CHAPTER –3

FOOD HABIT OF SELECTED BIRD SPECIES

Cattle Egret study

1. Introduction

Birds are potentially excellent agents of natural pest control (Sweetman, 1958; Hassell, 1985), as most of the species are highly mobile and can disperse over a large area, and are able to concentrate quickly in large number when a sudden outbreak of insect pests occurs The 50 % food of more than 1200 species of birds in Indian subcontinent consists of Insects (Ali and Ripley, 1983) Some colonial bird species are specially adapted to exploit abundant food, such as insect pest with cyclic population fluctuations Because of their high metabolic rate (Walsberg, 1983), they can be voracious eaters and they can increase their potential to eat large quantities of insects, especially during the breeding season (Holmes, 1990)

Cattle egret is a colonial bird belonging to family ardidae. An agricultural field provides feeding ground to cattle egret during all the agricultural operations (Parashara, 1989; Patel, 1991). There are only some studies on food of Cattle Egret (Ikeda, 1956, Mukherjee, 1971; McKilligan, 1984; Sodhi and Khera, 1984 and Patel, 1996b). Most studies of birds preying on insect pest in India are not clearly indicating their role in agricultural pest control. Quantitative research on impact of cattle egret on pest species where neglected largely and hence, failure to consider as natural control agent. To determine the economic status of the Cattle Egret, one needs to have the detailed quantitative and qualitative studies on its food

and its feeding habits. The aim of present study was to determine the abundance of pest species in cattle egret diet and its role in agricultural landscape.

2. Material and methods

2.1. Study area

Kheda district is situated (22°07' 23°18' N 72° 15' 73° 38' E) in the central part of Gujarat state. The total area of the district is 7194.0 sq. km, which is 3.7 % area of Gujarat state. Entire district lies between two major rivers; Mahisagar on the eastern side and Sabarmati on the western side. The southern side is attached to the gulf of Khambhat. Major area of the district encompass of plain land except for a small area in Kapadvanj and Balasinor tashils, which are hilly The region has typically fertile soil, which is popularly known as Goradu soil with loamy sand of alluvial origin.

The district comprises of ten tahsils (administrative unit) and the major area of the district has canal irrigation facility and therefore, irrigated farming is practiced The total cultivated area of the district is 658495 ha (Data from District Agriculture office. Nadiad). Paddy and pearl millet are the major cereal grown in study area during monsoon. The climate of the region is semiarid, tropical monsoon type. Southwestern currents in the summer bring monsoon rain from the third week of June to September end and average annual rainfall of the district is 840 mm.

2.2. Sample collection, processing and analysis

A total of 245 regurgitated samples of food were collected from the nestling of Cattle Egret from 18 colonies distributed in Kheda district (22°07' 23°18' N 72° 15' 73° 38' E) from June to August 1999 and 2000 The nestling of the Cattle Egret regurgitates the food stored in the crop when frightened (Hancock and Khushlan, 1984) The sound was made

below the tree to frighten the nestling, and the food samples were collected just after the peak foraging period, either in the morning (08·00-11·00 hrs) or in the evening (18:30-19:30 hrs).

Immediately after collection each food sample was separately preserved in 70% alcohol. Latter the samples were strained through a 0.5 mm sieve and washed with tap water to remove the foreign materials. The samples were analyzed within 24 hours period of collection. The prey items in each samples were sorted up to the species level using published key (Richards and Davis, 1977; Vyas, 1996) and weighed to nearest one milligram. Occurrence and frequency of prey items in each sample were recorded. The following parameters were calculated:

2.3. Presentation of data

1. Percent Occurrence (% O).

$$\% O = \frac{F_i \times 100}{n}$$

Where, F_i is the number of sample in which *i* th food item was present, n total number of samples analyzed

2. Percent Biomass (% G)

$$\% G = \frac{G_i \times 100}{\sum_{i=1}^{n} G_i}$$

Where, G_i is the wet weight of *i* th food item.

3. Relative Importance Index (RII)

$$RIIi = 100\ AIi / \sum_{i=1}^{n} Gi$$

Where, Absolute importance $AIi = Fi + Ni + Mi^2$, Ni Percentage by number of prey type *i* , F*i* frequency of occurrence of prey type *i*, Mi per cent biomass of prey type *i*, G*i* is the wet weight of prey type *i* th and n number of prey.

