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A seasonal study of food of some birds of the Wasatch chaparral

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A SEASONAL STUDY OF THE FOOD OF SOME BIRDS OF THE WASATCH CHAPARRAL

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This thesis by Herbert H. Frost is accepted in its present form by the Department of Zoology and Entomology as satisfying the Thesis requirement for the degree of Master of Arts.

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Signed:

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INTRODUCTION

In the past, numerous studies have been made of the seasonal food of birds in different parts of the United States. In Utah County, Cottam (1929) reported on the status of the Ring-necked Pheasant (Phasianus colchicus torquatus) and Liddle (1936) worked on the seasonal food of the English Sparrow (Passer domesticus domesticus). These and other studies have been made with the view of determining the importance of the species economically as insect predators or as game birds. Very little work has been done on the seasonal food of a group of birds of a particular biotic community. With this in mind, the writer has tried, over a period of several years, to collect the birds common to the chaparral of the western slope of the Wasatch Mountains in the vicinity of Provo, Utah to determine the seasonal variations and fluctuations of the types of food consumed.

ACKNOWLEDGMENTS

Without the assistance and cooperation of many individuals a study such as this could not be accomplished. The writer wishes to extend to Dr. C. Lynn Hayward deep appreciation for the many suggestions, encouragements and aids that he has given since the inception of this study in 1942. He has also aided in the collection of specimens and the determination of the insect material. Dr. Vasco M. Tanner, Head of the Department of Zoology and Entomology, Brigham Young University

of stomachs for analysis. The writer wishes to extend his thanks to Dr. Bertrand F. Harrison and Mr. Ernest Reimchiissel, Brigham Young University for their aide in the determination of the plant material. Mr. Melbourne D. Wallace and Dr. Raymond B. Farnsworth, Brigham Young University have very graciously loaned their collections of weed seeds to the writer which have been of great assistance in determing the seed material. To his associates and many friends who have helped in innumerable ways to assist and encourage him the writer also wishes to give his thanks.

METHODS and PROCEDURE

In collecting specimens to ascertain the stomach contents no one particular area in the Chaparral has been used. The bulk of the collecting has been done on the western slope of the Wasatch Mountains east of Provo, Utah County, Utah. This area, together with supplimental collecting areas as shown on Fig. 1. constitute the localities where the data were obtained.

Wherever possible when collecting the birds the skins were mounted. In this manner the birds served a two fold purpose, (1) provided the necessary data for this study and (2) increased the avifaunal collection at Brigham Young University.

The material collected for this study has not been gathered entirely in the past year but is the result of a number of years work. In the

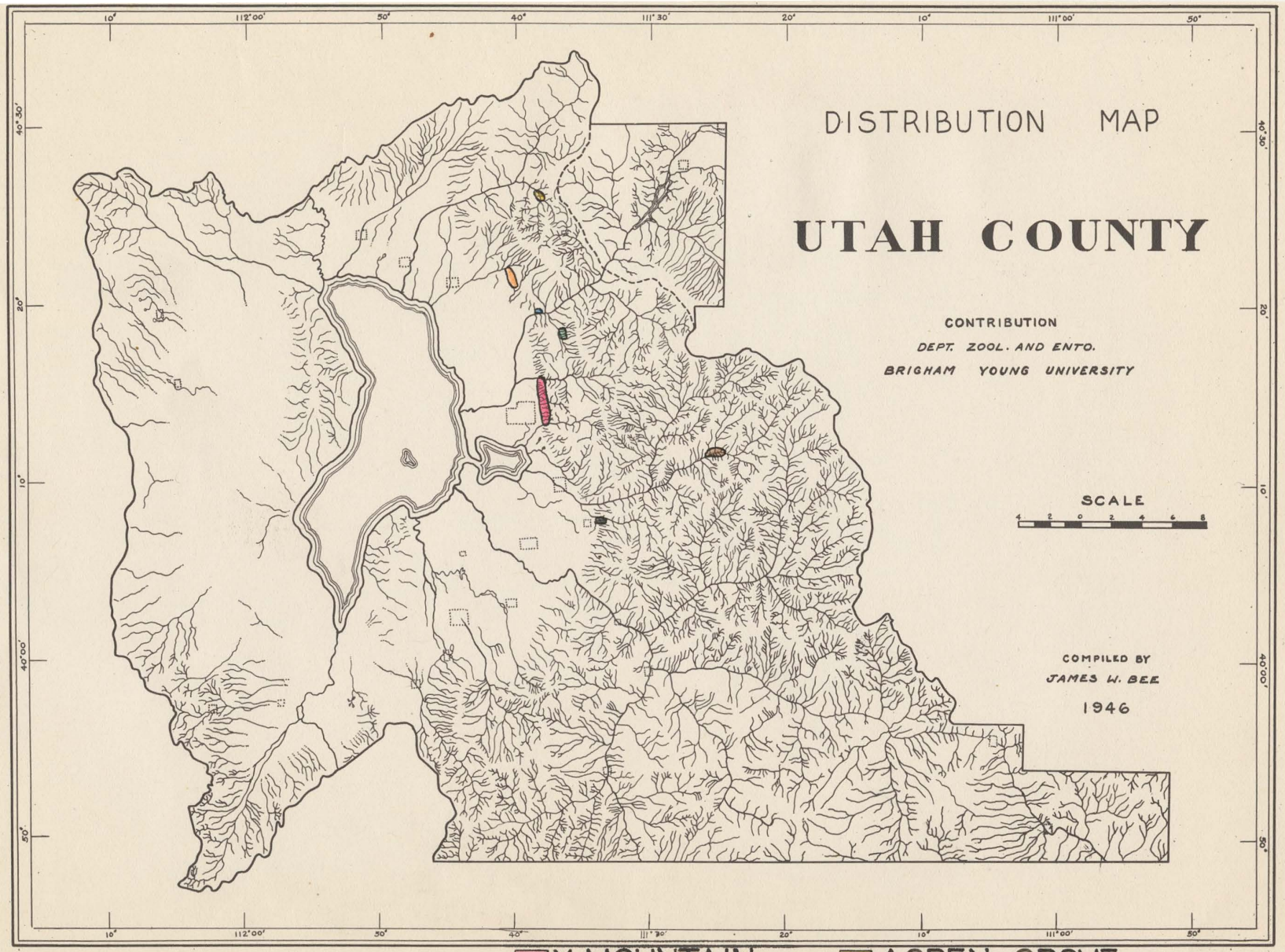

FIG. 1 COLLECTION AREAS

Collections were made by the writer from the first of May 1946 up to and including January 1947.

The stomachs when collected, if not immediately analyzed, were placed in a ten percent solution of formalin. This preservative has been found to be very satisfactory in keeping the material over a period of years without deteriorating.

Techniques used in separating, computing the volume of material and recording the data obtained, for the most part, follow the procedure used by the Fish and Wildlife Service (June, 1942). The contents of the stomach to be analyzed were emptied into a fifteen millileter graduate which was calibrated to one tenth of a cubic centimeter. Previously to emptying the contents into the graduate a known amount of water was added. The displacement of the water by the stomach contents indicated the total volume of these contents. Since most of the stomachs examined were two cubic centimeters or less in volume this type of graduate was found to be very practical. In cases where the stomach contents were greater than two cubic centermeters a fifty cubic centimeter graduate calibrated to one cubic centimeter was used.

As soon as volumetric measurements were made of the stomach contents, they were placed in one or more watch glasses depending upon the type of material and its degree of disintegration. Gravel material was separated from the rest of the stomach contents counted, and then

possible. The different particles of plant and animal material that could be distinguished was weighed and placed in separate vials for further determination. Plant material was preserved dry whereas the animal matter was placed in a seventy percent solution of alcohol.

In order to have a permanent record of all the available data for each specimen, work sheets were made up at the time of the preliminary analysis and all information was recorded thereon. After the preliminary analysis has been completed the material was reexamined and determinations made as far as possible as to the particular type of plant and animal material. This additional information was recorded on the work sheet so that each sheet contained all the available information concerning one particular bird.

