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Notes on the Breeding Biology of Captive Rosy-Faced Lovebirds *Agapornis roseicollis**)**)

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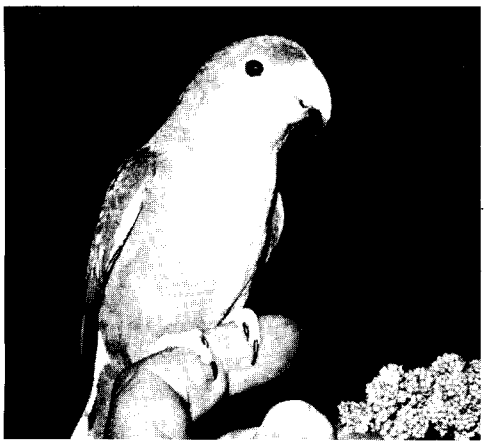

The following observations on clutch sizes, egg shapes, and egg laying were recorded during a six years' investigation in West-Germany of the behavioural biology of captive rosy-faced lovebirds. The data represent a by-product of my results published in a forthcoming report on this species. The experimental group consisted of thirteen couples, four of which were "male-female-female pairs" or "female-female pairs" (details on polygyny and on female bonding will be described separately). Except for one male-female couple, which was socially and acoustically isolated from conspecifics until it raised its own young, the whole lovebird population was kept in a community aviary containing a sufficient number of nest boxes. The climatic conditions in the aviary room did not differ from those in other rooms of the institute. As it was not my intention to raise as many as possible young, I strictly avoided to interfere in the "normal" reproductive activities and social relations of group members. Nor did I try to improve any conditions for breeding after hatching failures.

The entire period of observation, for which the data below are valid, lasted from January 1, 1977 to December 31, 1979. Additional findings obtained during 1974, 1975, 1976 and 1980 will be incorporated in a subsequent report. Some of the topics (point 4 below) are occasional records, which await confirmation or substantiation from observers with similar experiences.

1. Variation in clutch size

The clutch size of either free-living or captive rosy-faced lovebirds is usually stated as between 3—6 and 4—6 eggs. Yet attempts to determine how often 3, 4, 5, or 6 eggs per clutch and female occur during a longer time span have never been published before. The table below shows clutch and egg counts from the continuous period of 36 months:

Number of eggs/clutch	1	2	3	4	5	6	7	8	Total
Clutch rate during 36 months from all pairs	7	7	25	24	25	11	2	3	104
Subtotal (eggs)	7	14	75	96	125	66	14	24	421

*) In the literature, the names peach-faced and rosy-faced are used synonymously for *Agapornis roseicollis*. The former is more widely applied than the latter, particularly by US American and European biologists, and also breeders. The List Committee of the Southern African Ornithological Society refers to this species, whose wild form is endemic to southwestern Africa, as the rosy-faced lovebird. I recommend to use the latter notation.

**) This paper is dedicated to the late H. Hampe, Braunschweig, Germany.

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In the five cases where seven and eight eggs/clutch occurred, two bonded females had laid either three plus four, or four plus four eggs, and both birds incubated in the same nest box. The fertilization rates of the clutches of the two "female-female pairs" were significantly lower than those of the clutches of the two "male-female-female pairs", because copulation between one of the bonded females and a lonely male took place only occasionally. The seven clutches comprising one egg of male-female couples were not incubated, the seven clutches comprising two eggs were incubated during the day only by some of the mated females. It is probable that these birds would not have laid a 1–2 egg clutch under conditions of social isolation from the other couples (details on the so-called "Fraser-Darling effect" for birds in captivity will be described separately).
Although the total amount of 421 eggs counted for all 104 clutches leads to an arithmetic mean of ~4 eggs/clutch, the use of this average figure should be avoided in favour of "clutch size: 3–6 eggs" as a future reference for captive *A. roseicollis*, as based on the listed rates of 25, 24, 25 and 11.

2. Number of clutches per female and year

According to various avicultural reports, it appears to be widespread practice among breeders to withdraw nest boxes from couples after the females have laid a second or third consecutive clutch. This is done in the belief that: it avoids further laying and the physical exhaustion of females; it prevents unsuccessful broods either because the embryos will be too weak to hatch, or the chicks will be too weak to survive. In order to obtain more reliable data on the physical potency of females, I left all next boses in the aviary (for a temporary exception see point 4 of the occasional observations below). The following records a–d of clutch and egg counts for four male-female couples are quoted as an illustration. Small letters denote males, capital letters female mates; the first digit denotes the number of eggs/clutch, the second digit the number of hatched young (e.g. 5/0 = 5 eggs/clutch; no hatchlings).

a) couple b–D

1977: 5/4; 1/0; 5/0 (subtotal 11/4 for 3 clutches)
1978: 6/0; 6/0; 5/0; 4/0; 3/0; 3/0; 6/0 (subtotal 33/0; 7 clutches)
1979: 5/0; 4/0; 4/0; 3/0; 3/0; (subtotal 19/0; 5 clutches)

b) couple e–F

1977: 4/3; 6/2; 5/0; 2/1; 5/0 (subtotal 22/6; 5 clutches)
1978: 6/0; 6/0; 4/0; 5/0; 1/0 (subtotal 22/0; 5 clutches)
1979: 1/0; 5/2; 3/0; 6/0; 5/0; 6/0; 5/0; 6/0 (subtotal 37/2; 8 clutches)