3. Result and Discussion

The diet composition of Cattle Egret nestling collected is as follows: the average sample weight was 4.44 mg and the diet consists of variety of animals belonging to different classes (Table 3.1).

3.1. Class

The animals belonging to class insecta was highest in the cattle egret nestling diet by frequency, and occurrence than other class except, the biomass which was equal to amphibias followed by the annelida The frequency of the insects in the diet was 48 times higher than amphibians, annelids were the second highest by the frequency followed by the amphibians (Table 3 1, Figure 3 1)

The Relative Index of Importance for insecta and amphibia in the diet was higher than other classes (Figure 3.2) But of the two the RII of amphibia was slightly higher than the insecta, the annelida formed third relatively important group after insecta and amphibia

Of the (11 orders of) insects present in the diet of the Cattle Egret nestling, the biomass, frequency and occurrence of the orthoptera was highest in the diet than other orders except coleoptera, where its biomass was

Table 3.1: Diet composition of Cattle Egret nestlings (n =245).

Food items (Order wise)	Family	% O	No. Item	Gi (g)	% G
Lepidoptera			**134**	**14.81**	**1.04**
American Boll Worm *Helicoverpa armigera*	Noctudae	2 86	9	0.56	0.05
Tobacco Caterpillar *Spodoptera litura*	Noctudae	22.04	63	6 40	0.59
Armyworm *Mythima separata*	Noctuidae	4 49	18	1.20	0.11
Blue butterfly *Cosmolyces baeticus*	Pyridae	0.81	3	0.20	0 02
Tur Plume Moth	Tupulidae	1.22	4	0.01	0.00
Semilooper larva		2.45	7	3 85	0 35
Unidentified larva		3.67	11	1.20	0.11
Unidentified pupa		4.08	12	0 16	0 02
Unidentified adult		1.22	7	1 23	0.11
Coleoptera			**565**	**132.57**	**12.17**
Tiger Beetle *Arthia sexguttata*	Carabidae	9.79	24	4 80	0 44
Bombardial Beetle *Brachinus crepitans*	Carabidae	7.35	19	2.06	0 19
Water Beetle *Dytiscus marginalis*	Dytiscidae	8.57	21	5 07	0.47

Water Beetle *Naterus sp.*	Dytiscidae	12.24	32	7.01	0.64
Chafer *Anomala benghalensis*	Melolonthidae	31.02	82	22.08	2.03
Chafer *Anomala dubia*	Melolonthidae	12.24	35	4.62	0.44
White Grub *Autoserica nathani*	Melolonthidae	20.41	55	7.41	0.68
White Grub *Holotrichia sp.*	Melolonthidae	46.94	129	51.06	4.69
Dung Roller Beetle *Heliocopris bucephalus*	Scarabaeidae	8.98	24	7.01	0.64
Mylocerus Weevil *Myllocerus sp.*	Curculionidae	15.51	42	4.93	0.45
Unidentified Weevils		4.9	21	3.00	0.27
Click Beetle	Elaterridae	5.71	17	3.70	0.34
Elytrid larva	Elaterridae	13.06	42	6.21	0.56
Other coleopteran		6.12	22	3.61	0.33
Orthoptera			**860**	**129.31**	**11.88**
Surface Grass Hopper *Chrotogonus saussuri*	Acrididae	93.88	274	32.88	3.02
Mole Cricket *Gryllotalpa gryllotalpa*	Gryllotalpidae	38.37	97	6.79	0.62
Paddy Grass Hopper *Hieroglyphus banian*	Acrididae	98.78	261	60.03	5.51
Phadka Grass Hopper *Hieroglyphus nigrorepletus*	Acrididae	28.16	73	6.57	0.61

