

## Probable population decline of the Little Bustard *Tetrax tetrax* in north-west Africa

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To document the population trend of the Little Bustard in north-west Africa, we performed an extensive literature review, and conducted six surveys in seven areas with potentially suitable habitat in north-western Morocco between 1999 and 2005. Both the number of birds and their distribution have apparently decreased, especially during the last third of the twentieth century. The present distribution is limited to the north-western part of Morocco, where at least five areas have been identified where Little Bustards have been sighted during the last years. The current population is extremely endangered, with an estimated total of not more than a few tens of birds. A detailed field survey is urgently needed to determine precisely numbers and distribution of the extant population in Morocco, as a first step to establish a conservation plan that aims to guarantee its survival in the future.

### Introduction

Little Bustards *Tetrax tetrax* occur in fragmented populations from north-western China westwards to the Iberian Peninsula (del Hoyo et al. 1996). The species also occurs in northern Africa, but ornithological reviews include only scarce data from this part of its distribution range. Cramp and Simmons (1980) found no recent sightings for Tunisia, stating that the species is only a winter visitor in Algeria, and mentioned a probable recent decline in Morocco, where they found no evidence of recent breeding. Urban et al. (1986) considered the species an uncommon resident with no recent proof of breeding, and an uncommon winter visitor to Morocco and Algeria and rarely to Tunisia and northern Libya. Ten years later, del Hoyo et al. (1996) presented practically the same information. Thévenot et al. (2003) concluded that the species is very rare, a local resident and winter visitor in Morocco, and recently the species has been placed on the Moroccan Rare Birds Committee list (Bergier and Thévenot 2006). Isenmann and Moali (2000) and Isenmann et al. (2005) consider it extinct in Tunisia and Algeria.

Little Bustards present serious conservation problems worldwide due to recent changes in land use and agricultural intensification, and the species qualifies as Near Threatened in the IUCN Red List (BirdLife International 2008). During the last decades most European populations of this species have suffered marked declines, and therefore it is classified as Vulnerable at a continental scale (BirdLife International 2004). According to latest habitat quality analyses this is one of the species most seriously threatened by recent land-use changes, which have decimated numbers in France and are apparently causing important population decreases also in Spain (Wolff et al. 2001, García et al. 2006, García et al. 2007b). Two decades ago Urban et al. (1986) predicted the extinction of Little Bustards

on the African continent, but since then there has been no specific attempt to assess the current status of the species in northern Africa. The aim of this study was to assess the recent historical trend of Moroccan Little Bustard populations and evaluate whether the available evidence supports the high extinction risk proposed by Urban et al. (1986). In addition to reviewing thoroughly all historical and latest records on the species' status in Africa, we present the sightings obtained during our field surveys carried out in Morocco between 1999 and 2005.

### Methods

We performed an extensive literature search in databases such as the *ISI Web of Knowledge* and *Zoological Records* to obtain references on the Little Bustard in North Africa. Moroccan ornithological journals, such as *Porphyrio*, were thoroughly reviewed as well. Some data reached us through personal contacts with ornithologists. We also report on our records of the species during censuses carried out between 1999 and 2005 (Alonso et al. 2005). We surveyed an area of c. 5 000 km<sup>2</sup> of habitat identified in previous studies (Alonso et al. 2000, Hellmich and Idaghdour 2001) as potentially suitable for Little Bustards and Great Bustards *Otis tarda*, i.e. flat to slightly undulated areas of dry cereal farmland, between Tangier and Meknes. Almost all surveys were carried out in the first half of March: 11–13 March 1999, 4–10 March 2001, 28 February–7 March 2002, 2–8 March 2003, and 14–19 March 2005. Each survey was conducted by one (1999), two (2003) or three (2001, 2002, 2005) teams working simultaneously as a rule in the same area, and being in contact through radio. Each team consisted of two observers, operating from a four-wheel drive vehicle, using binoculars and telescopes 20–60×, a GPS and 1:50 000

maps. Surveys started at dawn and ended at dusk, with a pause during midday (11:00–15:30 GMT). The census itinerary was carried out at very low speed (<20 km h<sup>-1</sup>), with frequent and prolonged stops at vantage points to carefully look for birds. This method has been used to census Little Bustards in the Iberian Peninsula (e.g. García et al. 2007a). Because of the terrain difficulties, lack of tracks and inaccessibility due to water courses or wet ground, it was frequently necessary to leave the car and continue walking relatively long stretches to reach hilltops and look over some areas.

