

SHORT COMMUNICATION

DIET PREFERENCES OF SUB-SPECIES OF OSTRICH (*STRUTHIO CAMELUS CAMELUS* AND *STRUTHIO CAMELUS MOLYBDOPHANES*) AT LANGANO OSTRICH FARM, ABIJATA SHALLA LAKES NATIONAL PARK, ETHIOPIA

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ABSTRACT: This study investigated diet preferences of two sub-species of ostriches (*Struthio camelus camelus* and *S. c. molybdophanes*) at Langano Ostrich Farm during the dry and wet seasons of 2009. Observations on the food items consumed and food leftovers were recorded. Observations were made five hours a day for 40 days for the natural food items consumed by the ostriches during morning (06:00 h-10:00 h) and in the afternoon (16:00 h-18:00 h). Twenty observations at an interval of five minutes were made to determine the frequency of natural diet consumed by the ostriches. Prepared food and wheat bran were given to the ostriches for five days and the frequency of consumption was recorded for 100 minutes. Ostriches consumed various parts of eight major plant species of eight families. On an average, the leaves of succulent grass, *Cenchrus ciliaris* was consumed most (41%) during both seasons. The leaves of *Acacia tortilis*, *Balanites aegyptiaca* and pods of *A. tortilis* were the most frequently consumed plant materials. Though both sub-species preferred the succulent grass during both seasons, the frequency of consumption was higher for the blue-necked ostrich (43-49%). Wheat bran was the most preferred (93.7%) by both sub-species among the prepared food items. The ostriches also consumed mineral salt and faeces of other animals and their own.

Key words/phrases: Diet preferences, Food items, Ostriches, Plant species.

INTRODUCTION

Ostriches are flightless birds. They originated in Africa and were introduced to Europe, Middle East, Asia and Australia (Shanawany and Dingle, 1999). In Africa, particularly the desert areas provide ample space for them (Floch, 1992). Africa harbours four ostrich species (*Struthio camelus*, *S. molybdophanes*, *S. massaicus* and *S. augtralis*). However, some scholars realize the presence of six sub-species of ostriches differing slightly in size, skin colour of the bare thighs, head, neck, size and texture of the eggs

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(Shanawany and Dingle, 1999). In spite of the differences in classification (Blower, 1969; Shanawany and Dingle, 1999; Sinclair and Ryan, 2003), this paper treats ostriches in Ethiopia into two sub-species, North African ostrich, *S. c. camelus* (Red-necked ostrich) and Somali ostrich, *S. c. molybdophanes* (Blue-necked ostrich). Though ostriches were once widely distributed in Ethiopia, currently they are restricted to only a few areas in the country. One of these areas is the Langan Ostrich Farm (LOF) of the Abijata Shalla Lakes National Park (ASLNP).

Due to changes in climate, habitat destruction, persecution for their skin and other values, ostriches in Ethiopia could not thrive well in their natural habitats (EFWCDA, 1993). This has led to transfer some of them to protected areas where they are assumed to do well. Within the protected areas they were transferred to, the ostriches faced several disadvantages in obtaining food and achieving reproduction. As a result, they were forced in part to survive on local food sources. Furthermore, birds are affected by other several variables as well (Morel and Morel, 1980; Bibby and Burgess, 1992; Bibby *et al.*, 1998; Girma Mengesha and Afework Bekele, 2008). One of these is the availability of palatable and preferred food items. Studies on diet and foraging behaviour of animals can answer questions about the type of food that a species consumes and reason for preferring an area (Sutherland, 2004). If an animal is faced with a variety of possible food items, it prefers some and avoids others (Krebs, 1999). Ostriches are monogastric herbivores. The natural diet of ostriches is mainly grass, berries, seeds, succulent plants and insects (Mushi *et al.*, 2008). Agena *et al.* (2003) observed a variety of diets of ostriches such as 75% plant materials and 4 to 5% insect eggs and small mammals. Though the diet requirement in the natural habitat is generally known, the feeding behaviour and preference of ostriches may be changed in a constrained environment such as the LOF. There is limited study that focuses on ostrich diet in such situations. Therefore, this study was aimed at investigating the diet and diet preferences of the two sub-species of ostriches in the LOF. The findings are expected to provide useful information for the management of the species in the area.