Desert Locust *Schistocera gregaria*	Acrıdidae	5.71	15	7.80	0.72
Comman Cricket *Acheta domesticus*	Gryllidae	40	117	10.61	0.97
Tettigonidae		8.16	23	4.63	0.43
Odonata			**64**	**7.46**	**0.69**
Dragonfly *Plathemis lydia*	Aeshnoidae	13.06	34	5.06	0.47
Damselfly *Enallagma exsulans*	Agrionıdae	2.45	9	1.23	0.11
Comman Mayfly *Stenonema canadense*		7.76	21	1.17	0.11
Diptera			**2185**	**29.13**	**2.68**
Syrphidfly *Tabanus striatus*	Tabanidae	20.4	372	5.34	0.49
Food items (Order wise)	Family	% O	No. item	Gi (g)	% G
Food items (Order wise)	Family	% O	No. item	Gı (g)	% G
Fruit Fly *Dacus spp*	Trypaneıdae	13.06	85	4.71	0.44
House Fly *Musca domestica*	Muscidae	38.78	1608	14.07	1.29
Bluefly		18.78	120	5.01	0.46
Dictyoptera			**168**	**7.04**	**0.65**
Comman House Cockroach *Periplanata amerıcana*	Epilampridae	8 57	111	5.03	0.46

Mantid *Mantis sp.*	Mantidae	5.71	57	2.01	0.19
Dermeptera			**150**	**4.72**	**0.43**
Comman Earwig Comman Earwig	Lapiduridae	22.86	92	3.55	0.33
Earwig *Labidura reparia*	Lapiduridae	16.73	58	1.17	0.10
Hymenoptera			**104**	**5.17**	**0.47**
Black ant *Camponotus levigatus*	Formicidae	10.20	28	0.63	0.06
Comman Wasp *Vespula sp.*	Vespidae	1.16	9	1.04	0.10
European Honeybee *Apis mellifica*	Apidae	4.90	21	1.63	0.14
Indian Honeybee *Apis indica*	Apidae	5.71	17	1.03	0.09
Little Honeybee *Apis florea*	Apidae	9.80	29	0.84	0.08
Hemiptera			**72**	**21.13**	**1.94**
Pegion pea Pod Bug *Clavigralla gibbosa*	Coreidae	0 41	3	0.46	0.04
Bug *Scutellera sp.*	Pantatomidae	1.63	7	0.96	0.09
Red Cottan Bug *Dysdercus cingulatus*	Reduvidae	2.45	12	4.68	0.43
Giant Waterbug *Belostoma indica*	Belostomatidae	2.04	10	8.50	0.78
Water Boatman *Sigara sp*	Corixidae	0.82	6	5.56	0.51

Bug? *Coranus spp.*	Reduvidae	0.41	2	0.31	0.03
Brown Plant Hopper *Nilapervata lugens*		2.86	32	0.66	0.06
Isoptera			**312**	**25.41**	**2.33**
Termite *Odontotermes obesus*	Termitidae	8.57	312	25.41	2.33
Phasmida			**7**	**0.48**	**0.04**
Stick Insect *Necroscia pholidotus*	Phasmatidae	0 41	2	0.13	0.01
Leaf Insect		0.83	5	0.35	0.03
Unidentified insect matter			-	10.32	0.95
Total insect matter			**4621**	**387.55**	**35.59**
Arachnida			**338**	**8.64**	**0.79**
Spider?	Aranedae	29.39	337	7.47	0.69
Scorpion	Scorpionidae	0.41	1	1.17	0.10
Annelida			**551**	**132.48**	**12.17**
Leech *Hirudinaria granulosa*	Suctoria(class)	36.73	121	52.00	4.78
Earthworm		49.39	430	80.48	7 39
Myriopoda			**70**	**9.72**	**0.89**

Milliped *Iulus sp.*	Chilopoda	13.06	52	5.71	0.52
Centiped *Lithobius*	Diplopoda	2.04	18	4.01	0.37
Amphibia			**95**	**409.54**	**37.61**
Indian Comman Toad *Bufo melanostictus*	Bufonidae	2.04	14	51.06	4.68
Food items (Order wise)	Family	% O	No. item	Gi (g)	% G
Marbled Toad *Bufo stomaticus*	Bufonidae	0.83	4	13.01	1.19
Uperodon sp.	Microhylidae	3.26	17	68.02	6.25
Euphlyctis cyanophlyctis	Ranidae	3.67	12	195.01	8.93
Indian Bull Frog *Hoplobatrachus tigerinus*	Ranidae	6.12	27	115.71	10.63
Pond Frog *Occidozyga cynophlyctis*	Ranidae	7.34	21	66.73	6.13
Reptelia			**32**	**46.01**	**4.23**
Yellow-green House Geco *Hemidoctylus flaviviridis*	Gekkonidae	0.41	1	5.03	0.46
Indian Garden Lizard *Calotes versicolor*	Sincidae	0.83	4	9.93	0.91
White Spotted Supple Skink *Lygosoma albopunctata*	Sincidae	1.22	3	3.71	0.34
Bronze Grass Skink *M. macularius*	Sincidae	1.22	4	5.02	0.46
Keeled Grass Skink *Mabuya carinata*	Sincidae	4.89	14	5.00	0.46