## Results

### Historical data

The data on Little Bustard status in north-west Africa through the twentieth century can be summarised as follows. In Tunisia the species was common and its meat very appreciated (Whitaker 1905). Through the first half of the twentieth century it was particularly frequent during spring migration, when large flocks could be easily observed. European migrants reached Tunisia in October–November and left this country in March–April (Gouttenoire 1955). Little Bustards were resident and their numbers increased considerably during both migration periods. Blanchet (1955) referred to summer observations in Ain Bou Dries, in the northern part of the country, as well as in the central region of Maknassy. Today the species is considered extinct, as no breeding records are known for recent years (Isenmann et al. 2005).

In Algeria there are references of this species that date back to the nineteenth century. Loche (1858) described how during the breeding season birds were observed in areas close to the Mediterranean coast (Chelif lowlands, east of Oran), and later they moved southwards. Whitaker (1905) defined Little Bustards as apparently common. In the 1970s and 1980s a number of birds were seen throughout the whole year (Belarbi 1989), and the species was a regular winter visitor in Macta (Oran, northern Algeria) until the 1980s, with winter (January–February) observations of up to 75 individuals in 1975 and 25 in 1985 (Ledant et al. 1981, Belarbi 1989). In the following decade, however, the species was considered extinct (Isenmann and Moali 2000).

As for Morocco, the higher number of available observations has allowed a more detailed depiction of the trend throughout the twentieth century (Thévenot et al. 2003). According to records from the first half of the century, Little Bustards apparently occupied two distinct areas (Figure 1): the first, extending at least 400 km along the Atlantic coast, between Tangier and El Jadida, reaching eastwards the Middle Atlas, from Khenifra to Meknes; the second, in the north-east of the country, close to the Algerian border. The species has never been reported in the Sahara desert or pre-desert (Heim de Balsac and Mayaud 1962, Thévenot et al. 2003).

In the first half of the twentieth century various authors coincided in describing the species as formerly abundant in the first area (from north to south and west to east): (1) the species was abundant in cultivated areas of northern Moroccan lowlands (regions of Tangier Peninsula and north of Rharb) (Irby 1895, Vaucher and Vaucher 1915, Bédé 1926); (2) in South Rharb, Little Bustards were also

frequent near the Atlantic coast, at the open fields near Mamora forest (Meade-Waldo 1905); (3) Riegenbach sent to European museums several birds from the Doukkala region, close to El Jadida and Farsh (Hartert and Jourdain 1923); (4) according to Hartert (1925) it was abundant on the plains of Zemmour, between Rabat and Meknes, and the species bred in the Sais region close to Meknes (Lynes 1920, Jourdain 1921); and (5) Lynes (1920) reported breeding in the plains near the Middle Atlas and Carpentier (1933) found Little Bustards breeding in the foothills of the western Middle Atlas, north of Khenifra.

