

Advanced autumn stopover dates of palearctic passage migrants in south sinai, Egypt

Abstract

Anthropogenic global climate change is correlated with increasing evidence of rapidly shifting avian migration phenology. Many spring migrants are arriving earlier on their breeding grounds, while the trend in autumn departures is less uniform, with both early and delayed departures reported. The ecological and evolutionary consequences of these changes are poorly understood, and empirical data are lacking for many regions. We contribute new empirical data on advanced autumn migration dates for eight species of Palearctic passage migratory birds in South Sinai, Egypt, along a major biannual bird migration route. We conducted ~270 field hours of surveys in regional wadis (ephemeral river beds), mountains, plains, and oases from elevations from 645 to 2650 m above sea level. We detected a total of 63 individual passage migrants from nine passerine species. For eight of the nine species, first autumn record dates were at least two to six weeks earlier than those documented 20 years previously. Populations of many long distance Palearctic migratory bird species are declining, and changing conditions in passage stopover regions may contribute to declines. Both migratory and resident birds in South Sinai face unprecedented conservation threats, including anthropogenic climate change and habitat loss.

Keywords: avian migration, climate change, phenology, annual life cycle, stopover, south Sinai, Egypt, St. Katherine protectorate, conservation

Volume 1 Issue 1 - 2016

Nicola Arcilla,^{1,2} Alaa Eldin Soultan,³ Samy Zalat^{4,5}

¹University of Georgia, USA

²Department of Biodiversity, Drexel University, USA

³Max Planck Institute for Ornithology, Germany

⁴Department of Science and Arts, Taibah University, Saudi Arabia

⁵Suez Canal University, Egypt

Correspondence: Nicola Arcilla, Department of Biodiversity, Earth and Environmental Science, Drexel University, Philadelphia, USA, Tel +1-215-571-4198, Email nsa46@drexel.edu

Received: October 26, 2015 | **Published:** January 06, 2016

Introduction

The timing of avian migration has been rapidly changing in response to anthropogenic global climate change.¹ While many migrants are arriving on their breeding grounds earlier in spring, the trend in autumn departures is less uniform, with both early and delayed departures reported.²⁻⁴ Climate change impacts are hypothesized to interact with migrants' ecological plasticity, population demographics, and evolutionary potential.⁵ Additional empirical data are needed to elucidate ecological and evolutionary mechanisms and consequences.⁶

Populations of many long distance migrants are declining, and causes may include climate change, especially in passage regions.⁷ Environmental constraints during migration may limit populations of migratory birds, but linking stopover habitat and other factors to fitness or population consequences presents a major challenge.^{8,9} Autumn migration may be longer in duration compared to spring, due to more and/or longer stopover periods en route.¹⁰ The way in which environmental conditions during passage stopovers may affect migration phenology is not well understood.¹¹

An estimated five billion birds of 479 species migrate from their breeding grounds in Eurasia's Palearctic ecozone to their wintering grounds in sub-Saharan Africa and back annually,^{4,12} of which an estimated 500 million birds of 283 species pass through Egypt's Sinai region on migration.¹³ We conducted surveys for birds in South Sinai, Egypt, along a major biannual migration route used by Palearctic birds to estimate bird abundance and distribution in regional wadis (ephemeral river beds), mountains, plains, and oases. We report details of advanced autumn stopover dates for Palearctic passage

migrants detected during our surveys for this region for which few recent empirical data exist in the published record.

