

# Reproductive Parameters in Captivity

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## 4.1 Introduction

In the following chapter information on reproductive parameters of captive houbara bustards is presented. The reproductive cycle of wild houbara is still largely unknown. Timing of nesting appears to be quite variable across the species' breeding range, but is concentrated in the spring months. In North Africa eggs are usually laid in March-April (Cramp & Simmons 1980), although according to Heim de Balzac and Mayaud (1962) egg-laying can occur between January and June. In Syria eggs are found from March to May (Cramp & Simmons 1980) and in the southern former USSR from April to June (Dement'ev & Gladkov 1968). Occasionally, eggs have been found in Algeria as early as November, or as late as June (Cramp & Simmons 1980).

Survival of a species in a semi-arid environment requires individuals to adjust to changing environmental conditions, and also to reproduce at a time of year which will be favourable for survival of young. The annual photoperiodic cycle is well-known as the most significant environmental variable, synchronizing seasonal reproductive activities in species breeding at middle and high latitudes where seasons are temporally well defined (Farner & Gwinner 1980), but little is known about which parameters predict suitable environmental conditions in arid climates, and control the timing of reproduction. Temperature, precipitation and food availability are certainly of utmost importance. For houbara, some authors have suggested that rainfall is important to trigger reproduction: breeding does not occur during dry years in Africa (Etchécopar & Hüe 1978) and in Israel most houbara do not breed after winters with little or no rain (Mendelssohn 1980). In Saudi Arabia, the occurrence of rain is

relatively predictable, with a high probability of rainfall between March and April (Abouammoh 1991). Eggs laid in February will hatch in March, when rainfall and the subsequent increase in food availability are most likely to occur.

Age of first breeding of houbara is not known (Cramp & Simmons 1980), although sexual maturity is thought to be reached after two years (Mendelssohn 1983). These parameters provide further demographic information: for example, deferred maturity is generally found in long-lived species, where the loss of a few breeding seasons has less impact on life-time reproductive potential than in short-lived species. In such species with low annual mortality, clutch size is often small and foraging techniques may take some time to perfect (Hall *et al.* 1987). Houbara bustards are reported to produce only one clutch of one-to-four eggs, laid on alternate days (Heim de Balzac & Mayaud 1962; Etchécopar & Hüe 1978; Mendelssohn 1980; Urban *et al.* 1986). A replacement clutch may be laid if the first is lost (Cramp & Simmons 1980).

We examined the following parameters in our captive flock: (1) the annual cycle of laying; (2) the influence of environmental factors on reproduction; (3) age at first reproduction; (4) timing of laying; (5) laying and clutch interval; (6) number of clutches in a reproductive season; and (7) reproductive potential.

## 4.2 Methods

The composition of the breeding stock and management of the birds from 1990 onwards have been described in Chapter 3. Birds aged between 1 and 12 years were kept in the breeding unit during winter and spring, and in heterosexual groups of 15 to 20 birds during summer and autumn. Dates of transfer of birds to the breeding units in the years 1990 to 1993 were 21 January, 27 January, 20 December, and 11 November respectively.

Males were checked for display twice a day from the date of transfer until August (Plate 4.1). Females were checked four times a day to collect eggs. Most eggs were collected for artificial incubation just after laying; this procedure is known as egg-pulling. On some occasions, and generally at the end of the reproductive cycle, the eggs were left under the female for natural incubation in order to reduce imprinting of chicks on human beings, and thereby to produce birds for release experiments. To

## Propagation of the Houbara Bustard

Table 4.1 Date of First Egg Laid

	1990	1991	1992	1993
<i>C. u. macqueenii</i>	13 Feb.	12 Feb.	20 Jan.	13 Dec.
<i>C. u. undulata</i>	22 Feb.	24 Feb.	29 Jan.	6 Jan.

analyse the degree of breeding synchrony among members of both sexes within each season, we have taken the laying date of the first egg for females and the date of first display for males.

A meteorological station was installed at the NWRC towards the end of 1989. Air temperature and rainfall were recorded systematically from 1990 onwards. In 1992, a study of the annual cycle of houbara kept under standard conditions was conducted on 24 *macqueenii* and 24 *undulata* (24 males and 24 females). All birds were kept isolated in individual pens, and food and water were provided *ad libitum*. Every 15 days body mass of birds and stage of moult were recorded. Eggs were collected every day, and displaying males were recorded.

### 4.3 Results

#### 4.3.1 Annual Reproductive Cycle

Although we found seasonal variation in the pattern and timing of the onset of laying for both subspecies, probably due to annual variations in ambient temperature and rainfall (Fig. 4.1), houbara showed a seasonal breeding pattern (see Table 4.1). In each year laying generally begins after maximum ambient temperatures decrease to below 20°C, and stops when maximum temperatures exceed 30°C (Fig. 4.1). Recommencement of laying later in the season, and a resurgence in the occurrence of male displays may follow significant rainfall, which tends to cause a temporary decrease in ambient temperatures. In these cases, laying occurs 15 days after rainfall. Since males were observed displaying as early as October, and one female laid in December when photophase was still decreasing, photoperiod does not seem to have an impact on the onset of the reproductive season. Instead, rainfall could act as a secondary 'Zeitgeber', and high ambient temperatures could be the major factor terminating the breeding season.

Peaks of laying are synchronous; the maximum number of eggs was always laid in the middle of March. Females generally