

FOOD AND FORAGING

Introduction

Knowledge on feeding behavior of birds has been central to the field of avian ecology (Lack 1954, Mac Arthur 1958, Robinson & Holmes 1982). According to Holmes and Recher (1986) the methods used by birds in searching food, leading up to prey capture, and the factors that influence these searching patterns important for understanding bird diets and ultimately community structure. The foraging behavior studies provide basic information on the requirements of bird species and avian communities and would help the Wild Life Managers to maintain habitats for a diverse avifauna.

The detailed information regarding the food and feeding habit of the Malabar Trogon is not available apart from the mention of Ali and Ripley (1987) that its food consists of mainly of caterpillars, beetles, grasshoppers, cicadas and other insects; also leaves and berries.

The objectives of the study were to collect information on the food of the bird, understand the foraging strata, the foraging height of male and female birds, strategies adopted for prey attack, to contrast the intra-sexual patterns in the foraging behavior, and to study the feeding associations.

Methodology

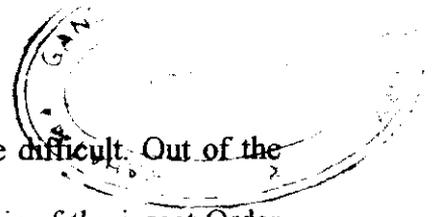
When a foraging individual was encountered, it was followed for as long as it could be kept in sight. The relatively dense foliage and high canopy of the forest made prolonged observations difficult; consequently, sometimes sequences were relatively short. All attempts to capture the prey, the substrate to which the bird was directed, maneuver used for prey capture, and the height above the ground were noted for each attack. Each food item taken by the bird was treated as one single observation. From the total number of confirmed field observations, the dietary preference was estimated. Along with the dietary observations, foraging behavior data were also collected. An analysis of the data was carried out to understand the foraging behavior and the intra-sexual differences in foraging.

A clear understanding of the dietary preferences would be possible if the gut analysis of the birds were carried out. But this procedure was not adopted for the present study.

Results and discussion

The food mainly consists of insects of Order Lepidoptera, Isoptera, Orthoptera, Coleoptera, Diptera, Hemiptera, Homoptera and Phasmida. Although prolonged observations were carried out, due to the speed of food

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handling the individual identification of food items were difficult. Out of the 1025 confirmed food items, the most favoured food item is of the insect Order Phasmida (Fig 5). Diptera and Homoptera were the least preferred insect group, which were gleaned from the leaves. Odonata insects were collected mainly from the ground level. The adult Lepidopterans not become the prey of Trogon directly; their smooth caterpillars were preferred. The Coleopterans were collected mainly from the bark and leaves. The termites and other species of the Order Isoptera were collected both from the bark and from ground. During the course of observation, no other animal matter becomes the prey of Malabar trogon.

