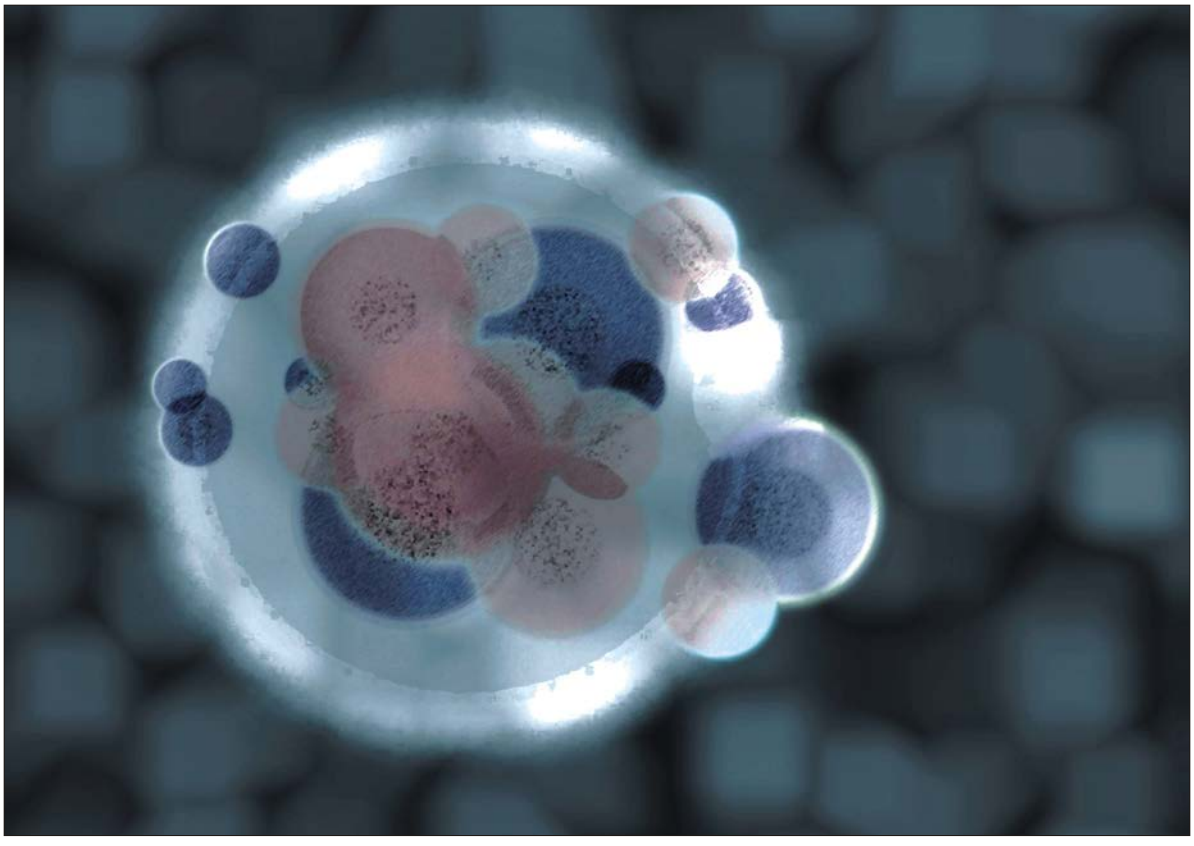

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Food Habits of the Double-spurred Francolin *Francolinus bicalcaratus* (Linnaeus) in Zaria, Nigeria

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Abstract: The crop and gizzard contents of 105 Double-spurred Francolins (*Francolinus bicalcaratus* Linnaeus) shot in the wild by hunters in Zaria and its environs were examined. Thirty food-organisms (i.e., species or other taxa that served as food for the francolins) were isolated from the gut content of the birds. *Brachiaria stigmatisata* and *Vigna ambacensis* were the most frequent food-organisms, having been found in the guts of 64 (60.95%) of the birds. In terms of the number of individual food items consumed by the birds, *Setaria pallide-fusca* scored the highest with 9.873 (22.72%) of the isolated food items. Gravimetrically, *Sorghum bicolor* was the most significant food-organism, accounting for 27.50% of the bulk of food items consumed. These four food-organisms appeared to be the most important food components in the habitats of the Double-spurred Francolins. With respect to the plant species consumed by the birds, food habits did not differ significantly between sexes ($p>0.05$). However, female birds appeared to eat more animal materials than the males ($p<0.05$). The significance of these findings with regards to egg formation, incubation and chick brooding are discussed.

