Technical Report No. 136

DIET OF THE MOURNING DOVE AT THE PAWNEE NATIONAL GRASSLAND, 1970-1971

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GRASSLAND BIOME

U.S. International Biological Program

November 1971

TABLE OF CONTENTS

ABSTRACT

The diet of the mourning dove (*Zenaidura macroura*) was studied for the spring and summer months of 1970 and 1971. Thirty-one birds, 28 adults and 3 juveniles, were collected for analysis of the stomach contents. Identification of 45 food taxa and estimates of dry weight parameters showed the diet to consist of over 99.9% seeds and less than one-tenth of one percent arthropods and molluscs. The most important food types were bee plant (*Cleome serrulata*) (28.1%), grasses (24.3%) and composites (19.6%). Almost 76% of the mourning dove diet was composed of seeds from plants characteristic of disturbed habitats, i.e., roadsides, cultivated and abandoned fields. Comparisons of adult and juvenile diets during midsummer revealed that juveniles ate mainly composites and grasses (96%), while adults consumed seeds of bee plant and spiderwort (*Tradescantia occidentalis*) (68%). Selection of seed size (length) by the two age classes also varied, with juveniles taking about 80% of their seeds in the 4.1 to 4.5 mm size class. Of the adult diet, 84% was composed of seeds less than 3.5 mm in length. This difference in seed size for juveniles and adults apparently resulted from the heavy use by juveniles and light use by adults of a single seed type, sunflower (*Helianthus annuus*), which was approximately 4.2 mm in length. Although sunflower seeds were equally available, to both age classes, they were not the preferred food of adults.

INTRODUCTION

The mourning dove (*Zenaidura macroura*) is a member of the avian community of the shortgrass prairie. It is one of several small birds that live on either seeds or invertebrates, or both. This community of birds might be arranged in linear fashion according to the composition of their respective diets. At one pole would be species eating entirely animal food, e.g., the nighthawk. Then would come those birds eating various proportions of arthropod vs. plant and seed foods such as sparrows, buntings, and larks. At the other pole would be the mourning dove alone, which eats seeds and little else in this environment.

The mourning dove occupies the Pawnee National Grassland on a seasonal basis, leaving the area in winter but present at other times as a migrant and summer resident. In summer it is commonly seen perching on fences and wires near roads, as well as at occasional trees and abandoned buildings where it often nests. The birds fly over the prairie to watering and feeding places.

Many studies have been made of the mourning dove's diet over a range of habitats, especially including woodlands and cultivated areas in many parts of the United States. None, however, were available for the short-grass prairie of northcentral Colorado.

Cultivated grains have been the most important foods in many studies, with corn, wheat, oats and buckwheat showing high frequencies of occurrence and percentages of volume. In addition, seeds from a great variety of native wild plants collectively have shown high frequency of occurrence but smaller volume (Lehner 1965). In the present study, cultivated grains are less prominent. Wheat and other grains are cultivated only in scattered fields representing a very small proportion of the shortgrass prairie environment investigated.

METHODS AND MATERIALS

This is a food habits study using stomach content analysis. Thirty-one mourning doves were collected in normal activities at the nesting habitat on the Pawnee National Grassland, and age, sex and other vital parameters recorded for each specimen. The doves were collected mainly near roadsides from fences or wires. They represented the spring and summer periods from May 2 to August 24. Collecting sites were in the grassland and more than one mile from the nearest farmstead. All birds were obtained between 7:00 A.M. and 1:00 P.M., Mountain Standard Time.

Foods of the mourning dove were identified and measured (length) under the dissecting microscope with aid of a reference collection of seeds and arthropods made at the locality where birds were collected. Dry weight of food taxa were estimated by weighing oven dried seeds of the same sizes and of corresponding taxa from the same habitat. Numbers of items eaten were determined by counting either whole items or repeated parts. The dry weight values refer to amounts of ingested food rather than to amounts of partial food remains present in the stomach of the bird. Dietary composition refers either to the proportion of dry weight biomass of foods in the diet or to the proportion of individual items eaten, as is made clear in the text.

GENERAL NATURE OF DIET

The food found in the mourning dove at the Pawnee National Grassland was comprised almost entirely of seeds (Table 1). Of the 17,675 food items identified, 17,663 were seeds and the remaining 12 were arthropods. Additional fragmented plant materials were occasionally present, but these were omitted from the calculations of food biomass.