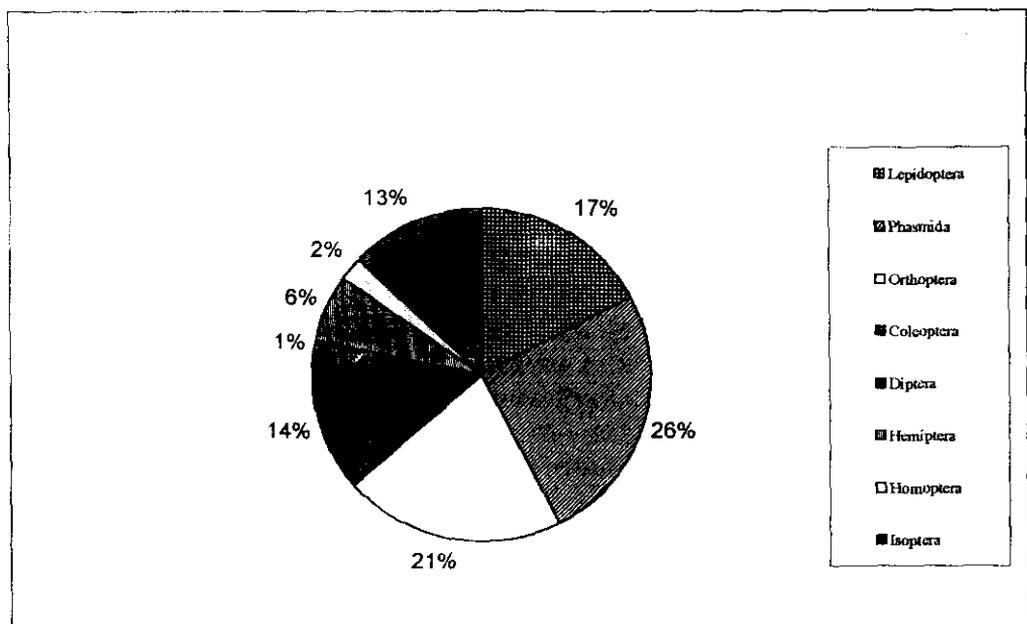


Fig. 5: Showing the percentage of each insect group consumed by the Malabar Trogon during the study period

Foraging heights

It was found that foraging heights of males ranges between 5 –10 m whereas for females it was between 3.5 – 7 m¹. The maximum height used by the bird for foraging was observed to be 19 m for both male and female. It was found that the mean foraging heights of males were always higher than the females. Seasonal differences of foraging heights were also observed for both the sexes. They preferred the under storey during the rainy season compared to the other seasons (Fig 6).

Foraging sites and strata

The feeding sites of trogons identified were trunk, twig, leaves, ground, and air. This classification was adopted based on the observations on the foraging and food capture behavior of Malabar trogon. They descent to the ground if the under growth is thick enough. Sometimes they lift dead leaves in search of prey. During the food collection from tree bark the bird clinged to the vertical branch of a tree or the tree trunk and took the prey one by one. During this process, the tail of the bird was pressed against the bark as in woodpeckers. Mostly they preferred the dead and decaying tree stump for this mode of feeding.

Prey attack methods.

Attack phase is the portion of foraging behavior from the moment when a food item or food concealing substrate is sighted to the moment when a capture attempt is made. The attack methods identified were hang, leap, sally strike, sally glide, sally stall, flush pursue, and picking.

Sally strike was a wing-powered maneuver. While this, the Trogon flew from a perch to attack a food item and then returned to the same or move to another perch. Sally glide was similar to sally strike except for the final approach at the target prey was a glide. During sally stall or hovering Trogon stall in front of the target with fluttering motions at the end of the sally. During leap, Trogons were launched in to the air to reach the food item too far for a reach but too close for a sally. This differs from sally in that the upward thrust seems to come mostly from leg movement without gliding and hovering.

Picking was adopted to pick the prey from the ground or from the tree branches. Malabar Trogon used the flush pursue maneuver deliberately to flush out the prey out from hiding places and then pursue the flying or falling prey.

¹ Confidence limit for mean foraging heights are calculated with confidence co-efficient 0.95

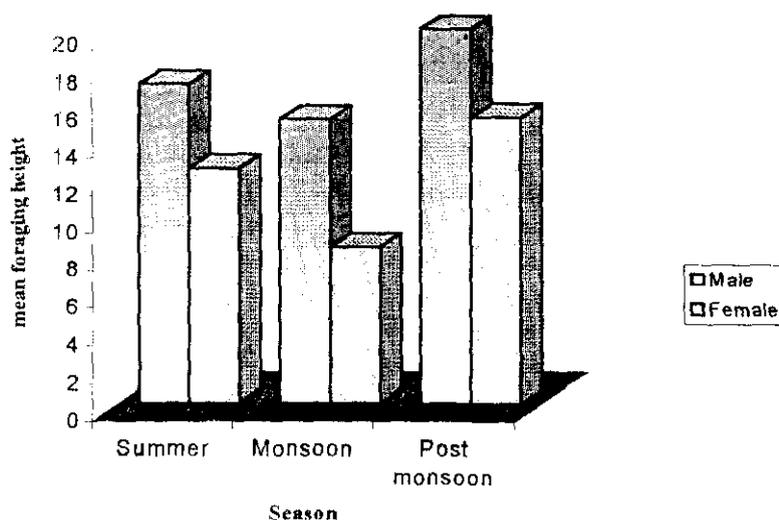


Fig. 6: Mean foraging height of Malabar Trogon in different Seasons during the study period

