Technical Report No. 134

DIET OF THE MOUNTAIN PLOVER AT THE PAWNEE NATIONAL GRASSLAND, 1970-1971

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ABSTRACT

The diet of the mountain plover (*Eupoda montana*) in Weld County, Colorado, was studied for the spring and summer period between the dates May 4 and August 11. Thirteen birds, eight adult and five juveniles, were available for analysis of stomach contents. Identifications of 90 food taxa and estimates of dry weight parameters for each type of food showed the diet to consist of 99.7% arthropods and 0.3% seeds. The most important food types were ground-dwelling beetles (60.0%), grasshoppers and crickets (24.5%) and ants (6.6%). The most important genus eaten was *Eleodes* (a darkling beetle) comprising 22% of the diet. Comparisons of diets of juvenile and adult mountain plover revealed that juveniles ate smaller insects such as ants, bees, wasps and parasites, leaf and flower beetles, and leafhoppers in slightly greater proportions than did adults. Adults, however, ate larger insects such as caterpillars, billbugs, and darkling beetles in somewhat greater proportions than did juveniles. The mean length of food items eaten by all adults was 10.0 mm, and by juveniles 8.5 mm. Overlap in size, i.e., length of food items eaten by the two age groups, was 60.3%.

INTRODUCTION

The mountain plover *(Eupoda montana)* is a bird adapted primarily to the shortgrass prairie of the western Great Plains. Its breeding range lies largely along the piedmont just east of the Rocky Mountains and it extends from Montana south to Colorado. The heart of its breeding range is said to be in Weld County, Colorado, the site of the present study (W. Graul, personal communication).

The densest breeding populations of the mountain plover apparently occur in the regions of shortest grass (e.g., *Buchloe dactyloides*) in the Pawnee National Grassland. The specimens for the present study were collected from this type of habitat either at, or approximately 10 miles east of, the Central Plains Experimental Range (T10N, R64W).

The mountain plover inhabits the interior grasslands from early spring to the end of summer. It frequents prairies of the relatively dry uplands, and, unlike the killdeer, is not drawn to aquatic or marshy habitats in this region.

A general statement of diet is found in Bent (1929, p. 266) to the effect that "the mountain plover's food consists almost wholly, if not entirely, of insects. Grasshoppers seem to be its principal food, but many crickets, beetles, and flies are eaten."

METHODS

This is a food habits study using stomach content analyses. The birds were obtained in normal activity at the nesting habitat; age, sex and other vital parameters were recorded for each specimen. The stomach contents were identified and measured under the dissecting microscope with

the aid of a reference collection of arthropods and seeds made at the locality where birds were collected. Dry weights of food taxa were determined by weighing oven dried samples from the same habitat. The number of insects or seeds eaten of each taxon was determined by counting repeated parts (heads, elytra, etc.) or whole items when possible. The dry weight values refer to amounts of food ingested by the bird rather than to amounts of partial food remains present in the stomach. Percentage composition of the diet can refer either to the proportion of individual items eaten or to proportion of dry weight biomass of foods in the diet.

Dr. C. W. O'Brien identified the reference collection of weevils and many of the specimens from stomachs. Ground beetles and darkling beetles were identified from keys by Bell (Bell 1970, 1971) and reference to the Colorado State University entomology collection. Other arthropods were identified from keys, reference to the Colorado State University collection, or with the assistance of Dr. T. O. Thatcher.

General Nature of Diet

The food found in the mountain plover at the Pawnee National Grassland was just short of 100% arthropod in nature (Table 1). Some 710 food items were recognized and identified; 698 were arthropods and 12 were seeds. In addition, either coarse or finely divided fibrous plant material was usually present in trace amounts in the food sample of each bird. The finely divided cellular plant material was certainly released from the guts of herbivorous insects eaten by the plover. These were omitted from the calculations of food biomass.

Table 1. General composition of sample of summer diet of mountain plover at Pawnee National Grassland.

Foods	Dry Wt. of Sample (g)	Proportion (%)
Arthropods	6.67	99.7
Seeds	0.02	0.3
All foods	6.69	100.0

Taxonomic Composition of the Diet

Ninety taxa were recognized from the stomach samples of the mountain plover. These are listed in Appendix I. These taxa were distributed among 10 orders and 40 families of arthropods and 3 families of plants. Coleoptera was the order best represented with nine families recorded, representing about one-quarter of the taxa at the familial level. Hymenoptera and Hemiptera were each represented with six families. Other orders had from one to five families. Similar comparisons below the family level are not available, as identifications often could not be made or were not made beyond the family level at this time.

Biomass Parameters of the Diet

Biomass estimates of all foods eaten were made in terms of the dry weight of the foods. The dry weights given in Tables 2 and 3 and in Appendix Tables 1, 2 and 3 were derived by taking the sum of estimated dry weights of all individual items eaten for each type of food. The percentages accompanying these biomass figures were calculated by dividing the total dry weight of each food type by the total dry weight of all foods in the sample. This form of expressing the composition of the diet is preferred to the commonly used percentage of numbers of individuals or percentage frequency of occurrence, since it can serve as an index to the quantity of energy furnished to the birds by each food.

The relative biomass contribution of many families is shown in Table 2. The darkling beetles were the most important family, as they provided

Table 2. Amount of biomass in sample and proportional representation of arthropod foods in summer diet of mountain plover.

Family (or other)		Total Dry Wt. in Sample (g)	Representation in Diet (%)[a/]
Acarina	Mites	.0002	< 0.1
Araneida	Spiders	.094	1.4
Carabidae	Ground beetles	.173	2.6
Cicindelidae	Tiger beetles	.017	0.3
Chrysomelidae	Leaf beetles	.033	0.5
Cleridae		.008	0.1
Curculionidae	Weevils	1.327	19.8
Histeridae		.005	0.1
Hydrophilidae		.022	0.3
Scarabaeidae	Scarab beetles	.797	11.9
Tenebrionidae	Darkling beetles	1.677	25.0
Diptera	Flies	.012	0.2
Coreidae	Bugs	.023	0.3
Pentatomidae	Bugs	.024	0.4
Other Hemiptera	Bugs	.015	0.2
Cicadellidae	Leaf hoppers	.004	0.1
Apoidea	Bees	.017	0.3
Formicidae	Ants	.4404	6.6
Other Hymenoptera	Wasps & parasites	.109	1.6
Lepidoptera	Caterpillars	.184	2.8
Neuroptera	Owl-flies	.005	0.1
Acrididae	Grasshoppers	1.304	19.5
Other Orthoptera	Crickets	.338	5.0

[a/] Weight of total sample = 6.7 g.

