

Diurnal Patterns of Daily Activities Frequencies of White-Faced Whistling Duck (*Dendrocygna Viduata*) in an Open Dam in Osogbo, Osun State, Nigeria

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Abstract

A non-invasive study on *Dendrocygna Viduata* was carried out at a selected water body in Osogbo, Osun State, Nigeria to investigate daily, monthly and seasonal patterns in key diurnal activities frequencies to quantify diurnal activity budgets, visibility, and habitat preference. Observations of species activities were evaluated, during morning and afternoon, and twenty six (26) species of *Dendrocygna Viduata* was recorded.

Focal animal sampling method was used to select one individual at a time for observation and collection of activity data. Overlapping in collection of data was avoided carefully. Eight key diurnal activities of White-faced Whistling Duck were selected for the study.

Normality test for all response variables was conducted using Shapiro-Wilk test for normality, and results was considered significant at 5% level. There was no significant difference in the mean frequency between the different activities, such as flying, resting, bathing and preening. There was a significant difference between the species activities and season and month. During the wet season, the highest mean frequency of activities was observed in April, while in the dry season the highest mean frequency of activities was observed in December. Although, the mean frequency of activities was slightly higher in the afternoon than morning, but it was not significant and does not determine the frequency of activities employed by the White-faced whistling duck. More research is needed to assess this species in early morning or late evening to achieve greatest accuracy and time-efficiency, creating desirable habitat in the vicinity by modifying the dam to encourage aquatic plant development.

Keywords: Species; Water body; White-faced whistling duck; Frequency and sampling method

Introduction

White-faced Whistling Duck (*Dendrocygna viduata*) are considered as important members of ecosystems and indicators of freshwater community health, presence of this bird species in an area confirms the standard of the water. So, detail information on activities of White-faced Whistling Duck would be supportive to understand the behavior and movements of this individual bird species across its habitats, as well as to recognize the fitness of water bodies and ecosystems within the territory of this species. Bird's activity study is significant in understanding its life history, physical condition, food availability, social structure, as well as ecological condition [1].

White-faced Whistling Duck (*Dendrocygna viduata*) is a water bird under family Anatidae (Order: Anseriiformes) and found world-wide. The present investigation of this species was focused to study the pattern of its diurnal activities in an urban site of Osogbo, Osun State. The major objectives were to measure frequency of each key diurnal activity per day in different months and to analyze monthly and seasonal variation by means of activity frequencies. Daily activity patterns in passerine birds are mostly influenced by food availability

and predator activity. However, also modified according to environmental conditions and type of habitat [2-4]. A global concern nowadays is to birds and other wildlife species often adjust to urban ecosystems behaviourally. For example, through changes in foraging behavior, dietary habits, and temporal activity patterns. So, this study was also intended to understand the typical urban factors as well as other apparent aspects behind any variability in patterns of daily activity frequency of White-faced Whistling Duck during observation period [5-7].

Materials and Methodology

The study was conducted, at Osogbo, Osun State, Nigeria from March 2016 to April 2017. The water body was a small size, comprising in close proximity. The GPS position of this study was Lat 7°38'11''N-Long 04°23'115''E.

The study area was surrounded in the by a highway road and major residential and commercial area. Few typical urban factors like high traffic noise of both vehicle and rail and increased human presence were noticeable as the day time increased during the field observation (Figure 1).

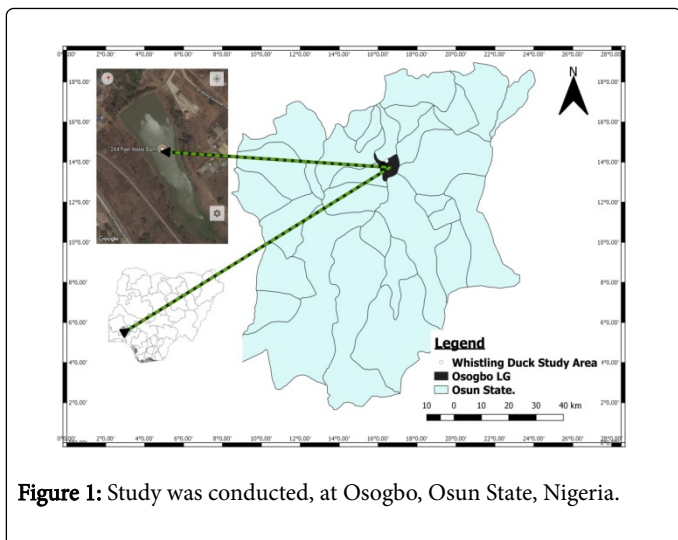


Figure 1: Study was conducted, at Osogbo, Osun State, Nigeria.

