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Food Habits of Cattle Egrets on St. Croix, U.S. Virgin Islands

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ABSTRACT.—Cattle Egrets (*Bubulcus ibis*) expanded their range greatly during the twentieth century, making localized food habit studies necessary to determine their impact in newly invaded ecosystems. We examined 44 Cattle Egret stomachs collected in January 1993 from Alexander Hamilton Airport on St. Croix Island, U.S. Virgin Islands. Orthopterans and lepidopterans were the most prevalent invertebrate food items. The St. Croix anole (*Anolis acutu*) was the major vertebrate prey. Meat scraps and ticks occurred in minor quantities. *Received 29 March 1999, accepted 5 Jan. 2000.*

The adaptability of Cattle Egrets (*Bubulcus ibis*) has allowed them to expand their populations from northern South America (A.O.U.

1998) to Canada (Buerkle and Mansell 1963). Cattle Egrets were first reported on St. Croix Island in 1955 (Seaman 1955) and 1500–2000 birds currently inhabit the island (Boyd and Hall, unpubl. data). Because of their opportunistic feeding behavior, studies on localized food habits are important to determine potential effects on vertebrate and invertebrate prey communities. For example, in Queensland, Australia, several species of lizards, northern dwarf tree frogs (*Litoria fallax*), and young marine toads (*Bufo marinus*) are common prey items, although orthopterans are the major prey (McKilligan 1984). Similarly, in northern Florida, orthopterans are the major food item during June and July (Fogarty and Hetrick 1973). In South Africa, lepidopterans were the major prey from December to March, but annelids made up 44.5–67.5% of the prey from April to September (Siegfried 1971). Based on the stomach contents of 1 bird collected on St. Croix in February, Seaman (1955) reported that 92% of the contents were orthopterans, 6% were unidentified arachnids,

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and 2% were carabid beetles. Because information on the dietary habits of Cattle Egrets in the Virgin Islands is limited and because of potential impacts on endemic species, we identified and quantified the dietary components of Cattle Egrets during the winter on St. Croix Island.

STUDY AREA AND METHODS

We collected Cattle Egrets on St. Croix Island, a 212 km² island located 64 km south of St. Thomas. The birds were shot at Alexander Hamilton Airport (17° 42' N, 64° 48' W) as part of an ecological study conducted to supplement a wildlife hazard management plan. The flock, approximately 500 birds, was located in a mangrove stand east of the runway. Forty-four birds (24 males, 19 females, and 1 unknown sex) were collected on the afternoons of January 21–23, 1993. We removed the stomachs and preserved the contents in 10% formalin. We classified insect, centipede, and spider prey at the ordinal level (Borror and Delong 1964). Ticks (suborder Acarina) were identified to species, and the condition of the hypostome (mouthpart) was noted. We identified vertebrates to species (MacLean 1982; Schwartz and Henderson 1985, 1991). Some reptiles could only be identified to genus because of advanced decomposition. Abundance of prey items was determined for each bird. Because invertebrates rarely remain intact during digestion, we chose a particular body part (e.g., thorax of lepidopterans and arachnids) to determine abundance. We determined volume by water displacement after soaking formalized specimens in water for at least 24 hr. Using these data, we estimated relative frequency by abundance (number of individuals of a prey item/total number of individuals of all prey items $\times 100$), volume (volume of a prey item/total volume of all prey items $\times 100$), and occurrence (number of samples in which a prey item occurs/total number of samples $\times 100$) and calculated an index of relative importance [(relative frequency by abundance + relative frequency by volume) \times (relative frequency by occurrence/200); Findholt and Anderson 1995].

RESULTS AND DISCUSSION

We identified 11 invertebrate orders and 7 vertebrate species from 44 stomachs (Table 1). Invertebrates accounted for 53.5% of the volume of the stomach contents, with orthopterans, lepidopterans, and arachnids having the greatest volumes. Vertebrates, primarily the St. Croix anole (*Anolis acutus*), constituted 36.4% of the stomach volume, and meat scraps and unidentified matter constituted 10.1%.

Orthopterans, lepidopterans, and arachnids were the most frequent prey items in our samples. No lepidopterans occurred in the one

Cattle Egret taken in February 1955 from St. Croix (Seaman 1955). However, lepidopterans are the major food item of Cattle Egrets in South Africa (Siegfried 1971). In Texas, orthopterans and arachnids frequently occur in the diet (Telfair 1983). In all of these studies, coleopterans, hymenopterans, hemipterans, dipterans, odonates, and scolopendromorph centipedes were of minor importance.

Other researchers reported that reptiles are not a major dietary component of Cattle Egrets (Snoddy 1969, Fogarty and Hetrick 1973, Telfair 1983, McKilligan 1984). In South Africa, vertebrates were more prominent in the diet during the wet season and early in the dry season (Siegfried 1971). The wet season on St. Croix begins in September and extends into December. *Anolis acutus* is the only *Anolis* species on the island (MacLean 1982) and occurred in 61.4% of the samples (Table 1). The common dwarf gecko (*Sphaerodactylus macrolepis*), a common species in the West Indies (MacLean 1982, Schwartz and Henderson 1991), occurred in 29.6% of the samples. The presence of these species suggests that Cattle Egrets likely forage in the taller vegetation or brushy habitats inhabited by these reptiles.