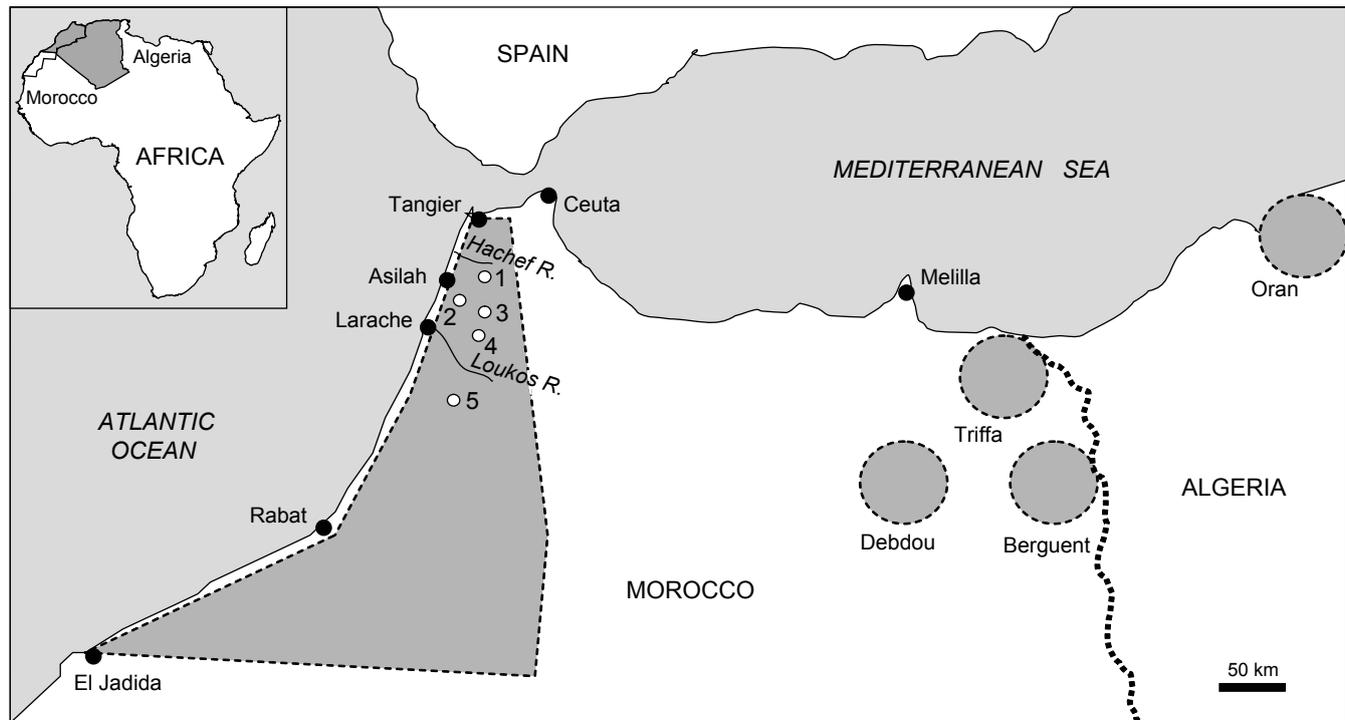
In the 1970s the species appeared to start declining in north-western Morocco (Pineau and Giraud-Audine 1977), a trend that was later confirmed by observations through the 1990s (Figure 2, references in Table 1). According to these records, wintering birds would have decreased from 1 000 to just 100 during the 1960s and 1970s. The decline would have continued until the 1990s, especially in the Loukos valley close to Larache, where in only six years wintering numbers went down from 100 to 15 (Figure 3, references in Table 1).

Records from the mid-twentieth century suggest that Little Bustards were also present at the Mediterranean coast, close to the Moroccan/Algerian border. Brosset (1956) described the species as common on the plains of north-eastern Morocco, e.g. on the plain of Triffa, where he found four nests. Numbers declined in the early 1950s following the construction of irrigation channels, and only a few birds remained in the 1960s at Oulad Mansour (Brosset 1961). Some years later Little Bustards were cited wintering in coastal areas of north-eastern Morocco (Smith 1965), and only a few birds have been sighted since then during the breeding season (Centrale Ornithologique Marocaine in Thévenot et al. 2003). The species apparently disappeared from north-eastern Morocco due to hunting pressure and agricultural transformations at the river Moulouya (D Jerez pers. comm.).

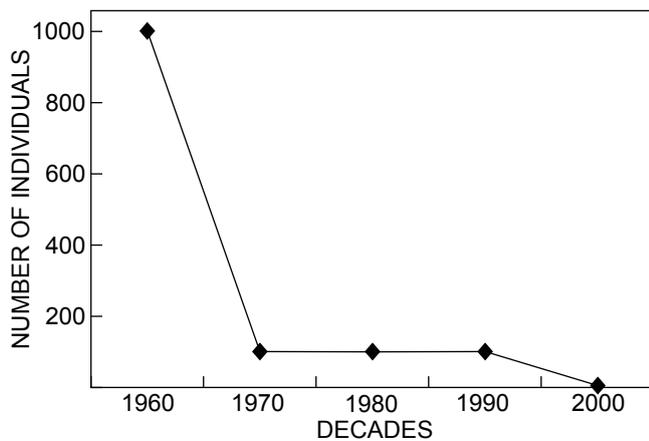
### Current distribution in Morocco

Table 1 summarises all known records of Little Bustards in north-western Morocco between 1964 and 2005. Based on our surveys, Little Bustards have been present during the breeding season in the current century at least in the following areas (from north to south, see Figure 1):

