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FOOD OF EASTERN MOLES, *SCALOPUS AQUATICUS*, ON CUMBERLAND ISLAND, GEORGIA

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ABSTRACT

Earthworms are usually the most heavily eaten food of eastern moles, *Scalopus aquaticus*, and scarabaeid larvae (grubworms), are also often very important. These were the two most important foods of this species on Cumberland Island, Georgia, making up 55.9% of the food by volume. Other important items were beetle larvae (11.3), ants (9.4), and centipedes (4.1). The purpose of this paper is to present information on the food of Eastern Moles on Cumberland Island, Georgia.

Key Words: Eastern mole, *Scalopus aquaticus*, Cumberland Island, foods, diet.

INTRODUCTION

The eastern mole generally feeds heavily on earthworms and scarabaeid larvae, commonly called grubworms (1, 2, 3, 4, 5). Whitaker and Schmeltz (1) examined 90 eastern mole stomachs from Indiana, and Hartman and coworkers (2) studied 374 stomachs of this species from the Coastal Plain of South Carolina. From Indiana the top two foods were earthworms (26.8%) and scarabaeid larvae (13.9%), together totaling 40.7% volume; 88% of the stomachs contained earthworms, and 32% contained scarabaeid larvae. Many other food categories were listed (Table I), the most important by volume being ants (10.5%), vegetation (9.0%), and adult ground beetles (Carabidae, 5.6%). From South Carolina, scarabaeid larvae made up 31.1% of the diet, followed by ants (15.5%), and centipedes (12.7%); these three items made up 59.3% of the diet there. Other important foods (in order of decreasing abundance) were beetle larvae other than scarabaeids, adult scarabaeid beetles, caterpillars, fungi of the family Endogonaceae, spiders, fly larvae, earthworms, seeds, other insect larvae, and snails. Numerous other items constituting less than 1% of the volume were also found.

Table I. Foods of the eastern mole, *Scalopus aquaticus*, from Cumberland Island, Georgia (this study); Indiana (1); and the Coastal Plain of South Carolina (2). Data presented as % volume in stomachs.

	Georgia				
	Cumberland Island	St. Simons	St. Marys	SC	IN
n =	16	6	11	374	90
Food Item					
ANNELIDA (earthworms)	29.6	20.8	47.3	2.9	26.8
COLEOPTERA (beetles)					
Larvae					
Scarabaeidae (grubworms)	26.3	47.5	30.9	31.1	13.9
Carabidae (ground beetles)	--	--	--	0.4	1.2
Unidentified Coleoptera	11.3	6.7	0.5	4.5	3.0
Adults					
Scarabaeidae (June bugs)	0.6	--	--	4.2	2.6
Carabidae (ground beetles)	0.3	--	--	0.6	5.6
Unidentified Coleoptera	4.7	1.7	1.8	2.6	<1.0
HYMENOPTERA (ants, including eggs and pupae)	9.4	3.3	2.3	15.5	10.5
ORTHOPTERA		--	--		
Gryllotalpidae (mole crickets)	--	8.6	--	--	--
Unidentified Orthoptera	4.4	--		<1.0	<1.0
DIPTERA					
Tipulidae					
Adult	0.9	--	--	--	--

Table I. *(continued)*

Larvae	0.6	--	--	<1.0	<1.0
Unidentified larvae	1.9	--	--	1.4	--
Unidentified adult	0.1	--	--	<1.0	<1.0
LEPIDOPTERA					
Larvae	0.9	--	0.5	4.1	1.9
Pupae	--	--	--	<1.0	1.9
HEMIPTERA					
Cydnidae	0.9	--	--	--	--
Unidentified	0.6	--	--	<1.0	--
CHILOPODA (centipedes)	4.1	10.0	3.2	12.7	3.1
ARANEAE (spiders)	0.9	5.0	2.7	1.8	1.0
MOLLUSCA (snails, slugs)	--	--	--	1.0	<1.0
ENDOGONACEAE (mycorrhizal fungi)	2.5	--	--	3.4	1.1
PLANT MATERIAL					
Vegetation, other plant remains	--	4.2	0.9	0.5	>9.0
Seeds	--	--	--	2.3	>4.5
UNIDENTIFIED MATERIAL (mostly insect)	--	--	--	4.0	<5.5
OTHER (various insects, other animal remains) (<1% vol)[1]	--	--	--	7.0[2]	9.4
Total	100.0	100.0	100.0	93.0	90.6

[1]We have included all the foods identified from Georgia but have not tried to include the many minor foods from South Carolina or Indiana. These are listed in the original papers, although for consistency those minor foods found in Georgia are listed under South Carolina and Indiana as "<1.0" or included in subtotals with the sign ">."

[2]Numbers in "OTHER" are the difference between the total of itemized foods and 100.0.

MATERIALS AND METHODS

Cumberland Island is a barrier island with freshwater sloughs occurring behind the beach dune complex. The majority of the uplands consist of maritime forest, scrub/flatwoods, and temporary freshwater ponds. Many apparently well-drained areas are underlain by humate, a hardpan which may perch the water table and provide the moisture moles and earthworms require. Moles are not deterred by a saline environment, as evidenced by their tunnels occasionally extending out into the hard, wet sand of the beach.

Eastern Moles are found on all the Georgia barrier islands including Cumberland Island (C. Ruckdeschel, in prep.). The few moles used in this study (n = 16) were found dead, killed by domestic cats, and some were found in conjunction with a herpetological survey carried out on the island. A few moles were collected on St. Simons Island, also off the coast of Georgia, and from the mainland adjacent to Cumberland Island for comparative purposes.

