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Bird surveys and distance sampling in St Katherine Protectorate, South Sinai, Egypt in 2007

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Abstract

Operation Wallacea and BioMAP Egypt conducted bird surveys and distance sampling in St Katherine Protectorate in June and July 2007. 18 repeat surveys in St Katherine City estimated bird abundance, diversity and density. 33 species were recorded, 17 during expeditions and 18 in St Katherine City. Rock Dove *Columba livia*, Laughing Dove *Streptopelia senegalensis* and Sinai Rosefinch *Carpodacus synoicus* had the highest abundance and density in the repeated St Katherine surveys. A number of bird species that formerly appeared to be common in St Katherine Protectorate were detected only rarely or were not detected at all in recent surveys. Mourning Wheatear *Oenanthe lugens* and a number of Hooded Wheatear *Oenanathe monacha* were observed in a variety of surveys, but had probably been missed in 2006. A pair of Bonelli's Eagle *Hieraaetus fasciatus* was observed in Wadi Arbaein for the second year running. Early migrant warblers were noted on stopover in mid-July, such as Olive-tree Warbler *Hippolais olivetorum* and Orphean Warbler *Sylvia hortensis*. Remaining bird populations are threatened with increasing pressure from overgrazing, settlement, expanding tourism, illegal hunting and demands placed on scarce water resources. St Katherine Protectorate is an important area for both resident and migratory birds, and requires ongoing protection, management, and further research.

Keywords: abundance, density, diversity, mountains, wadis

Introduction

St Katherine Protectorate Important Bird Area (IBA) is the focus of biological monitoring and research carried out by Operation Wallacea/BioMAP Egypt, starting in 2005. The main aim is to map biodiversity across St Katherine Protectorate and south Sinai. To achieve this a mapping grid of approximately 100 km² (10km x 10km) covering the Protectorate is used for baseline surveys (Grainger 2003a). This paper documents bird survey results from the 2007 season, including baseline repeated surveys in St Katherine City.

The Sinai Peninsula is located where the Asian and African continents meet and is a distinctive biological region with characteristic flora and fauna (Zalat *et al.* 2001). A large part of southern Sinai was given protected status in 1996 through the St Katherine Protectorate, established by the Egyptian Environmental Affairs Agency (EEAA) with EU funding. Birdlife International has given the Protectorate Important Bird Area (IBA) status. Resident bird communities include Egypt's Sahara-Sindian biome-restricted species, with many of these species uncommon or not represented in other IBAs in Egypt (BirdLife 2005). Goodman *et al.* (1989) reported around 50 resident breeding birds in the area, including species such as Sinai Rosefinch *Carpodacus synoicus* and Tristram's Starling *Onychognathus tristramii*.

Southern Sinai has a predominantly mountainous environment consisting of drainage systems made up of a number of connected wadis (ephemeral river beds). Geologically the peninsula is split into three sections: the northern sand dunes, a central limestone plateau, and the high-altitude igneous rock mountains of the south. Southern Sinai lies in the north African belt and has a Saharan-Mediterranean climate, with hot summers (mean temperature 36°C in August) and cool winters (mean minimum temperature 7.8°C in February). The area has an arid climate with a mean annual rainfall of 60 mm yr^{-1} with the addition of snow melt on higher mountain peaks, which can receive around 300 mm yr^{-1} (Grainger 2003b). Bedouin people have inhabited the mountains for hundreds of years, using the land for camels, goats

and sheep and tending gardens with fruit and olive trees in wadis. This natural resource base and cultural heritage are now at risk from significant recent development pressures (BirdLife 2005).

Bird communities in St Katherine Protectorate are threatened by increasing pressure by settlement, expanding tourism and demands placed on scarce water resources (Gilbert 1999, James 2004, Hoyle & James 2005). The tourism industry in the form of coastal resorts such as Sharm El Sheikh is one of the fastest growing in the world, and increasing numbers of people visit the historical sites in St Katherine. Grainger (2003b) states there are an average of 700 tourists per day visiting St Katherine's Monastery. Other important threats include overgrazing and recent shifts from traditional fruit crops to illegal cannabis and poppy plantations.