Fan-throated Lizard *Sitana ponticeriana*	Sincidae	1 22	5	12.40	1.14
Indian Flap shell Turtle *Lissemys punctata*	Trionichidae	0.41	1	5.00	0.46
Pisces			**37**	**72.86**	**6.69**
Mosquitoeating Fish *Haplochilus sp*	Aplocheilidae	12.26	37	72.86	6.69
Mammalia			**3**	**20.60**	**1.89**
Rat *Mus spp*	Muridae	0 82	3	20.60	1 89
Unidentifide non-insect matter		0 82	-	1 95	0.18
Total non insect matter			**1126**	**701.34**	**64.41**
Grand Total			**5747**	**1088.89**	**100**

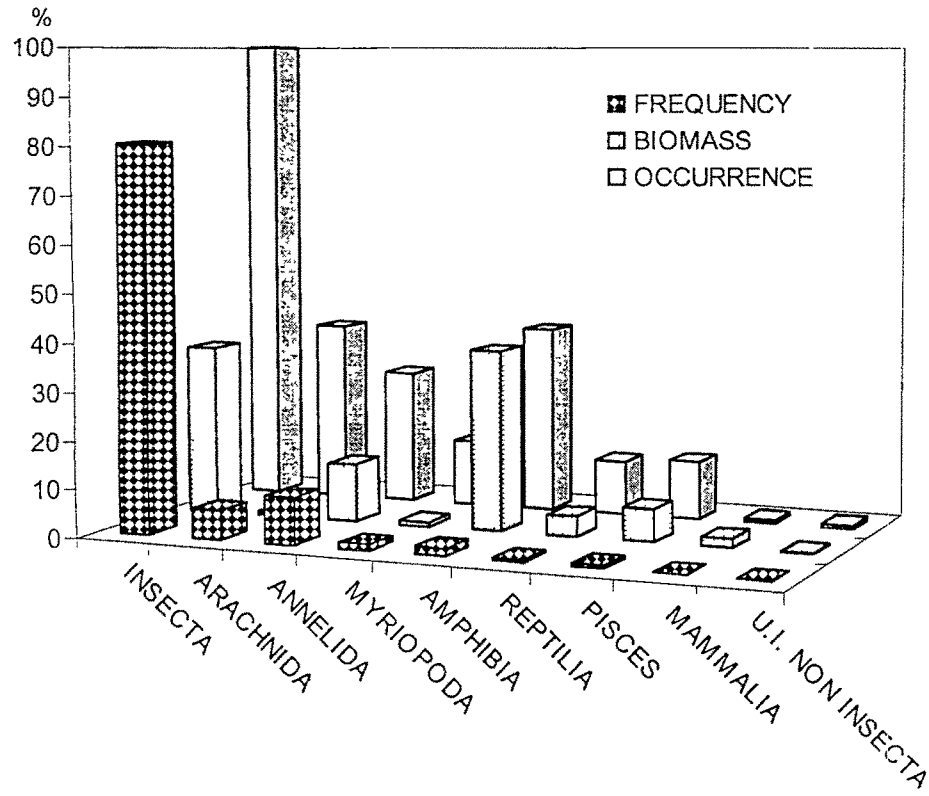

Figure 3.1: Prey consumption by the Cattle Egret nestlings

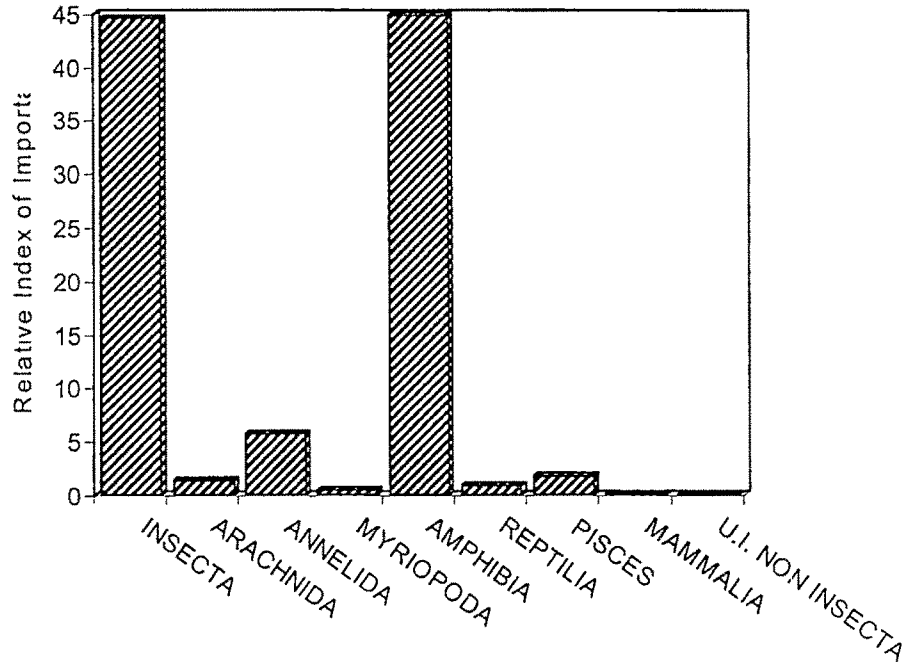

Figure 6.2: Relative Index of Importance of prey items in the diet

slightly higher The diptera was third important order in the diet. However the importance of other orders was minor and was *at par* with each other

3.2. Prey Item

Total 5747 items of 66 different species belonging to 41 different families were recovered from the diet (Table 3.1). The total identified species were 48 insects and 18 non-insects. The diversity of insects amongst the prey items in the diet was 2.78, which was higher compared to non-insect matter in the diet (2.23).

