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Time-activity Budget of White-breasted Kingfisher *Halcyon smyrnensis* in Cauvery Delta Region, Tamil Nadu, India

[1]*S. Asokan and* [2]*A. Mohamed Samsoor Ali*

[1]Post Graduate and Research Department of Zoology and Wildlife Biology,
A.V.C. College (Autonomous), Mannampandal-609 305, Mayiladuthurai, Tamil Nadu, India
[2]Department of Zoology, Owl Research Project, Saraswathi Narayanan College,
Perungudi, Madurai-625 022, Tamil Nadu, India

Abstract: Diurnal time activity budget of White-breasted Kingfisher *Halcyon smyrnensis* was studied in Cauvery delta region of Tamil Nadu, India between January 2005 and December 2006. White-breasted Kingfisher spent an average of 54% of time scanning, 23% feeding, 13% flying, 6% preening and 4% resting activities. Feeding and flying activities did not change ($P>0.05$) between years and seasons, but varied ($P<0.05$) among time blocks. Scanning and resting activities differed ($P<0.05$) between years and seasons (in 2006), but did not differ ($P>0.05$) among time blocks and habitats. Preening activities varied ($P<0.05$) between years, seasons (in 2006) and among time blocks.

Key words: Feeding · Preening · Scanning · Time spent · White-breasted kingfisher

INTRODUCTION

White-breasted Kingfisher *Halcyon smyrnensis* (Aves: Coraciiformes) is a common species of a variety of habitats, mostly open country in the plains with trees, electric wires and other perches. White-breasted Kingfisher is found in Turkey, Northern and Central Israel, Egypt, Iraq, Afghanistan and Northwestern India. Their food mainly comprised variety of agriculturally valuable insect pests [1] and also feed crustaceans [2], earthworms [3], rodents, fish and frogs [4]. However, detailed behavioural study of this species in India is almost scanty.

Time budget is a quantitative description of how animals apportion their time for feeding and other activities [5]. Patterns of daily activity and behavior can vary widely between species and these activity budgets helps us studying the life history and ecological adaptations of birds [6-8]. Time activity budgets reflect of a combination of factors including individual physical condition, food availability, social structure and environmental conditions [9]. Information on diurnal activity budget of Indian birds is scanty except very few studies [5, 10-13]. The present paper deals with diurnal time activity budget of White-breasted Kingfisher *Halcyon smyrnensis* in different time blocks, seasons, years and habitats.

MATERIALS AND METHODS

The study was conducted in two village's *viz*., Mannampandal and Thiruvalanagadu of Cauvery delta region in Nagapattinam District (18°18' N, 79°50' E), Tamil Nadu, India between 2005 and 2006. The study area is dominated by wet agricultural lands irrigated by the River Cauvery and its tributaries. Woody vegetation is sparse in the form of groves and roadside trees. The predominant wood plant species found in the study area are *Cocos nucifera, Borassus flabellifer, Madhuca indica, Mangifera indica, Enterolobium saman, Tamarindus indicus, Ficus benghalensis, Ficus religiosa, Thespesia populnea, Acacia arabica, Odina wodier* and *Azadirachta indica.* Important shrub species are *Prosopis juliflora, Jatropha glandulifera, Adhathoda vesica.* Plantations of *Casuarina equisetifolia, Tectona grandis and Bamboosa arundinacea* are also found in the study area.

Data were collected monthly twice from January 2005 to December 2006 in two habitats *viz*., agricultural lands and riverine habitat. Each day was divided into 4 time blocks: early morning (06:00-09:00), late morning (09:00-12:00), midday or afternoon (12:00-15:00) and late evening (15:00-18:00). The study season was divided in the

