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# DISTRIBUTION AND CONSERVATION STATUS OF THE LITTLE BUSTARD *TETRAX TETRAX* IN THE IBERIAN PENINSULA

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SUMMARY.—*Distribution and conservation status of the Little Bustard in the Iberian Peninsula.* This paper is a compilation of data about the distribution and relative abundance of the Little Bustard *Tetrax tetrax* in the Iberian Peninsula, from a conservation point of view. Besides a comprehensive literature review, indices of relative abundance in 36 localities and absolute densities of breeding males in another 10 localities are presented. A detailed distribution map of the Little Bustard in the Iberian Peninsula is presented for the first time. Its population status differs considerably among regions: in the Southern Meseta, Extremadura and Alentejo the distribution is practically continuous, showing high densities (a guess of 170,000 breeding males is provisionally advanced for the Southern Meseta and Extremadura); whereas in the northern half of the Peninsula and most of Andalucía it is present in small areas and usually at very low densities, apparently having experienced important decreases. Increasing agricultural intensification seems to be responsible for the decline of the Little Bustard in the Iberian Peninsula, its main global stronghold.

*Key words*: Abundance, conservation, distribution, Iberian Peninsula, *Tetrax tetrax*.

RESUMEN.—*Distribución y estado de conservación del Sisón en la Península Ibérica.* Este trabajo consiste en una recopilación de datos sobre distribución y abundancia relativa del Sisón *Tetrax tetrax* en la Península Ibérica, bajo una perspectiva conservacionista. Junto con una revisión bibliográfica se presentan índices de abundancia relativa en 36 localidades y estimaciones de densidades absolutas de machos reproductores en otras 10 localidades. Por primera vez se elabora un mapa detallado de la distribución del Sisón en la Península Ibérica. La situación de sus poblaciones difiere considerablemente entre regiones: en la Meseta Sur, Extremadura y el Alentejo la distribución es prácticamente continua y las densidades son relativamente elevadas (provisionalmente se cree probable la presencia de 170.000 machos reproductores en la Meseta Sur y Extremadura), en la mitad norte peninsular y la mayor parte de Andalucía el Sisón se distribuye en pequeños núcleos y con densidades normalmente muy bajas, habiendo experimentado, aparentemente, notables disminuciones. La creciente intensificación de la agricultura podría ser responsable de la regresión de la especie en la Península Ibérica, donde se concentra la mayor parte de la población mundial.

*Palabras clave*: Abundancia, conservación, distribución, Península Ibérica, *Tetrax tetrax*.

## INTRODUCTION

The Little Bustard *Tetrax tetrax* was, until recently, considered *Globally Threatened Species* (Collar & Andrew, 1988), being catalogued now as *Near-threatened* (Collar *et al.*, 1994). Important populations are found in the Iberian Peninsula, with an estimated 10,000-20,000 birds in Portugal and 50,000-70,000 in Spain, representing more than half of the world population (Schulz, 1985*a*; Goriup, 1994).

It is suspected that the Little Bustard, like other steppe birds, may be suffering a global reduction in range and numbers due to current agricultural intensification (De Juana *et al.*, 1993; Goriup, 1994). Similar processes seem to have occurred in France (Lecompte & Voisin, 1991) and Italy (Petretti, 1991), where only small and localised populations remain. The knowledge of the species' status in Spain is very incomplete and so it is catalogued as *Indeterminate* (Blanco & González, 1992).

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In an attempt to increase our knowledge, a wide study was carried out by SEO/Birdlife with financial support from the RSPB (Martínez, 1992; Martínez & De Juana, 1993). As part of this work, we present a compilation of data on the distribution and densities of the Little Bustard in the Iberian Peninsula, based as much on the literature as on unpublished information.

