

T H E S I S

on

A Study of the Economic Status of the Ringed-neck  
or Chinese Pheasant in Oregon

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APPROVED:

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A STUDY OF THE ECONOMIC STATUS OF THE RINGED-NECK  
OR CHINESE PHEASANT IN OREGON

Thos. C. Allen

INTRODUCTION

The hybrid of the English pheasant, Phasianus colchicus colchicus Linn. and the Chinese pheasant, Phasianus colchicus torquatus Gmelin. commonly known as the Ringed-neck or China pheasant, Phasianus torquatus is the most common pheasant in the United States (13). Early introductions into Oregon were pure Chinese pheasants sent to this country by Judge O. A. Leany, from Shanghai (17). These shipments of birds arrived in Oregon in 1881 and 1882, and were the first successful introduction of the China pheasant in the United States. The pheasant multiplied rapidly from this first stocking, and in 1892 fifty thousand birds were reported to have been killed the first day of an opened shooting season (5). The pheasant is now listed as game in forty-three states, but an open season during which time birds may be taken is permitted only in eighteen states.

In the past few years, doubt has arisen in the minds of many agriculturists as to the economic status of the pheasant in Oregon. Complaints have been received by the Oregon State Game Commission from farmers condemning the

bird for injuring certain crops, especially during the spring of the year. As a result, the Game Commission under the direction of F. M. Brown, co-operated with the Oregon State Agricultural College Experiment Station in making a study of food habits of the pheasant over a period of one year, June 1, 1928 to June 1, 1929. Ten distributed counties were chosen from which birds were to be collected, and which represented, as far as possible, every phase of farming practiced in Oregon. However, owing to the poor state of preservation of many stomachs, the inability of the wardens to shoot birds, and the snow and frost of mid-winter which made necessary the feeding of pheasants, fewer counties were represented and less stomachs were sent in for analyses.

Except for the determination of plant food, the analysis was carried on by the writer who entered into this study with an unbiased mind, giving results, but no conclusions as to the economic status of the pheasant.

Literature pertaining to the study of food habits of the Chinese pheasant seems rather scant. Articles upon this subject are of the last few years and in these a difference of opinion has been expressed as to the economic importance of this bird. Maxon and Burnett (11) conclude from evidence obtained in their studies, that the value of the pheasant has been overestimated. With respect to the eating habits of the birds, the authors report that "the pheasants by no

means show a preference for insect food, and are very indifferent to grasshoppers". On the other hand, Simpson (16) states that the pheasant is "primarily an insect eating bird" and Leffingwell (18) in his studies of their food habits, finds that weed seeds, insects and cultivated crops were the general foods of the pheasant.

In this thesis, the food present in the stomachs of the pheasants is segregated into four classes: crop seed, weed seed, animal matter and unclassified plant food. Two other segregations, undetermined material and gravel, constitute the remaining taken from the stomachs. From results of this study, the volume of weed seeds added to the volume of animal material and weighed against that of the crop seeds is considered a fairly good basis upon which conclusions may be drawn as to the economic status of the pheasant in Oregon.

### PROCEDURE

The method used in the analyses of pheasant stomachs is the percentage-by-volume method (8) and the procedure in general as suggested by the Biological Survey of the United States Department of Agriculture and McAtee (9).

Birds were taken from eight counties: Linn, Umatilla, Malheur, Marion, Multnomah, Lane, Hood River, and Yamhill beginning June 1, 1928 for a period of approximately one

year. Fifty-one of the total number of stomachs taken in these counties were chosen at random to represent the data contained in this thesis.

In divising what seemed to be a feasible process in the preparation and actual analytic work of the stomachs, the following steps were used and are reported in sequence.

I. The preparation of analyses involved:

- a. The construction of bolting cloth sieves used in washing the stomach contents and segregating the gravel from the plant food and animal matter.
- b. The construction of supports for the sieves and sediment trays.
- c. The preparation and painting the sediment trays. The trays were painted white to facilitate observation in separating the gravel content.
- d. The preparation of vial and tube holders. These containers are used for storing the segregated portions of seeds, insects, gravel and other material.
- e. The construction of drying racks. These are used for drying the total plant food and animal matter after gravel has been segregated.
- f. Securing and assembling the necessary materials and supplies used in stomach analysis. Forms for tabulating data, petri dishes, etc.

II. The analyses involved:

- a. Receiving and unpacking the stomachs. Each stomach



had been tied within cloth, labeled and preserved in formaldehyde solution, when extracted from the bird in the field. (Plate I., Fig. 1)

- b. Checking and comparing the numbers on the stomachs with those of field blanks. (Plate V., Fig. 1)
- c. Placing in jars of preserving material (70% commercial alcohol) those stomachs not shipped in jars, and adding preservative material to the stomachs in all jars and labeling. Two quart economy jars are used for containers.
- d. Splitting the crop, gullet and gizzard open and scraping the contents into a labeled sediment tray. A clothespin, retaining the number of the stomach within, is clamped to the tray. A flask with a spout, containing water, assisted in cleaning the contents from the stomachs into the trays.
- e. Segregating the gravel from plant food and animal matter by use of sediment trays, tray supports and bolting cloth sieves known as decantation.
- f. Collecting the gravel left in the sediment trays and transferring it to a petri dish previously labeled with stomach number, and placing the dish on rack for drying.
- g. After drying, the gravel is transferred to vials and stored for future reference in estimating percentages.
- h. Transferring the plant food and animal matter from

bolting cloth sieves to white blotter within a petri dish previously labeled with stomach number. The petri dish is then placed on the drying rack.