Table 3. Representation of important arthropod types in diet of mountain plover.

Arthropod Type		Total Dry Wt. in Sample (g)	Representation in Diet (%) [a]
Grasshoppers and crickets	(1)[b]	1.642	24.5
Caterpillars and moths	(2)	0.184	2.7
Spiders and mites	(3)	0.0942	1.4
Ants	(4)	0.4404	6.6
Bees, wasps, parasites	(5)	0.126	1.9
Leaf and flower beetles	(6)	0.041	0.6
Ground-dwelling beetles	(7)	4.018	60.0
Bugs and hoppers	(8)	0.066	1.0
Flies	(9)	0.012	0.2

[a] Weight of total sample = 6.7 g.

[b] Numbers in parentheses indicate which families were included in each arthropod type listed; see Appendix I.

25% of the food biomass. Following next in order were the weevils, 19.8%, and short-horned grasshoppers, 19.3%.

A broader picture of the sources of food bulk is given in Table 3, where the families have been combined as general types of arthropods. Ground-dwelling beetles had outstanding importance and accounted for 60% of the food mass eaten. Grasshoppers and crickets were next with 24.5%, and ants were third, with 6.6%. All other general types provided 7.8% collectively and from 0.2 to 2.7% individually, of the dietary mass.

The one most important type of beetle eaten was the darkling beetle, *Eleodes*. Adults found in the stomachs were 15 to 16 mm in length, while larvae were up to 30 mm. Together, these comprised 22% of the diet.

Seasonal Occurrence of Arthropods in the Diet

The use of the most important arthropod types for food over the spring and summer appeared to be quite uniform. The shifts in percentage composition which did occur were complementary among the three main food types (Table 4 and Fig. 1). The ground-dwelling beetles were eaten in increasing amounts from late spring to midsummer and then more lightly in late summer. Just the opposite trend occurred with grasshoppers and ants, which were eaten most lightly in midsummer.

Composition of Diet of Adults vs. Juveniles.

The diets of adult and juvenile mountain plovers in the early summer, June 16 to July 15, were compared (Tables 5 and 6). The taxa eaten by both age groups were nearly the same, but the proportionate representation of certain taxa changed. The darkling beetles and their

Table 4. Seasonal occurrence of important arthropod types shown as percent for each period.

Arthropod Type	Period 1 May 1-15 (%)	Period 4 June 16-30 (%)	Period 5 July 1-15 (%)	Period 7 Aug. 1-15 (%)
Ground-dwelling beetles	46.2	56.2	77.2	59.1
Grasshoppers and crickets	34.7	22.5	4.1	32.6
Ants	12.2	6.8	4.0	6.5

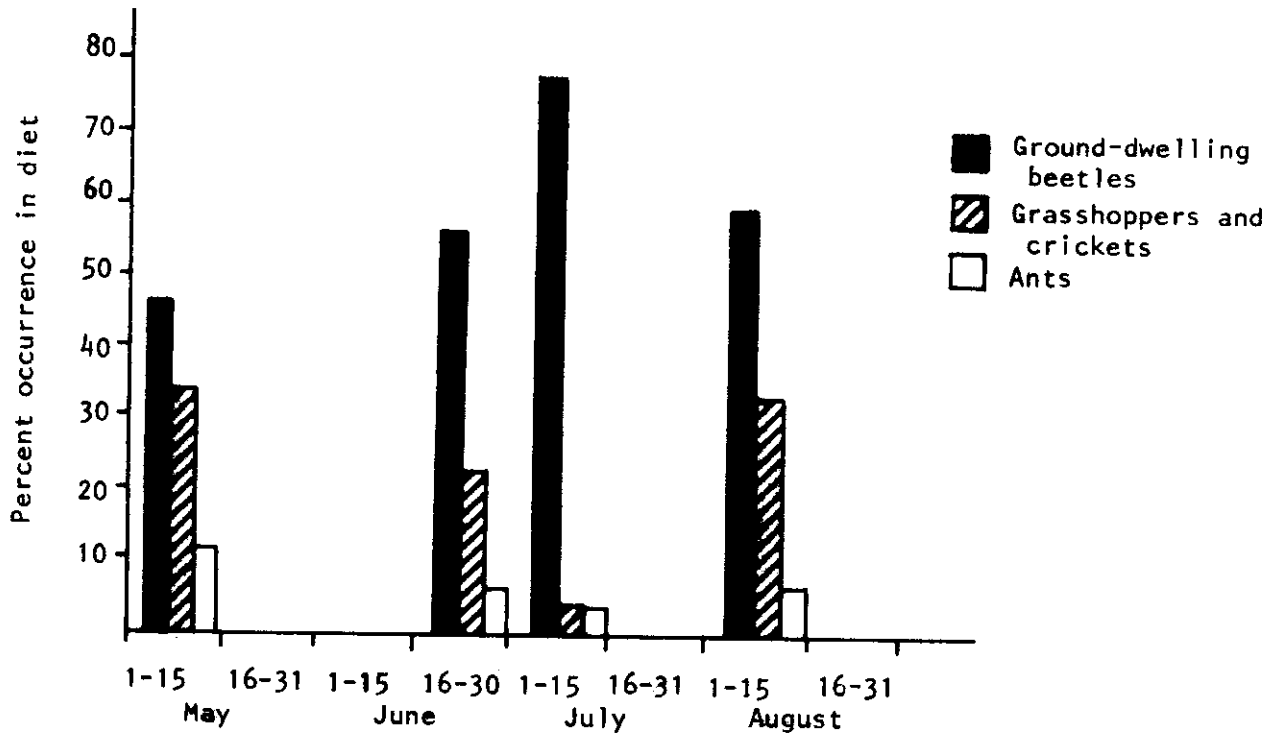

Fig. 1. Seasonal occurrence of important arthropod types in diet of the mountain plover. Dry weights were used for comparison. Percentages shown are those for each group of arthropods in relation to total dry weight of sample foods for each period.

