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Breeding Habitats of the Rose-Ringed Parakeet (*Psittacula krameri*) in the Cultivations of Central Punjab

HAMMAD AHMAD KHAN, MIRZA AZHAR BEG AND AKBAR ALI KHAN
Department of Zoology and Fisheries, University of Agriculture, Faisalabad

Abstract.- Six major habitats *viz*., croplands, villages, roadside forest plantations, canal side forest plantations, city road avenues and a university campus, all located in Central Punjab, of the rose-ringed parakeet (*Psittacula krameri borealis*) were surveyed during the breeding season of the parakeet in 1997 and 1998. In the croplands, from a total of 2224 trees, 64 nests (0.002 nests per tree), from 2094 trees of the road side forest plantations, 248 nests (0.118 nests per tree), from 3952 trees of the canal side forest plantations 96 (0.002 nests per tree), from 258 trees of the city road avenues 56 nests (0.217 nests per tree), and from 199 trees of the university campus 52 (0.26 nests per tree) were recorded. It was inferred that the kind of trees and their age were the important factors determining the number of parakeet nests in various habitats.

Key words: Tree cavities, nest cavities, croplands, forest plantations, rural and urban habitations.

INTRODUCTION

The rose-ringed parakeet (*Psittacula krameri borealis*) is a serious pest of agriculture. Its feeding niche is considerably wide (Khan, 2002) but it prefers feeding on orchard fruits, maize and oil-seed crops (Khan and Ahmad, 1983; Shafi *et al*., 1986; Fiedler *et al*., 1991; Chakarvorty *et al*., 1998; Gupta *et al*., 1998). In its native range in South Asia, the rose-ringed parakeet inhabits the lightly timbered areas, cultivated farmlands, urban gardens and parks (Paton *et al*., 1920). In India and Pakistan the parakeet nests largely in tree holes but in some cases suitable recess and cracks in buildings and telegraphic poles may also be used for nesting (Ali and Ripley, 1969; Sarwar *et al*., 1989; Roberts, 1991). The parakeet actively searches for the nest holes in small parties of 2 to 5 birds from December through May, and from August till October whereas copulation takes place in February through May (Sarwar *et al*., 1989). This paper gives an account of the distribution of the rose-ringed parakeet nests among six major habitats found in the Central Punjab of the Punjab of Pakistan.

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MATEIALS AND METHODS

Portions of six major habitats of the Central Punjab for the presence of parakeet nests, number of cavities, and the composition of trees in the areas sampled were surveyed during the four breeding months *viz*. February through May in 1997 and 1998. All cavities having the mouth diameter about 7 cm or more were recorded. To determine as to which of the cavities were being used by the parakeets as nests, short duration observations noting the prakeets activities around several potential nest cavities were simultaneously made. The evidence of breeding included the staying of the female inside the cavity, males bringing food for the females, and defence of the nest cavity. A team of six to eight workers was involved in this survey work.

Croplands

All trees present over an area of 1000 acres were checked for the presence of tree cavities and parakeet nests. Small groves of trees present amidst the croplands were considered a part of croplands. The sampling were done at four sites. Each being 250 acres in size.

Villages

Four villages, each measuring 25 acres in size,

were sampled. All trees growing within the limits of these villages and the tree groves present at their peripheries were checked for the requisite information.

Roadside forest plantations

Forest plantation strips among four roads *viz.* Faisalabad - Sheikhupura, Faisalabad - Okara, Faisalabad - Jhang and Faisalabad - Sargodha were sampled. From each of these roads, nine stretches of the plantation strips were randomly selected. The necessary data from the selected portions of the strips were recorded in 1997 and 1998; each year different strips were sampled.

Canal side forest plantations

For sampling canal side forest plantations, the following main irrigation canals *viz.* Gogera, Jhang, Rakh and Bhowana branches were selected. The procedure of selecting the points was same as adopted for sampling the roadside forest plantations. During the two years, 18 acres of the plantations were sampled from each of the four canals. In this way, a total of 72 acres of the canal side plantation was sampled. It may be pointed out that the rest houses present on the banks of these canals were not included although they were a part of plantations. The reason for doing so was that the tree species in the premises of the canal rest houses were generally different from that of canal side plantations.

