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Roosting, Nesting and Breeding Behaviour of Rose-Ringed Parakeet, Psittacula Krameri (Scopoli)

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Abstract: *Roosting, nesting and breeding behaviour of rose-ringed parakeet was observed at four different locations in campus of the University of Karachi. Number, species, trunk diameter and location of dominant trees, and the number of parakeets leaving and returning to roosts at all locations were observed. Overall 103 nest cavities (average 9.92 ± 1.89 per location) were observed. Out of which 36 active nest cavities (average 2.77 ± 0.96 per location) were selected to observe breeding behaviour of the parakeets. Significant relationship was observed between the number of nests and the tree diameter. Number of eggs per nest ranged between 2 to 5 with an incubation period ranging between 19 to 25 days. Tree specie, trunk diameter, height of nest from the ground and breeding success (number of fledging chicks in nest) were observed. Fledging period of the chicks was observed to be 6 to 7 weeks. A perfect negative relationship was observed between the height and the number of nests. A negative relationship was observed between the nest height and fledging chicks.*

Keywords: *Psittacula krameri, rose-ringed parakeet, roosting, nesting and breeding behaviour.*

1. INTRODUCTION

The rose-ringed parakeet, *Psittacula krameri*, is native to a broad band of sub-Saharan Africa and from India to Indo-China (Farsaw, 1973). It is found throughout Pakistan and India (Ali and Ripley, 1987). It has been introduced in a variety of areas around the world with varying degree of success (Long, 1991; Morgan, 1993; Pithon & Dytham, 2001, 2002). Alexander the Great brought the first rose-ringed parakeet to Europe after seeing it on his travels through India, which was probably the first parakeet to be kept by man (Vriends, 1985).

The rose-ringed parakeet is a highly adaptable species and common in different habitats from deciduous woodland to arid scrubs and even in areas of dense human population. It is equally versatile in its feeding habits, eating fruits, berries, flowers, nectar, seeds and grains (Farsaw, 1989).

The rose-ringed parakeet is one of the favourite cage-birds, principally due to its ability to parrot and mimic (Hassan, 2001). However, in an agro-eco-system, it is considered an agricultural pest. It is abundant and a serious agricultural pest particularly where citrus fruits, sunflower and maize are important cash crops (Roberts, 1991). Many researchers worked on pestilence and food habit of the rose-ringed parakeet: Ramzan & Toor (1973), Bashir (1978, 1981), Khan & Ahmed (1983), Khan & Wadood (1984), Shafi *et al* (1986), Khan & Hussain (1990), Subramanya (1994), Bidari & Kotikal (1996), Khan (1998, 2000, 2001).

Knowledge about the roosting, nesting and breeding behaviours of any avian pest specie helps in its effective management. Some early studies regarding roosting, foraging and breeding aspects of the rose-ringed parakeet were carried out in the central Punjab (Sarwar, 1987; Beg *et al*, 1988; Brooks *et al*, 1988; Iqbal, 1998; Khan, 2002). However, no significant study has been carried out on this subject in the province of Sindh. This paper reports the roosting, nesting and breeding behaviour of rose-ringed parakeet in the campus of the University of Karachi. The university campus has a very complex and rich flora of tall and old trees, which serve as communal roost and nesting sites for the

rose-ringed parakeet. The preliminary findings of this study may be useful in effective parakeet management for agriculturists and may also be of interest for the lovers of nature and wild-life.

2. Materials and Methods

A year-round study on roosting, nesting and breeding behaviour of the rose-ringed parakeet was undertaken in the campus of the University of Karachi. Four locations were deterministically selected for the study, namely, nursery, teaching departments, residential area and girls' hostel. Old, dense and tall trees provide roosting sites and nesting cavities to the parakeets at these locations. Observations were made during the entire study period. However, surveys for search of the active nest cavities were conducted during the breeding season (from December 2015 to June 2016). The survey was conducted by a team of eight person Composition, location, species and diameter of the trees at shoulder height (TDSH) bearing the nest cavities were recorded. In addition, Nests height was also noted. The morning and evening counting of the parakeets leaving and returning to the roosts was recorded. The observations were made on aiternate days in a week, from dawn to noon and from noon to dusk. Study areas were visited randomly throughout the study period to record activities of the breeding pairs. Observations regarding parakeet activities were conducted from suitable distance to avoid any disturbance to the parakeets. Field binoculars were used where necessary.

3. Result and Discussion

All four locations (nursery, teaching departments, residential area and girls' hostel) selected for the study were densely populated with old and tall trees of various species. A total of 2,350 trees were counted at these locations. As shown in Table 1, 1,553 trees (mean 388.25 ± 161.80/ location) had TDSH <50", 679 trees (169.75 ± 62.16/ location) had TDSH 50-100" and 118 tress (29.50 ± 7.88/ location) had TDSH >100".