## Methods

The distribution of the Little Bustard was basically determined by means of ornithological atlases, either published (De Juana, 1980; López & Guitián, 1980; Muntaner *et al.*, 1983; Elósegui, 1985; Carnero & Peris, 1988; Rufino, 1989; San Segundo, 1990; Uríos *et al.*, 1991; Ceballos & Guimerá, 1992; Pleguezuelos, 1992; Díaz *et. al.*, 1994) or unpublished (Diputación General de Aragón, in prep.; Manrique, in prep.; Purroy, in prep.; Román *et al.*, in prep.). In regions with no available atlas, Extremadura, Castilla-La Mancha and a great part of Castilla-León and Andalucía, we have mapped specific localities extracted from recent literature or, in most cases, unpublished data (own data; ICONA, unpublished; ETI S.L., unpublished). To draw the boundaries of the different subareas we have considered the habitat requirements of the species, by consulting maps of relief, vegetation and land use.

Fieldwork to determine geographical variation in abundance of breeding males was carried out in April and May 1993 and in May 1994. These months were chosen considering the phenology of the species across its range (Martínez, 1992). Thirty-six localities representing the range of climatic conditions and agricultural habitats in the species' distribution range in Spain (Table 1) were randomly selected from land use maps (MAPA, 1988). Census itineraries, averaging 21 km (range: 14-28 km), were made by car along tracks or secondary roads with a very low traffic intensity. Counts were made in the first three hours after dawn or in the three hours before dusk, peak times for the calling display (Schulz, 1985). Stops of three minutes duration at 1 km intervals were made to record all contacts with calling males. Duration of counts was based on the calling frequency of the breeding males (Schulz, 1985*b*; Petretti, 1993). Indices of relative abundance were obtained by dividing the total number of contacts by the number of kilometres of each transect. This index does not provide a measure of the actual density of the Little Bustard, but allows comparisons of abundance at a broad geographical scale (Blondel, 1975; Frelin, 1982).

To estimate the density of breeding males, ten areas representing the climatic conditions and the landscape units that constitute Little Bustard habitat in Spain and where the presence of the species was previously known were selected (Table 2). Four censuses were made between April and June in both 1992 and 1993. The census technique was a combination of mapping and line transect methods (Enemar & Sjöstrand, 1970; Svensson, 1979; Hildén, 1981; Tellería, 1986). Census itineraries were established on 1:25,000 scale maps so that plots were entirely covered. Birds were recorded within 500 m on either side of the transect line, the maximum detection distance of calling males (André, 1985). The visual survey was combined with listening points of three minutes duration at 500-750 m intervals. All contacts with calling males were recorded and mapped. The density of breeding males was estimated by evaluating the map of contacts with territorial males in the four censuses.

## Results

The distribution of the Little Bustard is shown in figure 1. The species is widely distributed in the Peninsula, although it is absent or very rare in the so-called humid Iberia (northern Portugal, Galicia, Asturias, Cantabria, País Vasco and northern parts of Navarra, Aragón and Cataluña) as well as in the principal mountain areas and in most of the eastern and southern coastal zones.

### *Galicia*

In the Cantabrian belt of the Peninsula, the Little Bustard seems to be absent as a

TABLE 1

Geographical variation in the abundance of breeding males of Little Bustard at 36 Spanish localities. *[Variación geográfica de la abundancia de machos reproductores de Sisón en 36 localidades españolas].*