MATERIALS AND METHODS

Description of the study area

The Langan Ostrich Farm is in the Abijata Shalla Lakes National Park and located at about 207 km south of Addis Ababa (Fig. 1). The park covers an area of 887 km². The elevation of the park ranges between 1,540-2,075 m a.s.l. (EWNHS, 1996). The terrestrial woodland habitat of the park covers

an area of 382 km² (43%) of *Acacia* woodland whereas its three lakes cover an area of about 506 km² (57%) (Fikadu Teferra and Rezenom Almaw, 2002). The present study site occurs in the terrestrial habitat at the northern side of the park where 1 km² is fenced as the ostrich farm (Fig. 1). The climate of the park lies within the eco-climatic zone III “upper kola” with a moisture between 45 and 52 and periodic drought (Daniel Gemechu, 1977). The average annual rainfall within the park is 500 mm. The main rainy season is between late January and early April, with variations from year to year. The temperature in the park is normally in the range of 16-24°C. However, it can increase up to 45°C during the warm months (Fikadu Teferra and Rezenom Almaw, 2002).

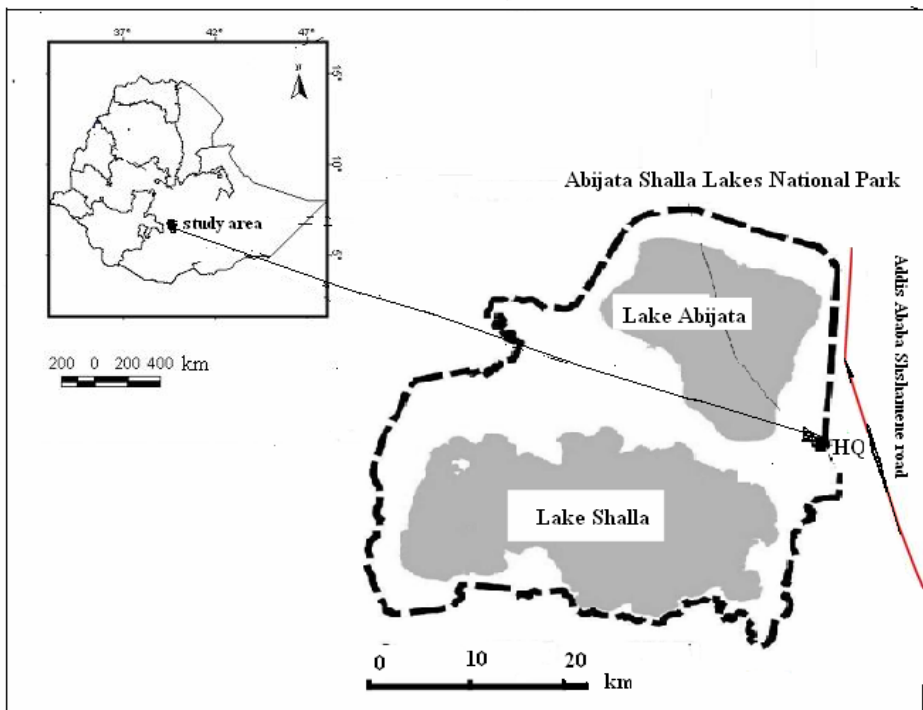


Fig. 1. Map showing the location of Langano Ostrich Farm in the ASLNP.

Methods

This study was carried out during the dry and wet seasons in 2009. The methods described in Sutherland (2004) were followed to collect data on feeding site by direct observation using naked eyes and binoculars while the food is consumed. Foraging methods such as collecting food from substrate, feeding on barks, leaves and fruits were observed and recorded. Plant

species consumed by the ostriches were identified. Unidentified plant species were collected and confirmed at the National Herbarium, Addis Ababa University. The frequency of plant food items consumed was recorded for 100 minutes from 08:00 - 09:40 h for six weeks each during dry and wet seasons. During each observation, 20 pecks were recorded at an interval of 5 minutes for two days per week and 5 hours a day. In order to avoid biases due to time of the day, peck count was made for blue-necked ostrich in the morning on the first day and the next day morning for the red-necked ostrich. Similar counts were also made in the afternoon. Bite marks and discarded husks were checked. In addition, various food items were supplied to both the sub-species by putting food materials in a tray for 24 hours, twice a week (Sodhi *et al.*, 1997) and the most frequently consumed food was identified and recorded. The food items given to the ostriches during the experimental period were those known to be used by the ostriches such as wheat bran, bones and cabbages.

Data analysis

Data were analyzed using SPSS descriptive statistical package for the analysis of frequencies and 2 by 2 contingency table for association based on Fowler and Cohen (1990), and the methods described in Krebs (1999) for food preference analysis. Simpson's similarity index was computed to analyze the similarity in preferred food use by the blue-necked male, red-necked male and female ostriches (Simpson, 1949).

RESULTS

Ostriches were observed to feed on eight major plant species of six families (Table 1). During both dry and wet seasons, green grass, particularly, *Cenchrus ciliaris* was the most frequently consumed plant by both male and female ostriches (Table 2).

