A Note on Spring Food of Armadillos, *Dasypus novemcinctus*, in a Residential Area

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Food items were identified from stomachs of 37 armadillos taken at Fort Sill, Oklahoma, on 29 and 30 April, 1989. Compared to findings in other states in spring, greater quantities of cicada nymphs were consumed, but less plant material and fewer dipterans, formicids and myriapods.

INTRODUCTION

Food habits of the nine-banded armadillo (*Dasypus novemcinctus)* have been studied in Louisiana (*1*), Texas (*2, 3*), and Florida (*4*). Armadillos are opportunistic predators on soft-bodied invertebrates, particularly arthropods, but occasionally consume amphibians, reptiles, other small vertebrates and even plant materials (*5*). The armadillo did not become well established in southwestern Oklahoma until the 1970s (*6*). Zimmerman (*7*) examined the annual diet of armadillos in northcentral Oklahoma's scrub oak-prairie region. The present study assessed the types of food consumed during late April by armadillos from a residential area surrounded by mixed-grass prairie habitat.

METHODS

An armadillo "round-up" was held by about 50 members of the Lawton-Fort Sill Cooperative Association on the nights of 29 and 30 April 1989 on Fort Sill, Comanche County, Oklahoma. This activity was intended to reduce turf damage being inflicted by armadillos upon lawns and golf courses. Thirty-seven animals were captured with long-handled nylon fish-landing nets and retained in large plastic trash receptacles with several air holes for ventilation. Each was sacrificed and its stomach contents removed and washed through sieves with mesh: 4.8 mm and 0.6 mm. Food items from each stomach were then placed on a tray and air-dried for two days. Individual prey species were identified and their frequency of occurrence calculated. Water displacement in a 1000-ml graduated cylinder was used to determine the volume comprised by various foods. Because food samples were in contact with the water only a few seconds, there was not time for them to absorb enough water to bias the data.

RESULTS AND DISCUSSION

Coleopterans (particularly adult scarabeids and carabids) and lepidopteran larvae were more numerous than all other food items in the stomachs (Table 1). On a volumetric basis, the larger pre-emergent cicada nymphs were most important, comprising 57% of the total volume. This volumetric proportion of cicadas in spring was substantially greater than that for other studies, which ranged from only 0.4% in Louisiana (*1*) to 9.5% in northcentral Oklahoma (*7*) (Table 2). During a spring survey in 1989, state district entomologist Phillip Mulder found abnormally high numbers of adult cicadas in Comanche County (pers. comm.), which might suggest opportunistic foraging. Coleopterans occupied 34% of the volume, which is in general agreement with other studies. Most scarabeids were of the genus *Phyllophaga* (June beetles). Adult scarabeids comprised 48% of all coleopterans and 16% of total volume, while their larvae ("white grubs") constituted 44% of all beetles and 15% of the volume. Collectively, cicadas, beetles and lepidopterans contributed 96% of the food volume.

Terrestrial beetles (primarily Scarabaeidae, Carabidae and Elateridae) were identified in 92% of the stomachs. Although carabids comprised only 7% of all coleopterans and just 2% of the volume, they occurred in 89% of the samples. Cicada nymphs were apparently easy to obtain and appeared in 82% of the stomachs. Adult and larval scarabeid beetles were found in

79% of the stomachs, respectively, again indicating ease of capture. June beetle larvae do widespread damage to grass roots. It is therefore probable that armadillos digging in lawns are searching for these and other grubs. Kalmbach (*2*) identified 19 species in this genus from armadillos in Texas and stated that "...the economic good the armadillo does in insect destruction lies to a large extent in its consumption of scarabaeid beetles and their larvae..." (p. 35). Many ground beetles (genus *Callosoma,* especially *C. scrutator*), despite their disagreeable odors, were ingested. The beetle family Elateridae was represented only by larvae ("wire worms"). Although this family contributed only 2% of all beetles and 0.6% of total volume, it occurred in 45 % of the stomachs. These findings are comparable to those of other workers (*1, 2*). Armadillos in this study ate only trace amounts of beetles in the families Staphylinidae and Histeridae, probably indicating that they spend some time feeding on or near carrion. Texas armadillos showed similar habits (*2*).