| Locality *[Localidad]* | Coordinates *[Coordenadas]* | Point counts *[Puntos de conteo]* | Abundance *[Abundancia]* |
|---|---|---|---|
| EBRO VALLEY | | | |
| Fuendejalón-Pédrola | 41° 46' N, 1° 21' W | 20 | 0 |
| Villanueva de Gállego | 41° 47' N, 0° 49' W | 19 | 0 |
| Samper de Calanda-Puig Moreno | 41° 10' N, 0° 20' W | 19 | 0 |
| La Almolda-Monegrillo | 41° 35' N, 0° 18' W | 28 | 0.11 |
| NORTHERN MESETA | | | |
| Fuentemilanos-Sta. M.ª la Real de Nieva | 40° 58' N, 4° 20' W | 24 | 0.08 |
| Nava del Rey-Cantalapiedra | 41° 14' N, 5° 08' W | 29 | 0.17 |
| Gallegos del Pan | 41° 36' N, 5° 32' W | 18 | 0.38 |
| Medina de Río Seco | 41° 53' N, 5° 03' W | 24 | 0 |
| Villafruela-Antigüedad | 41° 55' N, 4° 01' W | 19 | 0.05 |
| Melgar de Fernamental-Villadiego | 42° 28' N, 4° 08' W | 18 | 0 |
| Gómara | 41° 37' N, 2° 13' W | 21 | 0 |
| Morón de Almazán | 41° 25' N, 2° 24' W | 20 | 0 |
| SOUTHERN MESETA | | | |
| Meco | 40° 33' N, 3° 20' W | 20 | 0.55 |
| Daganzo | 40° 32' N, 3° 27' W | 19 | 1 |
| Campo Real | 40° 20' N, 3° 23' W | 20 | 1.70 |
| Estremera | 40° 11' N, 3° 07' W | 14 | 1.27 |
| Fuentidueña de Tajo | 40° 07' N, 3° 10' W | 24 | 1.14 |
| Pinto | 40° 15' N, 3° 42' W | 16 | 1.06 |
| Torrejón de Velasco | 40° 10' N, 3° 37' W | 21 | 1.19 |
| El Bonillo-El Ballestero | 38° 57' N, 2° 30' W | 17 | 1.18 |
| Montiel-Almedina | 38° 40' N, 2° 55' W | 28 | 1.32 |
| Tembleque-Villanueva de Bogas | 39° 42' N, 3° 35' W | 19 | 1.21 |
| Torrijos | 39° 59' N, 4° 18' W | 24 | 1.25 |
| Cabezamesada-Horcajo de Santiago | 39° 49' N, 3° 03' W | 19 | 0.63 |
| Belinchón | 40° 03' N, 3° 04' W | 24 | 1.08 |
| Calera y Chozas | 39° 53' N, 4° 59' W | 20 | 1.10 |
| EXTREMADURA | | | |
| Cabeza del Buey | 38° 44' N, 5° 13' W | 19 | 0.21 |
| Granja de Torrehermosa | 38° 19' N, 5° 35' W | 27 | 1.37 |
| Valencia de las Torres | 42° 17' N, 5° 31' W | 19 | 0.89 |
| La Albuera | 38° 43' N, 6° 49' W | 14 | 0.71 |
| Brozas | 39° 37' N, 6° 47' W | 21 | 0.29 |
| Trujillo-Ibahernando | 39° 28' N, 5° 53' W | 22 | 2.23 |
| ANDALUCIA | | | |
| El Carpio-Santa Cruz | 37° 56' N, 4° 30' W | 19 | 0.21 |
| Córdoba | 38° 53' N, 4° 46' W | 27 | 0 |
| Ecija | 37° 33' N, 5° 04' W | 21 | 0 |
| Carmona | 37° 28' N, 5° 38' W | 25 | 0.48 |

TABLE 2

Densities of breeding males of Little Bustard at ten Spanish localities.
*[Densidades de machos reproductores de Sisón en diez localidades españolas].*

| Locality *[Localidad]* | Coordinates *[Coordenadas]* | Area (ha) *[Area (ha)]* | Density (males/km²) *[Densidad (machos/km²)]* 1992 | 1993 |
|---|---|---|---|---|
| EBRO VALLEY | | | | |
| Belchite | 41° 18' N, 0° 45' W | 40 | — | 0 |
| NORTHERN MESETA | | | | |
| Villafáfila | 41° 50' N, 5° 36' W | 1,000 | — | 3.6 |
| Campo Azálvaro | 40° 41' N, 4° 25' W | 300 | 7.3 | 5.3 |
| SOUTHERN MESETA | | | | |
| Colmenar Viejo | 40° 43' N, 3° 47' W | 500 | 2.4 | 1.2 |
| Valdetorres de Jarama | 40° 42' N, 3° 29' W | 1,200 | 3.5 | 4.1 |
| Zarza de Tajo | 40° 03' N, 3° 10' W | 900 | 3.7 | — |
| Oropesa | 39° 57' N, 5° 11' W | 500 | 3.0 | — |
| Ocaña | 39° 55' N, 3° 30' W | 1,000 | 3.9 | 5.1 |
| Higueruela | 38° 57' N, 1° 28' W | 900 | — | 3.8 |
| EXTREMADURA | | | | |
| Castuera | 38° 49' N, 5° 30' W | 500 | — | 4.6 |

