

Short Communication

Current status of the threatened Dupont's lark *Chersophilus duponti* in Spain: overestimation, decline, and extinction of local populations

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Abstract The European population of Dupont's lark *Chersophilus duponti*, restricted to Spanish steppe, was estimated to be 13,000 pairs in c. 50 populations in 1988. There is, however, recent evidence that this number was overestimated because of the previous use of line transects for estimating population sizes. In 2002–2004 we surveyed 34 previously known local populations in patches of variable size across half of its Spanish distribution. We found 13 (38%) local populations to be extinct, and a total of only 283–339 territories in 17 of the extant populations, seven of which held <5 territories. This census contrasts dramatically with the estimate of c. 3,000 pairs in the same populations in the 1980s. We estimate that the present Spanish population is c. 1,300 pairs. The discrepancy between this and earlier estimates is partly

but not entirely due to previous overestimations. Habitat loss due to ploughing, and possibly habitat degradation and the resulting stochastic extinction of small and isolated populations, have contributed to the species' decline. Urgent research is needed to design and manage an adequate network of steppe patches that will ensure the long-term existence of this species. We recommend that Dupont's lark be categorized on the IUCN Red List as Endangered, both globally and nationally within Spain.

Keywords *Chersophilus duponti*, Dupont's lark, extinctions, habitat changes, population decline, Red List, Spain.

Dupont's lark *Chersophilus duponti* is restricted to steppe (dry, flat areas with low, scattered vegetation) areas of North Africa and Spain (Cramp, 1988). Due to the secretive behaviour of this species, together with the fact that it exclusively inhabits the few remnant patches of natural steppe, its presence was largely unreported in Spain until the 1980s (Aragüés, 1992). A national survey was conducted in 1988 by estimating densities of singing males using line transects and extrapolating the obtained densities to the surfaces occupied by suitable habitat, yielding an estimate of 13,000 individuals across 50 areas of variable size (Garza & Suárez, 1990). This may, however, have been an overestimation, as recently suggested by the same authors after comparing the results, in a locality in central Spain, from line transects with a more accurate census based on territory mapping (Garza *et al.*, 2003a). To the extent that their results could be

generalized to the whole Spanish population, they suggested the 1988 estimate may need to be reduced from 13,000 to only 1,900 pairs. Here we present the results of a recent extensive survey, conducted in a number of representative Spanish localities, which also suggests the previous extrapolation was an overestimation but nevertheless indicates that there has been a recent decline, with the extinction of some local populations.

Fieldwork was conducted during the breeding seasons of 2002–2004. We visited 34 localities, in six provinces, where the species was present in the 1980s (Fig. 1, Table 1). Four of these (Navarra, Huesca, Zaragoza and Teruel) included steppe areas in the Ebro valley, which is one of the two core areas for the species (Garza & Suárez, 1990), and two (Murcia and Granada) contain isolated populations. The survey covered all known localities in Navarra, Huesca, Murcia and Granada, and representative localities in Zaragoza and Teruel. Localities refer to clearly defined patches of natural steppe vegetation surrounded by a matrix of habitat unsuitable for the species. Localities 5 and 6 group some close patches, and locality 10 has a mosaic of small steppe patches and cereal crops from which we selected five representative areas (Table 1). Size of surveyed patches, obtained from the literature or through direct measurements with a global positioning system (GPS), varied from one of the smallest

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Fig. 1 Distribution (dark shaded areas) of Dupont's lark in Spain, 1985–2002, modified from Garza *et al.* (2003b). In this study the species was surveyed in steppe areas of the six named provinces (see Table 1 for further details).

(<50 ha) to the largest (>2,000 ha) area of steppe vegetation occupied by the species, and totalled c. 14,800 ha.

Surveys to detect singing males were conducted in good weather conditions, from 1 hour before sunrise to 1 hour after sunset, combining the detection of spontaneous song with provoking males to sing by playing a digital recording of the species' song. Individuals were also located using a previously undescribed warning call (P. Laiolo, M. Vögeli, D. Serrano & J. Tella, unpubl. data), which is useful for detecting birds when they are not singing. Localities where the species was not detected were further surveyed to be certain that the species was absent. The mapping method was used to census the number of territorial males (Garza *et al.*, 2003a). It was carried out by 1–6 persons surveying each patch, the number varying with patch size, to locate males that sang simultaneously. Males were georeferenced using a GPS, and clusters of contacts were considered to be territories (Garza *et al.*, 2003a). Census effort for each patch was proportional to its size. In total we carried out c. 900 hours of surveys over 145 days of fieldwork.