Four types of hang maneuvers were distinguished in Malabar Trogon. To hang Trogon used legs and toes to suspend the body below the feet to reach food that cannot be reached from any other perched position. Hang up attack method recorded 17 times during the study period. In this method, the bird hanged with its head held up. Normally small hanging branches of trees, climbers, or long slender leaves were used as a substrate for hanging up. Seven observations of hang down were recorded. During this, the male birds clinged to a small branch of a climber with its head down and searching the ground, and swinging sideways.. Hang vertical is the method used by the Malabar Trogon to capture insects clinging to the vertical trunk of trees. During this Trogon perch or cling to the vertical surface of a tree trunk with its head held upwards.

The number of occurrence of different prey attack methods of Trogons in the five different substratums were recorded during the study.. Out of the 1609 observations, 817 observations for male and 792 for female. The occurrence of different behavior on different substratum are arranged in the Table 9.

Table 9

Classification of foraging sites and occurrence of maneuvers of Malabar Trogons in different substratums

Maneuvers	Feeding sites				
	Leaf	Twig	Trunk	Ground	Air
Sally Strike	*	*	—	—	*
Sally Glide	*	*	—	—	—
Sally Stall	*	*	*	—	—
Leap	*	*	—	—	—
Flush Pursue	*	—	—	—	—
Hang	—	*	*	—	—
Picking	—	—	—	*	—

* Presents of the maneuver

The maneuvers used by Trogons in leafy substratum identified were sally strike, sally glide, sally stall, leap and flush pursue. Sally strike, sally glide, sally stall, leap and hang were the maneuvers in the twig substratum. In the trunk, sally stall and hang maneuvers were used.

Table 10

Showing the number of occurrence of different foraging maneuvers of Malabar Trogon in different substratum

Manoeuvres	Substratum									
	Leaf		Twig		Trunk		Air		Ground	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
Sally strike	294	277	226	162	-	-	19	15	-	-
Sally glide	36	46	69	57	-	-	-	-	-	-
Sally stall	54	37	36	32	18	13	-	-	-	-
Leap	16	14	12	49	-	-	-	-	-	-
Flush Pursue	13	3	-	-	-	-	-	-	-	-
Hang	-	-	4	10	15	-	-	-	-	-
Picking	-	-	-	-	-	-	-	-	5	27
Total	413	377	347	310	33	13	19	15	5	27

Picking was the only method used in the ground. Sally strike was the most common method adopted for food collection. The number of occurrence of different foraging maneuvers of both male and female Malabar Trogon in different substratum are described in Table 10.

While considering the foraging maneuvers of male trogon, out of the total observations (n=817) 51% on leaf, 42% on twig, 4% on trunk, 2% on air and 1% on ground. From the Fig 7, it is clear that Trogons used leaf as the major substratum for foraging. Twigs come second in foraging. Female trogons

collected their prey species from leaf (50.8%), twigs (41.7%), trunk (1.7%), air (2.02%). Ground usage was 3.6% of the total observations.

When we compare the attack methods of Trogon on ground it was found that females preferred more (41%) than male (1%). Female selection on trunk was less than male. Except the differences in the substrate selection, no marked difference was noticed in substrate utilization of Malabar Trogon.