The St Katherine Protectorate is thus an important area for both resident and migratory birds and deserves ongoing protection, appropriate management and further research in conservation science.

Materials & Methods

Bird surveys were conducted between June 29th and July 29th 2007 with an aim to record breeding resident birds and early migrants. The bird research team was lead by Matthew White (Operation Wallacea/BioMAP & University of Plymouth) and assisted by Alaa Eldeen Mohammed (St Katherine Protectorate). Line transects of 1.0 to 2.7 km were walked along each wadi starting as near as possible to 0600 h (local time) at a slow pace of 1 km per hour. Late afternoon surveys were also conducted from around 1700 h. Temperatures were very high and bird activity low throughout the middle of the day (Meakin *et al.* 2005).

In surveys of previous years, most birds were concentrated along the middle semi-vegetated parts of wadis and in the Bedouin gardens: the landscape was therefore divided into wadi-beds (sampled strata) and mountainsides (unsampled strata). Random start and end points were applied to each transect using a random-number generator. Locations, distances and elevations of various points along the transect were noted using hand-held GPS (Garmin eTrek).

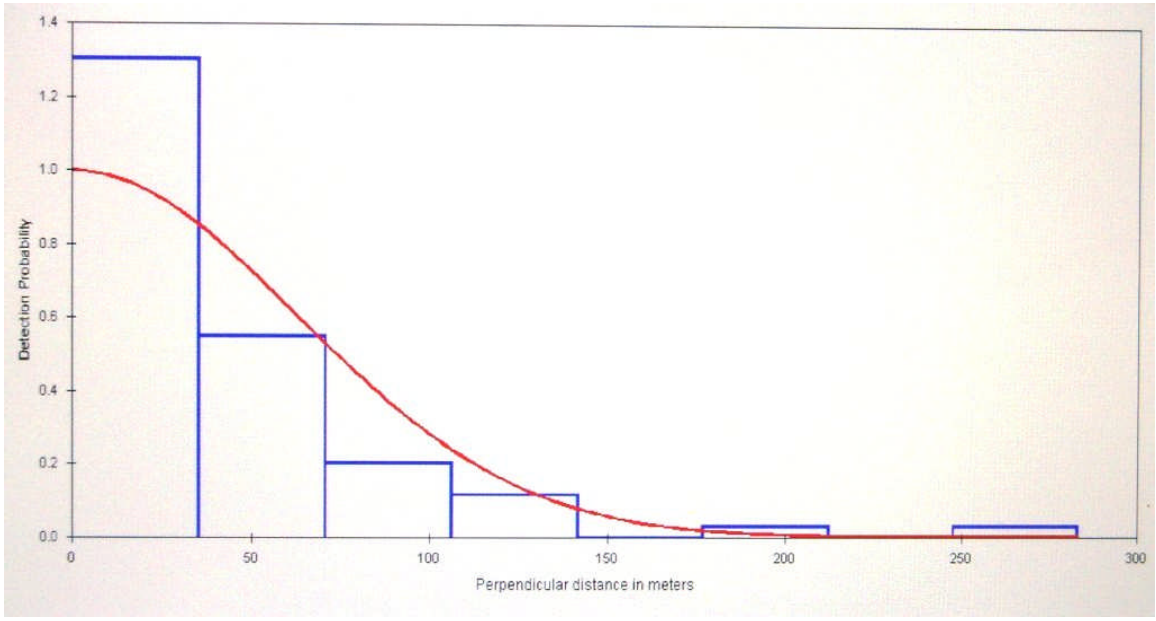
The perpendicular distance in meters was recorded from the transect line to each observation (single or cluster of birds). A Bushnell Scout laser rangefinder was used to estimate distance in 2007, improving the accuracy of distance observations. Each bird species, time, number, possible sex, flying or perched, heard or seen, habitat, distance and notes were recorded on a pre-prepared data sheet.