Table 1. General composition of sample of summer diet of mourning doves at Pawnee National Grassland.

Food	Dry Wt. of Sample (g)	Proportion (%)
Arthropods	0.024	0.04
Seeds	61.952	99.96
All foods	61.976	100.00

TAXONOMIC COMPOSITION OF THE DIET

Forty-five taxa were recognized from the stomach contents of the mourning dove. These are listed in Appendix I. These taxa were distributed among 17 families of plants, four orders of arthropods, and one order of mullusc. The plant family best represented was the Graminae with five genera recorded, representing approximately one-fifth of the taxa at the familial level. Beckwith (1959) also found that the grasses were prominent in the diet of doves. Following the Graminae, Chenopodiaceae was represented by four genera, and other families had one to three genera recorded.

BIOMASS PARAMETERS OF THE DIET

Biomass estimates of all ingested foods were based on the dry weight of the foods, and are given in Appendix Table 1. The dry weights listed in Appendix Tables 1 and 2 and also Tables 2 and 3 were calculated by taking the sum of estimated dry weights of all individual items eaten for each type of food. These sums for each food type were then divided by the total dry weight of all foods to give the percentage representation of the taxa biomass. This form of expressing dietary composition is preferred to the commonly used percentage of numbers of individuals or percentage frequency of occurrence, because it can serve as an index to the quantity of energy furnished to the birds by each food.

The relative biomass contribution of the major plant families is shown in Table 2. The bee plant (*Cleoma serrulata*), in the family Capparidaceae represented the most important family, as it provided 28.1% of the food biomass. Following next in order were the grasses, 24.3%, the composites, 19.6%, and Commelinaceae, 14.6%.

Table 2. Amount of biomass and proportional representation of major plant families in the summer diet of mourning doves.

Family	Number of Individuals in Sample	Total Dry Wt. (g)	Proportion of Diet (%)
Amaranthaceae	2348	3.0748	4.96
Capparidaceae	2989	17.3888	28.07
Commelinaceae	2709	9.0874	14.67
Compositae	3935	12.1564	19.62
Graminae	3294	15.0466	24.29
Malvaceae	600	0.9771	1.58
Polygonaceae	761	1.8113	2.92
Others [a/]	1027	2.4092	3.89
Totals	17663	61.9516	100.00

[a/] Boraginaceae, Caryophyllaceae, Chenopodiaceae, Convolvulaceae, Cyperaceae, Hydrophyllaceae, Leguminosae, Liliaceae, Papaveraceae, and Verbenaceae.

Table 3. Comparison of foods obtained from disturbed and undisturbed habitats in the summer diet of mourning doves.

Habitat	Number of Genera	No. of Individuals in Sample	Total Dry Weight (g)	Proportion of Diet (%)
Disturbed	20	12,808	47.0711	75.98
Undisturbed	16	4,855	14.8805	24.02
Totals	36	17,663	61.9516	100.00

An ecological segregation of food sources can be made on the broad basis of disturbed vs. undisturbed habitats. A listing of those genera occurring in the dietary samples, which, according to Harrington (1964), are most likely characteristic of these two categories is found in Appendix Table 2. As can be seen in Table 3, almost 76% of the dietary mass was derived from those species characteristic of disturbed habitat, i.e., road sides, around buildings, cultivated and abandoned fields. Lehner (1965) identified diets of 181 mourning doves in New York. Approximately 90% of the dietary volume in his study was composed of taxa from either cultivated or other disturbed habitats. Seeds of cultigens represented 89% of the food (by volume) of mourning doves in Tomkins County, New York; whereas they represented only 12% of the food eaten in Weld County, Colorado (Appendix Table 2). Therefore, the mourning dove had adequate subsistence in the shortgrass prairie without dependence on cultigens for food. However, a large proportion of its food, 76%, came from plants thriving in disturbed areas.

SEASONAL OCCURRENCE OF PLANT SEEDS IN THE DIET

The composition of the diet remained fairly uniform throughout the spring and summer, except for the decrease in the proportional utilization of the Capparidaceae (Table 4 and Fig. 1). This shift in composition was compensated by proportional increases in other main food types, particularly by the Graminae and Commelinaceae. Other changes in composition apparently were related to changes in seed availability as the summer progressed.

Table 4. Seasonal occurrence of major plant families shown as percent of dry weight biomass in diet for each period.