Food items were identified with the aid of a 10-70x zoom dissecting microscope (Olympus America SZH, Melville, NY). The percent volume of each item in each stomach was estimated visually (6) and the data were averaged for a total percent volume for each item recorded (sum of individual volumes of food / total volume for all samples x 100). Percent volume indicates the amount of food of each type in the sample. Percent frequency represents the percent of animals which contained each food item.

RESULTS

Eastern moles from Cumberland Island fed most heavily on the following 7 foods, by volume: earthworms (29.6% volume), scarabaeid larvae (grubworms, 26.3), other beetle larvae (11.3), ants (including eggs and pupae; 9.4), beetle adults (5.6), orthopterans (4.4), and centipedes (4.1). Other items were eaten in smaller amounts (Table 1). Insects totaled 62.9% (21.9 adults, 41.0 larvae). Other invertebrates totaled 34.6%, primarily earthworms. Plant material was not found in the Cumberland Island stomachs, though subterranean (mycorrhizal) fungi totaled 2.5%.

DISCUSSION

Feral livestock, horses and swine, are abundant on Cumberland Island and influence every habitat, especially freshwater areas which are subject to drought. Intense grazing and rooting transforms temporary ponds or sloughs into churned, plowed areas, facilitating further desiccation. Whether swine will eat moles is not known.

Earthworms are common on Cumberland Island and found in most suitable habitats (pers. obs.). Pressure from feral livestock, especially swine, no doubt affects mole and prey habitat and likely reduces numbers of both. Beetles of the Family Scarabaeidae were determined the most prevalent insects in number and biomass in a pitfall trap study on Cumberland Island (7), with twenty-three species recorded. The large number of coprophagous species may be the result of the abundance of feral livestock.

The main foods of eastern moles in Indiana in percent volume were earthworms (26.8%), scarab larvae (13.9%), vegetation (9%), adult beetles (<9.2), ants (10.5%), and carabids (5.6%). On the Coastal Plain of South Carolina they were scarab larvae (31.1%), ants (15.5%), and centipedes (12.7%); and on Cumberland Island they were earthworms (29.6%), scarab larvae (26.3%), unidentified beetle larvae (11.3%), and ants (9.4%).

Foods of these three areas were generally similar. Earthworms are generally a very important food of moles, and were the top food of the eastern mole in Indiana and on Cumberland Island. However, they were not very important on the Coastal Plain of South Carolina. This suggests that earthworms may not have been very abundant in the sands there. In South Carolina, grubworms replaced earthworms as the top food by volume. Ants are heavily eaten, being among the top foods in each of the studies. Moles clearly entered the nests of the ants, as stomachs contained adults, and often pupae, larvae, and eggs. Another interesting food eaten in small amounts were clusters of spores of subterranean fungi of the family Endogonaceae. These fungi are heavily eaten by jumping mice, shrews, some other species of cricetids (8), and on Cumberland Island even by nine-banded armadillos, *Dasypus novemcinctus* (9). The spore clusters are small and are probably obtained by the mammals using olfaction.

Stomach samples from 6 eastern moles from St. Simons Island, Georgia, a barrier island about 40 km to the north, and 11 samples from animals on the adjacent mainland in the vicinity of St. Marys, Georgia, were also examined for food for comparative purposes. On St. Simons Island, scarabaeid larvae ranked highest in volume (47.5%) and frequency (66%), with earthworms second. On the mainland, earthworms were again the most abundant food, with 47.3% volume and occurring in 81.8% of the samples. One individual from Fernandina Beach, Florida, the barrier island adjacent to Cumberland, had eaten 60% adult beetles and 40% beetle larvae.

In summary, eastern moles on Cumberland Island feed mostly on earthworms and a variety of insects, particularly scarabaeid larvae, but a variety of other adult and larval insects including many ants.

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LITERATURE CITED

1. Whitaker JO Jr and Schmeltz LL: Food and external parasites of the eastern mole, *Scalopus aquaticus*, from Indiana. Proc Ind Acad Sci 83: 478-481, 1974.
2. Hartman GD, Whitaker JO Jr. and Munsee JR: Diet of the mole *Scalopus aquaticus* from the Coastal Plain Region of South Carolina. Am Midl Nat 144: 342-351, 2000.

3. Dyche LL: Food habits of the common garden mole. Trans Kans Acad Sci 18: 183-186, 1903.
4. Scheffer TH: The common garden mole. Kans State Agric Coll Bull 168: 1-36, 1910.
5. West JA: A study of the food of moles in Illinois. Bull Ill State Lab Nat Hist 9: 14-22, 1910.
6. Whitaker JO Jr: Food habits analysis of insectivorous bats. In Ecological and Behavioral Methods for the Study of Bats (Kunz TH, ed). Washington, D.C,: Smithsonian Institution Press, pp171-189, 1988.
7. Hillestad HO, Bozeman JR, Johnson AS, Berisford CW and Richardson JI: The Ecology of the Cumberland Island National Seashore, Camden Co., Georgia. Technical Report Series 75-5, Georgia Marine Science Center, University of Georgia, Skidaway Island, Georgia, 1975.
8. Whitaker JO Jr: *Endogone, Hymenogaster*, and *Melanogaster* as small mammal foods. Am Midl Nat 67: 152-156, 1962.
9. Whitaker JO Jr, Ruckdeschel C and Bakken L: Food of the armadillo *Dasypus novemcinctus* L. from Cumberland Island, GA. Southeastern Nat 11(3): 487-506, 2012.