St Katherine City transect surveys were also conducted, representing three different transects with different predicted levels of human disturbance. Each was repeated six times (0600 and 1700 h) to estimate the average diurnal abundance of common birds, diversity and densities. All transects were about 2.5 km long. Distance 5 was used to estimate the densities and detection probabilities of common birds, with data from all 18 transects combined to provide an adequate sample size. Densities of some individual species were calculated when at least 30 observations were available, to avoid bias (Stanbury 2000). All species apart from Sinai Rosefinch had a detection model with a half-normal curve fitted (Fig 1) and series expansion turned off, the options used for the Breeding Bird Survey (Stanbury 2000). Most Sinai Rosefinch records were very close to the transect route, because birds were feeding on seeds in camel dung: because of this, a uniform curve detection model was used for this species.

Sites: (Fig 2) In the first week of July, we ran surveys at the oasis of Ain Hodra, mostly using different areas from those of 2006 (White *et al.* 2007), although some were repeat transects. In the second week, a new part of the Sheik Awad area was surveyed (Wadi Gharba, Wadi Sulaf).

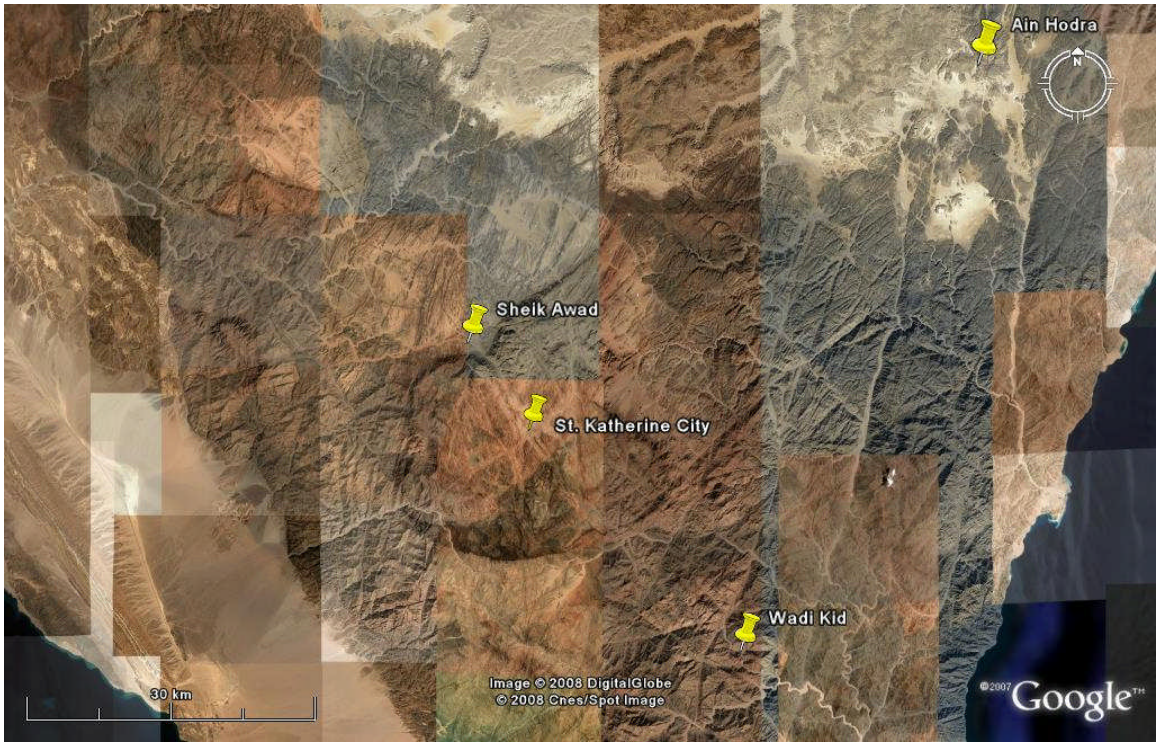
Wadi Kid was surveyed in the third week for the first time. Throughout June and July, three transects in St Katherine City were surveyed (Fig 3).

