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Estimation of the Punjab (Pakistan) wintering population of the Houbara Bustard *Chlamydotis macqueenii*

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Abstract. The study was carried out in 3 plots in the province of Punjab (Pakistan) in November 2001. The total population of the Houbara Bustard was estimated at about 4 746 birds with an overall density of $0.147 \pm 0.006/\text{km}^2$. The number of birds in Rajanpur/Rojhan was estimated at 685, in Thal at 672 and in Cholistan at 3 389.

Key words: Houbara Bustard, *Chlamydotis [undulata] macqueenii*, Punjab, Pakistan, census methods

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INTRODUCTION

Over the last few decades Houbara Bustard populations have declined in several countries due to unsustainable hunting, habitat degradation and agricultural development (e.g. Collar 1980, Cramp & Simmons 1980, Seddom & van Heezik 1996). Pakistan is believed to have one of the largest migratory populations of this species in the world, holding between twenty and twenty five thousand of birds (del Hoyo et al. 1995). Province of Punjab holds a significant part of the population estimated on about 5 000 specimens (Chaudhry 1994).

Trapping and falconry are the main reasons for the decline of Houbara in Pakistan. Houbara are being trapped on a large scale (4 000–7 000 per year) and smuggled to Middle Eastern countries (Goriup 1997). Mian (1997c) reported annual decline rate of Houbara as high as 18%.

The present study was undertaken to establish the current number of Houbara wintering in the Province of Punjab, SE Pakistan. Similar studies on this endangered species have been doing since 1992 (Chaudhry 1994, Mian et al. 1997). Repeated estimates of populations, using standardised methods seem to be needed to ascertain the effectiveness of protective management practises on long-term periods (Seddom & van Heezik 1996).

STUDY AREA

The study was carried out at three areas within the Punjab province: Rajanpur/Rojhan, Thal and Cholistan. In Punjab the total estimated wintering habitat of Houbara Bustard covers 32 300 km². Rajanpur/Rojhan shares 4 600 km² (14.2%), Thal 4 800 km² (14.9%) and Cholistan 22 900 km² (70.90%). All these three areas have different set of ecological conditions and thus support different vegetation cover. However, the dominant plant species in all those areas are similar: *Dipterygium glaucum*, *Calligonum polygonoides*, *Cymbopogon jwarancusa*, *Aerva javanica* and *Haloxylon salicornicum*. The Rajanpur/Rojhan is covered by clay-clay loam soil with little sand, and cultivated *Brassica* sp. and *Sorghum bicolor* provides feeding grounds for Houbara along with natural vegetation. At the Thal area dominate high sand dunes. These dunes are barren and used for Chickpea (*Cicer arietinum*) cultivation. There are some patches of thick vegetation between the dunes and low-lying areas. Houbara feed on Chickpea but disturbance caused by agricultural activities of local people in October/November forces them to move adjacent areas. On the other hand Houbara arrive in Thal after mid November, stay there and use the Chickpea crop. The annual expansion of

agricultural areas is a great threat to the wintering population in this area. Cholistan is covered by a sandy tracts with desert climate.

MATERIALS AND METHODS

The study was carried out in November 2001. The Houbara surveys should be carried out in peak of winter season — November/December, because in early/late seasons (October/February) birds are still arriving/departuring. Therefore data collected in November should allow to estimates the densities/ populations precisely. Estimates of Houbara wintering population were obtained by transect methods. Transects of 10 km length and 500 m wide (250 m on both sides of central line) were inspected, by vehicle at a low speed (20 km/h). Transects were chosen randomly at different habitats. Survey time was from sunrise to 10.30 a.m. and from 3.00 p.m. to sunset. The distance to birds flushed was noted in approximation and later categorized in one of three groups: 0–100, 100–200, > 200 m from the observer. Also other signs such as footprints, droppings and feathers were also noted on both sides of transects. Fresh footprints and droppings were taken into consideration while estimating population number.

In total 247 transects covering ca 1 235 km² (ca 4% of total suitable wintering area) were controlled.

Estimates of population

The studied areas were un-even, with undulating sand dunes and characteristic vegetation of the area. According to these factors, i.e. height of sand dunes and vegetation cover effect, the visibility of transect was poor and birds present across the dunes could not be observed. Thus, there were chances of missing the birds present in studied transects.

Assuming that Houbara Bustard as well as the sand dunes and vegetation cover were randomly distributed in the studied areas (Mian 1997a) it was possible to correct the results increasing them on birds that could be missed. It was estimated that in each transect there were similar amount of areas that were out of view. According to the frequency of observations of birds as well as amount of out of sight area in particular areas along the transect it was possible to correct the results using the formula:

CF = 0.666/A + 0.1/B

where A and B coefficients are the frequencies of bird's occurrence of in distance 0–100 m (A) and

100–200 (B) from observers. Coefficients 0,66 and 0,1 were calculated in relation to the estimated shares of out of sight areas in particular parts of transects (Table 1).

Table 1. Frequency (%) of Houbara Bustard occurrence in different width of the transects, and correction factors (CF) for the estimations of populations sizes.

Area (number of birds)	Width of transects		CF
	0–100	> 100–200	
Rajanpur/Rojhan (N = 26)	0.8	0.2	1.33
Thal (N = 9)	0.78	0.22	1.3
Cholistan (N = 24)	0.7	0.3	1.28

Total estimated population was obtained by multiplying number of Houbara 's groups seen, mean group size, and correction factor.

