The soaring bird spring migration bottleneck at Ayn Sokhna, northern gulf of Suez, Egypt

MARY MEGALLI & GUDRUN HILGERLOH

Results of the first spring migration count of soaring birds at Ayn Sokhna, 60 km south of Suez on the west coast of the gulf of Suez, are presented. Significant numbers of raptors can be observed from this one observation site throughout the migration season regardless of each day's wind direction and speed. Observations were recorded 5 hours daily 1 March–2 May 2012. A total of 183 275 migratory soaring birds were identified and counted, of which 154 276 were raptors (18 985 eagles), and 28 999 were storks, pelicans and cranes.

The timing of the passage of the following species was documented: Black Stork *Ciconia nigra*, White Stork *Ciconia ciconia*, European Honey Buzzard *Pernis apivorus*, Egyptian Vulture *Neophron percnopterus*, Short-toed Snake Eagle *Circaetus gallicus*, Eurasian Sparrowhawk *Accipiter nisus*, Steppe Buzzard *Buteo b. vulpinus*, Long-legged Buzzard *Buteo rufinus*, Lesser Spotted Eagle *Aquila pomarina*, Steppe Eagle *Aquila nipalensis* and Booted Eagle *Aquila pennata*. Totals and timing are compared to results of the study done in the Suez area 30 years ago.

INTRODUCTION

Over one and a half million soaring birds are expected to migrate annually along the Red sea/Levant rift valley portion of the Africa/Eurasia flyway (Porter 2006). Most of them depend upon thermal air currents to help them cross this large area. Their routes have developed to favour areas producing thermals and updrafts along mountainous topography, and also to avoid areas lacking thermals, such as large bodies of water (Newton 2008). The East African flyway continues northwards along the mountains of Egypt's Eastern desert west of the gulf of Suez, and many soaring birds continue north all the way to the head of the gulf of Suez, completely avoiding a sea crossing. Studies of spring migratory soaring-bird passage have described in broad terms the flight paths of birds reaching the Ayn Sokhna and Suez areas of Egypt (Baha El Din & Bruun 1981, Wimpfheimer *et al* 1983, Christensen & Jensen 2002), and extensive work has been carried out in central and northern Israel tracking their passage northward (Shirihai *et al* 2000). The importance of the southern gulf of Suez crossing near Gebel el Zeit (Figure 1) has long been recognized (Grieve 1996, Christensen & Jensen 2002), and recent studies have recorded the migration volume, phenology and flight directions of soaring birds at that latitude, many of which cross the Red sea to south Sinai, while others continue north along the west coast of the gulf of Suez (Hilgerloh 2009, 2011, Hilgerloh *et al* 2009, 2011, Megalli 2011). The first migration counts

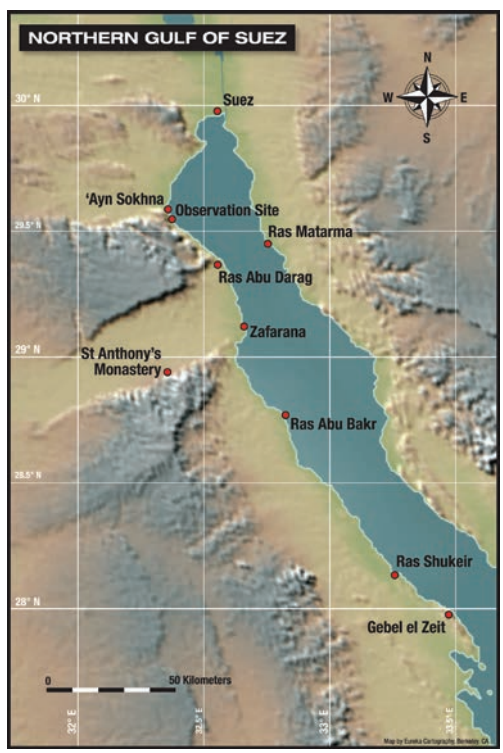


Figure 1. The gulf of Suez area, Egypt. Ayn Sokhna is at the northern foot of the North Galala plateau, St Antony's monastery is at the north face of the South Galala plateau. The two plateaus are separated by the wide Wadi Araba.

in the northern gulf of Suez area were done 30 years ago (Wimpfheimer *et al* 1983) at sites in and near Suez. The present study records spring soaring bird migration passage in the northern gulf of Suez area at the 'bottleneck' of Ayn Sokhna, 48 km (direct line) south of Suez (Figure 1).