Table1. *Dominant Trees Used for Communal Roosts by Parakeets in the Study Areas*

Dominant Trees	**Tree Location**	**Tree Diameter at Shoulder Height TDSH** *(in inches)*		
		<50	**50-100**	**>100**
Acacia nilotica (Babul or Kikar; Acacia Arabica), *Adenanthera pavonina* (Ratan Gung; Coral Wood), *Albizzia lebbek* (Siras; Lebbek Tree), *Azadirichta indica* (Neem; Neem), *Cassia fistula* (Amaltas; Laburnum), *Cocos nucifera* (Narial; Coconut Plus), *Cordia gharaf* (Gundni; Cordia), *Cordia myxa* (Lasoora; Cordia), *Delonix regia* (Gul Mohar; Sunset Tree), *Eucalyptus* (Safaida; Eucalyptus), *Eugenia jambolana* (Jaman; Eugenia), *Ficus benghalensis* (Bergad or Bar; Banyan), *Ficus glomerata* (Gular; Ficus), *Ficus religiosa* (Peepal; Ficus), *Guaiacum officinale* (Lignum; Lignum vitae), *Mangifera indica* (Aam; Mango), *Manilkara hexandra* (Kherni; Mimusops), *Manilkara zapota* (Chikoo; Sapodilla Plum), *Phoenix dactylifera* (Khajoor; Date Palm), *Roystonea regia* (Palm; Royal Palm), *Tamarindus indica* (Imli; Tamarind), *Terminalia catappa* (Badam; Indian Almond), *Thespesia populnea* (Paras Peepal; Bhendi Tree) and *Zizyphus jujuba* (Ber; Zizyphus)	Nursery Area	175	55	9
	Teaching Departments	830	334	45
	Residential Area	428	195	26
	Girls Hostel Area	120	95	38
Total Number of Trees at All Four Locations		1553	679	118
Mean ± SE		388.25 ± 161.80	169.75 ± 62.16	29.50 ± 7.88

The number of parakeets leaving from and returning to roosts at all locations was counted (Table 2). It was observed that the number of parakeets returning to the roosts increased usually, which may be due to the reason that during diurnal foraging for search of food, nest or roost, other parakeets of adjacent areas joined the returning flock. Communication among parakeets appeared to be well

developed. Parakeets foraged in small flocks of four to six birds. During their activities they omitted calls and joined each other using audio-visual communication. In some cases, the returning number of parakeets was observed to be lesser than the leaving number of parakeets. It appeared that some parakeets found other opportunities or new companions. These findings corroborate with those of Brooks & Hussain (1990) and Khan (2000).

Table2. *Parakeets Leaving from and Returning to their Communal Roosts*

Month	**Leaving** (Mean ± SE)	**Returning** (Mean ± SE)
Jan	98 ± 1.08	123 ± 2.20
Feb	125 ± 2.24	144 ± 1.60
Mar	297 ± 3.80	311 ± 3.00
Apr	332 ± 1.84	304 ± 1.28
May	408 ± 2.00	475 ± 2.14
Jun	395 ± 4.09	330 ± 3.09
Jul	300 ± 2.40	341 ± 1.71
Aug	220 ± 1.88	182 ± 2.06
Sept	123 ± 1.45	98 ± 1.09
Oct	75 ± 1.24	56 ± 1.52
Nov	70 ± 1.68	73 ± 1.01
Dec	59 ± 0.98	42 ± 0.28

Nesting behaviour of parakeets was observed at all locations. Species and diameter of the trees bearing nest cavities was recorded (Table 3). Table 4 depicts the frequency distribution of the number of nests in relation to tree diameter. Overall 103 nest cavities were found in the study area: 77 in trees having TDSH <50", 22 in trees having TDSH 50-100" and 4 in trees having TDSH >100". Four categories of tree diameter were established while 3 categories of the number of nests were made to make an R × C contingency table 4. The chi-square was calculated and found chi-square = 28.52 with 6 df and was found significant ($p \leq 0.001$) ($G = 23.97$). This shows a positive association between tree diameter and number of nests. Regression analysis revealed significant relationship between the number of nests and the tree diameter (Table 5). It seems that parakeets prefer young trees with TDSH <50" for their soft-wood, size or any other reason. Moreover, it may be due to the reason that some birds (such as, mynah, wood-pecker and spotted-owlet) and even squirrel compete for nesting cavities in thick trees. This conforms to the findings of Siddiqui (1993) and Inam (1992).