Family	Periods I & II May 1 - 31 (%)	Periods III & IV June 1 - 30 (%)	Periods V & VI July 1 - 31 (%)	Periods VII & VIII August 1 - 31 (%)
Amaranthaceae	1.41	0.88	0.32	21.44
Capparidaceae	55.86	27.98	20.95	23.75
Commelinaceae	2.46	13.11	20.44	16.34
Compositae	10.70	14.08	31.13	19.64
Graminae	15.34	35.59	17.41	16.15
Malvaceae	1.70	1.82	1.79	0.73
Polygonaceae	8.31	2.63	3.11	0.45
Others [a/]	4.22	3.91	4.85	1.50
	100.00	100.00	100.00	100.00

[a/] Boraginaceae, Caryophyllaceae, Chenopodiaceae, Convolvulaceae, Cyperaceae, Hydrophyllaceae, Leguminosae, Liliaceae, Papaveraceae, and Verbenaceae.

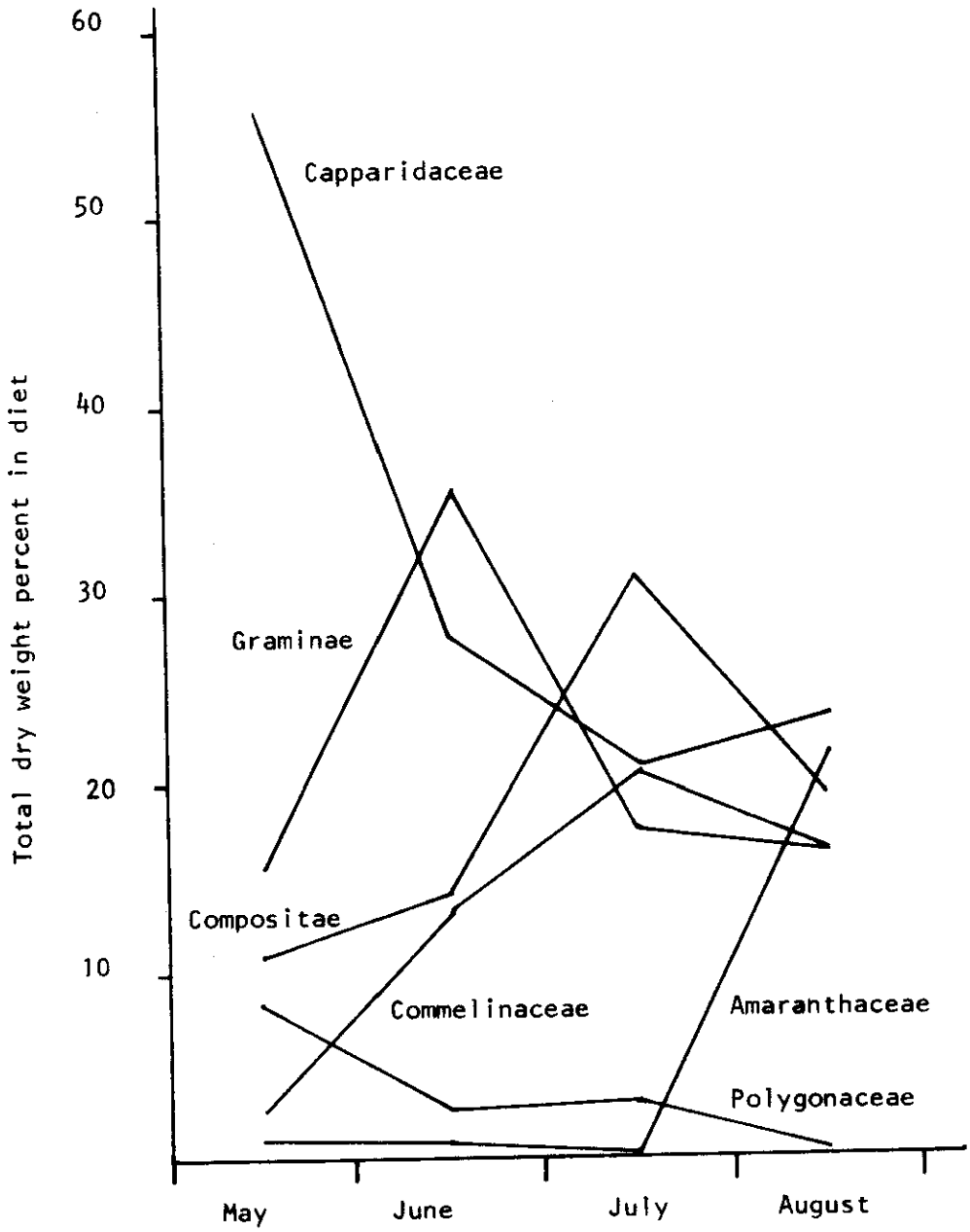

Fig. 1. Seasonal dry weight biomass for major seed foods for each month.