Out of 77 prey items identified 32 were harmful, 19 beneficial, 3 neutral and 23 remained unconfirmed for their role in agriculture in the study area Of the total 5747 items recorded in the diet, 3785 were harmful, 1192 beneficial, 72 neutral and 698 remained unconfirmed in their role in the environment (Figure 3 3) Amongst the harmful prey items recorded, Surface grasshopper and Paddy grasshopper were highest except the housefly by frequency Syrphid fly was highest by number in the beneficial group

3.3. Monthly variation

The monthly variation in the composition of Cattle Egret nestling diet was well documented and is shown in Table 3.2. The importance of occurrence orthopteran and amphibian decreased gradually while other groups fluctuated slightly. The coleoptera, lepidoptera amongst the insects and pisces and mammals amongst the non insects increased over the time, isoptera and annelida were maximally shown to be consumed during July but decreased then with progress of breeding season. Consumption of diptera, lepidoptera, hemiptera, hymenoptera and reptilia once decreased and after that increased over time It was thus evident that insect was the main prey during July but showed gradual decline during August

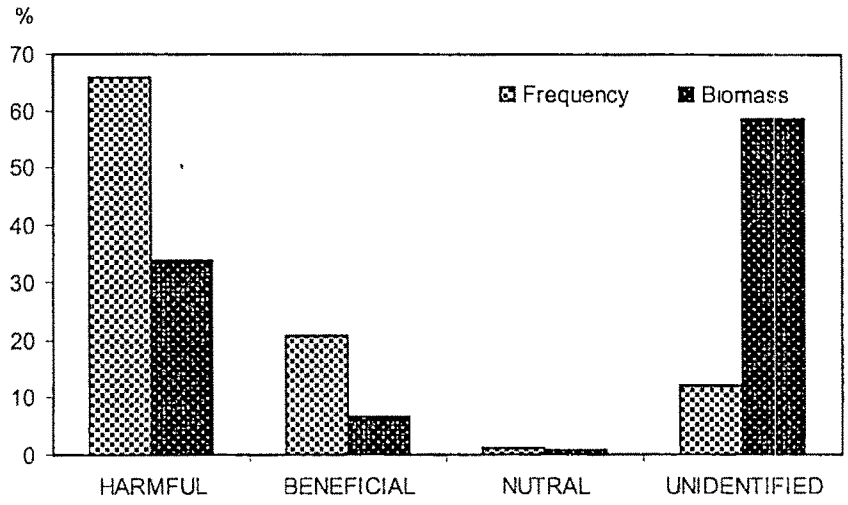

Figure 3 3: Classification of prey items with respect to its role in agriculture.

