INTRODUCTION

Eleonora’s falcon (Falco eleonora) is a trans-equatorial migrant breeding in the Mediterranean region, from Cyprus in the east, to the Canary islands and the Atlantic coast of Morocco in the west (Walter 1979). Studies of migration routes of Eleonora’s Falcon using satellite telemetry suggested they avoid ecological barriers, but no study ever included the Cypriot population, which seems to have the shortest distance to travel from all other populations towards the main wintering grounds in Madagascar, though still travelling distances of over 6000 km during each migration season. Cyprus hosts the easternmost breeding population of Eleonora’s Falcon with about 130 pairs (Hadjikyriakou and Kirschel 2016).

RESULTS / DISCUSSION

In autumn migration, following departure from Cyprus, Eleonora’s Falcons cross the Mediterranean and fly non-stop, approximately due south over the desert of Sinai, along the western boundary of the Red sea and through eastern Sudan, maximizing their speed to overcome the desert ecological barrier (Alerstam 2009). They have a major stopover as soon as they pass the Sahara desert and enter higher EVI areas in the more humid savannah of Ethiopia (Figures 1 and 2). After refueling they fly again with high speed through Ethiopia and Kenya, having another main stopover within the humid savannah of Southern Kenya, before continuing through Tanzania and Mozambique to Madagascar, crossing the Mozambique channel. While in Autumn there is a clear preference to spend time over high EVI and tree cover areas (Figure 3), in spring they do not seem to choose high EVI or high tree cover vegetation. They rather fly towards breeding grounds with just one stopover in Ethiopia before following a more easterly route than in autumn (Mellone et al. 2013), along the east coast of the Red sea (in contrast to predictions in Krantstauber et al. 2015). In addition, in autumn they pass over areas with richer vegetation (higher EVI) than random (based on values for 10,000 points within a minimum convex polygon encompassing the actual transmitter locations for the season, Mann–Whitney U test, N = 8233, z = 12.493, P < 0.0001), while in spring there is no significant difference in EVI between actual migration points and random ones (N = 6017, z = -1.164, P = 0.242.) Overall, individuals fly greater distances during daylight hours, often roosting at night, though faster speeds have been recorded during the night when they fly solely for migratory purposes (GLM: N = 959, F = 16.1061, P < 0.0001), possibly in better flying conditions (Alerstam 2009). Birds fly faster over areas with low EVI compared to high EVI areas (F = 15.1989, P = 0.0001, Fig. 4), which we attribute to fly-by-and-forage behaviour (Alerstam 2009) and their selection of stopovers in areas with higher EVI, where they are likely to find more insect prey. The average duration of autumn migration is 26 days, and average distance covered in autumn is about 6900 km, while in spring it is a little longer at approx. 7550 km, though there is no significant difference in travelling speed between the seasons (F = 0.3727, P = 0.5419).

METHODS

For the first time, we used GPS transmitters on Eleonora’s falcon to accurately monitor the species’ feeding and ranging areas, its migration routes and wintering ground preferences, allowing us to map in high spatial and temporal detail their all-year round movements (Mellone et al. 2013). Fourteen transmitters, 12 GPS/GSM (Ecostone Telemetry) and 2 Argos PTT’s (Microwave Telemetry), were attached on individuals breeding at Akrotiri colony, Cyprus, during the 2013 and 2014 breeding seasons. The data collected during migration allowed us to calculate the relationship between migration routes and Enhanced Vegetation Index (EVI) data during relevant seasons, as well as the speed and distance covered between each interval during both day and night. Recorded locations were overlaid over EVI and tree cover data from the MODIS satellite, and point to raster relationships were calculated in ArcGIS 10.1. Statistical analyses were performed in Stata 11.0 and R 2.12.0.

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LITERATURE CITED