breeding species (Alvarez *et al.*, 1985; Noval, 1986). A population of 200-250 pairs has been estimated in Galicia (Fernández-Cordeiro & Domínguez, 1991), probably based on the censuses of postbreeding concentrations carried out between 1975 and 1984, which recorded 1,120-1,275 birds distributed in 11 nuclei (Bárcena *et al.*, 1987). However, given that those censuses were done in autumn, it is possible that the birds had come from other regions. It is significant that in the area where Bárcena *et al.* (1987) estimate the largest breeding population, La Limia —as many as 750 birds were seen on 30 September 1984—, the earliest observation date was 5 June, when in France breeding birds settle between mid March and early May (André, 1985). According to that study, breeding has been confirmed in Terra Chá (Lugo province) and Cualedro (Orense), and is reported as possible in Bergantiños (La Coruña). The most recent records of breeding in Galicia are from La Limia area, where the species possibly bred in 1992 (F. Arcos, pers. comm.).

*Ebro Valley*

The distribution, very discontinuous, is known in considerable detail. A first population centre occupies the southern half of Navarra province, where Elósegui (1985) cited 40-50 pairs and C. Astrain (pers. comm.) estimates a present population of 400-500 birds, and considers the population to be apparently stable. In La Rioja province, De Juana (1980) did not record the species, but Gámez (1993) confirmed its breeding in Murillo de Río Leza in 1991 and C. Astrain (pers. comm.) indicated observations in Alfaro. The ornithological atlas of Spain (Purroy, in prep.) extends this area slightly to Soria province.

The atlas of the breeding birds of Aragón (Diputación General de Aragón, in prep.) shows a continuous area of greater size that covers the south of Huesca, the east of Zaragoza and the northeast of Teruel provinces. This area is extended to the Catalan province of Lleida (Muntaner *et al.*, 1983) where Estrada *et al.* (unpublished) estimate the presence

FIG. 1.—Distribution of the Little Bustard in the Iberian Peninsula. Continuous line: limits given by ornithological atlases; dashed line: limits according to distribution of suitable habitat; dots: unpublished localities; triangles: published localities.
*[Distribución del Sisón en la Península Ibérica. Línea continua: límites según atlas ornitológicos; línea discontinua: límites según distribución del hábitat potencial; puntos: localidades inéditas; triángulos: localidades en bibliografía.]*

of at least 612 territorial males. Aixalá (1987) gave a list of localities where the species is present. According to the recent report of the Diputación General de Aragón (unpublished) densities in the Aragonese part seem to be very low: in Los Monegros, to the north of the Ebro river, only five zones with some relevance exist (Puilatos-Sarda Blanca, La Dula-Val de la Filada, El Piporro-Moluna, El Ralenco y La Plana de Peñalbeta), where 65-75 pairs are estimated, and another four to the south of the Ebro (Salada de Mediana-llanos del Planerón, llanos de Belchite-Lécera-Vinaceite, Saladas de Alcañiz y llanos de Monferré), with 16 pairs. This study records mean densities of 0.30 and 0.06 birds per $km^2$ to the north and south of the Ebro, respectively, and reports a pronounced decline of the population in the 15-20 last years. In our sample (Table 1), we only found 3 territorial males in 86 point counts, while Hernández & Pelayo (1987) did not even record the Little Bustard in a study carried out in 7 areas with steppe vegetation.

Without considering isolated localities with only possible breeding, the atlas of Aragón only shows the species to the west of Teruel, on both sides of the Jiloca river, on the high plateaus of the Sistema Ibérico. By means of these high plateaus this area would connect with the small populations of Guadalajara and Soria provinces, in the Northern Meseta. The numbers must be very low, with no birds recorded in our sample surveys at Gallocanta and Torralba de los Sisones (Zaragoza).