Table 3.2: Monthly variation in diet (%G) of Cattle Egret nestling (n=245).

Sr. No.	Food items (Order wise)	June	July	August
1	Lepidoptera	0.91	0.68	3.49
2	Coleoptera	11.10	10.84	17.08
3	Orthoptera	13.34	11.16	9.40
4	Odonata	1.17	0.12	0.43
5	Diptera	3.43	1.77	2.33
6	Dictyoptera	0.53	0.16	1.80
7	Dermptera	0.48	0.26	0.61
8	Hymenoptera	0.46	0.36	0.72
9	Hemiptera	1.97	0.88	3.70
10	Isoptera	2.03	3.78	0.48
11	Phasmida	0.09	0.00	0.00
12	Unidentified insect matter	0.72	1.50	0.56
	Total insect matter	**36.23**	**31.51**	**40.60**
13	Arachnida	0.99	0.60	0.62
14	Annelida	8.55	20.15	7.58
15	Myriopoda	0.63	1.25	0.93
16	Amphibia	44.05	32.96	29.31
17	Reptilia	5.72	2.13	4.11
18	Pisces	3.37	7.88	13.07
19	Mammalia	0 00	3.52	3.63
20	Unidentified non insect matter	0.37	0 00	0.00
	Total non-insect matter	**63.77**	**68.49**	**59.40**
	Total	**100.00**	**100.00**	**100.00**

3.4. Impact on agriculture

The insecta and amphibia were important component in the diet of the cattle egret as revealed from the study. The insects were mainly captured from the agricultural area in the near vicinity while the amphibians were captured from the local water bodies and reservoirs near the heronries (*pers. obs.*). The study clearly indicates that 65.86 % of food consists of harmful organism (Mainly the insects) being consumed by the Cattle egrets. The avian community structure foraging in the agricultural landscape was recorded during various agricultural operations (Table 3.3, Plate II). The cattle Egret was seen attending all the operations. The occurrence of the Cattle Egret during various cultural operations was found to be higher than other avian species. They were also found feeding in association with 52 other bird species.

It is a generally accepted fact that certain avian predators consume large number of insect prey and thus play an important role in regulation of insect population in various ecosystems. The significance of birds in controlling the forest pest was recognized as early as 1335 AD when civic authorities of Zurich (Switzerland) issued an order for the protection of the birds as the enemies of the insect pests (Otvos, 1979). However, birds play an important role in controlling agricultural pests was identified by Ali (1949) There is a general tendency to view the harm that the bird do is probably because, most of the land birds feed on grains, vegetables and fruits The fact remains ignorant that most of them also feeds on insect pests. Most of the insectivorous birds are facultative feeders utilizing multiple prey species opportunistically.

Though the non-insects matter was predominantly present in terms of relative mass but the consumption of insects were 4 times higher when frequency was considered. It revealed the importance of the insect matter

Table 3 3: Importance of Cattle Egret during various cultural operations.

Cultural Operation	No. Observation	Total Species	Cattle Egret	
			%O	R. A.
Harvesting	7	12	85 71	29.37
Threshing	10	17	90.00	11 55
Harvested	22	52	45 45	4 62
Ploughing	7	24	100 00	37.64
Irrigation	4	17	50 00	3.36
Inundated	4	17	50 00	10.42
Uncultivated	10	17	90.00	3.60

Note· %O = Per cent occurrence

R.A = Relative abundance

Plate II. Cattle Egret Foraging in agricultural field.

for the development of the nestlings at the same time the analysis reflects the importance of the presence of this Cattle Egret in controlling insect pests. Since the entire district is under intensive cultivation, the types of crop grown and their relative proportion determined the prey availability and their relative abundance. Besides this, relative abundance of the various prey type was also influenced by the crop stage and different farm operation-taking place during the study period. Abundance of several insect species was strongly influenced by the first rain of the south west monsoon (Anon., 1986). Coleoptera, Isoptera and Hymenoptera in particular are predominant after the first rain. Diet composition is also influenced strongly by the time period of a particular month Several studies have shown that the Cattle Egret is an opportunistic predator and feed on any thing that comes across (Jenni, 1973; O' Connor, 1993) In other words composition of the diet reflects the relative availability in the environment.

