Diet of the Long-legged Buzzard *Buteo rufinus*, Jordan

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The diet of the Long-legged Buzzard *Buteo rufinus* was investigated west of Jurf Al Darweesh area, southern Jordan. 19 intact regurgitated pellets and 15 fragmented pellets yielded 56 individual prey items representing seven species (two small mammals, two agamid lizards, one frog, one unidentified bird, and one grasshopper). Small mammals, reptiles, birds, and grasshoppers constituted 75%, 19.64%, 1.8%, and 3.6 % of the diet, respectively. Prey items were dominated by the Fat Sand Rat *Psammomys obesus* (38 individuals) and the Starred Agama *Stellagama stellio* (6), followed by the Long-eared Hedgehog *Hemiechinus auritus* (4), an unidentified agamid lizard (4), grasshoppers (2), a toad (1), and an unidentified bird (1). The results suggest that the Long-legged Buzzard preferred hunting diurnal, ground-dwelling small mammals. It was selective for higher-energy-yielding mammalian prey (*P. obesus*), yet showed some opportunistic feeding habits likely influenced by prey availability. We recommend that hunting areas of raptors be investigated during the site-selection of development projects such as renewable energy.

INTRODUCTION

The Long-legged Buzzard *Buteo rufinus* has a broad distribution within the Palearctic, Afrotropical and Indomalayan regions (Ferguson-Lees & Christie 2001, GRIN 2018). It breeds in north Africa, southeast Europe, Arabia and southwest and central Asia and forages over relatively undisturbed open habitats, particularly steppe and semi-desert and desert edges, uncultivated country with suitable crags or gorges for nesting, barren rocky or stony landscapes, including dry scrubland, but also adapts to wooded areas with sizable clearings (del Hoyo *et al* 1994, Ferguson-Lees & Christie 2001, Jennings 2010, Friedemann *et al* 2011).

In Jordan, the Long-legged Buzzard is one of the most common large breeding raptors (Qaneer *et al* 2013). It resides along the margins of the Great rift valley in Al Mujib and Dhana Biosphere Reserves, the Eastern Desert and as far as the Wadi Rum area in the south (Andrews 1995, Qaneer *et al* 2013). It is generally observed singly or in pairs, but is more gregarious during migration when larger flocks can form. Yet little is known about

Plate 1. A view of the area west of Jurf Al Darweesh, southern Jordan. Insert shows the pile of rocks used by the Long-legged Buzzard as a look-out and where pellets were collected. © *Ibrahim Al Hasani*

its local ecology such as habitat use and feeding behaviour. The present study is the first report on the Long-legged Buzzard's diet from Jordan.

METHODS

Regurgitated pellets (19 intact and 15 fragmented) from a Long-legged Buzzard day roost site (30° 44′ N 35° 47′ E) in southern Jordan were collected during September–November 2016. At least two individuals were seen using piles of rocks as a look-out/day roost site on the edge of a sparsely vegetated low area. The pair was observed flying together a few times in the area suggesting a close-by nesting site. Single birds were also seen hovering against the wind while scanning the ground. In addition, one juvenile was also recorded frequently at the site, perching on a pile of rocks and scanning its surrounding small wadis. That the site was used for feeding, nesting and/or breeding was not confirmed within the area.

The study area is situated west of Jurf Al Darweesh and represents a typical arid habitat of Jordan. The area is part of the flat highlands east of the Great rift valley (the closest distance to the rift margins is *c*15 km). The majority of the area is barren stone desert rarely covered by vegetation. It is characterised by barren, gravel plain ecosystems with scattered vegetation interspersed with seasonal streambeds (run-off wadis) and lowland areas locally known as marab (Plate 1). The dry water courses (wadis) provide vegetated bush/shrubby microsystems mainly of *Astragalus spinosus*, *Phlomis* sp, *Atriplex halimus* and *Gymnarrhena micrantha*, that reach up to 30–80 cm in height. The area is partially degraded through overgrazing by sheep.