METHODS

Observation site

The observation site (29.554° N, 32.361° E, Figure 1) is 60 km south of Suez by road. It is 4 km south of the hot spring (Arabic 'ayn sokhna') that gives the local area its name, an artesian brackish spring and reedbeds at the northern foot of the North Galala plateau. Migrating soaring birds concentrate here and are visible from the coastal highway. The observation site used for the present migration count was a shaded roof terrace allowing unobstructed views in all directions and located just above sea level *c*50 m from the gulf of Suez coastline to the east and *c*200 m from the rocky unvegetated slopes of the North Galala plateau to the west. The elevations of the plateau here are 500–530 m asl. Observers face the rocky slopes and view birds arriving from their left (from SW–SE) or birds that come into view from SW–W from behind the peaks (Plates 1, 2). Birds flying above these heights will be able to see the bay of Suez, Suez canal, and the gently rising sandy slopes of the western Sinai peninsula. Prevailing winds here are N–NW, meaning that birds fly into headwinds, or quartering winds, but thermal currents and topography-induced updrafts help them gain altitude before soaring and gliding above the sea-level plain north of the North Galala plateau.

Observations

Twenty-two experienced observers, in teams of two plus a recorder per day, identified and counted birds with the aid of 10× binoculars and 20–60× telescopes. Each team spent five hours a day for seven consecutive days at the observation site. Bird species and numbers were recorded immediately on a large chart. The observer teams worked 63 consecutive days, 1 March–2 May 2012. On 5 days bad weather reduced observation time by one hour.

Observations were made 09.00–14.00 h 1–22 March and 08.00–13.00 h 23 March–2 May, for a total of 310 observation hours. Steppe Buzzards *Buteo b. vulpinus*, the most numerous species, were counted with a handheld clicker.

Weather

Conditions were noted hourly during observation times: wind direction (N, NNE, NE, ENE *etc*) and speed (Beaufort scale), cloud cover (%), visibility (excellent, some impairment, strong impairment). Of the 63 days spent at the site, 36 (57%) had optimum visibility, 20 (32%) had some impairment of visibility and 7 (11%) had badly impaired visibility. Grey clouds greatly reduced observers' ability to detect colour and markings on birds, while a similar effect due to haziness, was caused by dust or particulate pollution.

RESULTS AND DISCUSSION

183 275 migratory soaring birds of 28 species were observed during the 310 hours of observation (Table 1). The 24 raptor species totalled 154 276, while storks, pelicans and cranes totalled 28 999. Of the raptors, 116 560 or 75.6% were Steppe Buzzards, while 18 985 or 12.3% of the raptors were eagles of 7 species. Passage of most migrant species had begun by 1 March, but Common Cranes *Grus grus*, Lesser Kestrels *Falco naumanni* and Eurasian Sparrowhawks *Accipiter nisus* were first recorded after March 20 (Figure 2). The first Levant Sparrowhawks *Accipiter brevipes*, European Honey Buzzards *Pernis apivorus* and Great White Pelicans *Pelecanus onocrotalus* arrived in April (Figure 2).

