

The oasis effect: bedouin gardens benefit resident and migratory birds in southern Sinai, Egypt

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St Katherine protectorate in southern Sinai is an important bird area (BirdLife International 2012). Despite this classification there is little quantitative data relating to birds there, with no bird observatories or ringing stations, and no long-term data available on birds in the Sinai as a whole (Goodman *et al* 1989, Ibrahim 2011). This is in contrast to neighbouring Israel, which has an established history of bird-ringing and has been extensively studied as an important migratory corridor (Shirihai 1996). In the 1970s an Israeli study demonstrated that migratory species were feeding in the gardens associated with St Catherine's monastery and suggested that the southern Sinai oases were acting as important refuelling sites for migratory birds (Lavee & Safriel 1974). More recent surveys have been conducted in St Katherine protectorate by Operation Wallacea, 2006–2009, and these recorded a high diversity of migratory birds in addition to resident species (White *et al* 2008).

St Katherine protectorate covers much of southern Sinai (435 000 ha) and encompasses the entire Ring Dyke massif (BirdLife International 2012), a mountain range that includes Egypt's highest peaks, Gebel Katherine (2641 m), Gebel Um Shomar (2586 m) and Gebel Musa (2280 m). The habitat within the massif is typified by rugged granite mountains which are interspersed by a network of deeply cut wadis and ravines. The higher altitudes are associated with a milder climate, which facilitates the cultivation of orchard gardens that are exclusive to the mountain region. These oasis-like gardens form a distinctive part of the landscape (Plate 1) and contain a higher diversity of plants and insects than surrounding habitat (Norfolk *et al* 2013, 2014). During our most recent expedition to the region, February–March 2014, we observed higher densities of birds within the gardens. It was also noted that spring migrants were exclusively utilising the gardens and were absent from surrounding sparsely-vegetated habitat (Norfolk *et al* 2015). Here we report bird sightings from a previous expedition in 2012 carried out in later spring and summer.

METHODS

The expedition took place 15 April–15 August 2012, with the primary aim of collecting population data on the rare endemic butterfly, the Sinai Hairstreak *Satyrrium jebelia* (Power *et al* 2014). The butterfly has a small range and persists only in the high mountain region within the St Katherine protectorate. Throughout the entire period all bird sightings were recorded, along with their location and abundance. Birds were observed with binoculars or identified by call. Field work was restricted to the high mountain region (>1300 m asl), with surveys conducted in the wadis surrounding St Katherine town (Wadi Shraig, Wadi Arbein, Wadi Ahmar, Jebel Katherine, Abu Druce, Wadi El-Freya, Wadi Jebel, Abu Towaita). The majority of time was spent in the unmanaged mountainous habitat where the butterfly was present, or within the bedouin gardens. Bird sightings were classified according to their location, with habitats categorised as either gardens (Plate 2; areas actively irrigated and managed for agriculture) and unmanaged habitat (Plate 3; wadi beds and mountain slopes). Individual sightings of Rock Dove/Feral Pigeon *Columba livia*, Laughing Dove *Spilopelia senegalensis*, White-crowned Black Wheatear *Oenanthe leucopyga*, Sinai Rosefinch *Carpodacus synoicus*, Desert Lark *Ammomanes deserti* and Rock Martin *Ptyonoprogne fuligula* were not noted due to their high numbers.

RESULTS

In total we recorded 51 bird species. Of these 18 were residents (Table 1) and 33 were migrants (Table 2). Twenty two migratory species were observed exclusively within the gardens (all passerines) and six were seen in both habitat types (Figure 1). These species are insectivorous and frugivorous, and many were observed feeding in the gardens. Blackcap, Golden Oriole and Garden Warbler were seen feeding on apricots and plums, and a small flock of Eastern Orphean Warblers and a Hooded Wheatear were seen feeding on mulberries. Several migrant insectivores were also observed foraging within the gardens, such as Spotted Flycatcher, Semi-Collared Flycatcher, Wood Warbler, Common Redstart and European Bee-eater.

Only five migratory species were seen exclusively in the unmanaged habitat and three of these were large raptors in flight. These raptors were observed migrating through Wadi Jebel in a large mixed-species group of over 100 individuals which comprised mostly of Steppe Buzzard and Long-legged Buzzard, with one Honey Buzzard. Ortolan Bunting and Eastern Bonelli's Warbler were also observed only in unmanaged habitat in the well-vegetated Wadi Ahmar.