- (1) Araoua. This is the most northern area where the species has been sighted during the breeding season (three individuals in March 2003). It is an open river valley with smooth slopes and two well-differentiated parts, the flood plains of the lower Hachef and Jenane Aissa rivers, at an altitude of 1–12 m above sea level (asl), which were important wintering areas for the species in the past, and the cultivated hillsides around these valleys, where altitudes reach up to 130 m asl.
- (2) Asilah. Located at the north-western coast, this could be considered the most important breeding site for Little Bustards in Morocco. Although 19 males were estimated to breed here (Hellmich and Idaghdour 2001) in 1999, and four years later only three males were sighted, it is not possible to establish a trend based on these scarce data. This is a slightly undulated area with low hills up to 100 m asl, crossed by a few streams and limited to



**Figure 1:** Possible distribution of the Little Bustard in Morocco and western Algeria. Shaded areas show the likely distribution during the first two-thirds of the twentieth century. White dots show the location of records during the breeding season since 2000: 1, Araoua; 2, Asilah; 3, Arba Ayacha; 4, Tletta Rissana; 5, Mhrhitane



**Figure 2:** Possible trend in the minimum number of wintering Little Bustards counted in the region between Tangier and Larache, Morocco, during the last five decades, based on spot sightings from various authors (references 1, 2, 5, 6 and 8 in Table 1)

the east by the Tangier–Rabat highway. The construction of the Asilah–Larache sector of this highway in 2000 destroyed a significant part of the habitat suitable for Little Bustards.

- (3) Arba Ayacha. Fourteen birds were observed here in March 2002 (N Mouati pers. comm.). The area seems important, as there are records here since the early 1990s.

- (4) Tleta Rissana. Located 30 km east of Larache and 20 km north of Ksar el Kbir, this area is in the centre of the distribution range of the species in Morocco. In March 2000 and 2001 we only sighted one bird. Smooth hills of up to 100 m asl alternate with small valleys at 40 m asl, and the river Mekhazen constitutes its natural southern limit.
- (5) Mhrhitane. One male has been recorded in March 2005. This zone is located 30 km south of the city of Ksar el Kbir, and 20 km north of Souk-el-Arba-du-Rharb, it is slightly undulated with rounded knolls and elevations of 40–80 m asl.

Finally, there are only three records of Little Bustards south of these areas: one bird on 31 March 2001 near Boujad (F Romero, pers. comm.), three possibly migrating birds on 16 November 2005 in the Mamora forest (Cherkaoui et al. 2007) and one female on 13 April 2008 near Sidi Bettache (region of Zaers; Nawfel and Cherkaoui 2009).

**Discussion**

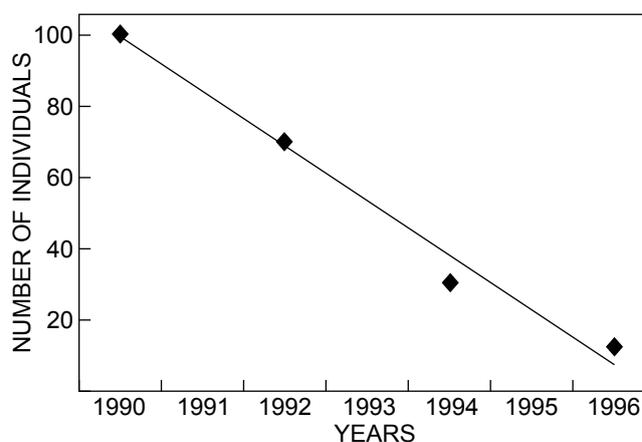
No detailed Little Bustard surveys are available for northern Africa, and therefore it is difficult to establish unquestionable population trends or changes in its distribution range. However, the data presented in this study are probably enough to suggest that North African Little Bustards have undergone a decrease in both their distribution range and numbers. This decrease has been particularly marked during the last third of the past century. Little Bustards were common in North Africa during the first two-thirds of the

**Table 1:** Records of Little Bustards in Morocco since 1964. References: 1, Thévenot et al. (2003); 2, Pineau and Giraud-Audine (1979); 3, Goriup (1983); 4, Pouteau et al. (1992); 5, Pouteau (1993); 6, Schollaert et al. (1994); 7, Schollaert and Franchimont (1995); 8, El Ghazi and Franchimont (1997); 9, Hellmich and Idahdour (2001); 10, own data; 11, F Romero pers. comm.; 12, N Mouati pers. comm.; 13, CA Martín pers. comm.; 14, Cherkaoui et al. (2007); and 15, Nawfel and Cherkaoui (2009)

