 preys; amphibians being more than one third of preys; Mediterranean painted frog, *Discoglossus pictus*, being the most consumed. Rodents were however also consumed almost in the same proportion. Birds were represented in almost one fourth of the prey items. Insects and reptiles were rarely represented (Fig. 1C). The amphibians and hygrophilous rodents such as black Norway rat, *Rattus norvegicus*, are found in water bodies, shady trees and damp places as the favoured habitats.

Frequency of ingested tawny owl and barn owl preys

Common wall gecko was the most frequent species in the diet of tawny owl during 1996/1997

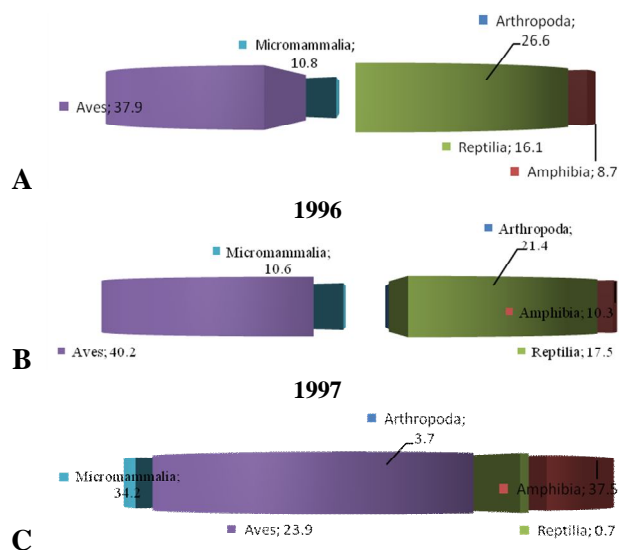


Fig. 1. Food spectrum of tawny owl in the park Agronomic Ecole Nationale Supérieure of El-Harrach during the year 1996 and 1997 (A, B) and park of the Gardenessai of Hamma during the year 1997 (C).

(Table I), followed by the sparrow *Passer* sp. and the amphibian Mediterranean painted frog, *Discoglossus pictus*. Other prey items of significance included black Norway rat and insects like field cricket, *Gryllus bimaculatus*. The barn owl in 1997 consumed Méditerranéen painted frog the most, followed by field mouse, *Mus musculus* and black Norway rat. Amongst birds European starling, *Sturnus vulgaris*, was the most consumed followed by the sparrow and common bulbul, *Pycnonotus barbatus* (Table I).

DISCUSSION

Diet spectrum of tawny owl and barn owl

Diet of tawny owl included five (5) categories of life forms, the birds being the most dominant group. Nadji (1997) studied the diet of tawny owl in the region of Staoueli and reported that birds were the most common preys with 78.0% of preys in the diet. Zalewski (1994) reported that the birds constituted 66.6% of the diet of tawny owl in Poland's suburban environment; house sparrow *Passer domesticus*, was the most consumed bird species. Zedrzyjewski *et al.* (1996) reported that during autumn/winter period 1991/1992 the tawny

Table I.- Relative frequency of prey species in the diet of tawny owl and barn owl.

