FEEDING ECOLOGY OF MOURNING DOVES (*ZENAIDA MACROURA*) IN SOUTHEASTERN NEW MEXICO

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ABSTRACT—On 1-2 September 1979, mourning doves (*Zenaida macroura*) were collected in southeastern New Mexico to determine the amounts and kinds of food items ingested, to ascertain whether foods were selected in proportion to those available, and to evaluate sexual, age, and temporal variation in feeding ecology. Prairie sunflower (*Helianthus petiolaris*) was the dominant food item. Foods were not taken in proportion to plant densities at the study site. Discriminant analyses revealed no consistent differences between sexes, but there were some differences between ages and time of collection.

Food habits of mourning doves (*Zenaida macroura*) have been studied in several areas of the southwestern United States (e.g., Dillon, 1961; Browning, 1962; Carpenter, 1971; Davis et al., 1971; Davis and Anderson, 1973; Tyler and Jenkins, 1979). We studied these birds in the Los Medaños region of southeastern New Mexico because they are abundant there and little quantitative information exists regarding their feeding ecology in that area. Our purposes were to determine: the identities and amounts of food items ingested by mourning doves; whether sexual, age, or temporal differences could be detected; and whether foods were selected in proportion to those available. These data could provide insight into the degree of intraspecific competition for food resources by this species.

METHODS—The study area was centered at drill hole ERDA 9 (SE corner, Sec. 20, T22S, R31E) approximately 40 km E of Carlsbad, and extended outward to a radius of 8 km. Most of the area was in eastern Eddy County, but it also extended into extreme western Lea County. Extensive vegetation analyses of this non-cultivated area have been conducted by W. C. Martin of The University of New Mexico (see Best and Jackson, 1982). Our specimen collection sites were restricted to the shinnery oak-mesquite (*Quercus havardii-Prosopis glandulosa*) association to minimize the effects of different habitat types.

In 1979, we collected 157 mourning doves by shooting during the morning hours of 1-2 September. For each specimen we recorded: time, date, sex, and whether the specimen was adult or non-adult. Ageing criteria were those of Swank (1955) and Wight et al. (1967); sex was determined by dissection. Crop contents were removed, placed into plastic vials, frozen, and later air-dried. Food items were identified by comparison with plant samples we collected on the study site. Food items that were not identifiable to genus or species were listed as unknowns (e.g., U53).

Average weights and measurements of seeds were taken for each food item (Best et al., 1982). The volume of each food was determined by multiplying the seed dimensions by the number of seeds in the crops. Percent volume was calculated for each food item similar to Martin et al. (1946), i.e., volume of each food/total volume x 100. Foods with less than 0.01% of the total volume were considered trace occurrences (tr.). Mean and standard deviation were calculated for each food item. Discriminant analyses (Nie et al., 1975), using the numbers of seeds of each food item as characters, were used to test for temporal, sexual, and age related variation in food habits. Statistical analyses were conducted using the IBM computer systems at Eastern New Mexico University and The University of New Mexico.

RESULTS AND DISCUSSION—The food taken in the greatest amount was *Helianthus petiolaris* seeds, which accounted for 78% of the total volume

TABLE 1—Foods present in crops of mourning doves (*Zenaida macroura*) in southeastern New Mexico. Frequency, mean, standard deviation, maximum number observed in any single crop, and percent volume are listed for each food item.

Food item[a]	Frequency[b]	Mean[c]	Standard deviation	Maximum observed	Percent volume
Amaranthaceae					
Amaranthus albus	1	141.0	0.00	141	0.01
Boraginaceae					
Lithospermum multiflorum	10	6.5	13.61	45	0.15
Chenopodiaceae					
Chenopodium U10	16	15.8	48.48	197	0.08
Cycloloma atriplicifolia	4	1.0	0.00	1	tr.
Commelinaceae					
Commelina U105	2	5.5	6.36	10	0.03
Compositae					
Helianthus petiolaris	140	669.1	559.55	2,362	77.72
Convolvulaceae					
Ipomoea U174	2	20.0	16.97	32	0.35
Cyperaceae					
Cyperus schweinitzii	5	14.2	24.55	58	0.04
Euphorbiaceae					
Croton UA	1	11.0	0.00	11	0.09
Croton UC	1	3.0	0.00	3	0.01
Croton U44	68	30.4	66.19	331	9.94
Euphorbia U2	85	83.6	205.89	1,009	2.38
Euphorbia U3	56	41.9	91.06	538	2.43
Euphorbia U30	82	66.6	150.96	863	0.99
Euphorbia U113	6	19.0	17.37	40	tr.
Phyllanthus abnormis	3	190.0	323.04	563	0.34
Graminae					
Panicum capillare	2	1.0	0.00	1	tr.
Panicum obtusum	63	35.9	95.41	618	1.37
Paspalum setaceum	100	78.4	136.14	839	3.66
Paspalum stramineum	1	1.0	0.00	1	tr.
Paspalum U181	1	6.0	0.00	6	tr.
Labiatae					
Monarda punctata	41	13.3	24.97	131	0.06
Leguminosae					
Astragalus U32	4	2.3	1.50	4	tr.
Phaseolus U118	1	1.0	0.00	1	tr.
Vicia U120	4	1.3	0.50	2	0.01
Vicia sp.	1	1.0	0.00	1	tr.
Loasaceae					
Mentzelia U20	9	2.4	2.30	8	0.01
Nyctaginaceae					
Abronia fragrans	2	13.0	12.73	22	0.03
Boerhaavia intermedia	1	1.0	0.00	1	tr.
Onagraceae					
Gaura villosa	1	1.0	0.00	1	tr.
Papaveraceae					
Argemone U167	1	1.76	0.00	176	0.17
Portulacaeae					
Talinum angustissimum	1	7.0	0.00	7	tr.
Zygophyllaceae					
Kallstroemia grandiflora	3	2.3	1.53	4	0.01
U6	10	2.8	4.73	16	0.02
U101	35	2.7	3.72	16	0.03
U104	1	1.0	0.00	1	tr.