RESULTS AND DISCUSSION

In total wintering population of Houbara was estimated on ca 4 700 birds (Table 2). In Rajanpur/Rojhan 27 groups of birds were recorded. Average group size was 1.62 birds (max. 6). Assuming that the some of the transect areas were out of sight the 44–58 birds could winter there. During the study period up to 903 specimens probably winter in this area (Table 2). Majority of the birds were observed around *Capparis* sp. plants. In Thal area not all planned transect could be inspected. In Muzaffar garh due to army exercises only 9 transects was controlled while the prime area could not be surveyed. In Athara Hazari and Mankera feathers of Houbara with cartridges were seen. Mean group size was 1.02 and group up to 2 birds were recorded. Probably the overall number of wintering birds reached here 39–50 specimens and the total population in Thal was assessed on up to 864 birds (Table 2). In Cholistan 89 groups of Houbara Bustard were recorded. Mean group size was 1.11 (up to 4 birds) and in total 99-126 birds could winter there (Table 2). The overall mean group size in all localities was 1.18, with maximum of 6 birds within one group.

The densities of birds were similar in all three areas of the province of Punjab (Table 2) habitats indicates the random distribution of Houbara (see Mian 1997a), which mainly depends on food availability and other pressures to the species. Sometimes at one locality the highest number of birds had occurred, but later the same locality

Table 2. Estimations of Houbara Bustard population in Punjab.

Area (habitats for wintering Houbara)	Number of transects (area controlled km ²)	Birds (+footprints) recorded	Density/km ²	Total population
Rajanpur/Rojhan				
Rajanpur (3 000 km ²)	39 (195)	17 (+8)	0.127 ± 0.022	381–490
Rojhan (1600 km ²)	20 (100)	9 (+10)	0.190 ± 0.046	304–413
In total (4 600 km ²)	59 (295)	26 (+18)	0.149 ± 0.018	685–903
Thal				
Choubara (1 632 km ²)	19 (95)	3 (+8)	0.115 ± 0.037	187–234
Mankera (1270 km ²)	11 (55)	2 (+8)	0.181 ± 0.07	229–294
Athara Hazari (1 036 km ²)	16 (80)	3 (+11)	0.175 ± 0.051	181–218
Muzaffargarh (862 km ²)	9 (45)	1 (+3)	0.088 ± 0.057	75–118
In total (4 800 km ²)	55 275)	9 (+30)	0.140 ± 0.018	672–864
Cholistan				
Sadiqabad (2 098 km ²)	22 (110)	1 (+9)	0.091 ± 0.029	191–248
Rahim Yar Khan (7953 km ²)	54 (270)	9 (+40)	0.182 ± 0.021	1447–1834
Yazman (10857 km ²)	33 (165)	8 (+14)	0.134 ± 0.026	1455–1853
Fort Abbas (1992 km ²)	24 (120)	6 (+12)	0.149 ± 0.035	296–383
In total (22 900 km ²)	133 (665)	24 (+75)	0.148 ± 0.009	3389–4318
Punjab total (32 300 km ²)	247 (1235)	59 (+123)	0.147 ± 0.006	4746–6085

hold less numerous population. Comparison to results from previous studies shows that population of Houbara in Punjab province is rather stable (Table 3). However, the weather in the winter areas (especially temperature and rain-falls) affects the distribution of Houbara Bustard. Higher clumping of Houbara was noted under drought conditions while a random distribution was observed following mild rainfall. The fluctuations of bird densities were generally affected by the variation in rainfall and availability of green foliage (Mian 1997a, 1997b). In the last three years the drought conditions were severe in another Pakistan province — Balochistan. Therefore it is possible that Houbara did not stay there and bulk of the population migrated to the habitats in Punjab areas.

ize the exact situation, the population counting should be carried out also in other Provinces of Pakistan. The census should be carried out at the same time in all provinces with the same methodology.

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Table 3. Densities (birds/km²) of wintering Hobara Bustards in Punjab provinces in 1992–2001.

Area	1992 (Mian et al. 1997)	1993–1994 (Chaundhry 1994)	2001 (this study)
Rajanpur/Rojhan	0.131–0.318	0.148	0.149
Thal	0.05–0.088	0.175	0.14
Cholistan	0.056–0.114	0.139	0.148

Although the population of Houbara Bustard is declining all over the world, Punjab still hosts a significant number of wintering birds. To visual-

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STRESZCZENIE

[Szacunki liczebności hubary arabskiej zimującej w Pendżabie (Pakistan)]

Badania przeprowadzono w listopadzie 2001 r. na 3 powierzchniach zlokalizowanych w prowincji

Pendżab. Liczebność ptaków określano na 247 transektach (10 km dł., 500 m szerokości każdy). Z uwagi na ukształtowanie krajobrazu zastosowano współczynnik CF do oszacowania liczby ptaków, które mogły zostać przeoczone na niewidocznych fragmentach transektu (Tab. 1).

Na podstawie liczby obserwowanych hubar, świeżych śladów oraz stosując współczynnik CF oszacowano całkowitą liczebność zimującej populacji hubary na wydzielonych obszarach prowincji Pendżab (Tab. 2). Mimo, że na całym świecie obserwowany jest spadek liczebności tego gatunku, na terenach objętych badaniami w ostatnim dziesięcioleciu nie stwierdzono istotnych zmian liczebności (Tab. 3).

INTERNATIONAL SYMPOSIUM ON ECOLOGY AND CONSERVATION OF STEPPE-LAND BIRDS

(Lleida, Spain, 3–7 December 2004)

The Centre Tecnologic Forestal de Catalunya (CTFC) in collaboration with the Universitat de Lleida (UdL), the Universidad Autónoma de Madrid (UAM) and the Universitat de Barcelona (UB) are organizing the “International Symposium on Ecology and Conservation of Steppe-Land Birds” which is going to be held on December 3rd to 7th of 2004 in Lleida (Catalonia, Spain).

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