- i. Segregation of the plant food and animal matter when dry by means of a binocular microscope (10x). Forceps and a needle were found convenient for this purpose. All identified animal matter is segregated out of the plant food.
- j. Transferring the plant food and animal matter into separate vials previously labeled with stomach number and placing in vial holders. From these tubes determination of the plant food and animal matter is made.

### III. Plant food determination:

Note: Mrs. C. E. Schuster, assistant seed analyst of the Farm Crops department in this institution has kindly consented to submit the following methods used in the determination of the plant food.

The process of separating the plant food into its various parts was carried on in the Seed Laboratory, using their equipment as follows: table board, forceps, hand lenses, binoculars, sieves, and seed blower. In the identification work the plant herbarium of the Botany Department, the seed herbarium, seed plates, and botany books of the Seed Laboratory were used. The books used were "The Flora of the Northwest Coast" by Piper and Beattie, "Elementary Flora of the Northwest" by Frye and Rigg, and "A

Spring Flora of Northwestern Oregon" by Helen M. Gilkey. Professor G. R. Hyslop permitted the use of the Seed Laboratory for this work. Miss Bertha Hite of the Seed Laboratory and Dr. Gilkey of the Botany Department were of some assistance in identifying seeds and fruits.

Each sample was examined in a dry state and was completed before another was started, in so far as possible. In any case all bottles were carefully labeled to avoid any mixing. For the actual separation, equipment was assembled as follows:

1. Table board, elevated in the center with slanting arm rests at sides and covered with white paper.
  2. Forceps for picking out seeds and handling smaller amounts. For larger quantities a triangle of cardboard served better to push the material about.
  3. A cardboard bent up along one side to about one inch height and the other edge inserted under paper in the board, served as a convenient scoop for conveying material to bottles.
  4. Series of sieves of graduated sizes.
- A. Separation process as follows:
1. Putting material (part at a time if sample is large) in .610 sieve and shaking a few times.
  2. Examining the portion going through with a seven times lens to see if by chance any minute seeds were present. If so, picking them out with forceps and

setting aside for further separation.

3. Putting remainder of siftings in a vial labeled "Undetermined".
4. Placing contents of .610 sieve on the board and examining to determine what sieves would be useful for further separation. If none were needed, the material was then separated with forceps and cardboard, keeping each kind of seed and the inert by itself. This separation was first done without lens and then with a seven times lens.
5. Putting the inert matter in a bottle labeled "Unclassified".
6. Counting and identifying each kind of seed.
7. Putting sample through a series of sieves if they would be useful (4) and thus cutting it up into parts of similar sized pieces.

B. Examining each sieve of material as follows:

1. Separating immediately, if blower would be of no particular advantage, first without lens and then with lens.
2. Using blower if sample was very chaffy and making as many blowings as were needed to approximate a line between chaff and seed.
3. Examining each blowing for seeds and taking these out if found.
4. Separating balance of material and making counts as

in 6 above.

C. Identifying process as follows:

1. Identifying immediately as far as possible from a knowledge of seeds.
2. Placing crop seeds in a bottle labeled as such.
3. Putting weed seeds in another vial labeled "weeds".
4. Listing crop seeds in the order of frequency giving number, scientific name and common name in so far as possible.
5. Listing weed seeds in the same manner in a separate column.
6. Completing further identification, if necessary, by comparison with seeds in the seed herbarium and pictures on seed plates, and by referring to the botany books for the distribution of species and names. When this is not sufficient, Miss Hite and Dr. Gilkey assisted in identification.
7. Carrying the identification to the specific name as far as possible, otherwise to genus only. In one or two instances the family name only was given, but this was sufficient to determine whether the seed was crop or weed.

D. Results of separation and identification:

1. Four bottles of material as follows:
  - a. Undetermined: This contains dust and minute pieces of plant and animal matter that would be difficult

and very tedious to separate or identify with a seven times lens.

- b. Unclassified: This contains stems, leafage, empty glumes, chaff, inflorescence parts, pieces of seed coat and pieces of seed too small to count as seed. This latter often indicates that many more seeds were eaten than the count indicated.
- c. Crop: This contains all cultivated crop seeds including all pieces of a half or more which were counted as seeds.
- d. Weed: This contains all weed seeds and pieces of a half or more. This also contains in some instances, the bulbs of wild plants found in the crop and fruits that were intact or nearly so.