DISCUSSION OF THE CHAPARRAL

Lying between the desert shrub formation of the valleys and the montane forest is an area of low growing, dense vegetation. The Spanish when they encountered a similar growth in California called it "Chaparral" which means evergreen scrub of scrub oak (Plummer, 1911). As the life zone and vegetational concepts have been developed, different workers have referred to it under different names. Merriam gave it the name Transitional Zone. Sampson in Tidestrom's Flora of Utah and Nevada (1925) has called it the Yellow Pine and Oak Brush Belt. Daubenmire (1943) and Hayward (1945) refer to it as an ecotone. The former

Throughout the Rocky Mountains, the Cascade and Coast Ranges and the interior Ranges of Utah and Nevada the chaparral ecotone is present. In some localties it is a narrow belt and in other places it may reach a vertical development of 1,200 feet (Daubenmire, 1943). Locally on the western front of the Wasatch Mountains it extends approximately from the Bonneville level (5,200) vertically for 1,000 to 1,200 feet. On north facing slopes it has been found that the chaparral has been encroached upon by the montane forests. The factor of water, from the evidence presented, seems to be very important in this respect (Daubenmire, 1943).

The ecotonal nature of the chaparral makes it a good place in which to find many species of plants. However, few are confined solely to this area. Out of fifty-eight species found here twenty-six are present in the montone forests and twenty-eight are also found at lower elevations.

The most common shrub to be found in this part of the chaparral is the oak (Quercus) of which there are several species in this locality. Large areas of the sidehills arecovered with a thick growth of this plant forming a dense and in some instances and almost impenetrable mass. Numerous other shrubs are found scattered through the chaparral. The most common are: Hackberry (Celtis sp.), Wild cherry (Prunus melanocarpa), Maple (Acer grandidentatium), Sumac (Rhus cismontana), Mountain mahogany (Cercocarpus ledifolius), and Shadblow (Amelanchier

CLIMATE

It has been found that the mean annual precipitation for the Chaparral is 17.5 inches and that the mean annual temperature is 42.6 degrees Fahrenheit (Hayward 1945). The precipitation in the winter is the result of low pressure areas moving eastward from the northwestern Pacific Coast States. The amount of deflection of the storms from their regular paths determines to a great extent the precipitation for this area during this season of the year. Summer precipitation in the form of short intense showers, is the result of warm air rising rapidly upon coming in contact with the mountains. The rising air expands and rapidly cools which causes condensation and precipitation (Hayward, 1945).

It has been noticed by the writer that snow does not lie for great periods of time in the chaparral on the west front of the Wasatch. A few days of sun, unless the weather is exceptionally cold, usually melts it. This condition is very advantageous for those birds that inhabit this area in winter.

GENERAL DISCUSSION

There has been no attempt in this study to collect certain species of birds. In order to get a representative population of the chaparral it was felt that this could be best accomplished by collecting each time in the field those species observed. In this manner, the species

was in the chaparral in Y Mountain. Each field trip taken in this area was so arranged that the same part of the chaparral was not visited twice in succession. In this manner it was felt a more representative avian fauna would be encountered.

During the collection period, 1942-47, fifty six species of birds were obtained. These represent twenty one families and eight orders. The order and nomenclature of the species follows that of Behle(1944):

Falconiformes

Accipitridae
Accipiter striatus velox (Wilson). Sharp-shinned Hawk.

Falconidae
Falco sparverius sparverius Linnaeus. Eastern Sparrow Hawk.

Galliformes

Phasianidae
Phasianus colchicus torquatus Gmelin. Ring-necked Pheasant.

Columbiformes

Columbidae
Zenaidura macroura marginella (Woodhouse). Western Mourning Dove.

Strigiformes

Strigidae
Bubo virginianus occidentalis Stone. Montana Horned Owl.
Aegolius acadicus acadicus (Gmelin). Saw-whet Owl.

Caprimulgiformes

Caprimulgidae
Phalaenoptilus nuttallii nuttallii (Audubon). Nuttall Poor-will.

Micropodiformes

Piciformes

Picidae

Colaptes cafer collaris Virgors. Red-shafted Flicker.
Sphyrapicus varius nuchalis Baird. Red-naped Sapsucker.
Dryobates pubescens leucurus (Hartlaub). Rocky Mountain Downy Woodpecker.

Passeriformes

Tyrannidae

Empidonax sp.
Nuttallornis borealis borealis (Swainson). Olive-sided Flycatcher.

Corvidae

Cyanocitta stelleri diademata (Bonaparte). Long-crested Steller Jay.
Aphelocoma californica woodhousei (Baird). Woodhouse Jay.
Pica pica hudsonia (Sabine). American Magpie.

Paridae

Parus atricapillus nevadensis (Linsdale). Nevada Black-capped Chickadee.
Parus gambeli gambeli Ridgway. Mountain Chickadee.

Certhiidae

Certhia familiaris montana Ridgway. Rocky Mountain Creeper.

Troglodytidae

Troglodytes aedon parkmanii Audubon. Western House Wren.
Catherpes maxicanus conspersus Ridgway. Canon Wren.
Salpinctes obsoletus obsoletus (Say). Rock Wren.

Turdidae

Turdus migratorius propinquus Ridgway. Western Robin.
Hylocichla guttata auduboni (Baird). Audubon Hermit Thrush.
Sialia currucoides (Bechstein). Mountain Bluebird.
Myadestes townsendi (Audubon). Townsend Solitaire.

Sylviidae

Polioptila caerulea amoenissima Grinnell. Western Gnatcatcher.
Regulus calendula cineraceus Grinell. Western Ruby-crowned Kinglet.

Bombycillidae

Bombycilla garrula pallidiceps Reichenow. Bohemian Waxwing.
Bombycilla cedrorum Vieillot. Cedar Waxwing.

Passeriformes (Cont'd)

Compsothlypidae
Vermivora celata orestera Oberholser. Rocky Mountain Orange-crowned Warbler.
Vermivora ruficapilla ridgwayi van Rossem. Calaveras Warbler.
Vermivora virginiae (Baird). Virginia Warbler.
Dendroica auduboni memorabilis Oberholser. Rocky Mountain Audubon Warbler.
Oporornis tolmiei (Townsend). Macgillivray Warbler.
Wilsonia pusilla pileolata (Pallas). Northern Pileolated Warbler.

Icteridae
Sturnella neglecta Audubon. Western Meadowlark.

Thraupidae
Piranga ludoviciana (Wilson). Western Tanager.

Fringillidae
Hedymeles melanocephalus melanocephalus (Swainson). Rocky Mountain Black-headed Grosbeak.
Passerina amoena (Say). Lazuli Bunting.
Hesperiphona vespertina brooksi Grinnell. Western Evening Grosbeak.
Carpodacus cassinii Baird. Cassin Purple Finch.
Carpodacus mexicanus (Say). HouseFinch.
Spinus pinus pinus (Wilson). Northern Pine Siskin.
Spinus tristis pallidus Mearns. Pale Goldfinch.
Spinus psaltria hesperophilus (Oberholser). Green-backed Goldfinch.
Pipilo maculatus montanus Swarth. Spurred Towhee.
Chondestes grammacus strigatus Swainson. Western Lark Sparrow.
Junco hyemalis hyemalis (Linnaeus). Slate-colored Junco.
Junco oreganus montanus Ridgway. Montana Junco.
Junco caniceps caniceps (Woodhouse). Gray-headed Junco.
Spizella passerina arizonae Coues. Western Chipping Sparrow.
Zonotrichia leucophrys oriantha Oberholser. Oregon White-crowned Sparrow.
Passerella iliaca schistacea Baird. Slate-colored Fox Sparrow.
Melospiza melodia montana Henshaw. Mountain Song Sparrow.