Figure 1: Distribution of observations of White-tailed Wheatear for the St Katherine City surveys, together with the half-normal detection probability fitted by Distance 5.0



Ain Hodra Oasis (ca. 600 a.s.l) is located near the head of Wadi Hodra to the north of the road to Dahab. The site consists of two main Bedouin gardens with cultivated date palms fruit trees and various vegetables; it is also used for campsites for tourists. Further north of the oasis the wadi opens into a wide river bed with low level scrub and steep cliffs of sandstone and metamorphic rock.

Figure 2: South Sinai bird survey areas in 2007



Sheik Awad, including Wadi Gharba and Wadi Sulaf (ca.1100–1200 m a.s.l.) is just outside the north-west of the Ring Dyke, within three-hours walking distance to the north of St Katherine. Surrounded by high granite mountains, this area has a series of wells used for irrigation, and a variety of crops grown in Bedouin gardens with several different species of trees. Al Karm Ecolodge provides accommodation for tourists in the area. Local Bedouin said there was less water in the wadi this year (2007), with possible detrimental effects to the habitat.

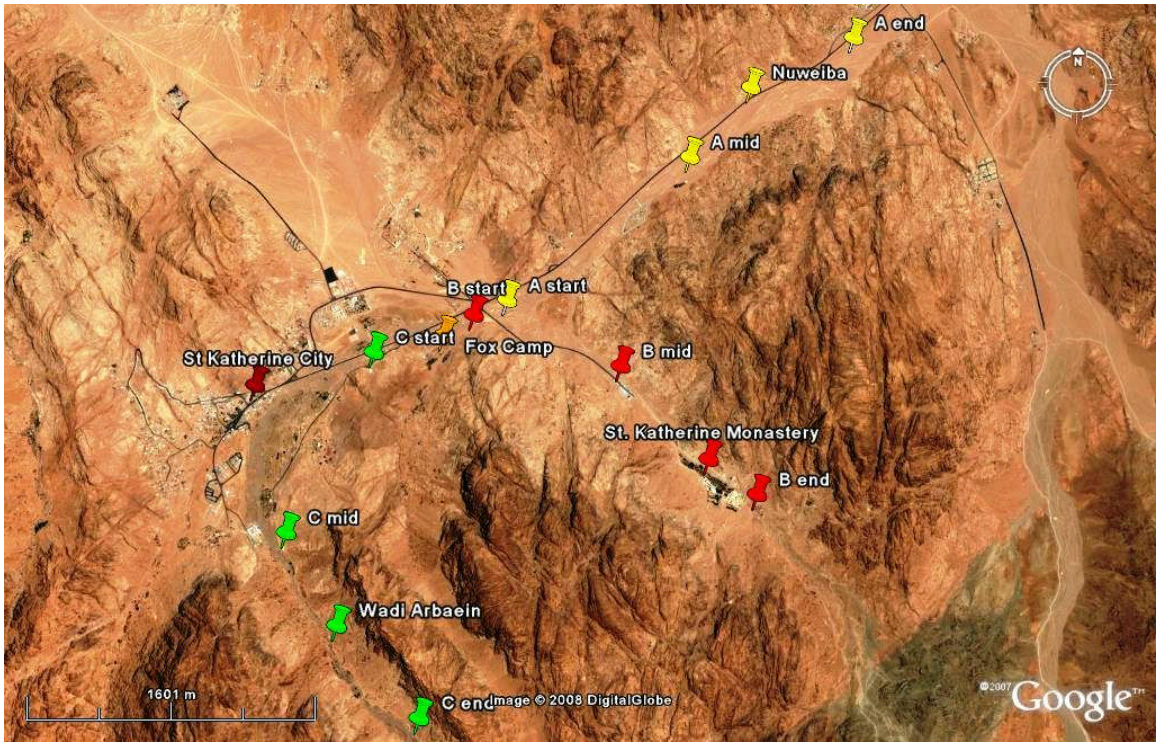
Wadi Kid (583-716 m a.s.l.) is a very dry, lower-altitude wadi, with only one small Bedouin garden and settlement. Most of the wadi consists of an open flat large central gravel plain with low scrub and acacia trees, sparsely concentrated near to the wadi sides. One isolated Bedouin garden had a high concentration of birds in an old date palm plantation.