COMPOSITION OF DIET OF ADULT VS. JUVENILE MOURNING DOVES

The diets of adult and juvenile mourning doves in midsummer, 21 July to 11 August, were compared (Table 5 and Fig. 2), using the four adults and three juveniles available for this period listed in Appendix III. Composites and grasses totalled about 96% of the juveniles' diet but only about 15% of the adults' during the same time period. The bulk of the adult diet consisted of bee plant (*Cleome serrulata*) seeds (51%) and spiderwort (*Tradescantia occidentalis*) seeds (17%). These same two species contributed less than 1% to the juvenile diet. Overlap in the use of the same seed taxa was only 18.8%, which seems surprisingly low. Of the food bulk (dry weight) 18.8% came from the same taxa, whereas 81.2% came from different taxa.

Food size and the proportional representation of each size in the diets of adult and juvenile mourning doves are shown in Table 6. Seeds which measured 4.1 to 4.5 mm in length were much more numerous in the food of juveniles than of adults, i.e., 81% vs. 9% of all items eaten. Sunflower (*Helianthus annuus*) seeds comprised most of the seeds in this size class. For this same summer period, 84% of the adult diet was composed of seeds less than 3.5 mm. Upon rearranging the data in broader size classes it was seen that overlap was fairly high in the use of middle-sized seeds, 3.1 to 6.0 mm, by both adults and juveniles, as both age groups obtained approximately two-thirds of their food from such seeds (Fig. 3). Juveniles ate more seeds of large size, amounting to about 30% of their food mass, whereas adults ate more small seeds, amounting to about 30% of their food mass.

Table 5. Comparison of biomass of major plant families eaten by adult and juvenile mourning dove. [a/]

Family	Adult [b/] Diet		Juvenile [b/] Diet	
	Wt. of Sample (g)	Representation (%)	Wt. of Sample (g)	Representation (%)
Amaranthaceae	0.7839	8.24	0.0077	0.16
Capparidaceae	4.8464	50.91	0.0067	0.14
Commelinaceae	1.6388	17.22	0.0204	0.41
Compositae	0.9198	9.66	3.7241	75.24
Graminae	0.5845	6.15	1.0239	20.68
Malvaceae	0.1930	2.04	0.0	0.0
Polygonaceae	0.4134	4.35	0.0441	0.89
Others [c/]	0.1354	1.43	0.1228	2.48
Totals	9.5152	100.00	4.9497	100.00

[a/] From July 16 to August 15, Periods VI and VII

[b/] Average juvenile body weight, 96.1 g; average adult body weight, 120.5 g.

[c/] Boraginaceae, Chenopodiaceae, Convolvulaceae, Cyperaceae, Leguminosae, Papaveraceae, and Verbenaceae