All other studies on the nestling diet (Siegfried, 1966; Jenni, 1969; 1973, Meteos and Lazaro, 1986; O' Connor, 1993) have shown that insects formed a major component of the diet. However, in the present study insects formed the minor component of the diet, where heronries were situated near water bodies relatively far from agricultural area. The study site of Jenni (Florida), Siegfried (South Africa), Meteos and Lazaro (Spain) and O' Connor (South Africa) were natural habitat away from the agricultural area and thus the composition of the diet of the nestling were different. Studies at Punjab by Sodhi and Khera (1984), showed that insects contributed only 32.9 % G, whereas amphibians contributed 45 5% G in the diets of the nestling. Our present findings were somewhat similar to them, as both the studies were carried out in intensively cultivated area.

Amongst the insects the most preferred orders are Orthoptera, Coleoptera and Lepidoptera and are very well documented (Kadry, 1942; Heubeck,

196; Martin *et al.,* 196; Burns and Chapin, 1969; Seigfried, 1971b, Fogarty and Hetrick, 1973). Several insects species identified from the diet are known pests of agricultural crops. Hence the foraging activities of the egrets are beneficial to the farmers and mankind. As a matter of fact, the farmers knows the role of egrets in insect pest control and hence, he allows the egrets to feed on his crop fields and also allows them to make nest within the village.

Apart from other animal composition, for the first time we recorded a fresh water turtle from the diet, which has never been reported earlier in the diet of the Cattle Egret anywhere in the World. The Cattle Egret selectively consumes the insect pests and feed the same to its young ones. Predatory pressure on insect pest during monsoon (Breeding period) is immense because the egrets have to feed their young ones Hence, the foraging activities of the cattle egret are highly beneficial to agriculture. Thus, the present study has established that the Cattle Egret is a powerful bio-control agent in controlling the agricultural notorious pests. For the same reason the Cattle Egret enjoys protection from the people while nesting within the human habitation. Thus this study highlights the maximum advantage of Cattle Egrets in insect pest management and perhaps new can call Cattle Egret as a eco-friendly bird

Black-throated Weaver Bird

1. Introduction

The Black -throated Weaver Bird has a continuous and conspicuous distribution, chiefly in northeastern and northwestern parts of the country (Ali and Ripley, 1983) The Black-throated Weaver Bird is the most common and most abundant bird in Gujarat and found in various parts of the state (Ali,1949, Dharmakumar Sinhji, 1977).

The Black-throated Weaver Bird is another predominant species in the study area and are closely associated with the agricultural field basically for foraging, breeding and roosting. They frequently occupy the cropped area for different activities. Hence the chance of exposure to pesticides is high through different routes. However, the major route for pesticides entry is oral through consumption of food contaminated with various pesticides So it is important to do analysis of the diet and the place from where the food was obtained Information on the diet composition of Black-throated Weaver Bird is not available in details except for a few occassoinal studies (Dhindsa and Toor, 1990) Looking to these facts the present study was aimed.

2. Materials and Methods

The Black-throated Weaver Bird was collected from the roosting sites after the sunset during July 2000. The evening hours and the roosting site was selected to get maximum bird caught with full gut content. Total ten individuals were caught using mist net. The periodically entangled birds in the net were collected and immediately brought to the laboratory. The birds were weighed and sacrificed using ether. The gut content was removed individually dissecting them. Each sample was marked and analyzed separately The different food component were sorted out using Zoom Stereomicroscope and weighed with physical balance. The separated diet components were oven dried at 60° C for 98 hours to obtain a constant weight. Collectively, all the data was analyzed using parameters like frequency, percentage occurrence, and relative total mass and percentage biomass The details of the same are as described earlier under section Cattle Egret in this Chapter.