The number of total individuals of White-faced Whistling Duck species in this area was only about 26. The area was found suitable for this study as this bird species was easily traceable due to the nearby presence of healthy water bodies. A total of 32 days (4 days in each of 8 months) and 384 hours (12 hours in each day) were spent in the field. Selection of days was made as one day in every week of each month.

Total day hours of each field day were divided into two periods and allocated as morning (600 h to 1200 h) and afternoon (1201 h to 1800 h). Typical field work was started at 06h00 and carried out on a selected point from morning till afternoon. Ad libitum Sampling' Altmann J (1973) was used during data collection. Following Ad Libitum method of continuous monitoring, as much information as possible about its each activity was recorded until the bird becomes invisible from eyesight. Each sampling period was designed as continuous two hours observation time with 15 minutes break in between. During field observation, most of the time, groups of more than three White-faced Whistling Duck were available for data collection, the focal animal sampling method was used to select one individual at a time for observation and collection of activity data. Any overlapping in the collection of data was avoided carefully.

Eight key diurnal activities of White-faced Whistling Duck were selected for this study and characterized as following:

Scanning: perching in an upright position waiting and searching for prey;

Diving: performed for feeding and bathing purpose, plunging into the water from a height, either from a perch or a hovering position,

Feeding: one full feeding included catching, killing and swallowing a prey whole;

Flying: very swift flying adjacent to water level to change perching position, flying to another nearby feeding territory and hovering,

Preening: bill cleaning, scratching most often after bathing, diving, and feeding,

Calling: loud, continuous calls while sitting and flying,

Resting: sitting like drowsy for a long period of time without any other body movement,

Local movement: flying away from one water body to another nearby water body in search of food and again returning to the previous one after some time.

Some other activities were also found, however have not been considered for the current study, for example, bathing, fighting. Two seasons during this data collection period were considered as Dry season (November to February), and Wet season (April to July).

Statistical analysis

Data were entered into Microsoft office Excel 2013 and imported into R statistical software, version 3.4.1 (R Core Team, 2014), where all analyses were performed. Normality test for all response variables in the data was conducted using Shapiro-Wilk test for normality and frequency distribution using the histogram of the residuals. The mean frequency of activities per week was the response variable, while the explanatory variables were activities, time of day, season and month.

General Linear Model (GLM) was used to test for the means and standard errors of all the variables and thus presented in bar charts. The model used was:

$$\text{Mean frequency of activities per week} =$$

$$\alpha + \beta_2(\text{Activities}) + \beta_3(\text{Season}) + \beta_4(\text{Month}) + \beta_5(\text{TimeofDay}) + \text{Activities} * \text{Season} + \text{Activities} * \text{Month} + \text{Season} * \text{Month} + \text{Activities} * \text{Season} * \text{Month}$$

The best model was selected using the lowest Akaike's Information Criterion (AIC).

Results

Differences in the mean frequency between the different activities

There was no significant difference in the mean frequency between the different activities (Table 1). However, mean frequency was slightly higher in the local movement, flying, resting, bathing and preening respectively (Table 1, Figure 2). The three-way interaction between activities, season and month was highly significant.

Parameters	Marginal means±SE	F	P
Activities		1.61	0.14
Bathing	2.53±0.04		
Calling	2.45±0.04		
Feeding	2.49±0.04		
Flying	2.56±0.04		
Local Movement	2.63±0.05		
Preening	2.51±0.05		
Resting	2.53±0.04		
Seasons		0.07	0.41
Dry	2.52±0.02		
Wet	2.53±0.02		
Months		6.44	<0.001

November	2.52±0.05		
December	2.56±0.04		
January	2.42±0.05		
February	2.52±0.05		
April	2.77±0.05		
May	2.42±0.05		
June	2.46±0.05		
July	2.48±0.04		
Time of Day		<0.001	0.99
Morning	2.52±0.02		
Afternoon	2.53±0.02		
Activities*Season		2.85	0.009
Activities*Month		2.25	0.002
Season*Month		7.34	<0.001
Activities*Season*Month		2.60	<0.001

Table 1: Differences in the mean frequency of activities per week across different activities, seasons, time of day and month.

between activities and seasons; seasons and months were highly significant (Table 1, Figures 3, 4 and 5).