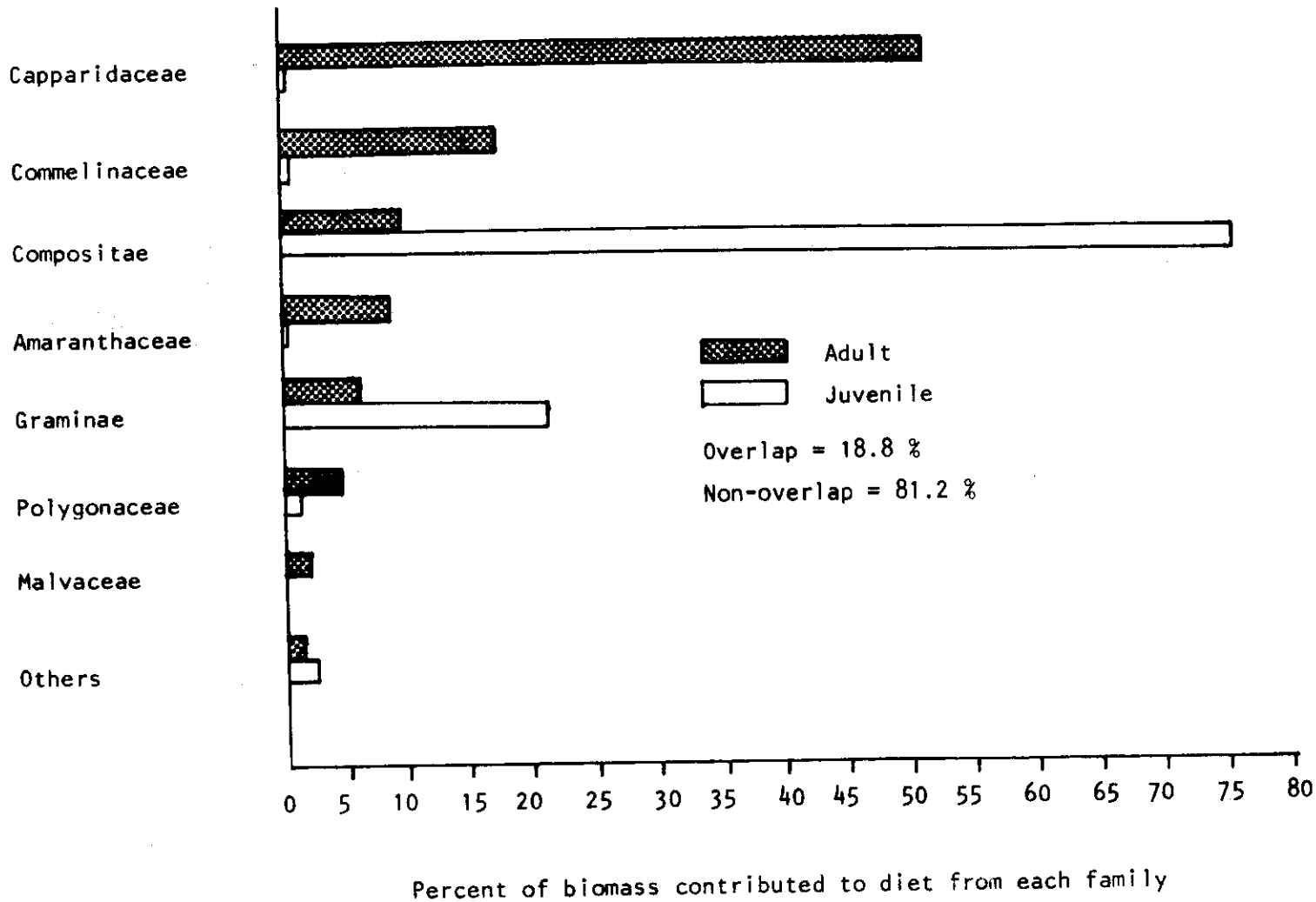

Fig. 2. Comparison of percent composition of diets of adult and juvenile mourning dove by plant families. The data are from Table 5.

Table 6. Comparison of food sizes of adult and juvenile mourning dove in length and dry weight. [a/]

Length of Seed (mm)	Length				Dry Weight			
	No. of Items per Bird		% of Total No. of Items		Wt. of Items per Bird		% of Total Dry Wt. of Item	
	Juvenile	Adult	Juvenile (%)	Adult (%)	Juvenile (g)	Adult (g)	Juvenile (%)	Adult (%)
0.5 - 1.5	16.3	7.0	3.28	1.05	.0057	.0034	0.32	0.15
1.6 - 2.0	15.3	158.7	3.08	23.88	.0128	.2297	0.70	9.75
2.1 - 2.5	39.7	4.7	7.97	0.71	.0274	.0140	1.49	0.59
2.6 - 3.0	12.0	144.7	2.41	21.78	.0324	.4687	1.76	19.90
3.1 - 3.5	0.7	283.3	0.13	42.61	.0033	1.2739	0.19	54.09
3.6 - 4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4.1 - 4.5	402.7	61.3	80.85	9.21	1.2351	.2278	66.65	9.67
4.6 - 5.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5.1 - 5.5	0.0	0.3	0.0	< 0.1	0.0	.0020	0.0	0.08
5.6 - 6.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6.1 - 6.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6.6 - 7.5	11.3	4.7	2.28	0.71	.5353	.1350	28.89	5.73

[a/] Average body weights: juveniles 96.1 g; adults 120.5 g.