Each pellet was soaked in warm water and teased using forceps and a needle to separate prey remains. 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, Amr 2012). Diet was expressed by the number of individuals and percentage composition (number of individuals of each prey type divided by the total number of prey individuals). The total number of prey individuals in a pellet was determined using the total number of mandibles and/or skulls found in each pellet (Yalden & Morris 1990).

RESULTS

Pellets were light and cone-shaped or cylindrical (with a few circular ones), with an average length of 85.13 ± 11.9 mm (mean ± standard error) and 47.79 ± 4.62 mm in width (N = 19). The sample of 34 pellets contained prey items that belonged to a total of 56 prey individuals including two mammal species (Rodentia: Muridae; Eulipotyphla: Erinaceidae), two reptile species (Squamata: Agamidae), one frog species (Anura: Bufonidae), an unidentified species of a passerine bird, and remains of two grasshopper species (Orthoptera). Most pellets (68%) contained one prey item, 26% contained two, and only 5% of the pellets contained three items. Additionally, 74% of the pellets contained a rodent. The mammal remains were comprised of the Fat Sand Rat *Psammomys obesus* (67.86%) and Long-eared Hedgehog *Hemiechinus auritus* (7.14%). The Starred Agama *Stellagama stellio* was the main reptilian prey (Table 1). Average measurements for intact mandibular tooth row for *P. obesus* were 5.99 ± 0.25 mm.

DISCUSSION

This is the first study on the diet of the Long-legged Buzzard in Jordan. The Fat Sand Rat, *Psammomys obesus* (a diurnal rodent and one of the largest in Jordan), followed by the Starred Agama Lizard, *Stellagama stellio* (family Agamidae) were the main prey items of

Table 1. Food composition of the Long-legged Buzzard in terms of total number and percentage of prey items in collected pellets.

Prey item	Total number	Percentage of diet (%)
Mammals:		
Psammomys obesus	38	67.86
Hemiechinus auritus	4	7.14
Reptiles and Amphibians:		
Stellagama stellio	6	10.71
Unidentified agamid lizard	4	7.14
Bufotes variabilis	1	1.79
Birds:	1	1.79
Arthropods (Orthoptera):	2	3.57
Total	**56**	**100**

the Long-legged Buzzard. *P. obesus* and *S. stellio* are also the two species with the highest population densities in the area. Therefore, it seems reasonable to conclude that they are the main food sources for birds of prey. The Long-legged Buzzard feeds primarily on small to medium-sized mammals and reptiles, but also takes birds, amphibians, large insects, and some carrion depending on local availability. Diurnal mammals may form up to 85% of its diet including many jirds (*Meriones* spp), pikas (*Ochotona* spp) and microtine voles, lagomorphs, squirrels, as well as hedgehogs. Reptiles are frequent (locally to 30–40% of prey taken) mostly larger lizards such as *Uromastyx* and *Agama*. Generally, fewer birds are taken, ranging in size from small ones *eg* larks (Alaudidae) up to gamebirds. Insects may be important at times, especially if numerous, when many orthopterans and beetles are eaten (del Hoyo *et al* 1994, Ferguson-Lees & Christie 2001, Khaleghizadeh *et al* 2005, Jennings 2010).

Long-legged Buzzards rarely hunt small birds (11.7–18.56), presumably because the energy gained from such prey would be low compared to the time and energy spent on hunting. Lizards have a higher frequency in the diet despite their low biomass, their capture is easier than that of birds (Alivizatos & Goutner 1997, Khaleghizadeh *et al* 2005, Hosseini-Zavarei *et al* 2008, Wu *et al* 2008, Bakaloudis *et al* 2012, Shafaeipour 2015). Table 2 summarizes the diet of the Long-legged Buzzard in different studies.