The Ayn Sokhna site

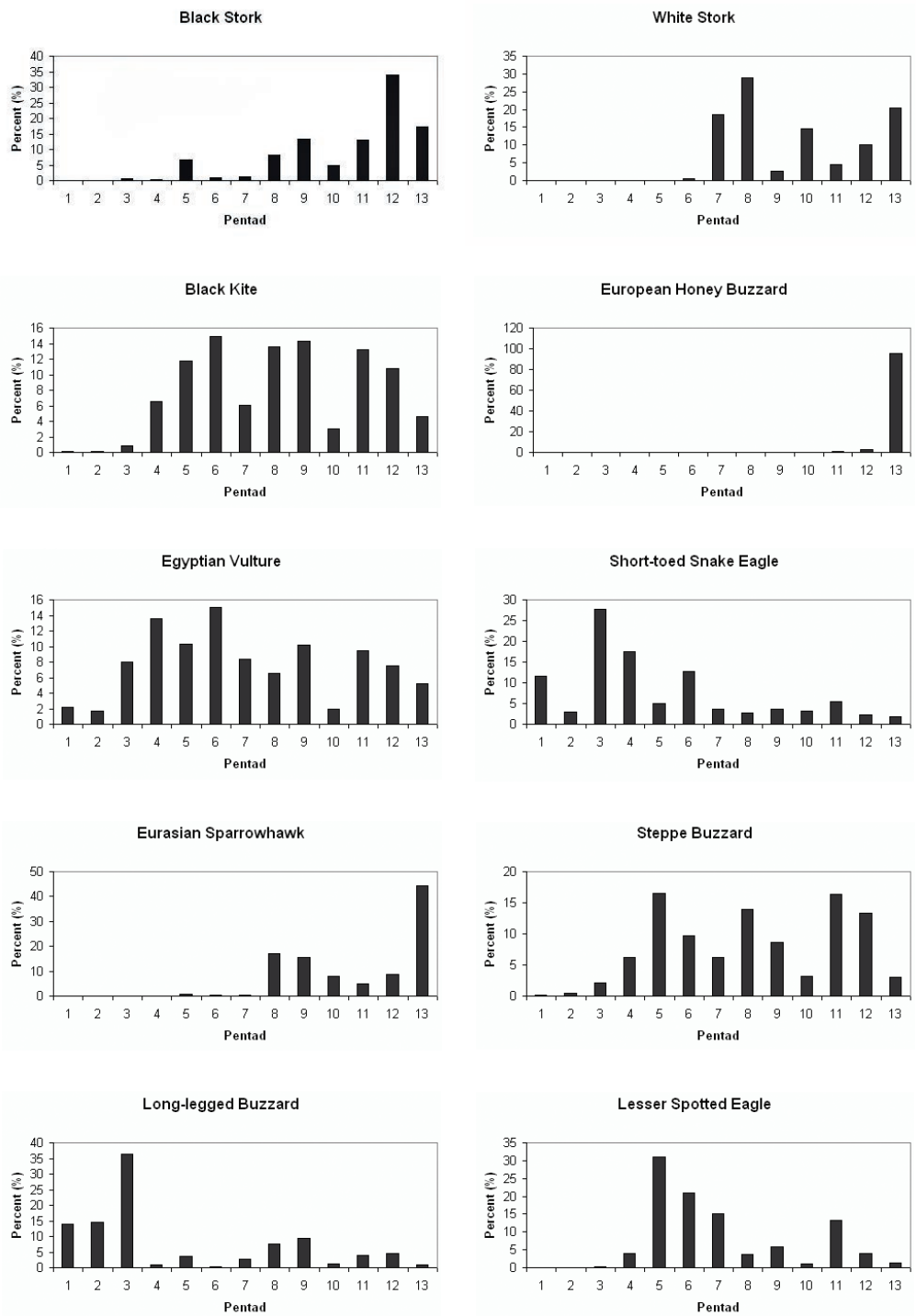
Clearly a rather compact 'bottleneck' or concentration point exists at the northeast corner of the North Galala plateau. Bird passage was concentrated at our Ayn Sokhna observation site in all wind conditions, although some wind directions limited the observers' ability to see all migrants. On days with N–NW winds (even of very low wind speed), conditions that predominated during the entire observation period, birds soared within range of vision. From *c*11.00 h, after gaining height in well developed thermals, birds glided N–NE at greater height and speed. On a very few days during the survey, winds with a strong SW–W component may have drifted birds eastward as they approached the Ayn Sokhna site from the south, and in this case, they appeared over our heads, or even from over the sea. Unless already gliding very high and fast, they invariably worked back west to pass over and gain thermal lift from the North Galala plateau. In mid March, in such winds, a large flock of White Storks *Ciconia ciconia* approached the site from half a kilometre out to sea, some flying low over the water, flew directly W–NW towards the mountains and stopped to rest on the small hill directly in front of us. The entire group tried flying north, but then flew 1 km south to 'Sara' peak (Plate 1), found updrafts there, gained altitude, and continued north over the peaks. At other migratory bottleneck areas, such as Gibraltar (Bernis 1980) or at and near Suez (Bijlsma 1983, Wimpfheimer *et al* 1983), concentration points vary according to wind conditions.

