Avocetta N° 17: 19-22 (1993)

Notes on the lek behaviour of the Little Bustard in Italy

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Abstract — The display behaviour of Little Bustard (*Tetrax tetrax*) males was studied in Sardinia and in Apulia.
Little Bustard males occured from April to June in steppe-like habitats and clustered in display centers with average density of 1.9 males/100 ha. Mean nearest neighbour distance was 450 m.
The habitat of the area exploited by the birds consisted mainly of permanent pastures grazed by sheep and cattle, secondly of oat/barley fields and fallow land.
The birds were mostly active at dawn and dusk, giving snort calls at the maximum frequency of 1 call/9.3 seconds. More elaborate courtship display, like wing flashing and jumping, occurred only in twilight.
The author compares the behaviour of Sardinian and Apulian males, finding out some differences in the pattern of display.
In Sardinia males showed complete courtship display and occurred always in relaxed groups, while in Apulia the males were never recorded wing flashing or jumping and sometimes they were so dispersed as to be considered "soloists".

Introduction

Most species of bustards show elaborate courtship systems, ranging from solitary displaying individuals, though monogamous, to communal displaying by groups of polygamous males in dispersed territories (exploded lek) or in tightly associated territories (true lek-like behaviour) (Carranza *et al.* 1989).
The mating system of the Little Bustard (*Tetrax tetrax*) is described by Schulz (1985 and 1986).
During the breeding season the males display at display centers and females visit these areas for copulation. Usually a bond is never formed and hens nest independently from males.
This paper deals with the display behaviour of Little Bustard males of two populations, in Sardinia and in Apulia.
The status of the two populations is strikingly different, since the Sardinia one is healthy and consists of 1,435-2,075 individuals (Schenk and Aresu 1985), while the Apulia one, which occurs at the eastern periphery of the species range in Europe, is on the verge of extinction and consists of a small population not exceeding 100 individuals (Petretti 1985, 1986b).
Both populations are sedentary, showing some winter dispersal from the nesting grounds (Schenk and Aresu 1985, Petretti 1986b).

Methods

The study was carried out from 1982 to 1990 and results from 110 days of fieldwork, mainly spread from April to June.
Three study areas have been surveyed, one in Sardinia and two in Apulia.
Their climate falls into a typical Mediterranean pattern, with cool and rainy autumns and winters and very dry summers. Diurnal temperature variations can be considerable. Average annual rainfall is 586 mm for Sardinia and 478 mm for Apulia. The Sardinia area lies at 170 m a.s.l., in the alluvial valley of the river Coghinas (40°45' N, 9°00' E). The two Apulia area lies on average at 150 m a.s.l. in a calcareous plateau close to the Adriatic Sea (41°30' N, 15°30' E).
Land use and habitat types were assessed through the analysis of vegetation maps, aerial photos, Landsat imagery and ground surveys.
In a both areas, the land is mainly used to rear free ranging sheep and cattle and to harvest fodder and cereal crops (Petretti 1986a).
Hunting pressure is very high in Apulia between September and March.
Data were collected from Sardinia (1984 to 1987) and Apulia (1982/1983), recording each year the number of displaying males respectively in a study area of 250 ha and two study areas of 340 (area A) and 180 ha (area B) (the latter 10 km apart).

Accepted 15 September 1993

The three study areas have clear boundaries set up by permanent streams and paved roads which separate bustard habitats from intensive cereal cultivations, wetland and maquis.
I recorded the position of males in the display area at least six times per day, during two consecutive days each year. Each individual display territory (lek) was thus identified by 12 mapped points. Assuming that the same male occupied its own lek during the reproductive season, the polygon resulting from connecting the outer points was considered as the lek, whose center at the intersection of the diagonals was drawn to find out the mean nearest neighbour distances.
The display behaviour in Sardinia and in Apulia was recorded from fixed vantage points, with the use of a binocular and telescope.
With the help of two more observers, in Sardinia I continuosly monitored three males. For each one I made 144 10-minute sets of observations (total 4,320 minutes) from midday 24 April to midday 30 April 1985, throughout 24 hours.
I made further scattered observations on the behaviour of cocks in 1986 and 1987, spending 15 days in the study area. With the help of one more observer, in Apulia I recorded the activity of three males in the study area A from May 29th to June 1st 1982 and from May 26th to May 30th 1983 for a total of 1,800 minutes scattered throughout 24 hours.
Since in 1984 the study areas in Apulia were deserted by the bustards, I start surveying a whole district of 5,000 ha to locate displaying males and continue collecting data on habitat selection and behaviour. From 1984 to 1990 I did a further 18 days of observation on solitary displaying males outside the sudy area. In 1990 I followed a single male for three days, recording 72 sets of 10-minute observations each hour from 0600 of 20 May to 0600 of 23 May. Bright skies allowed the observers to track the males also by night.