These species when separated into numbers collected and month collected are shown in Table I. From this table is noted that in all, 278 specimens were collected and examined. A preliminary examination of

TABLE I

Record by Month and by Species of Birds Collected 1942-47

Species	Months												Total
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	
triatus velox									1				1
rius sparverius							1						1
olchicus torquatus								1					1
acroura marginella									1				1
lanus occidentalis			1										1
adicus acadicus								2					2
tus nuttallii nuttallii						1		1					2
platycercus platycercus						1							1
er collaris								1	1	1			3
varius nuchalis								1					1
ibescens leucurus										1			1
.				1		1				1			3
borealis borealis					1								1
stelleri diademata		1							1	1			3
alifornica woodhousei		1			1		1	4	4		2	1	14
idsonia		1				1	3		1				6
pillus nevadensis	3	1	2	3	1	1	1			2	2	2	18
i gambeli								1	1	2	3	1	8
liaris montana		1										1	2
aedon parkmanii									2				2
xicanus conspersus							1			1			2
bsoletus obsoletus							4	1	2				7
torius propinquus	4	2	3				2	1					12
guttata auduboni					1	1							2
icoides			1										1
wnsendi	2		2			1							5
aerulea amoenissima				1				1		2			4
ndula cineraceus								1					1

TABLE I (CONT'

	Species	1.	2.	3.	4
29.	Bombycilla garrula pallidiceps		4	1	
30.	Bombycilla cedrorum		2		
31.	Vireo gilvus leucopolius				
32.	Vermivora celata orestera				
33.	Vermivora ruficapilla ridgwayi				
34.	Vermivora virginiae				
35.	Dendroica auduboni memoriabilis				
36.	Oporornis tolmiei				
37.	Wilsonia pusilla pileolata				
38.	Sturnella neglecta		3	1	4
39.	Pirange ludoviciana				
40.	Hedymeles melanocephalus melanocephalus				
41.	Passerina amoena				
42.	Hesperiphona respertina brooksi				
43.	Carpodacus cassinii	1			
44.	Carpodacus mexicanus				
45.	Spinus pinus pinus	5	1	3	1
46.	Spinus tristis pallidus	1			
47.	Spinus psaltria hesperophilus			1	
48.	Pipilo maculatus montanus	1			9
49.	Chondestes grammacus strigatus				
50.	Junco hyemalis hyemalis		1	1	
51.	Junco oreganus montanus	4	2	4	1
52.	Junco caniceps caniceps				2
53.	Spizella passerina arizonae				
54.	Zonotrichia leucophrys oriantha				
55.	Passerella iliaca schistacea				1
56.	Melospiza melodia montana	1			
	Total	22	20	20	23

Months								Total
5.	6.	7.	8.	9.	10.	11.	12.	
								5
								2
6	2							8
6				2				8
				2				2
1		1	2	2				6
				7				7
1	2							3
			1					1
								8
		1	1					2
2								2
2	7	1	1					11
		1						1
								1
		2	4					6
					3	1	3	17
					1			2
								1
6	5	4	5	4		1	2	37
			1					1
							1	3
					4	6	4	25
1	3					1		7
1	1							2
				1	1			2
								1
								1
30	27	23	30	32	20	16	15	278

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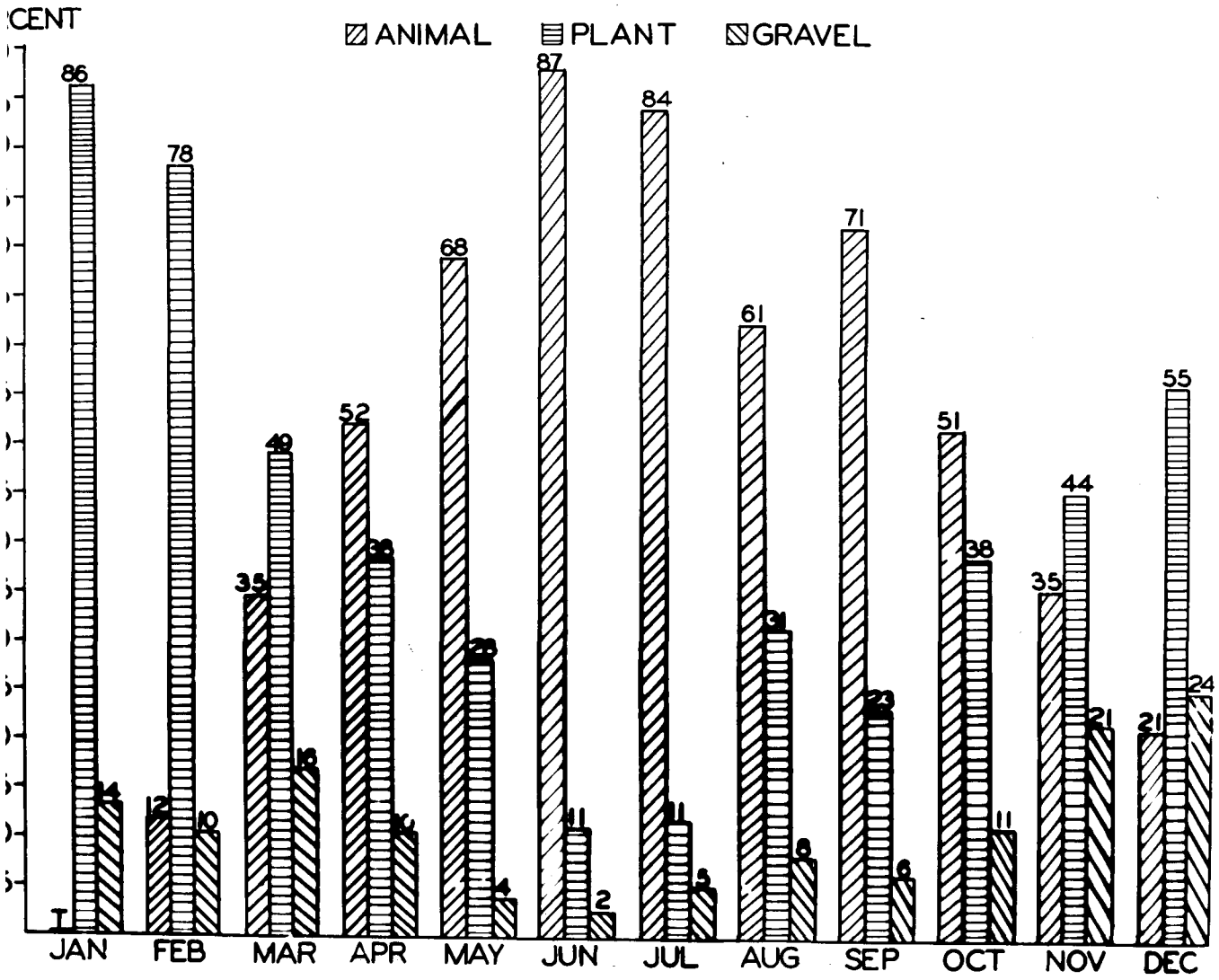
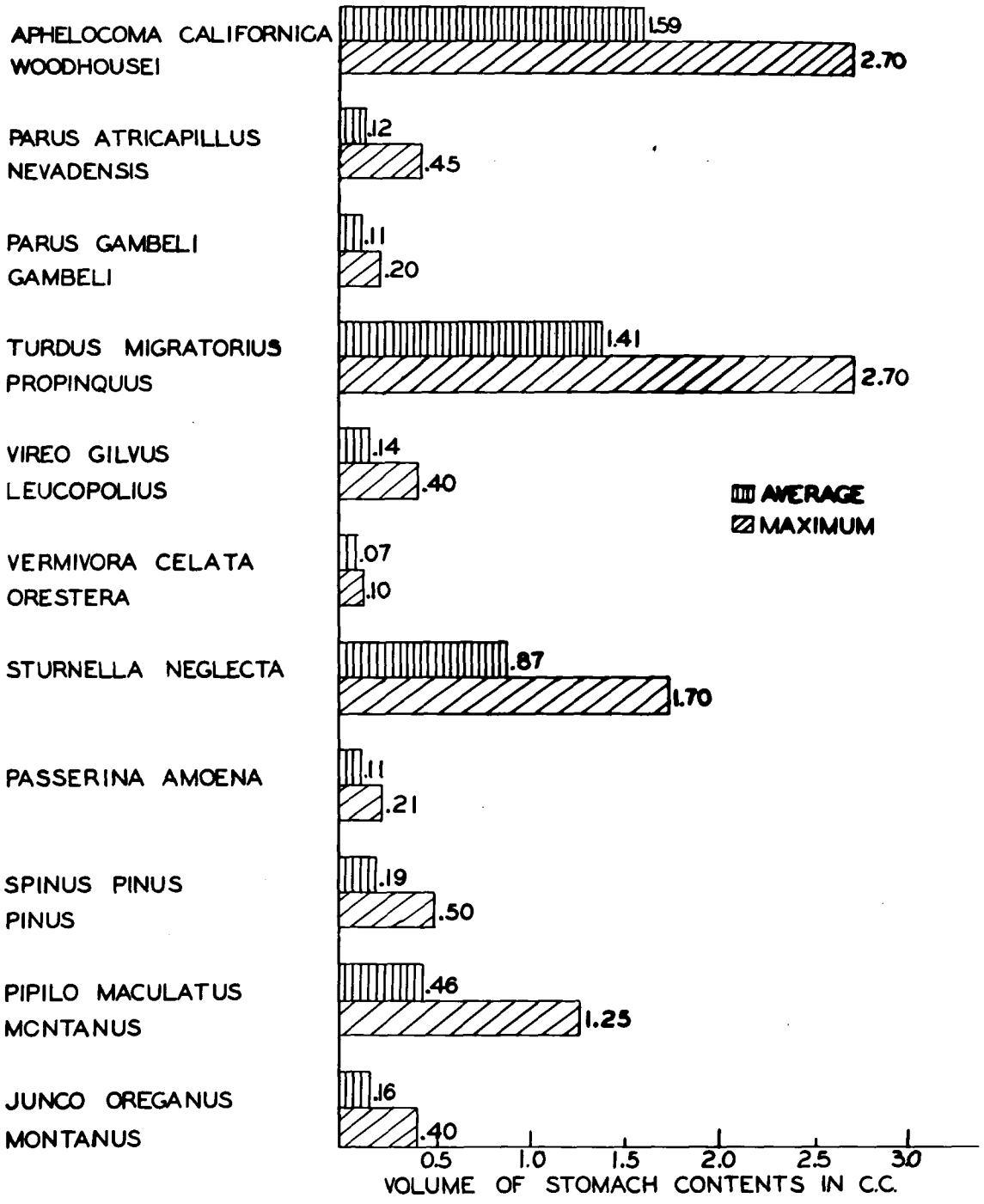