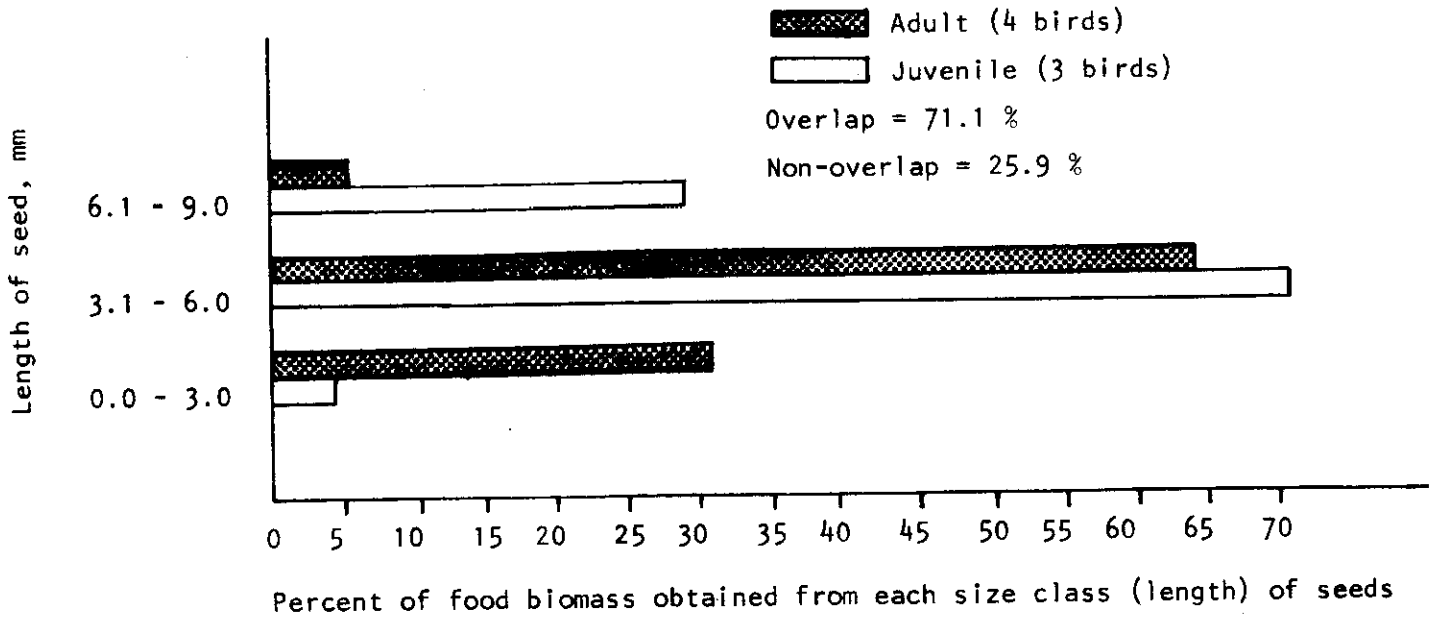

Fig. 3. Comparison of percent composition of diets of adult and juvenile mourning dove by size (length) of food objects eaten. The data are from Table 6.

Perhaps the adults showed more skill and inclination to search out a variety of small and nutritious seeds; whereas juveniles may have fed more on seeds easy to find and to harvest and which provided more bulk for less effort. Information in Table 6, however, indicated that the choice of sunflower seeds by these juveniles was influenced more by the availability of this specific seed type than by preference for a particular seed size. Sunflower seeds were equally available to the adults but not eaten as much by them, hence were not a preferred food of adults in midsummer.

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Harrington, H. D. 1964. Manual of the plants of Colorado. Swallow Press Inc., Chicago, Illinois.

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APPENDIX I

List of Food Taxa and Codes

Food Taxon	Code
Arachnida Araneida Labidognatha, sp.	AR AR LAB
Gastropoda Stylommatophora, sp.	GA ST
Insecta Coleoptera Polyphaga Chrysomelidae Alticinae, sp.	IN CO POL CHR ALT
Hymenoptera Scolioidea Formicidae Myrmicinae *Monomorium minimum*	IN HY SCO FOR MYR MON MI
Myrmicinae, sp.	IN HY SCO FOR MYR
Amaranthaceae *Amarantus graecizans*	AMA AMA GR
Amarantus retroflexus	AMA AMA RE
Boraginaceae *Cryptantha minima*	BOR CRY MI
Lithospermum incisum	BOR LIT IN
Capparidaceae *Cleome serrulata*	CAP CLE SE
Caryophyllaceae *Saponaria vaccaria*	CAR SAP VA
Chenopodiaceae *Chenopodium album*	CHE CHE AL
Chenopodium berlandieri	CHE CHE BE
Chenopodium leptophyllum	CHE CHE LE
Kochia scoparia	CHE KOC SC
Salsola kali	CHE SAL KA
Sueda depressa	CHE SUA DE
Commelinaceae *Tradescantia occidentalis*	CMM TRA OC
Compositae *Ambrosia elatior*	COM AMB EL
Cirsium sp.	COM CIR