2. Record cards with information as follows:

- a. Crop seeds in one column with count and scientific and common names.
- b. Weed seeds in another column with counts and names.
- c. On back of card, notes as to the contents of the "Unclassified" group, also in order of frequency, and other remarks.

IV. Animal determination:

Very little of the animal matter revealed any other material than insect. A number of small pin feathers, shells, parts of centipedes, and spiders were frequently found and, except for the centipede parts and several small

spiders, they were not included in the volume that constituted the animal bulk. Such material was recorded, however, and its identification is listed with the insect or animal matter. The insect material is treated by volume as one segregation, but a distinction between beneficial, injurious, and neutral forms is recorded on the tabulated lists.

The segregation and identification of the animal matter was accomplished by:

- a. Placing the contents of the vial containing animal matter upon a white blotter paper within a petri dish.
- b. Grouping similar or associated insects or parts of insects under a binocular microscope (10x) by the aid of forceps and needle.
- c. Identifying and counting the number of whole specimens, heads, or similar parts of insects. Hardened portions of insects resist digestion and often such material as part of a wing, mandible, tibio-femoral plate, or ovipositor give a clue to what has been eaten. (Plate III., Fig. 2 & 3) For example, 16 caterpillars and 11 pupae of the Alfalfa Butterfly, Eurymus eurytheme Bdv. were found in one stomach, and in addition 152 mandibles of the caterpillar. This indicated that while 27 individuals of the Alfalfa Butterfly were consumed during the pheasant's last feeding, 76 caterpillars at least had been eaten in the previous meal.

- d. Recording results of identification on cards (Plate VI.) and storing contents for future reference in obtaining volume measurement and calculating percentages.

#### V. Measurement and percentage:

The volume of each segregate; gravel, crop seeds, weed seeds, animal matter, unclassified plant food, and undetermined material was measured in the dry state with either a 1 ml., 25 or 100 ml. graduate, the amount of bulk determining which graduate was used. Gravel percentage was figured on the total volume contents of the stomach and thereafter crop seeds, weed seeds, animal matter, unclassified plant food, and undetermined matter segregates were computed on the basis of 100 percent.

A report of the analyses was made each month. (Plate V., Fig. 2) In this report the kind and number of crop seed, weed seed, and insects was recorded, and the volume percent of each segregate was made. The unclassified plant food represented the vegetable matter that was associated with or a part of the crop and weed seed separated from one individual stomach. If the crop seed content was high in an individual stomach, the unclassified plant food was usually chaff, semi-digestible matter, and parts of that particular crop seed. It is seen that this segregate indicates a very large percent of the total plant food taken by the pheasant, (Plate IV.) which is largely due to the



gizzard analysis. The gizzard contained partly digested plant food as well as similarly digested animal matter. The classification named total plant food, included the crop seed, weed seed and unclassified plant food. The undetermined material consisted of very small particles of plant food, animal matter, and dust. No attempt was made to identify the unclassified plant food and the undetermined material.

STOMACH CONTENTS OF INDIVIDUAL PHEASANTS

No. 1. Locality, Linn #2. - Male, in pasture 5 miles N. of Lebanon, June 2, 1928, 3:30 p.m.

## Plant Food:

Crop Seed

Weed Seed

none

745 Chickweed, Cerastium vul-  
gatum68 Spurrey, Spergula arvensis47 Buttercup, Ranunculus sp.

## Animal Matter:

1 Neuroptera (crushed)

1 snout of Rhynchophora beetle

1 larva, Muscidae

5 Coleoptera mandibles

Small parts of insects and Arachnida portions.

## Percentages:

Crop Seed	0	Unclassified	60.00
Weed Seed	10.00	Undetermined	23.30
Animal	6.70	Gravel	26.82

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No. 2. Locality, Linn #4. - Male, in wheat and oats 3 miles W. of Lebanon, June 25, 1928, 10:30 a.m.

## Plant Food:

Crop Seed

Weed Seed

111 Oats, Avena sativa4 Buttercup, Ranunculus sp.

## Plant Food: (Continued)

Crop Seed

Weed Seed

1 Darnel, Lolium temulentum

## Animal Matter:

Small pieces of Coleoptera chitin.

## Percentages:

Crop Seed	20.32	Unclassified	77.23
Weed Seed	1.02	Undetermined	.91
Animal	.62	Gravel	11.66

- - - - -

No. 3. Locality, Umatilla #1. - Dale, in orchard and alfalfa near Stanfield, June 13, 1928, 8:40 a.m.

## Plant Food:

Crop Seed

Weed Seed

none

none

## Animal Matter:

1 False wireworm, Eleodes sp.12 heads of Eleodes sp.

1 head of grasshopper

3 grasshopper mandibles

1 Reduviidae, probably Sinea sp.

Coleoptera parts and chitin.

## Percentages:

Crop Seed	0	Unclassified	57.14
Weed Seed	0	Undetermined	2.86
Animal	40.00	Gravel	27.58

No. 4. Locality, Umatilla #3. - Dale, in wheat near Athena,  
June 21, 1928, 7:45 a.m.

