Feeding Ecology of Rose-Ringed Parakeet *Psittacula krameri* in Polonnaruwa

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The food of Rose-ringed Parakeets has been described by numerous authors as consisting of fruits, berries, seeds, buds and flowers (Forshaw 1981, Henry 1971, Ali and Ripley 1968, Whistler 1949, Mason and Lefroy 1912, Legge 1881). Detail studies on the feeding and food, by gut analysis and observation by Mason and Lefroy (1912), Simwat and Sidhu (1973a), Toor and Ramzan (1974a, 1974b), Ramzan and Toor (1972), Sekhon (1966) and Shivanarayan (1980) have confirmed these and have also shown that they are responsible for a considerable amount of crop damage and loss too. Information of the above nature is not available for Sri Lanka. Feeding studies were done in the forests at Archaeological Reserve, Polonnaruwa, and in selected paddy fields close by.

SITE

The studies were conducted at Polonnaruwa which is in the North -West dry zone at 7^0 56' N and 81^0 00' E. The annual rainfall in the area is 1671mm while the temperature is between 25^0 and 28^0C. The investigation of the Parakeet in its 'natural' surroundings was carried out in the Polonnaruwa Archaeological Sanctuary. This was the capital city of Sri Lanka in the past, and had been abandoned and secondary forest reverted back over the entire area. Most of the 'natural' vegetation in the area has been kept intact, except for the undergrowth and shrub layers which have been removed in the immediate vicinity of the ruins. The area of intensive paddy cultivation selected for the study was approximately 8 km south of the Archaeological Reserve.

The extent which was a remote corner surrounded by forested areas was 64.56 hectares.

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Vegetation of Forest Site

The vegetation here is secondary evergreen type (Peeris 1975, Walter 1971, and Dittus 1977). The species of trees in the forest at Polonnaruwa differs somewhat from other dry zone forests in the prevalence of *Grewia polygama, Cassia fistula* and *Ixora arborea*. *Drypetes sepiara* with a relative density of 21.3% remains the most abundant species as in all other dry zone forests. The average height of the forest canopy is about 20-28 meters. The tallest trees are *Adina cordifolia* (38-40m), *Schleichera oleosa* (38-40m) and *Stereospermum personatum* (38-40m). The present study was carried out in an area dominated by *Adina* spp.

METHODS

(a) Feeding in forests

Observations on the feeding were made by a version of the strip-transect method, described by Driscoll (1977). We followed a pre-determined path through the study area, stopping for 5 minutes every 100m. The path was determined so that the entire 9 hectares of the study area was covered during the observations. Every time a Parakeet was sighted the following information was obtained and recorded:

(1) The activity of the Parakeet at the time it was first seen,
(2) The sex/age of the Parakeet, viz. whether male, female or juvenile.

Six transects, at two per ten days spread over each month were done. The six transects consisted of three in the morning between 1600-1900 hours. The transects commenced in May 1979 and continued for 12 months continuously.

(b) Feeding in Paddy Fields

A vantage point was selected along the flight path of the birds going to roost from the paddy field. The birds flying along this flight path were counted from around 1700 hours till no birds were seen flying past. Parakeets did not leave the roost along fixed paths, so it was not possible to make precise counts of the Parakeet leaving for the study area. Therefore the evening counts are assumed to be the number of birds that remained in the study area during the day, thus representing the potential number that feed on paddy in the fields.

To study the seasonal patterns of the feeding recorded, the observations were initially standardized to the number of occurrences of each activity per 100 birds seen in each transect. These transect data were then combined to provide a mean value per transect for each month. As the main objective was to detect seasonal changes in frequency of different activities, the mean values were plotted after a log conversion against each month. The log converation gives a better representation of rates of change form month to month than absolute values. The data was then subjected to an analysis of variance to determine whether the observed patterns were significantly different from random, *i.e.* were truly seasonal in character. They were tested at the 5% level.

Results and Discussion

The monthly values show considerable variation, no doubt caused by many factors related to the availability of food sources in and outside the forest, the almost silent and secretive feeding method of the Parakeets, and the difficulty in identification of the Parakeets when feeding among the foliage. Food sources were not evenly distributed in the study area, and were also not equally available through out the year. When Parakeets feed, they generally tend to be silent. (Very soft calls not audible for

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more than 10-15 feet, are made, but these were not included in the repertoire of calls or to identify feeding birds, as they were not heard during transects). Further more, feeding normally occurred in groups which could be due to the patchy food source or because Parakeets are known to move and feed in flocks (Henry 1955, 1971. Ali 1968). Hence if one bird was seen feeding, the chances of seeing more Parakeets feeding thus became higher. Thus, there are either high values, or law values, resulting in a high variability.

Feeding within the forest showed three clear peaks; in March - June, August and October - November (Fig. 1 Table 1). A number of explanations for this pattern may be suggested;

(1) on the basis of the availability of paddy in the fields,
(2) on the availability of food in the forest,
(3) on the nutritive requirements of the Parakeets, and
(4) a combination of all the above factors.