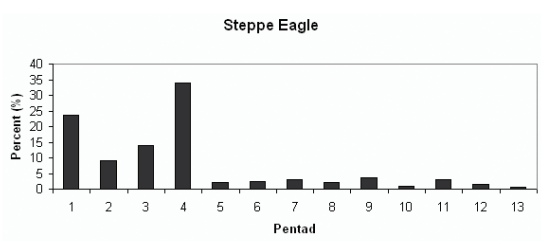
Table 1. Number of migratory soaring birds observed at Ayn Sokhna, Egypt, 1 March–2 May 2012.

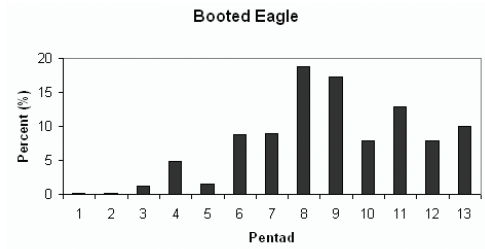
Black Stork	*Ciconia nigra*	1438
White Stork	*Ciconia ciconia*	27 030
Great White Pelican	*Pelecanus onocrotalus*	500
Lesser Kestrel	*Falco naumanni*	9
Common Kestrel	*Falco tinnunculus*	106
Red-footed Falcon	*Falco vespertinus*	2
Eleonora`s Falcon	*Falco eleonorae*	19
Eurasian Hobby	*Falco subbuteo*	2
Lanner Falcon	*Falco biarmicus*	1
Falco species		3
Osprey	*Pandion haliaetus*	34
European Honey Buzzard	*Pernis apivoris*	595
Black Kite	*Milvus migrans*	10 024
Egyptian Black Kite	*Milvus m. egyptius*	1
Red Kite	*Milvus milvus*	1
Egyptian Vulture	*Neophron percnopterus*	1128
Eurasian Griffon Vulture	*Gyps fulvus*	5
Short-toed Snake Eagle	*Circaetus gallicus*	5301
Western Marsh Harrier	*Circus aeruginosus*	24
Montagu's Harrier	*Circus pygargus*	15
Harrier species		6
Levant Sparrowhawk	*Accipiter brevipes*	67
Eurasian Sparrowhawk	*Accipiter nisus*	512
Steppe Buzzard	*Buteo b. vulpinus*	116 560
Long-legged Buzzard	*Buteo rufinus*	322
Buteo species		588
Lesser Spotted Eagle	*Aquila pomarina*	6536
Greater Spotted Eagle	*Aquila clanga*	57
Steppe Eagle	*Aquila nipalensis*	8837
Eastern Imperial Eagle	*Aquila heliaca*	43
Booted Eagle	*Aquila pennata*	1177
Eagle species		2301
Common Crane	*Grus grus*	31
Total soaring birds		183 275
Total raptors		154 276
Total storks pelicans cranes		28 999
Total eagles		18985
Eagles % of raptors		12.3%
Eagles % of soaring birds		10.3%
Steppe Buzzards % of raptors		75.6%