City road avenues

In the civil lines areas of Faisalabad city, several of the roads had narrow strips of plantations on their both sides. The entire length (about 1.5 km) of the following three roads; District Council, Club, and Race course roads were sampled for the required data.

University campus

The old campus of the University of Agriculture, Faisalabad (UAF), which represented the parks and gardens, was sampled twice, once in 1997 and again in 1998. Each time, any area of 20 acres was covered. The sampling area comprised the avenues of the main road, the premises of the circuit house, ladies hostel, old dairies, ladies hospital, and student hostels.

RESULTS

Well treed university and college campuses, parks and gardens, roadside tree avenues particularly in the civil lines areas and cantonments and similar well wooded urban areas are the rose-ringed parakeet's favourable sites in the urban situations. Although the canal rest houses (CRHs) area part of the canal side forest plantations, yet they are closer to the above stated urban areas on account of vegetational similarities. If such an urban habitat happens to be close to croplands and orchards, the parakeets have an easy access to such essentials of life *viz.* Food, nests and roosts.

Croplands

The croplands were largest of all six habitats of the Central Punjab. They are canal irrigated supporting a variety of crops simultaneously almost throughout the year; wheat, sugarcane and rice being the main crops. The small land holdings of the farmers are usually demarcated from each other by trees and shrubs. Besides, it is a common practice to grow trees at the margins of the fields within their own holdings to meet their requirements for wood. Generally, the trees are pollard in the fall. *Dalbergia sissoo* and *Accacia* are the common croplands trees. In well irrigated regions, the former is common, while in the drier areas, the latter dominates. All the trees present in the 1000 acres of the cropland were checked for the presence of cavities or parakeet nests. Only *D. sissoo*, *Mangifera indica, Morus alba* and *Albizzia lebbek* were found to carry cavities in their limbs and trunks of which the last three species provided the nests too. Of a total of 64 nests, that were located in the area surveyed, 40 were present in *A. lebbek* (Table Ia).

Villages

Within the premises of the villages a variety of trees are present. Mostly, they are grown for shade. Outside the villages, but not far from these groves of trees are also present. Table Ib provides the data from the four sampled villages for this study. Only *Azadirachta indica, A. lebbek* and *Acacia* provided the parakeet nests. Most of the nests were present in the *A. lebbek* trees.

Table I.- Occurrence of tree cavities and nests of the rose-ringed parakeet in different species of trees found in the various habitats of the agroecosystem of Central Punjab.

Trees	No. trees	No. cavities	No. cavities / tree	No. nests	No. nests / tree
a) Croplands (area surveyed = 1000 acres)					
D. sissoo	1110	08	0.28	-	-
M. indica	672	184	0.27	16	0.025
M. alba	80	72	0.90	08	0.002
A. lebbek	72	128	1.78	40	0.556
Acacia	32	-	-	-	-
A. indica	10	-	-	-	-
E. cumini	24	-	-	-	-
Zizyphus	08	-	-	-	-
M. azedarach	08	-	-	-	-
F. carcica	08	-	-	-	-
Total	2224	392	0.18	64	0.029
b) Villages and the tree groves (area sampled = 100 acres)					
A. indica	458	20	0.37	04	0.007
A. lebbek	70	30	0.80	07	0.100
S. oleoides	16	07	0.44	-	-
C. obliqua	12	-	-	-	-
F. bengalensis	12	04	0.33	-	-
Acacia	08	-	-	01	0.125
D. sissoo	08	07	0.87	-	-
Zizyphus	12	07	0.58	-	-
P. spicegera	04	-	-	-	-
Total	600	75	0.13	12	0.020
c) Roadside plantation (area surveyed = 72 acres)					
Acacia	1234	912	0.74	208	0.170
D. sissoo	672	32	0.03	08	0.008
T. aphylla	124	168	0.75	32	0.140
S. oleoides	24	16	0.67	-	-
Zisyphus	24	24	1.00	-	-
P. spicegera	16	-	-	-	-
Total	2094	1152	0.55	248	0.118
d) Canal side plantation (Area surveyed = 72 acres)					
Acacia	3000	408	0.14	80	0.027
D. sissoo	826	36	0.78	-	-
P. juliflora	48	-	-	-	-
T. aphylla	22	80	3.62	16	0.500
P. spicigera	20	80	4.00	-	-
S. oleoides	12	-	-	-	-
Zizyphus	16	-	-	-	-
P. datylifera	08	-	-	-	-
Total	3952	604	0.152	96	0.024
e) City road avenues (Civil lines, Faisalabad) (Area sampled = 16 acres)					
D. sissoo	78	28	0.35	16	0.25
T. arjuna	68	70	1.02	08	0.12
S. malabarica	52	32	0.61	20	0.38
C. toona	52	100	1.92	12	0.24
F. bengalensis	04	04	1.00	-	-
F. religiosa	04	-	-	-	-
Total	258	234	0.91	56	0.217
f) University campus (area sampled = 40 acres)					
T. arjuna	40	48	1.20	12	0.30
P. roxburghii	32	52	1.61	04	0.12
J. mimosifolia	28	18	0.65	-	-
F. religiosa	28	08	0.29	-	-
E. suberosa	24	12	2.00	12	0.50
D. sisso	16	04	0.25	-	-
S. malabarica	07	32	4.57	12	1.71
A. procera	08	03	1.50	08	1.00
B. variegata	04	04	1.00	-	-
F. bengalensis	04	-	-	-	-
Pinus spp.	04	12	3.00	-	-
C. toona	04	08	2.00	04	1.00
Total	199	201	1.01	52	0.26

