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ASSESSMENT OF BUDGERIGAR (*MELOPSITTACUS UNDULATUS*) HATCHING IN PRIVATE BREEDING

Dorota Banaszewska, Barbara Biesiada-Drzazga, Dominik Ostrowski, Katarzyna Andraszek, Anna Wereszczyńska

University of Natural Sciences and Humanities, Siedlce, Poland

Abstract. The aim of this study was to evaluate the budgerigar hatching in captivity. The study was carried out from 2009 through 2012 on four pairs of budgerigars kept in year-round outdoor aviaries in a private farm in Masovian voivodeship, Poland. The analysis of hatching was based on the following indicators: the number of eggs laid by four females in the system of three clutches per year, the percentage of fertilization and the hatchability ratio. Within four subsequent breeding seasons, the highest number of eggs laid by females altogether was in Clutch 2 (92) and the lowest in Clutch 3 (79). Some variability occured between the females: the poorest results were attained by Pair I, which raised 57 chicks of 64 laid eggs over the 4 subsequent years. Most chicks (69 of 74 laid eggs) were obtained from Pair IV. The latter pair had an impressive, 100% reproductive rate in the first year of the study. The studied pairs of budgerigars demonstrated good reproductive rates. In most cases the percentage of fertilization and hatchability exceeded 90%. Presented study is a base for further studies on the reproduction and nesting behavior of budgerigars and it could represent a comparative material for this type of studies carried out in the natural environment.

Key words: budgerigar, hatching, reproductive rates

INTRODUCTION

Budgerigar is one of the most popular ornamental birds bred in home aviaries [Kruszewicz 2005]. The parrots gained popularity due to their speaking abilities, pleasant disposition, nice appearance, and the easiness of taming [Bielfeld 1997]. Wild budgerigars live in Australia, except for its closed woodlands [Wyndham

Corresponding author – Adres do korespondencji: Dorota Banaszewska, PhD, Siedlce University of Natural Sciences and Humanities, Department of Breeding Methods and Poultry and Small Ruminant Breeding, ul. Bolesława Prusa 14, 08-110 Siedlce, Poland, e-mail: banaszd@op.pl

1980, Wolter 2004]. Those tiny birds eat mainly grass and herb seeds [Forshaw 1992]. Budgerigars are very social and – if sufficiently cared-for – they treat their owner as a companion and do not need the company of their avian mates [Bielfeld 1997]. The important element of budgerigar breeding is the selection of a suitable cage [Alderton 1994]. The bigger the cage, the better it is for the birds [Bartenschloger 2002]. An aviary in which the birds can easily fly is the best solution, giving the owner the opportunity to observe budgerigars' social behavior [Bielfeld 1997].

Although in recent years there has been a significant progress in developing birds breeding techniques, the ongoing observations are constantly giving more and more valuable information. Since 1840, when first bugderigars were brought to England, they have gained a great popularity becoming exhibition birds. Throughout the years of breeding work on budgerigars, over a hundred colour varieties have been bred and the parrot's body weight doubled compared to their native ancestors [Samour 2002]. Budgerigars are considered to be a pleasant study object due to the opportunity they give of observing their mating behavior even in small cages. This enables learning their behavior in a natural surrounding [Kruszewicz 2003]. Therefore, the aim of this study was to evaluate the budgerigar hatching peroformance in private breedings.

MATERIAL AND METHODS

The study was carried out in a home breeding facility in Masovian voivodeship in 2009–2012. The breeding was carried out in the year-round outdoor aviaries with dimensions of $4 \times 3.5 \times 2.2$ m (length$\times$width$\times$height). The aviaries were equipped with an outbuilding with dimensions $1.5 \times 1.5 \times 2.2$ m, where the birds could find a shelter from bad weather. Feeding was provided twice a day. In autumn and winter, when air temperatures dropped well below 0°C, the diet was enriched with additional portions of herbs.