Methods

We used a sample effort of *c.* 270 field hours in South Sinai, Egypt to conduct bird surveys from 28 June to 05 August 2006, from elevations of 645 to 2650m above sea level. The arid high mountain region of South Sinai is host to nearly 40% of Egypt's total flora species and characteristic and range-restricted fauna,¹⁴⁻¹⁷ and includes a 435,000 ha protected area, the St. Katherine Protectorate. Resident bird communities include Egypt's Saharo-Sindian biome-restricted species, some of which are restricted to the region.¹⁶

We surveyed birds in regional wadis, mountains, plains, and oases, with a sample effort of *c.* 270 field hours.¹⁸ Areas surveyed (Figure 1) include:

- (i) Wadi Nasb
- (ii) Wadi Marra (including Wadis Tebik el Marra, Sa'al, Hibran)
- (iii) Wadi Gharaba (including Wadis Gharba, Sulaf)
- (iv) Wadi Gebel (including Wadis Baidaa, Ahmer, Ghazna, Hreza, Omgraf, Shagg, Zewatein)
- (v) Wadi Itlah (including Wadis Abu Dagash, El Hadibi, Wadi Itlah, Shagg Tinia)
- (vi) Ain Hodra (including Wadi Rum, White Canyon); and St. Katherine and environs (including Wadis Arba'ein, Sheikh, El Deir)

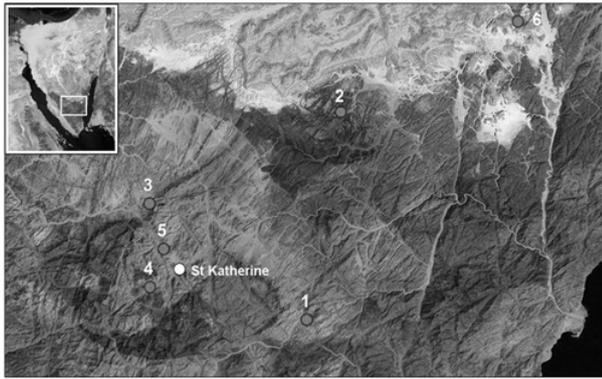


Figure 1 Bird survey sites in South Sinai, Egypt.

Site key: 1–Wadi Nasb; 2–Wadi Marra; 3–Wadi Gharaba; 4 - Wadi Gebel; 5–Wadi Itlah; 6–Ain Hodra; and St. Katherine and environs.

Results and discussion

We recorded 31 species during transect counts, including 22

Table 1 Migratory bird species observed in Sinai from 28 June to 05 August 2006

Species	Total number observed	Date of first observation in 2006	Earliest known date in sinai according to Goodman et al. ¹⁴	Approximate advance in autumn migration through sinai
European Bee-Eater <i>Merops apiaster</i>	1	29-Jun	Late August	6 weeks
Rufous Bush Robin <i>Cercotichas galactotes</i>	1	28-Jun	Mid August	6 weeks
Eastern Olivaceous Warbler	24	19-Jul	Mid August	3-4 weeks
<i>Iduna pallida</i>				
Olive-tree Warbler <i>Hippolais olivetorum</i>	7-Jan	19-Jul	Early August	2 weeks
Eastern Bonelli's Warbler	3-Jan	13-Jul	Late July	2 weeks
<i>Phylloscopus orientalis</i>				
Eurasian Blackcap <i>Sylvia atricapilla</i>	2	30-Jul	23-Aug	3 weeks
Lesser Whitethroat <i>Sylvia curruca</i>	14	23-Jul	Late July	0-1 week
Eastern Orphean Warbler	19	22-Jul	Mid August	3 weeks
<i>Sylvia crassirostris</i>				
Arabian Warbler	11	19-Jul	17-Aug	4 weeks
<i>Sylvia leucomelaena</i>				

Rufous bush robin *Cercotrichas galactotes*: Previous records describe this species as a fairly common passage migrant in autumn from mid-August to mid-October.¹⁴ We observed a single R u f o u s Bush-Robin on 28 June 2006 in Wadi Nasb, which was likely an early autumn passage migrant (NA). This appears to be the only known recent record of this species. This species has also been known to breed in various vegetated portions of Egypt, including one possible location in south Sinai between 1970–1987; however, we did not make any further sightings of this species on repeat surveys of Wadi Nasb.