Plant Food:

Crop Seed	Weed Seed
107 Wheat, <u>Triticum aestivum</u>	none

Animal Matter:

4 Orthoptera mandibles  
9 Coleoptera mandibles  
1 bug, Galgulidae (remains)  
1 Orthoptera, Rhaphidophorinae (remains)

Parts of insects and chitin, mostly Coleoptera.

Percentages:

Crop Seed	26.59	Unclassified	69.25
Weed Seed	0	Undetermined	1.38
Animal	2.78	Gravel	6.23

- - - - -

No. 5. Locality, Malheur #4. - Dale, in oats 2 miles W. of  
Nyssa, June 19, 1928, 11:30 a.m.

Plant Food:

Crop Seed	Weed Seed
139 Barley, <u>Hordeum vulgare</u>	12 Green foxtail, <u>Chaetochloa viridis</u>

Animal Matter:

1 Disonycha sp.  
1 Orthoptera mandible  
Insect parts and a few small pheasant feathers.

No. 5. (Continued)

## Percentages:

Crop Seed	43.93	Unclassified	51.67
Weed Seed	.26	Undetermined	.26
Animal	3.88	Gravel	12.75

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No. 6. Locality, Hood River #3. - Male, in plowed field in potatoes and corn, Odell, June 20, 1923, 4:50 a.m.

## Plant Food:

Crop Seed	Weed Seed
7 Wheat, <u>Triticum aestivum</u>	317 Wild blackberry, <u>Rubus</u> sp.
	141 Amaranth, <u>Amaranthus</u> sp.
	2 Brome grass, <u>Bromus</u> sp.
	1 Barnyard grass, <u>Echinoch-</u> <u>loa crus-galli</u>

## Animal Matter:

2 Coleoptera mandibles

Small parts and chitin of Coleoptera.

## Percentages:

Crop Seed	2.02	Unclassified	58.59
Weed Seed	26.26	Undetermined	10.10
Animal	3.03	Gravel	22.04

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Total percentages of contents in stomachs collected the month of June, 1928:

Crop Seed	15.48	Unclassified	62.31
Weed Seed	6.26	Undetermined	6.45
Animal	9.50	Gravel	17.85

Total plant food 84.05

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No. 7. Locality, Linn #6. - Male, in pasture 8 miles E. of Albany, July 3, 1928, 10:20 a.m.

Plant Food:

Crop Seed	Weed Seed
25 Ryegrass, <u>Lolium</u> sp.	133 Wild blackberry, <u>Rubus</u> sp.
16 Oats, <u>Avena sativa</u>	
11 Wheat, <u>Triticum aestivum</u>	
1 White or alsike clover, <u>Trifolium</u> sp.	

Animal Matter:

1 grasshopper mandible  
Parts of Coleoptera and Orthoptera chitin  
Several small feathers (pheasant).

Percentages:

Crop Seed	11.76	Unclassified	78.43
Weed Seed	5.89	Undetermined	1.96
Animal	1.96	Gravel	20.31

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No. 8. Locality, Linn #7. - Male, in pasture, Harrisburg,  
July 10, 1928, 3 p.m.

Plant Food:

Crop Seed	Weed Seed
46 Common vetch, <u>Vicia sativa</u>	504 Darnel, <u>Lolium temulentum</u>
6 Wheat, <u>Triticum aestivum</u>	3 Cockle, <u>Agrostemma githago</u>
3 Oats, <u>Avena sativa</u>	(Badly battered and identification doubtful)

Animal Matter:

6 grasshopper mandibles  
Small parts of grasshoppers and chitin.

Percentages:

Crop Seed	10.28	Unclassified	32.53
Weed Seed	51.37	Undetermined	4.10
Animal	1.72	Gravel	13.35

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No. 9. Locality, Umatilla #5. - Male, in wheat, Pilot Rock,  
July 16, 1928, 7:45 a.m.

Plant Food:

Crop Seed	Weed Seed
441 Wheat, <u>Triticum aestivum</u>	13 Lady's thumb, <u>Polygonum</u>
1 Barley, <u>Hordeum vulgare</u>	<u>persicaria</u>
	1 Slender chess, <u>Bromus tectorum</u>

Animal Matter:

11 Coleoptera mandibles

## Animal Matter: (Continued)

8 grasshopper mandibles

Orthoptera and Coleoptera chitin.

## Percentages:

Crop Seed	57.28	Unclassified	29.88
Weed Seed	.34	Undetermined	4.86
Animal	7.64	Gravel	13.00

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No. 10. Locality, Umatilla #6. - Male, in weed and alfalfa,  
Pendleton, July 16, 1928, 7:40 a.m.

## Plant Food:

Crop Seed	Weed Seed
24 Wheat, <u>Triticum aestivum</u>	none

## Animal Matter:

6 grasshopper mandibles

Small Coleoptera parts.

## Percentages:

Crop Seed	13.17	Unclassified	80.83
Weed Seed	0	Undetermined	1.20
Animal	4.80	Gravel	16.03

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No. 11. Locality, Malheur #7. - Male, in alfalfa, Malheur  
County Experiment Farm, July 10, 1928, 5:35 p.m.

