

BREEDING BIOLOGY OF THE ISLAND CANARY *SERINUS CANARIA* (AVES: FRINGILLIDAE) ON THE DESERTAS ISLAND ILHÉU CHÃO

By C. VOIGT¹ & S. LEITNER¹

With 2 figures and 2 tables

ABSTRACT. We studied the breeding biology of the Island Canary (*Serinus canaria*) on Ilhéu Chão, the most northern of the Desertas Islands during the breeding seasons of 1996 to 1998. We estimated a population size of 210 birds in 1996 and 215 birds in 1997 with a female to male ratio of 1:1.5. The breeding season lasts approximately 5 months, from February until the end of June. Island Canaries are socially monogamous, forming pairs throughout at least one breeding season. Single pairs could be seen together also during the nonbreeding seasons and even in two subsequent years. Males did not engage themselves in nest building, incubation and brooding of the young, but both males and females fed nestlings. Mean clutch sizes varied from 3.4 eggs in May 1997 to 4.5 eggs in May 1996. The incubation period lasted 14 days and about 80% of the eggs hatched. In 1996 successful pairs fledged on average 3.0 ± 0.3 SE juveniles. Nesting failure, with 30% the highest in March 1996, might have mainly been weather related, as predation was low.

RESUMO. Neste estudo são apresentados os resultados do estudo da biologia da nidificação do Canário (*Serinus canaria*), no Ilhéu Chão, Ilhas Desertas, Arquipélago da Madeira, entre 1996 e 1998. Foi estimada uma população constituída por 210 pássaros em 1996 e 215 em 1997, com um *ratio* fêmeas/machos de 1:1.5. A duração de cada período de nidificação é de aproximadamente cinco meses, entre Fevereiro e o final de Junho. Esta espécie apresenta uma estrutura social monogâmica, com formação de casais que se mantêm fora da época de nidificação, e que pode durar pelo menos dois anos. Os machos não se envolvem directamente na construção do ninho, nem na incubação. A média de eclosão dos ovos variou entre 3.4 em Maio de 1997 e 4.5 em Maio de 1996. O período de incubação foi estimado em 14 dias e a percentagem de sucesso de eclosão foi de 80%. Em 1996 os pares com sucesso reprodutor deram origem a uma média de 3.0 ± 0.3 de juvenis. A taxa de insucesso reprodutor, com um máximo de 30% em Março de 1996, pode ter sido devida à ocorrência de condições meteorológicas desfavoráveis.

¹ Arbeitsgruppe Prof. Dr. Manfred Gahr, Max-Planck-Institut für Verhaltensphysiologie Seewiesen, Postfach 1564, D-82305 Starnberg, Germany

INTRODUCTION

The Island Canary (*Serinus canaria*) is a small, rather long-tailed finch, ancestor of the larger domesticated canary. Males have a grey-yellow coloured face and a golden-yellow forehead, throat and breast. The wings are ashy-black, with yellow bars, the rump is olive-yellow and the tail grey-brown. Females are duller than males and less bright yellow in face and foreparts of the body. For more details see CRAMP & PERRINS (1994). Island Canaries are resident birds on the islands of the Madeira Archipelago, the Azores and the Canary Islands. The study was conducted on Ilhéu Chão, the most northern of the three uninhabited Desertas Islands. They are part of the Madeiran Archipelago and are located 12 nautical miles southeast of Madeira. Ilhéu Chão is about 1850 m long and 617 m wide, on top it is rather flat and the highest point reaches 98 m (COSTA NEVES et al. 1992). The island is covered with low vegetation, there exist no large trees. Besides canaries, the songbird species Berthelot's pipit (*Anthus berthelotii maderensis*) as well as the seabird species Bulwer's petrel (*Bulweria bulwerii*), Madeira storm petrel (*Oceanodroma castro*), Cory's shearwater (*Calonectris diomedea*) and Herring gull (*Larus argentatus atlantis*) breed on Ilhéu Chão.

This paper describes aspects of the breeding biology of Island Canaries, studied on the Desertas Islands from 1996 to 1998.