Roadside forest plantations

A relatively small area as compared to the area under the crops is under forest plantations. The area includes the narrow strips along highways, wider ones along main irrigation canals and the blocks of irrigated forest plantations. Table Ic provides the data on the tree species composition, and the number of tree cavities and parakeet nests present in the 72 acres of the sampled roadside plantation. Of the 248 parakeet nests, more than 83% were found in *Acacia* trees. However, when the distribution of these nests was considered on per tree basis, occurrence of nests both in the *Acacia* and *T. aphylla* were comparable (Table Ic).

Canal side forest plantations

Trees present on 72 acres of canal side forest plantations were checked for cavities and parakeet nests. Life the roadside plantations, *Acacia* and *D. sissoo* were the dominant trees in the canal side plantation sample. In spite of much higher density

of tree in this habitat, the number of nests was much smaller as compared to that of the roadside forest plantations, possibly because the trees in the sample were relatively young. The number of trees recorded in the canal side forests was very low when compared in the context with tree density (Table Id).

City road avenues

Species of trees grown along the roads of the civil lines area of the Faisalabad city an at the old campus of UAF were very different from the preceding four habitats. In these habitats, the per umber of tree cavities and the parakeet nests was much higher than in the previous habitats. The type and age of tree species in these habitats could be cited as important factors here. A total of 16 acres of the city road avenues was sampled to record 258 trees and 234 cavities. Of the 234 cavities, 56 served as parakeets nests; *Cedrella toona* being the main contributor of the nests (Table Ie).

University campus

From 40 acres of the old campus of the UAF sampled, 199 trees, 201 cavities, and 52 parakeet nests were recorded. Thirty six of these were equally shared by *Terminalia arjuna, Erythrina suberosa* and *Salmalia malabarica* (Table lf).

Tree cavity and nest density

The density of tree cavities and parakeet nests has been described in the following pages in two ways *viz*. their numbers per tree as well as per unit area. In Table II the data from the six habitats have been summarized. According to this table, the number of cavities per tree was highest at the UAF campus, closely followed by the city road avenues. The number of cavities per tree was much lower in croplands, villages and canal side vegetation. But, the number of cavities per tree in the roadside plantations was between the above two stated extremes. The same type of distribution existed with respect to the rose-ringed parakeet nests. The canal side distribution had the highest tree plantation density, but the proportion of tree cavities and parakeet nests was low in relation to the number of trees. Seemingly, this was due to the fact that most of the stands sampled from these samples were young and that *Acacia* and *D. sissoo* overwhelmingly out numbered the other trees. The tree distribution in the roadside plantations was also uneven and the two afore mentioned tree species carried larger number of tree cavities and nests here. Other tree like *T. arjuna, S. malabarica* and *C. toona* which harboured larger number of cavities and nests were also present in this habitats. At the university campus, species diversity was greater, there being 12 species in this habitat. The density of trees in the six man-made habitats varied greatly. However, the number of tree cavities in relation to the number of trees followed no particular pattern. In the canal side plantations, the tree density was very high but the density of cavities with the parakeet nests was low. In comparison to this, density of trees in the roadside plantations and city road avenues was not comparable but the density of cavities being used as the parakeet nests were not very different in these two habitats. The similar sort of disparity existed with respect to tree density, three cavities and parakeet nests in the remaining habitats *viz*. the croplands and the university campus. Possibly, the kind of trees and their age were the important factors in this connection.