Within our study area all mammalian and reptilian predators (*eg* Caracal, Red Fox, False-horned Viper) are nocturnal, so the diurnal *Psammomys obesus* is mainly subject to predation by diurnal avian predators. *P. obesus* is a colonial desert rodent that inhabits wadi beds and sandy areas rich in *Anabasis articulata* and *Atriplex halimus* vegetation. It constructs its burrow underneath larger bushes of *A. articulata* or *A. halimus* that provide protection from avian predators (Harrison & Bates 1991, Tchabovsky *et al* 2001, 2002). It is strictly solitary (Daly & Daly 1975) and thus lacks a long-distance early warning system via alarm calls, it relies only on itself to detect and avoid predators. Individuals in vegetated wadis mainly feed above the ground, whereas those at the "terrace" habitats with scattered vegetation mainly hoard (Tchabovsky *et al* 2001, Tchabovsky & Krasnov 2002). It has been reported that it does not venture very far from the burrow, when foraging for food the animal would run to the nearest *Anabasis* shrub, cut a branch and come back to the burrow where it eats the richest distal parts of the branch (Gromov 2001). *P. obesus* makes an ideal prey item for the Long-legged Buzzard as it hunts from high perches or scans the ground in-flight. The presence of *P. obesus* in the pellets also suggests that the buzzard may also stalks prey or stand on the ground and wait at burrow entrances.

Table 2. Diet composition (%) of Long-legged Buzzards in different areas along its distributional range.

Study area	Mammalia	Reptilia	Aves	Amphibia	Arthropoda	Reference
Kuma delta, Russia	47	22	6	7	18	Petrov (1964)
Northern Aral, Kazakhstan	63	17	1		19	Varshavsky (1973)
Negev desert	4	34	62			Frumkin (1986)
Evros area, northeast Greece	34	21	16	0	29	Alivizatos & Goutner (1997)
Turan biosphere reserve, Iran	61.5	5.9	11.7	0	0	Khaleghizadeh *et al* (2005)
Junggar basin, northwest China	60	22	18	0	0	Wu *et al* (2008)
southeast Bulgaria	68.78	13.23	8.99	1.06	7.41	Milchev (2009)
southern Cyprus	50.5	41.7	3.5	0	0	Bakaloudis *et al* (2012)
Forests, southwest Iran	45.72	35.71	18.56	0	0	Shafaeipour (2015)
Judean mountains	18.3	47.2	32.2	0	2.3	Friedemann *et al* (2016)
southern Jordan	75	17.85	1.79	1.79	3.57	Present study

The Long-legged Buzzard seems selective for higher-energy-yielding mammalian prey (*P. obesus*), yet, shows some opportunistic feeding habits by taking smaller diurnal lizards (*Stellagama stellio*), toads, and insects. This may also be due to the seasonal effect oflizards being less active. Remains of *P. obesus* did not contain any complete skulls, this is due to the prey being torn into small pieces as the buzzard fed on the perch. The presence of Long-eared Hedgehog remains was based on the presence of white, postnatal spines in the pellets. As a nocturnal species, its presence is likely an opportunistic finding of a nest within a shrub or taken as road-kill. The feeding habits and prey selection within this arid environment will be influenced by variations in abundance and availability of prey species.

The site where the pellets were collected is designated for developing a wind farm project. As a raptor hunting in open areas, the Long-legged Buzzard is highly vulnerable to the impacts of potential wind energy developments through collision and electrocution with powerlines (STRIX 2012). The species is also threatened by habitat degradation caused by large-scale agricultural practices and overgrazing which may reduce prey populations. Electrocution has also caused fatalities (Mebs & Schmidt 2006). In Saudi Arabia, stone quarrying has reduced populations (GRIN 2018). In Jordan, the collection of adult raptors is practiced, with Long-legged Buzzard being the most captured raptor because of its relatively large size and attractive plumage (Qaneer *et al* 2013). Poisoning is also practiced in and around agricultural areas to eliminate rodents and other animals, while raptors often die from drinking poisoned water (Qaneer *et al* 2013, Thiollay 2007). Studies have shown that changes in *Buteo* populations are related to changes in the population densities of favoured mammals (*eg* Rough-legged Buzzard *B. lagopus* Potapov 1997; Common Buzzard *Buteo buteo* Buteta *et al* 2010). We recommend that raptors' feeding behaviour and preferred hunting areas be investigated prior to the development of wind energy projects in the area, this would help development of practical criteria for site selection and management plans to conserve these raptors.

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