The Nigerian Field **81:** pp. 39-48, 2016

Food and Feeding Behaviour of the Cattle Egret (*Bubulcus ibis*) on the Campus of Obafemi Awolowo University, Ile-Ife, Nigeria

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Abstract

The food and feeding behaviour of the cattle egret (*Bubulcus ibis*) were studied in selected locations in Obafemi Awolowo University Campus with a view to determining the feeding habits and the prey items preferences of this species in the absence of grazing mammals which they usually symbiotically associate with. Observations were made for 10 weeks from selected locations to determine their feeding habits, and 20 specimens of the egrets were sacrificed to determine the occurrence of prey items in their diet. Recovered prey items were identified, sorted, counted and measured. The index of relative importance for each prey item category was calculated to determine their significance. A total of 802 prey items were recovered from the gut of the dissected egrets which had a mean weight of 355.05 ± 1.24 g. Winged reproductive termites were the most commonly occurring item, while the order Orthoptera had the highest index of relative abundance in the gut of the observed specimens. *B. ibis* observed in this study were found to be wide foragers and prefer feeding when the weather was cool.

Keywords: *Bubulcus ibis*, feeding habits, prey item preference, index of relative importance.

INTRODUCTION

The cattle egret (*Bulbulcus ibis*) is a midsized heron with white plumage, yellow bill, orange coloured tibio-tarsus and a hunched posture (Hosein, 2012). The length of adult birds varies from 46 – 56 cm; with a wingspan ranging between 88 and 96 cm; and an average weight of 338g (Ivory, 2000). The species acquired its name

from their habit of foraging in pasture lands in association with livestock, whose movement and grazing activities flush out insects and other potential prey items (Heatwole, 1965; Jenni, 1973). *B. ibis* belongs to the Class Aves, Order Ciconiiformes, which consists of storks, herons and ibises, Family Ardeidae which comprises herons and egrets.

The *B. ibis* unlike the other members of the family *Ardeidae,* which mostly live in or near shallow waters, *B. ibis* are more likely to occupy grasslands (Sharah, 1998). They underwent considerable expansion of range in the 20th century and are now present almost worldwide (del Hoyo et al, 1992). It is an ubiquitous species in the warm temperate zones, tropics and subtropics (Frankis et al, 2012). Cattle egrets usually inhabit and feed in habitats such as dry fields, farmlands, grasslands and artificial grasslands such as lawns, parks, fields, wetlands such as rice fields flood plains, freshwater swamps, wet pastures, shallow marshes and mangroves (Burchart et al, 2012). They are social birds as they tend to migrate as well as settle in large colonies often with other closely related species of birds (Ivory, 2000) The International Union for the Conservation of Nature (IUCN) classifies it in the 'Least Concern' category (IUCN, 2015).

Foraging is characterized by food selection, habitat preferences and prey capturing tactics or behaviour employed by avian species in a particular habitat (Scott, 1984). Most birds spend the majority of their time in foraging-related activities either for themselves or for a brooding mate or hatchling being cared for (Mayntz, 2012). Approximately 41 foraging behaviours based on movement, body and head posture, and the use of wings or feet have been reported in the Family Ardeidae (McKilligan, 2005; Kushlan and Hancock, 2005). The foraging ecology of egrets such as food intake, prey capture rate and percentage of successful pecks have been investigated in various habitats such as rice fields, freshwater marshes, rivers and estuaries (Custer et al, 2004; Taylor and Schultz, 2008).

The objectives of this study were to observe the foraging behaviour of *Bubulcus ibis* on Obafemi Awolowo University Campus, identify the prey items consumed by the species and study the pre-feeding and post-feeding activities exhibited by the species.

Literature Review

'Foraging behaviour' is defined as the location, acquisition and assimilation of food by organisms (Breed and Moore, 2010). It is an essential aspect of bird behaviour in which food resources are obtained and consumed using a variety of tactics. Therefore, foraging behaviour is one of the most important activities of avian species with respect to survival and reproduction (Yu-Seong, et al, 2008).