Results

Displaying population

I was not able to cover the whole spring and summer, thus I cannot provide information on displaying phenology.
Anyway, in the whole study period I observed displaying males in Sardinia as early as April 23rd and as late as June 4th and in Apulia as early as April 19th and as late as May 30th.
The females were only seen when flushed or chased by males. On May 30th 1985 I flushed a female from the nest with eggs in Sardinia, about 100 m from the lek center of one male.
In the Sardinia study area, males were observed displaying throughout the study period, from 1984 to 1987, while the Apulia study area A was occupied only in 1982 and 1983 and the study area B only in 1982. Since then, I found only small groups of males and solitary individuals scattered in a district of 5,000 ha.
The Sardinia study area was occupied by 7 males in 1984, 6 in 1985 and 1986 and 5 in 1987. The Apulia study area A was occupied by 5 males in 1982 and 7 in 1983, the study area B by 3 males in its only year of activity (1982).
Other groups of males were found outside the Sardinia study area, the closest about 2 km, while those monitored in Apulia seemed to represent the total displaying population in a district of 5,000 ha.
Male density ranged from 2.0 males/100 ha to 2.8 males/100 ha in Sardinia (mean = 2.4 $\pm$0.32; N = 4) and from 1.4 males/100 ha to 2.0 males/100 ha in Apulia (mean = 1.5 $\pm$0.43; N = 3).
Combined mean is 1.9 males/100 ha ($\pm$0.58).
The data are too scanty be statistically tested.
The mean display ground area (lek) covered 2.17 ha $\pm$0.60 (range 1.1-3.0) in Sardinia and 2.08 ha $\pm$0.69 (range 0.8-3.0) in Apulia. Combined data give and average figure of 2.13 ha ($\pm$0.63; N = 39).
Mean nearest neighbour distance was 449.8 m $\pm$129.94 in combined areas (range 175-675 m; N = 39).
The highest density of males was recorded in Sardinia in 1987 (the mean nearest neighbour distance was 225.0 m; N = 5) when the study area was partially ploughed and the males were forced to cluster in the remaining grassland.

Habitat Selection

For the purpose of the present study the habitat was classified into four main categories:
A. Permanent pastures dominated by Asphodels (*Asphodelus* spp.), Umbelliferae (*Ferula communis* and *Thapsia garganica*), Thistles (*Cardus* spp.) and Grasses (*Stipa* spp., *Poa* spp.). These grasslands are never ploughed.
B. Barley and oat fields and related fallow lands. Fields are harvested once a year in late May/early June.
C. Wheat fields. Suitable to bustards only between late autumn and early summer. Later harvesting, burning and ploughing activities turn the fields into bare grounds.
D. Small marshes, gravel pits, maquis and garigues. These habitats are not exploited by Little Bustards.
Each study area consisted of all the four main habitat types identified, but the situation was not stable during the study period, since farming activities led to a reduction of fallow land and an increase in wheat fields.
Values given in Table 1 (N = 39) refer to the mapped leks and to an arbitrarily chosen surface of 19.6 ha centred on the lek (radius 250 m). This distance represents a reasonable estimate of the movements of a single male during its display season (Schulz 1985).

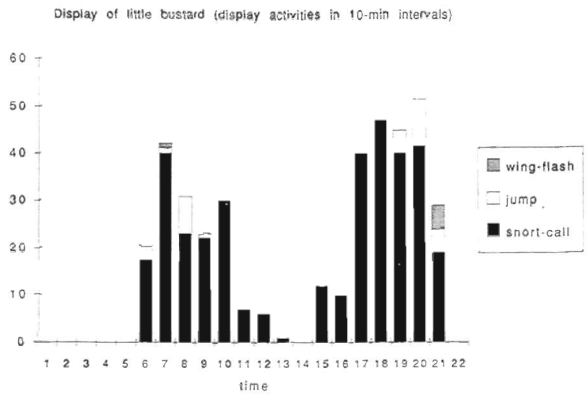

Figure 1. Display activities of males classified in snort-calling (first bar), jumping (second bar) and wing flashing (third bar). Data collected in Sardinia from midday April 24th to midday April 30th 1985, expressed as number of display activities in 10-minute intervals (1 interval per hour). Data combined from three males. Sunrise 0600. Sunset 2015.

Displaying males occurred mainly in permanent pastures, which cover 81.3% of the plotted leks and 50% of the three study areas (data combined), and avoided wheat fields which cover only 5.3% of leks against 25.0% of all the study areas.

