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Source: *Ardea*, 99(1) : 113-116

Published By: Netherlands Ornithologists' Union

URL: <https://doi.org/10.5253/078.099.0113>

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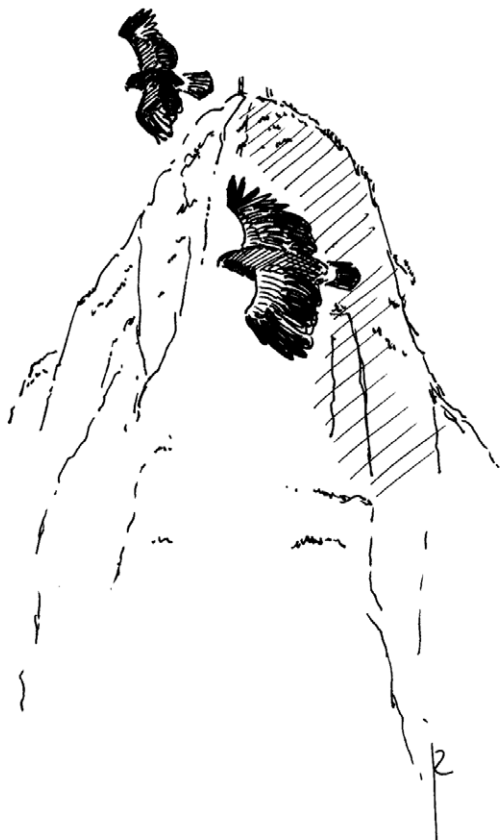
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## Autumn migration of Lesser Spotted Eagle *Aquila pomarina* in the Strait of Gibraltar: accidental or regular?

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Onrubia A., Muñoz A.-R., Arroyo G.M., Ramírez J., de la Cruz A., Barrios L., Meyburg B.-U., Meyburg C. & Langgemach T. 2011. Autumn migration of Lesser Spotted Eagle *Aquila pomarina* in the Strait of Gibraltar: accidental or regular? *Ardea* 99: 113–116.

The Lesser Spotted Eagle (LSE) migrates to its winter quarters via the eastern Mediterranean corridor. During 1998 to 2009, 47 LSEs have been registered in the Strait of Gibraltar during a monitoring program of bird migration. All observations were made between 6 August to 12 October (mean 16 September, median 12 September). Of thirteen age-identified LSEs, ten birds were non-juveniles. Six out of 86 LSEs fitted with a satellite transmitter at the western limit of its distribution followed the western route. Three of those birds reached Africa via the Strait of Gibraltar. The presence of LSE in our study area, albeit in small numbers, indicates the existence of a minor migration route across the Iberian Peninsula.

Key words: Lesser Spotted Eagle, *Aquila pomarina*, migration, Strait of Gibraltar

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The Lesser Spotted Eagle *Aquila pomarina* (hereafter LSE) is a medium-sized migratory raptor that breeds mainly in central and eastern Europe. The breeding population consists of approximately twenty thousand pairs (BirdLife International 2004). The birds leave the breeding grounds from early September to early October and most of them return during April. The species winters in eastern and southern Africa, south of the Equator (Ferguson-Lees & Christie 2001).

The LSE migrates to the winter quarters following the eastern Mediterranean corridor, through the Caucasus, Turkey and the Middle East (Bijlsma 1987), a route that has been confirmed by means of satellite telemetry (e.g. Meyburg *et al.* 1995). In the Central Mediterranean the species is considered rare on migra-

tion (Kisling *et al.* 1994). There are few published records in the western Mediterranean. In Spain, recent observations were restricted to the Balearic Islands and Doñana (De Juana 2006, Rüegg 2007). For the Strait of Gibraltar there is a single possible observation in October 1976 (Bernis 1980). The species is listed as Rare by the Spanish Rarities Committee (Clavell *et al.* 2005). In Morocco, it is an accidental visitor, with one record only (a subadult on 18 April 1996; Thévenot *et al.* 2003).

The aim of this study is to demonstrate its regular occurrence and autumn migration pattern in the Strait of Gibraltar. We also present the first records of satellite tracked birds migrating through the Iberian Peninsula and northwestern Africa.

## Methods

The Strait of Gibraltar is located at the southernmost point of the Iberian peninsula. The Strait is an approximately 20 km-long channel that connects the Atlantic Ocean and the Mediterranean Sea and that separates Europe from Africa (Fig. 1). This short sea-crossing makes the Strait an important migration bottleneck, channelling the majority of thermal-using migratory raptors of Western Europe. At this site, we monitored raptor migration from July to October 1998–2009. Daily censuses were carried out between 7:00 and 16:00 UTC during 68–87 days per year (on average 77 days/year), depending on weather conditions. Three strategic vantage points with a good view along the northern coast of the Strait were used for counting (Fig. 1). At least two observers per watch site continuously scanned the sky with binoculars; a telescope was used to aid identification. For each migratory raptor we recorded time, species, number of birds, direction, and age and sex (when possible). Climatic conditions were measured every second hour; when wind speed exceeded 60 km/h (c. 7 Bt) we interrupted the survey.