Nuweiba road is a disturbed large flat open wadi with with patchy low-level scrub vegetation and high granite mountains on either side. The only main road out of St Katherine heads north-east, to the west of the transect. There is also a visitor centre and gravel car park based close to the start of the east side of the transect.

Wadi Arbaein (1700-1900 m a.s.l.) is on the south side of St Katherine City, with the Suez Canal University Environmental Research Centre at its mouth, rising through red granite boulders with high steep cliffs, and ending at the garden of Deir El Arbaein at the foot of Mount St Katherine, Egypt's highest mountain. Wadi Arbaein receives reasonably heavy camel traffic and human disturbance. In the winter the steep wadi sides can receive snow melt from the high mountains, replenishing the wells in good years.

St Katherine's Monastery is in Wadi El Deir, a heavily disturbed, large open wadi. The monks of the monastery have cultivated and tended their fruit and vegetable gardens for centuries. The road and pathway leading to the monastery receive very heavy vehicle, animal and human traffic. Early most mornings, hundreds of people walk from the car park (the mid-point of the transect) up to the monastery.

Figure 3: St Katherine City repeated transects 2007



Key: A – Nuweiba road transect, B – St Katherine Monastery transect, C – St Katherine/Wadi Arbaein transect, Mid – middle point of transect

Results

During 35 line-transect surveys (17 expedition & 18 St Katherine City), a combined total of 2,183 birds were recorded, 587 in expedition surveys and 1596 in St Katherine City surveys Tables 1 & 2). A total of 33 different species of birds were recorded between 29th June and 29th July 2007, both during and extra to the surveys. Survey effort in transects was about 40 hours, 20 in expedition surveys and about 20 in St Katherine surveys. St Katherine City had the highest diversity of species (22), but survey effort was much greater for this site (18 separate transects), as opposed to about five for each wadi expedition survey.

Rock Doves were the most abundant species overall (38% of total bird abundance in expedition surveys), followed by Laughing Dove (13%), Desert Lark (11%) and White-tailed Wheatear (9%). The Sheik Awad area had the highest total number of birds of all three expeditions (53% of all birds). Rock Doves were also the most frequently seen during the expedition surveys (12/15), followed by Rock Martin and White-tailed Wheatear (10/15).

Ain Hodra: 11 different species were recorded during and extra to the surveys. Rock Dove (42%) and Laughing Dove (31%) were by far the most abundant species of the four transects. A male Hooded Wheatear was recorded perching on a rock in the main Wadi Hodra, possibly missed from the surveys in 2006. A single Egyptian Vulture *Neophron percnopterus* was observed soaring over the Wadi Hodra cliffs, also present in 2006 (White *et al.* 2007).

Sheik Awad area – Wadi Sulaf: 11 species were recorded at the Sheik Awad site from the five transects. Rock Dove (41%) followed by Desert Lark (19%) were the most abundant species. A male Mourning Wheatear was noted on 12 July at 1912 h perched on a rock in Wadi Sulaf, a species not recorded since 2002 on these surveys. A Common Kestral was seen gliding over Wadi Gharba on 12 July 2007 at 1020 h, probably the same hand-reared bird mentioned by Meakin *et al.* (2005).

