

On the diet of Little Owl *Athene noctua* from Al Reem biosphere reserve in Qatar, with the first record of Pygmy Gerbil *Gerbillus henleyi* for Qatar

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The diet composition of Little Owl *Athene noctua* was investigated in Al Reem biosphere reserve, northern Qatar. Eighty-seven regurgitated pellets yielded 193 individual prey items representing at least five rodent spp, two lizard spp, unidentified bird(s) spp, at least one scorpion sp, several beetle (Coleoptera) and grasshopper (Orthoptera) spp. Prey items were dominated by beetles (45%) and rodents (37%) which were found in 58.6% and 70% of the pellets, respectively. Reptiles, birds, scorpions, and grasshoppers constituted 6.4, 3.8, 2.1, and 5.4% of the diet, respectively. The results suggest that the Little Owl is an opportunistic feeder, hunting 1–5 prey items per day (ave 2.03±0.13) from a wide range of fast-moving prey to ground-dwelling insects. The analysis resulted in the first record of Pygmy Gerbil *Gerbillus henleyi* (Rodentia) from Qatar.

INTRODUCTION

Analysis of owl pellets for prey remains provides a useful tool for gaining insights into the abundance and distribution of small vertebrates (Heisler *et al* 2016, Torre *et al* 2004, Santos-Moreno & Espinosa 2009). Though populations of insectivores and grassland rodents may be oversampled, owl pellets often contain a high overall richness and provide complementary information for small mammal inventories (Torre *et al* 2004). For example, barn owl food composition is suggested to be one of the most useful methods for landscape-level analysis of small mammal occurrence (Askew *et al* 2007, Avenant 2005).

The Little Owl *Athene noctua* has a broad distribution in lowland areas of 84 countries in the middle and lower latitudes of the northern hemisphere (Van Nieuwenhuysse *et al* 2008). It inhabits a wide range of habitats from open steppe, grasslands, deserts and semi-deserts, pastureland, and edges of semi-open woodland and urban areas (Obuch & Krištín 2004, Van Nieuwenhuysse *et al* 2008). It is known as an opportunistic feeder and takes a high diversity of small-sized prey (Obuch & Krištín 2004, Van Nieuwenhuysse *et al* 2008).

In Qatar, Mohamedano *et al* (2014) conducted the first owl diet analysis there using pellets of Pharaoh Eagle Owl *Bubo ascalaphus*. No previous studies have been conducted on Little Owl diet in Qatar though a few have been reported from the wider region including Kuwait (Clayton 1991), Jordan (Al Melhim *et al* 1997), the United Arab Emirates (Cunningham & Aspinall 2001), Egypt, Syria, and Iran (Obuch & Krištín 2004). The present study reports on Little Owl diet from Qatar and includes a new rodent species for the country.

METHODS

Regurgitated pellets (87 in total) from a Little Owl roost site in Al Reem biosphere reserve (25° 89' N, 51° 05' E, Plate 1a) in northern Qatar were collected April–May 2014 and 2015. A Little Owl was seen using piles of rocks as a look-out/roost site on the edge of a vegetated low area in the reserve (Plate 1b). It was also seen at night while radio-tracking hedgehogs (Mammalia: Erinaceidae). It was not known whether the owl was breeding in the area. Al Reem biosphere reserve, which covers c1190 km² in northwest Qatar, is representative of the typical arid habitat of Qatar (ave annual rainfall 76.5 mm) and is characterized by gravel plain ecosystems interspersed with seasonal riverbeds (run-off wadis) and lowland areas locally known as 'rawdhat' or 'marab' (Plate 1c). The area is partially degraded by overgrazing by camel and sheep and accommodates a suite of agricultural settlements and recreational winter camps. The majority of the area is barren stone desert rarely covered