Bubulcus ibis is a diurnal bird that feeds during the day and sleeps at night (Butchart, et al, 2012) Feeding activity is more pronounced in the mornings and evenings with the least activity in the afternoon (Siegfried, 1971), the bird rests during midday when the sun is hottest (Seedikkoya, et al, 2005). They usually forage in small groups or by themselves in dry fields or farmlands or any type of grazing area (Ivory, 2000) and are opportunistic foragers and usually follow grazing animals or moving vehicles to take advantage of flushed or exposed prey items (Seedikkioya, et al, 2005). Cattle egrets may forage alone, in pairs and in flocks; searching, running and flying after prey items to catch them, moving through grasses, shrubs, farm crops and other low vegetation to search of prey (Sharah, et al, 2008).

Cattle egrets which associate their feeding with grazing animals obtain their prey at a much quicker rate and expend less energy than ones which do not associate with grazing animals (Seedikkoya, et al, 2005). They appear not to have preference for any specific ecosystem while foraging, as they are found in various parts of the world with different weather patterns, occupying various niches, ecosystems or environments (Sharah, et al, 2008). When feeding, cattle egrets walk at a steady pace followed by short forward darts and then a swift stab; small prey are swallowed whole (Ivory, 2000).

The most favoured food items include Dipteran (flies), Orthoptera (grasshoppers and crickets), Aranae (spiders), Lepidoptera (moths and butterflies), Coleoptera (beetles) and larger prey such as frogs, fish, crayfish, snakes and sometimes feeding on the nestlings of other birds and bird eggs (Ivory, 2000). Kushlan and Hancock (2005) reported that morphological characteristics such as such long beaks and necks enables cattle egrets and their larger cousins to hunt for a variety of prey items at various water depths.

Materials and methods

A pilot study was carried out to determine the best time and locations for observation for 3 weeks in August, 2013 and then observations were made from 8 a.m. to 1 p.m. and 4 p.m. to 7 p.m. from August 2013 to November 2013 while the collection of birds for gut content study was done weekly from both sites for 10 weeks.

Observations were made every other day from two locations on the OAU campus; the Sewage Oxidation Pond area (Site A); and the Awolowo Hall of residence, the Alumni Hall of residence and the Murtala Mohammed Hall of residence, where the birds have been known to forage (were combined as Site B).

The birds were observed as closely as possible as they have somewhat habituated to the presence of humans, machinery and vehicles. Nonetheless, observations of the birds were made with binoculars, whenever it was difficult to ascertain the food items being ingested, or when it was impossible to observe the birds without disturbing them during feeding or when the terrain was difficult to navigate.

In view of their abundance and the non-threatened conservation status of *B. ibis*, a justification was made for the sacrifice of 20 specimens to identify the ingested prey items. The dissected specimens were all obtained in the evening, just before the end of the observation of foraging activities.

Twenty *B. ibis* specimens were caught using a modified sweep net with a diameter of 60cm and a handle length of 150cm. The birds were anesthetized by placing them in a killing jar containing cotton wool soaked heavily with chloroform. The birds were immediately taken to the laboratory where their guts were excised. Dissection was done by making a longitudinal incision on the dorsal portion along the sagittal plane; this was done immediately after capture and anesthetization in order to obtain ingested prey items before the process of digestion made identification of prey items difficult.

The contents of the guts were collected into a petri dish and washed with distilled water to separate the bolus; it was then sieved using a fine meshed net. The prey items were preserved in formalin prior to analysis, the preserved ingested items were carefully sorted, counted and measured and each item was identified and classified to the lowest taxonomic level possible.

The length and width of undigested prey items were measured using a dissecting microscope with an ocular micrometer. The length was measured from the foremost

portion of the head to the furthest part of the prey item while the width was measured as the distance between the lateral points perpendicular to the length measurement.

The volume of intact prey items was estimated with the formula for a prolate spheroid.

$$V = 4/3\ \pi\ (L/2)(W/2)^2$$

Where V represents volume, L and W represent length and width respectively.

