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Microhabitat Use and Diurnal Time-activity Budgets of White-headed Ducks (*Oxyura leucocephala* Scopoli, 1769) Wintering at Burdur Lake, Turkey

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Abstract: Diurnal time-activity budgets of White-headed Ducks were investigated with respect to sex and temporal environmental variables to document behavioral responses to winter conditions and nutritional requirements at Burdur Lake where the largest winter concentrations occur. Behaviors of males and females were recorded separately in randomly selected focal flocks during 1140 sessions. For the entire population a large proportion of time was spent resting. During the day they spent 61% of time resting, 22% feeding, 12% comfort and 5% in locomotion. Resting peaked in the middle of day while feeding was observed frequently in evening and morning. Time use did not differ significantly between sexes. However, it was detected that more time was spent feeding during windy days as wave-height increased.

Key words: White-headed duck, behavior, diurnal period, wintering, Burdur Lake

INTRODUCTION

White headed duck, *Oxyura leucocephala*, is a species under threat in the World. According to IUCN criteria (International Union for Conservation of Nature), the species is categorized as EN, endangered, in the Red List. And also, this species is at A.2 status including endangered species in the Red List of Turkey Birds (Kiziroglu, 2008).

Although, the divisions between the biogeographic ranges of White-headed Duck populations are largely unknown, principally four populations can be distinguished (Essetti and Benaissa, 1996; Scott and Rose, 1996; Dimitrov *et al.*, 2000; Green and Hughes, 1996; Robinson and Hughes, 2006). Turkey provides the habitat for White-headed Duck to winter and breed, many bird species as well. Seventy percent of the global population of the species winters in Lake Burdur (Anstey, 1989; Green *et al.*, 1996; Buckley *et al.*, 1998).

Basic information on diurnal behavior patterns of White-headed ducks is lacking in the Burdur Lake where the largest wintering population occur. In this study, we investigated diurnal time activity budgets of White-headed Ducks with respect to sex and temporal environmental variables to document behavioral responses to winter conditions and nutritional requirements at Burdur Lake.

MATERIALS AND METHODS

Study area: Burdur Lake is a brackish, closed-basin lake without emergent vegetation and with an area of about 140 km², southwest Turkey (37°43'N, 30°12'E). The four suitable study stations were determined to consider food availability, predator effects and observations in Burdur Lake. The first station is Seker Beach which is located south of the lake. Widely used for wintering by the species, this station is situated along the cove north of sugar factory. The second station is located northeast of the lake. The third station is to the north. Lake shore is steep sloped. The fourth station is located northwest of the lake and south of Karakent (Fig. 1).

Behavioural observations: Scan Sampling and Focal Sampling methods were used to estimate diurnal time budgets of White-headed ducks at 4 coastal observation station in Burdur Lake during the wintering season 2008-2010. Each site was visited during each of 3 equal diurnal periods (morning, afternoon, evening) once a month. Behaviors of males and females were recorded separately in randomly selected focal flocks during 1140 sessions (Altmann, 1974). We categorized behaviors as feeding, resting, locomotion and comfort. The frequency of occurrence of these behaviors exhibited different time periods in the population were determined.

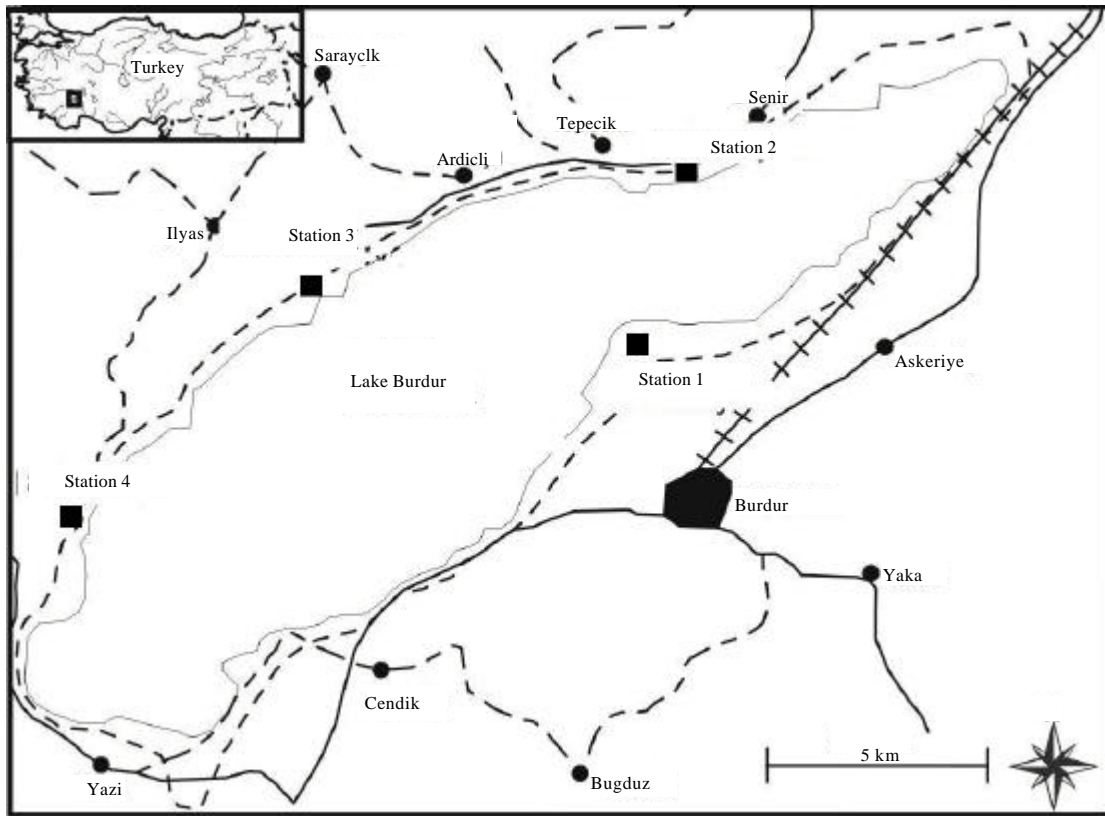


Fig. 1: Observation stations at Burdur Lake

Statistical analysis: We identified sex differences with independent t-test and diurnal period differences with ANOVA. To determine correlations between behavior and environmental variables such as wave height and wind conditions, we used Tukey test.

