CATTLE EGRET AS A BIOCONTROL AGENT

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Abstract

Cattle Egret, *Bubulcus ibis*, one of the most common wetland birds seen in a variety of habitats, is seen widely exploiting solid municipal waste dumps rich in maggots of disease spreading house flies and blue bottle flies. Maggots were found in extraordinarily high numbers during southwest monsoon when egrets migrate out of Kerala state to breed. It was found that a single egret removes about 100-150g of live maggots per day acting as an important bio-control agent.

Keywords

Biocontrol agent, Blue Bottle Fly, *Bubulcus ibis*, Cattle Egret, house flies, maggots, vectors, waste dumps

Cattle Egret is one of the most widely distributed herons in our country. Its ability to exploit human-interfered habitats (Subramanya, 1996) even acting as a scavenger (Javed, 1983) is important for its success. It scavenges on invertebrates and fishes, which are usually laid out for sun drying (Seedikkoya, 2003) and has been reported feeding on flies attracted to decaying fish wastes (Reynolds, 1965). The role of this bird in management of insect pests in different agro-ecosystems is also reported (Yadav, 1999; Middlemiss, 1955). In South Africa, they are given much importance as controllers of dipterous pests of cattle (Blaker, 1969). Ali (2002) and Siegfried (1972) have reported presence of prey items such as green blowfly of the family Calliphoridae in the food of this bird. In the present study, an attempt was made to investigate the role of this bird in artificial habitats such as solid waste dumps in Kerala.

Study Area

The study was conducted at Njaliyanparambu (11°12'01.7"N & 75°48'59.8"E), Kundayithode that is being used as a waste-dumping site by the Kozhikode Municipal Corporation in Kerala state. The site extending to about 15ha is located south of Kozhikode city, about 8km by road from the railway station. This yard operating for the last five decades or more receives solid wastes from meat shops, fish and vegetable markets, hotels, groceries and so on. The area is under the strict control of the Municipal Corporation and entry is restricted. From June to September the whole area becomes slushy and soggy; the stink of putrefying waste is intolerable during this period. The waste deposited daily at different locations in the yard remains exposed for a few days. After depositing a large enough quantity of waste at a particular slot, it is covered with soil. The sequence of deposition and covering with soil continue in cycles. This practice of dumping solid wastes in this yard have invited lot of public protests and the municipality is considering installation of a modern solid waste treatment facility to manage the wastes.

Methodology

Data on maggots of houseflies and calliphorids, and percentage composition of the wastes were collected by laying 1x1m quadrats randomly twice a month (1999-2001) at different locations on various decaying waste substances. Separate quadrats were laid for maggots of houseflies and calliphorids. Wastes were classified into five types, namely, chicken parts, hotel wastes, vegetable wastes, fish wastes and miscellaneous items. Counts of maggots and adult houseflies were also made in a few nearby houses in the vicinity of the study site using the same method. Apart from this, the numbers of maggots developing in 500g of decaying meat, fish and chicken discards were also determined. Maggots and adult flies were identified following Nayar *et al.* (1996). Birds were counted regularly within two hours after sunrise at each site by the spot map method formulated by the International Bird Census Committee (1970) and following standard methods (Dickson, 1979; Cody, 1968; Subramanya *et al.*, 1998) using binoculars of 10x50 magnification.

Results

More than 100 tonnes of solid wastes, from various locations of Kozhikode Municipal Corporation, were dumped everyday in the waste dumping yard at Kundayithode. The wastes were composed of a variety of items from shops, vegetable markets, slaughterhouses, hospitals, hotels and residences (Table 1). The materials transported to the yard also included dead cows, sheep, buffaloes and dogs.

Food of Cattle Egrets in the wasteyard

The major food item of Cattle Egrets is insects (Table 2) (Seedikkoya, 2003). They capture a variety of insects from all available habitats. Maggots are abundant in the decomposing wastes and they form the chief food of Cattle Egrets in waste dumps. The Dipteran maggots include mainly of housefly, *Musca domestica* (Families Muscidae) and of Blue Bottle Fly, *Calliphora* sp. (Calliphoridae). Calliphorids being carrion feeders are observed mostly in decaying chicken and fish wastes, while muscids are found mostly in hotel wastes and decaying vegetables. The maggots of muscids are smaller than that of the calliphorids; the length of a third instar muscid larva is about 9mm whereas that of a calliphorid is about 12mm. Relative percentages of these two types of maggots vary according to the composition of the wastes (Table 3). From 500g of decaying fish, Indian Mackerel (*Rastrelliger kanagurta*), 6.7g (170 individuals) of calliphorid maggots were counted.