Wadi Kid: A high diversity of species was recorded at Wadi Kid (16) but in much lower abundances than elsewhere. Again, Rock Dove was most abundant (19%) over the five surveys, followed by Sand Partridge (18%). Two species of note recorded in surveys were both cuckoos, seen initially in Bedouin gardens. The Common Cuckoo was being mobbed by White-spectacled Bulbuls, not seen during surveys since 2002. The rarer Great Spotted Cuckoo was observed perching on a date palm, not seen since 2005. Another interesting observation was the pair of Brown-necked Ravens, not seen on any other survey in 2007 including the St Katherine City surveys: the pair was seen casually several times, gliding over the wadi cliffs in early morning and late evening. A small number of Olivaceous Warblers were seen during the surveys using *Acacia* trees, probably for stop-over sites on migration, evidence of the Sinai being an important migration route for warblers. A dead female Kestrel was found outside the Bedouin garden of Wadi Kid, cause of death unknown.

St Katherine City surveys: St Katherine harboured the greatest diversity of species (22) observed during and extra to line-transect surveys. Only 13 species were observed during the 18 transects. The Monastery had the highest transect abundance (41% of observations), followed by Wadi Arbaein (40%) and Nuweiba (19%). In terms of average species abundance, Rock Dove had the highest (54%), followed by Laughing Dove (13%), Sinai Rosefinch (10%) and White-tailed Wheatear (5%). The lowest abundances (2) were the migrant warblers, Common Kestral and Bonelli's Eagle (2). Rock Dove, Laughing Dove and White-tailed Wheatear were also in the top four species abundance in expedition surveys.

Table 1: Total numbers seen of each species for surveys in 2007

Species	Status	No. of Surveys Rec. (15)	Ain Hodra	Sheikh Awad	Wadi Kid	St Katherine City	Total
Sand Partridge *Ammoperdix heyi*	R	1	*		17	*	17
Chukar *Alectoris chukar*	R	1			2		2
Hoopoe *Upupa epops*	R	*				*	*
Hume's Owl *Strix butleri*	R	*				*	*
Common Swift *Apus apus*	M	*				*	
Rock Dove *Columba livia*	R	12	76	127	18	*	221
Eurasian Collared-Dove *Streptopelia decaocto*	R	*				*	*
Laughing Dove *Streptopelia senegalensis*	R	8	56	13	8	*	77
Great Spotted Cuckoo *Clamator glandarius*	M	1			1		1
Common Cuckoo *Cuculus canorus*	M	1			1		1
Common Kestral *Falco tinnunculus*	R	*		*		*	*
Sooty Falcon *Falco concolor*	R	*				*	*
Egyptian Vulture *Neophron percnopterus*	R	*	*				*
Bonelli's Eagle *Hieraaetus fasciatus*	R	*				*	*
Common Sandpiper *Actitis hypoleucos*	M	*				*	*
Brown-necked Raven *Corvus ruficollis*	R	*			*		*
Mourning Wheatear *Oenanthe lugens*	R	*		*			*
White-tailed Wheatear *Oenanthe leucopyga*	R	9	12	34	5	*	51
Hooded Wheatear *Oenanathe monacha*	R	1	1		*		1
Blackstart *Cercomela melanura*	R	5	11	3	7		21
Tristram's Starling *Onychognathus tristramii*	R	3		5	3	*	8
Rock Martin *Hirundo fuligula*	R	10	6	12	10	*	28
Streaked Scrub Warbler *Scotocerca inquieta*	R	4		12	2	*	14
White-spectacled Bulbul *Pycnonotus xanthophygos*	R	4	2		8		10
Olivaceous Warbler *Hippolais pallida*	M	3			7	*	7
Olive-tree Warbler *Hippolais olivetorum*	M	*				*	*
Arabian Warbler *Sylvia leucomelaena*	R	*					*
Orphean Warbler *Sylvia hortensis*	M	*				*	*
Desert Lark *Ammomanes deserti*	R	10	2	59	4	*	65
Palestine Sunbird *Nectarinia osea*	R	*				*	*
House Sparrow *Passer domesticus*	R	2	15				15
Trumpeter Finch *Buccanetes githaginea*	R	*				*	*
Sinai Rosefinch *Carpodacus synoicus*	R	4		48		*	48
TOTAL			181	313	93	*	587