Table3.*Number of Nest Cavities at Different Locations in Various Tree Species*

Name of Specie Scientific Local English	**Location of Trees/Nest Cavities**				**Nest Cavities**		**Tree Diameter (TDSH)** *in inches*		
	Nursery Area	**Teaching Deptts.**	**Resid'l Area**	**Girls Hostel Area**	**Total**	**Active**	**<50**	**50-100**	**>100**
Albizzia lebbek Siras Lebbek Tree	1	0	1	0	2	0	1	1	0
Azadirichta indica Neem Neem	2	5	6	0	13	8	6	7	0
Cassia fistula Amaltas Laburnum	3	7	4	1	15	5	7	8	0
Delonix regia Gul Mohar Sunset Tree	7	11	5	2	25	11	21	4	0
Eucalyptus specie Safaida Eucalyptus	0	2	0	0	2	0	2	0	0
Eugenia jambolana Jaman Eugenia	2	0	8	0	10	4	10	0	0

Ficus benghalensis Bergad or Bar Banyan	1	0	0	3	4	0	0	0	4
Ficus glomerata Gular Ficus	0	0	2	1	3	0	1	1	0
Ficus religiosa Peepal Ficus	0	1	0	0	1	0	1	0	0
Mangifera indica Aam Mango	1	0	7	1	9	2	9	0	0
Tamarindus indica Imli Tamarind	0	2	1	0	3	1	3	0	0
Terminalia catappa Wild almond Indian Almond	0	4	2	0	6	2	6	0	0
Zizyphus jujuba Ber Jujube	2	4	3	1	10	3	9	1	0
Total	19	36	39	9	103	36	76	22	4
Mean ± SE	1.46 ± 0.5385	2.77 ± 0.9348	3.00 ± 0.7679	0.69 ± 0.2627	7.92 ± 1.8996	2.77 ± 0.9618	5.85 ± 1.5926	1.69 ± 0.7794	0.31 ± 0.3077

Table4. *Frequency of Nest Distribution in Relation to Tree Diameter*

Tree Diameter (in inches)	**No. of Nests**	**Tree Diameter** (in inches)	**No. of Nests**
24	1	51	3
25	1	52	2
28	2	55	2
31	2	56	1
32	3	57	2
34	1	61	1
35	3	67	1
36	3	68	2
38	3	69	1
39	4	70	1
40	5	71	1
41	4	72	1
42	6	74	1
43	3	77	1
44	2	79	1
45	11	82	1
46	4	120	1
47	2	145	1
48	11	190	1
49	6	228	1

Table5. *Regression Analysis: Nests versus Tree Diameter*

The regression equation: nests = 3.66 - 0.0173 tree diameter

Predictor	**Coef**	**SE Coef**	**T**	**P**
Constant	3.6612	0.6689	5.47	0.000
width	-0.017304	0.008903	-1.94	0.059

S = 2.32469 R-Sq = 9.0% R-Sq(adj) = 6.6%

The rose-ringed parakeets remained nearer to the nest cavities throughout the year generally. Active search for nests started between November and December. Male played active role in selection of the

nest cavity and female (after occupying) widened it. Breeding pairs occupied nest cavities from December to January. Both partners defended the occupied nest cavities. Out of 103, thirty-six (36) active nest cavities were selected to study the breeding behaviour. It was observed that the nesting material only contained few wood chips. Egg laying was observed from February to April. The number of eggs (clutch size) ranged from 2 to 5 per nest. Eggs were pure white in colour, roundish oval in shape and measured closed to 30 mm x 20 mm in size. The incubation period observed was 19-25 days. Female generally stayed in the nest cavity before and during the incubation period. The male foraged around and allofed the female and chicks by regurgitation in nest cavities. Allofeeding and allopreening in the breeding pairs was observed throughout the breeding season, as was observed by some earlier researchers in Punjab (Sarwar, 1987; Inam, 1992; Iqbal, 1998; Khan, 2000).

Height of the active nest cavities and the number of fledging chicks therein were observed. Fledging period of chicks was observed to be six to seven weeks. The height played an important role in breeding success. The best height was three to five meters followed by five to seven meters. These findings may be justified by the fact that at lower than three to five meter height, some predators, for example, varanus and snake may eat eggs and chicks. Man can also take out chicks from the lower heights for pet trade. Whereas at height greater than five to seven meters, nests may be exposed to predator birds, rain water and sun heat. Dead chicks were observed in a nest cavity at height above seven meter, exposed to sun heat and light. With increase in height there was a significant decrease in the number of nests and fledging chicks in Table 6.

Table6. *Breeding Success with Relation to Nest Height*

Nest Height (meters)	**No. of Nests**	**Nests with Eggs**	**Nests with Hatchling Chicks**	**Nests with Fledging Chicks**
<3	11	8	13	2
3-5	10	9	8	8
5-7	9	9	2	6
7-9	6	6	7	0

Interdependence between Nest Height, Number of Nests and Nests with Fledglings

	Nest Height	***No. of Nests***	***Nests with Fledging Chicks***
Nest Height	1		
No. of Nests	r_{12} = -0.956182887	1	
Nests with Fledgling Chicks	r_{13} = -0.282842712	0.507092553	1

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