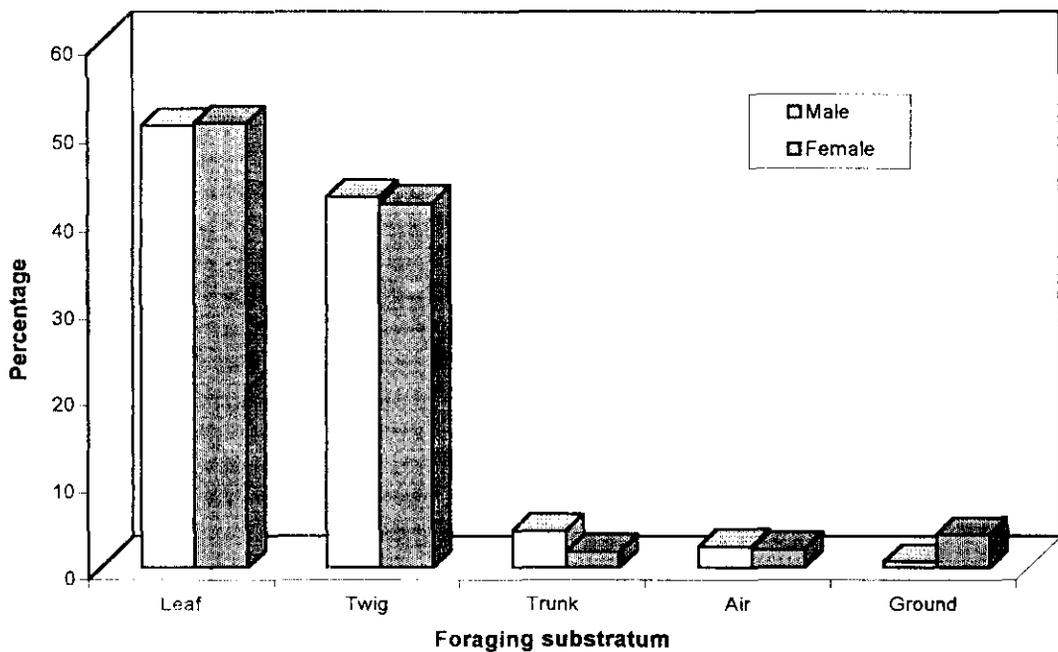


Fig. 7: Showing the percentage of occurrence of foraging maneuvers of Malabar Trogon in different substratum

Trogon showed variation in the prey attack methods utilization in different substratum. In leaves male used 71% sally strike. The least used maneuver was the flushes pursue. Sally glide, sally stall, and leap were at the rate of 9, 13% and 4%. In female Trogon the sally strike was the most used and flush pursue was the least used maneuver. The other maneuvers were at the rate of 12%, 10% and 4% respectively (Fig 8). While considering the intrasexual difference in the maneuvers on leaf, the methods were almost same for male and female. All the five methods were adopted by the two sexes.

On twig, sally strike was the most frequently used method for male and female. The least used maneuvers were hang and constituted 1% for male and 3% for female. Male and female showed remarkable difference in the occurrence of leap, 3% for males and 16% for females (Fig 9). Sexes showed significant difference in leap and sally strike compared to other types of maneuvers.

On trunk male used sally stall and hang. However, female used only sally stall. No hang method was observed for female Trogon on trunk.

On ground picking observed only five times in male and 27 times in female. The ground preference of female was greater than males. From these female birds were more preferred the ground than male. In air no notable difference in the using of maneuvers were observed.