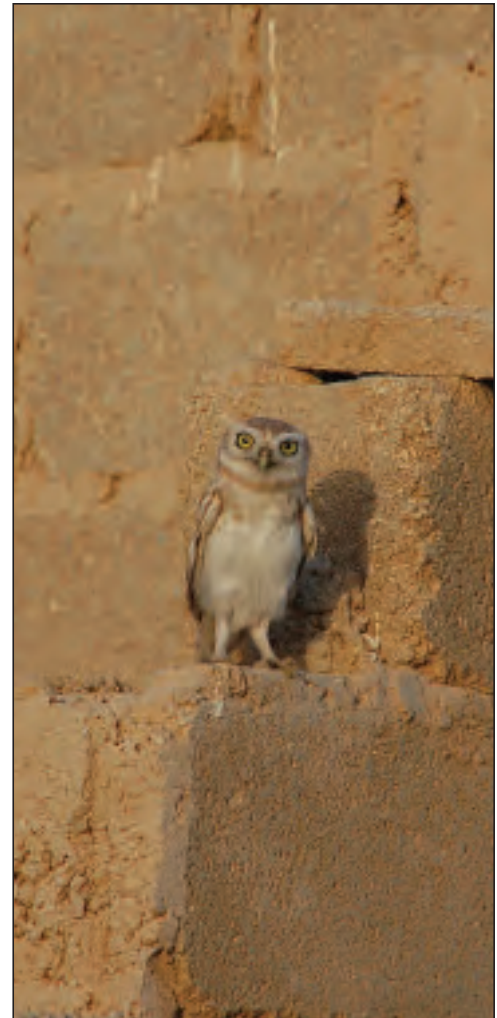
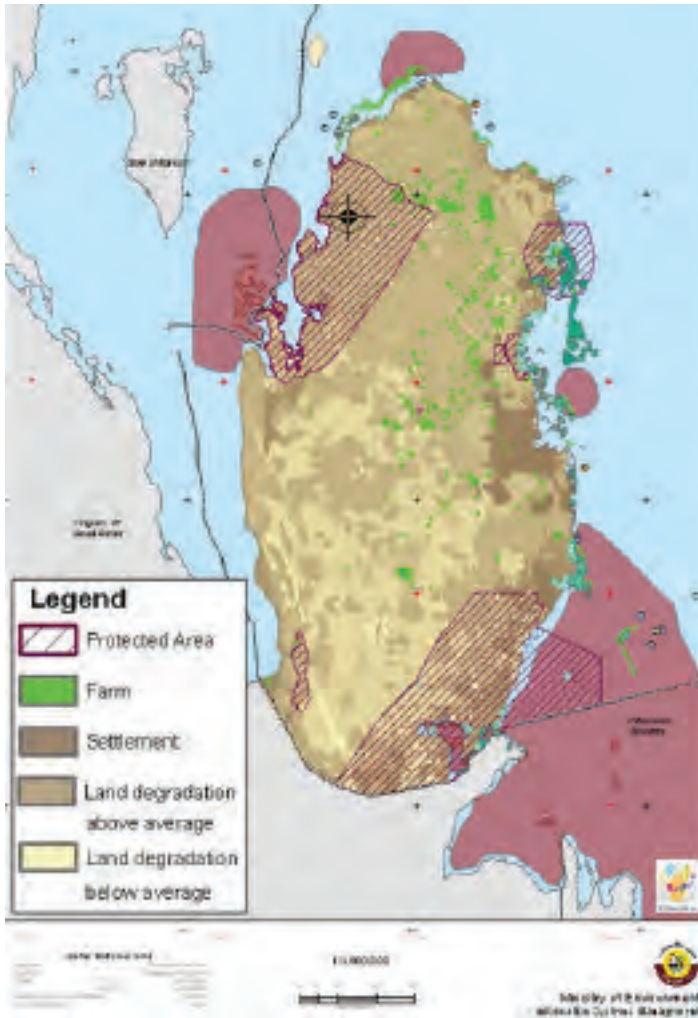


Plate Ia. (top left) Location of Al Reem biosphere reserve in northwest Qatar.

Plate Ib. (top right) The Little Owl *Athene noctua* on the remains of a building near its roost site, Al Reem biosphere reserve, Qatar. © Mohammad A Abu Baker

Plate Ic. (bottom) A pile of rocks at the edge of this 'rawdhat' was the roost site where Little Owl *Athene noctua* pellets were found, Al Reem biosphere reserve, Qatar. © Mohammad A Abu Baker

by vegetation. The wadis and rawdats provide vegetated bush/shrubby microsystems mainly of *Astragalus spinosus*, *Lycium shawii* and *Acacia tortilis* that reach up to 2 m in height.

Each pellet was teased dry using forceps and a needle to separate prey remains for identification. For each specimen, lower and upper jaws were cleaned and preserved. Prey remains were identified using distinctive morphological characteristics of body and/or skull parts (eg mouthparts, mandibles, dentaries) based on previous collections from the region (Harrison & Bates 1991, Abu Baker & Amr 2003a). Diet composition was expressed by the number of individuals, percentage (number of individuals divided by the total number of prey individuals) and frequency of occurrence of each prey item in the pellets (number of pellets in which a prey item occurred). The total number of prey individuals in a pellet was determined using the total number of mandibles and/or skulls found (Yalden & Morris 1990).