Lepidopteran larvae (caterpillars) were present in 61% of the stomachs and represented 6% of the total volume compared to 9% in northcentral Oklahoma (*7*) and 12% in Texas (*2*).

Ants (Formicidae) occurred in 68% of the stomachs but made up only 0.8% of the volume, considerably lower than in previous reports (Table 2). Some ants probably were ingested coincidentally with other food. Similarly, dipteran larvae appeared in only trace amounts in the present study but were appreciably more common in other studies (Table 2).

Myriapods (centipedes and millipedes) comprised about 1% of the volume compared to 3% in northcentral Oklahoma (*7*), 5% in Texas (*2*) and 7% in Louisiana (*1*). The percent occurrence for myriapods was much lower in our study (32%) compared to 75% in northcentral Oklahoma (*7*) and 84% in Louisiana (*1*).

Other foods included isopods (sowbugs), orthopterans (crickets and roaches), hymenopterans (wasps), gastropods (snails), hemipterans (true bugs) and one salamander (skull only). Miscellaneous unidentifiable insect parts, fragmented plant material, and gravel constituted 27.7% of all stomach contents. The remainer, 72.3% - the identifiable contents - were prorated by volume (Table 1). No fleshy fruits or berries were recovered in this study, but in Texas, these comprised 3.5% of the total spring food volume (*2*) and in Louisiana, fleshy fruits, seeds and mushrooms made up nearly 10% of the total (*1*).

The great preponderance of cicadas and the small volumetric percentages of dipterans, formicids, and plant material found in the present study might be explained in several ways. For example, the large quantity of cicadas eaten reduced percentages of other foods. Perhaps cicadas were locally or seasonally abundant (i.e., undergoing a cyclic emergence) in the small area and during the short period of time in which armadillos in this study were collected. Finally, Comanche County receives an average of only about 80 cm of annual precipitation, less than most other areas that have been studied, a factor that might indirectly affect availability of certain foods.

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TABLE 1. Food of 37 armadillos from Comanche County, Oklahoma, collected 29 and 30 April, 1989

Food Item	Volume (% of food[a])	Occurrence (%)
Cicadidae	56.7	81.5
Scarabeidae (adult)	16.0	79.0
Scarabeidae (larvae)	14.7	63.0
Lepidoptera (larvae)	6.0	60.5
Carabidae	2.3	89.0
Isopoda	1.6	16.0
Diplopoda	1.0	21.0
Formicidae	0.8	68.0
Elateridae	0.6	45.0
Diptera	Tr	26.0
Orthoptera	Tr	26.0
Hymenoptera (wasps)	Tr	26.0
Coleoptera (other)	Tr	13.0
Gastropoda	Tr	13.0
Chilopoda	Tr	10.5
Hemiptera	Tr	3.0
Amphibia	Tr	3.0

a Tr = trace.

TABLE 2. Comparison of armadillo food habits in spring (as % of total volume[a])

Food Item	TX[b] (n=169)	LA[c] (n=104)	OK[d] (n=50)	SW OK[e] (n=37)
Homoptera	[f]	0.4	9.5	56.8
Coleoptera	43.5	33.6	36.4	33.7
Lepidoptera	12.0	10.8	8.9	6.0
Hymenoptera	9.4	5.0	7.2	0.8
Diptera	3.8	12.1	7.4	Tr
Orthoptera	2.4	3.3	0.6	Tr
Hemiptera	7.7	Tr	Tr	Tr
Total insects	78.8	65.2	70.0	97.3
Miscellaneous invertebrates[g]	3.4	11.1	16.4	1.6
Myriapoda[h]	4.8	7.3	3.1	1.0
Vertebrata	1.7	2.2	1.9	Tr

a Tr=trace
b Texas, Kalmbach, 1943; ref. 2.
c Louisana, Fitch et al., 1952; ref. 1.
d Oklahoma (north-central), Zimmerman, 1982; ref. 7.
e Oklahoma (southwestern), This study
f Apparently listed with Hemiptera.
g Includes Annelida, Mollusca, and Crustacea.
h Includes Diploda and Chilopoda.