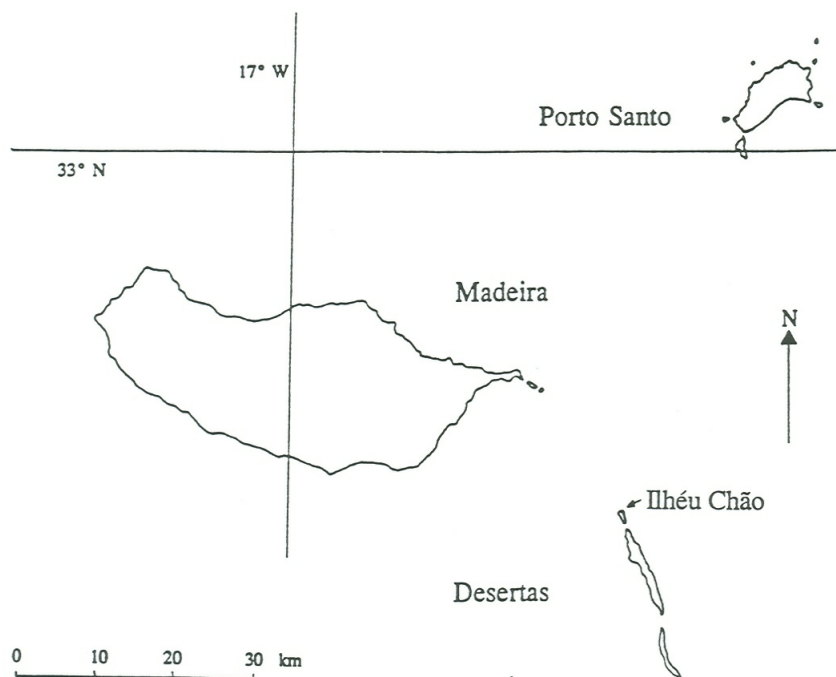


Fig. 1 - The Madeiran Archipelago. Modified after PRESS & SHORT (1994).

METHODS

Birds were captured with Japanese nets, set around the highest vegetation on the island. Birds were banded with a numbered aluminium band and a unique combination of two or three plastic colour bands, to serve the purpose of identification of individual birds and breeding pairs. Juveniles in the nests were banded around posthatching day 10. During the 3-years study period we banded a total of 198 adult birds and 220 juveniles. During the year 1996 we captured 111 adult birds, 67 males and 44 females, resulting in a female to male ratio of 1: 1.5. In the following years we obtained similar sex ratios. Capture-recapture calculations following JOLLY (1965) yielded a population size of 210 canaries in March 1996 and 215 individuals in April 1997. Therefore, we assumed the number of breeding pairs to be about 80. Body weight of all captured birds was measured. For characterisation of nest locations we recorded the plant species, the height of the nest, egg-laying dates, clutch size, hatching and fledging dates. The incubation period is defined as the time the female started incubating the clutch until the first egg hatched. The nestling period is the time between hatching and the date the young leave the nest. Reproductive data were gathered in total from 88 nests.

RESULTS

Timing of breeding

The breeding activities of the canaries on Ilhéu Chão start at the beginning of February and last until the end of June. In 1996 on Ilhéu Chão the first nest was found on February 23 with about 10 day old chicks and on May 30 we found the last nest, when the female was still egg-laying. In 1997 the latest nests with juveniles could be found on June 21. Observations from the year 1995 showed, that the reproductive period is over in July. SCHMITZ (1899) reported from the main island of Madeira, that he found the first nest on February 15 and the latest nest on June 25. These dates can vary a few days depending on the weather conditions.

The breeding season of 1996 was characterized by lower temperatures and more rainfall than in the two subsequent years (Table 1). The breeding season of 1997 was rather dry without any permanent water supply. Regarding the data of the mean temperature and total rainfall there were no important differences between Ilhéu Chão and Funchal.

Reproductive behaviour

Island Canaries are socially monogamous, forming pairs throughout at least one breeding season. Single pairs could also be seen together during the nonbreeding seasons and even in two subsequent breeding seasons. Pairs usually attempt to breed 2-3 times per season.

TABLE 1 - A) - Mean temperature (°C) on Ilhéu Chão and Funchal and **B)** total rainfall (mm) in Funchal during the breeding season from 1996-1998. The climate data for Funchal were provided by the Observatório Meteorológico do Funchal, the data from Ilhéu Chão were collected by own measurements, --: no data available.

February		March		April		May	
Ilhéu Chão	Funchal	Ilhéu Chão	Funchal	Ilhéu Chão	Funchal	Ilhéu Chão	Funchal
15.6	14.9	16.0	15.9	17.3	17.0	17.5	17.9
--	16.3	--	17.6	20.3	18.1	20.2	18.8
--	17.6	--	19.0	--	17.3	18.1	17.8

February	March	April	May
48.2	187.7	32.1	89.1
49.3	40.3	48.5	37.2
145.2	27.7	1.6	40.1

Nests are exclusively built by females. Nest building can last from 2 to 11 days. In 1996 we observed a decline in overall nest building time from 10.8 days in February (n=5) to 3.8 days in May (n=4). Males guard their females intensively during that period and perform song flights over the nest and copulate frequently with their mate. Pairs do not possess large territories, they defend their nestbush and a small surrounding area. Nest defending is mainly the task of the male.