Table 1. List of major plant species consumed by ostriches in the LOF.

Scientific name	Family name	Common name
<i>Hypoestes forskoolii</i>	Acanthaceae	White ribbon bush
<i>Rhus natalensis</i>	Anacardiaceae	Natal rhus
<i>Balanites aegyptiaca</i>	Balanitaceae	Desert date
<i>Boscia salicifolia</i>	Capparidaceae	Willow-leaved shepherd tree
<i>Maerua triphylla</i>	Capparidaceae	Small bead-bean
<i>Acacia tortilis</i>	Fabaceae	Umbrella thorn
<i>Cenchrus ciliaris</i>	Poaceae	Buffel grass
<i>Craterostigma plantagineum</i>	Scrophulariaceae	Blue gem

During the dry season, green grass was the most frequently consumed natural food item of both sexes of blue-necked and the male of red-necked ostriches. There was significant difference in the preferences shown between males of these subspecies ($\chi^2 = 7.5$, $p < 0.05$). During this season, leaves of *Acacia tortilis* were the most frequently consumed food item by the male blue-necked ostrich. But, leaves of *Balanites aegyptiaca* and pods of *Acacia tortilis* constituted the most frequently consumed food item of the red-necked ostrich. In general, during dry season, all animals were observed pecking parts of different plant species, pods, seeds, leaves and inflorescences of succulent plants as food items.

Table 2. Observed food items of ostriches and the frequency of consumption during the dry and wet seasons.

Food items	Frequency of consumption in different seasons											
	Dry						Wet					
	Blue-necked ostrich	% freq.	Red-necked ostrich	% freq.	Female	% freq.	Blue-necked ostrich	% freq.	Red-necked ostrich	% freq.	Female	% freq.
Inflorescent grass	0	0	2	2	5	5	0	0	2	2	5	5
Succulent or green grass	43	43	35	35	43	43	49	49	34	34	42	42
Pods of <i>Acacia tortilis</i>	10	10	15	15	10	10	8	8	15	15	5	5
Leaves of <i>A. tortilis</i>	20	20	13	13	6	6	5	5	2	2	3	3
Leaves of <i>Balanites aegyptiaca</i>	5	5	15	15	13	13	23	23	16	16	14	14
<i>Asparagus</i> spp.	2	2	2	2	1	1	0	0	2	2	0	0
<i>Hypoestes forskoolii</i>	3	3	2	2	0	0	4	4	4	4	5	5
<i>Rhus natalensis</i>	3	3	0	0	2	2	0	0	0	0	1	1
<i>Boscia salicifolia</i>	1	1	0	0	0	0	11	11	0	0	2	2
<i>Maerua triphylla</i>	1	1	0	0	0	0	0	0	16	16	9	9
<i>Craterostigma plantagineum</i>	8	8	10	10	12	12	0	0	0	0	0	0
Mineral salt	5	5	3	3	1	1	0	0	1	1	2	2
Pellet of Grant's gazelle	0	0	2	2	3	3	0	0	0	0	2	2
Pellet of ostriches	0	0	1	1	1	1	0	0	0	0	2	2
Pellet of Bohor reed buck	0	0	0	0	2	2	0	0	3	3	4	4
Sandy salt	0	0	0	0	1	1	0	0	5	4	5	4

During the wet season, the leaves of *Balanites aegyptiaca* was the more frequently consumed item next to the succulent or green grass. The red-necked ostrich also frequently consumed the pods of *Acacia tortilis* during the wet season. In addition, mineral salt, sand and faeces of different animal species and their own were also consumed by ostriches.

Simpson's similarity index showed all the ostriches had very strong similarity in the preferences to succulent grass (Table 3). During both seasons, the blue-necked and the red-necked ostriches had the strongest similarity in preference to the green grass. However, among the prepared food items given to the ostriches, wheat bran was the highly preferred (97.3%) food item.

Table 3. Similarity indices in succulent grass during the dry and wet seasons.