The peaks correspond very closely with the non-availability of paddy in the fields (as described previously). The major paddy cultivation seasons are October to March or early April, and late May to September. Hence during most parts of the months April and May there is generally no paddy cultivation.

The Yala season is dependent largely on rains, and less on irrigated water, hence cultivation is generally not synchronized. This results in a very irregular pattern of planting and harvesting and thus irregular availability of paddy for Parakeets. On the other hand the Maha season (October - March) is very regular, controlled largely by abundant quantities of water, which are regulated by the irrigation system. Hence planting and harvesting are regular over large areas of land, providing an abundant source of paddy for the Parakeets.

The low feeding records in January. February and September was, therefore most likely due to the availability of paddy in the fields. Similarly, as more paddy in large amounts was available at the end of the Maha season, i.e in January/February, the incidence of feeding in the forest was much less than in September. The very low value in July cannot be explained on this basis.

During the study, the Parakeets were seen to feed on buds, flowers and fruits of several species of tree, on Orchid *Vanda tessalata,* on *Cassia thora* and *Mimosa pudica* pods. Reflushing, flowering and fruiting of trees in a semi-evergreen forest occur in an irregular periodic fashion (Koelmeyer, 1960). There is however a general abundance of tender leaves during the months of January to March, flowers from March to May and June to September (Koelmeyer, 1960). The phenology of the tree species on which the Parakeets fed in the study area confirmed closely to the above generality (Table 2).

In August the Parakeets fed mostly on *Mimosa pudica, Vanda tessalata* and *Cassia thora*, and to a lesser extent on the available fruits and flowers. In April, the feeding was mainly on flowers of *Drypetes sepiara*, while in October-December the feeding was on *Ficus retusa*, *Adina cordifolis* and *Grewia polygama* fruits (Table 3). During the months of January, February, July and September when low feeding incidences were recorded, there was available in the forest considerable amounts of food on

Table 1: Mean (log 10), variance and standard error of the total number of feeding parakeets per transect per 100 birds (Anova f = 3.14 d.f. 11,60 p 0.01)

MONTH	MEAN (LOG 10)	VARIANCE	STANDARD ERROR
May	0.6434	0.2876	0.2190
June	0.4782	0.2107	0.1874
July	0.0681	0.0278	0.0681
August	0.9557	0.2863	0.2184
September	0.2123	0.1094	0.1350
October	0.6870	0.1263	0.1451
November	0.6867	0.1226	0.1430
December	0.4076	0.4350	0.2693
January	0.0988	0.0585	0.0988
February	0.0	0.0	-
March	0.2960	0.1340	0.1494
April	0.7582	0.3953	0.2567

Table 2

	Adina cordifolia b. fl. fr.	Drypetes sepiar b. fl. fr.	Ixora arborea b. fl. fr.	Crewia polygama b. fl. fr.	Sapindus emarginatus b. fl. fr.	Sterculia foetida b. fl. fr.	Holoptelea integrifolia b. fl. fr.	Vitex pinnata b. fl. fr.	Manilkara hexandra b. fl. fr.	Ficus retusa b. fl. fr.	Schleichrera oleosa b. fl. fr.	Aglia roxburghiana b. fl. fr.	Orchid Roots	Mimosa	C.thora
January	*			*	*			* *	* *			*			
February	*		*	* *	*			*	* *			*			
March	* *	*	*		*	*		*	* * *		* *	*			
April	* *	*	* *	*	*	*		*	* *	*	* *	*			
May	* * *	*	* * *	* *	* *	* * *	*	* * *	*	*	* * *	* * *	*	*	*
June	* *	* *	*	* *	* *	* * *	* *	*	*		* *	*			
July	* *	*	*	*	* * *	* * *	* * *	* *	*		*	*			
August	* *	*	*	* *	* * *	*	* * *	* *	*		*	*		*	*
September	* *	*			* *	*	*	* * *	* *	*			*		
October	* *			*		*	*	*							
November	* * *			* *		*	*	*				*		*	*
December	* *			* *		*	*	* *	* *			*		*	*

which the Parakeets fed during the other months (Table 2). Thus the feeding incidences in the forest appear to show no relationship to the abundance of food there.

But however, it has been known for a long time that the food items of birds vary from season to season. This is specially marked among the omnivorous species of birds, where the amount of insect food consumed during the spring and summer is considerably higher than the rest of the year (Berthold, 1976). This change in the diet is due to the higher nutrient requirement of the bird during various stages of the birds annual cycle *i.e.* breeding, moult, migration. Similar changes in the diet have also been shown to occur among some herbivorous birds (Moss 1968, 1969, 1972; Spids 1980; Pulliainen 1979; Jenkins, Watson & Miller 1967, 1963; Eastman & Jenkins 1970; Ydenberg & Prins 1981). These authors have shown that nutrient requirements especially Nitrogen and Phosphorous were obtained by changing the food item. Furthermore, it has been shown that the breeding success has been increased (Moss 1968, Moss, Watson, Parr & Glennie 1971). The higher feeding records of the Parakeets may be for similar nutrient requirements, as the October-November peak occurs before the commencement of the breeding season in December. This requirement would be mainly for the production of eggs, and hence would expect to see more females feeding than males. However, this does not seem to happen (Table 4).