A few weeks before the first expected mating (April), nesting boxes were installed in the aviaries. In order to stimulate the mating behavior, birds were given a prepared egg mixture (hard-boiled egg, bread crumbs, grated carrot), with crushed egg shells and fine gravel. Such diet had been continued until the first egg was laid. Then the egg mixture was withdrawn in order to stop males mating behavior. Observations were carried out on four pairs of budgerigars. These pairs were formed by: Female I at the age of 1.5 years with a Male I at the age of 1 year, Female II at the age of 3 with Male II at the age of 1.5 years, Female III at the age of 3 years with a Male III at the age of 3 years, Female IV at the age of 2 years with a Male IV at the age of 4 years (age at the beginning of observation period).

After mating, the females laid their eggs and incubated them almost exclusively by themselves. The eggs were laid every 1–2 days, and the incubation started as soon as the first egg has been laid. The analysis of hatching was based on the following indicators: the number of eggs laid by four females in the system of three clutches in one year, the percentage of fertilization, and the hatchability ratio. There was no biological analysis of breeding during the observation, so as not to interfere with the incubation behavior of parrots. Statistical differences between the samples were tested using Fisher's Exact Test.

RESULTS

Figure 1 shows the number of eggs laid by four females observed in 2009––2012. Females of all pairs in each of the three clutches laid up to a total of 20 eggs (Female IV in 2009). The greatest number of eggs, 71, were laid by all of four females in 2010. In 2012 there were 13 eggs less. Female IV had the best lay with 74 eggs during the observation period (14 more than Female II) and the most balanced lay, 17–20 eggs per season (the significant decrease in the number of laid eggs was shown by Female II).

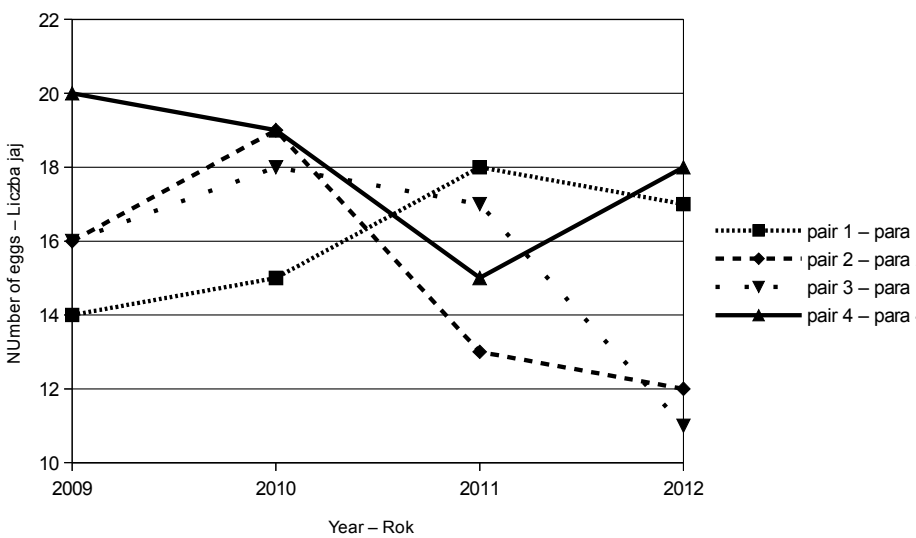

Fig. 1. Eggs laid by females within 4 years (2009–2012)

Rys. 1. Liczba jaj zniesionych przez samice przez 4 lata (2009–2012)

Table 1 shows the number of eggs laid by females in particular years and clutches. The number of laid eggs varied depending on the clutch. The highest

number of eggs was laid in Clutch 2 (92 eggs). It was about 5 eggs more than in Clutch 1, and 13 eggs more than in Clutch 3. This was mainly determined by the fact that in 2009 and 2010 in Clutch 2 all the females demonstrated a high laying level, which was 6–7 eggs. In those years also appeared the highest total number of eggs, respectively: 66 and 71. The poorest laying performance was noted in 2012 (58 eggs), which was the result of a lower number of eggs laid by Females II and III.