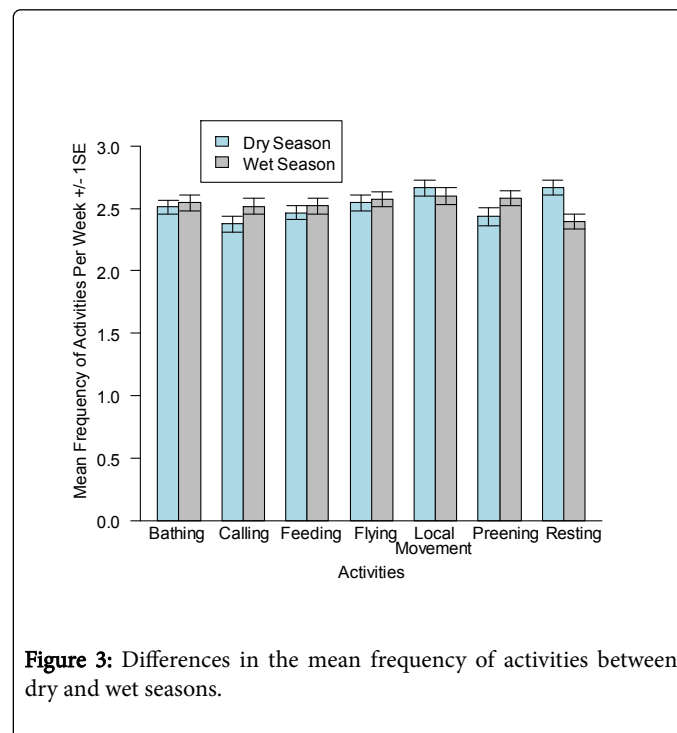


Figure 3: Differences in the mean frequency of activities between dry and wet seasons.

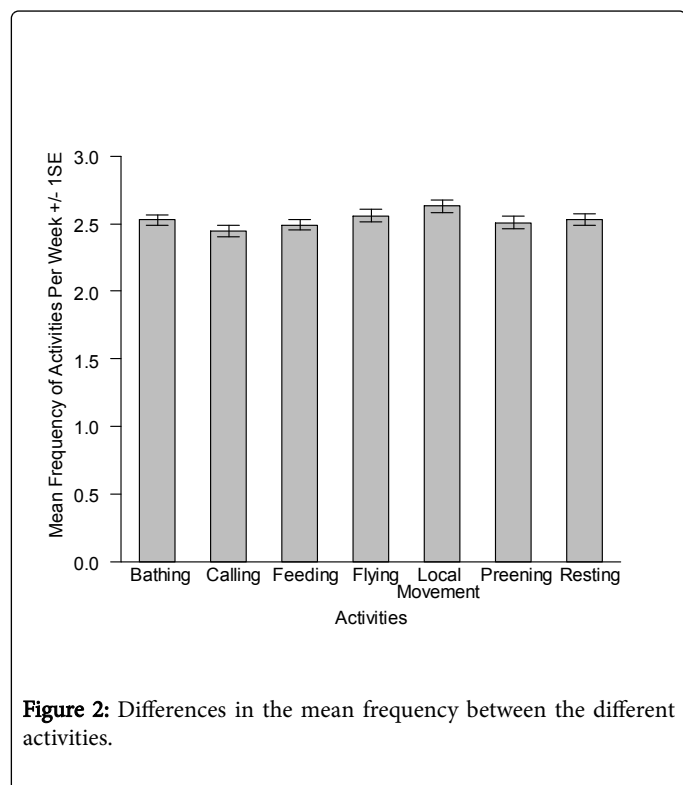


Figure 2: Differences in the mean frequency between the different activities.