We detected Dupont's lark in 21 out of 34 localities where this species was present during the two previous decades (Table 1). We censused 16 of these, and one (locality 33) was censused by J.M. Rivas (pers. comm.). Despite considerable search effort, we cannot completely rule out the presence of the species in four of the 13 localities where we did not observe the species (given that singing and territorial activities may be relaxed at low densities; J. Tella, M. Vögeli, M. Carrete & D. Serrano, unpubl. data), although its presence in these areas would be at most 1–2 territories, which in terms of the viability of local populations is close to extinction. In seven of the

censused extant populations the number of territories was <5, and in the others there were <50 territories (Table 1). We estimate that there was a total of 283–339 territories in the censused localities (Table 1). This may be a slight overestimation; the minimum number is territories detected simultaneously, and the maximum includes additional locations of singing males that were not singing at the time. Given that territories could be larger than expected, with some singing males moving up to 800 m (Tella, Vögeli, Carrete & Serrano, unpubl. data), some of the territories included in the maximum number could have been counted twice. In addition, although it is widely assumed that singing male Dupont's larks are defending breeding territories, some of them could be unmated, as has been recently shown for the Raso lark *Alauda razae* (Donald *et al.*, 2003).

Excluding localities that were not previously censused, the maximum number of territories detected in this study was 304, contrasting dramatically with the maximum of 2,968 previously estimated for the same group of localities (Table 1); i.e. the population appears to be c. 10 times lower than previously estimated. As this comparison includes the survey of 10,150 ha of steppe distributed across 26 localities, covering most of the species' range and varying vegetation characteristics and degrees of isolation, our results highlight the poor status of this species, as recently suggested by Garza *et al.* (2003a). Extrapolating our results to the localities that we did not survey, the Spanish population of Dupont's lark could be as low as 1,300 pairs, and thus one of the most threatened European passerines.

The large difference between the numbers estimated in 1988 and our survey could, however, be due in part to previous overestimation from use of line transects for censusing (Garza *et al.*, 2003a). Most contacts with males are auditory and, because of the unusually strong song of this species, there is a tendency to mistakenly count distant birds as being within 25 m either side of the transect line. In addition, singing males often stop singing when they detect an approaching human (sometimes at 50–80 m), run away without taking flight (and are thus difficult to detect) and begin to sing again some time later at varying distances, at which time it can be difficult to ascertain whether they are the same individual. These facts resulted in an overestimation of densities in previous surveys (Garza *et al.*, 2003a; Tella, Vögeli, Carrete & Serrano, unpubl. data). The application of a correction factor to the earlier line transect data produced an estimate of the Spanish population of c. 1,900 territories in 1988 (Garza *et al.*, 2003a), i.e. 1.5 times our estimate for 2002–2004. This still suggests that the population has recently declined, but not so dramatically. Evidence for a decline is further supported by the fact that 38% of the local populations that we resurveyed appear to

Table 1 Number of territories of Dupont's lark in 2002–2004 compared with previous estimates (1982–1988, 1990–2000) in 34 localities in six provinces (Fig.1), with the approximate area of individual steppe patches.

Province	Localities	Patches	Area (ha)	Number of territories ¹		
				1982–1988 ²	1990–2000 ²	2002–2004
A. Navarra	1. Las Bardenas		2,236	1,000		37–48
	2. Ablitas	Peñadil	400	100		36–40
	3. Ablitas	Aeródromo	60		P	1–2
	4. Pulguer		40		2	0
		<i>Total</i>		>1,100	245–560	74–90
B. Huesca	5. Ballobar	Basal – 1	46	48–120		0
		Basal – 2	20			1
		Basalet	49		3	2–3
	6. Ontiñena	Ontiñena – 1	20		1	0
		Ontiñena – 2	20		1	0
		Ontiñena – 3	20		1	0
	7. Chalamera	Chalamera	30		P	0
8. Pallaruelo		150	10		0	
C. Zaragoza	9. Belchite	Planerón	600	183		18–20
		Lomaza	600	105		38–42
	10. La Puebla de Albortón	Estación	100	20		4
		Valdeabellera	472			5
	11. Pina	Valdeoro	167			2
		Marco Antonio	185			2–4
		Zapater	296			2
		Lerín	70			3–4
		<i>Total</i>	1,190	140		14–17
	12. Perdiguera		50	20		0
	13. Osera	Saso	300	75–185		P
	14. Bujaraloz		50	10–20		0
	15. Urrea Jalón	Val de Urrea	300	80–150		14–18
	16. Lumpiaque		300	10–60		0
	17. Longares		60	11		0
	18. Zuera	Picantrón	100	23–25		0
	19. Zuera		100	40		0
20. Zaragoza	Torrero-Valmadrid	400	130		21–25	
21. Zaragoza	Valdespartera	700	70–80		P	
22. Mediana	Salada	500	130		10–20	
D. Teruel	23. Alcañiz	Salada	51	10–66	20–34	3–5
			60			2–3
	25. Calanda		40		2	0
	26. Azaila		70	7	7	2
	27. Albalate		525	120	100	34–38
	28. Anadón		150			P
	29. Ejulve		300	164	164	P
E. Murcia	30. Aledo		650		354	3–5
	31. Bancal Viejo		30		8	0
	32. Chiripa		1200			12
F. Granada ³	33. Padul		1300		129	17
	34. Baza		150	10		0