Birds passed either over the summits of the plateau, or below the summits across the face of the rocky slopes. Flying below these east-facing slopes invariably caused birds to lose elevation, but after circling and soaring on updrafts, they left our sight to the north after regaining the elevation of the long ridge on the right. Birds of some species, notably

Figure 2. Passage of migratory soaring birds at Ayn Sokhna, Egypt, as percentage of total birds of the species, 1 March–2 May 2012 (for species totals see Table 1). Pentads: 1, 1–5 Mar; 2, 6–10 Mar; 3, 11–15 Mar; 4, 16–20 Mar; 5, 21–25 Mar; 6, 26–30 Mar; 7, 31 Mar–4 Apr; 8, 5–9 Apr; 9, 10–14 Apr; 10, 15–19 Apr; 11, 20–24 Apr; 12, 25–29 Apr; 13, 30 Apr–4 May (3–4 May extrapolated).







harriers, sparrowhawks and falcons, usually flew at low elevations. In very light winds, or winds with an easterly component, birds may remain well to the west of the peaks below which our observation site is situated. Though the area's prevailing N–NW wind direction predominated, this wind direction was often too light to bring any birds from the west into closer view.

Flight patterns south and north of Ayn Sokhna

On spring migration, soaring birds more or less follow the Red sea mountains in the Eastern desert of Egypt (Figure 1), which up to 100 km north of the Gebel El Zeit area are steep granitic mountains lying well to the west of the sea (*c*30 km). The coastline trends SE–NW and in the vicinity of Ras Abu Bakr (28.731° N, 32.831° E), the granite mountains give way to the limestone South Galala plateau of much lower elevations. The South Galala plateau is separated from the North Galala plateau by the wide Wadi Araba, with the small town/lighthouse of Zafarana situated on the coast to the east (29.111° N, 32.656° E, Figure 1). At this point, soaring birds are rarely seen closer to the sea than about 10 km inland, but at St Anthony's Monastery (28.929° N, 32.350° E), 36 km inland and nestled in the E–W extending north face of the South Galala plateau, large numbers of soaring birds can be seen until sunset attempting to cross the Wadi Araba floor, about 20 km wide at this point, or descending to roost overnight on the ground.

After crossing Wadi Araba well inland of the sea, birds encounter the low elevations of the North Galala plateau. Raptors are never seen from the shore along which the highway runs north, although north of Zafarana, higher elevations, attracting soaring birds by their high thermals, are situated nearer the coast. Up to just 2 km south of our Ayn Sokhna observation site, the plateau heights are considerable, but birds are not seen from the highway either east of, or even over, these heights, though of course, very strong west winds may occasionally drift them toward the sea. Soaring or gliding birds appear in front of observers at our site from not more than 2 km to the S–SE, or from the S–SW. To birds at this point, the head of the gulf of Suez must be visible to the north. The NW facing escarpment of the North Galala plateau, with prevailing N–NW winds, creates updrafts that help birds gain height and cross the short water distance flying NE, or continue north toward Suez, eventually to enter Asia via the Sinai peninsula**.**

Migratory passage at the Ayn Sokhna site generally declined around 12.00–13.00 h. This is probably due to the greater elevation of thermals from this time and accordingly the higher flight level of birds (Bruderer *et al* 1994, Leshem & Yom-Tov 1996, Meyburg *et al* 2012). As industrial installations, power lines, and air pollution to the north of the site have increased considerably since the 1980s, birds might avoid that area for roosting and prefer to stay in the mountains of the North Galala plateau for the night. At four sites between Ayn Sokhna and Suez, raptors used to be observed, 1981–2006, in some numbers roosting in late afternoon or early morning, whereas few birds are now, 2007–2012, observed at these sites (MM pers obs*).*