U106	1	3.0	0.00	3	tr.
U107	2	1.0	0.00	1	0.01
U109	4	1.8	0.96	3	tr.
U122	2	1.0	0.00	1	tr.
U123	1	1.0	0.00	1	tr.
U165	1	4.0	0.00	4	0.01
U166	1	20.0	0.00	20	0.07
U170	1	1.0	0.00	1	tr.
U172	1	1.0	0.00	1	tr.
Arthropod larvae	3	39.7	47.65	94	—
Mouse feces	2	21.0	16.97	33	—

[a]Number of crops examined = 157; number of crops with contents = 148.
[b]Number of crops containing each category.
[c]Average number of seeds in the crops of those containing the category.

and were present in 95% of the crops (Table 1). Other important foods were *Croton* U44 seeds composing 10% of the volume in 46% of the crops, *Paspalum setaceum* seeds with 4% of the volume in 68% of the crops, and three *Euphorbia* (U2, U3, U30) which accounted for 6% of the volume in 38-57% of the crops. Forty-seven different food items were found; 41 of these were present in amounts less than 1% of the total volume.

Discriminant analysis of the crop contents revealed no consistent sexual differences in feeding habits (Table 2). Variables that accounted for some difference in feeding habits between sexes are listed below Table 2. Discriminant analysis between adults and non-adults showed some possible age differences (Table 2). *Croton* U44 and *Euphorbia* U2 contributed the most to the observed differences (Table 2). Age of the birds was determined by wing plumage differences, rather than by presence or absence of the bursa of Fabricius. Use of this method may have caused classification errors because early-hatched immatures could have replaced their primary coverts (and thus resembled adults). Despite this potential error, which would have served to decrease the possibility of showing differences between ages, some differences may be present. Considering times of collection by hour from 0500 through 1100, discriminant analysis showed some temporal variation in the crop contents of mourning doves (Table 3). Variables contributing

TABLE 2—Discriminant analyses between sexes and ages of mourning doves (*Zenaida macroura*) in southeastern New Mexico.

	Actual group	n	Predicted group membership	
Between sexes[a,b]				
			Males	Females
	Males	85	80(94.1%)	5(5.9%)
	Females	70	54(77.1%)	16(22.9%)
Between age groups[c]				
			Adults	Non-adults
	Adults	83	63(75.9%)	20(24.1%)
	Non-adults	72	29(40.3%)	43(59.7%)

[a]The data below are given as: % of specimens that were correctly classified; in decreasing order of importance, the variables accounting for differences.
[b]61.9%; *Croton* U44; *Euphorbia* U30, U122, *Gaura villosa*, *Paspalum* U181, *Paspalum* U99, U172, *Vicia* sp., *Abronia fragrans*, *Cycloloma atriplicifolia*, *Astragalus* sp.
[c]68.4%; *Croton* U44; *Euphorbia* U2, U109, *Abronia fragrans*, U107, *Cyperus schweinitzii*, *Euphorbia* U30, U172, *Helianthus petiolaris*, *Phaseolus* U118, mouse feces, *Paspalum* U99, *Paspalum setaceum*, *Monarda punctata*, U106, *Chenopodium* U10.