*Northern Meseta*

The distribution of the Little Bustard in the middle of the Duero basin seems conti-

nuous, but it tends to fragment at the mountainous periphery. Here, the species occupies the high plateaus named «páramos», where crops alternate with pastures and shrubs of chamaephytes, as in the Masa and La Lora areas (Burgos), at altitudes of 900-1,100 m (De Juana, 1980; Roman *et al.*, in prep.). Garza & Suárez (unpublished) estimate 10 pairs in Masa and 5 pairs in La Lora, besides estimates for another five localities in Soria (Altos de Barahona, 20 pairs; Layna, 2; Soria, 10; Campo de Gómara, 10, and Monteagudo de las Vicarías, 10; all numbers are for pairs).

Another interesting peripheral population is located in Campo Azálvaro (Ávila), on relatively humid pastures at the base of Sistema Central, at 1,100-1,250 m (San Segundo, 1990). We found a density of 7.3 territorial males/km$^2$ in 1992 (Table 2), and Garza & Suárez (unpublished) estimate a minimum of 100 pairs.

In the pure cereal areas, prevalent in the centre of the basin (Mayoral, 1987), the Little Bustard seems to be scarce at present. In Burgos province Román *et al.* (in prep.) have estimated 50-80 pairs and in Salamanca Carnero & Peris (1988) estimated 400-600 pairs. Our mean index of abundance for this region was 0.09 males by point count (173 point counts), being negative in four of the eight transects (Table 1). Tellería *et al.* (1988) reported a spring density of 0.2 birds/km$^2$ in cereal crops of Sepúlveda (Segovia). However, in the Lagunas de Villafáfila National Wildlife Reserve (Zamora), with cereal alternating with legumes and pastures, we found an average of 3.6 males/km$^2$, which, if extrapolated to the whole reserve give a total of 1,177 territorial males. In the area of Tierra de Campos, Díaz *et al.* (1993) recorded a spring density of 6.3 birds/km$^2$ in a locality with extensive dry farming, whereas the species was absent from two nearby localities with dominance of intensive dry and irrigated land. In León province, F. J. Purroy (pers. comm.) estimates higher densities in peripheral zones of great cereal extensions, where some lands are not cultivated, being occupied by vineyards and shrublands. In the same way, in Burgos Román *et al.* (in prep.) indicate that in cultivated areas the Little Bustard only occupies zones with alternation of fallows and shrublands.

Given the historical trends and the present level of agricultural intensification in the whole of the Northern Meseta (Cabo, 1987), it seems very probable that Little Bustard populations have suffered a severe reduction, although numerical data to support this suggestion are lacking. Some old records from localities where the species is absent nowadays, such as San Ildefonso and El Espinar (Segovia) or Santa Colomba de Somoza (León) (Castellarnau, 1877; Gil-Lletget, 1945; Bernis, 1946), could be a sign of a slight range contraction.

*Southern Meseta*

The Little Bustard distribution appears to be practically continuous and, in general, with high densities. The atlas of the Comunidad de Madrid (Díaz *et al.*, 1994) shows the species widely distributed with the exception of highland areas and the urbanized surroundings of the city. Our data in this province show mean densities of 1.8 males/km$^2$ in pastures of Colmenar Viejo and 3.8 males/km$^2$ in cereal lands of Valdetorres de Jarama (Table 2). The mean index of abundance for seven cultivated areas (Table 1) is 1.13 males by point count, over 134 point counts. Lilford (1866) had already found the species to be common in Aranjuez during the breeding period, while Gil-Lletget (1945) recorded it in Fuencarral, Torrejón de Ardoz, Daganzo, Alcalá de Henares and Villalba.

The status of the Little Bustard could be similar in the rest of the region. Gil-Lletget (1945) recorded it in Fontanar and Vega de Maluque (Guadalajara), the Sagra area (Toledo) and Daimiel (Ciudad Real), and it is reported to be a common breeder in Daimiel (Jiménez *et al.*, 1992) and in La Roda (Albacete) (Picazo, 1989). Localities where the Little Bustard is present in spring are widely distributed within all flat areas from the Sistema Central to the Sierra Morena, although towards the Sistema Ibérico, records for Cuenca and Guadalajara provinces are very scarce. The distribution of the species in Guadalajara suggests a geographical link, across the Campiña of Guadalajara and Alcarria highlands (J. Charco, pers. comm.), with the populations of the Northern Meseta

and Aragón (highlands of Maranchón-Layna and Embid-Molina) (De Juana, 1990). To the southeast, the distribution marginally extends to the País Valenciano from the Manchuela area (Uríos *et al.*, 1991) and in the Murcia region from Almansa (Albacete) (Hernández *et al.*, 1987).