Key words: Food habits, food-organisms, Francolins, euryphagic

INTRODUCTION

Among the galliforms, one of the most diverse genera of the family Phasianidae is the genus *Francolinus*. The genus comprises 41 species, 36 of which are Afrotropical. They are common in Africa, some species being more abundant in certain parts of the continent[1-6]. According to Keith *et al.*[5] seven of these 36 Afrotropical francolin species, including the Double-spurred Francolin, have been recorded in Nigeria.

The external features of the Double-spurred Francolin and the Domestic Chicken *Gallus gallus dometicus* are similar, probably due to their phylogenetic relationship; but the former has a more rounded shape. Being wild phasianids and because their meat is very tasty, francolins are widely consumed as bush-meat in Nigeria and other African countries. This fact was confirmed by Onyenekwe[7] in a comparative biochemical study of the meat quality and digestive enzymes of the Double spurred Francolin and Domestic chicken. A team of 10 taste panelists in that study found the meat of the former tastier, juicier and more palatable than the latter. The francolin meat was also found to be richer in protein than chicken meat.

In many countries, poultry has become one of the most important components of the livestock industry. According to the FAO[8,9] it is the cheapest source of animal protein among the various categories of livestock. Abdu *et al.*[10] estimated the poultry population in Nigeria to consist of about 10 million exotic and 124 million local chickens, 45 million guinea fowls, 1 million turkeys and 1 million ducks. From this foregoing statistics, it is obvious that domesticated phasianids play a vital role in the country's animal protein supply.

In the Guinea Savanna ecological zone where this study was carried out, little information is available in the food habits of the Double-spurred Francolin. According to Keith *et al.*[5] and Onyenekwe[7], the ecological preferences of the species (the knowledge of which will be a key requirement for managing the species in the wild) are still poorly understood. Bridging this information gap is very essential, as the species is a good candidate for future domestication owing to the universal acceptability of its meat. It is, therefore hoped that the findings of this study will serve as baseline information and stimulate more research that may lead to the eventual domestication of the species. That the domestication of this species is a feasible initiative can be seen in the adaptability, which

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the species exhibits to anthropogenicaly altered environments.

MATERIALS AND METHODS

Local hunters, between July 2000 and May 2001 shot the 105 Double-spurred Francolins used in this study. The killing of the birds arrested digestion of any food they had eaten, thereby enhancing the identification of any consumed food-organisms. All the birds came from localities around Zaria (location 11° 03NN 07° 42NE) in Kaduna State, Nigeria. Once collected, a bird was taken to the laboratory where it was dissected and the alimentary tracts from the oesophagus to the cloaca extracted intact from the body cavity. The crop and gizzard were severed from the rest of the gut and opened, and their contents removed and kept into separate petri dishes. Identifiable contents of the crop and gizzard were sorted out by species. Seeds that could not be identified directly were sown in pots and watered to enhance germination. The germinated food plants were identified at some stage of their growth and development.

Three methods for the assessment of the crop and gizzard contents were utilized. These were I) frequency of occurrence, ii) numerical and iii) gravimetric methods, adapted from Ricker[11]. Following the statistical procedures described by Fowler and Cohen[12] and Sokal and Rohlf[13], Mann-Whitney U-tests were used to compare possible differences in food habits between female and male birds.

RESULTS

Table 1 presents the consumed food-organisms and their frequency of occurrence, as well as their numbers and weights. Nineteen (67.86%) of the food-organisms recovered from female the Double-spurred Francolins were plant materials while nine (32.14%) were of animal origin.