Eastern olivaceous warbler *Iduna pallida* (formerly *Hippolais pallida*): Previous records describe this species as an abundant migrant breeding bird in Western Desert, parts of the Nile Delta and Valley and Suez Canal area.¹⁴ It passes through Egypt in autumn from

resident species¹⁸ and 63 individuals of nine non-resident species (Table 1). Eight of the nine non-resident species appeared to be autumn passage migrants that were between two and six weeks earlier than the earliest known autumn passage records for the same species as documented 20 or more years previously.¹⁴ Observations of a ninth species, Arabian Warbler *Sylvia leucomelaena*, may represent either early migrants or a previously unknown resident population. Details are presented in species accounts below, using nomenclature following Blair et al.¹⁹

Species accounts

European bee-eater *Merops apiaster*: Previous records indicate this species as a common passage migrant in autumn from late August to late October, with migration peaking in September; two June sightings on the Red Sea coast in 1981 and 1984 were recorded as late spring passage migrants.¹⁴ In 2005, observations of Bee-eaters were reported in June in St. Katherine and in August in Wadi Feiran.²⁰ We observed a single Bee-eater on 29 June 2006 in Wadi Nasb, which we assume was an early autumn migrant (NA). It has also been known as a rare migrant breeder in NE Sinai.¹⁴

mid-August to late October (early November). In 2005, the first of four migrating Olivaceous Warblers was observed on 6 July,²⁰ up to six weeks earlier than its previously documented earliest date of autumn passage through Sinai.¹⁴ We observed a total of 24 Eastern Olivaceous Warblers, starting with two individuals observed on 19 July in Wadi Gharaba; one subsequent individual of this species was observed at Wadi Nasb (NA).

Olive-tree warbler *Hippolais olivetorum*: Previous records show this species as a probable rare passage migrant in autumn from early August to late November, with one summer record.¹⁴ A single report from 2005 listed a single Olive-tree Warbler on 4 August in Wadi Hamman.²⁰ We observed a total of seven Olive-tree Warblers, starting with two on 19 July in Wadi Gharaba.

Eastern bonelli's warbler *Phylloscopus orientalis*: Previous records show this species as a fairly common migrant throughout the country in autumn from (early) mid-August to late September (late November), and as a rare summer visitor.¹⁴ We made three sightings of this species on 13 July in Wadi Marra (NA), which appear to be the only recent records of this species in the area.

Eurasian blackcap *Sylvia atricapilla*: Previous records show this species as a scarce autumn passage migrant, with the vanguard arriving in late August and the majority of birds coming through from mid-September to late October; the earliest autumn record they report is on 23 August 1986 at St. Katherine.¹⁵ Recent surveys did not observe this species during summer surveys in 2005 but report two sightings from 2002.²⁰ We observed two Blackcaps on 30 July 2006 at Wadi Itlah (NA).

Lesser whitethroat *Sylvia curruca*: Previous records show this species as a common passage migrant throughout the country, with the earliest known vanguard in late July and the bulk of migration occurring in Sinai from mid-September to early October, and as a rare summer visitor.¹⁴ Subsequent surveys report observing a single Lesser Whitethroat in mid-August 2005 in Wadi Feiran and at least one individual in August 1996 in Wadi Isla.²⁰ Bedouin residents reported their perspective that this species has shown population declines decreased in recent years.²⁰ We made 14 observations of Lesser Whitethroats starting with a single individual on 23 July 2006 at Wadi Nasb (NA); subsequent sightings were made at Wadi Gebel, St. Katherine and Wadi Itlah (NA and AES).

Eastern Orphean warbler *Sylvia crassirostris*: Previous records show this species as a rare passage migrant in autumn from mid-August to late October.¹⁴ Subsequent surveys report seeing the first of eight Orphean Warblers on 02 August 2005, and report a total of 18 sightings at undisclosed dates from 2001 and 2002.²⁰ We first observed the first of 19 Orphan Warblers recorded during our surveys on 22 July in Wadi Nasb (NA) and recorded additional sightings at Wadi Gebel, St. Katherine, and Wadi Itlah (NA and AES).