RESULTS

Pellets were dark and cylindrical in shape with an average length of 34 ± 1.8 mm (mean \pm standard error) and 13 ± 0.2 mm in width. The sample of 87 pellets contained prey items that belonged to a total of 193 prey individuals including at least five mammal spp (Rodentia: Dipodidae, Muridae), two reptile spp (Gekkonidae, Agamidae) and unidentified species of passerine bird(s), scorpions, Coleoptera and Orthoptera (Table 1). Most pellets (76%) contained ≤ 2 prey items, the rest contained 3–5 prey items, and one pellet contained remains of 10 individual beetles (Figure 1). Out of the total 87 pellets, 61 contained rodents, 27 contained only rodents, 16 contained rodents and arthropods and 16 contained only arthropods.

The 71 mammal remains were comprised of 7% *Jaculus jaculus* (Plate 2a), 28% *Meriones crassus* (Plate 2b), 17% *Gerbillus dasyurus* (Plate 2c), 7% *G. henleyi* (Plates 2d,e), 3% *G. nanus*, and 38% rodent limbs. The pellets also contained remains of 8 Blanford's Rock Lizards *Bunopus tuberculatus* and 5 agamids *Uromastix aegyptia* (Plate 2f). An intact tail of a juvenile *U. aegyptia* was recovered from a pellet (Plate 2g). Arthropod prey items were represented by three groups: Coleoptera (beetles), Orthoptera (grasshoppers) and Arachnida (scorpions, Plate 2h).

Remains from five individuals of Pygmy Gerbil *Gerbillus henleyi* were recovered, which represent the first record of this species in Qatar. Average measurements for intact dentaries and bones of *G. henleyi* include: maxillary tooth row of 2.8 mm, mandibular tooth

Table 1. Food composition of Little Owl in Qatar in terms of percentages (number of individuals divided by the total number of prey individuals) and frequencies (number of pellets in which a prey item occurred) of prey items.

Prey item	Total number	Percentage in diet (%)	Frequency of occurrence
Mammals:			
<i>Jaculus jaculus</i>	5	2.59	5
<i>Meriones crassus</i>	20	10.36	16
<i>Gerbillus dasyurus</i>	12	6.22	12
<i>G. henleyi</i>	5	2.59	5
<i>G. nanus</i>	2	1.04	2
Unidentified rodents (limbs)	28	14.51	27
Reptiles:			
Geckos (<i>Bunopus tuberculatus</i>)	8	4.15	8
Agamas (<i>Uromastix aegyptia</i>)	5	2.59	5
Birds (Aves)	7	3.63	7
Arthropods:			
Grasshoppers (Orthoptera)	10	5.18	10
Scorpions (Arachnida)	4	2.07	4
Beetles (Coleoptera)	87	45.08	44
Total	193	100	145

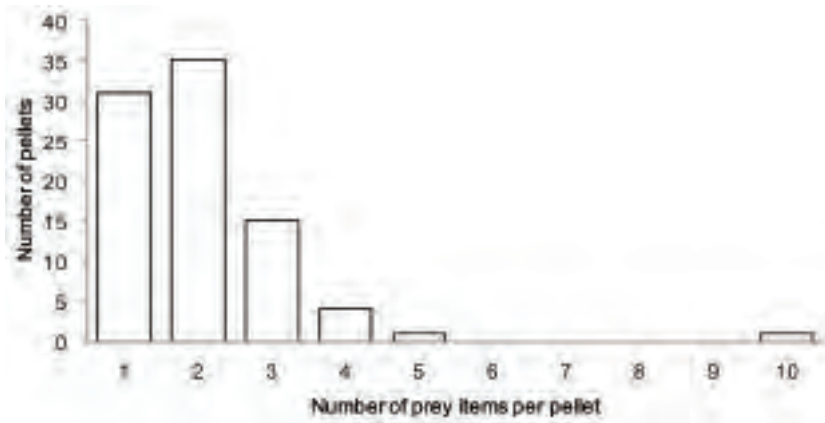


Figure 1. Number of prey items per pellet.