All records used in this study refer to positive identifications by experienced birdwatchers. We considered juveniles to be birds in fresh plumage with a wing band formed by the pale tips of the upper primary and greater coverts, and non-juveniles (either adults or immatures) as those in active moult or in worn plumage

with uniformly coloured remiges (see Forsman 2007 for detailed information).

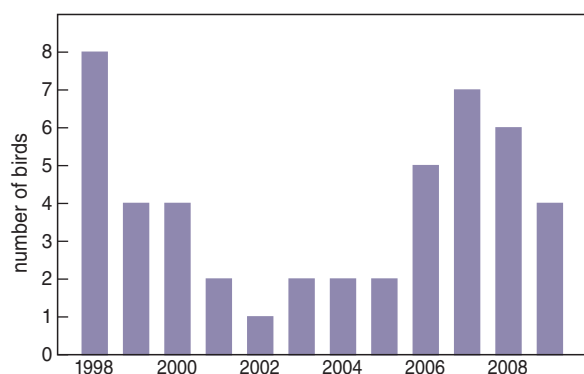
As supplementary information we used the data provided by a long-term project in which 74 birds (39 adults and 35 nestlings) were fitted with satellite transmitters (PTTs) in 1992–2009, the majority in Germany at the north-western edge of the species' breeding range (Meyburg & Meyburg 2007). From 2004 onwards the devices deployed were GPS enhanced PTTs. The tags were programmed to record a GPS fix every hour, transmitting information on flight altitude, speed and direction. Additionally, in 2009 twelve young Latvian Lesser Spotted Eagles, taken to Germany as part of a translocation project (Meyburg *et al.* 2008), were fitted with PTTs and released into the wild at a hacking station some 60 km north of Berlin.

## Results

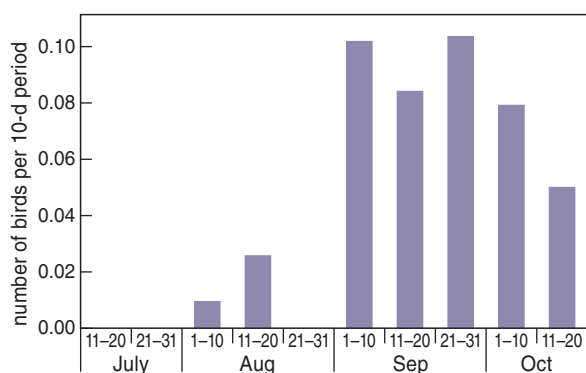
From 1998 to 2009 a total of 47 LSEs were observed, with annual sightings (Fig. 2). The birds were observed between 6 August and 12 October, with an average and modal date of passage of 16 and 12 September respectively (Fig. 3). The peak of migration occurred between 5 and 24 September (55% of all records). Most of the birds ( $n = 35$ ) were observed in the central area of the Strait of Gibraltar (Cazalla and Tráfico observatories, Fig. 1), where the largest survey effort was conducted. The birds passed between 7:00 and 16:00 h (UTC), the



**Figure 1.** Breeding range of Lesser Spotted Eagle (modified from Riede 2004), study area and observatories used in the monitoring program. Altitudinal lines (m) are indicated.



**Figure 2.** Number of Lesser Spotted Eagles registered at the Strait of Gibraltar during autumnal migration counts in 1998–2009 ( $n = 47$ ).



**Figure 3.** Seasonal pattern of Lesser Spotted Eagle passage at the Strait of Gibraltar (mean number/10-day,  $n = 47$ ), summed for 1998–2009.

majority (64% of  $n = 47$ ) between 9:00 and 12:00 h. Of thirteen age-identified LSEs, ten birds were non-juveniles.

#### SATELLITE TRACKING

Four out of 74 German LSEs fitted with a satellite transmitter followed the western route. Two of those birds reached Africa via the Strait of Gibraltar. A third LSE tried to cross the Mediterranean Sea from Cape Gata (Andalusia, Spain) to Cape Viejo (Morocco), but failed during this attempt. Another young bird took the western route but it was tracked only as far as France.

