

Nesting behaviour of *Psittacula krameri* L.

S.Kannaiyan and J.Pandiyan*

PG & Research Department of Zoology & Wildlife Biology, AVC College (Autonomous), Mannampandal - 609 306, Mayiladuthurai, Tamilnadu, India

Abstract

The nesting ecology of birds varies depending on the species and the nature of the individual and sex. Five different pairs and ten individuals consisting of five male and five female of Indian Rose Ringed Parakeet (*Psittacula krameri*) were studied. Inter and intra sexual variations of the nesting behaviour of both sexes of the birds were studied from 6.00 am to 6.00 pm. Female bird spent more time than the male bird in the nest. Spending time inside the nest varied with reference to sexes of the individuals. There are significant differences between inter and intra sexual variations of the birds with reference to spending time inside the nest ($P < 0.001$).

Key words: Behavioural ecology, conservation, inter and intrasexual variations, nesting behaviour

INTRODUCTION

Populations of native cavity nesting birds are declining gradually throughout the country. Loss of suitable nesting sites and competition from non-native birds are the major factors affecting the population. In animals, evolutionarily the breeding system is significant in behavioural ecology (Skutch, 1982; Winkler and Walters, 1983; Martin, 1987; Clutton-Brock, 1991; Ligon, 1999). Several studies reported that there were inter and intrasexual variations in the nesting ecology, especially in birds. In addition to that females of most of the endotherms with internal fertilization spend more time than the males time inside the nest, without any help from mates (Clutton-Brock, 1991). Birds are always an exception because approximately 80% of species provide bi-parental care to offspring, although females usually invest more than males (Lack, 1968; Cockburn, 2006). But, there is fascinating exception to the general rule of "higher female investment" in parental care such as 1% of all species, mainly precocial species within the Ratites and Charadriiformes (Lack, 1968; Cockburn, 2006). The present article deals with the nesting ecology of Indian Rose-ringed Parakeet (*Psittacula krameri*) with reference to variation in spending time in relation to sex and individual species in the nest during their breeding hours.

Study Area

The study area covers 25 km² of Arulmozhi agricultural area near Lower Anaicut, Ariyalur District, Tamilnadu, southern India. It is situated in between Kollidam and Ponnar river. These two rivers are the major water source for 10000 hectares of agricultural land in the Cauvery deltaic region southern Tamilnadu. The lands are mainly cultivated with paddy, banana, cotton, sugarcane, coconut, black and green grams, gingelly and spices. Natural vegetation is very scarce, which includes small areas of short scrubland and other

sporadic busy type of vegetations. The nests were observed in palm and coconut plantations. All the trees are nearly 50 years old and they are more than 15 to 22 meters height. These include nearly 1000 trees of palm and coconut. Most of the dead trees are having cavities and holes that are used by the birds as their nesting site.

MATERIALS AND METHODS

The study was conducted from November 2012 to July 2013. Focal animal sampling (Altman, 1974) method was used to monitor the arrival and departure of the birds by using 7"x20" binocular. The male and female individual birds were identified on the basis of their external plumage, colour and field characteristics (Ali and Hussain, 1981). The activity patterns of the birds with reference to arrival and spending time inside and outside the nest were observed for twelve hours 06.00 am to 06.00 pm. A single nest and a single pair were observed in a day in order to avoid confusion among the pairs and individual of birds in the breeding ground. The time of arrival and departure of birds from the nest was recorded without any difficulty. Care was taken to ensure the same pair used the nest for a prolonged period of time since it has to overcome the competition from other birds. Hence this study did not require marking of individuals for identification. Observations were made at a distance of 2 mts away from the nest bearing tree, without disturbing the birds.

Statistical analysis

General Linear Model (GLM) was applied to determine the differences in spending time inside and outside the nest during the breeding season and the inter and intrasexual variations. Mann-Whitney Test was used to evaluate the nesting ecology and intersexual differences in the spending time inside and outside the nest, and Kruskal-Wallis Test was applied to study the intrasexual differences in the spending time inside and outside the nest. SPSS 12.0 was used for statistical analysis. The results are interpreted on the basis of Sokal and Rolf (1981).