Prey species / Predatory species	Tawny owl			Barn owl		
	Number	RF (%)	B (%)	Number	RF (%)	B (%)
<i>Aranea</i> sp. ind.	24	0.97	0.03	0	0	-
<i>Periplaneta americana</i>	92	3.72	0.11	2	0.76	0.01
<i>Mantis religiosa</i>	4	0.16	-	0	0	-
<i>Iris oratoria</i>	1	0.04	-	0	0	-
<i>Sphodromantis viridis</i>	41	1.66	0.16	0	0	-
<i>Gryllus</i> sp.	2	0.08	-	0	0	-
<i>Gryllus bimaculatus</i>	125	5.06	0.11	1	0.37	0.004
Gryllidae sp. ind.	1	0.04	-	0	0	-
Orthoptera sp. ind.	1	0.04	-	0	0	-
Ensifera sp. ind.	6	0.24	-	0	0	-
Caelifera sp. ind.	13	0.53	0.01	0	0	-
Tettigoniidae sp.	1	0.04	-	0	0	-
<i>Aiolopus strepens</i>	2	0.08	-	0	0	-
<i>Aiolopus thalassimus</i>	2	0.08	-	0	0	-
<i>Aiolopus</i> sp.	3	0.12	-	0	0	-
<i>Pamphagus elephas</i>	2	0.08	0.01	0	0	-
<i>Eyprepocnemis plorans</i>	7	0.28	0.01	0	0	-
<i>Anacridium aegyptium</i>	4	0.16	0.01	0	0	-
<i>Forficula auricularia</i>	12	0.49	0.01	0	0	-
<i>Tettigia orni</i>	3	0.12	-	0	0	-
<i>Cicadetta montana</i>	50	2.02	0.02	0	0	-
Coleoptera sp.	2	0.08	-	3	1.10	0.004
Carabidae sp. ind.	2	0.08	-	0	0	-
<i>Carabus morbillosus</i>	0	0	-	1	0.37	0.006
<i>Pentodon</i> sp.	2	0.08	-	0	0	-
Scarabidae sp. Ind.	3	0.12	-	0	0	-
<i>Copris hispanus</i>	2	0.08	-	1	0.37	0.007
<i>Amphimallon scutellare</i>	26	1.05	0.02	0	0	-
<i>Ocyopus (Staphylinus) olens</i>	15	0.61	-	0	0	-
<i>Phyllognathus silenus</i>	90	3.64	0.15	2	0.74	0.01
<i>Rhizotrogus</i> sp.	6	0.24	-	0	0	-
<i>Chalcophora mariana</i>	1	0.04	-	0	0	-
Cetoniidae sp.	1	0.04	-	0	0	-
<i>Cetonia aurata funeraria</i>	2	0.08	-	0	0	-
<i>Silpha</i> sp.	2	0.08	-	0	0	-
Cerambycidae sp. ind.	2	0.08	-	0	0	-
<i>Hesperophanes</i> sp.	4	0.16	-	0	0	-
<i>Phoracantha semipunctata</i>	4	0.16	-	0	0	-
<i>Vespa germanica</i>	2	0.08	-	0	0	-
<i>Apis will mellifera</i>	1	0.04	-	0	0	-
Noctuidae sp. Ind	31	1.25	0.01	0	0	-
Insecta sp. ind.	1	0.04	-	0	0	-
<i>Hyla meridionalis</i>	5	0.20	0.1	2	0.76	0.18
<i>Discoglossus pictus</i>	228	9.22	10.47	95	36.12	21.5
<i>Bufo mauritanicus</i>	1	0.04	0.12	5	1.90	3.02
<i>Tarentola mauritanica</i>	414	16.75	4.12	2	0.76	0.09
<i>Passer domesticus</i> X <i>P. hispaniolensis</i>	411	16.63	16.98	10	3.80	1.9
<i>Carduelis chloris</i>	114	4.61	5.23	2	0.76	0.41
<i>Sylvia atricapilla</i>	86	3.48	2.37	1	0.37	0.14
<i>Pycnonotus barbatus</i>	91	3.68	9.75	10	3.80	3.20
<i>Turdus merula</i>	10	0.40	1.36	8	3.04	6.15