Table 1: Food-organisms recovered from the gut of Double-spurred Francolins (No. of ♀s = 64; No. of ♂s = 41)

	Frequency of occurrence		Number of items		Weight (g)	
Food-organisms	Female	Male	Female	Male	Female	Male
Cultivated seeds						
Sorghum bicolor	42	14	2552	1298	85.93	43.73
Zea mays	27	12	308	193	61.11	30.01
Oryza sativa	23	13	1109	237	32.95	6.65
Pennisetum typhoides		1	22	568	Trace	4.65
Vigna unguiculata	4	7	13	427	0.73	40.73
Arachis hypogea	3	1	70	1	1.10	0.20
Wild seeds						
Asystasia gangetica	1	2	9	10	0.09	0.10
Paspalum orbiculare	10	5	332	317	1.13	0.75
Hackelochloa sp.	15	3	3621	691	19.04	3.73
Brachiaria stigmatisata	42	22	15346	7517	51.87	28.01
Cyperus esculentus	1		2		0.04	
Cyperus sp.	22	5	1234	307	9.49	2.76
Ageratum conyzoides	1		34		0.30	
Commelina diffusa	12	4	1643	360	7.15	1.74
Crotolaria retusa	2	3	23	2230	0.09	0.40
Setaria pallide-fusca	1	8	12	9861	0.03	22.70
Vigna ambacensis	44	20	373	71	3.45	0.89
Mariscus alternifolius	5		610		2.55	
Desmodium hirsitum	3	1	18	2	Trace	Trace
Unidentified seed 1		1		15		0.07
Unidentified seed 2		1		55		0.10
Animal materials						
Trilophidia conturbata	2		2		Trace	
Bugs	3		86		0.05	
Geotomus sp.						
Scantius clavimanus						
Agonoscelis versicolor						
Papilio sp. (larvae)	2		6		0.05	
Beetles/beetle larvae:	6	4	19	9	0.28	0.06
Ootheca mutabilis						
Heteronychus oryzae						
Sinoxylon senegalense						
Coelostoma alhuaudi						
Curculionidae						

Table 1: Continued

Food-organisms	Frequency of occurrence		Number of items		Weight (g)	
	Female	Male	Female	Male	Female	Male
Cerambicidae larva						
Ants	9	7	716	81	0.27	0.17
Oecophylla longinoda						
Oecophylla sp.						
Paratrechina sp.						
Camponotus sericeus						
Camponotus perrisi						
Termes bellicosus	7	7	2011	2830	1.94	3.29
Lymnaea sp. (snails)	4	1	4		0.24	Trace
Frog	1		1		0.20	
Polyxenus sp. (millipedes)	3		2		0.28	

Table 2: Food-organisms recovered from the gut of Double-spurred Francolins (No. of ♀s = 64; No. of ♂s = 41)

Food-organism	% frequency	% number of all food items consumed	% weight of all food items consumed
Cultivated seeds			
Sorghum bicolor	53.33	8.86	27.50
Zea mays	37.14	1.15	19.33
Oryza sativa	34.29	3.10	8.40
Pennisetum typhoides	0.95	1.36	0.99
Vigna unguiculata	10.48	1.01	8.79
Arachis hypogea	3.81	0.16	0.28
Wild seeds			
Asystasia gangetica	2.86	0.04	0.04
Paspalum orbiculare	14.29	1.49	0.40
Hackelochloa sp.	17.14	9.92	4.83
Brachiaria stigmatisata	60.95	20.83	16.94
Cyperus esculentus	0.95	0.01	0.08
Cyperus sp.	25.71	3.55	2.60
Ageratum conyzoides	0.95	0.08	0.06
Commelina diffusa	15.24	4.61	1.89
Crotolaria retusa	4.76	5.19	0.10
Setaria pallide-fusca	8.57	22.72	4.82
Vigna ambacensis	60.95	1.02	0.92
Mariscus alternifolius	4.76	1.40	0.54
Desmodium hirsitum	3.81	0.05	Trace
Unidentified seed 1	0.95	0.03	0.01
Unidentified seed 2	0.95	0.13	0.02
Animal materials			
Trilophidia conturbata	1.90	<0.01	Trace
Bug	2.86	0.20	0.01
Geotomns sp.			
Scantius clavimanus			
Agonoscelis versicolor			
Papilio sp. (larvae)	1.90	0.02	0.01
Beetles/beetle larvae	9.52	0.06	0.07
Ootheca mntabilis			
Obelistes sp.			
Heteronychus oryzae			
Sinoxylon senegaleuse			
Coelostoma alluaudi			
Curculionidae			
Cerambicidae larva			
Ants	15.24	1.83	0.09
Oecophylla longinoda			
Oecophylla sp.			
Paratrechina sp.			
Camponotus perrisi			
Termes bellicosus	13.33	11.14	1.11
Lymnaea sp. (snails)	4.76	0.01	0.05
Frog	0.95	<0.01	0.04
Polyxenus sp. (millipedes)	2.86	<0.01	0.06