## Plant Food:

Crop Seed	Weed Seed
none	1 <u>Echinochloa</u> sp.



No. 11. (Continued)

## Animal Matter:

1 Common Milkweed bug, Lygaeus sp.

Insect chitin.

## Percentages:

Crop Seed	0	Unclassified	95.68
Weed Seed	.30	Undetermined	2.01
Animal	2.01	Gravel	23.71

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No. 12. Locality, Hood River #5. - Male, in alfalfa, Hood  
River district, July 16, 1928, 6:50 p.m.

## Plant Food:

Crop Seed	Weed Seed
286 Ryegrass, <u>Lolium</u> sp.	1647 Wild blackberry, <u>Rubus</u> sp.
	4 Snowberry, <u>Symphoricarpos</u> sp.

## Animal Matter:

1 snout of Rhynchophora beetle

2 Coleoptera mandibles

Portions of Coleoptera.

## Percentages:

Crop Seed	10.75	Unclassified	60.93
Weed Seed	24.02	Undetermined	3.58
Animal	.72	Gravel	7.61

- - - - -

No. 13. Locality, Lane #9. - Male, in agricultural crop,  
Springfield, July 24, 1928, 5 p.m.

Plant Food:

Crop Seed	Weed Seed
157 Wheat, <u>Triticum aestivum</u>	94 Evergreen blackberry, <u>Ru-</u>
30 Common vetch, <u>Vicia sativa</u>	<u>bus</u> sp.
2 Ryegrass, <u>Lolium</u> sp.	14 <u>Hookera</u> sp.
	13 Lesser starwort, <u>Alsine</u> <u>gramineae</u>
	4 Bedstraw, <u>Galium</u> sp.
	3 Wild mustard, <u>Brassica</u> sp.
	2 Green foxtail, <u>Chaetochloa</u> <u>viridis</u>

Animal Matter:

42 grasshoppers, Melanoplus sp. (nymphs)\*  
 34 grasshopper heads, probably Melanoplus sp.  
 (nymphs)\*  
 76 grasshopper mandibles  
 1 Leafhopper, Draeculacephala sp.  
 8 Cucurlio beetles  
 2 snouts of Cucurlio beetles  
 2 Ground crickets, Gryllinae (crushed)  
 9 Western twelve-spotted cucumber beetles, Diabro-  
tica soror Lec.

\* Determination made by L. P. Rockwood.

## Animal Matter: (Continued)

4 heads and eight elytra of Diabrotica soror Lec.1 Tarnished plant bug, Lygus pratensis Linn.2 heads of Lygus pratensis Linn.

3 Tree crickets, Oecanthinae (crushed)

Hemiptera and Orthoptera parts and chitin.

## Percentages:

Crop Seed	31.93	Unclassified	20.34
Weed Seed	3.49	Undetermined	3.49
Animal	40.70	Gravel	4.13

- - - - -

Total percentages of contents in stomachs collected the  
month of July, 1928:

Crop Seed	19.32	Unclassified	56.95
Weed Seed	12.20	Undetermined	2.98
Animal	8.04	Gravel	14.75

Total plant food 88.46

- - - - -

No. 14. Locality, Linn #11. - Male, in agricultural crop,  
Lebanon, August 2, 1928, 9:10 a.m.

## Plant Food:

Crop Seed	Weed Seed
101 Wheat, <u>Triticum</u> <u>aestivum</u>	2 Cleavers, <u>Galium</u> sp.
	1 Wild turnip, <u>Brassica</u> sp.
	1 Rosaceae

No. 14. (Continued)

## Animal Matter:

- 2 Red-legged locust, Melanoplus femur-rubrum  
De Geer.\*
- 1 Jumping locust, Melanoplus saltator Scudder.\*
- 3 grasshopper heads, Melanoplus sp.\*
- 1 Orthoptera head
- 17 grasshopper mandibles
- 1 Long-horned grasshopper, Centhophilus sp.
- 2 Tarnished plant bugs, Lygus pratensis Linn.
- 1 head of Lygus pratensis Linn.
- 1 head of leafhopper, Draeculacephala sp.
- 1 head of Hemiptera (crushed)
- 6 small spider remains, Arachnida
- Portions of centipedes, Chilopoda
- Large number of grasshopper parts.

## Percentages:

Crop Seed	37.90	Unclassified	36.45
Weed Seed	1.46	Undetermined	.87
Animal	23.32	Gravel	6.79

- - - - -

No. 15. Locality, Linn #13. - Male, in stubble, Albany,  
August 13, 1928, 11 a.m.

\* Determination made by L. P. Rockwood.

No. 15. (Continued)

## Plant Food:

Crop Seed	Weed Seed
268 Wheat, <u>Triticum aestivum</u>	9 Snowberry, <u>Symphoricarpos</u>
10 Ryegrass, <u>Lolium</u> sp.	sp.
1 Barley, <u>Hordeum vulgare</u>	6 Bindweed, <u>Polygonum con-</u> <u>volvulus</u>
	3 <u>Prunus</u> sp.
	1 Wild turnip, <u>Brassica</u> sp.