Of those birds crossing the Strait, the first was marked as a nestling on 23 July 2008 some 50 km ESE of Rostock (Germany). It left the nest on 11 August and a week later was still observed in the company of the parents. After migrating through Germany and France, it flew southwards along the Spanish Mediterranean

coast to reach the Strait of Gibraltar on 6 October where it remained until 29 October (where it was observed and photographed by T. Chodkiewicz *et al.*, pers. comm.). A first attempt at crossing the Strait on 27 October was aborted when within 6.5 km of the open sea at a height of 758 m (at 14:00 h). The actual crossing occurred on 29 October, departing from Spain some 7.2 km ENE of Tarifa. The bird was tracked as far as eastern Ivory Coast where the signal was lost. The second bird was fitted with a PTT transmitter as a nestling on 24 September 2009 near Templin, some 70 km north of Berlin. It departed from the breeding area on 14 September 2009. On 1 October, around 16:00 h (UTC), the bird reached Tarifa, but continued its migration parallel to the Atlantic coast until it reached a point some 55 km northeast of Lisbon on 7 October. The bird then veered towards Gibraltar and crossed the Strait on 9 October.

In 2009, two out of 12 young Latvian Lesser Spotted Eagles translocated into Germany followed the western route. The first young eagle began its autumn migration on 11 September and spent the night of 8/9 October 9 km north of Algeciras. The following morning it resumed migration at about 07:30 h and at 10:00 h was located 2 km north of the coast (4.9 km southwest of Algarrobo). At 11:00 h it had covered 32 km and had crossed the Strait. The second young Latvian eagle also began its migration on 11 September 2009. On 29 September it arrived at Cape Gata. At about 13:00 h it attempted to cross the Mediterranean in a southerly direction. Until 18:00 h it flew with a speed of 30–36 km/h, coping with a SE to ESE crosswind of 11–15 km/h. South of the coast its flight altitude gradually decreased from 500 m to 100 m a.s.l. At 18:00 h the bird was clearly exhausted and continued flying a few metres above the waves for another 4 km with a speed of 35 km/h, before apparently drowning 12 km west off the coast near Mellila.

#### Discussion

The regular presence of LSE, albeit in small numbers, suggests an unknown migration route via the Iberian Peninsula and the Strait of Gibraltar. The number of birds crossing to Africa via the Strait of Gibraltar is probably underestimated, mainly due to methodological and identification problems. Information from satellite tracking further suggests that these birds originate from the western limit of its breeding distribution, mainly northeastern Germany and western Poland, possibly including Central Slovakia, southwest Hungary and northern Croatia. The wintering sites of these birds are still a mystery. The bird tracked as far as

Ivory Coast might still have been migrating at the time of its loss. At present, there is no information to suggest that West Africa is a regular wintering site of any importance (Ferguson-Lees & Christie 2001), nor that it has been in the recent past when LSE was slightly more common in the western parts of its breeding range (Brown *et al.* 1982).

We show that the species has occurred annually in the Strait of Gibraltar at least since 1998, which makes a revision of its status in the western Mediterranean necessary, particularly for the Iberian Peninsula and Morocco. Furthermore, the presence of non-juveniles birds shows that the movements are not just naive juveniles on the wrong track. These results suggest two alternative hypotheses: 1) this route might be of recent origin, or 2) it is a relict of a once frequently used route, when the range of LSE expanded well into West Europe and numbers were higher (e.g. Meyburg *et al.* 2004). This route may have implications for the conservation of this endangered species, and it should be considered in the European recovery plans of the species, especially those focused on the dwindling westernmost populations (which are most likely to be involved in the western route).

The Programa Migres, on which the present study is based, is promoted by the *Consejería de Medio Ambiente (Junta de Andalucía)*. We thank all volunteers that participated in the programme. The satellite tracking was financed in 2007 and 2008 by Deutsche Bundesstiftung Umwelt and Deutsche Wildtier Stiftung. We particularly acknowledge Rob G. Bijlsma for many helpful comments.

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## Samenvatting

Tijdens systematische tellingen van de najaarstrek van vogels bij Gibraltar in Zuid-Spanje werden van 1998 tot en met 2009 jaarlijks één of meer Schreeuwarenden *Aquila pomarina* gezien. De 47 vogels passeerden tussen 6 augustus en 12 oktober, overwegend in de ochtenduren. Van de 13 op leeftijd gebrachte arenden waren er tien niet-juveniel. Een onafhankelijke bevestiging van deze trekroute werd gevonden in Schreeuwarenden uit Duitsland die met een GPS-zender waren uitgerust. Vier van de 74 gezenderde vogels vlogen in zuidwestelijke richting, waarvan er twee strandden in respectievelijk Frankrijk en tijdens de oversteek van Spanje naar Noord-Afrika. Twee andere haalden Afrika, eentje zelfs oostelijk Ivoorkust, alvorens het signaal verloren ging. De oversteek via Gibraltar is bijzonder, omdat Schreeuwarenden normaliter via de oostelijke Middellandse Zee naar hun overwinteringsgebieden in Oost- en zuidelijk Afrika vliegen. Het is onbekend of sommige Schreeuwarenden al langer een zuidwestelijke route volgden, of dat het een nieuw fenomeen is. De status van 'zeldzaam' in Spanje en Marokko moet in ieder geval worden herzien. (JP)

Corresponding editor: Jouke Prop

Received 6 November 2010; accepted 24 December 2010