Arabian warbler *Sylvia leucomelaena*: Previous records showed only two known observations of this species in Sinai on 17 and 18 August 1984 of single birds in Wadi Solafand and Wadi Nasb, noting that it was unknown if birds were migrants or local breeders as there has been a known breeding population northeast of Sinai in the vicinity of Elat, Israel.¹⁴ Subsequent sightings of four Arabian Warblers were reported in 2002 in Wadi Gebel and El Galt Al Azraq, but none during surveys in 2005.²⁰ We made 11 observations of this species starting with two in Wadi Gharaba on 19 July 2006 (NA); subsequent sightings were made in Wadi Itlah (AES).

Surveys during the same period in 2005 suggest a high degree of variation in the movements in passage migratory species and/or a high degree of variation in the detectability of these species in Sinai.²⁰ In addition to the passage migrants or possible passage migrants we observed in 2006, 2005 surveys²⁰ reported very small numbers of the following passage passerines in singles or very small numbers: Eurasian Reed Warbler *Acrocephalus scirpaceus*, Upcher's Warbler, *Hippolais languida*, Olive-tree Warbler, Icterine Warbler *Hippolais icterina*, Chiffchaff *Phylloscopus collybita*, Green Warbler *Phylloscopus trochiloides nitidus*, Garden Warbler *Sylvia borin*; however, their surveys report Orphean Warbler and Lesser Whitethroat as the only common migrants in the region.

The arrival of autumn passage migrants earlier in the year may expose them to higher temperatures in South Sinai, which is also warming with anthropogenic climate change. Passage migrants,

together with resident birds in South Sinai, also contend with multiple other anthropogenic threats and are threatened by the demands placed on water supplies by a recent dramatic increase in tourism as well as by overgrazing²¹ and recent shifts from traditional fruit crops to illegal cannabis plantations. Hunting has been banned in the St. Katherine Protectorate but illegal hunting persists; diurnal raptors in particular face direct threats of trapping for use in falconry and persecution by residents who consider them agricultural pests.²¹

Major economic and social changes were introduced to South Sinai starting in 1967, when Egyptian was replaced by Israeli political control.²² These changes were well underway by 1979, when the region was returned to Egypt. Indigenous Bedouin residents of the region began to adopt wage labor and a sedentary lifestyle rather than their traditional lifestyle as pastoral nomads, and their population has at least quadrupled within the last 70 years.^{17,22}

Recent extirpations and population declines of birds in the St. Katherine Protectorate²¹ coincide with significant recent increases in numbers of human residents and tourists and associated illegal hunting and habitat loss. Passage migrants in South Sinai thus face multiple unprecedented conservation threats. Climate change, habitat loss, and other threats may interact synergistically to compound negative impacts on birds²³ including passage migrants. The complex life histories of migratory species make it difficult to predict specific impacts of climate change, and the interaction between phenological and geographic shifts may have interactive effects²⁴ on the passage migrant species we detected during our surveys.

Conclusion

We have reported significantly advanced autumn passage stopover dates for at least eight Palearctic migrants traveling from breeding to wintering grounds through a major migration route. These changes in migration phenology have implications for migrants' survival and evolution as these phenological shifts may imply facing greater challenges from climate change and multiple other anthropogenic threats during their stopovers in South Sinai. Further empirical data from this poorly studied region would contribute to understanding the patterns, mechanisms, and implications of the challenges avian migrants face during annual migration under anthropogenic climate change. Conservation measures including habitat restoration and other measures to address threats may mitigate their impacts on migratory and resident birds.

Acknowledgements

None.

Conflict of interest

The author declares no conflict of interest.

