Comparison of Different Techniques for Houbara *Chlamydotis undulata macqueenii* Population Estimates

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Abstract

Different population estimates for Houbara were obtained, following four different "Standard Techniques". According to Simple Random Sampling (429), King's Strip (2235), Simple Strip (8782) and Mofified Strip method (3660) Houbara were estimated. Total 39300 Km^2 area was assessed available habitat for haubara in Thal, D.G. Khan and Cholistan in the Punjab. In Thal 6%, D.G. Khan 2.2% and Cholistan 1.0% area was surveyed. Average of four different "Techniques" suggested that 138 birds migrated to Thal, 629 D.G. Khan and 3000 in Cholistan. Highly significant yc2 (654.17) at (n1-1) (n2-2) d.f. and 95% CI indicated no association between different 'Techniques' and available habitat types. According to Dispersion Index, Thal (DI=120), D.G. Khan (DI=127) and Cholistan (DI=216), the population was widely distributed in the available habitat. The results indicated that precise Houbara population estimation is possible through average of different estimates made following different 'Techniques'. Estimation through one technique will reflect very low to high estimates. Selection of appropriate technique according to available habitat will be equally important. Precision in estimates can also be obtained by increasing the study area upto 10%. Precise estimation will be helpful for future management of Houbara.

Key words: Houbara bustard, Population estimates.

Introduction

Houbara bustard (*Chlamydotis undulata macqueenii*) is an important Game bird for Arab Dignitaries, who hunt it through falconery operations. It winters in Thal, D.G. Khan and Cholistan in the Punjab, Pakistan. Every year a large part of Houbara population is hunted through falconery in the three habitats of the Punjab.

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Due to growing interest of Arab Dignitaries, the importance of Houbara, has been increased manifold. Linked with this interest, all illegal activities like netting, trapping are also increasing. Involvement of local people in Houbara has also been increased. The trapped birds are gifted to Dignitaries or otherwise smuggled. Such activities directly effect Houbara population.

Studies on Houbara bustard breeding grounds in the Soviet Union indicate an overall reduction of the total population from 1956 to 1979 of about 70 per cent (Alekseev, 1980). An other Russian study noted a dramatic decline in numbers starting from 1968, by no coincidence the year when large scale hunting by Arab visitors to Pakistan was started (Ponomareva, 1979). According to Roberts (1991) status of Houbara bustard is scarce and becoming rare.

Habitat degradation is affecting Houbara indirectly. Livestock grazing and fuel-wood collection are major threats to habitat. Feed, forage and shelter are shared by Houbara and livestock. Under natural conditions, fruits of *Capparis aphyla* are primary and main source of food for Houbara. The fruits are shed by livestock owners for their livestock, destroying Houbara food sources in the available habitat.

In Thal and Cholistan, the habitat is sandy tract. However, in Thal, most of the area is under cultivation. Grams (*Cicer arietinum*) and mustards (*Brassica* spp.) are main agricultural crops. On the contrary the habitat in D.G. Khan is plain and mustard is main agricultural crop. Such cultivation in the habitat co-incides with Houbara migration. These crops serve for food alongwith naturally available food in the habitat. Under drought conditions, the cultivation is delayed and pressure on natural vegetation is increased. Under such adverse conditions, Houbara, locally migrates to other favourable habitats. During local migration the birds become more vulnerable to netting, trapping, hunting and predation.

To monitor population trend and to identify threats, to Houbara population, different authors made population estimates. Chaudhry *et al.,* (1994) provided estimates of Houbara population wintering in Thal, D.G. Khan and Cholistan. Mian *et al.,* (1992) conducted surveys in Thal, D.G. Khan and Cholistan. They produced a technical report on the biology of Houbara describing

density per km^2, estimated population, group-size and distribution pattern.

However, the previous work is mainly confirmed to Houbara population estimation following one method or the other. Comparison of different methods in Houbara estimation has been made for the first time to assess the validity of different 'Techniques'. The objectives were to make precise and accurate estimate for future management plans for Houbara. Scientific management will be based on precise and accurate population estimation.

Materials and Methods

The study was completed in Thal, D.G. Khan and Cholistan during October-November, 1999. Transects of 10 km length and 500m wide were studied on vehicles. Distance of the birds, flushed was noted in approximation. Indirect clues, such as foot-prints, droppings and signs of feeding (plucking shoots of crops) were also considered. Data was analyzed following Simple Random Sampling, King's Strip, Simple Strip and Modified Strip Methods (Tanner, 1978).