TABLE 3—Discriminant analysis of collection time (MST) based upon crop contents of mourning doves (*Zenaida macroura*) in southeastern New Mexico.[a]

Actual group	n	Predicted group membership					
		5:00-6:00	6:00-7:00	7:00-8:00	8:00-9:00	9:00-10:00	10:00-11:00
5:00-6:00	23	19(82.6%)	2(8.7%)	2(8.7%)	0	0	0
6:00-7:00	60	16(26.7%)	35(58.3%)	6(10.0%)	1(1.7%)	2(3.3%)	0
7:00-8:00	34	4(11.8%)	17(50.0%)	13(38.2%)	0	0	0
8:00-9:00	24	4(16.7%)	8(33.3%)	2(8.3%)	8(33.3%)	2(8.3%)	0
9:00-10:00	13	4(30.8%)	3(23.1%)	2(15.4%)	0	4(30.8%)	0
10:00-11:00	1	0	0	0	0	0	1(100%)

[a]51.6% of the grouped classes were correctly classified; in decreasing order of importance, variables accounting for differences between times of collection were *Euphorbia* U2, *Paspalum setaceum*, *Euphorbia* U3, *Helianthus petiolaris*, *Cyperus schweinitzii*, *Croton* U44, mouse feces, *Panicum capillare*, *Monarda punctata*, *Chenopodium* U10, U101, *Gaura villosa*, *Phaseolus* U118, *Kallstroemia grandiflora*, *Panicum obtusum*, *Paspalum* U181, U172, *Lithospermum multiflorum*, *Commelina* U105, *Croton* UA.

the most to temporal variation were *Euphorbia* U2, *P. setaceum*, *Euphorbia* U3, and *H. petiolaris* (Table 3).

Best and Jackson (1982) evaluated the 29 most common plant species occurring in the study area. Their data were obtained during the summer and early autumn of 1979 from 62 1-ha study plots scattered throughout the area. The mean number of plants per ha were: *Aristida* sp., 7,815; *Artemisia filifolia*, 985; *Bouteloua eripoda*, 3,644; *Cenchrus insertus*, 1,384; *Croton* sp., 1,718; *Dithyrea wislizenii*, 1,240; *Eriogonum* sp., 4,068; *Euphorbia* sp., 2,757; *Gutierrezia sarothrae*, 25,016; *Helianthus petiolaris*, 2,363; *Heliotropium convolvulaceum*, 506; *Heterotheca psammophila*, 1,895; *Hoffmanseggia* sp., 20; *Houstonia humifusa*, 38,897; *Larrea tridentata*, 396; *Lesquerella fendleri*, 2,954; *Monarda punctata*, 2,097; *Muhlenbergia porteri*, 566; *Munroa squarrosa*, 41; *Panicum capillare*, 4,101; *Paspalum setaceum*, 1,615; *Pectis angustifolium*, 568; *Perezia nana*, 103; *Prosopis glandulosa*, 104; *Quercus havardii*, 10,522; *Senecio multicapitatus*, 3,279; *Sporobolus* sp., 5,724; *Tridens pulchellus*, 2,154; and *Yucca campestris*, 512. Seeds of only six of these were found in the crops, i.e., *Croton* sp., *Euphorbia* sp., *H. petiolaris*, *M. punctata*, *P. capillare*, and *P. setaceum*. Considering the small number of these 29 species represented in the dove crops, the major foods consumed by doves appear to be selected—not taken randomly as plant species are encountered. Griffing and Davis (1978) also indicated that doves must reject or pass by some foods while searching for others.

Griffing and Davis (1974) examined the crops of 19 doves collected during the summer of 1971, and 24 crops collected during the winter of 1971-1972 in the same habitat about 10 km south of our study area. Eleven food items were present in the crops collected in the summer of 1971, six of which were also present in the crops examined in this study, i.e., seeds of *Croton*, *Amaranthus*, *Phyllanthus*, *Mentzelia*, *Panicum*, *Euphorbia*, and *Kallstroemia*. Of the two foods accounting for 97% of the total crop volume during their study (*Croton* and *Phyllanthus*), only *Croton* was important in our study. The food item most frequently encountered was seeds of *H. petiolaris*—this was not found during the 1971 study. In south-central New Mexico, Davis (1974) found *Kallstroemia* was the most important food category—*Euphorbia*, *Croton*, and *Panicum* were the most important foods in common between that study and ours.

In Oklahoma (Carpenter, 1971; Tyler and Jenkins, 1979) and Texas (Dillon, 1961), the major food items were *Triticum aestivum, Setaria italica,* and *Sorghum vulgare.* Other important foods were *Croton, Helianthus, Panicum,* and *Amaranthus* which were also important in our study. No agricultural species were found in the dove crops we collected. The nearest cultivated land was more than 30 km from our study site; however, agricultural species were used for domestic livestock feed by local ranchers.

In the southwestern United States, mourning doves eat the seeds from a variety of plant species. However, seeds of certain genera may be the food of choice; *Helianthus, Croton, Euphorbia,* and *Amaranthus* regularly appear in the diet of doves, even in cultivated areas where agricultural species become the dominant food source. In adverse years when a lack of precipitation inhibits growth of many annual species, other available seeds are probably eaten. To learn more about the ecology of this species, it would be interesting to investigate the degree of variability in foods taken between years, to determine the causes of the variability, and to look closer at sexual, temporal, and age differences in food-resource utilization.

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