Only 1 mammalian species, the house mouse (*Mus musculus*), occurred in the stomachs, indicating that mammals are not a regular food item (Telfair 1983). Caribbean white-lipped frogs (*Leptodactylus albilabris*), Antillean frogs (*Eleutherodactylus antillensis*), Cuban treefrogs (*Osteopilus septentrionalis*), and marine toads were infrequent prey items. Meat scraps occurred in 6 (13.6%) samples, often in conjunction with dipterans. Previous researchers (Schwartz 1969, Pomeroy 1975, Burger and Gochfeld 1985) have suggested that Cattle Egrets eat insects concentrated at refuse sites.

Ticks occasionally were present in the stomach contents. We found 128 specimens of *Boophilus microplus* in 5 birds. It is uncertain whether these birds obtained ticks attached to the host (Telfair 1983). In a Florida study, no ticks were found in 841 Cattle Egret stomachs (Fogarty and Hetrick 1973). However in Texas, 2 Lone Star ticks (*Amblyomma americanum*) were recovered from 1000 boluses (Telfair 1983), and Snoddy (1969) found that ticks comprised 0.1% of the prey items in the sum-

TABLE 1. Composition of the diet of Cattle Egrets from St. Croix Island ($n = 44$).

Prey items	Relative frequency by abundance ^a	Relative frequency by volume ^b	Relative frequency by occurrence ^c	Index of relative importance ^d
Insecta				
Orthoptera	15.9	18.6	72.7	12.5
Lepidoptera (adult)	21.8	15.8	70.5	13.2
Lepidoptera (larvae)	21.2	11.7	70.5	11.6
Hymenoptera	0.4	0.0	15.9	0.0
Diptera	7.9	1.7	54.5	2.6
Odonata	0.1	0.2	2.3	0.0
Coleoptera	0.1	0.2	9.1	0.0
Hemiptera	0.3	0.1	6.8	0.0
Chilopoda				
Scolopendromorpha	0.1	0.2	2.3	0.0
Arachnida				
Araneida	15.4	4.0	72.7	7.1
Acarina				
<i>Boophilus microplus</i>	3.7	1.1	11.4	0.3
Amphibia				
<i>Leptodactylus albilaris</i>	0.2	0.2	6.8	0.0
<i>Osteopilus septentrionalis</i>	0.2	0.4	11.4	0.0
<i>Eleutherodactylus antillensis</i>	0.0	0.1	2.3	0.0
<i>Bufo marinus</i>	0.0	0.1	2.3	0.0
Reptilia				
<i>Anolis acutus</i>	10.8	32.1	61.4	13.1
<i>Sphaerodactylus macrolepis</i>	1.6	1.7	29.5	0.5
<i>Sphaerodactylus</i> sp.	0.3	0.3	13.6	0.0
Mammalia				
<i>Mus musculus</i>	0.1	1.6	6.8	0.1
Other				
Meat scraps	t ^e	7.0	13.6	t
Unidentifiable matter	t	3.1	t	t

^a RFN = (number of individuals of a prey item/total number of individuals of all prey items) \times 100.

^b RFV = (volume of a prey item/total volume of all prey items) \times 100.

^c RFO = (number of samples in which a prey item occurs/total number of samples) \times 100.

^d IRI = (RFN + RFV) \times (RFO/200).

^e t = trace.

mer diet of Georgia birds. The occurrence of a broken hypostome (mouthpart) or presence of cement cones (formed as a part of the attachment process) around a hypostome suggests tick removal from a host by Cattle Egrets (McKillingan 1984). Of 44 ticks selected randomly from boluses collected in Queensland, Australia, 3 had broken hypostomes, and 6 had cement cones. Using these criteria, we found that 107 (84%) ticks we observed likely had been removed directly from the host.

The Cattle Egret is an opportunistic feeder that has colonized many diverse habitats. Their adaptability to agricultural practices ne-

cessitates localized food habits to assess potential impacts. In our limited sample, we found no evidence that Cattle Egrets were consuming threatened or endangered vertebrates. However, because vertebrates were common in the diet of Cattle Egrets on St. Croix, additional studies with larger sample sizes are warranted.

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First Described Renesting Attempt by an American Bittern

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ABSTRACT.—Most life history traits of the American Bittern (*Botaurus lentiginosus*) have not been studied and are poorly understood. The ability of the American Bittern to renest has not been confirmed previously. A second nesting attempt by an American Bittern was observed on Agassiz National Wildlife Refuge on 8 July 1996. This information provides insight into American Bittern fecundity by showing that ad-

ditional reproductive capability exists when nests are destroyed by predation or weather related events. Future studies of nesting bitterns will need to consider renesting when estimating density of nesting females. Received 18 March 1999, accepted 22 Dec. 1999.

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The American Bittern (*Botaurus lentiginosus*) is the most widely distributed wading bird in North America, breeding as far north as central Canada and wintering as far south as Central America (Bent 1926). Breeding Bird Survey results indicate a decline of 2.2%/year for American Bitterns survey-wide from 1966–1996 (Sauer et al. 1997). The American Bittern is listed as a migratory nongame bird of special concern by the U.S. Fish and Wildlife Service (1995) and is Blue-Listed by the National Audubon Society (Tate 1986).