Table 5. Comparison of biomass of major food taxa eaten by adult and juvenile mountain plover.

Food Taxon		Adult Diet		Juvenile Diet	
		Wt. of Sample (g)	Representation [a] (%)	Wt. of Sample (g)	Representation [b] (%)
Acarina	Mites	0	0	.0002	< 0.1
Araneida	Spiders	.064	2.2	.026	1.7
Carabidae	Ground beetles	.057	2.0	.054	3.6
Cicindelidae	Tiger beetles	0	0	.017	1.1
Chrysomelidae	Leaf beetles	.009	0.3	.019	1.3
Curculionidae	Weevils	.469	16.2	.243	16.2
Histeridae		0	0	.005	0.3
Hydrophilidae		.006	0.2	.016	1.1
Scarabaeidae	Scarab beetles	.315	10.9	.266	17.7
Tenebrionidae	Darkling beetles	1.136	39.2	.189	12.6
Diptera	Flies	.012	0.4	0	0
Coreidae	Bugs	.018	0.6	.005	0.3
Pentatomidae	Bugs	.009	0.3	.015	1.0
Other Hemiptera	Bugs	.004	0.1	.007	0.5
Cicadellidae	Leafhoppers	.002	0.1	0	0
Apoidea	Bees	0	0	.017	1.1
Formicidae	Ants	.059	2.0	.215	14.3
Other Hymenoptera	Wasps & parasites	.053	1.8	.056	3.7
Lepidoptera	Caterpillars	.088	3.0	.020	1.3
Neuroptera	Owl-flies	0	0	.005	0.3
Acrididae	Grasshoppers	.440	15.2	.289	19.3
Other Orthoptera	Crickets	.104	3.6	0	0

[a] Weight of total sample = 2.7 g.

[b] Weight of total sample = 1.5 g.

Table 6. Comparison of important arthropod types eaten by adult and juvenile mountain plover.

Arthropod Type		Adult Diet		Juvenile Diet	
		Wt. of Sample (g)	Representation [a] (%)	Wt. of Sample (g)	Representation [b] (%)
Grasshoppers and crickets	(1)[c]	.544	18.8	.289	19.3
Caterpillars and moths	(2)	.088	3.0	.020	1.3
Spiders and mites	(3)	.064	2.2	.0262	1.7
Ants	(4)	.059	2.0	.215	14.3
Bees, wasps, parasites	(5)	.053	1.8	.073	4.9
Leaf and flower beetles	(6)	.009	0.3	.019	1.3
Ground-dwelling beetles	(7)	1.983	68.4	.790	52.7
Bugs and hoppers	(8)	.033	1.1	.027	1.8
Flies	(9)	.012	0.4	0	0

[a] Weight of total sample = 2.9 g.

[b] Weight of total sample = 1.5 g.

[c] Numbers in parentheses indicate which families of arthropods were included in each general type listed; see Appendix I.

larvae provided 39.2% of the adult food but only 12.6% of the juvenile food. The mean length of tenebrionid food items for adults was 22.7 mm (N = 35), while mean length for juveniles was 10.2 mm (N = 18). The scarab beetles and larvae accounted for 10.9% of the adult diet but 17.7% of the juvenile diet. The mean length of scarabaeid food items for adults was 13.3 mm (N = 18), while mean length for juveniles was 7.5 mm (N = 68). Ants were consumed in distinctly larger proportions by juvenile plovers. Grasshoppers were eaten by both age groups in approximately equal bulk; however, the mean length of grasshoppers taken by adults was 14.1 mm (N = 35) and by juveniles, 12.1 mm (N = 29).

Size of Food Items Eaten by Adults vs. Juveniles

The differences in consumption of important arthropod types pointed out in the previous paragraph suggest that the requirement as to size of food item differs between adult and juvenile mountain plover. Additional data on size of items eaten are presented in Tables 7 and 8, and graphic comparisons are made in Fig. 2 and 3. The data appearing in these tables and figures are for the interval, June 16 to July 15, with six adult and three juvenile birds.

For the time interval analyzed, the mean length of food item eaten by adults was 12.5 mm and that by juveniles 8.5 mm. Adults ate food items of 9 to 12 mm in length more frequently than any other length class, while juveniles ate items 6 to 9 mm in length more frequently.

The mean amount of biomass ingested per food item by adults was 0.014 g (dry weight), whereas it was 0.006 g for juveniles. Adults obtained a larger proportion of food biomass from arthropods 15 to 18 mm in length

Table 7. Size of food items of adult mountain plover in length and dry weight, June 16 to July 15.

Length of Food Item (mm)	Occurrence by Length		Dry Weight	
	No. of Items Per Bird	% of Total No. of Items	Dry Wt. of Items Per Bird (g)	% of Total Dry Wt. of Items
30.0 - 32.9	1.3	4.2	.039	8.3
27.0 - 29.9	2.0	6.3	.067	14.8
24.0 - 26.9	0	0	0	0
21.0 - 23.9	0.5	1.6	.017	3.7
18.0 - 20.9	0.8	2.6	.035	7.5
15.0 - 17.9	3.3	10.4	.107	23.1
12.0 - 14.9	5.0	15.6	.070	15.2
9.0 - 11.9	8.2	25.5	.085	18.4
6.0 - 8.9	5.8	18.2	.030	6.4
3.0 - 5.9	5.0	15.6	.013	2.7
0 - 2.9	0	0	0	0

Table 8. Size of food items of juvenile mountain plover in length and dry weight, June 16 to July 15.