Table I Continued

Prey species / Predatory species	Tawny owl			Barn owl		
	Number	RF (%)	B (%)	Number	RF (%)	B (%)
<i>Phylloscopus</i> sp.	36	1.46	0.39	0	0	-
<i>Parus caeruleus</i>	23	0.93	0.42	0	0	-
<i>Erithacus rubecula</i>	13	0.53	0.40	0	0	-
<i>Streptopelia turtur</i>	51	2.06	10.57	0	0	-
<i>Streptopelia senegalensis</i>	35	1.42	7.23	0	0	-
<i>Columbidae</i> sp. ind.	6	0.24	1.24	4	1.47	9.05
<i>Sturnus vulgaris</i>	10	0.40	1.22	27	10.27	14.66
<i>Serinus serinus</i>	25	1.01	0.99	1	0.37	0.02
<i>Apus</i> sp.	28	1.13	1.37	1	0.37	1.33
<i>Hirundo rustica</i>	8	0.33	0.39	0	0	-
<i>Hirundinidae</i> sp. ind.	7	0.28	0.34	0	0	-
<i>Cisticola juncidis</i>	1	0.04	0.01	0	0	-
<i>Aves</i> sp. Ind	9	0.36	0.28	1	0.37	0.23
<i>Rattus norvegicus</i>	128	5.18	19.58	42	15.97	31.7
<i>Rattus rattus</i>	8	0.32	1.22	0	0	-
<i>Mus musculus</i>	79	3.20	2.30	46	17.49	6.6
<i>Mus spretus</i>	22	0.89	0.64	4	1.52	0.57
<i>Pipistrellus kuhlii</i>	25	1.01	0.23	1	0.37	0.04
<i>Crocidura russula</i>	3	0.12	0.05	0	0	-
Total	2472	100	100	272	100	100

RF %: Relative frequency; B%: Biomasse; unid.: unidentified

owl hunted birds only up to 18% of the diet items. Almost 50% of the bird prey species are considered to be migratory.

Zedrzyjewski *et al.* (1996) also reported that migratory birds like thrush and amphibians like common frog, *Rana temporaria*, are the important components of the diet of tawny owl. Bayle (1992) reported the importance of rodents (40.6%) in the diet of tawny owl in Marseille's urban environment. Minor contribution to the diet was made by spiders (Arachnids, 1.1%), bats (Chiroptera, 1.1%) and insectivores (0.1%). Occasionally the main prey of tawny owl could be the small mammals; the preferred prey species however could be the birds. The barn owls select the small mammals as their main prey; they have to spend a long time on hunting them thus utilizing more energy. Massernin and Handrich (1997), therefore, report that energy acquired by predators essentially depends on their diet. Because of the size and strength of barn owl there is a great diversity in its diet (Baudvin, 1991). The diet of nocturnal predators varies from species to species and from environment to environment. Moorish gecko *Tarantola mauritanica*, because of its nocturnal habits, easily accessible to tawny owl in Salernes, hence a major part of the diet (Cheylan

1971). Our study of 1997 confirmed this observation.

The diet of barn owl is also constituted of 5 categories dominated by amphibians, rodents and birds. Several authors have reported rodents as the dominant group in the diet of barn owl in Mediterranean basin; 73% in Spain (Herrera, 1974), between 60 and 70% (Cheylan, 1976). Saint Girons *et al.* (1974) determined that the field mouse (81%) and field cricket (8%) were the dominant part of the diet of barn owl at Settat in Morocco. Rifai *et al.* (1998) found that rodents and notably Tristram's jird, *Meriones tristrami*, were the preferred diet of barn owl in Jordan. Birds were, however, found to be the main diet (59.6%) of barn owl at Casablanca (Saint Girons and Thouy 1978). Likewise, Brosset (1956) reported that the birds constituted 89.5% of the diet of barn owl in Morocco. The diet of non-specialized predators is varied hence they have to utilize more energy, as hunting of a particular species would be easier and less energy demanding. The predator has better chances of capture by exact recognition in the environments they frequent and warding of defense technique that the preys possess to escape to predator's actions.

Rates comparison of different categories of

Table II.- Rates comparison of different categories (%) of tawny owl's prey items.