RESULTS AND DISCUSSION

White headed ducks wintering at Burdur Lake displayed different behaviors to balance their body temperature and reduce heat loss in different periods of the day. We detected that on average, White-headed ducks spent most of the diurnal period by resting. During the day they spent 61% of time resting, 22% feeding, 12% comfort and 5% in locomotion (Table 1).

Feeding, resting and locomotion were the main diurnal behaviors (Table 2). Resting peaked in the middle of day ($F: 36.884, p < 0.001$) while feeding was observed frequently in evening and morning ($F: 93.625, p < 0.001$) as found several other wintering ducks (Fischer and Griffin, 2000; Baaziz and Samraoui, 2008). Why many ducks feed mainly at night is unclear yet. Various explanations

Table 1: Diurnal time budgets of white-headed ducks at Burdur Lake during wintering season 2008-2010

Behavior	n	Time spent (%)
Resting	695	61
Feeding	246	22
Comfort	139	12
Locomotion	60	5
Total	1140	100

n: No. of individual

Table 2: Diurnal rhythms of white-headed ducks at Burdur Lake

Behavior	Period	n	Mean±SD	Statistical value
Feeding	Morning	380	0.35±0.024	p<0.001
	Noon	380	0.00±0.000	
	Evening	380	0.30±0.024	
	Total	1140	0.22±0.012	
Resting	Morning	380	0.54±0.026	p<0.001
	Noon	380	0.78±0.021	
	Evening	380	0.51±0.026	
	Total	1140	0.61±0.014	
Comfort	Morning	380	0.08±0.014	p<0.001
	Noon	380	0.17±0.019	
	Evening	380	0.12±0.017	
	Total	1140	0.12±0.010	
Locomotion	Morning	380	0.04±0.010	p>0.05
	Noon	380	0.06±0.010	
	Evening	380	0.07±0.013	
	Total	1140	0.05±0.007	

n: No. of observations

Table 3: Distribution of some daily activities of white-headed ducks between the sexes

Behavior	Sex	n	Mean±SD	Statistical value
Feeding	Male	570	0.22±0.017	p>0.05
	Female	570	0.22±0.017	
Resting	Male	570	0.61±0.020	p>0.05
	Female	570	0.60±0.021	
Comfort	Male	570	0.11±0.013	p>0.05
	Female	570	0.14±0.014	
Locomotion	Male	570	0.06±0.010	p>0.05
	Female	570	0.05±0.009	

n: No. of individual

including avoidance of diurnal predators, food availability, thermoregulation, etc. have been put forward (McNeil *et al.*, 1992; Green *et al.*, 1999; Houhamdi and Samraoui, 2008).

Comfort behavior especially peaked in the middle of day when the air temperature rised (F: 7.613, p<0.001). Because of thermoregulatory advantage individuals usually showed resting and comfort behaviors at noon. Houhamdi and Samraoui (2008) suggested that ducks first adapt their behavior to minimize their energy expenditure during the coldest part of the wintering season. Green and El Hamzaoui (2000) detected an increase in swimming activity of *Marmaronetta angustirostris* from October-March was related to increased courtship activity. As days lengthened, increased the proportion of daylight hours spent in feeding and resting activities while locomotion decreased. But this change was not significant statistically. Also we didn't observed such an early courtship activity evidently at Burdur Lake.

Time use did not differ significantly between sexes (p>0.05). Females spent more time feeding than males but it was not significant statistically (Table 3).

White-headed ducks were performed almost all daily activities in water. But rarely some individuals were observed resting on a rock near the shore or roots on water (Fig. 2).

Environmental conditions as weather condition and wave-height also were correlated with White-headed duck behavior (p<0.001). It was detected that more time was spent feeding during windy days as wave-height increased.

Diurnal time budgets showed significant differences between different parts of the lake. White-headed ducks made regular movements from one part of the lake to other. It was determined that the Peker Beach located on the southern shore is the most preferred place during the day. However, Tabur (2002) reported that the population was concentrated in the northern parts of the lake-relatively free of pollution. Green *et al.* (1996), indicated that more than 70% of individuals congregated between Senir-Karakent and they favored in the southern



Fig. 2(a-b): Resting behavior of white-headed duck

regions. Kiziroglu *et al.* (1995) stated that the number of species increased between 1969 and 1991 and that they were not affected by pollution. So, we considered that this change of habitat preference could be originated from anthropologic pressures intensified in northern parts of the lake and noise pollution (especially the airport).

CONCLUSION

White-headed ducks mostly preferred the northwest part (around Karakent) of Burdur Lake for feeding. After spending the night there, they relocated to the south in the early morning. Individuals concentrated together into densely packed flocks when resting but dispersed widely when feeding. Distance from shore of feeding and resting areas are different. Their distribution especially when feeding is strongly related to distribution of their food supply.

High feeding performance in windy days might be explained by high prey availability with high tides and

increased water circulation. This behavior may explain why feeding was positively correlated with tide level. But Burdur Lake offers White-headed ducks little shelter from high winds owing to a lack of emergent vegetation.

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