Pattern of male activity

The males flew away from their territory only when disturbed by man or when chasing passing males or females. Cocks usually returned promptly to their lek and started displaying again.

The display was classified into three categories, according to Cramp and Simmons (1980) and Schulz (1985).

1. Snort call. This is the basic display, consisting of a brief vocalization uttered with a sharp toss of the head.
2. Wing flashing. The bird tramples its feet on the ground, ruffling its neck feathers, uttering the snort call and beating its wings, producing a characteristic whistle from the 7th primary. This is considered a territorial display by Schulz (1985).
3. Jumping. This is considered the peak courtship display. It consists of foot stamping, snort calling and finally of a jump one metre above the ground with the wings beating to enhance both the whistle and the visual signal of the white wings.

Closer observation of displaying males and slow motion film sequences showed a fourth behaviour intermediate between the snort call and the wing flash, when the male ruffled its neck feathers, stamped its feet on the ground and then uttered the snort call. I excluded it from my records, since from the vantage points it was not possible to distinguish this behaviour from the first one.

The behaviour of the males is conspicuous.

The call carries well. The mean maximum distance recorded was 470 m ± 140 (range 300-800 m, N = 20). Wing flashing and jumping males were spotted in bright night with moonlight from a maximum distance of 500 metres without binoculars.

Snort calls were uttered by all males on all monitored days, but wing flashing and jumping occurred only in few instances in Sardinia and were never recorded in Apulia.

Considering the sunrise and the sunset of six days and three monitored males in Sardinia (N = 36), jumping occurred in 17 instances at the sunrise (47.2%).

The maximum activity frequencies ever recorded in the study period, within a 10-minute sample interval, were recorded in Sardinia as follows: 1/9.3 seconds for snort calling (April 28th 1985, 2034-2044) and 1/26 seconds for jumping (April 26th 1985 0745-0755).

I recorded night display only in Sardinia on April 27th and 28th 1987, during two consecutive nights with calm weather and bright moonlight: the same male snort called, wing flashed and jumped between 2300 and 0200, but I did not record the frequency of display activities.

Table 1 - Habitat composition (%) in the three study areas, in the circular plots (radius 250 m) around lek center and in the mapped leks. Data combined from Apulia and Sardinia. Habitat composition in the three study areas represents the avarage value in the whole study period.

Habitat Category	Study areas	Circular plots	Leks
Pastures	50.0	68.6	81.3
Cat/barley	15.0	10.7	13.4
Wheat	25.0	18.0	5.3
Other	10.0	2.7	0

Discussion

Although Little Bustard males made some use of all the available habitats in the study areas, they showed a strong preference for permanent pastures, which are the more stable and rich habitats.

Small parcels of barley and oat fields were mainly used by the birds to forage at dawn and dusk, while wheat fields were visited only by flushed birds.

Little Bustard males show a similar choice of habitat in Portugal, with a marked preference for pastures and fallow lands (Schulz 1985, Cheyland 1980).

Display activity peaked around sunrise and sunset, both in snort calling and in the more elaborate behaviour: wing flashing and jumping occurred mainly in twilight. The same pattern was noted by Schulz (1985) and in other jumping bustards, like the Lesser Florican (*Sypheotides indica*) (Sankaran & Rahmani 1986).

Table 2 summarizes the density figures for different populations of displaying males in the Mediterranea. The Portuguese population reached the highest values (Ferguson-Lees 1967, Schulz 1985), matched only by the Sardinia one in few particular cases recorded by Schenk and Aresu (1985).

Table 2 - Density figures of displaying little bustard males in different studies populations data expressed as number of males in 100 hectares.

Area	Density	Figure Source
Crau (France)	2.0-6.0	Cheylan in Schulz (1985)
Loire (France)	1.5-2.7	Beaudoin in Schulz (1985)
France	0.7-1.0	Metais in Schulz (1985)
Portugal	9.0-13.8	Schulz (1985)
Portugal	13.0-16.0	Ferguson-Lees in Schulz (1985)
Sardinia	0.8-3.1	Schenk and Aresu 1985
Sardinia	2.4	This study
Apulia	1.5	This study

This seems to suggest that male density changes little in a wide range of situations and the structure of the display cluster could be density — independent and represent a stable compromise between the need for territorial males to maintain spatial segregation and the needs to gather to enhance the power of attraction for females in homogeneous and almost flat country where ground visibility is poor.
In particular conditions (e.g. Apulia), however, it is possible that the traditional communal behaviour could turn into a less conspicuous display strategy. The males of this species usually show high site fidelity (Schulz 1985), but the harassed and very thin population of Apulia showed high and unusual mobility and included solitary displaying males ("soloists").
Since different display strategies have been recorded in the Great Bustard (Carranza *et al.* 1989), according to the conservation status of the population, the same could apply to the Little Bustard.
Apulia males seem to behave differently from Sardinia ones, since they were never seen jumping or wing flashing.
Although my data are too scanty to allow any conclusion, it is possible that the low number of birds in Apulia and the fragmentation of preferred permanent grasslands among unsuitable intensive cereal cultivations (Petretti 1986b) could lead to a general decrease in the display activity and to an increase in the "soloist" activity.