Table 3: Summary of food-organism preferences of female and male Double-spurred Francolins

	Number of food-organisms consumed	
Sexes	Plants	Animal
Female	19	9
Male	18	3

On the other hand, 18 (85.71%) of the food-organisms recovered from males were plant materials while three (14.29%) were animals. This suggests that females may have been foraging more for animal materials than males.

In Table 2 where food-organisms are depicted as percent of total food consumed, *Brachiaria stigmatisata* (60.95%), *Vigna ambacensis* (60.895%) and *Sorghum bicolor* (53.33%) were the most frequent. However, when the significance of food-organisms was based on its value as a percentage of the total number of food items consumed, *Setariapallide-fusca* (22.72%), *Brachiaria stigmatisata* (20.83%), *Termes bellicosus* (11.14%) were the most important. When the importance of a food-organisms was based on its weight as a proportion of the total weight of food items consumed, *Sorghum bicolor* (27.%0%), *Zea mays* (19.33%) and *Brachiaria stigmatisata* (16.94%) were the most significant.

Table 3 is a comparison of the consumption of plant and animal materials by female and male Double-spurred Francolins. Although there no difference between females and males in the consumption of plant materials ($p>0.05$; Man-Whitney U-test), the consumption of animal materials was significantly different between sexes ($p<0.05$).

DISCUSSION

The wide variety of food-organisms recovered from the gut of the Double-spurred Francolins showed that the species is euryphagous. In terms of frequency of occurrence in the diet, number of items consumed and contribution by weight of food-organisms consumed, *Brachiaria stigmatisata* appears to be a very important food-organisms of the Double-spurred Francolins. *Sorghum bicolor* was important with respect to frequency of occurrence and contribution by weight. Thus, any habitat management for the Double-spurred Francolin should ensure the availability of these two food-organisms. Other food-organisms that may be similarly considered are *Vigna ambacensis*, *Setaria pallide-fusca* and *Zea may,* which also rated high in their value as food for the birds.

Differences in food habits between females and males were mainly discernible with respect to the animal materials consumed by the two sexes. Females appeared to consume larger amounts and variety of animal food-organisms than the males. This may be explained by the fact that female birds expend more energy than males in the reproductive process[14]. The relatively larger amount of animal materials consumed by females are vital to egg formation, as well as the accumulation of the body fats that are metabolized during incubation and chick rearing.

The habit of feeding on cultivated plant seeds exhibited by the Double-spurred Francolins has caused them to become implicated as crop pests[15]. However no reports have been made in the Zaria area of the species depredating on farm crops. Conversely, the agro-ecological values of their prodigious consumption of wild seeds are noteworthy. Adang[16] has argued that doves feeding on wild seeds (a form of biological control) probably help to reduce the impact of weeds on farm crops. This may also apply to the Double-spurred Francolin. Furthermore, the presence of these birds on farmlands may, as argued by Verne[17], provide fertilizer through their droppings, thereby supplementing the use of artificial fertilizer.

In conclusion, the double-spurred francolins of Zaria, Nigeria are euryphagous; thus any attempts to domesticate the birds must consider the organisms it feeds on. The disparity in animal materials consumed by the females compared to the males are vital for reproductive processes and worth incorporating in habitat management.

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