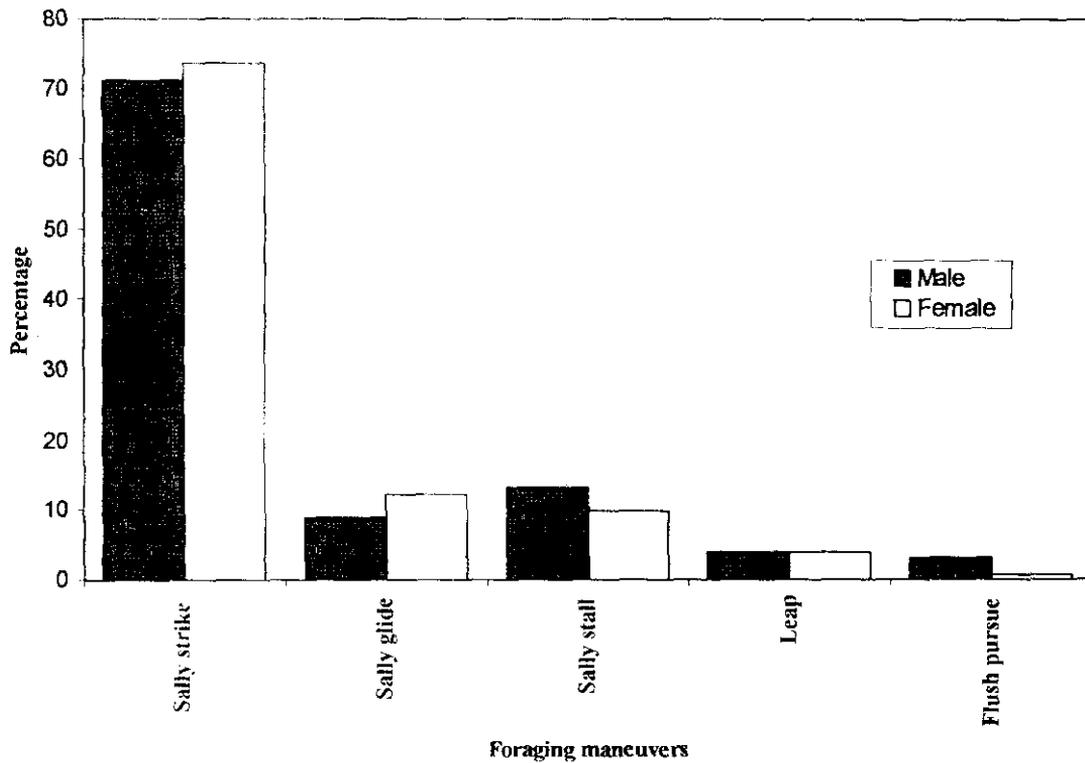


Fig. 8: Showing the percentage of foraging maneuvers of Malabar trogon on leaf

The foraging behaviour of Trogon showed considerable intra-sexual variation in resource exploitation between the sexes. Foraging studies of Franzreb (1983), Jackson (1970), Kilham (1965), Morse (1968), Williamson (1971), Morrison (1982), and on different species of arboreal birds also reported that foraging patterns of males and females were different.

Food handling techniques

Once the food is captured it may be eaten or delivered to the offspring by the bird. The way that the food is handled is significant because; 1. Food-handling time must be considered in the cost: benefit ratio of any food type 2. It is a factor in studies of adaptive morphology (Remsen and Robinson 1990).

The food handling techniques adopted by the Trogon was engulf, gulp, snap, mash, shake, and beat. The term 'engulf' referred to capture and swallow in one continuous motion, without being held by the bill. This was seen in most of the cases (n=236) while handling small insects. 'Gulp' refers to swallow upon capture without any noticeable manipulation other than being held briefly by the bill (n=17). 'Snap' was adopted while handling the caterpillars that were very long and hanging sideways when in the bill (n=28). During this, the prey was pinched momentarily, usually between tips of mandibles and usually to kill prey before further handling. 'Mash' was adopted by trogon while they feed their juveniles (n=134). During mash the prey squeezed or moved around between the mandibles before swallowing or delivered to the juvenile. This was to kill the prey or to remove undesirable portions, such as wings, legs, shells, and husk. Some times juice or pulp was squeezed out of the prey and solid portions were discarded. Birds 'shake' the food item violently to remove undesirable portions. During 'beat', the food item was beaten against the perching branch (n=19). To remove distasteful substances or undesirable

portions such as hairs or stingers the bird usually rubbed the prey on the perching branch. These various methods adopted by Trogons maximise the utilization of available food resources.