Figure 2. Monthly average of total animal, plant and gravel material found in stomachs

In January, 86% of the stomach contents were found to be plant material. A trace of animal material was found for the same period. There was a decided decrease in the amount of plant material found as the season advanced from winter to spring and then summer. In June and July the plant material was the same for both months - 11% of the stomach contents. During the period from January to July the animal material steadily increased from a trace in January, to 87% in June and 84% in July. In the six month period there was a complete change in the dominant type of diet. The change of diet is also reflected in the gravel present. During the months when the diet was predominantly plant material and there seemed to be a necessity for gravel to aid mechanically in digestion there was considerable more present. In November, December and January there was 21%, 24% and 14% found. For the three months, May, June and July, when animal matter was the principle diet and the need for mechanical aids to digestion seemed to be least, the gravel present was lowest. In these three months the gravel present was, May 4%, June 2% and July 5%. From these data it would appear that gravel has a decided role in the preparing of plant food for digestion but is not as important when the diet is primarily of animal origin.

In computing the volume of stomach contents found in the species studied it was observed that there were quite large variations in the volume. The largest stomach examined, that of a Ring-necked Pheasant; (Phasianus colchicus torquatus) measured 5.0 c.c. in volume. Figure 3


APHELOCOMA CALIFORNICA WOODHOUSEI
1.59
2.70
PARUS ATRICAPILLUS NEVADENSIS
.12
.45
PARUS GAMBELI GAMBELI
.11
.20
TURDUS MIGRATORIUS PROPINQUUS
1.41
2.70
VIREO GILVUS LEUCOPOLIUS
.14
.40
VERMIVORA CELATA ORESTERA
.07
.10
STURNELLA NEGLECTA
.87
1.70
PASSERINA AMOENA
.11
.21
SPINUS PINUS PINUS
.19
.50
PIPILO MACULATUS MONTANUS
.46
1.25
JUNCO OREGANUS MONTANUS
.16
.40
AVERAGE
MAXIMUM
0.5
1.0
1.5
2.0
2.5
3.0
VOLUME OF STOMACH CONTENTS IN C.C.

having average capacities over 0.46 c.c. are all seven inches in length or larger. The remaining seven, all six inches in length or smaller, have average capacities of 0.19 c.c., approximately two and one half times less than the larger birds. Three out of four of the larger birds' maximum capacity was less than double the average capacity. Four out of seven of the smaller birds had maximum capacities greater than double the average capacity. These figures might prove of interest if more data could be assembled concerning the capacities of the birds under discussion.

Upon evaluating the data it was found that certain items of food, both plant and animal, occurred more frequently than others. Tables II and III summarize the plant and animal food as found in the 278 stomachs examined. It will be noted that seven species of plants, Helianthus annus, Celtis sp., Quercus sp., Polygonum convolvulus, Amaranthus blitoides, Chenopodium album and Amaranthus graecizans Composed 82.8% of all the identified plant food. Coleoptera, Hymenoptera, Lepidoptera larvae, Orthoptera, Undetermined larvae, Diptera, Homoptera, Coleoptera larvae, Araneae and Hemiptera constituted 91.8% of all the identified animal food consumed. 8.2% of the remaining material belonged to thirteen items of animal origin. It is interesting to note that 22.8% of the animal food consumed was some type of larvae. This is an indication of the importance of the immature forms of insect life in the diet of the birds. From the above it seems that seven types of

TABLE II

FREQUENCY BY MONTHS OF PLANT FOOD FOUND IN 278 STOMACHS EXAMINED

food	Months												No. times found	Average % of volume
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.		
annuus	9	3	5	3			2		1	7	7	5	42	51.9
	8	6	3	4	1		1	1	1	2	1	3	31	47.7
	1	2			1			4	10	2	2	2	24	23.9
nvolvulus			1	3				1		2	3	1	11	27.1
litoides					4	4					1		9	46.4
album	1			2				1		2	2		8	5.6
graecizans		1	1							1	2	1	6	31.5
cifer	3	1											4	39.2
ea	2											2	4	48.2
lis				2				1					3	51.6
riola								1	1	1			3	3.3
rum		2											2	42.5
	1	1											2	50.0
								2					2	16.5
rophila	1							1					2	20.0
									1				1	3.0
merata								1					1	5.0
etroflexus	1												1	85.0
ficinalis									1				1	16.0
apsus		1											1	4.0
	8	9	8	13	6	4	4	12	3	6	9	7	89	36.4

TABLE III

FREQUENCY BY MONTHS OF ANIMAL FOOD FOUND IN 278 STOMACHS EXAMINED

?ood	Months												No. times found	Average % of volume
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.		
		2	6	14	10	11	6	6	11	3	1	2	72	35.1
		1		1	1	2	2	6	13	13	6	6	51	55.0
.arvae	1		1	1	16	7	4		2	1			33	60.7
						4	11	4	4	1			24	64.0
larvae			2	4	7	5		1		1			20	27.6
		1	2	1		5	2	1	4	1			17	48.6
			1	2			1	1		2	2		9	18.5
.rvae		1	1	2	1	3				1			9	41.0
		1		1		4						1	7	8.5
			1	2	2		1						6	26.8
					2	1	2						5	54.2
		1	1			1		2					5	60.6
		1				1		1					3	9.0
ccoptera	1												1	Trace
								1					1	58.0
								1					1	20.0
							1						1	70.0
		1											1	2.0
						1							1	19.0
									1				1	100.0
				1									1	30.0
			1										1	76.0
				1									1	5.0
	1	5	5	5	6	5	6	9	4	1	6	5	58	33.4

in quite a different order. Their greatest abundance is when other types of food are least readily obtained. In the winter months, October to March, the greatest concentration of this plant material was found. Some were found during the summer but not as consistently or as extensively as during the cold winter months. The cherry, Prunus sp. and several of the other less common plants were only found during the summer months. In the case of the cherry this might be due to it being more palabable when it is ripe. The animal material followed the opposite pattern of abundance from the plants. During the summer months when the insects are most abundant, they were found in greater numbers in the stomachs. There seemed to be less deviation from this pattern in the animal food than there was in the plant food. One reason for this is that the plants are present the entire year but the insects are restricted more to the months when it is warm. It seems logical that there would be less deviation in the animal food material on this assumption.

DISCUSSION OF FOOD BY SPECIES

As mentioned previously, it was felt that the species of birds collected the greatest number of times would represent the ones that were most common to the chaparral. Evaluating the fifty six species collected it was found that seventeen species or 30.4% of the total number were collected six or more times during the year. Thirty nine species or 69.6% were collected five times or less. However, the total number of stomachs examined of the common birds far exceeded the number examined in the less

data concerning them could be presented as a single unit. In the case of the more prevalent species, however, it was believed that individual discussions of the species would be more practicable. Following this procedure, data pertaining to the less frequent species has been summarized in Table IV. The remaining seventeen species will be treated Individually following the discussion of the data presented in above mentioned table.