In order to determine the importance of each prey category consumed, the Index of Relative Importance (IRI) was calculated according to the method of Pinkas, et al (1971).

$$IRI = (\%\ V + \%\ N)\ X\ \%\ F.$$

where the $\%\ V$ is the total volume of a prey item category in all stomachs divided by the total volume of all prey items; the $\%\ N$ is the total number of items in a prey item category divided by the total number of all prey items, and the $\%\ F$ is the total number of stomachs containing a prey item category divided by the number of stomachs containing prey items.

Results

A total of 802 prey (table 1) were recovered from the gut of 20 dissected egrets which had a mean weight of 355.05 ± 1.24 g. Only recognizable ingested prey items were considered for the prey intake analysis. Winged reproductive termites were the most numerous item in the gut of the dissected specimens.

The order Isoptera was the most abundant prey item recovered from the stomachs of dissected *B. ibis* as it represented by 164 items followed by the order Orthoptera and the family Formicidae with 126 and 107, respectively (table 2). The order Hymenoptera was differentiated into family Formicidae items and order Hymenoptera due to the prominent representation of the family among the ingested items.

Non-animal material recovered from guts of site B include rubber bands, shirt buttons, stones and dried plant parts. Vegetal matter was found in the stomachs of the egrets in Site A as well. Only egrets from Site A had vertebrates represented by the Order anura present in their diet. All unidentifiable or non-animal material found to have been ingested were excluded from analysis as they were adjudged to have

been accidentally or erroneously ingested. Nonetheless, they illustrate the increasing problem and dangers of solid waste pollution to Nigerian wild fauna.

Table 1. (Wg) indicates weight of recovered specimens and (N) the number of recovered food items

SITE A			SITE B			
Date of capture	W (g)	N	Date	W(g)	N	
25/08/13	355	32	28/08/13	350	59	
01/09/13	350	40	04/09/13	364	47	
08/09/13	359	53	11/09/13	356	51	
15/09/13	349	34	18/09/13	346	28	
22/09/13	358	39	25/09/13	355	39	
29/09/13	354	29	02/10/13	360	41	
6/10/13	347	53	09/10/13	347	43	
13/10/13	361	49	16/10/13	358	29	
20/10/13	353	38	23/10/13	364	31	
27/10/13	357	23	30/10/13	361	44	
TOTAL	3,540	390		3,561	412	802
Mean SE	354± 1.37			356.1 ±2.08		355.06

Table 2. Diet of *Bubulcus ibis* showing number of retrieved items per food taxon

Prey Item	N	% N	% OC	% F	% V	IRI
Aranea (spider)	36	4.74	5.74	60	0.27	300.37
Isoptera (termites)	164	20.45	9.57	100	7.38	2,782.64
Hymenoptera (ants, wasp;s, bees)	43	5.36	6.70	70	1.20	459.9

Prey Item	N	%N	%OC	%F	%V	IRI
Formicidae (ants)	107	13.34	9.57	100	1.29	1,462.98
Orthoptera (grasshoppers/locusts)	126	15.71	9.09	95	41.33	5,418.78
Hemiptera (tree bugs)	88	10.35	9.57	100	8.15	1,849.55
Ixodidae (hard ticks)	29	3.62	8.61	90	0.29	351.12
Amura (frogs)	11	1.37	3.88	40	6.36	309.34
Blattodea (cockroaches)	39	4.86	6.22	65	16.96	1,418.17
Coleoptera (beetles)	41	5.11	9.09	95	5.27	986.22
Odonata (dragon flies)	16	2.00	3.83	40	3.44	217.31
Diptera (flies)	61	7.61	9.57	100	0.36	796.46
Gastropoda (snails/slugs)	6	0.75	1.91	20	0.40	22.96
Annelida (earth worms)	38	4.74	6.70	70	7.33	844.51
TOTAL	802					17,219.51

(N) and its percentage, percentage occurrence of prey items (% OC), percentage frequency of prey items (% F), percentage volume of prey item (% V) and Index of Relative Importance (IRI)

Discussion

The foraging success and efficiency of detectable prey items of the cattle egret increased as prey abundance increased. This agrees with the results obtained by Heatwole (1965), Grubb (1976) and Seedikkoya, et al, (2005). Although the cattle egrets observed during this study did not forage with cattle or any other herding herbivores as these were absent in the habitats studied. The egrets however

occasionally took advantage of the movement of people around the halls of residence, who unwittingly flushed out the arthropod food items sought by the egrets.