c) couple i–J

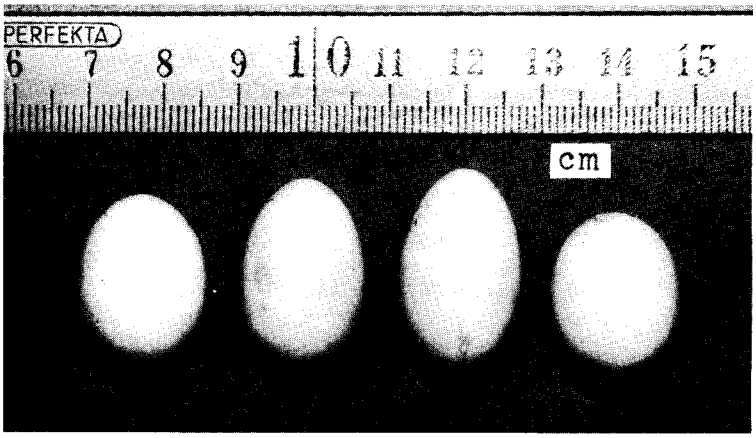
1977: 4/0; 4/0; 4/4 (subtotal 12/4; 3 clutches)
1978: 5/0; 5/0; 3/0; 1/0; 5/1 (subtotal 19/1; 5 clutches)
1979: 5/1; 1/0; 5/1; 4/1; 4/0 (subtotal 19/3; 5 clutches)

d) couple epsilon-N
1979: 3/0; 5/0; 2/0; 5/0; 4/0; 4/0; 3/0; 4/0 (subtotal 30/0; 8 clutches)

In spite of a total of 18 clutches with 81 eggs and 8 young hatched for female F (case b), this lovebird never showed obvious signs of exhaustion. In 1979 it even increased the rate of egg laying. An almost similar behaviour applied to female D (case a: 15 clutches, 63 eggs, 4 hatchlings), and to female J (case c: 13 clutches, 50 eggs, 8 hatchlings). Considering the totals of 81/8 for female F and of 50/8 for female J, one might regard the latter bird as the most successful breeder in terms of hatched young; and female N with a total of 30/0 – although during only 12 months – the most unsuccessful. An assessment of this kind, however, has a value for private records only. General conclusions from the breeding behaviour of these birds are inadmissible, firstly, because of the couples' dissimilar social conditions (isolated or not isolated); secondly, because of varying fertilization/non-fertilization rates for the different clutches; thirdly, because of the different ages of the birds involved; fourthly, because of varying next box locations relative to others belonging to dominant or sub-dominant couples; and fifthly, because of unequal microclimates in the various nest boxes due to different material and design, position within the aviary, exposure to sun, etc.
An examination of all fertilized eggs which failed to hatch (more than ¾ of the 421 eggs were fertilized) revealed that most embryos had died during the last ten days before the expected time of hatching. Reasons for this phenomenon, which has been reported by German lovebird breeders in the past, are unknown. I consider that inappropriate microclimata in the nest cavities are probably responsible for hatching failures.

3. Shape of eggs

Data given for wild *A. roseicollis* vary from 20,4–26,3 mm × 16,2–18,8 mm (Winterbottom, 1971). Measurements of eggs of the captive lovebirds by means of a sliding caliper resulted to 27,3 mm × 16,1 mm for the longest, and to 22,6 mm × 18,1 mm for the most spherical egg ever collected from the population (see photograph: third and fourth egg from the left; the first and second eggs from the left are average sized). Possible factors determining the shape and size of an egg of a bird species or of individual females within a given population (heredity, age, laying progression, etc.) have been discussed earlier, e.g. Richdale (1955), Koskimies (1957), Kendeigh et al. (1956), and Kendeigh (1975).



4. Occasional observations

During incubation a rosy-faced lovebird displaced an egg from the nest to the far corner of the nest box. In order to find out whether this reduction of clutch size was done deliberately, I marked the cold egg and returned it into the nest. The next morning the egg was again in the same far corner of the nest box. A closer inspection of this egg and the other eggs of the clutch revealed that the rejected one was unfertilized and had desiccated. The dry contents of the egg were concentrated at one end. Surprisingly, a similar attribute applied to another egg within the clutch. Yet this one had been left in the cavity.
The lovebird's motivation and criterion for the rejection of a certain egg and the acceptance of another or other eggs within the clutch with similar properties remain unknown.
I observed similar cases of displacements of single eggs from their clutches on three other occasions.

Undamaged eggs were several times found on the bottom of the wire cage containing the nest box, or on the floor of the aviary containing four or five wire cages. At the same time the clutch size of a particular couple was reduced by one egg. It is extremely improbable that one of the mates had destroyed and eaten the missing egg in the clutch, while coincidentally another female in the group had laid an egg outside its own nest. Because of the construction of the nest boxes, wire cages, and aviary, the only way the egg could move was if it was carried by the birds. As lovebird eggs are wider than the gap between the upper and lower mandibles when the bird's beak is widely opened, the question of how these small parrots had managed to transport the egg without damaging it, is a complete mystery.

Lovebird females have a distinct incubation posture involving the ruffling of their plumage while resting on the eggs. One bird "pseudo-incubated" within the nest box for three consecutive days after I had removed the clutch. Although on several occasions clutches were removed from other females, this behaviour was only observed once.

Although lovebirds are typical hole nesters, one of the females in my population (which at that time did not possess its own nest box) laid a clutch of three eggs on the aviary floor under a protective structure and began incubating. Two days after the last egg was laid, incubation ceased. At the same time most other females within the group possessing nest boxes were incubating.
This and two similar cases indicate that the mere removal of nest boxes from certain females, of couples who are socially integrated in a group currently in a reproductive state, is insufficient to prevent the development and laying of eggs (cf. "Fraser Darling effect" mentioned above).

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The two photographs were taken from the dissertation of the author.