

# LOW BREEDING SUCCESS IN HOUBARA BUSTARD (*CHLAMYDOTIS [UNDULATA] MACQUEENII*) DOES NOT ALLOW CURRENT HUNTING YIELD

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## Abstract

Nesting success and chick survival of a migratory population of Houbara Bustard was studied during three consecutive years (1998–2000) in the Xinjiang province of north-west China. A total of 45 nests were monitored and 85 broods comprising 227 chicks were captured, of which 82 chicks were radio-tracked. The laying mode fell consistently between 26th and 30 April. For the three years, the mean clutch size was 4.0 (SD=0.8) (range 2-6). The average nesting success was 0.588 (SD=0.270) but great variations were observed between years – 0.882 in 1998, 0.530 in 1999 and 0.351 in 2000. This was related to increased predation in 1999 and 2000, which is reflected by increased predator density (mostly Corsac Fox, *Vulpes corsac*). The overall hatchability, defined as the proportion of eggs hatched in successful nests was 0.839 (SD=0.238). The average brood size at hatching was 3.2 (SD=0.94). The overall chick production was 0.827 per breeding female per year and the probability of an egg laid to give a fledging of 8-weeks old was 0.190. The breeding success estimated in this study area reveals that productivity of houbara is low and can not support the current hunting and smuggling pressures observed in their wintering range.

**Key words:** houbara bustard, *Chlamydotis [undulata] macqueenii*, China, breeding success, conservation

## Introduction

The Asian Houbara Bustard (*Chlamydotis [undulata] macqueenii*) is a desert and steppe dwelling bird distributed from Mongolia to the Arabian Peninsula, through Central Asia (Del Hoyo *et al.*, 1996). In the IUCN Red Data Book of Threatened Species of the World, the Houbara Bustard (hereafter "houbara") is classified as "lower risk/near threatened", which is close to "vulnerable", *i.e.* "facing a high risk of extinction in the wild in the medium-term future" (Hilton-Taylor, 2000, see <http://www.redlist.org>). Houbara populations are declining dangerously all over their distribution range from Mongolia to the Arabian Peninsula, through Central Asia, due to poaching, excessive hunting, and a general impoverishment and fragmentation of their habitat (Combreau *et al.*, 2001). Moreover, for some years now, hunting has been allowed in breeding grounds of Kazakhstan, Uzbekistan and Turkmenistan (NARC, unpublished data). Crucial for the implementation of effective population conservation efforts, published demographic parameters on this species are rare. During three breeding seasons (April–July 1998–2000), we investigated the nesting success and chick survival of a population of Houbara Bustard in the Jungar Basin, Xinjiang province of northwest China.

## Material and Methods

More details on material and methods can be found in Combreau *et al.* (2002).

**Study area.** Bordered by the Tien Shan Mountains to the south and sand dunes to the north, the study area is a high flat steppic plateau (850–1100 m above sea level) on the eastern fringe of the Jungar Basin. It is a transitory pasture dominated with associations of *Anabasis sp.* and *Artemisia sp.* and ephemeral plants species in spring (*Plantago sp.*, *Lepidium sp.*, *Ceratocarpus sp.*, *Tulipa sp.*, *Scorzonera sp.* and *Corydalis sp.*) that is used by Kazakh shepherds in the early spring and the early autumn only. The human population density is low (max. 0.5 inhabitants per km<sup>2</sup>), as is the grazing pressure (sheep, goats, camels and horses).

Breeding parameters. Females flushed with the car at a low speed (maximum 40 km/h) or seen by telescope while foraging were then observed from a distance of at least 800m until they return to their nest or brood. Once the nest or brood was located, one person was guided to it by the observer. Radio tracking of females also allowed us to find three nests.