In the uncommon birds it was found that the hackberry Celtis sp. was the most abundant item of plant food, being present in nine out of seventy three stomachs. The oak Quercus sp. and the sunflower Helianthus annuus were the next most important plant food items being found in four and three stomachs respectively. Polygonum convolvulus, Chenopodium album and Rosaceae were each found in two stomachs. Comparing these results with Table II it will be noted that the four most important plant food items in both instances were the same. Their relative importance to each other is as follows:

Importance	Table II	Uncommon Species
First	Helianthus annuus	Celtis sp.
Second	Celtis sp.	Quercus sp.
Third	Quercus sp.	Helianthus annuus
Fourth	Polygonum convolvulus	Polygonum convolvulus

Of the twenty items of plant food found in all the stomachs, fifteen or 75% were found in the group under discussion.

The animal food items of this group in comparison with the general animal food of all the species were quite similar to that of the plant

TABLE IV

)NAL FOOD ANALYSIS (IN PER CENT) OF STOMACH CONTENTS OF LESS FREQUENT SPECIES COLLECTED

			ANIMAL							PLANT		
Mo.	Vol of Food in c.c.	Orthoptera	Homoptera	Lepidoptera	Coleoptera	Aves	Mammalia	Undetermined	Prunus sp.	Melilotus officinalis	Helianthus annuus
iter striatus velox											
Sep	5.20					100					
sparverius sparverius											
Jul	3.75		67	33							
anus colchicus torquatus											
Aug	8.00	70							30		
dura macroura marginel la											
Sep	0.40									16	58
virginianus occidentalis											
Mar	0.10						100				
ius acadicus acadicus											
Aug	0.05						100				
Aug	2.50						100				
enoptilus nuttallii nuttallii											
Jun	0.90							100			
Aug	1.10				99						

TABLE IV (CONT'D)

Mo.	Vol of Food in c.c.	ANIMAL							PLANT		
		Nematoda	Coleoptera	Hymenoptera	Diptera	Larvae	Araneae	Undetermined	Dactylis glomerata	Celtis sp.	Undetermined
phorus platycercus platycercus											
Jun	Tr							Tr			
tes cafer collaris											
Aug	1.90			88					5		5
Sep	3.00			97							
Oct	0.90			89						11	
apicus varius nuchalis											
Aug	0.55			60							40
ates pubescens leucurus											
Oct	0.15			53							47
onax sp.											
Apr	0.10	30	20		40	10					
Jun	0.10				80		20				
Oct	0.10			95		5					

TABLE IV (CONT'D)

Mo.	Vol of Food in c.c.	ANIMAL								PLANT	
		Orthoptera	Hemiptera	Lepidoptera	Coleoptera	Hymenoptera	Diptera	Diplopoda	Undetermined	Quercus sp.	Undetermined
allornis borealis borealis											
May	0.90		6		94						
ocitta stelleri diademata											
Feb	2.60								Tr	89	Tr
Sep	1.90				68					21	Tr
Oct	3.30	3								74	9
ıia familiaris montana											
Feb	0.15				1	98		1			
Dec	0.10								100		
.odytes aedon parkmanii											
Sep	0.15	100									
Sep	0.04				100						
erpes mexicanus conspersus											
Jul	0.27			85			15				
Oct	0.10				20	60	20				

TABLE IV (CONT'D)

Mo.	Vol of Food in c.c.	ANIMAL									PLANT	
		Orthoptera	Lepidoptera larvae	Lepidoptera	Coleoptera	Hymenoptera	Diptera	Chilopoda	Larvae	Undetermined	Celtis sp.	Undetermined
cichla guttata auduboni												
May	0.18			56	44							
Jun	0.80			14	5		44	19				
ia currucoides												
Mar	0.60		50		50							
estes townsendi												
Jan	Tr										Tr	
Jan	0.60										100	
Mar	Tr										Tr	
Mar	Tr								Tr			Tr
Jun	0.70	43			57							
optila caerulea amoenissima												
Apr	0.09									89		11
Aug	0.10									100		
Oct	0.10					100						
Oct	0.12					100						

TABLE IV (CONT'D)

No.	Mo.	Vol of Food in c.c.	ANIMAL			PLANT		
			Lepidoptera Larvae	Coleoptera	Diptera	Celtis sp.	Rosaceae	Undetermined
Regulus calendula cineraceus								
1.	Aug	0.05			100			
Bombycilla garrula pallidiceps								
1.	Feb	2.10				100		
2.	Feb	Tr						Tr
3.	Feb	0.75					100	
4.	Feb	1.20				100		
5.	Mar	0.20						100
Bombycilla cedrorum								
1.	Feb	0.20				100		
2.	Feb	0.80				100		
Vermivora ruficapilla ridgwayi								
1.	Sep	0.05			80			20
2.	Sep	0.10	10	10	80			

TABLE IV (CONT'D)

			ANIMAL									PLANT
).	Mo.	Vol of food in c.c.	Orthoptera	Thysanoptera	Hemiptera	Lepidoptera larvae	Coleoptera larvae	Coleoptera	Hymenoptera	Diptera	Undetermined	Undetermined
)orornis tolmiei												
.	May	0.10				45			55			
.	Jun	0.03						100				
.	Jun	0.15						36	20	30		
lsonia pusilla pileolata												
.	Aug	0.10		20					80			
ranga ludoviciana												
.	Jul	0.30			62				38			
.	Aug	0.30							63		20	17
dymeles melanocephalus melanocephalus												
	May	0.35				7						93
.	May	0.40					25	Tr				70
speriphona vespertina brooksi												
.	Jul	1.10	12					74				

TABLE IV (CONT'D)

			ANIMAL			PLANT							
).	Mo.	Vol of Food in c.c.	Hymenoptera	Larvae	Undetermined	Polygonum convolvulus	Salsola pestifer	Amaranthus blitoides	Rosaceae	Convolvulaceae	Helianthus annuus	Undetermined
arpodacus cassinii												
L.	Jan	0.10							Tr	99		Tr
pinus tristis pallidus												
L.	Jan	0.50					98					2
2.	Oct	0.45									90	
pinus psaltria hesperophilus												
L.	Mar	0.10									38	
ondestes grammacus strigatus												
..	Aug	0.15			Tr	81						Tr
unco hyemalis hyemalis												
..	Feb	0.35		1	4							67
2.	Mar	0.07				56						
5.	Dec	0.15	Tr									67
pizella passerina arizonae												
2.	May	0.07		35					55			
2.	Jun	0.10		100								

TABLE IV (CONT'D)

			ANIMAL		PLANT							
o.	Mo.	Vol of Food in c.c.	Hymenoptera	Undetermined	Quercus sp.	Celtis sp.	Chenopodium album	Amaranthus graecizans	Amaranthus retroflexus	Lactuca Scariola	Undetermined
onotrichia leucophrys oriantha											
1.	Sep	0.20								10	25
2.	Oct	0.25	24		32	28		Tr			12
asserella iliaca schistacea											
1.	Apr	0.30	Tr	Tr			Tr				69
elospiza melodia montana											
1.	Jan	0.10					15		85		

as follows: Coleoptera 16, Diptera 9, Undetermined larvae 6, Orthoptera 5, Lepidoptera larvae 4, and Lepidoptera 4. Comparing these with Table III the following is noted:

Importance	Table III	Uncommon Species
First	Coleoptera	Hymenoptera
Second	Hymenoptera	Coleoptera
Third	Lepidoptera larvae	Diptera
Fourth	Orthoptera	Undetermined larvae
Fifth	Undetermined larvae	Orthoptera
Sixth	Diptera	Lepidotpera larvae
Seventh	Homoptera	Lepidoptera

All but two of the food items are the same except for their relative importance. Fifteen or 65.2% of all animal food items are found in the diet of these birds. It was found that in 35 or 47.9% of the stomachs the entire contents were animal food. In 20 stomachs or 29.3% the contents were mixed and in 18 or 24.6% the material found was entirely plant material.