* observed outside the survey times

Nuweiba Road: Eight species were recorded during the course of the six transects. The most abundant species were Rock Dove (76%), observed in all surveys, and Streaked Scrub Warbler (5%), observed in five of the six surveys. On the 28th of July, at about 0619 h, seven Common Sandpiper were seen roosting outside the Protectorate visitor centre, and seven were again noted during the followed survey at 1807 h in the same position. This is the first time this species has been recorded during these surveys: they were probably passage migrants on their way to the coast to the south.

Table 2: St Katherine City, average number of birds per transect (n=6)

Species	Status	Nuweiba Road	St Katherine Monastery	Wadi Arbaein	Total
Sand Partridge *Ammoperdix heyi*	R			1	1
Rock Dove *Columba livia*	R	37.6	55.1	50.6	143.3
Eurasian Collared-Dove *Streptopelia decaocto*	R	0.1	9.6	0.3	10
Laughing Dove *Streptopelia senegalensis*	R	1.3	17.1	15.5	33.9
Common Kestral *Falco tinnunculus*	R		0.1		0.1
Bonelli's Eagle *Hieraaetus fasciatus*	R			0.6	0.6
Common Sandpiper *Actitis hypoleucos*	M	2.3			2.3
White-tailed Wheatear *Oenanthe leucopyga*	R	1.6	6.5	6	14.1
Tristram's Starling *Onychognathus tristramii*	R	0.6	4.5	4	9.1
Rock Martin *Hirundo fuligula*	R	1	3.5	3.3	7.8
Streaked Scrub Warbler *Scotocerca inquieta*	R	2.6	2.3	2.5	7.4
Olive-tree Warbler *Hippolais olivetorum*	M			0.1	0.1
Orphean Warbler *Sylvia hortensis*	M		0.1	0.1	0.2
Desert Lark *Ammomanes deserti*	R	2.3	2	3.8	8.1
Palestine Sunbird *Nectarinia osea*	R		0.5		0.5
Sinai Rosefinch *Carpodacus synoicus*	R		7.1	19	26.1
TRANSECT TOTAL		49.4	108	107	264.6

St Katherine Monastery: 12 species were recorded in the course of the six Monastery transects. The most abundant species were Rock Dove (51%), Laughing Dove (16%), Eurasian Collared Dove (9%), all of which were seen in all surveys. Other notable species not recorded on Nuweiba transects were Tristram's Starling (4%), Sinai Rosefinch (7%), a single Kestrel and three Palestine Sunbirds feeding from flowers in the monastery garden. White-tailed Wheatear, Rock Martin, Desert Lark were also recorded in all surveys.

Wadi Arbaein: 13 species were recorded during six Wadi Arbaein transects. The most abundant species were Rock Dove (47%), Sinai Rosefinch (18%) and Laughing Dove (14%), all of which were seen during all surveys. Sinai Rosefinch were nearly all observed in the half of Wadi Arbaein distal to the town (see Fig 2). Other species not recorded in the previous two transects were Bonelli's Eagle (2 adults) and migrating Olive-tree and Orphean Warblers. After four observations throughout June and July, a pair of Bonelli's Eagles was positively identified gliding and perching in various locations along Wadi Arbaein in the early morning and late afternoon. On one occasion (not during surveying), a young juvenile was seen flying by the side of one of the adults, strong evidence that breeding has taken place. After several conversations with local Bedouin, they also positively identified the eagles from field guides and said they may have moved from Wadi Gebel to breed in Wadi Arbaein two years previously. Baha El Din (2000) notes that Bonelli's Eagle were present in Wadi Arbaein in the year 2000, and it seems likely these individuals have remained since then, feeding on the plentiful Rock Hyrax (*Procavia capensis*) and Spiny Mouse (*Acomys* spp).