Of the 18 resident bird species recorded, four species were observed exclusively within the gardens (Table 1). Four resident species were only recorded in the unmanaged habitat; Chukar, Sand Partridge, Desert Lark and Bonelli's Eagle. The other nine resident species were recorded in both habitats and tended to be observed in relatively well-vegetated areas in both the gardens and unmanaged habitat. White-crowned Black Wheatear and Rock Martin were observed using bedouin structures for nesting.

DISCUSSION

These data confirm the value of St Katherine protectorate for birdlife, particularly for migratory species which consisted of over half the species recorded. Though designated an IBA for its range-restricted resident species, the region clearly plays an important role for migratory birds as well. The oasis-like bedouin gardens supported high numbers of both migrant and resident species suggesting that they are important for birds throughout



Plate 1. View of St Katherine town from Abu Gifa shows the distinctive presence of walled gardens in the protectorate, southern Sinai, Egypt. © Olivia Norfolk

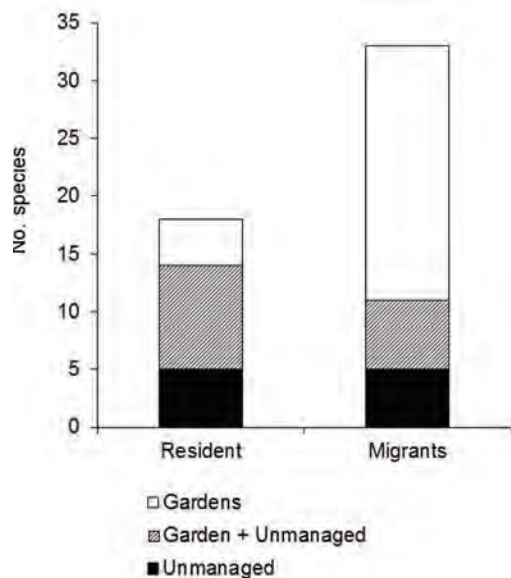


Figure 1. Total number of bird species observed and habitat type, 15 April–15 August 2012, St Katherine protectorate.

Table 1. Resident breeding bird species observed showing number of sightings and location, 15 April–15 August 2012, St Katherine protectorate. Y = Birds present.

Species	Feeding guild	Sightings	
		Gardens	Unmanaged habitat
Chukar <i>Alectoris chukar</i>	Granivore	0	16
Sand Partridge <i>Ammoperdix heyi</i>	Granivore	0	5
Kestrel <i>Falco tinnunculus</i>	Carnivore	2	3
Bonelli's Eagle <i>Aquila fasciata</i>	Carnivore	0	1
Laughing Dove <i>Spilopelia senegalensis</i>	Granivore	Y	0
Rock Dove <i>Columba livia</i>	Granivore	Y	Y (Feral)
Collared Dove <i>Streptopelia decaocto</i>	Granivore	2	0
Hoopoe <i>Upupa epops</i>	Insectivore	1	0
White-spectacled Bulbul <i>Pycnonotus xanthopygos</i>	Frugivore + insectivore	4	1
Palestine Sunbird <i>Cinnyris osea</i>	Nectarivore	7	14
Tristram's Starling <i>Onychognathus tristramii</i>	Insectivore + frugivore	8	7
White-crowned Black Wheatear <i>Oenanthe leucopyga</i>	Insectivore	Y	Y
Hooded Wheatear <i>Oenanthe monacha</i>	Insectivore	1	14
Rock Martin <i>Ptyonoprogne fuligula</i>	Insectivore	Y	Y
Scrub Warbler <i>Scotocerca inquieta</i>	Insectivore + frugivore	4	7
House Sparrow <i>Passer domesticus</i>	Granivore	5	0
Sinai Rosefinch <i>Carpodacus synoicus</i>	Granivore	Y	Y
Desert Lark <i>Ammomanes deserti</i>	Granivore	0	Y
Total		34	68



Plate 2. A typical bedouin garden, Abu Towaita, St Katherine protectorate, Egypt. Garden habitats typified by the presence of orchard trees, interspersed by herbs, vegetables and wild shrubs. © Andrew Power



Plate 3. Example of unmanaged habitat, Wadi El-Freya, St Katherine protectorate, Egypt. Unmanaged habitat typified by sparse shrubby vegetation. © Andrew Power

the year and not just in spring (*cf* Norfolk *et al* 2015). The bedouin utilise rainwater harvesting to boost the agricultural potential of the land, which results in a higher plant density than the outside environment (Norfolk *et al* 2013). The mountain gardens thus provide valuable additional resources, and appear to act as refuelling stations for migrant birds whilst bolstering the resources available to resident species. Other studies have demonstrated the value of oases for breeding birds in arid Tunisia (Selmi & Boulinier 2003) and it is perhaps inevitable that irrigated land in arid climates has a positive effect on bird diversity, in contrast to temperate and tropical countries, where agricultural land generally has a negative impact on biodiversity (Benayas & Bullock 2012).