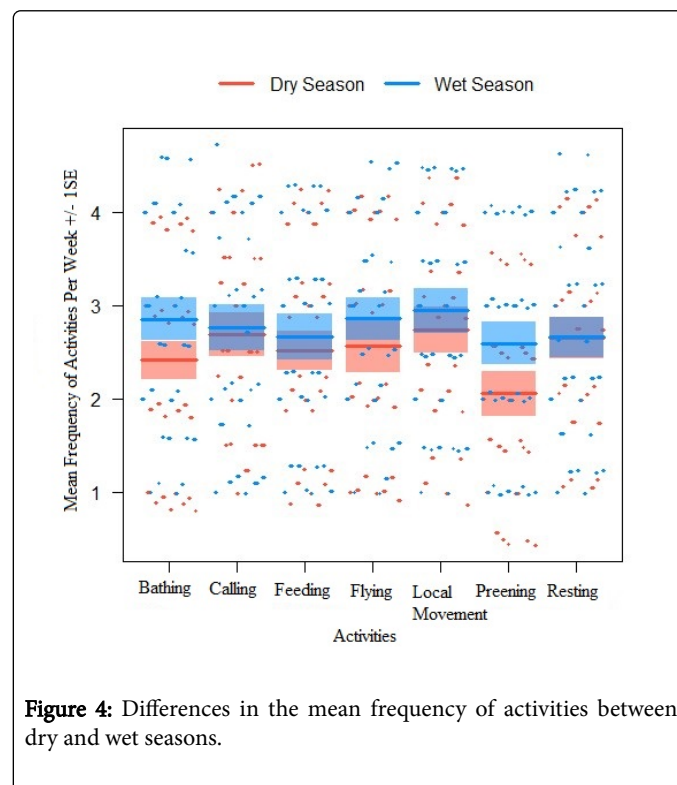


Figure 4: Differences in the mean frequency of activities between dry and wet seasons.

Differences in the mean frequency of activities between dry and wet seasons

Although, there was no significant difference in the mean frequency of activities between dry and wet seasons (Table 1). The interactions

Differences in the mean frequency of activities between months

There was significant difference in the mean frequency of activities between the eight months in which the study was carried out (Table 1). In the wet season, the highest mean frequency of activities was observed in April (Table 1 and Figure 6) while in the dry season, the highest mean frequency of activities was observed in December (Table 1 and Figure 6). The interactions between activities and months was also significant (Table 1).

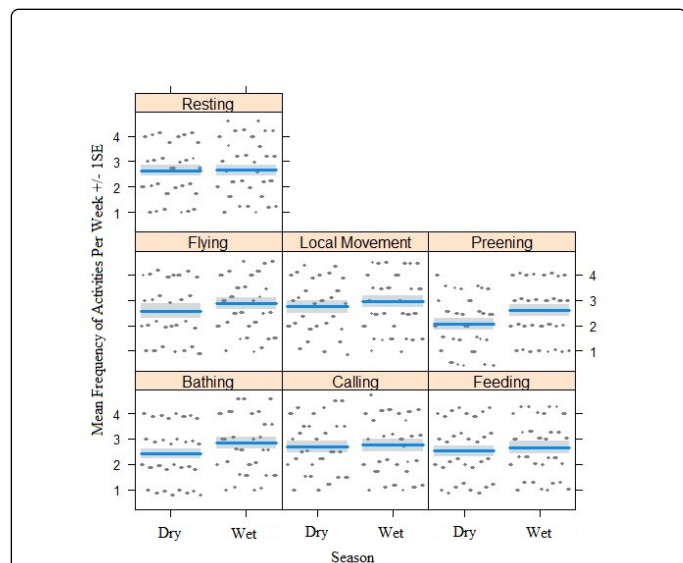


Figure 5: Differences in the mean frequency of activities between dry and wet seasons.

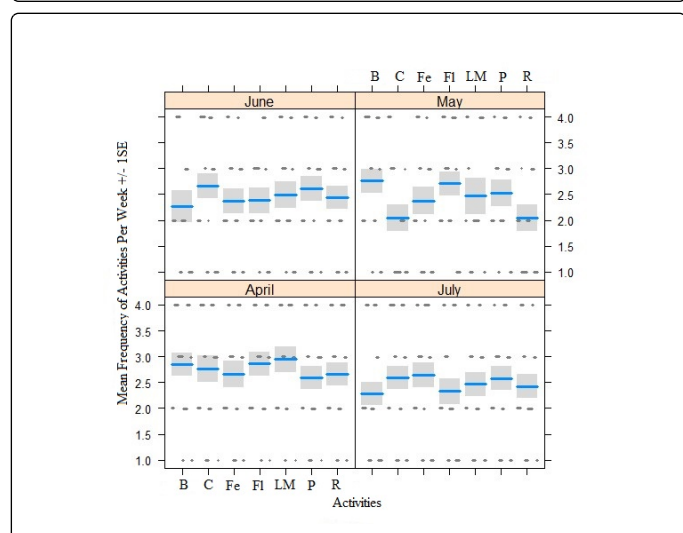


Figure 6: Differences in the mean frequency of activities between months in the wet season. Note: B=Bathing, C=Calling, Fe=Feeding, Fl=Flying, LM=Local Movement, P=Preening, R=Resting.