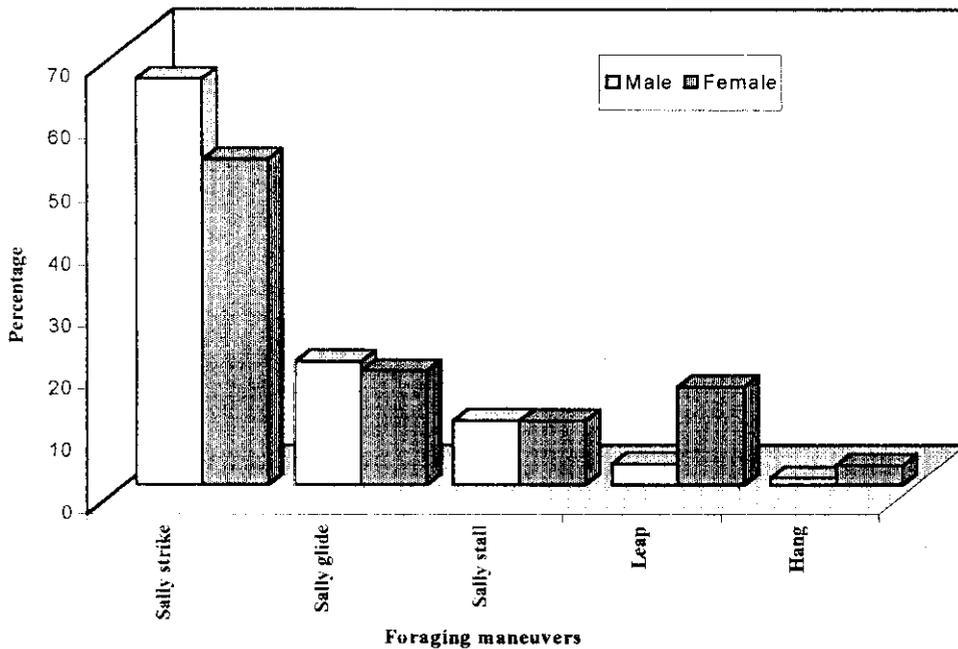


Fig.9: Showing the percentage of foraging maneuvers of Malabar Trogon in the twig substratum

Feeding associations

Trogons feed solitary in most of the time. But occasionally racket-tailed drongo was in association with the Trogon. Several occasions racket-tailed drongo tried to steal the Trogons catch but failed because Trogons have very much expertise in handling the catch and the prey was safely handled with the bill. Bronzed drongo was another member, which followed Trogon for feeding. The other birds in association with the Trogon while foraging were ashy drongo, common tree pie, fairy bluebird and white throated ground thrush. On one occasion the White throated Ground Thrush observed to be competing for food with Trogon which lead to a chase and fight. Feeding association with small mammals was evident from the presence of dusky striped squirrel while the bird was foraging (n=7). Once a male Trogon was followed by a troop of bonnet macaque at Idamalayar. During this, the macaques were in the middle storey and Trogon in the lower storey.

No other feeding associations were noticed during the study on the food and feeding habits of Malabar trogon.

Conclusion

From the observations, it was apparent that Malabar Trogon belongs to the insectivorous guild. The food mainly consists of insects of order

Lepidoptera, Isoptera, Orthoptera, Coleoptera, Diptera, Hemiptera, Homoptera and Phasmida. The most favoured food item is of the insect order Phasmida. But occasional association with racket-tailed drongo, bonnet macaque, and dusky striped squirrel were also noticed.

The foraging behavior of trogon showed some interesting features. The sexes showed seasonal variation as well as difference in foraging height. Foraging heights of males ranges between 5 –10 m whereas for females it was between 3.5 – 7 metre. the mean foraging heights of males were always higher than the females. Foraging heights for both male and female birds were found to be different for seasons, and they preferred the under storey during the rainy season compared to the other seasons.

The feeding sites of trogons identified were trunk, twig, leaves, ground, and air. The attack methods identified were hang, leap, sally strike, sally glide, sally stall, flush pursue, and picking. Trogons showed no difference between sexes in the foraging maneuvers, all the five methods were adopted by both sexes. The percentages of utilization of different foraging maneuvers in the five different substratums were found different between the two sexes.

The food handling techniques adopted by the trogon was engulf, gulp, snap, mash, shake, and beat.

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