## Animal Matter:

1 Tarnished plant bug, Lygus pratensis Linn.  
 1 head of Lygus pratensis Linn.  
 1 Ant, Formicidae  
 3 heads of leafhoppers, Cicadellidae  
 2 Hemiptera heads  
 1 Long-horned grasshopper, Tettigoniidae (crushed)  
 4 grasshopper mandibles  
 1 Cricket, Gryllidae  
 Parts of centipedes  
 Elytra, small parts of insects and chitin.

## Percentages:

Crop Seed	51.51	Unclassified	36.36
Weed Seed	4.55	Undetermined	3.03
Animal	4.55	Gravel	8.33

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No. 16. Locality, Umatilla #7. - Male, in alfalfa and  
wheat, Athena district, August 20, 1928, 8:20 a.m.

Plant Food:

Crop Seed

2 Wheat, Triticum aestivum

Weed Seed

6691 Green foxtail, Chaetochloa  
viridis

36 Barnyard grass, Echinochloa  
crus-galli

11 Yellow foxtail, Chaetochloa  
glauca

4 Vervain, Verbena sp.

2 Nightshade, Solanum sp.

1 Lupine, Lupinus sp.

Animal Matter:

16 caterpillars of Alfalfa Butterfly, Eurymus eury-  
theme Bdv.

11 pupae of Alfalfa Butterfly, Eurymus eurytheme Bdv.

152 mandibles of alfalfa butterfly larvae

5 grasshopper mandibles

1 Ant lion, Myrmeleonidae (crushed)

1 Reduviidae

1 spider, Arachnida

Parts of Cucurlio beetles

Parts of Carabid beetles

Chitin and small insects remains.

No. 16. (Continued)

## Percentages:

Crop Seed	.75	Unclassified	50.00
Weed Seed	22.50	Undetermined	8.75
Animal	18.00	Gravel	9.03

- - - - -

No. 17. Locality, Umatilla #9. - Male, in alfalfa and  
wheat, Hermiston district, August 24, 1928, 5:30  
p.m.

## Plant Food:

Crop Seed	Weed Seed
24 Hairy vetch, <u>Vicia villosa</u> 165	Yellow foxtail, <u>Chaetoch- loa glauca</u>
	58 Green foxtail, <u>Chaetoch- loa viridis</u>
	3 Sweetclover, <u>Melilotus</u> sp.

## Animal Matter:

7 Coleoptera mandibles

Small portions of grasshoppers, and Coleoptera  
chitin.

## Percentages:

Crop Seed	15.62	Unclassified	54.69
Weed Seed	17.19	Undetermined	10.15
Animal	2.35	Gravel	20.49

- - - - -

No. 18. Locality, Malheur #13. - Male, in stubble, Sand  
Hollow, August 15, 1928, 4:45 p.m.

Plant Food:

Crop Seed	Weed Seed
198 Wheat, <u>Triticum aestivum</u>	43 Wild sunflower, <u>Helianthus annuus</u>
	16 Nightshade, <u>Solanum</u> sp.
	2 Wild oats, <u>Avena fatua</u>
	1 Clover, <u>Melilotus</u> sp.

Animal Matter:

none

Percentages:

Crop Seed	46.07	Unclassified	44.37
Weed Seed	5.13	Undetermined	4.43
Animal	0	Gravel	12.01

- - - - -

No. 19. Locality, Marion #10. - Male, in sheep pasture 6  
miles S. of Turner, August 4, 1928, 8:30 a.m.

Plant Food:

Crop Seed	Weed Seed
1 Canary grass, <u>Phalaris can-</u>	4194 Sorrel, <u>Rumex acetosella</u>
<u>ariensis</u>	153 Brome grass, <u>Bromus</u> sp.
	127 <u>Rubus</u> sp. (Probably wild evergreen blackberry)
	5 <u>Panicum</u> sp.
	1 Buckhorn, <u>Plantago</u>



## Plant Food: (Continued)

## Crop Seed

## Weed Seed

lanceolata1 Brassica sp.1 Buttercup, Ranunculus sp.

1 Bird's foot trefoil,

Lotus sp.

## Animal Matter:

81 grasshopper mandibles

47 parts of grasshopper mandibles

Rhynchophora remains and small portions of grass-  
hoppers.

## Percentages:

Crop Seed	1.12	Unclassified	45.09
Weed Seed	36.83	Undetermined	8.48
Animal	8.48	Gravel	10.15

- - - - -

No. 20. Locality, Marion #12. - Male, in oats 15 miles S.  
of Salem, August 9, 1928, 4:30 p.m.

## Plant Food:

## Crop Seed

## Weed Seed

618 Wheat, Triticum aestivum 56 Prickly lettuce, Lactucascariola1 Goosefoot, Chenopodium sp.

## Animal Matter:

1 grasshopper head, Locustinae

## Animal Matter: (Continued)

11 grasshopper mandibles

4 parts of grasshopper mandibles

Grasshopper parts and small pieces of chitin.