Plate 1. Northeast corner of the North Galala plateau at Ayn Sokhna, Egypt, as seen from the observation site. The 3 peaks, left to right, are nicknamed Tom, Fawzy and Mary to aid counting and identification between observers. A fourth peak 0.5 km southwest of Tom, 'Sara', is not shown in this photo. © *Yasemin Öztürk*

Comparison with other migration counts

The 1982 spring migration counts (Wimpfheimer *et al* 1983) are the only comparable ones in the northern gulf of Suez. That survey was done at various sites 40–60 km north of our Ayn Sokhna site. There is a general agreement between the temporal migration patterns in both surveys (Figure 2, Wimpfheimer *et al* 1983). However, Steppe Eagle *Aquila nipalensis* and Lesser Spotted Eagle *Aquila pomarina*, did not show much similarity in seasonal patterns in the two studies. Instead, in our count the main passage of Lesser Spotted Eagles was observed mid March–mid April, similar to that in northern Israel (Shirihai *et al* 2000). The pattern of passage of Steppe Eagles with large numbers up to mid March and low numbers in the later part of our count period resembles more the pattern at Gebel El Zeit and Eilat than that of the Suez study (Wimpfheimer *et al* 1983, Bruun 1985, Shirihai *et al* 2000, Hilgerloh *et al* 2009). The timing of passage of adult and subadult Steppe Eagles is consistent with the notion that adults are the first to migrate (peaking end of February/beginning of March), followed by subadults during March and April (Forsman 2003). Satellite telemetry studies have revealed that Steppe Eagles continue migration towards the area of the Caspian sea and do not pass northern Israel (Meyburg *et al* 2012).

With respect to numbers three groups of species can be distinguished: species with similar numbers in 1982 and 2012 (Egyptian Vulture *Neophron percnopterus*, European Honey Buzzard and Eastern Imperial Eagle *Aquila heliaca*), species with far higher numbers in 2012 (White Stork, Black Kite *Milvus migrans*, Short-toed Snake Eagle *Circaetus gallicus*, Eurasian Sparrowhawk, Steppe Buzzard and Booted Eagle *Aquila pennata*) and species with lower numbers in the Ayn Sokhna count compared to the Suez study (Eurasian Griffon Vulture *Gyps fulvus*, Lesser Spotted Eagle and Steppe Eagle). A few Spotted Eagles *Aquila clanga* were recorded in both surveys. Of the 20 recorded in 1982, most were seen 26 February–28 March, while all 43 recorded at Ayn Sokhna were seen 5 April–2 May.

While the primary Red sea crossing of White Storks is at the southern end of the gulf of Suez (Berthold *et al* 2001, Hilgerloh 2009), at Ayn Sokhna a remarkable number of 26 950 White Storks were counted compared to 15 500 in the Suez study and >118 000 at Gebel El