Table 2. Migrant bird species observed showing number of sightings and location, 15 April–15 August 2012, St Katherine protectorate.

Species	Feeding guild	Sightings	
		Gardens	Unmanaged Habitat
Sparrowhawk <i>Accipiter nisus</i>	Carnivore	1	4
Long-legged Buzzard <i>Buteo rufinus</i>	Carnivore	0	1
Steppe Buzzard <i>Buteo buteo vulpinus</i>	Carnivore	0	2
Honey Buzzard <i>Pernis apivorus</i>	Carnivore	0	1
Turtle Dove <i>Streptopelia turtur</i>	Granivore	3	0
European Bee-eater <i>Merops apiaster</i>	Insectivore	2	3
Golden Oriole <i>Oriolus oriolus</i>	Frugivore + insectivore	5	0
Wheatear <i>Oenanthe oenanthe</i>	Insectivore	2	0
Rock Thrush <i>Monticola saxatilis</i>	Insectivore	2	0
Whinchat <i>Saxicola rubetra</i>	Insectivore	1	0
House Martin <i>Delichon urbicum</i>	Insectivore	2	1
Swallow <i>Hirundo rustica</i>	Insectivore	2	1
Red-rumped Swallow <i>Cecropis daurica</i>	Insectivore	1	0
Swift <i>Apus apus</i>	Insectivore	1	1
Wood Warbler <i>Phylloscopus sibilatrix</i>	Insectivore	3	0
Garden Warbler <i>Sylvia borin</i>	Insectivore + frugivore	4	0
Blackcap <i>Sylvia atricapilla</i>	Insectivore + frugivore	4	1
Eastern Olivaceous Warbler <i>Iduna pallida</i>	Insectivore + frugivore	1	0
Eastern Bonelli's Warbler <i>Phylloscopus orientalis</i>	Insectivore	0	1
Eastern Orphean Warbler <i>Sylvia crassirostris</i>	Insectivore + frugivore	1	0
Lesser Whitethroat <i>Sylvia curruca</i>	Insectivore + frugivore	1	0
Semi-collared Flycatcher <i>Ficedula semitorquata</i>	Insectivore	4	0
Spotted Flycatcher <i>Muscicapa striata</i>	Insectivore	8	0
Masked Shrike <i>Lanius nubicus</i>	Insectivore + carnivore	5	0
Isabelline Shrike <i>Lanius isabellinus</i>	Insectivore + carnivore	2	0
Ortolan Bunting <i>Emberiza hortulana</i>	Granivore + insectivore	0	1
Black-headed Bunting <i>Emberiza melanocephala</i>	Granivore + insectivore	1	0
Yellow Wagtail <i>Motacilla flava</i>	Insectivore	1	0
Redstart <i>Phoenicurus phoenicurus</i>	Insectivore	5	0
Tree Pipit <i>Anthus trivialis</i>	Insectivore	2	0
Barred Warbler <i>Sylvia nisoria</i>	Insectivore + frugivore	1	0
Subalpine Warbler <i>Sylvia cantillans</i>	Insectivore + frugivore	1	0
Eastern Reed/Marsh Warbler <i>Acrocephalus</i> sp	Insectivore	1	0
Total		67	17

If climate change predictions for Egypt are correct, the St Katherine protectorate will become hotter and drier (Hulme *et al* 2001) and bedouin gardens may take on added importance as the food supply and resources in unmanaged habitat decrease. Maintaining the gardens is becoming increasingly challenging as bedouin become more reliant on paid employment and have less time to devote to garden maintenance (Gilbert 2011). According to local bedouin the increase in illegal growing of opium poppies and cannabis is also a threat to the traditional gardens, diverting water from both natural habitats and the gardens. Increasing populations and tourism pressures could also place further constraints on water demand (Abdulla *et al* 2003, Hilmi *et al* 2012). Despite the multiple-

pressures being placed on these gardens, their maintenance is likely to be highly beneficial for birdlife within the St Katherine protectorate IBA.

ACKNOWLEDGEMENTS

We thank the Egyptian Environmental Affairs Agency and Mohamed Qotb, St Katherine Protectorate manager, for permission to do the work. Niall Keogh assisted with bird identification. We are grateful to our expert local bedouin guides Nasr Mansour and Suleiman Abusada. We thank Lisa Gecchele, Brian Power, Peter Cutler, Féaron Cassidy, Luke McLeod and Katy Thompson for field support and companionship and everyone at Fox Camp for logistical help.

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