Corresponding Author: A. Mohamed Samsoor Ali, Department of Zoology, Owl Research Project, Saraswathi Narayanan College (Autonomous), Perungudi, Madurai-625 022, Tamil Nadu, India Email: amsamsoor@yahoo.co.in

following manner: post-monsoon (January-March), summer (April-June), pre-monsoon (July-September) and monsoon (October-December). Observations were made with 7 x 50 field binoculars and duration of activities was measured with an electronic stopwatch. Behavioural data were collected from individual birds for 15 minutes each, using focal animal sampling technique [14]. The month-wise time spent in different activities was calculated and from these values and percentage time spent for each activity during different times on the day was estimated. The activities are divided into five major categories (1) Feeding-time spent by the birds in capturing the prey and handling them into buccal chamber, (2) Flying-time spent by the birds in flight which was very often in pursuit on prey, (3) Scanning-birds perched in an upright position, scanning their surroundings actively, (4) Resting-perched birds that were sleeping or dozing, with the head retracted and eyes closed and (5) Preening-all forms of comfort movements including the feather shaking, wing flapping, bill cleaning, bill scratching, body shaking and tail shaking.

We compared each activity between years and between habitats (years, seasons and time blocks pooled), using t-tests. We used one-way analysis of variance (ANOVA) to compare each activity among time blocks (years, seasons and habitats pooled) and seasons within years. All the analysis was performed by MINITAB statistical software. We tested all comparisons at $P<0.05$. Results of the above analysis were interpreted using standard statistical procedures [15].

RESULTS AND DISCUSSION

White-breasted Kingfisher spent an average of 23% of their diurnal time feeding, which did not vary ($P>0.05$) between years and between seasons within years (Table 1). Feeding activity varied ($P<0.05$) among time blocks and was higher in the morning (22.5%) and evening (25.6%) than that midday (15.1%; Table 2). They fed most often ($P<0.05$) in agricultural lands (23.4%) than riverine habitat (Table 3).

Table 1: Mean percentage of diurnal time spent in various activities by white-breasted kingfisher in Cauvery delta region, Tamil Nadu, India

	2005					2006				
Activity	POM	SUM	PRM	MON	Overall	POM	SUM	PRM	MON	Overall
Feeding	21.3	27.1	22.6	18.9	22.4	24	28.2	20.8	20.1	23.2
Flying	11.6	14	15.6	15.3	14.1	9.3	15.5	12.6	14.3	13
Scanning	56.7	47.3	52.8	57.4	53.5*	58.6**	49.4**	52.2**	56.2**	54.1*
Resting	4.1	2.7	5.1	2.6	3.7*	4.2**	3.6**	6.3**	5.0**	4.8*
Preening	6.3	8.9	3.9	5.8	6.2*	3.9**	3.3**	8.1**	4.4**	4.9*

POM = post-monsoon; SUM = summer; PRM = pre-monsoon; MON = monsoon

*Differ ($P<0.05$) between years

**Differ ($P<0.05$) between seasons

Table 2: Mean percentage of diurnal time spent in various activities by white-breasted kingfisher in different time blocks (years, seasons and habitats pooled) in Cauvery delta region, Tamil Nadu, India

	Time blocks (hours)				
Activities	06:00-09:00	09:00-12:00	12:00-15:00	15:00-18:00	Overall
Feeding	22.5	18.3	15.1	25.6	20.4*
Flying	13.3	14.1	13.9	12.9	13.6*
Scanning	54.5	56.6	58.3	51.5	55.2
Resting	3.9	6.1	6.9	2.3	4.8
Preening	5.8	4.9	5.8	7.7	6.1*

*Differ ($P<0.05$) between time blocks

Table 3: Mean percentage of diurnal time spent in various activities by white-breasted kingfisher among habitats (years, seasons and time blocks pooled) in Cauvery delta region, Tamil Nadu, India

Activities	Agricultural lands	Riverine habitat	Overall
Feeding	23.4	20.9	22.2*
Flying	11.8	12.5	12.2*
Scanning	55.4	58.3	56.9
Resting	4.1	3.2	3.7
Preening	5.3	5.1	5.2