¹P, species present, but census not carried out

²Previous estimates are from Garza & Suárez (1988), Sampietro (1990), Aragiús (1992), Astrain & Etxeberria (1998), Martín-Vivaldi *et al.* (1999) and Guardiola *et al.* (2000).

³Censused in 2003 by J.M. Rivas (pers. comm.)

be extinct. Extinction appeared to have occurred more in small (<100 ha) than larger areas of steppe (Fisher exact test, $P = 0.0004$). Some extinctions are related to the ploughing of the whole area (localities 7, 12 and 19). We

also recorded that ploughing, which has often been indirectly promoted by the European Common Agricultural Policy (subsidies for half of the surface of dry cereal crops cultivated encourages landowners to illegally plough

steppe areas), has also reduced steppe during the last two decades in 21 of the localities surveyed by us (we observed ploughing in localities 2, 20, 21, 23 and 30 in 2002–2004). Other factors have also reduced steppe habitat in some of the localities: partial afforestation with pines *Pinus halepensis* (localities 2, 20, 27 and 30), urbanization (20 and 21) and transport routes (16 and 18).

Low territory densities in some of the larger localities (e.g. locality 1, which has remained unaltered in the last 50 years) cannot be related, however, to the loss of habitat. In this locality, as in most of the others, territories are clumped and the species occurs in no more than half of the potential habitat. This may be a result of the species' social behaviour or of unknown microhabitat preferences within patches of steppe. Soil and vegetation features, perhaps related to food availability, could possibly constrain the species' abundance. Many of the localities are grazed by sheep, and this may have affected vegetation structure and thus the abundance of larks (Aragüés, 1992). Predation by foxes and dogs is known to be responsible for 68–99% of breeding failures in larks (Yanes & Suárez, 1996), and these opportunistic predators may have increased in recent years. In addition to these factors, the movement rate of individuals between small and isolated steppe localities surrounded by unsuitable habitat may be relatively low (see Serrano & Tella, 2003, for low dispersal rates between localities in other steppe bird species), and therefore the populations may be vulnerable to extinction due to environmental or demographic stochasticity (Hanski, 1999).

There is an urgent need for the design and management of a network of protected steppe patches to ensure the long-term viability of Dupont's lark. To support this, research will be required on the fine-scale habitat and space requirements of the species, demographic parameters and factors affecting them, population dynamics, and movements among local populations, all within a metapopulation framework. This would also help the conservation of other steppe bird species and their habitats, which are among the more threatened in Europe (Tucker & Heath, 1994). Research is also needed on the North African population of the Dupont's lark, which is apparently as small as the Spanish one (Tucker & Heath, 1994). This work needs to be promoted by the wildlife services of the various regional and national governments.

Dupont's lark is currently categorized as Rare on the Spanish Red List of Vertebrates on the basis of earlier estimates (Blanco & González, 1992) but our surveys and analysis indicate that the species' Red List status needs to be reconsidered. Based on the data presented here we propose that Dupont's lark should be categorized as Endangered on the national Red List for Spain as it meets

criteria (IUCN, 2001) B2ab(ii–v), i.e. area of occupancy <500 km² (B2), severely fragmented (a) and with continuing decline (b(ii–v)) (see also Garza *et al.*, 2003b). Similarly, the European Threat Status should be upgraded from Vulnerable (Tucker & Heath, 1994) to Endangered. Finally, the species is not currently on the global Red List (IUCN, 2003). Taking into account its status in Spain together with the small size and fragmentation of the North African population, where it is regarded as a separate subspecies (*Chersophilus duponti margaritae*; Cramp, 1988), we propose that it should be categorized globally as Endangered based on criteria (IUCN, 2001) B1ab(ii–v), i.e. extent of occurrence <5,000 km² (B1), severely fragmented (a) and with continuing decline (b(ii–v)). It would then be regarded as a globally threatened species and thus a Species of European Conservation Concern with the category SPEC 1 (Tucker & Heath, 1994).

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Biographical sketches

José L. Tella is interested in several aspects of the evolutionary ecology, physiology, and conservation of birds. David Serrano and Martina Carrete have devoted most of their research to the population ecology and conservation of threatened species in semi-arid habitats. Matthias Vögeli is studying the ecology of Dupont's lark in fragmented populations.