Densities: We selected the common species (>30 obs) and combined the repeat-survey data from St Katherine City (where all surveys had the same observer MLJW, the same length [2500 m], and similar habitat). Rock Dove had the highest density, followed by Laughing Dove and Sinai Rosefinch (Table 3).

Table 3: Estimated densities of common bird species in and near St Katherine City

Species	No of individuals	Density (km^{-2})	95% confidence limits
Rock Dove *Columba livia*	799	72.1	51.1 - 100.4
Laughing Dove *Streptophilia senegalensis*	209	51.8	35.1 - 76.2
Sinai Rosefinch *Carpodactus synoicus*	154	23.7	14.8 - 37.9
Desert Lark *Ammomanes deserti*	42	11.2	7.4 - 16.8
White-tailed Wheatear *Oenanthe leucopyga*	81	11.1	7.8 - 15.6
Streaked Scrub Warbler *Scotocerca inquieta*	48	6.2	4.3 - 8.6

Discussion

Over the 2007 summer, a total of 33 species of bird were observed during and extra to the surveys, as opposed to 32 in 2006 (White *et al.* 2007). The 2007 observations included a rare migrant (Great Spotted Cuckoo) at Wadi Kid, and rare wetland visitors to St Katherine (seven early-passage migrating Common Sandpiper). In 2007, five species of bird of prey were seen. Two adult Bonelli's Eagle were seen at the same mountain-crag location as in 2006, with one juvenile observed twice near the adults. Other birds of prey were a Sooty Falcon at Wadi Itlah (Tim Newbold pers. com.), and clear sightings of Kestrels at St Katherine Monastery, Wadi Gharba (Sheik Awad) and Wadi Kid. An Egyptian Vulture was seen at Ain Hodra for the second year running, and Hume's Tawny Owl responded to playback at Wadi Arbaein. Thus species that were perhaps missed in 2006, were observed during 2007.

These are still very low numbers of birds for such a large area as the St Katherine Protectorate. Diurnal raptors in particular face the threat of trapping for use in falconry, and persecution by residents who consider them agricultural pests. Hunting is said to be banned in St Katherine Protectorate, but illegal hunting persists with pressures on the Bedouin to find an income and source of food. Hunting will probably impact negatively on local populations of birds of prey and other predators, since small species such as Rock Hyrax and Sand Partridge are important prey for larger eagles (Baha El Din 2000).

In 2007, White-tailed Wheatears were common across most of the wadi surveys. Surveys in 2007 helped improve knowledge of the distribution of Hooded Wheatear, observed four times in three different wadi systems (Ain Hodra, Wadi Sulaf, Wadi Kid). The observation of the Mourning Wheatear was important because none were seen during surveys from 2005, and the last survey observation in St Katherine Protectorate was in 2002 (Meakin *et al.* 2005).

Overgrazing is one of the most important problems facing the St Katherine Protectorate. Comparison with photographs from the early 20th century show a significant decline in plant cover. If substantiated, such a decline would surely have had a strong effect on the density and composition of the fauna of the region (Baha El Din 2000).

Recent shifts from traditional fruit crops to illegal cannabis and poppy gardens may change and/or decrease the variety food sources for birds, although species such as the Sinai Rosefinch were observed feeding on poppy seeds.

In following years, Operation Wallacea in collaboration with BioMAP, funding permitting, could extend surveys from the summer time to coincide with the spring breeding season of resident birds as well as passage migrants. This will clarify further what species actually breed in St Katherine Protectorate, including the important question of the breeding population of the rare Bonelli's Eagle (Baha El Din 2000). Long-term monitoring (ten years or more) is needed to develop conservation management schemes to combat human-induced pressure on communities and ecosystems, which has an impact over longer temporal periods (Sutherland 2004, Spellerberg 2005).

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