Length of Food Items (mm)	Occurrence by Length		Dry Weight	
	No. of Items Per Bird	% of Total No. of Items	Dry Wt. of Items Per Bird (g)	% of Total Dry Wt. of Items
30.0 - 32.9	0	0	0	0
27.0 - 29.9	0.3	0.4	.010	2.0
24.0 - 26.9	0	0	0	0
21.0 - 23.9	0	0	0	0
18.0 - 20.9	0.6	0.8	.010	2.0
15.0 - 17.9	1.0	1.3	.033	6.6
12.0 - 14.9	4.7	5.9	.063	12.7
9.0 - 11.9	7.2	18.1	.151	30.3
6.0 - 8.9	38.3	48.5	.195	39.2
3.0 - 5.9	19.0	24.1	.035	7.1
0 - 2.9	0.6	0.8	.0002	< 0.1

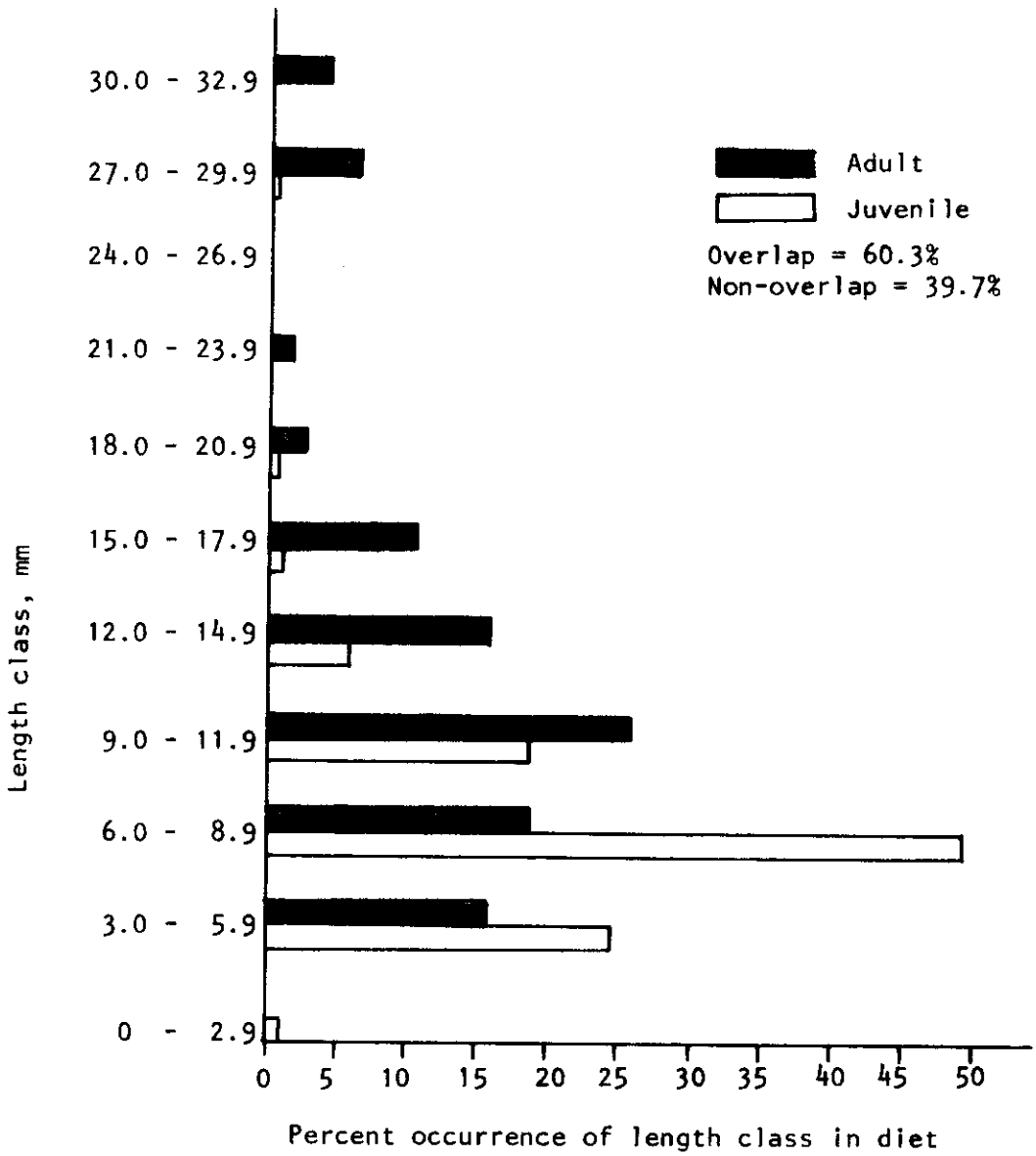

Fig. 2. Comparison of percent composition of the diets of adult and juvenile mountain plover by length of food items.

