

Migration of Spanish Montagu's Harriers (*Circus pygargus*)

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The Montagu's Harrier (*Circus pygargus*) is a medium-size and long-distance migratory raptor which breeds over large areas within Europe and Western Asia. It is generally assumed that populations breeding in Western Europe overwinter in Western Africa, whereas the populations that breed in Eastern Europe spend the winter in Eastern Africa, and those that breed in Asia presumably travel to Sri Lanka and the Indian subcontinent during the winter. Nonetheless, to date, all studies on migration for this species are based on ringing recoveries and observations at bottleneck points along their migratory routes. Hence, data on the exact winter distribution of European Montagu's harriers in Africa, as well as their migratory routes, are still scarce.

Ten adult Montagu's harriers (six males and four females) were captured between May and June 2006 using dho-gaza nets and a stuffed Eagle Owl (*Bubo bubo*) as a decoy, in inland Castellón (Eastern Spain). The sex of captured birds was determined based on the pattern of colours of the plumage; they were weighed and ringed, and a Microwave Telemetry 9.5g solar-powered PTT-100 platform transmitter terminal (PTT) was affixed to their backs using a Teflon harness. Birds were released within 30 minutes of capture. For the first three months of operation the PTTs were programmed on a 6h on/16h off duty cycle, followed by a 10h on/56h off duty cycle for the following months. All data were retrieved and managed using STAT, the Satellite Tracking and Analysis Tool. Only locations assigned to LCs 3, 2, 1 and 0 by Argos were used for the analyses, as they are the most reliable ones.

Prior to the migration onset, the tagged birds showed a pre-migration stage. The extent of this stage ranged between 3 and 72 days. Staging areas used during the pre-migration stage were located at higher altitudes than the breeding areas, and are characterized by the presence of shrublands and extensive cultivation areas, mainly cereals.

These cultivated areas constitute a particular landscape characterised by fallow fields and are maintained by a traditional rotation of cultivations. Montagu's harriers' use of these areas is likely to be related to food availability, as at higher altitudes the peak of abundance of arthropods occurs later than in the lowland breeding area. On the other hand, the search of new good sites for the following reproduction may also play an important role in the pre-migratory movements of the species.

At least six of the 10 birds marked completed their

migration from the breeding grounds in Eastern Spain to Western Africa, three males and three females. For one of these no data were obtained during the migration (we only have locations in the breeding and wintering grounds). The other four either died or the transmitter failed, two before starting the migration and two during. Hence, only five individuals were tracked throughout the whole migration. The harriers



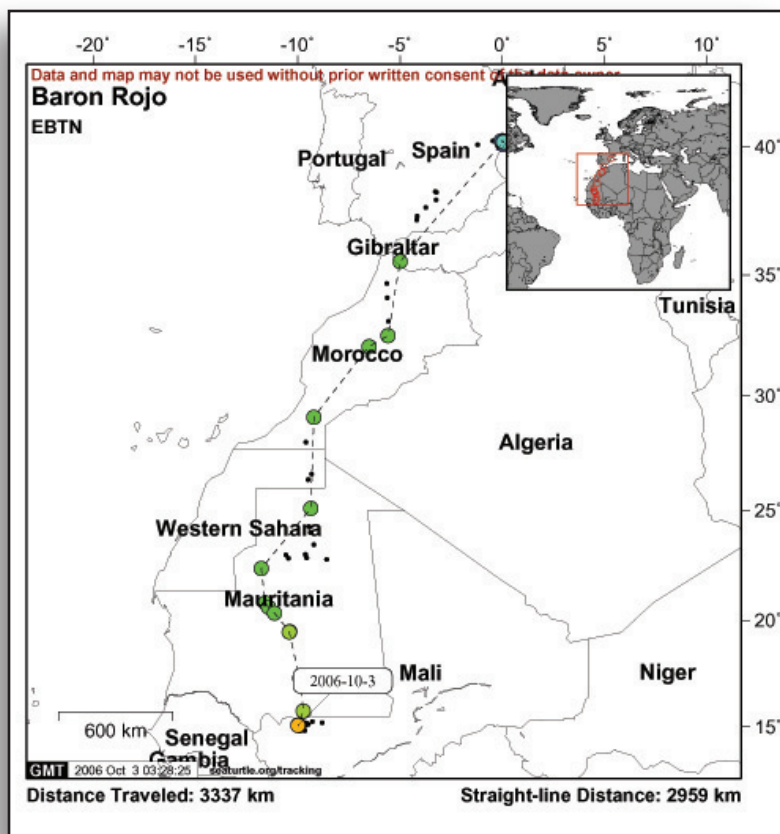
Photo Courtesy of Estación Biológica Terra Natura

An adult male Montagu's Harrier equipped with a 9.5g solar powered PTT.

started the migration in late July-August. The birds followed different migration routes. Some performed stopovers of more than a week, while others barely stayed in the same site for more than a day or two. Ultimately, the tagged birds established bases on the border of Mauritania with Mali and Senegal, a distance nearly 3000 km from the breeding sites, covering this in 10-30 days. These sites are located within a small range of latitudes (14°N and 17°N), although distributed over a wider range of longitudes (-15°E and -4°E), with some birds occupying sites more than 1000 km apart. Distance covered in a day ranged between 93 and 219 km/day, with peaks of travelling speed of up to 65 km/hour. Harriers were recorded travelling only during the daytime and covering the longest distances in the late afternoon,

which suggests that they are daytime migrants. Most of the movements occurred between 3 and 8pm. None were recorded between 8pm and 5am.

This research of the Terra Natura Biological Station is part of a wider focus on raptor behavioural ecology and has been made possible with the support of the Aeropuerto de Castellón and the Terra Natura Foundation. Knowledge obtained on harriers' exact wintering sites may provide insights on the problems the species' face in winter, highlighting the need to take into account what happens in both the breeding and wintering grounds to implement successful conservation measures.



Migratory route of a male Montagu's Harrier tagged in Castellón (Eastern Spain). Map was obtained from seaturtle.org. Colored dots are locations belonging to LCs 3, 2 or 1, and small dots belong to LCs 0 or A.