Table 4. Number of Parakeets feeding

	OCTOBER	NOVEMBER
Males	11	18
Females	11	8

Equal sex rations have been shown for the red grouse when feeding under similar conditions (Moss 1972), where he suggests "the reason may be the very close pair bond at this season". The same reason may be operating among the Parakeets.

The higher feeding records from March to June, which occurs when there are young in the nests may be to provide high nutrient foods for the young. Collecting of high protein foods during the nesting period has been shown for many birds (Berthold 1976, Tinbergen 1981). Thus the high feeding records of two periods may be explained by the breeding requirements.

The high feeding incidences of August cannot be explained by breeding requirements, but may be

explained by moulting requirements. Smith (1972) recorded that in captivity Parakeets moulted in the months of June-August. If moulting occurs in August in the wild, (which is not known) may be then the peak feeding in August was to supplement the higher nutrient requirement. This is purely speculative and could only be confirmed by more intensive study.

However, nothing is known about the nutritive quality of the different food items consumed by the parakeets, and the specific nutritive requirements of the Parakeets. Hence the above explanation cannot be confirmed. More intensive studies on the feeding biology of the Rose-ringed Parakeet, especially with respect to the food items consumed in the forest, their seasonal abundance, nutrient content and the specific nutritive requirements need to be studied.

Preference for foods such as sunflower, sorghum, ground-nuts and maize over paddy (Simwat & Sidhu 1973b, 1974, Toor & Ramzan 1974a, Shivanarayan 1980) and the captive feeding studies, which showed a 23.8% drop in the consumption of paddy when fruits such as mango, plantains, papaw and guava were offered may raise the question as to why the Parakeet should feed on paddy at all. At Polonnaruwa none of the above mentioned crops are grown, except that mango, papaw and plantains are grown as home garden crops in very low quantities. Generally, many of these fruits are not left to ripen on the plant but are removed when they are mature and, moreover, there are too few tree to attract large feeding flocks away from the forests.

Table 3: Number of parakeets observed feeding on buds, flowers and fruits of tree species and other plants (Mimosa spp., Cassia spp., Vanda spp.)

MONTHS	BUDS	FLOWERS	FRUITS	OTHERS
January	-	-	-	3
February	-	-	-	-
March	1	-	4	4
April	2	36	3	-
May	6	6	5	2
June	6	4	-	-
July	1	-	-	-
August	3	14	16	57
September	2	-	-	3
October	5	8	15	-
November	8	-	10	9
December	-	-	12	8

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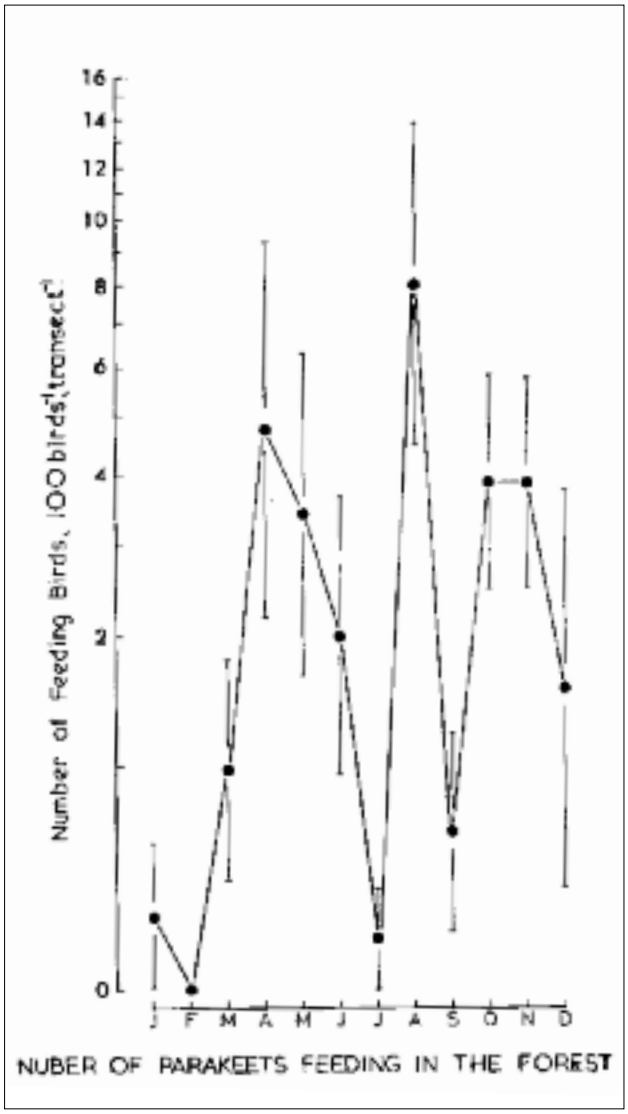

Figure 1