Locality	Date	No. of birds	Reference
Larache	January 1964	1000	1
Larache	10 October 1971	15	2
Larache	18 November 1971	20	2
Larache	14 October 1973	30	2
Mlalah (Tanger)	8 February 1976	15	2
Mlalah (Tanger)	15 February 1976	30	2
Briech (Hachef River)	5 January 1977	100	2
Larache	January 1981	100	1
Ksar el Kbir	1 March 1982	14	3
Larache	January 1990	100	1
Barga	28 October 1991	12	4
KenitraSouk el Arba	8 November 1991	17	4
Larache	5 December 1992	70	5
Asilah	January 1993	3	6
Larache	January 1994	31	6
Arba Ayacha	9 February 1994	13	6
Rabat-Salé	12 July 1994	8	7
Larache	17 January 1996	12	8
Kanouat	March 1998	2	9
Asilah	1998	11	9
Asilah	11 March 1999	3	10
Asilah	March 2000	19	9
Tleta Rissana	March 2000	1	9
Tendafel	4 March 2001	3	10
Tleta Rissana	6 March 2001	1	10
Boujad	31 March 2001	1	11
Arba Ayacha	March 2002	14	12
Araoua	04 March 2003	3	10
Asilah	08 March 2003	3	10
Mhrhitane	10 March 2005	1	13
Mamora forest	16 November 2005	3	14
Sidi Bettache	13 April 2008	1	15

twentieth century, both as a breeding and wintering species. Previously, its distribution range extended along the northern Atlantic and Mediterranean coastlines. Today the species is present only in isolated sites of north-western Morocco, where total numbers are probably of the order of several tens of birds.

The decline starting in the 1970s might be explainable at least two different theories. One hypothesis is that the decrease in numbers reflects a true reduction of the breeding population, which would have been particularly marked during the 1960s and 1970s. This is under the assumption that the species is mostly resident in Morocco, with seasonal dispersal movements and a tendency to aggregate in winter at favourable sites (Heim de Balsac and Mayaud 1962, Hellmich and Idahdour 2001, Thévenot et al. 2003). Evidence in favour of this hypothesis includes: (1) such winter aggregations of birds breeding in nearby areas (Andalucia, Spain) seems to be the usual behaviour



**Figure 3:** Possible trend in the minimum number of wintering Little Bustards counted in the region around Larache, Morocco, during the 1990s, based on spot sightings from various authors (references 1, 5, 6 and 8 in Table 1)

(Tellería 1981, García 2003, Yanes and Delgado 2006); (2) several authors cast doubt on whether the presumed migratory behaviour of the Little Bustards is really of such magnitude (Tellería 1981); and (3) in recent years there has been no proof of Little Bustard migration through the Straits of Gibraltar, in spite of continued migration observation programs (campaigns of the MIGRES Foundation, SEO/BirdLife and Colectivo Ornitológico Cigüeña Negra), and the marking of a number of birds with radio-transmitters in France, Portugal and Spain (Morales et al. 2002, García et al. 2004, Silva et al. 2007).

An alternative hypothesis for the decrease in winter numbers observed in recent decades could be that birds originally migrating from the Iberian Peninsula to Morocco in winter reduced their migration tendency through the time period analysed. A lower migration tendency might be explained by various factors, such as: (1) the species' decline observed over recent decades in Spain, where nonetheless the current breeding population is estimated at c. 29 000–48 000 birds (García et al. 2006); and (2) a change in the species' migratory behaviour or winter distribution due to global warming as has occurred with other birds (e.g. Valiela and Bowen 2003, Newton 2008). The data currently available do not enable deciding which has been the main cause of the decrease observed in the Little Bustard population in Morocco. Both the decline in the local resident population (as a consequence of intensive agriculture, the recent expansion of power lines in rural areas, hunting pressure and disturbance at nesting sites) and a reduction in numbers of winter visitors from the Iberian Peninsula, including a change in the migratory behaviour, could have played a role.

Although the Moroccan population of Little Bustard represents the south-western limit of the world distribution of the species and may be considered a marginal population, it is necessary to highlight the importance of conserving this population because conservation of central and marginal populations should be equally important (Guo et al. 2005).

A field survey of all potentially suitable areas is necessary to find out which are currently occupied by Little Bustards and determine the size of the population breeding and wintering at present in Morocco. Based on this information a scientifically based conservation plan should be established to guarantee the legal protection of these last remaining breeding areas of the Little Bustard in Africa.

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