In the sample surveys carried out in the cultivated areas of Castilla-La Mancha (Table 1), the Little Bustard is, together with the Crested Lark *Galerida cristata*, the most frequently recorded species, with a mean of 1.11 males/point count over 151 point counts. The mean density obtained in four localities, three in Toledo province and one in Albacete province, was 3.75 males/km$^2$ (Table 2). In Leganiel (Cuenca), Potti & Garrido (1986) have estimated a spring density of 1.3 males/km$^2$ in cereal lands. A study carried out in 1994 by the Dirección General de Montes y Medio Ambiente Natural of the Junta de Comunidades de Castilla-La Mancha (ETI S.L., 1994) estimates the following IKA of breeding males within the different provinces (mean values and in parentheses, extreme values, number of localities and number of sampled kilometres: Albacete: 0.50 (0 - 1.8; $n=9$; 52 km); Ciudad Real, 0.68 (0-1.8; $n=6$; 34 km); Cuenca, 1.33 (0-4.2; $n=8$; 43 km); Guadalajara, 1.20 ($n=1$; 5 km); Toledo, 1.38 (0.2-2.2; $n=9$; 47 km).

*Extremadura*

As in the Southern Meseta, the Little Bustard can be considered as common and widespread in all areas without mountains and with few trees (De Juana, 1990, 1994). Gil-Lletget (1945) had already recorded it as abundant in various localities of Cáceres (Ríolobos, Quinto de Potes, Valencia de Alcántara).

In our sample surveys, it is the species which shows the highest frequency of occurrence (79 point counts over 122), with an average of 1.01 males by point count (Table 1). In Trujillo (Cáceres), where pastures predominate over cultivated lands, it was present in all the point counts, the average of 2.23 males/point count being the highest of the 36 transects. In the area of La Serena (Badajoz), which also has more pasture than cereal lands, a spring density of 28 birds/km$^2$ has been recorded (Aguilar, De Juana and Tellería, in De Juana, 1988), although in 1993, the maximum density obtained in the locality of Castuera was 10 males/km2 and the mean density was 4.6 males/km$^2$ (Table 2). In the Vegas Altas del Guadiana area (Badajoz) a drastic decrease in Little Bustards has been observed in the irrigated lands (Aguilar, 1980; Pérez-Chiscano, 1975).

To the southwest of Badajoz, its distribution extends over the Andalusian province of Córdoba, in the area of Los Pedroches, to reach as far as Sierra Morena (Purroy, in prep.).

*Portugal*

The information available to us do not allow to precisely describe the status of the species in this country. The Portuguese atlas (Rufino, 1989) reports the presence of the Little Bustard in all localities with suitable habitat for breeding —open areas, cultivated lands, pastures and long fallow lands— with a continuous distribution to the south of the Tajo river, with the exception of the Algarve, while it is very local in the north of the country. In the south, chiefly in the Alentejo region, the species seems to be very common. Cary (1973) assessed it as plentiful, while Schulz (1985*b*) records densities of 9-13 males/km$^2$ in Vila Fernando (Alto Alentejo) near Elvas. M. Pinto (pers. comm.) indicates mean densities of 4 males/km$^2$ in the Baixo Alentejo, estimating a country population of 13,000-18,000 birds (10,000-20,000 in Tucker & Heath, 1994, who also suggest an apparent demographic stability).

*Andalucía and Murcia*

The populations of Little Bustard in this region are relatively small and scattered. The greatest continuous area is located in the cultivated lands of the Guadalquivir Valley, basically in the Córdoba and Sevilla provinces. Here we recorded 16 males in 92 point counts (Table 1). In the cultivated lands of Córdoba it seems to have been more abundant some time ago (Muñoz, 1987; Carpintero *et al.*, 1991).