Aphelocoma californica woodhousei

In examining the stomachs of the Woodhouse Jay, Table V, it was found that acorns were the most consistant item of food. Twelve out of fifteen stomachs examined or 80% of the stomachs contained fragments of this plant food. 37.5% of all food and 80% of all plant food consisted of this one food item. It was found through the entire year without any noticeable fluctuation due to seasons. The second most important food item, Coleoptera, was found to be 15.6% of all food and 29.4% of all animal food examined. Unlike the acorn, the major portion (80%) of the Coleoptera was found to occur in the warmer months of the year. This was found to hold true for the other three types of insect life found. There were 32 individual items of plant and animal food found in the stomachs examined. Plant food composed 15 or 46.8% of these items. 17 or 53.2% of these items of food were found to be animal material. It was found that in thirteen out of fourteen stomachs both plant and animal food was present. One stomach contained animal food entirely. Comparing the most common types of food found with Tables II and III it will be noted that there is a close correlation. An interesting item of food found in one stomach was the bones of a small mammal. These bones constituted 3% of the total volume of the stomach contents for that particular bird. It is believed that the Jay found the animal dead and had made a meal

TABLE V

OOD ANALYSIS (IN PER CENT) OF STOMACH CONTENTS OF APHELOCOMA CALIFORNICA WOODHOUSEI

			ANIMAL							PLANT		
No.	Mo.	Vol of Food in c. c.	Orthoptera	Lepidoptera larvae	Coleoptera	Hymenoptera	Acarina	Mammalia	Undetermined	Quercus sp.	Prunus sp.	Undetermined
1.	Feb	2.70					2	3		73		
2.	May	1.80		22					11	61		
3.	Jul	0.60							50			41
4.	Aug	1.90	44							32		
5.	Aug	2.10			19					74		
6.	Aug	1.50	29							64	3	
7.	Aug	1.00			40				35			
8.	Sep	1.50			17					80		
9.	Sep	1.40							4	89		
10.	Sep	1.30			54					35		
11.	Sep	2.50				22				74		
12.	Nov	1.50							3	89		2
13.	Nov	1.30							5	85		
14.	Dec	1.20			8					81		

Pica pica hudsonia

In analyzing the contents of the stomachs of the Magpies, Table VI, it was found that no particualr type of plant food was important. The most common type of animal food was insects of the order Orthoptera. They were found in four out of the six stomachs examined. 28.5% of all food consumed by these birds consisted of representative forms of this order. 40% of all animal food was computed to belong to the same order. The second most abundant food was insects of the order Coleoptera. Remains of these were found in half the stomachs examined. Except for one instance, all the animal food was found in the summer months. The plant material was found half in February and half in September with none found in the March to June period. There were 14 items of food separated out of the stomachs examined. 10 or 71.4% of these were animal and 4 or 28.6% were plant. Since most of the stomachs examined were collected in the summer months this follows the general trend toward higher animal food concentration in the summer. No stomach contained all plant food material. Two stomachs contained both plant and animal food and four had animal food exclusively. The most common type of food found in the Magpie was the fourth most important type for all species.

TABLE VI

SONAL FOOD ANALYSIS (IN PER CENT) OF STOMACH CONTENTS OF PICA PICA HUDSONIA

			ANIMAL				PLANT			
No.	Mo.	Vol of Food in c. c.	Orthoptera	Coleoptera	Mammalia	Undetermined	Glyceria sp.	Quercus sp.	Celtis sp.	Undetermined
1.	Feb	2.90		1					83	16
2.	Jun	2.20	95		5					
3.	Jul	2.75	100							
4.	Jul	3.30	85	5		10				
5.	Jul	3.10	12	85						
6.	Sep	1.50				9	3	81		

Parus atricapillus nevadensis

Table VII summarizes the food information concerning the Nevada Black-capped Chickadee. The most important plant food was found to be the sunflower, Helianthus annuus. In one third of the stomachs examined, this food was found. The amount represents 12.2% of all the food eaten by this species and 30.6 of all the plant food consumed. Coleoptera and Hymenoptera were present in equal numbers. Each constituted 9.7% of the entire diet and 16% of the animal food. The greatest concentration of plant food was found in the months of January, February, November and December. None was found in June or July. From March until November 60% of the animal food was found. Of the 41 items of food found 25 or 61% were of animal origin and 16 or 39% were plant food. The representative types of foods found, coincide exactly with the foods found for all species examined. A large amount (40%) of the food of this particular species was broken up very fine making identification very difficult. 11 of the stomachs examined contained both plant and animal material, 5 contained animal food and 2 contained plant food.

TABLE VII

AL FOOD ANALYSIS (IN PER CENT) OF STOMACH CONTENTS OF PARUS ATRICAPILLUS NEVADENSIS

		ANIMAL									PLANT		
Mo.	Vol of Food in c.c.	Hemiptera	Homoptera	Coleoptera larvae	Coleoptera	Hymenoptera	Diptera	Larvae	Arenese	Undetermined	Celtis sp.	Helianthus annuus	Undetermined
Jan	0.40									Tr		6	92
Jan	0.15										100		
Jan	0.50											100	
Feb	0.45						Tr		13	15		27	46
Mar	0.05						50			Tr			50
Mar	0.10	1								74			25
Apr	0.09				33								66
Apr	0.08									100			
Apr	Tr				Tr								
May	0.08							15					85
Jun	0.04							40		60			
Jul	0.10									100			
Oct	0.10				30	50						15	
Oct	0.10			40	60								
Nov	0.10					85							15
Nov	0.13		23			61						8	8
Dec	0.15									Tr			100
Dec	0.12					60			Tr				40

Parus gambeli gambeli

The food summarization of the Mountain Chickadee is shown in Table VIII. The most common food for this species of bird was found to be insects of the order Hymenoptera. In seven out of the eight stomachs examined this order was represented. 43.7% of all food material and 55.5% of all animal food eaten by these birds consisted of this order. As is shown by the table the insects were found throughout most of the year. As can be noted, the plant material was undetermined so very few comparisons can be made. 13 or 81.2% of the 16 items of food found were animal and 3 or 18.8 were of plant origin. Three stomachs examined contained both plant and animal food, the remaining five stomach contents consisted entirely of plant food. In comparing the food of the chickadee with the general summary of food it is found that the animal food is similar.

TABLE VIII

SEASONAL FOOD ANALYSIS (IN PER CENT) OF STOMACH CONTENTS OF PARUS GAMBELI GAMBELI

			ANIMAL				PLANT
No.	Mo.	Vol of Food in c.c.	Homoptera	Coleoptera	Hymenoptera	Undetermined	Undetermined
1.	Aug	0.05				Tr	100
2.	Sep	0.09	2	94	Tr		4
3.	Oct	0.10			100		
4.	Oct	0.10			100		
5.	Nov.	0.10	50		10	60	40
6.	Nov	0.12			100		
7.	Nov	0.20			100		
8.	Dec	0.15			90	10	

Salpinctes obsoletus obsoletus

The rock wren's principle food as shown in Table IX is Orthoptera. In the months collected, no trace of plant material was found in the stomach contents. Orthoptera composed 40% of the food items found in the stomachs. This food was not found in the stomachs collected before the latter part of July. Besides this food, single instances of five other insect orders were collected and identified. The Orthoptera found in all the stomachs was the fourth most important food as compared with this species.

TABLE IX

SEASONAL FOOD ANALYSIS (IN PER CENT) OF STOMACH CONTENTS OF SALPINCTES OBSOLETUS OBSOLETUS

ANIMAL

No.	Mo.	Vol of Food in c.c.	Orthoptera	Neuroptera	Lepidoptera larvae	Coleoptera	Hymenoptera	Diptera	Undetermined
1.	July	0.20							100
2.	July	0.25		70	15		15		
3.	July	0.20						100	
4.	July	0.20	100						
5.	Aug	1010	100						
6.	Sep	0.60	76			24			
7.	Sep	0.40	100						

Turdus migratorius propinquus

Table X gives the stomach contents as recorded for the Western Robin. Collections were made from January through August and it should be noted the change of dominant types of food. Up to the middle of February the food was hackberry but after that the animal material became more abundant and the plant material became less until finally the entire diet was animal food. Hackberry was the only type of plant material found and composed 36.8% of all the stomach contents. Among the animal food Coleoptera was found the greatest number of times. The next most important foods were Orthoptera, Coleoptera larvae and Lepidoptera larvae. Half of the stomachs examined contained all plant food, five contained all animal food and the remaining stomach had both plant and animal food in it. There were recorded 19 items of food, 12 or 63.1% were animal food items, the remaining 7 or 36.9% were of plant origin.