DISCUSSION

The various breeding habitats of the rose-ringed parakeet in the study area were treed with *D. sissoo* and *Acacia* with varying admixtures of a number of other species. Most of the trees of these habitats are exotic to the `doabs' (the land between two rivers) of the Punjab. Before the introduction of a network of irrigation canals at the beginning of the twentieth century, the doabs were largely under the tropical thorn forest. The forest consisted of low trees *viz*. *Prosopis spicigera*, *Salvadora oleoides* and *Tamarix aphylla* which occurred in clumps with bare ground of alkaline wastes and low bushes between them. In the fall, following the monsoon rains climbing plants and grasses appeared for some months. The brushes of saltwort family *Acacia jacquemontii*, and other plants occurred on well drained sandy soils (Parker, 1924). Obviously, before the introduction of the canal system such basic essentials as the nest cavities and food of the parakeets must have been scares. The obvious conclusion is that the agroecosystem which has

Table II.- A comparison of the density of the breeding pairs of the rose-ringed parakeet in the six habitats of the agroecosystem in Central Punjab.

Habitats	Area sampled (acreage)	No. trees	No. tree cavities	No. nests	No. cavities per tree	No. trees per acre	NO. cavities per acre	No. nests per acre	No. nests per tree
Croplands	1000	2224	392	64	0.18	2.22	0.392	6.4	0.029
Villages	700	600	75	12	0.13	6.00	0.750	12.0	0.020
Roadside plantations	72	2094	1152	248	0.55	29.19	16.00	3.4	0.118
Canal side plantations	72	3952	604	96	0.15	54.89	8.389	1.3	0.024
City road avenues	16	258	234	56	0.91	16.12	14.167	3.5	0.217
University campus	40	190	201	52	1.01	4.75	5.025	1.3	0.274
Total	1300	9318	2465	528	0.26	7.17	1.90	0.41	0.057

extensively replaced the thorn forest greatly favoured the parakeets as it has done so in the case of several other birds and mammals (Taber *et al*., 1967; Roberts, 1977, 1991). Trees like *S. malabarica, E. suberosa, Albizzia, Cedrella toona, Terminalia arjuna* and *Pinus roxburghii* harboured more cavities and parakeet nests (per tree) than the other trees found in the study area. However, trees like *Acacia*, *Dalbergia* and *Mangifera indica*, by virtue of their numerical superiority, harboured most of the parakeet nests in the study area. *Albizzia, S. malabarica, T. aphylla* and *T. arjuna* in spite of being present in much lesser numbers contributed significantly towards expanding the nesting niche of the parakeet as they were seemingly more prone to the formation of cavities in their trunks and limbs. With the exception of *Acacia, M. indica* and *D. sissoo*, the above mentioned trees were generally concentrated in urban settings and canal rest houses. *Albizzia, Acacia* and *D. sissoo* which were scattered all over the croplands, and roadside and canal side plantations provided the parakeets in general and the breeding pairs in particular an easy access to the food present in the fields and the orchards. The parakeet roosts in the premises of the canal rest houses are mostly amidst the croplands. As such, besides providing with ample nests and shelter, they also lend proximity to a surfeit of nutritious food resources to the parakeet (Iqbal, 1998; Khan and Beg, 1998).