Plate 2a. Remains of prey items recovered from the pellets of the Little Owl *Athene noctua* (scale bar = 5 mm); upper and lower teeth of *Jaculus jaculus* (Rodentia). © Mohammad A Abu Baker

Plate 2b. Upper teeth of *Meriones crassus* (Rodentia). © Mohammad A Abu Baker



Plate 2c. Upper teeth of *Gerbillus dasyurus* (Rodentia). © Mohammad A Abu Baker

Plate 2d. Femur of *Gerbillus henleyi* (Rodentia). © Mohammad A Abu Baker

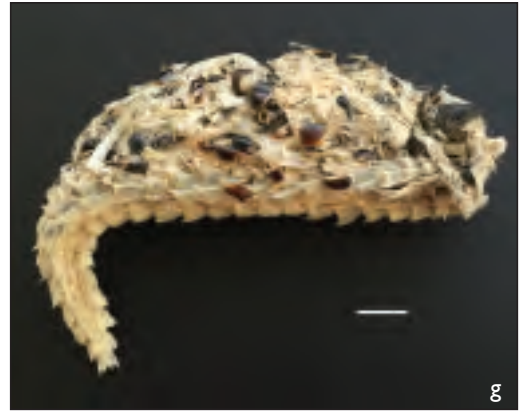


Plate 2e. Upper and lower (inset) teeth of *Gerbillus henleyi* (Rodentia). © Mohammad A Abu Baker

Plate 2f. Lower jaws of *Bunopus tuberculatus* (top) and *Uromastix aegyptia* (bottom), Reptilia. © Mohammad A Abu Baker

Plate 2g. An intact *Uromastix aegyptia* tail (Reptilia: Agamidae), broken pieces of beetle exoskeletons (Coleoptera) also visible. © Mohammad A Abu Baker

Plate 2h. Scorpion (Arachnida) pedipalps and telson. © Mohammad A Abu Baker

Table 2. Average teeth and bone measurements (mm) for Pygmy gerbil *Gerbillus henleyi*.

Study	Upper tooth row	Lower tooth row	Mandible	Humerus	Femur
Oman (single specimen, Harrison 1981)	2.4	2.6	10.7	7.6	11.0
NE Saudi Arabia (n = 1.5, Bauer 1988)	2.7	2.7			
Arabia (n = 13, Harrison & Bates 1991)	2.5	2.6	11.9		
Jordan (n = 14, Abu Baker and Amr 2003a)	2.6	2.5	10.0*		
Present study	2.8	2.7	9.8*		11.75