*Corresponding author,
E-mail: dunlinpandiyan@gmail.com

RESULTS

Intersexual variations

Totally five pairs of birds and five different nests were selected to record the intersexual participation in the nesting ecology of Indian Rose-ringed Parakeet (*Psittacula krameri*) from November 2012 to July 2013. The female spent more time than the male i.e. female spent 2137.4 ± 56.43 seconds/hour inside the nest. On the other hand the male spent 522.7 ± 8.62 seconds / hour inside in the nest (Table 1, Fig. 1). Whereas in the case of female alone 1816.6 ± 121.88 seconds/hour, and the male alone spent 218.8 ± 16.99 seconds/hour inside the nest. But both the male and female birds spent 320.7 ± 27.42 seconds/hour inside the nest (Table 1). There is a significant difference between male and female birds ($P < 0.001$) in the spending time in the nest. Significant difference was also recorded within male and female birds in the spending time inside the nest (Mann-Whitney U, $Z = -20.863$, $P < 0.001$).

Intrasexual

Totally five different individual birds were observed for each sex of the species to record individual variations or intrasexual variations in the nesting ecology of Indian Rose-ringed Parakeet (*Psittacula krameri*) (Table 1). In the case of lone female the time spent inside the nest was in the range of 1256.6 ± 107.70 to 2261.2 ± 114.07 seconds/ hour. On the other hand the time spent inside the nest was in the range of 148.9 ± 32.44 to 291.1 ± 42.54 seconds/hour. But, the male spent inside the nest for a minimum period of 341.2 ± 72.53 and maximum period of 872.5 ± 110.01 seconds/hour. The female spent the lowest of 1776.2 ± 130.96 and the highest of 2451.2 ± 115.32 seconds/hour inside the nest. However, there is no consistency in relation to spending time inside the nest among the individual birds. There is significant variation in the spending time inside the nest by male, female and male with female (Kruskal-Wallis H , $\chi^2_3 = 21.588$, H , $\chi^2_3 = 19.589$ and H , $\chi^2_3 = 20.179$ respectively, $P < 0.001$).

DISCUSSION

The nesting behavior of the birds varies not only with the selection of their microhabitat but also in spending their time in the nests. It varies depending on the species and also with sex. The female bird spent more time inside the nest than the male bird (Fig.2) There is significant difference within male and female birds in the spending time inside the nest (Mann-Whitney U, $Z = -20.863$, $P < 0.001$). Already several studies indicated that the female individuals of monogamy species could spend more time inside the nest because females incubate alone, males reduce recesses and increase attentiveness by bringing food for the incubating

females and supplementing their energy resources. Consequently female bird could spend more time inside nest purely for the purpose of care and possessiveness of their brood (Lack, 1940; Kendeigh, 1952; Silver *et al.*, 1985). In other words, food (or energy) limitation and nest predation interact (Martin 1992) with each other; energy limits female nest attentiveness and nest predation exacerbates this food limitation by constraining male help. Interspecific differences in the role of parents could be due to specialization of the sexes in particular activities (Breitwisch, 1989; Clutton Brock, 1991). For example, females typically play a greater role in incubation, while males often adopt the primary role in territorial defense, provide food for the incubating female (Clutton-Brock, 1991).

In the present study it was found that the male bird spent inside the nest less time than female bird. Spending time inside the nest by male, female and male with female varied significantly (Kruskal-Wallis H , $\chi^2_3 = 21.588$, H , $\chi^2_3 = 19.589$ and H , $\chi^2_3 = 20.179$ respectively, $P < 0.001$). Intraspecific studies showed that the female spending time inside the nest increased attentiveness (von Haartman, 1958; Lyon and Montgomerie, 1985; Lifeld and Slagsvold, 1986; Halupka, 1994). This might be due to the fact that the male birds protect their nest and play a role in food acquisition. Males also have to secure paternity, foraging for themselves or their mates, territorial defense and nest defense (Werschkul, 1982; Westneat, 1994). Male birds also provide female with her daily energy intake, and assist to her nest attentiveness (Martin and Ghaleb 1999; Tewksbury *et al.*, 2002). Besides male birds guard the nest (e.g., Gray Catbird, *Dumetella carolinensis*; Slack 1976), or the female, feed incubating females in both particularly cavity-nesting birds and also open-nesting birds (Lyon and Montgomerie 1987).