Presently, there is trend in the province of Punjab to remove old trees for varied reasons in the different habitats. Pure stands of *Eucalyptus, Salmalia* and *Populus* are reducing the existing diversity in the habitats under consideration. Even in the croplands pure stands of *Salmalia* have appeared during the past ten years. Generally, these trees are removed for commercial purposes before they get old enough to develop cavities in their hollows and trunks and limbs. This trend is adversely affecting not only the rose-ringed parakeet but also a host of other birds and animals. A variety of birds and mammals affect the agroecosystem because of its phytological heterogeneity (Roberts, 1977, 1991; Taber *et al*., 1967; Beg and Qureshi, 1972, 1980). The diversity of life in the agroecosystem, which also happens to be the largest of all the systems in Pakistan, is rich. In countries like Pakistan the agroecosystems are havens for many animals. Thoughtless tampering with the tree composition and unintelligent use of toxicants for inhibiting the pest species in the agroecosystems is not desirable. Rather, the management of such pest populations should be based on necessary basic studies.

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REFERENCES

ALI, S. AND RIPLEY, R.D., 1969. *A handbook of the birds of India and Pakistan,* vol. I. Oxford University Press, Bombay, India.

BEG, M.A. AND QURESHI, J.I., 1972. Birds and their habitats in the cultivated areas of Lyallpur District and vicinity. *Pakistan J. agric. Sci.*, **9**: 161-166.

BEG, M.A. AND QURESHI, J.I., 1980. Birds of the University Campus (Faisalabad) and their economic significance. *Pakistan J. agric. Sci*., **17**: 7-12.

CHAKARVORTY, A.K., SRIHARI, K.M., CHANDARPRASHAD, J., REDDY, P.P., KUMAR, N.K. AND VERGHESE, A., 1998. Management of bird pests in oil-palm plantations in Karnatka. *Advances in IPM for Horticultural Sciences*, pp. 183-187.

FIEDLER, L.A., FALL, M.W. BRUGGERS, R.L. AND DEGRAZIO, W., 1991. Rodent and bird problems in agriculture and their management in developing countries. *Proc. 11th International Congress, Plant Protection,* (I): October 5-9, Manila, Philippines.

GUPTA, M.K., RAJAN, R. AND BARUHA, R., 1998. Parakeet damage to sugarcane. *Indian J. Sugar*, **46**: 963-967.

IQBAL, M.T., 1998. *Roosts and roosting habits of the rose-ringed parakeet* (Psittacula krameri) *in Central Punjab*. M.Phil. thesis, Department of Zoology and Fisheries, University of Agriculture, Faisalabad, pp. 85.

KHAN, H.A., 2002. *Foraging feedings, roosting and nesting habits of the rose-ringed parakeet* (Psittacula krameri) *in the cultivation of Central Punjab, Pakistan*. Ph.D., thesis, Department of Zoology and Fisheries, University of Agriculture, Faisalabad, pp. 147.

KHAN, H.A. AND BEG, M.A., 1998. Roosts and roosting habits of the rose-ringed parakeet in Central Punjab (Pakistan). *Pakistan J. biol. Sci*., **1**: 37-38.

KHAN, A..A AND AHMAD, S., 1983. Parakeet damage to sunflower in Pakistan. *Proc. 9th Bird control seminar*, Bowling Green State University, Ohio, United States of America, pp. 191-195.

PARKER, R.N., 1924. *A forest flora of the Punjab, Hazara and Delhi*. Government Printing Press, Punjab, Lahore.

PATON, P.W.C., GRIFFIN, C.R. AND GRIFFIN, L.H., 1982. Rose-ringed parakeet nesting in Hawaii: A potential agricultural threat. *Elepaio*, **43**: 37-39.

ROBERTS, T.J., 1977. *Mammals of Pakistan*. Oxford University Press, London, England.

ROBERTS, T.J., 1991. *Birds of Pakistan*. Oxford University Press, London, England.

SARWAR, M., BEG, M.A., KHAN, A.A. AND SHAHWAR, D., 1989. Breeding behaviour and reproduction in rose-ringed parakeet. *Pakistan J. Zool*., **21**: 131-138.

SHAFI, M.M., KHAN, A.A. AND HUSSAIN, I., 1986. Parakeet damage to citrus fruit in Punjab. *J. Bomb. Nat. His. Soc*., **83**: 439-444.

TABER, R.D., SHERI, A.N. AND AHMAD, M.S., 1967. Mammals of Lyallpur District. *Mammalia*, **1**: 215-219.

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