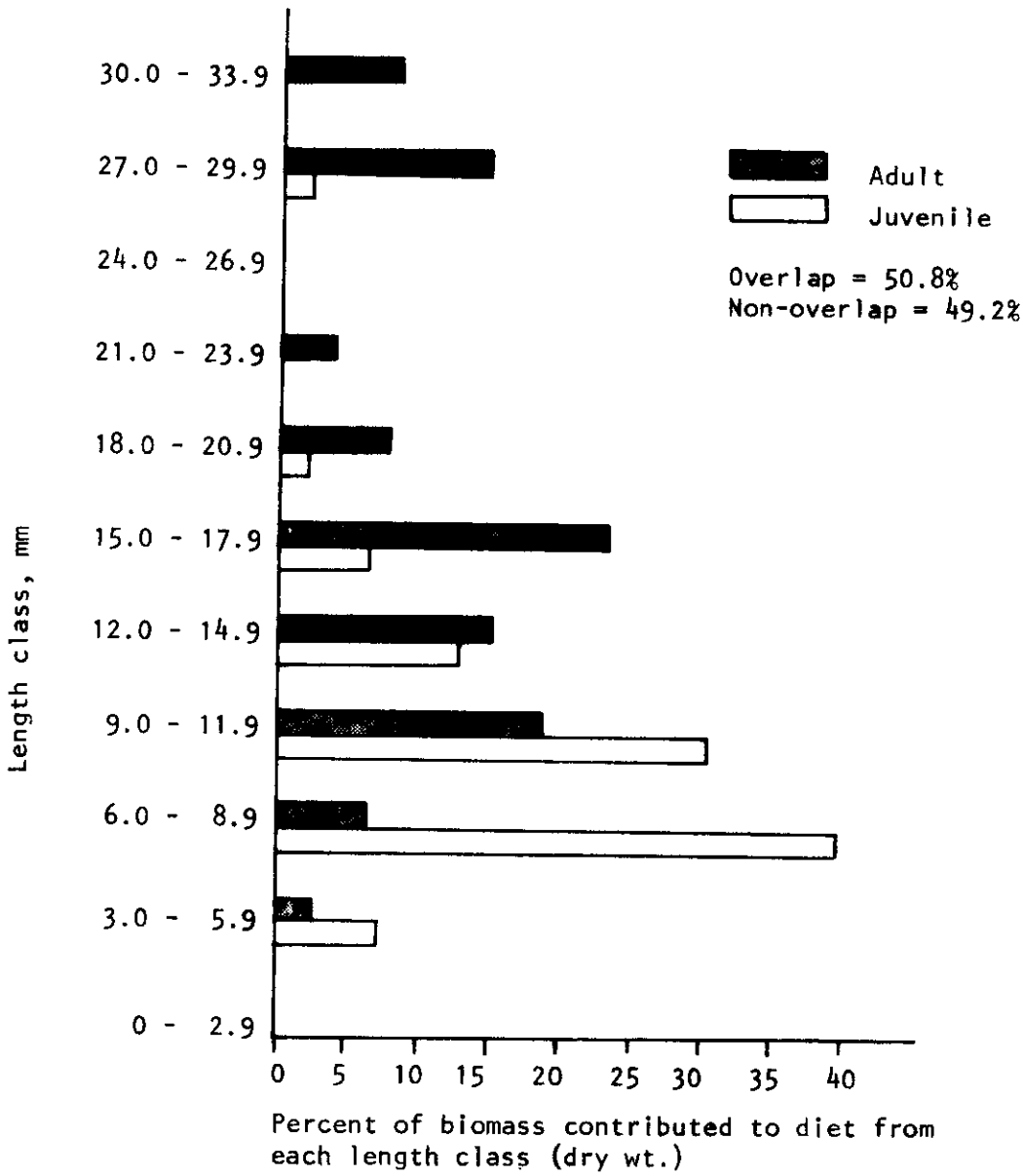

Fig. 3. Comparison of proportions of food biomass contributed to diets of adult and juvenile mountain plover from each size class of food.

than from any other length class. Juveniles obtained a larger proportion of food biomass from arthropods 6 to 9 mm in length than from any other length class. In adults, 25.1% of all items eaten were 15.0 mm or longer, and these items provided 57.6% of the dry weight biomass in the diet. In juveniles only 2.5% of all items eaten were 15.0 mm or larger, and these items furnished only 10.6% of the biomass in the diet.

In order to find out which different parts of the common food resource were used by the two age groups, overlap was examined. Overlap was calculated as the sum of the smaller components of each pair in Fig. 2 and in Fig. 3, while non-overlap was the difference between the overlap value and 100%. Overlap in the use of food items measured by length was 60.3%, and non-overlap, 39.7%. This means that 60.3% of the items eaten by each age group were matched in length by items eaten by the other, whereas 39.7% of the items eaten by each age group were not matched in length by any item eaten by the other. In respect to the percent of biomass contributed to the diet from each length class of food, overlap was 50.8%, and non-overlap 49.2%. This means that 50.8% of the food biomass was obtained by each age group in packages of the same length as eaten by the other age group. However, 49.2% of the food biomass consumed by each age group was taken in packages that were not matched in length by any eaten by the other age group.

The size of the plovers in these two age groups differed. The mean length of bill (tip to feathers at forehead) was 21.0 mm, and the range was 19.5 to 22.2 mm for five adults; the mean length was 16.7 mm, range 12.6 to 20.5 mm for the three juveniles. The mean body weight of the six adults was 101.9 g, range 93.8 to 104.1 g, and the mean body weight of the three juveniles was 50.0 g, range 19.1 to 82.9 g.

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APPENDIX I

List of Food Taxa and Codes

Food Taxon		Code
Acarina Mesostigmata Macrochelidae, sp.	(3)[a/]	AC MES MAC
Araneida Labidognatha, sp.	(3)	AR LAB
Clubionidae, sp.	(3)	AR LAB CLU
Lycosidae, sp.	(3)	AR LAB LYC
Salticidae, sp.	(3)	AR LAB SAL
Coleoptera Adephaga Carabidae Amarini *Amara convexa*	(7)	CO ADE CAR AMA AMA CO
Harpalini *Cratacanthus dubius*		CO ADE CAR HAR CRA DU
Piosoma setosum		CO ADE CAR HAR PIO SE
Cicindelidae Cicindelinae *Cicindela*, sp.		CO ADE CCN CCN CIC
Polyphaga, sp.		CO POL
Chrysomelidae, sp.	(6)	CO POL CHR
Alticinae, sp.		CO POL CHR ALT
Eumolpinae *Graphops nebulosus*		CO POL CHR EUP GRA NE
Myochrous squamosus		CO POL CHR EUP MYO SQ
Hispinae *Stenopodius flavidus*		CO POL CHR HSP STE FL
Cleridae Clerinae *Enoclerus*, sp.	(6)	CO POL CLE CLE ENO
Curculionidae, sp.	(7)	CO POL CUR
Calendrinae *Sphenophorus compressirostris*		CO POL CUR CAL SPH CO
Curculioninae, sp.		CO POL CUR CUR
Calandrinus grandicollis		CO POL CUR CUR CLA GR
Gerstaeckeria sp.		CO POL CUR CUR GER