From 1998 to 2000, we recorded the following parameters:

1) the age of eggs determined from their relative density according to the Hoyt's (1979) method and data from a sample of 103 Houbara eggs in the National Avian Research Centre, Abu Dhabi (Jarrett, Unpub. data). Considering the weight loss in a Houbara egg during a complete egg incubation (17% according

to Saint-Jalme and van Heezik, 1995), the estimated weight allowed us to calculate the incubation stage and the laying date,

2) the nesting success with the method developed by Mayfield (1975) taking into account the number of failures and the number of monitoring days,

3) the age of the chicks was estimated from the average tarsus length of siblings within each brood and from a polynomial regression function established from wild broods of known age (from known nests),

4) the chick survival was defined as the proportion of Houbara chicks hatched that reached the age of eight weeks (at which they can sustain at least a one km flight and escape mammalian predators). We distinguished the survival to partial predation by direct observation of broods according to their size and age and the complete predation by radiotracking chicks fitted with 4.5 g to 16 g transmitters from hatching to fledging. We estimated the survival rate of Houbara broods via the analysis of the radio tracking data with the Trent and Rongstad's (1974) method.

5) the density of predators was assessed by transect and calculated using the program Distance 3.5 (Research Unit for Wildlife Population Assessment, University of St Andrews, UK; <http://www.ruwpa.st-and.ac.uk/distance>).

## Results and Discussion

A total of 45 nests were monitored and 85 broods comprising 227 chicks were captured, of which 82 chicks were radio-tracked. According to satellite tracking data, the arrival of houbara in Chinese breeding grounds extends from 21 March to 17 May (Combreau *et al.*, 2002). For the 1998-2000 period, the laying mode fell consistently between 26 and 30 April (Figure 1). Mean clutch size was 4.0 (SD=0.8) (range 2-6) for early clutches and 3.3 (SD=1.1) for late clutches (range 2-5). The average nesting success was 0.588 (SD=0.270) but great variations were observed between years – 0.882 (95% C.I. 0.813-0.974) in 1998, 0.530 (95% C.I. 0.361-693) in 1999 and 0.351 (95% C.I. 0.216-0.486) in 2000. We attributed this to a heavy predation rate in 1999 and 2000. That was reflected by increased predator density (mainly Corsac Fox, *Vulpes corsac*). For the three years, the Corsac Fox adult density ranged from 0.0073 (95% C.I. 0.00386-0.0139) in 1998 to 0.0575 (95% C.I. 0.0240-0.137) individuals per km<sup>2</sup> in 1999. The number of dens in the study area varied also from 9 in 1998 to 78 in 2000. For the 1998-2000 period, the overall hatchability was 0.839 (SD=0.238) and the average brood size at hatching was 3.2 (SD=0.94). The overall chick production was 0.827 per breeding female per year and the probability of an egg laid to give a fledging of 8-weeks old was 0.190 (Table 1).

The breeding success in the study area shows that the breeding potential of houbara remains low in the wild. According to our results, 100 houbara eggs laid will give 49 chicks at hatching that will produce 19 fledglings. Based on the study on the mortality after the fledgling stage (Combreau *et al.*, 2002), we predict that of these 19 fledglings, 17 will survive the next year. However, if we take into account the hunting and poaching pressure generated by falconry, the final production is 13 sub-adults that are ready for the next breeding season. If human disturbance (grazing or hunting) seems to be a low threat in the study area, fledgling and adult Chinese houbara are however submitted to heavy hunting and poaching pressures on their stopover and wintering grounds (Kazakhstan, Uzbekistan, Turkmenistan, Iran and Pakistan). With the current hunting and poaching pressures, an annual decrease of the Asian houbara population of 15% was estimated (Combreau *et al.*, 2001). At short term, it means a reduction of the population to 50% of the current size for 2006-2007 (Combreau *et al.*, 2001; NARC, 2000).

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**Table 1.** Summary of the estimates of breeding success of houbara bustard in the Jungar Basin, Xinjiang Province of China (SD: standard deviations are given).

	Estimated value
Clutch size	4.0 ( $\pm$ 0.8 SD)
Nesting success	0.588 ( $\pm$ 0.270 SD)
Hatchability	0.839 ( $\pm$ 0.238 SD)
Brood size at hatching	3.2 ( $\pm$ 0.94 SD)
Survival to partial predation of broods	0.698
Survival to complete predation of broods	0.553
Probability for an egg to give a fledgling	0.19

**Figure 1.** Laying mode of houbara bustard in the Jungar Basin, Xinjiang Province of China for the 1998-2000 period.