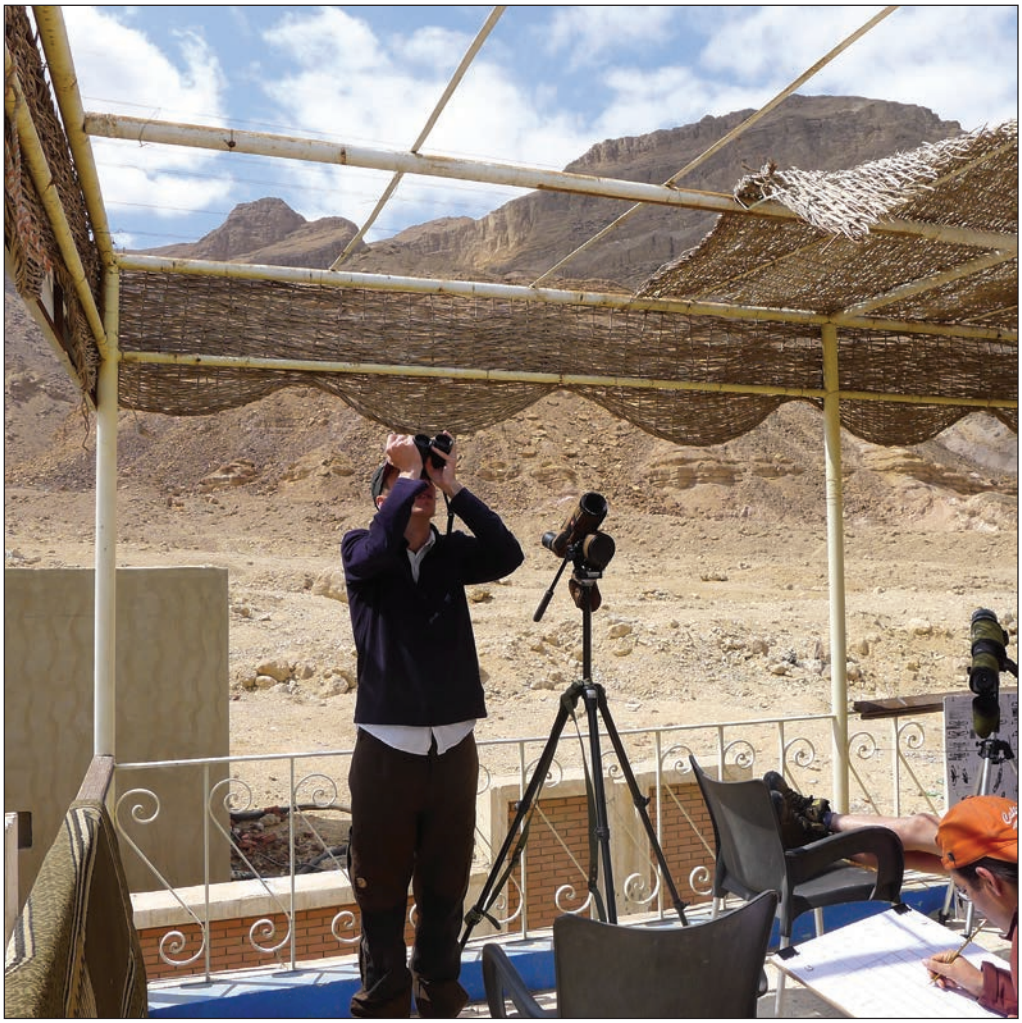


Plate 2. The observation site roof terrace, 4 km south of Ayn Sokhna, Egypt. © *Mary Megalli*

Zeit. 1424 Black Storks *Ciconia nigra* were recorded at Ayn Sokhna and only 265 in the Suez study, while at Gebel El Zeit 1709 were observed (Wimpfheimer *et al* 1983, Hilgerloh 2009). Apparently, Black Storks do not concentrate as White Storks do at Gebel El Zeit.

Several flocks of Great White Pelicans were observed 24 April–2 May, totaling 500 birds, a similar number as in the Suez study, while >1700 were counted at Gebel El Zeit. The Common Crane travels in quite large groups, and is a strong flier not adverse to crossing water up to 100 km in width (Alerstam & Bauer 1973). In the Ayn Sokhna count in 2012 just 263 cranes were counted, while those recorded from the Suez sites in 1982 totaled 668. Cranes are seen approaching or crossing the gulf of Suez at many latitudes, and are sometimes observed, due to their calls, migrating at night (MM pers obs). However, the most numerous passage takes place at Gebel El Zeit, where more than 15 000 cranes were observed during the systematic counts (Hilgerloh *et al* 2009).

The Ayn Sokhna totals emphasize our conclusion that the northeast corner of the North Galala plateau is an important concentration point in spring migration at the northern end

of the gulf of Suez, and that the Ayn Sokhna observation site is a very convenient location for viewing spring migration passage there.

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Mary Megalli. marydmegalli@gmail.com

Gudrun Hilgerloh, Fulfsweg 20, D-26386 Wilhelmshaven, Germany. gudrun@hilgerloh.eu