Most of the dead parts and wastes of organisms dumped in

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Table 1. Percentage composition of wastes in Kundayithode waste dumping yard during 1999-2000

Types of wastes	Percentage
Chicken wastes	22
Hotel wastes	19
Vegetables	23
Wastes from stationery	9
Fish wastes	8
Hospital wastes	4
Miscellaneous	15

Table 2. Abundance of different food items in the gut of Cattle Egret

Type	Number
Amphibia	15
Arachnids	7
Diplopoda	1
Insects	133
Mammals	1
Miscellaneous	9

this waste yard were bundled in plastic sacs or polythene bags. However, scavengers break them open. The maggots feeding on moist decaying inner soft material wriggle all around the surface of the bag, which disintegrates in due course. Since, the larvae are negatively phototactic preferring damp condition, they are seen feeding usually about 5cm below the surface layer of the waste. They move within a range of 10-20cm depending on the dampness of the waste. Some of the decaying fish parts or chicken parts are swarmed by thousands of maggots, which in turn attracts egrets. In East Africa, Cattle Egrets feeding on flies on decaying fish wastes (Reynolds, 1965) and the role of this bird as controller of dipterous pests of cattle (Blaker, 1969) is reported.

Examination of the solid wastes in the fresh deposits in the yard indicated that by the time these wastes reach the yard they are already a few days old; they are collected only a few days after deposition. This delay offers adequate time for the flies to lay eggs and the maggots to develop in sufficient numbers. Normally a muscid takes 8.5-16 days for development from egg to adult and a calliphorid takes 9-16 days (Aravindakshan, 1999). From the wastes, thousands of calliphorid and muscid maggots emerge daily. Thus, this waste yard forms a rich source of easy food for Cattle Egrets. From the numerous maggots in the decomposing waste adult flies emerge everyday, especially in the morning hours, in large numbers. A survey conducted in a house and hotel premises for a period of one year showed that the monthly variation in flies ranged from 3-93 and 3-124 per 1x1m quadrate respectively (Fig. 1). Their number was highest during monsoon when the Cattle Egrets migrate to their breeding sites elsewhere (Seedikkoya *et al*., 2006)

Egret population

The waste yard had a population of Cattle Egrets ranging from 98-386 and 85-254 during the period 1999-2000 and 2000-2001, respectively. The maximum number of the birds was seen from January 2000 to April 2000 and from January 2001 to March 2001 (Table 4). It is seen that areas with freshly

Table 3. Maggots in decaying wastes at Kundayithode waste yard during 1999-2000

S.No	Wastes	Percentage of maggot species	
		Musca domestica	*Calliphora* sp.
1	Chicken parts	5	50
2	Hotel wastes	40	12
3	Vegetables	30	3
4	Fish wastes	7	29
5	Miscellaneous	18	6

Table 4. Abundance of Cattle Egret at Kundayithode waste dump (1999 October to 2001 September)

Month	1999-2000		Monthly Avg	2000-2001		Monthly Avg
	I Week	IV Week	-	I Week	IV Week	-
October	67	129	98	45	85	65
November	163	221	192	121	135	128
December	284	290	287	162	218	190
January	297	309	303	180	224	202
February	324	336	330	202	238	220
March	356	364	360	226	254	240
April	382	390	386	183	117	150
May	177	97	137	124	56	90
June	0	0	0	0	0	0
July	0	0	0	0	0	0
August	0	0	0	0	0	0
September	0	0	0	0	0	0

deposited wastes had more Cattle Egrets than those areas where wastes were deposited earlier. The number of maggots apparently is the factor that determines the abundance of egrets. In a random estimation, it was found that a Cattle Egret made 4000-6000 pecks a day, suggesting that the bird removed about 100-150g of maggots/day. It is also suggestive of the magnitude of the service rendered by the birds in controlling the flies in and around the solid waste yard.

Abundance of egrets was comparatively low during April and May of 2001 than in 2000. Heavy rains in April 2001 might have advanced the northern migration of Cattle Egrets from their feeding ground to their breeding ground. In 2001, the pre-monsoon showers were comparatively heavy and the rains continued until the onset of southwest monsoon. Cattle Egrets were totally absent from June to September except for a few non-breeders. Application of chemicals and other management activities also might have reduced the number of maggots and as a result the number of Cattle Egrets in the location. Bleaching powder was applied in large amounts in 2001 in the waste yard, reducing the maggot population. Operation of a facility to convert the wastes into bio-fertilizers was also initiated causing a decline in the availability of fresh wastes in the yard.