This area extends eastwards to the surroundings of Jaén and the small cereal area of Jabalquinto, Linares and Baeza (J. Muñoz-Cobo, pers. comm.), while in the south the species appears to have a patchy distribution in Málaga province (Purroy, in prep.), the periphery of Doñana (some tens of individuals, according to Llandres & Urdiales, 1990) and a great part of western Cádiz province, where the species is common in the area of La Janda (Ceballos & Guimerá, 1992; M. Barcell & I. Sánchez, pers. comm.). In the extreme west of Andalucía a small nucleus exists in the Aljarafe area (Huelva), apparently an extension of the Alentejo population (Purroy, in prep.).

In the eastern part of this region only very isolated populations occur. In Granada province the Little Bustard was formerly more widespread, but at present only relict populations remain in the depressions of Guadix and Baza, and in the plains of El Temple, with means of 0.1 birds/km in cereal lands (Pleguezuelos, 1991, 1992). In the depression of Guadix a very severe regression has occurred in the last years (M. Soler, pers. comm.). The species extended from here to the north along the Guadiana Menor valley (Jaén), but recently has disappeared from this area probably due to the increased planting of olive groves and almond trees (Yanes, 1993). In Almería province it has also suffered a great decline associated with the extension of irrigated lands, almond plantations and abandonment of dry cereals, so now only small populations remain on the south coast (Campo de Níjar) and in the extreme north (highlands of Topares) (Manrique & De Juana, 1991). The northern area reaches the north tip of Granada, around La Puebla de Don Fadrique (Pleguezuelos & Manrique, 1987), and over the northwest of Murcia province, in El Moral (Hernández *et al.*, 1987).

In Murcia at present only very small population centres remain in the Calasparra plains (Cagitán-Almorchón), the highland of Yecla, and the Saladares of Guadalentín (Hernández *et al.*, 1987; Ballesteros *et al.*, unpublished).

## Discussion

This review enables the distribution of the Little Bustard in the Iberian Peninsula to be determined in detail for the first time. The distribution, compared with that given in Cramp & Simmons (1980), extends much more to the southeast, over Andalucía and Murcia, and as a whole the area is much more fragmented.

On available information it is not possible to calculate precisely the size of the Iberian population. However, the Spanish population must be well over the 50,000-70,000 birds previously estimated. If we only consider the Southern Meseta and Extremadura, and, given that the indices of relative abundance are very similar (Table 1), an extrapolation from the mean density of 3.6 males/km$^2$ (Table 2) to the land area occupied by dry cereal farming or pasture (more than 48,000 km$^2$, according to MAPA, 1988) results in 170,000 breeding males. As the area sampled to estimate absolute densities is very small and the sites were not strictly selected at random, this figure must be considered just a guess.

From a conservation perspective this figure could invite optimism, especially if it is compared with the 84,000-120,000 birds that Tucker & Heath (1994) have recently estimated for the world population. On the one hand, as we have seen, the species occurs in very low numbers in a great part of its range-possibly less than 2,000 birds in the whole Ebro Valley and less than 20,000 in the Northern Meseta —where population centres are very isolated, and probably relict. Although there is little precise information, it seems evident that the Little Bustard has suffered a recent severe decline in these regions and in Andalucía. On the other hand, the changes that have occurred over several years in land uses and in the dominant agricultural practices seem to affect the species negatively (De Juana *et al.*, 1993; Martínez & Purroy, 1993; Díaz *et al.*, 1994). In dry cultivations of Central Spain the Little Bustard clearly prefers habitats with a great diversity of substrates, positively selecting fallows, legume crops and pastures, and negatively cereal crops and ploughed lands (Martínez, 1994). The present intensification of Spanish agriculture (Ferrer & Sáenz, 1989) acts against these habitat preferences, by increasing cultivation, reducting fallow land, removing borders within holdings, decreasing legume production, etc. Be-

sides, in many areas the changes are more radical and incompatible with the species, as in the case of irrigation or the spread of arboreal cultivations, particularly olives and almond (De Juana *et al.*, 1993). Given the importance of the Iberian Peninsula for the species' survival, it is evidently necessary to know the extent of these changes and to monitor them strictly as well as the populations of the Little Bustard.

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