Sub-species and sex	Indices					
	Dry season			Wet season		
	Male blue-necked ostrich	Male red-necked ostrich	Female	Male blue-necked ostrich	Male red-necked ostrich	Female
Male blue-necked ostrich		0.97	0.84		0.93	0.93
Male red-necked ostrich	0.97		0.81	0.93		0.88
Female	0.84	0.81		0.93	0.88	

DISCUSSION

In the natural habitat of LOF, ostriches of both sub-species were observed to feed on different plant species. This was similar to Shanawany and Dingle (1999) who observed plant materials as the major component of ostriches' diet. However, green grass, *C. ciliaris*, was the most preferred food item in the natural habitat. This agrees with the findings of Agena *et al.* (2003), who identified green grass as the main natural diet of ostrich. During both dry and wet seasons, the male of blue-necked and female of both sub-species consumed green grasses more frequently than the male red-necked ostrich. This might be accounted by the low record of the red-necked ostrich as they were observed to wander and try to move out of the fenced areas rather than feeding. Though frequency of consumption of parts of the plants varied between the two sub-species and between the sexes, leaf and pod of *A. tortilis* and leaf of *B. aegyptiaca* were the other major food during both seasons. This is also supported by Agena *et al.* (2003) who revealed the diet of ostrich in the wild to consist of 60% plant materials. Furthermore, ostriches were observed to feed on mineral salts, sandy soil, faeces of their

own and of other animals in a limited amount. This was also earlier reported by Mushi *et al.* (2008).

During the wet season, all the ostriches were observed to aggregate more frequently and to feed on shoots of green plants rather than looking for leaves and pods. This could be due to the availability of diverse food sources during the wet season following rainfall. This goes in line with the study carried out by Girma Mengesha and Afework Bekele (2008), who observed aggregation of populations during the wet season in the area following rainfall.

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REFERENCES

- Agena, A. A., Agena, A. O. and Mphile, U. J. (2003). Ostrich feeding and nutrition. *Pak. J. Nat.* 2: 60-67.
- Bibby, C. J. and Burgess, N. D. (1992). **Bird Census Techniques**. Academic Press, London.
- Bibby, C., Jones, M. and Marsden, S. (1998). **Bird Survey, Expedition Field Techniques**. Royal Geographic Society, London.
- Blower, J. (1969). **Shell Guide to the Wildlife of Ethiopia**. Shell Ethiopia Ltd, Addis Ababa.
- Daniel Gemechu (1977). **Aspects of Climate and Water Budget in Ethiopia**. Addis Ababa University Press, Addis Ababa.
- EFWCDA (1993). **Past and Present Ethiopian Forestry and Wildlife Situations** (Amharic version). Ethiopian Forestry and Wildlife Conservation and Development Authority, Addis Ababa.
- EWNHS (1996). **Important Bird Areas of Ethiopia: A First Inventory**. Ethiopian Wildlife Natural History Society, Addis Ababa.
- Fikadu Teferra and Rezenom Almaw (2002). **Conservation and Management Issues of Abijata-Shalla Lakes National Park**. Abijata Shalla-Lakes National Park, Dolle. Unpublished.
- Floch, A. (1992). Family Struthionidae (Ostrich). In: **Handbook of the Birds of the World, Vol. 1 Ostrich to Ducks**, pp.76-83 (Del Hoyo, J., Elliot, A. and Sargatal, J., eds.). Lynx Edicions, Barcelona.
- Fowler, J. and Cohen, L. (1990). **Practical Statistics for Field Biology**. John Wiley and Sons, New York.
- Girma Mengesha and Afework Bekele (2008). Diversity and relative abundance of birds of

- Alatish National Park. *Int. J. Ecol. Environ. Sci.* **34**: 215-222.
- Krebs, C. J. (1999). **Ecological Methodology**. 2nd ed. Addison-Wesley Educational Publishers, Inc., Menlo Park, California, 620 pp.
- Morel, G. J. and Morel, M. M. (1980). Structure of an arid tropical bird community. *Prov. Pan Afr. Orn. Congr.* **4**: 125-133.
- Mushi, E.J., Binta, M. J. and Lumab, N.J. (2008). Behavior of wild ostriches (*Struthio camelus*) at Mokolodi Nature Reserve, Gaborone, Botswana. *Res. J. Poult. Sci.* **2**: 1-4.
- Shanawany, M. M. and Dingle, J. (1999). **Ostrich Production System: A Review**. Food and Agricultural Organization (FAO), Rome.
- Simpson, E. H. (1949). Measurement of diversity. *Nature* **12**:163-167.
- Sinclair, I. and Ryan, P. (2003). **The Field Guide to the Birds of Africa South of the Sahara**. Princeton University Press, New Jersey.
- Sodhi, S. N., Choo, S.P.S., Lee, H.Y. P.B., Quek, K.C. and Kora, A. U. (1997). Ecology of mangrove forest bird community in Singapore. *Raffles B. Zool.* **45**: 1-13.
- Sutherland, W.J. (2004). Diet and foraging behavior. In: **Techniques in Ecology and Conservation: A Handbook of Techniques**, pp. 233-241 (Sutherland, W.J., Newton, I. and Green, R. S., eds.). Oxford University Press, New York.