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Diet Behavior of the Cattle Egret (Ardea Ibis) in the Tebessa Region (Eastern Algeria)

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ABSTRACT

A total of 96 pelots of the Cattle egret were explored in order to assess their morphological and quantitative aspect. The diet of this bird was composed of: invertebrate and vertebrate prey. Invertebrate prey, especially insects, account for the majority of items consumed in terms of the number of individuals (96.14%) reaching their peak during the summer period with 98.96%. They present high diversity diet during all the periods of the life cycle, mainly during breeding period; the Shannon index was equal to 3,477 bits with a high abundance in May with a number of items of 963. The values of the index of equitability were significantly the highest during the major months of study. This result of prey population variation is in equilibrium which confirms the opportunists feeding behavior of this species.

Keywords: *Cattle Egret, Ardea Ibis, Tebessa, Life Cycle, Opportunists Feeding Behavior.*

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1. INTRODUCTION

In nature, adaptation is the key for many forms of survival and expansion. In bird's community, the Cattle egret (*Ardea ibis*) is one of the good examples of adaptation noted in the worldwide expansion: from Africa it has become cosmopolitan today, extending to the six continents. This species also breeds in the region of Tebessa (Sbiki, 2008), which is the only colony that coexists with another wader: The white stork (*Ciconia ciconia*), has close to 300 pairs. It is located in the farm "Djenna" (El-Merdja) corresponding to our study area. This contribution aims to study the feeding niche of the Cattle egret (*Ardea ibis*) during the different periods of its life cycle. Scientific investigations concern both qualitative and quantitative composition.

2. MATERIALS AND METHODS

2.1. Study area

The study area is the Tebessa region, the sample area is El-Merdja (North-East of the district Tebessa) in the "DJENNA" farm, where the present study was conducted. The region of Tébessa (35 ° 28 'N, 08 ° 07' E) is located in the northeastern part of Algeria. It is limited by successor from West to East in the following way: OUM EL -BOUAGHI and KHENCHELA, the Algerian-Tunisian borders, and by SOUK-AHRAS in the North, while in the South by EL-OUED. This district is located in the Mediterranean semi-arid climate characterized by cold winter.

2.2. Methods

Our study was carried out during the period October 2013 and September 2014. A total of 96 pelots were analyzed covering almost a life cycle of the species (8 pelots / month). The work in the laboratory followed the following steps:

- The pelots collected are subject to measurements, weighing and an overall description
- Dissection of the pelots is done after maceration for a few minutes in the water.
- One by one, the pelots are crushed using tongs and needles to collect all the undigested fragments.
- The systematic determination of the items up to the families will be carried out under the microscope binocular based on the different keys of identification.

2.3. Data analysis

The characteristics of Cattle egret rejection pelots are taken up considerably. In terms of quality, the adult food spectrum (classes, order and family) is treated globally and according to the life cycle periods of the species. These results are exploited using ecological indices such as richness and abundance, Shannon's diversity index and the equitability index followed by statistical techniques (A.F.C).

3. RESULTS

3.1. Characteristics of rejection pelots

The results concerning the physical characteristics (dimensions and dry weights) of 96 pelots are grouped in Table 1:

Table 1. Measurements and mean weighings of Beef Cattle rejection pellets from the El-Merdja region (Tebessa) during the study period (October 2013 - September 2014) (N = 96 pelots).

	Maximum	Minimum	Mean
Length	50,02	10	33,25 ± 8,69
Width	35,31	6	18,65 ± 7,26
Weight	8	0,5	3,42 ± 1,3

While these parameters for each life cycle period of the species are reproduced respectively by the following Figures:

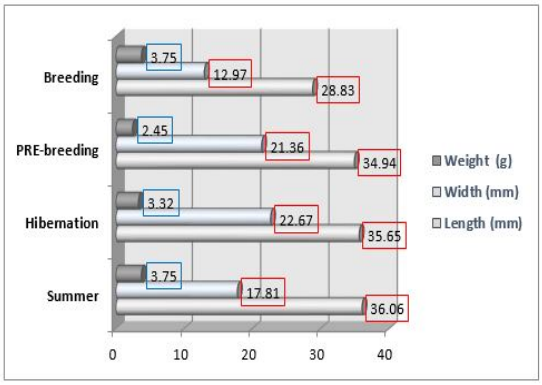

Figure 1. Mean measurements of Cattle rejection pellets from the El-Merdja region (Tebessa) during each period of its life cycle

The mean length values are close, even though the greatest value of the mean is recorded during the summer. We find that the highest value of the mean for the width corresponds to the pelots of the wintering period. Regarding the weights, we notice that the means are almost close and it is during the summer and breeding period that the pelots record the most important values.

3.2. Qualitative analysis of the diet of the Cattle egret (*Ardea ibis*)

During our study, 5727 items were explored, we counted as a total of 38 families divided into 6 classes and 16 orders, of which four (04) orders and ten (10) families remain undetermined.

