Further on the diet of wintering Long-eared Owls *Asio otus* in northern Israel

REUVEN YOSEF & KOBI MEYROM

In Israel, the Long-eared Owl *Asio otus* was classified as a scarce to uncommon resident in most low lying regions of the country and to some extent a rare to scarce migrant; and also as a winter visitor (Shirihai 1996). In recent years in Israel, the species has established further breeding populations and its numbers have increased greatly since 2002 with breeding pairs spreading into suburban and urban habitats (Dovrat & Meyrose 2005). They have also spread extensively into the Negev desert (Leader *et al* 2008).

It was previously suggested that raptors (Mendelson & Yom-Tov 1987) and Long-eared Owls (Yosef 1997) in northern Israel subsist during the winter period mostly on the very common Field Vole (*Microtus socialis guentheri*). Since these preliminary studies of wintering birds, Leader *et al* (2008) have studied the diet of Long-eared Owl breeding pairs in the northern and central Negev desert, and Kiat *et al* (2008) described feeding specializations of an urban Long-eared Owl pair in Jerusalem.

Following intensive attempts to eradicate voles in the northern parts of Israel and a steady decline in the number of wintering Long-eared Owls at a traditional roost site there (Yesod Hamaala), we considered it important to document whether there have been any obvious dietary changes so that pressures on the owls' wintering site could be better understood. Mikkola (1983) considered pellet analysis to be a reliable technique that reflected the species' diet.

STUDY AREA & METHODS

Yesod Hamaala (33° 03′ 27″ N, 35° 36′ 29″ E) is a collective-farming settlement in northern Israel. It is close to the Hula nature reserve and has many private gardens with ornamental bushes and trees. In the garden of a particular house, there is a concentration of River Sheoak *Casuarina cunninghamiana,* Silk-oak *Grevillea robusta* and Brazilian Pepper-tree *Schinus terebinthifolius* that has served as a winter roost for several owl species, mostly Long-eared Owls. The owner of the garden contends that the first of the spring heat waves initiates the return of the owls to their breeding grounds.

We visited the site 4 times in 1995 (Yosef 1997) and 7 times 2002–2004 and collected a total of 731 pellets at the base of the roost trees. As the overwhelming number of owls at the roost were Long-eared Owls and most of the others are of similar body size, and produce pellets of a similar size to those of the Long-eared Owl, no effort was made to try and separate the pellets by species All pellets were oven dried, separated, and the contents analyzed for prey content. We treated each pellet as containing the remains of the complete portion of the prey eaten (Raczyfiski & Ruprecht 1974). However, not all pellets were found complete and some were broken up, or had disintegrated because of the rain, resulting in different sample sizes.

RESULTS & DISCUSSION

On the 11 different visits 1995–2004 (17, 24, 31 Jan, 25 Mar 1995, 29 Dec 2002, 15 Jan, 11 Feb, 23 Dec 2003, 6, 19 Jan, 1 Feb 2004) we counted an average of 42 (28–61) owls at the site, with a total of 463 owl-days. In all counts the dominant species was Long-eared Owl (429, 92.6%), but we also saw Barn Owl (*Tyto alba*, 18, 3.9%), Scops Owl (*Otus scops*, 11, 2.4%) and Tawny Owl (*Strix aluco*, 5, 1.1%).

The average pellet length was 41.8 mm (±11.8, range 22.14–73.81, N = 512), breadth at widest part 25.84 mm (±4.4, 21.85–32.1, N = 512) and width at midsection 16.8 mm (±2.1, 15.4–24.3, N = 432). These dimensions are within the range mentioned by Mikkola (1983) for European countries.

A total of 1287 prey items were in the 731 pellets, an average of 1.76 (range 1–5) prey per pellet. Remains of 1236 (96%) Field Voles, 35 (2.7%) amphibians (Green Toads *Bufo viridis*, tree frogs *Hyla* spp), and 17 (1.3%) unidentified passerines (Table 1) were found. In 27 (2.1%) we found vegetation and particles of dust or stone imbedded in the pellet suggesting ingestion by the owls either accidentally with the prey or intentionally to aid with digestion.

A comparison between the pellets collected in 1995 (Yosef 1997) and those in 2002–2004 shows that the Field Vole continues to be the dominant prey species in the diet of the Long-eared Owls at Yesod Hamaala. However, the percentage of voles has decreased by 5% while there is a slight increase in the number of amphibians and birds (Table 1). This is probably a result of an increase in sampling size/years sampled. If this is a real trend the owls would have to resort to finding alternative prey to voles. Additional years of observation are required to establish whether there is any change in the diet of the Long-eared Owls at Yesod Hamaala and, indeed, if they are altering their hunting regimes to accommodate the vole eradication practiced in the agricultural fields.

Mikkola (1983) reported for several European countries that the Long-eared Owl fed not only upon voles, even though it was numerically by far the commonest prey, but also on a wide variety of small and medium sized mammals. Owls only very occasionally took amphibians, fish or invertebrates.