TABLE X

SEASONAL FOOD ANALYSIS (IN PER CENT) OF STOMACH CONTENTS OF TURDUS MIGRATORIUS PROPINQUUS

			ANIMAL						PLANT
No.	Mo.	Vol of Food in c.c.	Orthoptera	Homoptera	Lepidoptera larvae	Coleoptera larvae	Coleoptera	Pupa cases	Celtis sp.
1.	Jan	1.70							100
2.	Jan	Tr							Tr
3.	Jan	2.60							100
4.	Jan	1.20							100
5.	Feb	0.50							100
6.	Feb	2.70				100			
7.	Mar	Tr							Tr
8.	Mar	0.80				96	4		
9.	Mar	1.70		2			4	76	3
10.	Jul	0.80	55		40		5		
11.	Jul	1.10			73		27		
12.	Aug	0.60	100						

Vireo gilvus leucopolius

The Oregon Warbling Vireo was only collected during the months of May and June as Table XI indicates. In all but two instances, the entire stomach contents of these birds was either Lepidoptera larvae, Coleoptera or both. No plant food of any kind was recorded for the stomachs examined. The Lepidoptera larvae and Coleoptera were found an equal number of times (6). In four instances out of six this food was found in the same stomach. The collection record indicates that this species of bird is insectivorous in its food habits.

TABLE XI

SEASONAL FOOD ANALYSIS (IN PER CENT) OF STOMACH CONTENTS OF VIREO GILVUS LEUCOPOLIUS

			ANIMAL			
No.	Mo.	Vol of Food in c.c.	Lepidoptera larvae	Coleoptera	Diptera	Undetermined
1.	May	0.08	100			
2.	May	0.40		100		
3.	May	0.10	90	10		
4.	May	0.10	85	15		
5.	May	0.09	78	22		
6.	May	0.12		100		
7.	Jun	0.20	53	46		Tr
8.	Jun	0.10	85		15	

Vermivora celata orestera

The Orange-crowned Warbler, from the data recorded on Table XII appears to be insectivorous. Similar to the Oregon Warbling Vireo, no plant material was found in any of the specimens collected. The predominant type of insect life found was Lepidoptera larvae. In six out of the eight stomachs examined this food was found. 70% of all the food analyzed was larvae of some type. In six out of the seven stomachs containing larvae this food material was the entire stomach content or the greatest portion thereof. No seasonal fluctuation was noted.

TABLE XII

SEASONAL FOOD ANALYSIS (IN PER CENT) OF STOMACH CONTENTS OF VERMIVORA CELATA ORESTERA

			ANIMAL			
No.	Mo.	Vol of Food in c.c.	Lepidoptera larvae	Hymenoptera	Larvae	Undetermined
1.	May	0.07	99			Tr
2.	May	0.10	100			
3.	May	0.05	100			
4.	May	0.09			100	
5.	May	0.05	100			
6.	May	0.10	100			
7.	Sep	0.05	50			50
8.	Sep	0.09		100		

Vermivora virginiae

The Virginia Warbler was collected from May to September as is recorded on Table XIII. The most often occurring type of food of this species was insects of the order Hymenoptera. In this species, the food was not predominantly of one type as it was in the case of the Vireo and the Orange-crowned Warbler. A trace of plant food was found in one stomach in the month of July. The remaining stomachs contained nothing but animal material. In the stomachs examined there was only a trace of larvae found which was very different from the preponderance found Orange-crown and Vireo.

TABLE XIII

SEASONAL FOOD ANALYSIS (IN PER CENT) OF STOMACH CONTENTS OF VERMIVORA VIRGINIAE

			ANIMAL					PLANT	
No.	Mo.	Vol of Food in c.c.	Hemiptera	Coleoptera	Hymenoptera	Larvae	Undetermined		Undetermined
1.	May	0.08	20	80					
2.	July	1.50					99		Tr
3.	Aug	0.11			Tr		99		
4.	Aug	0.08		99		Tr			
5.	Sep	0.10			100				
6.	Sep	0.09			100				

Dendroica auduboni memorabilis

As in the case of the two previously discussed warblers and vireo, the food of the Audubon Warbler as shown on Table XIV is all of animal origin. Six out of the seven stomachs obtained contained Hymenoptera. This insect material made up 66.6% of all the stomach contents. In five stomachs out of six Hymenoptera was the entire or the greatest part of the food.

TABLE XIV

SEASONAL FOOD ANALYSIS (IN PER CENT) OF STOMACH CONTENTS OF DENDROICA AUDUBONI MEMORABILIS

ANIMAL						
No.	Mo.	Vol of Food in c.c.	Coleoptera	Hymenoptera	Diptera	Undetermined
1.	Sep	0.10		40	60	
2.	Sep	0.10				100
3.	Sep	0.15		100		
4.	Sep	0.10		100		
5.	Sep	0.14		100		
6.	Sep	0.15	15	85		
7.	Sep	0.22		100		

Sturnella neglecta

Table XV indicates the food content of the stomachs of the Western Meadowlark. The most important type of plant food was found to be Helianthus annuus. This plant food constituted 20% of the total food and 45.4% of the plant food consumed by these birds. Coleoptera was the most important animal food. It constituted 16% of all the food consumed and 28.5% of all the animal food used by the birds. 56% of all the food contained in the stomachs was animal and 44% was plant. Six insect orders were represented in the animal food consumed. Two species of plants were found. Six stomachs contained both plant and animal food, two contained only plant food.

TABLE XV

SEASONAL FOOD ANALYSIS (IN PER CENT) OF STOMACH CONTENTS OF STURNELLA NEGLECTA

			ANIMAL							PLANT		
No.	Mo.	Vol of Food in c.c.	Hemiptera	Homoptera	Lepidoptera larvae	Coleoptera larvae	Coleoptera	Larvae	Undetermined	Bromus tectorum	Helianthus annuus	Undetermined
1.	Feb	0.80								25		31
2.	Feb	1.00							Tr	60		Tr
3.	Feb	1.00							9		91	
4.	Mar	1.70									99	Tr
5.	Apr	1.10		Tr		5	28				62	
6.	Apr	0.70				3	Tr				97	
7.	Apr	0.50	12	13			20	45				10
8.	Apr	1.10	60		5		15				20	

Passerina amoena

The most common type of plant food of the Lazuli Bunting as shown on Table XVI was Amaranthus blitoides. This was found to be 18.7% of all the food and 75% of the plant food contained in the stomachs examined. Lepidoptera larvae was found to be 39.2% of all food and 41.6% of the animal food consumed. All types of larvae composed 75% of all the animal food eaten by this species of bird. The plant food constituted 25% of all the food and the animal food was 75%. Seven stomachs contained all animal food, three contained all plant food and one had both plant and animal food present.

TABLE XVI

SEASONAL FOOD ANALYSIS (IN PER CENT) OF STOMACH CONTENTS OF PASSERINA AMOENA

			ANIMAL					PLANT	
No.	Mo.	Vol of Food in c.c.	Orthoptera	Lepidoptera larvae	Coleoptera larvae	Coleoptera	Larvae	Setaria viridis	Amaranthus blitoides
1.	May	0.05							90
2.	May	0.08							87
3.	Jun	0.10		82					
4.	Jun	0.19		64	36				
5.	Jun	0.10		100					
6.	Jun	0.10			60				40
7.	Jun	0.09		89					
8.	Jun	0.12					92		
9.	Jun	0.20	55			6	35		
10.	Jul	0.21	72	28					
11.	Aug	0.11						82	

Carpodacus mexicanus

The House Finch's diet as shown in Table XVII was composed entirely of plant material. The stomachs in this study were Collected during July and August when it would be thought that animal food material would be more prevalent. Due to the smallness of the food particles it was difficulat to determine the type of plant food that was contained in most of these stomachs. Four species of plants were recognized as comprising part of the diet.

TABLE XVII

EASONAL FOOD ANALYSIS (IN PER CENT) OF STOMACH CONTENTS OF CARPODACUS MEXICANUS

No.	Mo.	Vol of Food in c.c.	PLANT				
			Chenopodium album	Plantago nitrophila	Helianthus annuus	Lactuca Scariola	Undetermined
1.	Jul	0.13			62		
2.	Jul	0.30			83		
3.	Aug	0.10					50
4.	Aug	0.21	Tr	5		Tr	71
5.	Aug	0.14					78
6.	Aug	0.14					64

Spinus pinus pinus

The food of the Pine Siskin that was found most frequently as shown in Table XVIII was Helianthus annuus. This food constituted 58.3% of all the food found and 82.3% of the plant food. Three orders of insects were found but the amount of material present was so scant that no measurements could be made. Since most of the stomachs analyzed were collected during the winter months it is not too strange to find a preponderance of plant material and a lack of animal food matter. Eleven of the stomachs had only plant material in them, six contained both plant and animal food.