Author – Year – Spots		Invertebrates	Amphibians	Reptiles	Birds	Mammals
Zalewski (1994)	Poland	8.8	13.2	0	41.6	36.3
Wendland (1984),	Berlin Germany	0	6.3	0	49.6	44.1
Cheyland (1971),	Salernes France	0	0	4	4.5	91.5
Bayle (1992),	Marseille France	10	0	27.2	21.1	41.7
Galeotti <i>et al.</i> (1991)	Norty Italia	18.5	2.1	0	46.8	32.3
Hamdine <i>et al.</i> (1999)	El Harrach Algérie	20.7	12.4	16.9	37.2	12.8
Présent étude (1996-1997)	EL Harrach Algérie	24.27	9.46	16.75	38.9	10.72

Table III.- Rates comparison of different categories (%) of barn owl's prey items.

Author – Year - Spots		Invertebrates	Amphibians	Reptiles	Birds	Mammals	Fish
Baudvin (1983)	Bourgogne France	0.2	1.1	0	0.6	98.1	0
Herrera (1974)	Spain	7.6	2.3	0.4	3.2	86.5	0
Aulagnier <i>et al.</i> (1999)	Morocco	10.8	3.1	0.5	11.6	74	0
Goodman (1986)	Egypt	0	0	0	45.4	54.2	0.4
Boukhemza (1989)	El Harrach Algérie	1.7 0	3.2	0	9.1	86.1	0
Present study Algeria (1997)	Algérie	3.7 0	37.5	0.7	23.9	34.2	0
Jardin d'essai Hamma							

tawny owl's prey items and barn owl's prey items obtained by different authors is shown in the Tables II-III.

It is concluded that diet spectrum of nocturnal predators generally depends on the availability of prey species available in the environment.

Centesimal frequencies of ingested preys by tawny owl and by barn owl

Common wall gecko and house sparrow were the most consumed preys by tawny owl (Table I). Nadji (1997) reported that house sparrow was the most favoured diet of tawny owl in agricultural environment at Staoueli with 129 individuals (52.7%) followed by barn swallow, *Hirundo rustica*, with 16 individuals (6.5%). Tawny owl appears to be well adapted to the habitats it occupies. Frequency of prey species in tawny Owl's diet depends on their abundance in the occupied environment. Delmee *et al.* (1979) suggests that birds play an important role as replacement food in tawny Owl's diet notably in urban environments.

They identified about 95% of birds in the absence of small mammals in the diet of a pair of tawny owl in a park in central London, 45% in the suburbs and only 10% in an oak forest out of agglomeration. Cheyland (1971) noted a frequency of 50.3% of murids, 4.5% of birds and 4% of reptiles in the diet of tawny owl in the same environment. During the study we noticed that most frequent species in the diet of barn owl are Mediterranean painted frog, house mouse and black rat (Table I). Talbi (1999) reported 27.6% frequency of Algerian mouse and 16% of house sparrow in the diet of barn owl in Staoueli region of Algeria. Amat and Soriguer (1981) reported a frequency of 30.8% house mouse in the diet of barn owl in Spain, whereas Saint Giron *et al.* (1974) suggested 87% of house sparrows in the total number of species captured by barn owl at Settat, Morocco. Amat and Soriguer (1981) are of the view that barn owl, being a generalist predator would stay all the year round in the same habitat even if the rodent population may decline during some part of the year. The study suggests that

centesimal frequency of prey species of barn owl may vary from habitat to habitat and region to region.

CONCLUSIONS

In suburban environment, tawny owl behaves as a polyphagous predator, its trophic diet being composed of five categories of preys that maintain a balance among them. barn owl on the other hand, believed to be depending mainly on rodents behaved in a different manner. During 1997 amphibians were dominant in the diet of barn owl with 37.5% presence followed by small mammals (34.2%), birds (23.9%) and insects (3.7%). As such the barn owl falls back on replacement preys in a suburban environment in case it faces difficulty in capturing rodents. The study of diet of tawny owl and barn owl emphasizes their role in the maintenance of biological balance and their survival skills in case of adverse environmental conditions. The tawny owl and barn owl serve the human beings by getting rid of the crop pests that may play a devastating role in the environment and allowing them to use the minimum chemical control measures that may pollute the environment.

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