APPENDIX I (continued)

Food Taxon		Code
Hyperodes gripidioides		CO POL CUR CUR HYP GR
Sitona sp.		CO POL CUR CUR SIT
Sitona cylindricollis		CO POL CUR CUR SIT CY
Smicronyx sordidus		CO POL CUR CUR SMI SO
Otiorhynchinae *Calyptillus cryptops*		CO POL CUR OTI CLY CR
Ophryastes sulcirostris		CO POL CUR OTI OPH SU
Ophryastes vittatus		CO POL CUR OTI OPH VI
Pantomorus planitiatus		CO POL CUR OTI PNT PL
Thecesterninae *Thecesternus morbillosus*		CO POL CUR THE THE MO
Histeridae Histerinae *Spilodiscus*, sp.	(7)	CO POL HIS HIS SPI
Hydrophilidae Sphaeridiinae *Sphaeridium scarabaeoides*	(7)	CO POL HYD SPD SPD SC
Scarabaeidae Aphodiinae *Aphodius fimetarius*	(7)	CO POL SCA APH APH FI
Rhyssemus scaber		CO POL SCA APH RHY SC
Scarabaeinae *Canthon laevis*		CO POL SCA SCA CNT LA
Tenebrionidae Tenebrioninae, sp.	(7)	CO POL TEN TEN
Blapstinus metallicus		CO POL TEN TEN BLA ME
Eleodes fusiformis		CO POL TEN TEN ELE FU
Eleodes obsoleta		CO POL TEN TEN ELE OB
Tentyriinae *Melanastus implicans*		CO POL TEN TNT MLA IM
Diptera, sp.	(9)	DI
Nematocera Chironomidae, sp.	(9)	DI NEM CHI
Hemiptera Gymnocerata Corimelaenidae, sp.	(8)	HE GYM COR

APPENDIX I (continued)

Food Taxon		Code
Coreidae, sp.	(8)	HE GYM CRE
Corizidae, sp.	(8)	HE GYM CRZ
Cydnidae Pangaeinae *Pangaeus congruus*	(8)	HE GYM CYD PAN PAN CO
Lygaeidae, sp.	(8)	HE GYM LYG
Miridae, sp.	(8)	HE GYM MIR
Pentatomidae Pentatominae *Thyanta custator*	(8)	HE GYM PEN PEN THN CU
Tingidae *Piesma*, sp.	(8)	HE GYM TIN 000 PIE
Homoptera Auchenorhyncha Cicadellidae, sp.	(8)	HO AUC CIC
Cuerna sp.		HO AUC CIC 000 CUE
Hymenoptera Apocrita, sp.	(5)	HY APC
Apoidea, sp.	(5)	HY APO
Apidae, sp.	(5)	HY APO API
Cynipoidea Cynipidae Cynipinae, sp.	(5)	HY CYN CYN CYN
Ichneumonoidea Braconidae Cheloninae *Chelonus*, sp.	(5)	HY ICH BRA CHE CHE
Ichneumonidae Ichneumoninae *Pterocormus*, sp.	(5)	HY ICH ICH ICH PTE
Scolioidea Formicidae, sp.	(4)	HY SCO FOR
Dolichoderinae *Tapinoma sessile*		HY SCO FOR DOL TAP SE
Formicinae *Formica*, sp.		HY SCO FOR FOR FOR
Formica fusca		HY SCO FOR FOR FOR FU
Formica neoclara		HY SCO FOR FOR FOR NC
Formica neogagates		HY SCO FOR FOR FOR NE

APPENDIX I (continued)

Food Taxon		Code
Formica obscuripes		HY SCO FOR FOR FOR OB
Formica (Raptiformica) sp.		HY SCO FOR FOR FOR RA
Formica rubicunda		HY SCO FOR FOR FOR RU
Lasius alienus		HY SCO FOR FOR LAS AL
Myrmicinae, sp.		HY SCO FOR MYR
Monomorium minimum		HY SCO FOR MYR MON MI
Myrmica sabuleti		HY SCO FOR MYR MYR SA
Pogonomyrmex occidentalis		HY SCO FOR MYR POG OC
Pompilidae, sp.	(5)	HY SCO POM
Sphecoidea Sphecidae, sp.	(5)	HY SPH SPH
Philanthinae, sp.		HY SPH SPH PHI
Lepidoptera Macrolepidoptera, sp.	(2)	LE MAC
Agaristidae, sp.	(2)	LE MAC AGA
Hesperiidae, sp.	(2)	LE MAC HES
Phalaenidae, sp.	(2)	LE MAC PHA
Microlepidoptera Pyralidae, sp.	(2)	LE MIC PYR
Tortricidae	(2)	LE MIC TOR
Neuroptera Planipennia Ascalaphidae, sp.		NE PLA ASC
Orthoptera Caelifera Acrididae, sp.	(1)	OR CAE ACR
Ensifera, sp.		OR ENS
Gryllacrididae Rhaphidophorinae *Ceuthophilus*, sp.	(1)	OR ENS GRC RHA CEU

APPENDIX I (continued)

Food Taxon		Code
Gryllidae Gryllinae *Gryllus*, sp.	(1)	OR ENS GRY GRY GRY
Tettigoniidae, sp.	(1)	OR ENS TET
Polygonaceae *Polygonum*, sp.		POL POL
Graminae *Buchloe dactyloides*		GRA BUC DA
Festuca octoflora		GRA FES OC
Cyperaceae *Carex*, sp.		CYP CAR

a/ Numbers in parentheses indicate which families of arthropods were included in each general food type listed in Table 6.

APPENDIX II

APPENDIX TABLES

Appendix Table 1. Total dry weight and percent representation in mountain plover diet of each arthropod food eaten. Sample consists of 13 mountain plover (MP-1 to MP-13) collected from May 4 to August 11, 1968 to 1971.