The *B. ibis*' foraging success may be attributed to its long neck and legs which substantially increases the field of view of the bird as well as its long beak, adaptations which facilitate prey capture.

Cattle egrets feed mainly in the mornings and in the evenings but sparingly in the afternoon. Foraging success, indicated by successful pecking percentage was significantly higher in the morning in this study, while feeding activities were Cattle egrets observed during this study time mainly caught their prey whenever the prey were in motion. The actions of other birds or machinery helped cause a disturbance and the subsequent dislodgement of the prey items, thereby increasing their noticeability, which in turn improved the egrets' hunting success. Birds were observed feeding at a distance of about 5 m behind the lawn mowers in Site A, searching the freshly cut grass for disturbed prey items.

The egrets sometimes caught prey by slowly stalking them or by remaining very still, the noticeably less pronounced in the afternoon between 12 pm and 3 p.m. This was probably due to the intensity of the sun as suggested by Kuranchie, et al (2013). Observations showed that there was an increase in feeding activities during and immediately after lawn mowing in sites A and B; the mowing machines playing a similar role to cattle, when the latter associate symbiotically with egrets. The egrets also seem to prefer locations with low vegetal cover, probably because of lower restriction of movement by obstacles, and greater prey item visibility.

The egrets sometimes stalked prey slowly or by remaining very still and then suddenly lunging and catching the the prey with a quick jab.

In this study, the foraging success and efficiency of *B. ibis* was observed to depend on the time of the day, with the highest foraging observed in the morning, between 7.30 and 9.30 a.m. During this period, the cold-blooded insect species and other prey would not have warmed up due to low temperatures, and are less able to flee. Furthermore most lawn mowing activities occur during this period. Egrets may be described as insectivores, as most of the prey they feed on, as evidence from the contents of their guts, were arthropods. Their hard long bills enable the egrets to easily catch, immobilize and kill its prey quickly. They were also observed foraging through refuse dumps in search of edible items, and sometimes picked up inorganic objects such as rubber bands, which were probably mistaken for worms. Small prey

items were usually gripped with the beak and then swallowed whole, while bigger prey items were first immobilized by knocking them against the ground before attempts were made to swallow.

Kushlan (1978) opined that the aggregation behavior of Ciconiiformes may constitute benign forms of mutualism as it enhances higher prey-capture success rates. This seems plausible as it increases their foraging efficiency by ensuring that prey items which escape one predator are consumed by another. Aggressive behaviour was also sometimes observed among the birds when competitively chasing after an escaped prey item. Some birds made attempts to peck at another egret, especially when it appeared that other bird had stolen its prey.

Winged reproductive termites were the most abundant prey items recorded during this research; this was probably due to the high availability and their ease of capture.

The *B. ibis* in this study were not observed foraging with cattle or any livestock, yet ticks were retrieved from the stomachs of 18 dissected specimens. It is likely that the birds may have foraged elsewhere in the company of cattle, before they were caught for the gut content analysis.

The index of relative importance showed the order Orthoptera to be the most essential prey item of the egrets on the OAU campus. The high availability of representatives of Orthoptera and anthropogenic activities such as lawn mowing and human traffic through the lawns may have contributed immensely to the successful capture of this group of prey items. Other important prey items based on the index of relative importance are the orders Isoptera, Hemiptera; family Formicidae and Blattodea.

Representatives of the order Isoptera, were noticeably more abundant after rainfall and this availability was reflected in the diet of the egrets. Cockroaches which had a relatively high index of relative importance were found mainly from egrets feeding in Site B, as Isoptera obtained from this site were well represented. Only the orders Isoptera, Hemiptera and Diptera and the family Formicidae were recovered from all egret stomachs sampled in Site B. The diversity of prey items recovered from the *B. ibis* shows that it is polyphagic. This study also revealed that fewer birds feed in mid-day when the sun is at it peak.

The presence of *B. ibis* on the fields of the halls of residence might proffer a solution to pest control.