In our study, the diet was similar in composition to those reported in Europe, with small mammals constituting the majority of prey, although the percentage of microtines is the highest of 179 diet studies reviewed in Williams (1996) and higher than that of subsequent studies (*eg* Tome 2003, Kiat *et al* 2008). This is probably the result of the wintering Long-eared Owls hunting in a comparatively homogenous agricultural environment (see Martinez & Zuborogoitia 2004) where the abundance of the Field Voles outnumbers those of other small mammal species (*cf* Erlinge 1987). The above may also be a result of the vulnerability of the voles in winter when their burrows are flooded by the rains and they

Table 1. A comparison of the prey of wintering Long-eared Owls *Asio otus* in the Hula valley (1995, 2002–2004), and of *Asio otus* breeding pairs in the northern Negev desert (Leader *et al* 2008) and Jerusalem (Kiat *et al* 2008). Small mammals in the Hula valley were exclusively Field Voles *Microtus socialis guentheri* but comprised a range of other species in the northern Negev and Jerusalem.

	Yesod Hamaala, Hula		Northern Negev	Jerusalem
	1995	2002–2004	2002–2003	2002–2005
No. Pellets	279	452	3034	107
No. Prey	438	849	4668	150
Prey/Pellet	1.57	1.87	1.54	1.4
Small Mammals	434 (99.1%)	802 (94.4%)	3327 (71.3%)	12 (8.0%)
Amphibians	3 (0.7%)	32 (3.8%)		
Birds	1 (0.2%)	16 (1.9%)	1236 (26.5%)	136 (90.7%)
Reptiles			3 (0.1%)	
Invertebrates			102 (2.0%)	2 (1.3%)

are forced to the surface. Also, as temperatures can be quite low in the Hula valley area, voles probably need to forage more frequently in winter (KM pers obs) exposing them to predation by the owls.

The Long-eared Owl has been described as having a more specialized diet than other sympatric owls (Andrews 1990) while other studies show that they are opportunistic (Bertolino *et al* 2001). Our study and those of Leader *et al* (2008) from the Negev desert and Kiat *et al* (2008) from Jerusalem suggest opportunistic feeding behaviour of the over-wintering and breeding populations of Long-eared Owl in Israel.

The Yesod Hamaala wintering population may well be dependent on the voles for their survival. It is likely that the voles are the only numerous prey species at the wintering site and hence vole eradication would need to be controlled. Long-eared Owls may be opportunistic hunters but if their prey base is lost we are liable to loose these over-wintering populations. An in-depth behavioural and foraging study is needed to understand if owls need to spend more time and energy to gain the same amount of food.

Another problem brought to our attention by the land owner is that it is imperative to regulate the visits by birdwatching groups at the roost sites of the owls. In recent years the number of disturbances to the owls has increased greatly owing to growing awareness by the public, and this may also have resulted in fewer owls being observed at this traditional roost. Ensuring a good supply of microtine prey, minimizing human disturbance and the establishment of a long-term study of the wintering population should ensure that the Long-eared Owls will continue to winter in the traditional roost at Yesod Hamaala.

REFERENCES

Andrews, P. 1990. *Owls, caves and fossils*. Natural History Museum Publications, London.

Bertolino, S, E Ghiberti & A Perrone. 2001. Feeding ecology of the Long-eared Owl (*Asio otus*) in northern Italy: is it a dietary specialist? *Canadian Journal of Zoology* 79: 2192–2198.

Dovrat, E & A Merose. 2005. Long-eared Owl breeding survey. *Torgos* 33: 9–23.

Erlinge, S. 1987. Predation and noncyclicity in a microtine population in Southern Sweden. *Oikos* 50: 347–352.

Kiat, Y, G Perlman, A Balaban, Y Leshem, I Izhaki & M Charter. 2008. Feeding specialization of urban Long-eared Owls *Asio otus* (Linnaeus, 1758), in Jerusalem, Israel. *Zoology in the Middle East* 43: 49–54.

Leader, Z, Y Yom-Tov & U Motro. 2008. Diet of the Long-eared Owl in the northern and central Negev Desert, Israel. *Wilson Journal of Ornithology* 120: 641–645.

Martínez, JA & I Zuberogoitia. 2004. Habitat preferences for Long-eared Owls *Asio otus* and Little Owls *Athene noctua* in semi-arid environments at three spatial scales. *Bird Study* 51: 163–169.

Mendelson, H & Y Yom-Tov. 1987. *Plants and animals of the land of Israel*. Vol 7. Ministry of Defence Publisher, Tel Aviv.

Mikkola, H. 1983. *Owls of Europe*. T & AD Poyser, Calton, UK.

Raczynski, J & AL Ruprecht. 1974. The effect of digestion on the osteological composition of owl pellets. *Acta Ornithologica* 14: 25–37.

Shirihai, H. 1996. *The birds of Israel*. Academic Press, London.

Tome, D. 2003. Functional response of the Long-eared Owl (*Asio otus*) to changing prey numbers: a 20-year study. *Ornis Fennica* 80: 63–70.

Williams, RSR. 1996. *Ecology and population dynamics of the Long-eared Owl Asio otus*. PhD thesis, University of East Anglia, Norwich, UK.

Yosef, R. 1997. Diet of Long-eared Owls *Asio otus* wintering in the Khula Valley, Israel. *Sandgrouse* 19: 148–149.

Reuven Yosef, International Birding & Research Centre in Eilat, PO Box 774, Eilat 88000, Israel. ibrce@eilatcity.co.il

Kobi Meyrom, Kibbutz Nir David, Mobile Post Har Gilboa 19150, Israel.