*excluding incisor

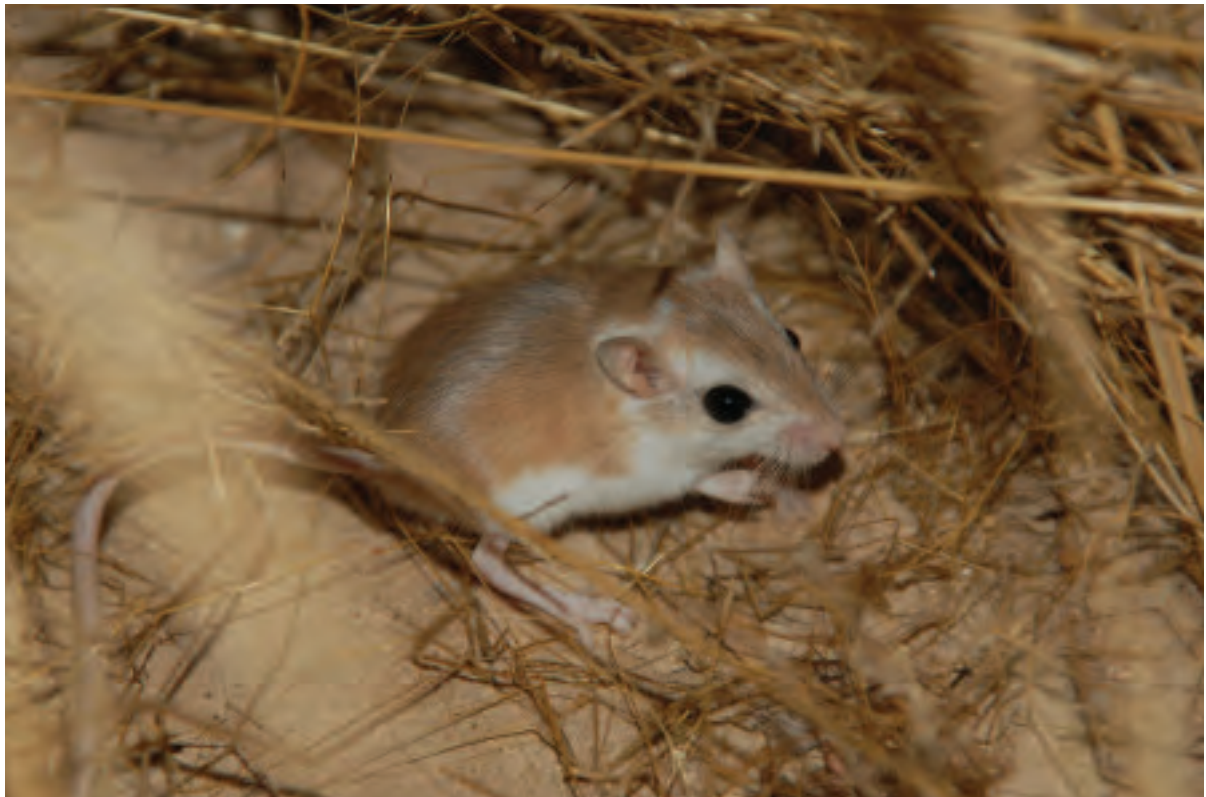


Plate 3. An adult live Pygmy Gerbil *Gerbillus henleyi* photographed at night (21.45 h, 25 May 2014), Al Reem biosphere reserve, Qatar. *G. henleyi* is distinctly small with minute limbs and ashy-grey back. © Mohammad A Abu Baker

row of 2.75 mm, mandible of 9.8 mm (excluding incisor) and four femurs 11.75 mm in length (Table 2).

DISCUSSION

In the arid environments of Qatar Little Owl diet contained a wide variety of prey items including small mammals, reptiles, birds, and several groups of arthropods. Arthropods comprised the highest frequency (c52%, of which beetles were 45%) followed by vertebrates (rodents were 37% of dietary remains). The frequency of rodent remains suggests that hunting for food was mostly done at night, to obtain prey with greater biomass and energetic yield. Similar to previous findings (Al Melhim *et al* 1997), prey remains did not contain any complete skulls. Al Melhim *et al* (1997) suggested that this is due to the prey being torn into small pieces or crushed by this small-sized owl. Previous studies from arid and semi-arid environments have shown that the Little Owl is predominantly insectivorous, its diet mainly comprising invertebrates (such as beetles, grasshoppers,

and scorpions) though in terms of dietary biomass, small mammals make up the most of its intake (Scott *et al* 2005, Ben Alaya & Nourira 2007, Chenchouni 2014, Shao *et al* 2007, Goodman 1988, Cunningham & Aspinall 2001, Obuch & Krištín 2004, Charter *et al* 2006). Al Melhim *et al* (1997) and Clayton (1991) demonstrated that Little Owl dietary composition from Jordan and Kuwait respectively was largely of small vertebrates (rodents, lizards).

Few studies have been conducted on the small mammal fauna of Qatar (Harrison & Bates 1991, Nader 1984). Our study provides crucial distribution records of small mammal species occurring in the north of Qatar. The remains of *Gerbillus henleyi* are especially important since this species has never been recorded from Qatar and our study extends its known distribution further east into the Arabian gulf coastal region (Bauer 1988). The recovered remains of *G. henleyi* undoubtedly belong to adult individuals based on the well-worn cheek teeth, small delicate limb bones, and the recorded measurements (Harrison 1981, Bauer 1988, Harrison & Bates 1991, Abu Baker & Amr 2003a, Table 2). Several live individuals of this rare and distinctly small gerbil were also seen at night while radio-tracking hedgehogs in the reserve (Plate 3). The Pygmy Gerbil is the smallest rodent known to inhabit the Arabian desert (Harrison & Bates 1991). It prefers the Hammada habitat type with scarce vegetation cover and is mostly found in association with Sundevall's Jird *Meriones crassus* and Three-toed Jerboa *Jaculus jaculus* (Abu Baker & Amr 2003a, b).

Our results strongly suggest that *Athene noctua* has a generalist diet and opportunistic feeding habits. While most higher-energy-yielding prey were nocturnal *eg Meriones crassus*, smaller to large diurnal prey (*Uromastix aegyptia*) were also hunted. Feeding and prey selection within the arid environment of Al Reem biosphere reserve was likely influenced by the temporal variations in abundance and availability of prey species (Al Melhim *et al* 1997, Van Nieuwenhuysse *et al* 2008).

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