Differences in the mean frequency of activities between morning and afternoon

There was no significant difference in the mean frequency of activities between morning and afternoon (Table 1). Time of day does not determine the frequency of activities employed by the White-faced whistling duck. However, the mean frequency of activities was slightly higher in the afternoon than the morning (Table 1 and Figure 7).

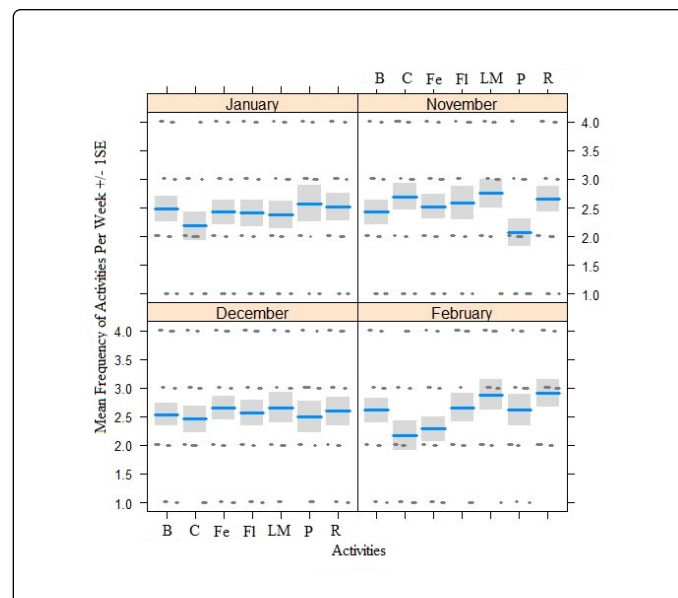


Figure 7: Differences in the mean frequency of activities between months in the wet season.

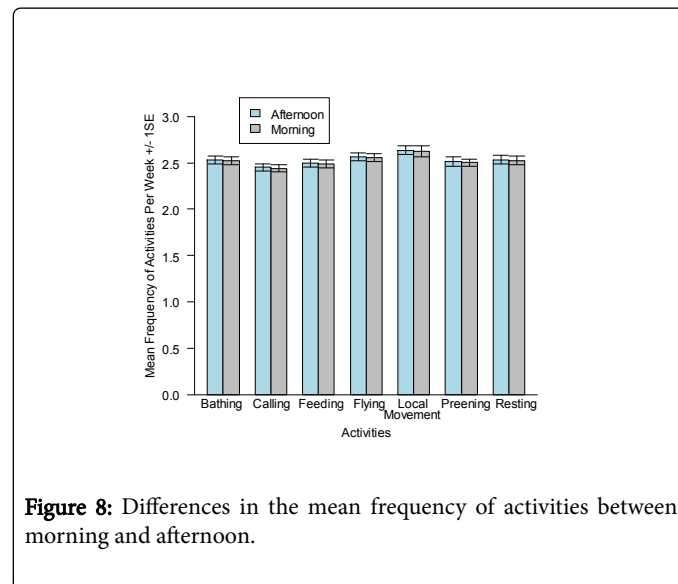


Figure 8: Differences in the mean frequency of activities between morning and afternoon.

Conclusion

Test for all response variables was conducted using Shapiro-Wilk test for normality, and results was considered significant at 5% level. There was no significant difference in the mean frequency between the different activities, such as flying, resting, bathing and preening. There was a significant difference between the species activities and season

and month. During the wet season, the highest mean frequency of activities was observed in April, while in the dry season the highest mean frequency of activities was observed in December.

Although, the mean frequency of activities was slightly higher in the afternoon than morning, but it was not significant and does not determine the frequency of activities employed by the White-faced whistling duck. More research is needed to assess this species in early morning or late evening to achieve greater accuracy and time-efficiency, creating desirable habitat in the vicinity.

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