*Differ ($P<0.05$) between habitats

White-breasted Kingfisher had a bimodal feeding patterns one during morning (06:00-09:00 hrs) and another during evening (15:00-18:00 hrs). Other birds are known to exhibit feeding maxima early in the morning and late in the evening [5-6, 11-13, 16]. More feeding activity of white-breasted Kingfisher in the late evening may reflect their need to obtain energy for overnight energetic requirements. Seasonal feeding activity inferred that they fed more during summer and low during monsoon. In the study area, the food resources were generally abundant during summer, so they take variety of preys like insects to large crabs. Feeding activity was greater in agricultural lands, because it is dynamic habitats that are unpredictable in terms of prey abundance and availability. Less time spent in river banks may be due to less insect availability, avian predator pressure and human disturbances. However, the amount of time spent in feeding does also reflect the effect of temperature, time of day and microhabitats.

White-breasted Kingfisher spent an average of 13% of their diurnal time flying, which did not vary ($P>0.05$) between years and between seasons within years (Table 1). Flying activity varied ($P<0.05$) among time blocks of a day and is always peaked 09:00-12:00 hours (Table 2). Flying activity differ between habitats and usually was greatest ($P<0.05$) in agricultural lands (Table 3). In general the peaks in flying were similar to the peaks in feeding in all time blocks, season and habitats.

Overall, white-breasted Kingfisher spent 54% of their diurnal time scanning, which varied ($P<0.05$) between years (53.5% in 2005 and 54.1% in 2006). In 2005, scanning activity was similar ($P>0.05$) between seasons, but they spent more time ($P<0.05$) during post-monsoon than other seasons in 2006 (Table 1). Scanning was similar ($P>0.05$) among the time blocks, but in general they allocated more time at midday than other time blocks (Table 2). Time spent scanning was similar ($P>0.05$) in both habitats (Table 3).

White-breasted Kingfisher is a 'sit-and-wait' predator, so they spent majority of day time to searching the prey. Earlier, many investigators have been reported that scanning as a major diurnal activity in predatory birds [10, 13, 17-18]. Among seasons, scanning activity was greater in monsoon and post-monsoon and lower in summer. During monsoon the study area was generally wet condition due to northeast monsoon rainfall and they greatly affected by prey species distribution. In post-monsoon also, due to colt temperatures, it could be expected that birds devote more time to scanning, while the reverse is true during summer. Differentiation of higher and lower amount of time spent to scanning within time blocks and habitats by white-breasted kingfisher was directly correlated with availability of prey.

White-breasted Kingfisher spent 4% of their diurnal time in resting activity. This activity was lower ($P<0.05$) in 2005 than in 2006. In 2005, time allocated to this activity did not change ($P>0.05$) between seasons. In 2006, white-breasted kingfisher spent less time ($P<0.05$) resting activity during the summer than other seasons (Table 1). They were equally rested ($P>0.05$) at all times of day (Table 3) and in both habitats (Table 3).

Earlier, many researchers found that resting to be a major midday activity of birds [18, 19-22]. Tamisier [23] suggested that an increase in resting in midday as a mechanism to minimize the heat load on a bird at high environmental temperatures. Sleeping was the major diurnal resting activity for white-breasted kingfisher and generally rested on dense shaded trees and electric power lines.

White-breasted Kingfisher averaged 6% of diurnal time in preening activities. These activities were higher ($P<0.05$) in 2005 than in 2006. In 2005, time allocated to these activities did not change ($P>0.05$) between seasons; in 2006, they spent more time ($P<0.05$) during pre-monsoon than other seasons (Table 1). Preening activities varied ($P<0.05$) among time blocks of day and it always peaked at midday (Table 2). Preening activities were occurred similarly ($P>0.05$) in both habitats (Table 3).

The wings, breast and back were body parts most often preened by white-breasted Kingfisher, followed by the tail, neck, rump and feet. The most frequent comfort activities were bill scratching, feather shaking and wing flapping. Time spent to this kind of body maintenance activities were recorded in several bird species [5, 11, 18, 24-26].

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