Dispersion index is an important factor describing distribution pattern in a population. A value of DI > 100 indicates aggregated distribution pattern. DI = 100 indicates random distribution and DI < 100 indicates uniform distribution pattern. DI was worked out following standard statistics:

$$DI = \frac{Mean}{Variance} \times 100$$
(Steel and Torrie, 1980)

Results and Discussion

According to results maximum Houbara population (8782) was estimated following simple strip method, wintering in the three habitats of the Punjab. 216 birds were estimated in Thal, 1566 in D.G. Khan and 7000 in Cholistan. According to modified strip method 3660 Houbara were estimated of which 182 in Thal, 487 in D.G. Khan and 2991 in Cholistan were estimated. Very low estimation (429) was obtained through simple random sampling method. Accordingly 39 birds were estimated in Thal, 102 in D.G. Khan and 288 in Cholistan. Total 2235 Houbara were estimated following king's strip method of which 115 in Thal, 361 in D.G. Khan and 1759 in Cholistan were estimated (Table).

Total available habitat in Thal, D.G. Khan and Cholistan was estimated 39300 km2. Thal provides 4800 km2, D.G. Khan 6500 km2 and Cholistan 28,000 km2. In Thal 59 transects covering an area of 295km2 were surveyed. In D.G. Khan 29 transects were surveyed and 145 km2 area was studied. Fifty six transects were studied in Cholistan, covering an area of 280 km^2 (Table 1).

Table 1: Comparison of Houbara population estimates through different techniques

Habitat	No. of transects	Area surveyed km2	Simple random sampling method	King's strip method	Simple strip method	Modified strip method	Average	Dis-persion
Thal	59	295	182	39	115	216	138	127
D.G. Khan	29	145	487	102	361	1566	629	120
Cholistan	56	280	2991	288	1759	7000	3009	216
Total	144	720	3660	429	2235	8782	3776	-

y_c^2 (654.17) > y_t^2 (1.66) at 95% C.I and $(n_1 - 1)(n_2 - 2)$ d.f.

Average of four methods indicated that total 3776 birds migrated in Thal, D.G. Khan and Cholistan. 138 birds were estimated in Thal, 629 in D.G. Khan and 3009 in Cholistan. Population was widely distributed following uniform pattern of distribution in the three habitats (Table).

Previous work regarding Houbara population estimates is based on simple strip method. Chaudhry *et al.,* (1994) attempted to estimate Houbara population in Thal, D.G. Khan and Cholistan following strip method. Mian *et al.,* (1992) carried detailed study on the biology of Houbara. They estimated 3500 – 4000 birds in three habitats (Thal, D.G. Khan and Cholistan) as compared to 3776 birds in the present study.

Dispersion index 127 for Thal, 120 for D.G. Khan indicated uniform pattern of distribution in these two habitats. However, in Cholistan, Houbara population was widely distributed as compared to Thal and D.G. Khan. According to Mian *et al.,* (1992), the population observed aggregated distribution pattern as indicated by overall dispersion index of 18.77.

According to Chi^2 statistics (y_c^2 (654.17) > y_t^2 (1.66) at 95% C.I. and at (n1-1)(n2-2) d.f. there was no association between different methods. Similarily the available habitats for Houbara (Thal, D.G. Khan and Cholistan) were independent having different sets of ecological conditions.

The estimates drawn through different 'Techniques' were highly variable. Though all the 'Techniques' followed are based on transect study and flushing distance incorporated into different 'Techniques'. King's strip method produced least estimates (429) and through modified strip method were estimated highest (8782). However, the estimates obtained on the basis of 'average' of different methods were precise and accurate as compared to estimates drawn through any one of the 'Techniques'.

Under the prevailing threats for Houbara like habitat degradation and falconery operations, precise and accurate estimation is the need of time. Future management activities will be based on precise estimation. Different standard 'Techniques' followed by different authors produce variations in results. Habitat characteristics like vegetation cover and distribution of sand-dunes are very important. The prevailing 'Techniques' confront with precise estimation for Houbara. The results obtained through different 'Techniques' and then taking average from different results will be a step towards accuracy. Similarly selection of appropriate 'Technique' according to habitat condition and increasing study area, precise population estimates can be obtained for Houbara.

In Houbara precise and accurate estimates can be achieved after analyzing data through different 'Techniques' and then taking average. The average from different 'Techniques' will represent precise and accurate estimates. Habitat conditions and selection of appropriate 'Techniques' will be equally important. Further precision in estimates can also be achieved by increasing study area and randomization of transects.

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