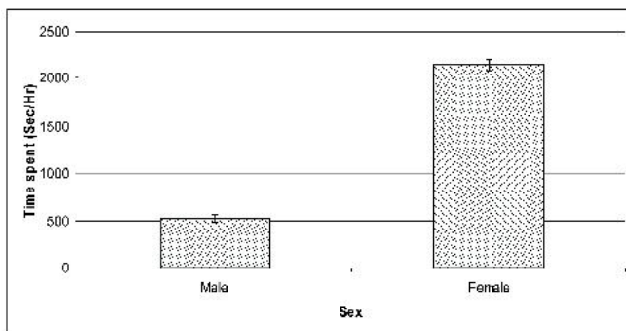
In many species the male birds spend less time inside the nest than the female birds (Lack, 1940; Kendeigh, 1952). In hornbills, some raptors and some songbirds the incubating female is completely dependent on incubation feeding (Kendeigh, 1952; Poulsen, 1970; Verbeek, 1972). However, in the majority of species males provide only a certain part of the daily food intake of incubating female (Davies, 1977). Male investment in activities such as nest building or territory defense enables females to re-allocate potentially considerable energetic expenditures into other nesting activities (Margalida and Bertran, 2000, 2005).

The presence of female birds always increased the reproductive success, while male removal had usually little or no deleterious effects on the number of offspring produced. This fact also suggests that male parental care is less important in precocial birds with self-feeding young than in altricial species, because in altricial birds the absence of males usually reduced the number or

Table. 1. Male and female birds (*Psittacula krameri*) spent time inside and outside nests, recorded in the study area during November 2012 to July 2013. (Values are Mean seconds \pm SE; N =720)

Nest	Female alone Inside nest (N=144)	Male alone Inside nest (N=144)	Male and Female inside nest (N=144)	Male inside nest total (N=144)	Female inside nest total (N=144)	P Value One way ANOVA
1	1256.6 \pm 107.70	291.1 \pm 42.54	603.7 \pm 87.54	872.5 \pm 110.01	1860.4 \pm 125.26	<0.001
2	1802.9 \pm 120.50	278.9 \pm 43.63	352.5 \pm 59.09	610.0 \pm 92.43	2155.4 \pm 127.65	<0.001
3	2261.2 \pm 114.07	174.6 \pm 31.44	190.0 \pm 40.32	351.2 \pm 64.48	2451.2 \pm 115.32	<0.001
4	2240.0 \pm 121.65	148.9 \pm 32.44	203.7 \pm 50.52	341.2 \pm 72.53	2443.7 \pm 121.73	<0.001
5	1522.5 \pm 123.79	200.4 \pm 37.36	253.7 \pm 52.45	438.7 \pm 77.72	1776.2 \pm 130.96	<0.001
Over all	1816.6 \pm 121.88	218.8 \pm 16.99	320.7 \pm 27.42	522.7 \pm 8.62	2137.4 \pm 56.43	<0.001

Fig. 1. Male and female birds (*Psittacula krameri*) spent time (seconds/hour) inside nest recorded in the study area during November 2012 to July 2013. (N =720)



condition of offspring (Wolf *et al.*, 1988). The fact that male removal did not result in total reproductive failure in many species indicates that factors other than the advantages of biparental care should often play a role in the maintenance of monogamy.

Conclusion

Intersexual and intrasexual variations occurred in the spending time inside and outside the nest of the Indian Rose-ringed Parakeet (*Psittacula krameri*) during their breeding season. The female birds spent more time inside the nest than the male bird. In total the female spent more time inside the nest along with the male bird, which was one of the significant observations of the present study. This indicates that female bird always preferred the presence of male birds and care during their nesting ecology. With reference to intrasexual variations, bird's spending time inside or outside nest varied significantly based on the nature of the individual birds the nesting behaviour. Hence the nesting behaviour of birds *Psittacula krameri* showed inter and intrasexual variations.

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