Table 1. The number of eggs laid by each female by clutch and year

Tabela 1. Liczba jaj zniesionych przez poszczególne samice w kolejnych latach z poszczególnych zniesień

Year Rok	Pair Para	The number of eggs laid – Liczba zniesionych jaj			
		Clutches – Lęgi			Total – Łącznie
		1	2	3	
2009	I	3	6	5	14
	II	4	7	5	16
	III	6	6	4	16
	IV	6	7	7	20
2010	I	5	6	4	15
	II	6	6	7	19
	III	7	6	5	18
	IV	6	7	6	19
2011	I	8	5	5	18
	II	5	4	4	13
	III	4	7	6	17
	IV	5	5	5	15
2012	I	6	6	5	17
	II	4	5	3	12
	III	5	3	3	11
	IV	7	6	5	18

Table 2 summarizes the data from the individual rates of budgerigar females. They also show that some variability occured between females. The poorest results were observed in Pair I, which indeed raised 57 chicks, but the difference between the number of laid eggs, and the number of hatched chicks was 7. The poorest results of this pair were recorded in 2009, when 14 eggs were laid, 11 eggs were fertilized with only 8 hatched chicks, while in 2011–2012, these rates were at 100%.

Pair III showed a good effectiveness of fertilization and good hatchability with 62 eggs laid, where only 2 were unfertilized and 59 chicks eventually hatched. Most chicks, 69, were obtained from Pair IV – the couple had in 2009 an impres-

sive reproductive rate, because all of 20 laid eggs were fertilized and 20 chicks hatched.

Table 2. Breeding results of the budgerigar pairs I–IV

Tabela 2. Wyniki reprodukcyjne badanych par papug (pary I–IV)

Year Rok	Eggs laid, number Liczba jaj zniesionych, szt.				Fertilised eggs, number (%) Liczba jaj zapłodnionych, szt. (%)				Hatched chicks, indiv. (%) Liczba wyklutych piskląt, osobn. (%)			
	I pair I para	II pair II para	III pair III para	IV pair IV para	I pair I para	II pair II para	III pair III para	IV pair IV para	I pair I para	II pair II para	III pair III para	IV pair IV para
2009	14	16	16	20	11 (78.6)	15 (93.3)	16 (100.0)	20 (100.0)	8 (72.7)	15 (100.0)	16 (100.0)	20 (100.0)
2010	15	19	18	19	15 (100.0)	19 (100.0)	18 (100.0)	18 (94.7)	14 (93.3)	18 (94.7)	18 (100.0)	18 (100.0)
2011	18	13	17	17	18 (100.0)	12 (92.3)	17 (100.0)	17 (100.0)	18 (100.0)	12 (100.0)	16 (94.1)	16 (94.1)
2012	17	12	11	18	17 (100.0)	10 (83.3)	10 (90.9	16 (88.9)	17 (100.0)	10 (100.0)	9 (90.0)	15 (93.8)

There were no statistically significant differences between the observed budgerigar females and breeding seasons.

DISCUSSION

Budgerigar wild populations inhabit almost the entire Australian area. It is harder to find them only in closed woodlands in the Northeast and South of the continent. Budgerigars inhabit open spaces of eucalyptus forests or individual trees and shrubs [Bielefeld 1997]. When the rainy season comes, they tend to migrate through the continent searching for areas rich in water and food [Samour 2002]. Budgerigar is a gregarious bird, usually monogamous, but there are individuals with polygamous tendencies. They usually choose hollows of trees for nesting, and it is common that sometimes there are between 5 and 30 nests in a single tree. Such cluster nesting stimulates birds to mating, allowing for the optimal use of the reproduction during the rainy season [Bielefeld 1997]. Despite the fact that budgerigar is numerous in its natural environment, little is known about their behavior during courtship and during incubation. This fact brought a great interest in individual breeders and hobbysts who conduct observations of budgerigars' mating behavior, which are a graceful object of scientific work. Indeed, during the breeding season, every day noisy budgerigars, become quiet and peaceful. In nature, after the very subtle courtship consisting of mutual skimming and feeding, comes the copulation and after that male is looking for a suitable place for female to lay eggs, usually a hollow [Bielefeld 1997].