References

1. Cotton PA. Avian migration phenology and global climate change. *Proc Nat Acad Sci USA*. 2003;100(21):12219–12222.
2. Bairlein F, Winkel W. Birds and climate change. In: Lozan JL, et al. editors. *Climate of the 21st Century: Changes and Risks*. Germany: Wissenschaftliche Auswertungen; 2001. p. 278–282.
3. Jenni L, Kéry M. Timing of autumn bird migration under climate change: advances in long-distance migrants, delays in short-distance migrants. *Proc Royal Soc*. 2003;270(1523):1467–1471.
4. Thorup K, Tøttrup AP, Rahbek C. Patterns of phenological changes in migratory birds. *Oecologia*. 2007;151(4):697–703.

5. Buckley LB, Kingsolver JG. Functional and phylogenetic approaches to forecasting species responses to climate change. *Ann Rev Ecol Evol Syst.* 2012;43:205–226.
6. Knudsen E, Linden A, Both C, et al. Challenging claims in the study of migratory birds and climate change. *Biol Rev.* 2011;86(4):928–946.
7. Finch T, Pearce-Higgins JW, Leech DI, et al. Carry-over effects from passage regions are more important than breeding climate in determining the breeding phenology and performance of three avian migrants of conservation concern. *Biol Cons.* 2014;23(10):2427–2444.
8. Both C. Flexibility of timing of avian migration to climate change masked by environmental constraints en route. *Curr Biol.* 2010;20(3):243–248.
9. Faaborg J, Holmes RT, Anders AD, et al. Recent advances in understanding migration systems of New World land birds. *Ecol Mono.* 2010;80:3–48.
10. Tottrup AP, Klaasen RHG, Strandberg R. The annual cycle of a trans-equatorial Eurasian–African passerine migrant: different spatio-temporal strategies for autumn and spring migration. *Proc R Soc Lond B.* 2012;279(1730):1008–1016.
11. Tottrup AP, Thorup K, Rainio K, et al. Avian migrants adjust migration in response to environmental conditions en route. *Biol Lett.* 2008;4(6):685–688.
12. Curry Lindahl K. *Bird migration in Africa: movements between six continents.* London: Academic Press; 1981.
13. Shirihi H. *The birds of Israel.* San Diego: Academic Press; 1996.
14. Goodman SM, Meininger PL, Baha El, et al. *The Birds of Egypt.* USA: Oxford University Press; 1989.
15. Zalat S, Semida F, Gilbert F, et al. Spatial variation in the biodiversity of Bedouin gardens in the St. Katherine Protectorate, Sinai, Egypt. *Egypt J Biol.* 2001;3(2):147–155.
16. *Birdlife International.* IBA Factsheet: St. Katherine Protectorate. 2015.
17. Hoyle M, James M. Global warming, human population pressure, and viability of the world's smallest butterfly. *Cons Biol.* 2005;19(4):1113–1124.
18. White MLJ, AEI Mohamed, N Dauphine, et al. Recent surveys of resident breeding birds in south Sinai, Egypt. *Sandgrouse.* 2008;30:190–200.
19. Blair M, Porter R, Aspinall S. *Ornithological Society of the Middle East (OSME) Regional List of Birds.* 2007.
20. Meakin K, De Kort SR, Gilbert H, et al. Monitoring birds, reptiles and butterflies in the St. Katherine Protectorate, Egypt. *Egypt J Biol.* 2005;7:66–95.
21. Baha El, Din SM, Baha El Din M, et al. *Biodiversity inventory and monitoring in St. Katherine Protectorate with a special emphasis on reptiles and birds of prey.* Report to the Egyptian Environmental Affairs Agency; 2000.
22. Perevolotsky A, Perevolotsky A, Noy–Meir I. Environmental adaptation and economic change in a pastoral mountain society: The case of the Jabaliyah Bedouin of the Mt. Sinai region. *Mount Res Dev.* 1989;9:153–164.
23. Travis JMJ. Climate change and habitat destruction: a deadly anthropogenic cocktail. *Proc Biol Sci.* 2003;270(1514):467–473.
24. James ARM, Abbott KC. Phenological and geographical shifts have interactive effects on migratory bird populations. *Am Nat.* 2014;183(1):40–53.