Breeding locations

Generally there was one area less frequently used for breeding activities, perhaps due to a high density of seagulls. The center of the island is mainly covered by small trees

of *Olea europaea* and shrubs of *Jasminum odoratissimum*. We call this area the main breeding area. In the surrounding area shrubs of *Suaeda vera*, *Carlina salicifolia* and *Artemisia argentea* are more abundant. Nests were found in all of these plants. There was no obvious preference of females for any type of bush.

Nests were built 10 cm up (in *Suaeda vera* and *Carlina salicifolia*) to 180 cm high (in *Olea europaea*). They had an inner diameter of an average of 5 cm and were stuffed with smooth seeds as well as with seagull feathers. The mean distance between two neighbouring nests was 15 m in the main breeding area and 30 m in the surrounding area. The closest distance which we observed was 90 cm between two nests. In that case three females had their nests in one large bush at the same time. Within the main breeding area the nest density was always higher than outside.

Canaries are seed-eaters and feed together on large feeding grounds on different grass species, mainly on *Avena sterilis* (Gramineae) and other plants like *Mesembryanthemum crystallinum* (Aizoaceae), *Chenopodium murale* (Chenopodiaceae) and *Plantago lanceolata* (Plantaginaceae). Canaries also frequently conjugate at the water puddle, which represents a small supply of rainwater during wet conditions.

Nesting characteristics

The average clutch size in 1996 was 3.9 ± 0.1 SE eggs in March (n=8), increasing to 4.5 ± 0.1 SE eggs in May (n=14). In April 1997 the mean clutch size was 3.9 ± 0.1 SE eggs (n=12), declining to 3.4 ± 0.2 SE eggs in May (n=9). In May 1998 on average 3.6 ± 0.2 SE eggs per clutch were laid (n=11). These findings were in agreement with observations of BANNERMAN & BANNERMAN (1965), who reported clutch sizes of 3-5 eggs on Madeira. There was no evidence that younger females laid smaller clutches. Females normally started incubating after the penultimate egg was laid. Incubation time was 14 days and around posthatching day 15 the juveniles generally fledged. During the first week after hatching the male fed the young and the female who incubated the hatchlings. After one week both parents shared the feeding. The juveniles were fed about every 20 minutes. At fledging age the young had reached an average weight of $16.0\text{g} \pm 0.2$ SE, (n=25), which was slightly higher than the mean weight of adults ($15.4\text{g} \pm 0.1$ SE, n=82). Juveniles are grey-brown coloured. About posthatching day 40 in most of the young males yellow feathers started to grow on the throat and breast. Adult plumage is completed after their first moult in August/September. After fledging from the nest juveniles were fed by the parents for another month and accompanied them to the feeding areas. If the female started building a new nest, only the male took care of the young.

Breeding success

The number of nests found during the breeding seasons of 1996 until 1998 are

listed in Tab. 2. For some months no data were available. Nests are assigned according to the laying dates. In March 1996 a lower number of nests was initiated compared with the other months. Tab. 2 also shows the proportion of nests with hatched juveniles. In 1996 pairs bred more successfully towards the end of the breeding season. That means, that during this period less nests were deserted after completing the clutch. The highest number of nests abandoned (30%) was in March 1996 (Tab. 2). In 1997 the percentage of nests with hatched juveniles was at the highest in April.

TABLE 2 - Number of nests initiated and percentage (%) of nests that hatched juveniles for the breeding seasons of 1996-1998, --: no data available, ? : unknown.

	February	March		April		May	
year	number of nests	number of nests	percentage of nests with hatched eggs	number of nests	percentage of nests with hatched eggs	number of nests	percentage of nests with hatched eggs
1996	12	6	70.0	21	70.8	14	84.0
1997	--	--	--	15	92.3	7	84.2
1998	--	--	--	4	100.0	9	?

From the number of successful breeding pairs we calculated the hatching and fledging success. Hatching success is defined as the mean number of hatchlings per nest at the time of hatching. Fledging success respectively as the mean number of fledglings per nest at the time of fledging. The data shown in Fig. 2 are for the year 1996. On average 3.3 ± 0.2 SE juveniles hatched and 3.0 ± 0.3 SE juveniles fledged per nest. The highest breeding success of the year 1996 was in May. Hatching success was lowest in March and, consequently, less juveniles fledged in April.

DISCUSSION

The main factor to initiate the breeding season of the Island Canary is primarily the photoperiod. When days are getting longer the gonads increase in volume (e.g. FOLLET et al. 1967). Our three years study revealed differences in breeding characteristics such as clutch size, breeding synchronization, hatching and fledging success that could be explained by changes in climate conditions. Nesting failure due to predation was rather low. Potential predators to eggs and chicks are hawks, kestrels, lizards, ants and mice.

The weather and, consequently, food and water availability might be the factors which had the strongest impact on the breeding situation of the canaries on Ilhéu Chão.