APPENDIX I (continued)

Food Taxon	Code
Helianthus annuus	COM HEL AN
Compositae, sp.	COM
Convolvulaceae *Evolvus nuttallianus*	CON EVO NU
Evolvus sp.	CON EVO
Cyperaceae *Carex* sp.	CYP CAR
Scirpus sp.	CYP SCI
Graminae *Festuca octoflora*	GRA FES OC
Oryzopsis hymenoides	GRA ORY HY
Panicum capillare	GRA PAN CA
Setaria italica	GRA SET IT
Sporobolus cryptandrus	GRA SPO CR
Sporobolus sp.	GRA SPO
Triticum aestivum	GRA TRI AE
Graminae, sp.	GRA
Hydrophyllaceae *Ellisia nyctelea*	HYD ELL NY
Leguminosae *Astragalus* sp.	LEG AST
Melilotus alba	LEG MEL AL
Psoralea tenuiflora	LEG PSO TE
Vicia sativa	LEG VIC SA
Liliaceae *Allium* sp.	LIL ALL
Malvaceae *Sphaeralcea coccinea*	MAL SPH CO
Papaveraceae *Argemone hispida*	PAP ARG HI

APPENDIX I (continued)

Food Taxon	Code
Polygonaceae *Polygonum convolvulus*	POL POL CO
Polygonum persicaria	POL POL PE
Verbenaceae *Verbena bracteata*	VER VER BR
Unidentified	000 000 00

APPENDIX II

APPENDIX TABLES

Appendix Table 1. Total dry weight and percent representation of foods in mourning dove diet. Sample consists of 31 mourning doves (MD-1 to MD-31) collected from 2 May 1970 to 28 July 1971.

Food Taxon	Number of Individuals in Sample	Total Dry Wt. (g)	Proportion of Total Diet (%) a/
AR AR LAB	1	.0020	< 0.1
GA ST	6	.0180	< 0.1
IN COL POL CHR ALT	3	.0020	< 0.1
IN HY SCO FOR MYR MON MI	1	.0010	< 0.1
IN HY SCO FOR MYR	1	.0010	< 0.1
AMA AMA GR	2285	3.0559	4.93
AMA AMA RE	63	.0189	< 0.1
BOR CRY MI	1	.0005	< 0.1
BOR LIT IN	87	.6959	1.12
CAP CLE SE	2989	17.3888	28.06
CAR SAP VA	1	.0019	< 0.1
CHE CHE AL	10	.0050	< 0.1
CHE CHE BE	222	.1101	0.18
CHE CHE LE	34	.0068	< 0.1
CHE KOC SC	54	.1275	0.21
CHE SAL KA	1	.0005	< 0.1
CHE SUA DE	7	.0028	< 0.1
CMM TRA OC	2709	9.0874	14.67

Appendix Table 1 (continued)

Food Taxon	Number of Individuals in Sample	Total Dry Wt. (g)	Proportion of Total Diet (%) a/
COM AMB EL	3	.0105	< 0.1
COM CIR OO	2	.0170	< 0.1
COM HEL AN	3925	12.0933	19.52
COM OOO OO	5	.0356	0.1
CON EVO NU	44	.1672	0.27
CON EVO OS	75	.3600	0.58
CYP CAR OO	2	.0054	< 0.1
CYP SCI OO	151	.1294	0.21
GRA FES OC	2	.0029	< 0.1
GRA ORY HY	879	2.9609	4.78
GRA PAN CA	1	.0018	< 0.1
GRA SET IT	2010	4.6230	7.46
GRA SPO CR	67	.0134	< 0.1
GRA SPO OO	2	.0004	< 0.1
GRA TRI AE	332	7.4440	12.01
GRA OOO OO	1	.0002	< 0.1
HYD ELL NY	2	.0032	< 0.1
LEG AST OO	1	.0017	< 0.1
LEG MEL AL	8	.0120	< 0.1
LEG PSO TE	15	.2160	0.35
LEG VIC SA	15	.2545	0.41

Appendix Table 1 (continued)

Food Taxon	Number of Individuals in Sample	Total Dry Wt. (g)	Proportion of Total Diet (%) [a/]
LIL ALL 00	36	.0756	0.12
MAL SPH CO	600	.9771	1.58
PAP ARG HI	29	.0696	0.11
POL POL CO	746	1.7762	2.87
POL POL PE	15	.0351	0.1
VER VER BR	113	.0565	0.1
000 000 00	108	.1161	0.19

[a/] Total weight of all food: 61.963 g.

