

SHORT REPORT

Is the European population of Dupont's Lark *Chersophilus duponti* adequately estimated?

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Capsule Our estimate using mapping is less than previously reported using transects.

Dupont's Lark *Chersophilus duponti*, is one of Europe's least known passerines (Cramp 1988). In Europe, its distribution is restricted to the Iberian Peninsula, the Spanish population having been estimated at 13 000 individuals in 1988, approximately 70% of which are concentrated in the central high plateaux (Garza & Suárez 1990). These figures were obtained from species density estimates in the main breeding areas using Finnish line transects (Järvinen & Väisänen, 1975; 50 m inner belt width), which were extrapolated to the habitat area available for each site (Garza & Suárez 1990). These initial estimates were regarded as provisional, because of the difficulties involved in defining the appropriate habitats for the species, which is highly selective (Garza & Suárez 1990), and because of the secretive behaviour of the species.

Despite these limitations, the early population estimate has been accepted unrevised in several Red Lists (e.g. Blanco & González 1992) and evaluations of the conservation status of European birds (Tucker & Heath 1994, Hagemeyer & Blair 1997). Here we show that the European population of Dupont's Lark is much smaller than previously estimated and we discuss this result in the light of other estimates of the Iberian populations of endangered pseudostepes birds (*sensu* De Juana *et al.* 1988).

The study was undertaken on the Barahona 'paramos' (Retortillo de Soria, Central Spain, 41°03'N; 2°58'W, 1250 m asl), the most important Iberian area for the species (estimated population in the area in 1988: 4400 individuals; Garza & Suárez 1990). The area has a flat relief in which a low scrub mosaic (primarily *Genista scorpius*, *Lavandula latifolia*, *Thymus zygis* and *T. loscosi*; 89.5% of the area) alternates with dryland cereal crops (10.5%). This area was censused

during the 1988 breeding period using the line transect method (50 m inner belt width; Garza & Suárez 1990), and in 1999 and 2000 by A. Hernández (pers. comm.) using the same methodology and inner belt width. Densities yielded by these counts were 2.89 birds/10 ha (37.7 ha censused), 7.80 birds/10 ha (19.5 ha) and 6.44 birds/10 ha (19.5 ha), respectively.

In May–June 2001, a census was carried out using a mapping method (Bibby *et al.* 1992) in 751 ha of the same area over 20 sampling days. The census area only covered zones where the species might potentially be present due to their flat relief and low scrub vegetation, avoiding cultivated land, as in the line transects (Garza & Suárez 1990). In order to locate singing males precisely, systematic surveys were undertaken throughout the study area, during which a digital recording of the male song was played whenever a singing male was detected. The playback song was also used to provoke and locate males that were not singing at the time. Individuals that answered the recorded call were located and observed visually, in some cases as close as 20 m, by gradually approaching the area where the bird was singing. These visually contacted individuals were geo-referenced using a global positioning system (GPS, approx. error 1–15 m). The same approach was used to locate a second or third male in simultaneous contacts. For the definition of territories from clusters of recorded points in different dates we used the instructions recommended by Marchant (1983). Total number of contacts was 259.

Territorial distribution revealed a clear clumped pattern (Fig. 1), with a total of all observations recorded in an area of 399 ha defined by the minimum convex polygon (MCP). The density for all the 751 ha censused was 0.41 territories/10 ha ($n = 31$ territories; 0.78 territories/10 ha considering only the 399 ha in the MCP). This figure is less than those from the transect

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Figure 1. Study area, showing individual observations of Dupont's Lark (dots), territories (small polygons) and minimum convex polygon (large polygon). For the definition of territories from clusters of recorded points we followed the recommendations of Marchant (1983). Grey areas are scrubs in flat areas; unshaded areas are cultures or steep slopes.

method (about 7% of the average density estimated from the three previous years censused by transects).

The large differences in results between the mapping and transects methods do not appear to be due to inter-annual fluctuations or to a fall in the population size of the species. The interannual variations in densities yielded by the line transect (around a factor of 2) are small compared with those found between the line transect and the mapping methods (the mapping results were lower than the transect results by a factor of 7–19 times). The 2000 study density (line transect) was more than 13 times higher than the 2001 study density estimates (mapping method). Moreover, the winter before the mapping census was climatically mild, with no obvious meteorological event (snow days, extreme temperatures or spring rain) that may have had an adverse effect on the breeding population. Since 1988 there have been no significant changes in agricultural surfaces or management patterns.

The differences are probably due to census methods. The mapping method is known to be more precise in the estimation of territorial passerine densities than

line transects (Bibby *et al.* 1992), while the Finnish line transect is known to generally yield lower densities than the mapping method (Järvinen *et al.* 1978, Hildén 1981), in contrast to the results obtained in this work. The difference in the results of the two methods is probably due to a tendency to assume that singing or calling Dupont's Lark individuals are closer than their actual distance from the observer. Here we found that this distance is about 25–50 m. Given this error and the fact that almost all contacts with the species along a line transect are auditory, it is highly likely that a proportion of bird contacts in the inner belt were in fact outside. This would result in an artificial increase in the estimated species density. The mapping method may also have errors as none of individuals were ringed because of difficulties capturing them. However, during the breeding season males respond very well to recorded calls, attending a playback and staying nearby until it is stopped. This behaviour allowed us to make many contacts per individual and a high number of simultaneous contacts, increasing the precision in assigning points to individual territories.

Considering the large size of the censused area, the results of the 1988 Spanish census can be corrected using the ratio between the densities obtained using the mapping method and those from the 1988 transects. The Dupont's Lark population in Spain (and consequently in Europe) would be then reduced from 13 000 individuals to roughly 1900 pairs. Its status in Europe, in accordance with the criteria defined by Tucker & Heath (1994), would therefore change from vulnerable to endangered and become one of the most critically endangered passerines in the EU in terms of population size. The species situation is aggravated by the fragmented nature of its breeding distribution in Spain, its concentration into certain locations and its narrow habitat selection (Suárez *et al.* 1982, Suárez & Garza 1989, Garza & Suárez 1990). All of these attributes make it extremely vulnerable to possible changes in such areas. The real population may be even smaller than this estimate due to the possible overestimation of the potential habitat sizes used (see clumped distribution in Fig. 1 and the size of areas with suitable habitat where the species is not present).

Problems of population estimates in establishing conservation status are not exclusive to Dupont's Lark, and may in fact be extrapolated to most Iberian pseudo-steppe species. With the exception of the Great Bustard *Otis tarda* (Alonso & Alonso 1996), Lesser Kestrel *Falco naumanni* (González & Merino 1990), Montagu's Harrier *Circus pygargus* (Pinilla *et al.* 1994) and Hen Harrier *C. cyaneus* (Ferrero 1995), most of the population estimates for this group of birds have been extrapolated from transect densities. The clustered nature of many of them, their low densities and the different criteria used to define the habitat area available make these estimates potentially unreliable. This situation includes some endangered species such as Pin-tailed Sandgrouse (*Pterocles alchata*), Black-bellied Sandgrouse (*P. orientalis*; Suárez *et al.* 1997b, Herranz & Suárez 1999) and Little Bustard (*Tetrax tetrax*; De Juana & Martínez 1996), together with almost all pseudosteppe passerines (Tucker & Heath 1994).

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