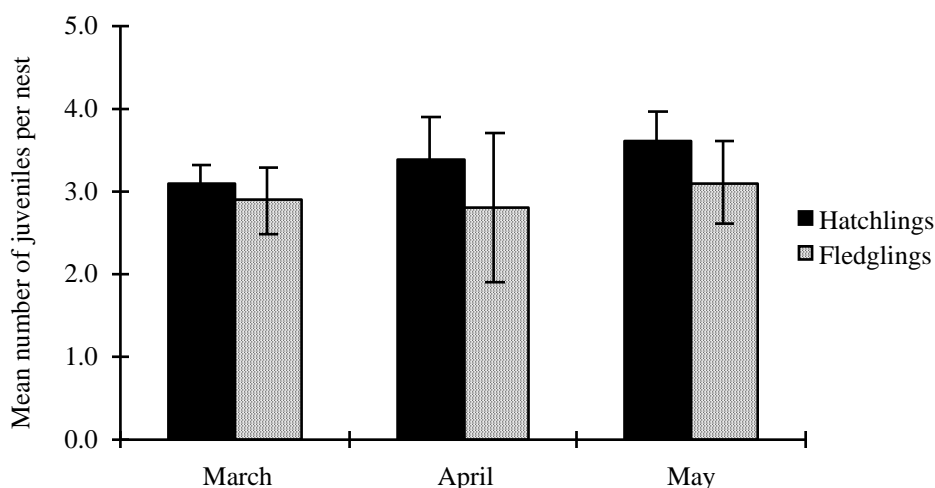


Fig. 2 - Hatching and fledging success for the breeding season 1996. Hatching success is defined as the mean number of hatchlings per nest at the time of hatching. Fledging success respectively as the mean number of fledglings per nest at the time of fledging. Bars indicate standard error (SE).

The increasing mean clutch size from March to May 1996 is likely to reflect the need of compensating the loss of eggs in March when there was high rainfall and strong wind (Tab. 1). Normally, the initiation of nest building was asynchronous between females. After remarkable weather events like very strong storms or huge rainfalls which happened for example in March 1996 many females initiated a new nest at the same time. By the beginning of April 1996 the number of females building a new nest was high and as the weather became stabilized the hatching success was high in the following months. Under dry conditions like in May 1997 the clutch size was reduced and we assumed that shortage of food did not allow to feed more than three hatchlings.

The island Ilhéu Chão is a suitable area to obtain information about the reproductive behaviour of individual birds because they are relative easy to catch and to observe due to the lack of high vegetation. However, the impact of the weather might be higher than in other habitats.

ACKNOWLEDGEMENTS

We would like to thank the Parque Natural da Madeira, especially Eng. H.M. COSTA NEVES for the permission to conduct the study on Ilhéu Chão. The wardens of the Parque Natural da Madeira, represented by FERNANDO, PAUL and FILIPE, kindly provided considerable logistical support. We are grateful to the Portuguese Navy for the transport

to and from Deserta Grande. Many thanks to Dr. J.M. BISCOITO, Dr. THOMAS DELLINGER and Dr. PAULO OLIVEIRA who gave us valuable advice during the study. Climate data for Funchal were kindly provided by the Observatório Meteorológico do Funchal. We are also grateful to Prof. Dr. MANFRED GAHR, ALEXANDER SCHEUERLEIN and SUSANN RÖSSEL for comments on the manuscript.

REFERENCES

BANNERMAN, D. A. & W. M. BANNERMAN:

1965. *Birds of the Atlantic Islands. Vol. I: A History of the Birds of the Canary Islands and of the Salvages.* Oliver & Boyd, Edinburgh and London, pp. 284-288.

BOLLE, C.:

1858. Der wilde Canarienvogel, eine Biographie. *Journal für Ornithologie*, **6**: 125-151.

COSTA NEVES, H., SILVA, I. & CARLOS PALMEIRA:

1992. Contributions to the knowledge of the flora of Desertas Islands. *Bocagiana*, **163**: 1-21.

CRAMP, S. & C. M. PERRINS:

1994. *Handbook of the Birds of Europe, the Middle East and North Africa. Vol. VII: Crows to Finches.* Oxford University Press, pp. 528-536, 34+39 Pls.

FOLLET, B. K., FARNER, D. S. & M. L. MORTON:

1967. The effects of alternating long and short daily photoperiods on gonadal growth and pituitary gonadotropins in the white-crowned sparrow, *Zonotrichia leucophrys gambelii*. *Biol. Bull.*, **133**: 330-342.

JOLLY, G. M.:

1965. Explicit estimates from capture-recapture data with both death and immigration-stochastic model. *Biometrika*, **52**: 225-247.

PRESS, J. R. & M. J. SHORT:

1994. *Flora of Madeira.* The Natural History Museum. London: HMSO.

SCHMITZ, P. E.:

1899. Die Vögel Madeira's. *Ornithologisches Jahrbuch*, **X** (1): 1-40.