Discussion

No notable vegetation was found growing in the study site since it is completely covered with municipal solid wastes. Such artificial habitats where prey is available in abundance are preferred by Cattle egrets, as they are more terrestrial and insectivorous. Studies have found that 87% of Cattle Egrets' food is insects (Seedikkoya, 2003). An examination of the habitat preference of the species showed that of the several

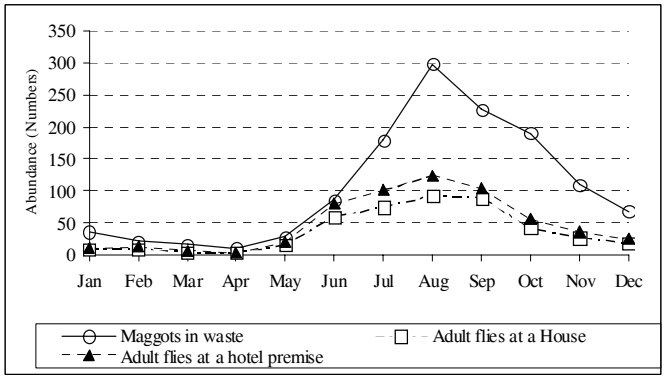

Figure 1. Maggots and adults of Muscids at Kundayithode Waste dump during 1999-2000

potential habitats the most favoured one was waste dump, which provides abundant dipteran maggots at low energy expenditure. Frederick & McGehee (1994) also reported usage of dumps and sewage ponds by the species.

The houseflies and blue bottles as vectors carry pathogens, causing diseases such as dysentery, typhoid and cholera, and even viral disease like poliomyelitis on their feet and mouthparts. Without a predator feeding upon them, the maggots would metamorphose and cause serious public health problems. Cattle Egrets, which eliminate thousands of such maggots daily, appear acting as an important bio-control agent.

References

Ali, S. (2002). *The Book of Indian Birds.* 13th Edition (Revised). Bombay Natural History Society & Oxford University Press, 326pp.

Aravindakshan, M.C. (1999). Studies on the ecology, biology and comparative abundance of two dipteran insects - *Musca domestica* and *Calliphora vicina*. M.Sc. Dissertation, University of Calicut, 64pp. (Unpublished).

Blaker, B.R. (1969). Behaviour of the Cattle Egret *Ardeola ibis*. *Ostrich* 40(3): 75-129.

Cody, M.L. (1968). On the methods of resource division in grassland bird communities. *American Naturalist* 102: 107-147.

Dickson, J.G. (1979). Seasonal populations of insectivorous birds in a mature bottomland hardwood forest South Louisiana. In: Dickson, J.C., R.N. Connor, R.R. Fleet, J.A. Jackson and J.C. Kross (eds.). *The Role of Insectivorous Birds in forest Ecosystems.* Academic Press, New York, 331pp.

Frederick, P.C. & S.M. McGehee (1994). Wading bird use of wastewater treatment wetlands in central Florida, USA. *Colonial Waterbirds* 17: 50-59.

International Bird Census Committee (1970). An international standard for mapping method in bird census work recommended by International Bird Census Committee. *Audubon Field Notes* 24: 722-726.

Javed, S. (1983). Scavenging by Cattle Egret. *Newsletter for Bird Watchers* 33(2): 38.

Middlemiss, E.H.J. (1955). Food of egrets. *Ostrich* 26: 159.

Nayar, K.K., T.N. Ananthakrishnan & B.V David (1996). *General and Applied Entomology.* Tata McGraw Hill, New Delhi, 589pp.

Reynolds, J. (1965). Association between Little Egret and African Spoonbill. *Breeding Birds* 58: 468.

Seedikkoya, K. (2003). Comparative ecology of certain paddy field birds with emphasis on the habitat quality. PhD Thesis, University of Calicut, 248pp. (Unpublished).

Seedikkoya, K., P.A. Azeez & E.A.A. Shukkur (2006). The breeding status of Cattle Egret in Kerala, south India. *Journal of Ornithology* 147(5)Suppl.1: 250

Siegfried, W.R. (1972). Aspects of feeding ecology of Cattle Egret (*Ardeola ibis*) in South Africa. *Journal Animal Ecology* 41: 71-78.

Subramanya, S. (1996). Distribution, status and conservation of Indian heronries. *Journal of the Bombay Natural History Society* 93: 459-486.

Subramanya, S. and G.K. Veeresh (1988). Avifaunal patterns in the rice fields of Bangalore, pp.30-53. In: Dhindsa, M.S., P.S. Rao & B.M. Parasharya (eds.). *Birds in Agricultural Ecosystem.* Society for Applied Ornithology (India) & Indian council of Agricultural Research, 196pp.

Yadav, D.N. (2000). All India Network Project on Agricultural Ornithology, Annual Report. Gujarat Agricultural University, Anand, 1-14pp.

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