According to own research, during the upcoming courtship there were nesting boxes installed in aviaries. Frequently after one day of installation of the nesting box, females began to look and come into it, which was a preparation for the breeding season, and helped to accelerate the maturation of eggs [Bielefeld 1997]. Approximately one week after placing nesting boxes in aviaries, particular pairs of budgerigars began the courtship. It is the male who first initiates the courtship. Female can either accept it or show aggression. In the case of the observed pairs of budgerigars, all the individuals in the pairs accepted each other. Moreover, hearing the sounds of other couples' courtship in neighbouring aviaries, budgerigars had mutual stimulation helping in preparation for breeding. After about a week from mating females began laying eggs – 3 to a maximum of 8 eggs in a clutch, laid in two-day intervals. From the moment the first egg was laid, the incubation process started and was dealt solely by females, while males took over the duty of feeding the mass they did not leave the nest. After about 28 days, with the intervals of two days, the chicks were hatching accordingly to the order of laying eggs in a nest.

The data of this study show that in the last year of observation period females laid the lowest number of eggs. Perhaps this situation is related to the age of females. Some authors' research suggest that males live longer than females. However, as in the case of animals, birds also show changes associated with aging of the organism. Budgerigars reach sexual maturity around the age of 3–4 months [Pohl--Apel 1980]. With age, there is a follicular aging, which may lead to a decline in laying ability after a few years of intensive breeding [Saino et al. 2002, Holmes et al. 2003]; this has been confirmed by other authors [Clubb and Karpinski 1992, Holmes and Austad 1995 a, b, Austad 1997]. It can be associated with cancer of the reproductive system intensified with age of the birds.

In some studies the authors show that the various environmental factors to some extent affect the reproduction of budgerigars, depending on latitude on which they are located [Wyndham 1980, Costantini et al. 2009]. This is undoubtedly related to photoperiod. Some authors have reported that the length of the light day does not affect the course of spermatogenesis in this species [Pohl-Apel and Sossinka 1975]. It was also observed that testicles of birds kept in cages showed activity all the time [Wyndham 1980]. Gosney and Hinde [1976] pointed to the negative impact of short photoperiod on laying eggs as well as an impact of male budgerigars mating behavior on reproductive rates. The observation of the males spending more time in the nest during incubation showed that they have better results of hatching rates [Baltz 1994]. This is evident in the higher body weight of ready offspring [Baltz and Clark 1997].

CONCLUSION

The observed pairs of budgerigars demonstrated good reproductive rates. The results of the present study may constitute the basis for further observations of reproduction and incubation behavior of the budgerigar and can be used in comparison of this kind of studies carried out in nature.

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OCENA LĘGÓW PAPUŻKI FALISTEJ (*MELOPSITTACUS UNDULATUS*) W HODOWLI INDYWIDUALNEJ

Streszczenie. Celem pracy była ocena lęgów papużki falistej w hodowli indywidualnej. Badania przeprowadzono w amatorskiej hodowli na czterech parach papużek falistych w latach 2009–2012 na terenie województwa mazowieckiego. Hodowlę prowadzono w wolierach zewnętrznych całorocznych. Analizę lęgów oparto na następujących wskaźnikach: liczba zniesionych jaj przez cztery samice w systemie trzech lęgów w jednym roku, procent zapłodnienia, i wskaźnik wylęgowości z jaj zapłodnionych. W ciągu 4 kolejnych sezonów rozrodczych największą liczbę jaj łącznie od 4 samic pozyskano w drugim zniesieniu (92), zaś najmniej w trzecim (79). Występuje pewna zmienność osobnicza pomiędzy samicami. Najgorsze wyniki reprodukcyjne stwierdzono u pary I, która przez 4 kolejne lata odchowała łącznie 57 piskląt, z 64 zniesionych jaj. Najwięcej piskląt, bo aż 69 z 74 zniesionych jaj otrzymano od pary IV, przy czym para ta w pierwszym roku badań uzyskała 100% zapłodnienia i wylęgowości. Obserwowane pary papużek falistych charakteryzowały się dobrymi wskaźnikami reprodukcyjnymi. W większości przypadków procent zapłodnienia oraz wylęgowość piskląt przekraczała 90%. Niniejsze badania stanowią podstawę do dalszych obserwacji nad reprodukcją i behawiorem inkubacyjnym papużki falistej i mogą stanowić materiał porównawczy dla tego typu badań prowadzonych w naturze.

Słowa kluczowe: lęgi, papużka falista, wskaźniki reprodukcyjne

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