3.3. Classes of prey

The cattle egret had a varied spectrum of diets whose consists of: 6 classes (Insecta, Arachnida, Annelida, Birds, Mammifera and Reptilia) of different sizes. Its diet is composed of invertebrate prey and vertebrate prey. Invertebrate prey represents the majority of species consumed with a total of 5681 prey (99.19%). There are 46 vertebrate prey species (0.80%). Among the invertebrates consumed, the class of insects largely dominates with 5506 items (96.14%). The composition of their diet undergoes a great variation according to the periods of its biological cycle (summer, wintering, pre-breeding and breeding and rearing of chicks) due to changes in ecological conditions of the environment (Tab.03). There were three categories of prey (Insecta, Arachnida and Birds) regularly recorded. Different proportion with a constant dominance of the class of insects reached a maximum during the summer period that corresponds to a prey number of 1480 or 98.66% of the total prey consumed. The class of mammals appears only at the summer period of the cycle with a number of 6 individuals, representing a small percentage. Classes of Annelids and Reptiles are rarely consumed in two different periods only with percentages not exceeding 0.4% (Table 2).

3.4. Orders of prey

The class of insects includes 8 orders (Orthoptera, Coleoptera, Dermaptera, Heteroptera, Hymenoptera, Homoptera, Diptera and Nevroptera) where the order Orthoptera is the largest with 58.30%, followed by the orders Coléoptera and Dermaptera respectively 23, 44% and 15.47% of the total prey species consumed.

Table 2. Prey categories identified in the diet of the Cattle egret in the El-Merdja region (Tébessa) according to life cycle

	Summer	Winter	Pre-breeding	Breeding
Insecta	98,66%	96,43%	92,30%	92,55%
Arachnida	1,13%	2,16%	1,92%	6,92%
Annelida	0,06%	0,38%	0%	0%
Oiseaux	0,13%	0,73%	4,48%	0,25%
Mammifera	0%	0,10%	0%	0,08%
Reptilia	0%	0,17%	0%	0,17%

The remaining orders represent only a small percentage (Figure. 02). While during each period of the life cycle, we find that Orders Coléoptera, Dermaptera, Orthoptera and Hymenoptera regularly appear in the diet of the Cattle egret with different percentages, while the remains are either absent or consumed in small quantities. The order of the Orthoptera which dominates during all the periods of the cycle except in pre-breeding period, is replaced by the order Coleoptera (40,97%).

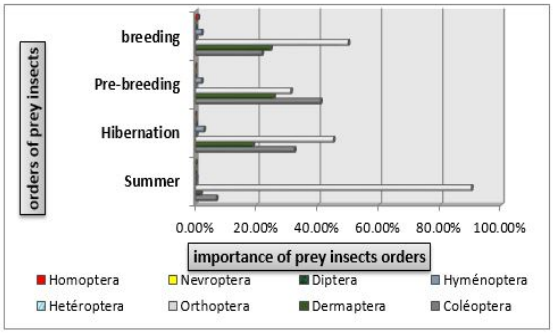

Figure 2. Orders of prey insects identified in the diet of the Cattle egret in the EL Merdja region (Tebessa) according to the life cycle

3.5. Family of prey

Out of a total of 8 orders of prey insects, we identified 33 families of insects. The high number of families of prey insects identified in its diet obliges us to limit these identified families to those that are important and regular. Which will be taken into consideration are only those whose prey number is equal to or exceeds 50 individuals per family. The family Acrididae (Orthoptera Order) is the largest family with a population of

3210 (50.08%). According to the different periods of the cycle (Figure 02), we find the regular presence of certain families during all the periods of the cycle. Also the Acrididae family remains the family consumed in priority during all study periods with different importance is 81% in summer, almost 42% in winter, 29% in pre-breeding and 37% in breeding season.

3.6. Ecological indexes

The diet structure of a broad-spectrum food species represents results in the following table (Table 03).

- It is reported that it is during the month of August, that the Cattle egret guard bulls is ingested the largest number of prey, whose Acrididae (Order Orthoptera) dominates his meal.
- The total wealth per month is between 21 families in May.
- It is noted that the values of Shannon diversity index are variable, the highest value being recorded during the month of April while the low during the month of May.
- Some values of equitability are close to 0. The max records during the month of August, with values of 0.805 bits which means that this wader is an opportunistic bird.

Table 3. Values of the different ecological indices of the prey of the Cattle egrets in the Tebessa region between October 2013 and September 2014

Months	Jull.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Jun.
Abundance	534	963	534	476	630	398	387	165	147	228	526	404
Richness	20	18	20	20	15	20	17	18	18	20	21	18
Shannon index	1,75	1,12	1,75	2,41	2,37	3,03	2,85	3,30	3,10	3,47	2,28	3,08
Equitability index	0,40	0,27	0,40	0,55	0,60	0,70	0,69	0,79	0,74	0,80	0,52	0,73