Food Taxon		No. of Individuals in Sample	Total Dry Wt. (g)	Proportion of Total Diet (%) [a/]
AC MES MAC	Mites	1	.0002	< 0.1
AR LAB 000	Spiders	4	.030	0.4
AR LAB CLU		2	.022	0.3
AR LAB LYC		1	.009	0.1
AR LAB SAL		3	.033	0.5
CO ADE CAR AMA AMA CO	Beetles	1	.013	0.2
CO ADE CAR HAR		5	.070	1.0
CO ADE CAR HAR CRA DU		3	.054	0.7
CO ADE CAR HAR PIO SE		2	.036	0.5
CO ADE CCN CCN CIC		1	.017	0.3
CO POL 000		6	.039	0.6
CO POL CHR		1	.001	< 0.1
CO POL CHR ALT		11	.022	0.3
CO POL CHR EUP		3	.007	0.1
CO POL CHR EUP PAR		1	.002	< 0.1
CO POL CHR HSP STE FL		1	.001	< 0.1
CO POL CLE CLE ENO		1	.008	0.1

Appendix Table 1 (continued)

Food Taxon	No. of Individuals in Sample	Total Dry Wt. (g)	Proportion of Total Diet (%) a/
CO POL CUR	4	.038	0.6
CO POL CUR CAL SPH CO	51	.707	10.6
CO POL CUR CUR	2	.008	0.1
CO POL CUR CUR CLA GR	1	.002	< 0.1
CO POL CUR CUR GER	7	.072	1.1
CO POL CUR CUR HYP GR	33	.132	2.0
CO POL CUR CUR SIT	2	.012	0.2
CO POL CUR CUR SIT CY	4	.012	0.2
CO POL CUR CUR SMI SO	2	.004	0.1
CO POL CUR OTI CLY CR	11	.028	0.5
CO POL CUR OTI OPH SU	3	.048	0.7
CO POL CUR OTI OPH VI	13	.210	3.1
CO POL CUR CUR PNT PL	5	.041	0.6
CO POL CUR THE THE MO	1	.013	0.2
CO POL HIS HIS SPI	1	.005	0.1
CO POL HYD SPD SPD SC	3	.022	0.3
CO POL SCA APH APH FI	96	.580	8.7
CO POL SCA APH RHY SC	24	.067	1.0
CO POL SCA SCA CNT LA	2	.150	2.2
CO POL TEN TEN	25	.704	10.5
CO POL TEN TEN BLA ME	32	.128	1.9
CO POL TEN TEN ELE OB	21	.807	12.0

Appendix Table 1 (continued)

Food Taxon		No. of Individuals in Sample	Total Dry Wt. (g)	Proportion of Total Diet (%) a/
CO POL TEN TEN ELE FU		1	.038	0.6
DI 000	Flies	1	.010	0.2
DI NEM CHI		2	.002	< 0.1
HE GYM COR	Bugs	1	.001	< 0.1
HE GYM CRE		4	.023	0.3
HE GYM CRZ		1	.002	< 0.1
HE GYM CYD PAN PAN CO		1	.002	< 0.1
HE GYM LYG		5	.008	0.1
HE GYM MIR		1	.001	< 0.1
HE GYM PEN PEN THN CU		5	.024	0.4
HE GYM TIN 000 PIE		1	.001	< 0.1
HO AUC CIC	Hoppers	1	.001	< 0.1
HO AUC CIC 000 CUE		2	.003	< 0.1
HY APC	Bees, wasps, ants, par's	2	.0016	0.2
HY APO		1	.004	0.1
HY APO API		1	.013	0.2
HY CYN CYN CYN		6	.012	0.2
HY ICH BRA CHE CHE		1	.001	< 0.1
HY ICH ICH ICH		4	.049	0.7
HY ICH ICH ICH PTE		1	.017	0.3
HY SCO FOR		1	.0006	< 0.1

Appendix Table 1 (continued)

Food Taxon		No. of Individuals in Sample	Total Dry Wt. (g)	Proportion of Total Diet (%) a/
HY SCO FOR DOL TAP SE		5	.005	0.1
HY SCO FOR FOR FOR		11	.032	0.5
HY SCO FOR FOR FOR FU		1	.003	< 0.1
HY SCO FOR FOR FOR NC		1	.005	0.1
HY SCO FOR FOR FOR NE		9	.022	0.3
HY SCO FOR FOR FOR OB		4	.020	0.3
HY SCO FOR FOR FOR RA		2	.006	0.1
HY SCO FOR FOR FOR RU		14	.056	0.8
HY SCO FOR FOR LAS AL		1	.001	< 0.1
HY SCO FOR MYR		1	.0004	< 0.1
HY SCO FOR MYR MON MI		1	.0004	< 0.1
HY SCO FOR MYR MYR SA		75	.168	2.5
HY SCO FOR MYR POG OC		11	.121	1.8
HY SCO POM		1	.014	0.2
HY SPH SPH		1	.008	0.1
HY SPH SPH PHI		2	.008	0.1
LE MAC	Caterpillars	10	.045	0.7
LE MAC AGA		1	.004	0.1
LE MAC HES		3	.033	0.5
LE MAC PHA		5	.085	1.3
LE MIC PYR		3	.011	0.2
LE MIC TOR		1	.006	0.1

Appendix Table 1 (continued)

Food Taxon		No. of Individuals in Sample	Total Dry Wt. (g)	Proportion of Total Diet (%) [a]
NE PLA ASC	Owl-flies	1	.005	0.1
OR CAE ACR	Grasshoppers	84	1.304	19.5
OR ENS		1	.021	0.3
OR ENS GRC RHA CEU		1	.020	0.3
OR ENS GRY GRY GRY		2	.084	1.3
OR ENS TET		4	.213	3.2

[a] Total dry weight of Arthropods: 6.669 g.

Appendix Table 2. Total dry weight and percent representation in mountain plover diet of each seed food taxon.