TABLE XVIII

SEASONAL FOOD ANALYSIS (IN PER CENT) OF STOMACH CONTENTS OF SPINUS PINUS PINUS

			ANIMAL			PLANT			
No.	Mo.	Vol of Food in c.c.	Lepidoptera larvae	Coleoptera	Hymenoptera	Salsola pestifer	Plantago nitrophila	Helianthus annuus	Undetermined
1.	Jan	0.50						90	
2.	Jan	0.10	Tr				35	15	
3.	Jan	0.25						70	
4.	Jan	0.20						65	
5.	Jan	0.10						50	
6.	Feb	0.40				31			69
7.	Mar	0.10		Tr					50
8.	Mar	0.10		Tr				70	
9.	Mar	0.15						77	
10.	Apr	0.10							40
11.	Oct	0.35			Tr			86	
12.	Oct	0.40			Tr			94	
13.	Oct	0.10						80	
14.	Nov	0.12						80	
15.	Dec	0.10						60	
16.	Dec	0.20						80	
17.	Dec	0.10						40	

Pipilo maculatus montanus

Table XIX gives the plant and animal food of the Spurred Towhee. In observing the table certain pertinent factors were noticed. Hackberry was found the most times as a plant food. It was followed in importance by the oak. The two most common insect orders found were Coleoptera and Orthoptera. It was found that the hackberry occurred 11 or 11.3% of the times, and that the oak occurred 7 or 7.2% of the times. Coleoptera was found 19.5% of the time and Orthoptera occurred 6.1% of the time. Of the total number of items of plant and animal food, the animal food occurs 57 or 58.7% of the times whereas the plant food occurs 40 or 41.2% of the time. In thirty of the stomachs both animal and plant material were found. In six stomachs only animal food was found and in one stomach plant material was found.

TABLE XIX

ASONAL FOOD ANALYSIS (IN PER CENT) OF STOMACH CONTENTS OF PIPILO MACULATUS MONTANUS

		ANIMAL													PLANT				
Mo.	Vol of Food in c.c.	Orthoptera	Odonata	Lepidoptera larvae	Lepidoptera	Coleoptera larvae	Coleoptera	Hymenoptera	Diptera	Larvae	Cocoons	Aranseae	Diplopoda	Undetermined	Quercus	Celtis sp.	Chenopodium album	Amaranthus blitoides	Undetermined
		1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	1.	2.	3.	4.	5.
Jan	0.50															40			60
Apr	0.30													47					50
Apr	0.30						33								60				
Apr	0.20						80									15			
Apr	0.30						70												20
Apr	0.50						40												50
Apr	0.10						75												20
Apr	0.70						55			15		5				18			2
Apr	0.30										5					57	23		
Apr	0.30													65					35
May	0.90			11	83														
May	0.40			40										50					
May	0.42									Tr				Tr				12	88
May	0.32													Tr					94
May	0.30									23				35		12			
May	0.23						83			13									
Jun	0.20			55										30					10
Jun	0.50	34				4	13	16				6	23						
Jun	0.74			10			43											8	34

		ANIMAL													PLANT				
Mo.	Vol of Food in c.c.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	1.	2.	3.	4.	5.
Jun	0.45						22											42	36
Jun	0.10						63												30
Jul	0.70	86														Tr			
Jul	0.40						50												24
Jul	0.30													51					41
Jul	0.70	100																	
Aug	0.40		58																40
Aug	0.40						95												
Aug	1.25	40						22						38					
Aug	0.60						8						3	27		55			Tr
Aug	0.25													82	2				
Sep	0.25						12	4							56	8			
Sep.	0.60						40								45				
Sep.	0.30	35							35						20				
Sep	0.75						12								81				
Nov	0.50						64									30			
Dec	1.10							1						11	76	5			6
Dec	0.80						Tr									87			

Junco oreganus montanus

The Montana Junco's dominant plant food is shown by Table XX. It will be noted that it is Helianthus annuus. 13 or 17.1% of all the food noted in the stomachs was this plant. It was also 22.8% of the entire plant diet. Polygonum convolvulus was found to be 7.7% of all food found and 10.5% of plant food consumed. The most important insect order represented was Hymenoptera which was 5.2% of all food obtained and 21% of all animal food consumed. More types of plant food was found for this species than animal food. Both plant and animal food was found in 14 stomachs, 9 stomachs contained plant food alone, and one stomach contained animal food entirely. The insect food when present was found to be more common in the summer months.

TABLE XX

SEASONAL FOOD ANALYSIS (IN PER CENT) OF STOMACH CONTENTS OF JUNCO OREGANUS MONTANUS

	ANIMAL								PLANT										
Vol of Food in c.c.	1. Corrodentia	2. Homoptera	3. Lepidoptera larvae	4. Coleoptera	5. Hymenoptera	6. Diptera	7. Larvae	8. Undetermined	1. Celtis	2. Polygonum convolvulus	3. Chenopodium album	4. Salsola pestifer	5. Amaranthus blitoides	6. Amaranthus graecizans	7. Convolvulaceae	8. Verbascum thapsus	9. Helianthus annuus	10. Lactuca Scariola	11. Undetermined
0.20	Tr.																75		Tr
0.15																	2		73
0.20									2			Tr							73
0.20												25			5				20
0.20																4	19		32
0.14														36					
0.20				5				4											79
0.15														100					
0.12						Tr		25											
0.40								Tr									38		24
0.10							6			8									26
0.20			40							2							3	Tr	10
0.20		5									Tr						Tr		45
0.20		5			10					50									75
0.15								5			Tr								10
0.10								10											

	Vol of Food in c.c.	ANIMAL								PLANT										
		1.	2.	3.	4.	5.	6.	7.	8.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.
v	0.20														9			20		46
v	0.11								36					Tr				9		18
v	0.20										5	7						20		23
v	0.22					4						Tr						55		Tr
v	0.22								5		Tr							59		
c	0.20					Tr					Tr				44	46				Tr
c	0.22															23		40		28
c	0.10																	30		
c	0.10					10			4	6										10

Junco caniceps caniceps

The food as shown in Table XXI for the Gray-headed Junco shows that the plant and animal food found was divided equally. Nine items of plant material and eight itmes of animal material were found. Polygonum convolvulus was found three times and Coleoptera, Araneae and Undetermined larvae occurred twice in the stomachs of the birds studied. There was not, as has been the case in a number of other species discussed, a particular food type that has dominated the diet. It would be difficult to say, from the data at hand, that any one particular type of either animal or plant food was important in the diet of this specie of Junco. Three stomachs contained both plant and animal food, two contained plant material alone and two contained only animal food.

TABLE XXI

SEASONAL FOOD ANALYSIS (IN PER CENT) OF STOMACH CONTENTS OF JUNCO CANICEPS CANICEPS

			ANIMAL					PLANT				
No.	Mo.	Vol of Food in c.c.	Lepidoptera larvae	Coleoptera	Diptera	Araneae	Larvae	Setaria viridis	Polygonum convolvulus	Amaranthus blitoides	Amaranthus graecizans	Undetermined
1.	Apr	0.22		10				9	Tr			75
2.	Apr	0.25						64	28			
3.	May	0.19					Tr					90
4.	Jun	0.50	80	16		1						
5.	Jun	0.09				15				85		
6.	Jun	0.18			78		17					
7.	Nov	0.19							69		Tr	

SUMMARY

A seasonal change occurred in the type of food consumed by the birds studied. Plant food was more important in the winter than in the summer. Animal food, except in one species, was found to be more important during the summer months.

The most important plant foods determined by frequency and listed in order of their abundance were: Helianthus annuus, Celtis sp., Quercus sp., Polygonum convolvulus, Amaranthus blitoides, Chenopodium album and Amaranthus graecizans.

The most important animal foods based on occurance in stomachs examined were: Coleoptera, Hymenoptera, Lepidoptera larvae, Orthoptera, Undetermined larvae, Diptera, Homoptera, Coleoptera larvae, Araneae, and Hemiptera.

Seventeen species of birds were found to be common residents of the chaparral based upon number of times collected. Thirty nine species were found infrequently.

Twenty different types of plant food was found among the species studied. Twenty three types of animal food was also recorded.

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