## Percentages:

Crop Seed	61.53	Unclassified	30.77
Weed Seed	2.20	Undetermined	.66
Animal	4.84	Gravel	5.60

- - - - -

No. 21. Locality, Multnomah #2. - Male, in cabbage near  
Fairview, August 12, 1928, 7 p.m.

## Plant Food:

Crop Seed	Weed Seed
139 Wheat, <u>Triticum aestivum</u>	562 Wild and Evergreen black-berries, <u>Rubus</u> spp.
6 Oats, <u>Avena sativa</u>	210 Lady's thumb, <u>Polygonum persicaria</u>
	27 Panic grass, <u>Panicum</u> sp.
	9 <u>Cornus</u> sp.
	7 Black bindweed, <u>Polygonum convolvulus</u>
	7 Wild mustard, <u>Brassica</u> sp.
	7 Wild vetch, <u>Vicia</u> sp.

## Animal Matter:

Small portions of insect chitin.

No. 21. (Continued)

## Percentages:

Crop Seed	40.39	Unclassified	38.84
Weed Seed	19.23	Undetermined	1.15
Animal	.39	Gravel	2.98

- - - - -

No. 22. Locality, Hood River #6. - Male, in stubble,  
Odell, August 3, 1928, 6:20 p.m.

## Plant Food:

Crop Seed	Weed Seed
492 Wheat, <u>Triticum aestivum</u>	50 Wild blackberries, <u>Rubus</u>
193 Ryegrass, <u>Lolium</u> sp.	sp.
	26 Green foxtail, <u>Chaetochloa</u>
	<u>viridis</u>

## Animal Matter:

Tibia, tibio-femoral plates and ovipositors of  
grasshoppers.

Grasshopper chitin.

## Percentages:

Crop Seed	58.16	Unclassified	40.40
Weed Seed	.48	Undetermined	.48
Animal	.48	Gravel	4.91

- - - - -

No. 23. Locality, Lane #14. - Male, in agricultural crop,  
Springfield, August 20, 1928, 4:30 p.m.

No. 23. (Continued)

## Plant Food:

## Crop Seed

none

## Weed Seed

73 Bulbs (probably Liliaceae)

9 Brome grass, Bromus sp.5 Blue-eyed grass, Sisyrinchium sp.4 Buttercup, Ranunculus sp.3 Sedge, Carex sp.1 Green foxtail, Chaetochloa  
viridis1 Buckhorn, Plantago lanceo-  
lata

## Animal Matter:

7 Grasshoppers, Chorthippus (Stenobothrus) curtipennis Harris.\*12 Melanoplus sp.\*1 tail of Red-legged locust, Melanoplus femur-  
rubrum De Geer.\*1 tail of Jumping locust, Melanoplus saltator  
Scudder.\*9 heads of Melanoplus sp.\*9 heads and parts of Meadow grasshopper, probably  
Conocephalus sp.

\* Determination made by L. P. Rockwood.

## Animal Matter: (Continued)

231 grasshopper mandibles

1 Western twelve-spotted cucumber beetle, Diabro-  
tica soror Lec.

1 Ant, Formicidae

5 Hemibracids or treehoppers

1 Hemiptera head

1 spider, Arachnida

Grasshopper parts and chitin.

## Percentages:

Crop Seed	0	Unclassified	23.43
Weed Seed	21.88	Undetermined	5.86
Animal	48.83	Gravel	9.22

- - - - -

Total percentages of contents in stomach collected the  
month of August, 1928:

Crop Seed	31.31	Unclassified	40.04
Weed Seed	13.15	Undetermined	4.39
Animal	11.12	Gravel	8.85

Total plant food 84.49

- - - - -

No. 24. Locality, Linn #17. - Male, in oat stubble,  
Halsey, September 4, 1928, 9:10 a.m.

## Plant Food:

Crop Seed	Weed Seed
none	none

No. 24. (Continued)

## Animal Matter:

- 1 grasshopper (remains)
- 24 grasshopper mandibles
- 34 parts of grasshopper mandibles
- Parts and chitin of grasshopper and Coleoptera.

## Percentages:

Crop Seed	0	Unclassified	53.96
Weed Seed	0	Undetermined	23.07
Animal	23.07	Gravel	38.09

- - - - -

No. 25. Locality, Linn #20. - Male, in corn stubble,  
Corvallis, September 25, 1928, 11 a.m.