Ackowledgements — I would like to thank Nigel Collar, Paul Goriup, Helmar Schenk and Holger Schulz of ICBP Bustard Group for their help and advice throughout my study. I wish also to thank Aldo Boano, Emanuele Coppola, Marco Gustin and Alessio Petretti for their help in the field work, and Sandro Lovari for valuable comments on the first draft of the manuscript. Michela Cherchi gave much needed support throughout field and desk work.

Riassunto — È stato osservato il comportamento al lek dei maschi di gallina prataiola (*Tetrax tetrax*) in Sardegna e in Puglia, in ecosistemi erbacei destinati prevalentemente al pascolo brado di pecore e mucche.
I maschi frequentano le zone di esibizione da aprile a giugno, concentrandosi in gruppi di arene con una densità media di 1,9 maschi ogni 100 ettari. In questi raggruppamenti la distanza media fra ciascun maschio è di 450 metri.
Il picco delle attività di esibizione si verifica all'alba e al tramonto, quando si raggiunge la frequenza massima di una emissione ogni 9,3 secondi. Comportamenti più elaborati, come "battito di ali" e "salto" si verificano soprattutto a basse intensità luminose.
Nel confronto fra il comportamento dei maschi in Sardegna e in Puglia sono state riscontrate alcune differenze.
In Sardegna i maschi mostrano comportamenti di esibizione completi e sono sempre associati in gruppi, mentre in Puglia non sono mai stati osservati i comportamenti di battito d'ala e di salto e sono stati trovati anche maschi solitari.
Questo fatto può essere imputabile alle esigue dimensioni della popolazione pugliese e alla bassa densità riproduttiva.

References

Beaudoin J.C. 1979. Recensement de l'outarde canepetiere *Otis tetrax* en Maine-et-Loire. *Groupe Angevin d'Etudes Ornithologiques* 9/25: 55-65.

Carranza J., Sebastian J., Hidalgo de Trucios and Ena V. 1989. Mating system flexibility in the Great Bustard: a comparative study. *Bird Study* 36: 192-198.

Cheylan G. 1980. Nouvelles estimations des densites de canepetieres *Tetrax tetrax*, de grandoules *Pterocles alchata*, d'oedicnemes *Burhinus oedicnemus* et de perdix rouge *Alectoris rufa* en Crau. *Bull. Cent. Rech. Orn. Provence* 3: 17-21.

Cramp S. and Simmons K.E.L. (eds). 1980). The Birds of the Western Paleartic, vol. II. *Oxford University Press*, Oxford.

Ferguson - Lees I.J. 1967. Studies of less familiar birds: Little Bustard. *British Birds* 60: 80-84.

Metais M. 1981. Etude de l'Outarde canepetiere dans les deux-sevres. *Groupe d'etudes et de recherches en ecologie appliquee.*

Petretti F. 1985. Preliminary data on the status of the Little Bustard in Italy. *Bustard Studies* 2:165-170.

Petretti F. 1986a. An inventory of steppe habitats in Southern Italy 125-143. In: Ecology and conservation of grassland birds. *ICBP Technical Publication 7.* Cambridge.

Petretti F. 1986b. Notes on the status of the bustards in Italy. *5th Bustard Symposium. Szarvas* (Hungary), October 1986.

Sankaran R. and Rahmani A.R. 1986. The Lesser Florican. Annual Report 2 (1985-86). *Bombay Natural History Society,* Bombay.

Schenk H. and Aresu M. 1985. On the distribution, number and conservation of the Little Bustard in Sardinia (Italy) 1971-1982. *Bustard Studies* 1: 161-164.

Schulz H. 1985. Grundlagenforschung zur biologie der Zwergtrappe *Tetrax tetrax. Staatlichen Naturhistorischen Museum.* Braunschweig.

Schulz H. 1986. Agonistisches Verhalten, Territorialverhalten und Balz der Zwergtrappe (*Tetrax tetrax*). *Journal fur Ornithologie* 127-2: 125-204.