Appendix Table 2. Plants characteristic of disturbed and undisturbed habitats.

Disturbed Habitat		Undisturbed Habitat	
Food Taxon	Proportion of Total Diet (%)[a/]	Food Taxon	Proportion of Total Diet (%)[a/]
AMM AMM GR	4.93	BOR CRY MI	< 0.1
AMM AMM RE	< 0.1	BOR LIT IN	1.12
CAP CLE SE	28.06	CHE CHE LE	< 0.1
CAR SAP VA	< 0.1	CMM TRA OC	14.67
CHE CHE AL	< 0.1	CON EVO NU	0.27
CHE CHE BE	0.18	CYP CAR OO	< 0.1
CHE KOC SC	0.21	CYP SCI OO	0.21
CHE SAL KA	< 0.1	GRA FES OC	< 0.1
CHE SUA DE	< 0.1	GRA ORY HY	4.78
COM AMB EL	< 0.1	GRA SPO CR	< 0.1
COM CIR OO	< 0.1	HYD ELL NY	< 0.1
COM HEL AN	19.52	LEG AST OO	< 0.1
GRA PAN CA	< 0.1	LEG PSO TE	0.35
GRA SET IT	7.46	LIL ALL OO	0.12
GRA TRI AE	12.01	MAL SPH CO	1.58
LEG MEL AN	< 0.1	PAP ARG HI	0.11
LEG VIC SA	0.41		
POL POL CO	2.87		
POL POL PE	< 0.1		
VER VER BR	< 0.1		

[a/] Based on dry weight estimates.

APPENDIX III

Mourning Doves Used in This Study

All mourning doves used in this study were collected in shortgrass prairie approximately 7 to 12 miles east and eastnortheast of Nunn, Weld County, Colorado.

Serial No.	Date Obtained	Age	Sex	Hour (MST)
MD-1	2 May 1970	Adult	Male	1110
MD-2	9 May 1970	Adult	Female	0930
MD-3	9 May 1970	Adult	Male	0935
MD-4	7 June 1970	Adult	Male	0915
MD-5	7 June 1970	Adult	?	0915
MD-6	7 June 1970	Adult	Male	0915
MD-7	13 June 1970	Adult	Male	1135
MD-8	13 June 1970	Adult	Male	1300
MD-9	23 June 1970	Adult	Male	0805
MD-10	30 June 1970	Adult	Male	0750
MD-11	7 July 1970	Adult	?	1159
MD-12	14 July 1970	Adult	Male	0905
MD-13 [a/]	21 July 1970	Adult	?	0750
MD-14 [a/]	5 August 1970	Juvenile	Female	1115
MD-15 [a/]	5 August 1970	Juvenile	Female	1130
MD-16 [a/]	11 August 1970	Adult	Male	0826
MD-17 [a/]	11 August 1970	Adult	Male	0922
MD-18	18 August 1970	Adult	Female	1128

APPENDIX III (continued)

Serial No.	Date Obtained	Age	Sex	Hour (MST)
MD-19	24 August 1970	Adult	Female	1022
MD-20	24 August 1970	Adult	Male	1022
MD-21	8 May 1971	Adult	Female	0900
MD-22	8 May 1971	Adult	Female	0925
MD-23	30 May 1971	Adult	Female	0820
MD-24	16 June 1971	Adult	Female	0715
MD-25	16 June 1971	Adult	Male	0735
MD-26	30 June 1971	Adult	Male	0808
MD-27	30 June 1971	Adult	Female	1029
MD-28	14 July 1971	Adult	Male	0724
MD-29	14 July 1971	Adult	Male	0743
MD-30 a/	28 July 1971	Juvenile	Male	0858
MD-31 a/	28 July 1971	Adult	Male	0915

a/ Used for comparison of adult vs. juvenile diets.