Taxon	Total Number of Seeds in Sample	Total Dry Wt. (g)	Representation in Diet (%) [a]
POL POL	1	.0030	
GRA BUC DA	9	.0153	0.2
GRA FES OC	1	.0016	
CYP CAR	1	.0015	

[a] Total dry weight of foods in sample = 6.7 g.

Appendix Table 3. Comparison of complete diets of adult and juvenile mountain plover for Periods 4 and 5 (June 16 to July 15). Juveniles: MP 6, 7, 9; adults: MP 1, 2, 3, 5, 8, 10.

Food Taxon		Adult Diet		Juvenile Diet	
		Wt. of Sample (g)	Representation [a] (%)	Wt. of Sample (g)	Representation [b] (%)
AC MES MAC	Mites			.0002	
AR LAB 000	Spiders	.022		.004	
AR LAB CLU		.022			
AR LAB LYC		.009			
AR LAB SAL		.011		.022	
CO ADE CAR HAR	Beetles	.057			
CO ADE CAR HAR CRA DU				.018	
CO ADE CAR HAR PIO SE				.036	
CO ADE CCN CCN CIC				.017	
CO POL 000		.002		.029	
CO POL CHR		.001			
CO POL CHR ALT		.005		.014	
CO POL CHR EUP GRA NE				.002	
CO POL CHR EUP MYO SQ		.002		.002	
CO POL CHR HSP STE FL				.001	
CO POL CUR		.016			
CO POL CUR CAL SPH CO		.378	13.0	.154	10.3
CO POL CUR CUR		.003		.005	
CO POL CUR CUR GER		.013		.010	
CO POL CUR CUR HYP GR		.004		.016	

Appendix Table 3 (continued)

Food Taxon		Adult Diet		Juvenile Diet	
		Wt. of Sample (g)	Representation [a] (%)	Wt. of Sample (g)	Representation [b] (%)
CO POL CUR CUR SIT		.012			
CO POL CUR CUR SMI SO		.004			
CO POL CUR OTI CLY CR		.004		.018	
CO POL CUR CUR OPH VI		.014		.020	
CO POL CUR OTI PNT PL		.021		.020	
CO POL HIS HIS SPI				.005	
CO POL HYD SPD SPD SC		.006		.016	
CO POL SCA APH APH FI		.162	5.6	.255	17.0
CO POL SCA APH RHY SC		.003		.010	
CO POL SCA SCA CNT LA		.150			
CO POL TEN TEN		.634		.040	
CO POL TEN TEN BLA ME		.012		.052	
CO POL TEN TEN ELE OB		.490	16.9	.097	6.5
DI 000	Flies	.010			
DI NEM CHI		.002			
HE GYM COR	Bugs			.001	
HE GYM CRE		.018		.005	
HE GYM CRZ				.002	
HE GYM CYD PAN PAN CO		.002			
HE GYM LYG		.001		.003	
HE GYM MIR		.001			

Appendix Table 3 (continued)

Food Taxon		Adult Diet		Juvenile Diet	
		Wt. of Sample (g)	Representation [a] (%)	Wt. of Sample (g)	Representation [b] (%)
HE GYM PEN PEN THN CU		.009		.015	
HE GYM TIN OOO PIE				.001	
HO AUC CIC OOO CUE	Leafhopper	.002			
HY APO	Bees			.004	
HY APO API				.013	
HY CYN CYN CYN	Gall wasps			.012	
HY ICH BRA CHE CHE	Parasites	.001			
HY ICH ICH ICH		.027		.022	
HY ICH ICH ICH PTE		.017			
HY SCO FOR		.0006			
HY SCO FOR FOR FOR		.016		.006	
HY SCO FOR FOR FOR FU		.003			
HY SCO FOR FOR FOR NC		.005			
HY SCO FOR FOR FOR NE		.001		.002	
HY SCO FOR FOR FOR OB				.020	
HY SCO FOR FOR FOR RU		.006		.040	
HY SCO FOR FOR LAS AL				.001	
HY SCO FOR MYR MON MI				.0004	
HY SCO FOR MYR MYR SA		.027		.025	
HY SCO FOR MYR POG OC				.121	

Appendix Table 3 (continued)

Food Taxon		Adult Diet		Juvenile Diet	
		Wt. of Sample (g)	Representation [a] (%)	Wt. of Sample (g)	Representation [b] (%)
HY SCO POM	Wasps			.014	
HY SPH SPH				.008	
HY SPH SPH PHI		.008			
LE MAC AGA	Caterpillars	.004			
LE MAC HES		.013			
LE MAC PHA		.071	2.4	.014	0.9
LE MIC TOR				.006	
NE PLA ASC				.005	
OR CAE ACR	Grasshoppers	.440		.289	
OR ENS GRC RHA CEU		.020			
OR ENS GRY GRY GRY		.084			
POL POL		.003			
GRA BUC DA		.003			
CYP CAR				.0015	

[a] Weight of all food in sample = 2.9 g.

[b] Weight of all food in sample = 1.5 g.

APPENDIX III

Mountain Plover Used in This Study

All mountain plover used in this study were obtained in shortgrass prairie approximately 7 to 21 miles northeast of Nunn, Weld County, Colorado.

Serial No.	Date Obtained	Age	Sex	Hour (MST)
MP-1	June 23, 1970	Adult	Male	1020
MP-2	June 23, 1970	Adult	Male	1120
MP-3	June 30, 1970	Adult	Female	1220
MP-4	May 8, 1971	Adult	Male	1203
MP-5	June 16, 1971	Adult	Male	1130
MP-6	June 16, 1971	Juvenile	?	1131
MP-7	June 30, 1971	Juvenile	Male	1350
MP-8	June 30, 1971	Adult	Female	1401
MP-9	July 14, 1971	Juvenile	Male	1310
MP-10	July 14, 1971	Adult	Male	1310
MP-11	August 11, 1971	Juvenile	Male	1310
MP-12	August 11, 1971	Juvenile	Female	1310
MP-13	May 4, 1968	Adult	Female	----