3. Result and discussion

During the month of July 2000, total 10 birds were collected and their gut content was analyzed using gravimetric methods. The findings of this study are presented in Table 3.4.

The result obtain indicate that the diet of the Black-throated Weaver Bird chiefly consists of plant material. The very little of animal material was found during the study period. It might be due to the fact that the animal food consumed is given immediately to the growing young ones. On the contrary, as reported by Patel 1996 that the diet of the nestling mainly constituted of animal mater during June–July. But as the availability of plant matter was relatively more as the study period coincides with the peak showing season for different cereal crops in the study area (Agricultural extension). Rice was the major food item; it was higher by percentage of occurrence and percentage biomass, followed by *E.Crusgalius.* It reflects that the birds had foraged on newly seeded rice grain filed from the nursery, as it was easily accessible and available during the period of consumption Secondly the major crop of this area is also paddy, which has showed its influence in consumption. Specifically broadcasting does the seeding and as a result many of the seed remained exposed on the ground, which is thus more easily available to the birds (consumers).

While E.Crusgali is the plant growing on the farm hedges and is a major weed with the cultivable crop. During this period Echinicoloa was also available either as shoed crop or on the edges of the farmlands.

The study indicates that the adult Black-throated Weaver Bird diet was mainly dependents on availability of various food components (grains), species food preference and the status of the species (breeding). Thus

Table 3.4: Diet composition of adult Black-throated Weaverbirds (n=10)

Sr. No.	Food item	% Occurence	% Biomass
	Plant matter		
1	Rice	80	42.1
2	Bajra	20	2.4
2	Sorghum	10	1.0
4	*Echinoloa colonum*	30	2.0
5	*E. crusgali*	70	38.6
	Total		12.0
	Animal matter		
6	Lepidoptera	20	0 4
7	Coleoptera	10	0.1
8	Orthoptera	10	0.2
9	Isoptera	40	0.3
10	Arachnida	10	0.1
11	Mollusca	60	0.8
	Total		1.9
12	Grit	100	
	Grand total		100

from the results data recorded it can be concluded that the rice as the major selected grains followed by *E. Crusgalis* seeds governed by the factor of abundance in the environment. It was also important to note that the insect matter was very less in the diet of the non-breeding birds.

The adult Black-throated Weaverbirds are mostly granivore. The preference for bajra is higher than rice but availability of bajra crop is lower than the rice (Dhinsha and Toor, Mathew 1976, Patel 1996). Rice is intensively cultivated in largescale in the study area. Hence, utilization of paddy crop in agricultural landscape of Kheda and Punjab is observed higher than rest of the grain crops. Simultaneously, pesticide utilization is also higher in paddy crop has increse the chance of exposure of the species to pesticide. Black-throated Weaver Birds also prefers to weed seed *E. colonum, E. crusagulis, Setaria* sp. Occurring in the paddy fields ((Dhinsha and Toor, 1990; Mathew,1976; Patel, 1996a). Nestling of Black-throated Weaver Bird mostly fed with animal matter from agricultural area (Patel,1996a). There was no difference in total amount of plant and animal matter recovered from both sexes (Patel, 1996a). He has observed the seasonal changes in food habit; the component in the diet was as follow: October to January is rice; bajra from April to October ranging from 6.8 to 89.6 percent. The food was more diverse during May to October and March to April. The quantity of food (dry weight) also varied seasonally.

It is evident from the studies on Cattle Egret and Black-throated Weaver Bird food habit that both species largely dependent on the agricultural ecosystem for feeding. Consequently, the large-scale cultivation of paddy crops has force to depend on the particular crop and also preference for agricultural pest as a component of their diet, which makes natural benefit to agricultural ecosystem. But at the same time there is high risk for exposure of species to pesticides, all the more because of the pesticide residues higher in pest species that have developed high level of

resistance to many group of pesticide due to repeated spraying So the dose to which these avifauna will be exposed gets magnified (biomagnifications) Till today there is no report of these birds being resistant to the pesticides so they are at the risk and this high toxicity of pesticides might perish these birds and affects the agricultural ecosystems and their food web