4. DISCUSSION

Our results show: 1) absence of the Myriapoda class, 2) similarity of the values for the other classes. Sbiki (2008) reports a proportion of this class with 92.75% out of a total of only 3 classes (Insecta, Arachnida and Reptilia). Setbel (2008) noted that it feeds heavily on insecta with rates ranging from 92.2% in Boudouaou to 97.9% in Mascara. The dominance of insects is also reported by Si Bachir (2005) in the region of Bejaia but of less importance is 88.5% out of a total of 8 classes (Gasteropoda, Arachnida, Myriapoda, Insecta, Amphibia, Reptilia, Birds and Mammifera). The consumption of Arachnids has a significant proportion in certain regions that those of our results (2.84%): 4% in South Africa (Siegfried, 1971), 10.02% in Ebro Delta, Spain (Ruiz and Javer, 1981) 12.2% in Veracruz, Mexico (Torres and Mayaudon, 1972), 6% in Florida (Gassett et al., 2000). It is 7.4% in the Boudouaou region (2001) in the Metidja, while it represents a small proportion in the Soummam Valley 0.2% (Si Bachir et al., 2000). Our study indicates that among the invertebrates, it is the Orthoptera which generally dominate the composition in number of the feed of the Cattle egret. As early as 1942, Kadry-Bey reported in Egypt 53.7% of species of Orthoptera in the feeding of the Cattle egret; Burns and Chapin (1969) report 77% of southern Louisiana. In North Florida, the rate is even higher at 96.8% (Fogarty and Hetrick, 1973). In Algeria, Doumandji et al. (1992) estimated 78.8% of Orthoptera in Drâa EL-Mizan, while Si Bachir et al. (2000) found 63.2% in the Soummam Valley. Least in other regions such as in the Boudouaou region (Metidja) (Setbel et al., 2004). However, it seems that the percentage of Orthoptera consumed decreases on the one hand in the island regions and on the other hand during breeding in the spring and summer (Doumandji et al., 1992). It is the same for the order Coleoptera (considerable proportions), Dermaptera, Hymenoptera. Our results do not differ much from those recorded by Selmane (2009) except for the absence of Neurotrophs and Homoptera with a considerable increase in the consumption of Dermapteres which reaches 15,47%. Boukhtache (2010) in the region of Batna, indicates that during the period of breeding, it consumes Orthoptera with a rate of 46.12%.

These results are different from those obtained by Si Bachir (2005) when he noticed the lack of hibernating Orthoptera which caused the Cattle egret to feed on alternative prey (swaying in Switching prey consumption). Contrary to the results obtained by Doumandji et al., (1992) where the percentage of Orthoptera consumed decreases during the breeding period. Bredin (1984) reports that during this period the choice is focused on the Orthoptera as we found. Fish consumption is rare (Hafner 1977, Bernis and Valverde, Herrera in Bredin 1984), but we noticed their absence. Regarding the total abundances of prey, the difference between the cycle seasons will be explained by the difference in the hardness of each period (only one month: March for pre-breeding). While for total wealth, Boukhtache (2010) records values of this parameter higher than our work, from which it gets a maximum value of Total Wealth in June with 80 prey species followed with values of 64 and 62 in March and July respectively. Setbel (2008) noted that the values of total wealth are less than that of Boukhtache (2010). They vary between 39 species found in August in 10 regurgitates and 54 species recorded in June in 58 regurgitats in 2001 in Tizi Ouzou. Similarly, in Hadjout in 2006, 68 species are recorded in 8 pelots in June and 75 species in May. Generally, Shannon-Weaver values are between 1.5 and 3.5 Bits which means the greatest diversity of his diet which ensures opponent. According to the periods of the biological cycle, it is the summer period which records the low values of the index of diversity which explains by the preference of the bird in its regime to the families of the Acrididae. The other periods noted generally large diversity with very significant diversity during the breeding season. Compared with that obtained by Boukhtache (2010), a greater diversity is recorded, the great value of the Shannon index is noted during the month of June followed by the month of April with 5.2 Bits and 5.1 Bits respectively. The values remain larger for all months. Taking each station separately, Setbel (2008) found that the overall value of H 'the most important is that of Hadjout with 5.80 Bits followed by that of Tizi Ouzou with 5.26 Bits, then by Redim with 5 Bits, by Boudouaou with 4.66 bits, by Bouira with

3.93 bits and by Mascara with 3.87 bits. The low values of E can be explained by the imbalance between the numbers of prey species since the family Acrididae (Order Orthoptera) dominates during these months (almost all prey tends to be concentrated on a single family). Boukhtache (2010) in the Batna region noted that the equidistribution of the different categories of prey consumed during the breeding season shows higher values for cattails with 0.9 in April. Concerning the pelots collected by Setbel (2008), the values of E fluctuate from one station to another whose stations where the levels of pelots with values of E greater than or equal to 0.5 are that of Bou Redim (89, 3%), Tizi Ouzou (96.4%), Bouira (95%), Boudouaou (98.1%), Hadjout (100%) and Mascara (100%). It should be noted that these results obtained for each study are for a different number of pelots.

Finally, the Cattle egret shows a great capacity of ecological adaptation. It can thus develop a feeding strategy adapted to the changes in the ecological conditions of the environment, notably by the seasonal variation (monthly) of the composition of his diet in relation to the food needs of the species according to the phenological periods.

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Conflict of interest

No conflict of interest disclosed for this study.

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