REFERENCES

Breed, M. D. and J. Moore, 2010. *Encyclopedia of Animal Behaviour.* London: Academic Press, p,33 – 40.

Butchart, S., J. Ekstrom and L. Malpas, 2012. Species Factsheet: *Bubulcus ibis*. Birdlife International: *Egretta garzetta* www.birdlife.org/datazone/species factsheet. php.

Custer, C. M., S.A. Suarez and D.A. Olsen, 2004. Feeding habitat characteristics of the great blue heron and great egret nesting along the upper Mississippi River, 1995-1998. *Waterbirds* 27 (4): 454 – 468.

del Hoyo, J., A. Elliott and J. Sargatal (eds.) 1992. *Handbook of the Birds of the World,* Vol. 1, Barcelona, Spain: Lynx Editions.

Frankis, M., R. Hole and J. Tasirin, 2012. *Bubulcus ibis.* Encyclopedia of Life. Gitayana. http://eol.org/pages/1048666/overview.

Grubb, T. C. 1976. Adaptiveness of foraging in the cattle egret. *The Wilson Bulletin*, 88, 145 – 148.

Heatwole, H. 1965. Some aspects of the association of cattle egrets with cattle. *Animal Behaviour* 13:79-83.

Hosein, M. 2012. *Bubulcus ibis* (cattle egret) Online Guide to the Animals of Trinidad and Tobago. International Union for the Conservation of Nature. 2015. IUCN *Red List of Threatened Species.* Version 2014. 2. www.iucnredlist.org.

Ivory, A. 2000. *Bubulcus ibis.* (Online) Animal Diversity Webanimaldiversity.org/ accounts/ *Bubulcus ibis.*

Jenni, D.A., 1973. Regional variation in the food of nesting cattle egrets. *Auk*, 95: 267–80

Kuranchie, A., R. Kyerematen, K.D. Attuquayefio, and H.H. Lars, 2013. Gut content of cattle egrets (*Bubulcus ibis*) in three distinct habitats in the Accra Metropolitan Area, Ghana. *Journal of Agriculture and Biodiversity Research.* 2 (6): 124 – 128.

Kushlan, J. A. and J .A. Hancock, 2005. *The Herons*. New York: Oxford University Press.

Kushlan, J. A. 1978. Feeding behavior of North American herons. *Auk*, 93: 86-94.

Mayntz, M. (2012). Roseate spoonbill. com/od/birdprofiles/p/Roseate-Spoonbill.htm.

McKilligan, N. G. 2005. *Herons, Egrets and Bitterns: Their biology and conservation inAustralia.* Clayton, Austrailia: Commonwealth Scientific and Industrial Research Organization, 144.

Pinkas, L.M., S. Oliphant and I. L. Iverson, 1971. Food habits of albacore, bluefin tuna, and bonito in Californian waters. *California Fish and Game* 152: 1-105.

Scott, D. 1984. The feeding success of cattle egrets in flocks. *Animal Behaviour* 32: 1089 - 1100.

Seedikkoya, K. P. A. Azeez and E. Shukkur (2005). Cattle egret *Bubulcus ibis* habitat use and association with cattle. *Forktail* 21: 174–176.

Sharah, H. A. 1998. Breeding biology and feeding ecology of cattle egrets, *(Bubulcus ibis L.*)in north-eastern Nigeria. Ph.D. Thesis, University of Maiduguri, Nigeria.

Sharah, H.A., E.A. Ali and I.D. Mohammed 2008. The feeding behavior of the cattle egrets, (*Bubulcus ibis* L.) in northeastern arid zone of Nigeria. *J. Agri. Soc. Sci.,* 4: 6–12.

Siegfried, W. R. 1971. Feeding activity of the cattle egret. *Ardea*, 59: 38-46.

Taylor, I. R. and M.C. Schultz 2008. Breeding seasons' diets of egrets in South East Australia. *Waterbirds*, 31(4), 593-601.

Yu-Seong, C., I. Kwon and J. Yoo 2008. A study of feeding methods in five species of herons and egrets in Korea. *Journal of Ecological and Field Biology.* 31(2): 147 – 151.