## Plant Food:

Crop Seed	Weed Seed
208 wheat, <u>Triticum aestivum</u>	53 Snowberry, <u>Symphoricarpos</u>
18 Oats, <u>Avena sativa</u>	sp.
17 Corn, <u>Zea mays</u>	5 Goosefoot, <u>Chenopodium</u> sp.
1 Barley, <u>Hordeum vulgare</u>	2 Panicked willow herb, <u>Epi-</u>
	<u>lobium paniculatum</u>
	2 Buckhorn, <u>Plantago lanceo-</u>
	<u>lata</u>
	2 Wild rose, <u>Rosa</u> sp.
	1 Dog fennel, <u>Anthemis cotula</u>
	1 Spike rush, <u>Eleocharis ob-</u>
	<u>tusa</u>

No. 25. (Continued)

## Animal Matter:

33 Diptera larvae, Muscidae

3 Aphodian dung-beetles, Aphodius fimetarius Linn16 Aphodian dung-beetles, Aphodius sp.

1 elytra of Western twelve-spotted cucumber beetle,

Diabrotica soror Lec.Grasshopper parts, Aphodius sp. portions, and  
small pieces of chitin.

## Percentages

Crop Seed	44.44	Unclassified	42.73
Weed Seed	2.57	Undetermined	4.27
Animal	5.99	Gravel	5.64

- - - - -

No. 26. Locality, Umatilla #13. - Male, in wheat and alfalfa, Sutuelia Creek, September 5, 1928, 6:30 p.m.

## Plant Food:

Crop Seed	Weed Seed
none	79 Wild rose, <u>Rosa</u> sp.
	6 Brome, <u>Bromus</u> sp.
	3 Blue-eyed grass, <u>Sisyrinchium</u> sp.
	1 Wild vetch, <u>Vicia</u> sp.

## Animal Matter:

120 grasshopper mandibles

3 Orthoptera eggs

## Animal Matter: (Continued)

Coleoptera and Orthoptera parts and chitin.

## Percentages:

Crop Seed	0	Unclassified	36.67
Weed Seed	12.00	Undetermined	4.66
Animal	46.67	Gravel	10.71

-----

No. 27. Locality, Marion #13. - Male, in orchard 6 miles

N. of Salem, September 19, 1928, 8:30 a.m.

## Plant Food:

## Crop Seed

none

## Weed Seed

260 Hawthorn, Crataegus doug-lasii190 Tarweed, Nadia sativa75 Hawthorn berries, Cratae-  
gus douglasii12 Buttercup, Ranunculus sp.3 Rat's tail fescue, Festuca  
myuros3 Brassica sp.2 Wild clover, Trifolium sp.2 Bird's foot trefoil, Lotus  
sp.1 Soft chess, Bromus horde-  
aceus



No. 27. (Continued)

## Animal Matter:

- 3 grasshoppers, Melanoplus sp. (nymphs)\*
- 2 grasshopper mandibles
- 1 Hemiptera remains
- 1 Tree cricket, Oecanthinae (crushed)
- 131 insect eggs (probably Hemiptera)
- 1 small pheasant feather
- Grasshopper parts and chitin.

## Percentages:

Crop Seed	0	Unclassified	35.52
Weed Seed	55.27	Undetermined	2.63
Animal	6.58	Gravel	6.17

-----

No. 28. Locality, Marion #14. - Male, in pasture 12 miles  
S. of Salem, September 20, 1928, 4:30 p.m.

## Plant Food:

Crop Seed	Weed Seed
211 Wheat, <u>Triticum aestivum</u>	869 Goosefoot, <u>Chenopodium</u> sp.
	478 Prickly Lettuce, <u>Lactuca</u> <u>scariola</u>
	21 Bird's foot trefoil, <u>Lotus</u> <u>americanus</u>
	9 Mustard, <u>Sisymbrium</u> sp.

\* Determination made by L. P. Rockwood.

## Plant Food: (Continued)

## Crop Seed

## Weed Seed

7 Lupine, Lupinus sp.7 Willow herb, Epilobium sp.1 Fiddle-neck, Amsinckia sp.

## Animal Matter:

2 grasshopper heads, Locustinae

2 grasshopper mandibles

4 Big-eyed plant bugs, Geocoris sp. (crushed)2 heads of Geocoris sp.

1 Coleoptera mandible

1 pheasant feather

Portions of grasshopper, and beetle chitin.

## Percentages:

Crop Seed	45.29	Unclassified	34.80
Weed Seed	9.41	Undetermined	1.79
Animal	8.71	Gravel	9.46

- - - - -

No. 29. Locality, Lane #18. - Male, in weeds, Alvaradori,

September 27, 1923, 2 p.m.

## Plant Food:

## Crop Seed

## Weed Seed

29 Wheat, Triticum aestivum 10238 Green foxtail, Chaetoch-27 Oats, Avena sativa loa viridis2 Hairy vetch, Vicia villosa 1352' Nightshade, Solanum sp.1 Ryegrass, Lolium sp.31 Goosefoot, Chenopodium sp.

## Plant Food: (Continued)

## Crop Seed

## Weed Seed

30 Lady's thumb, Polygonumpersicaria24 Prickly lettuce, Lactucascariola11 Barnyard grass, Echinoch-loa crus-galli1 Chickweed, Alsine media1 Bull thistle, Carduuslanceolatus1 Amaranth, Amaranthus sp.

## Animal Matter:

5 Red-legged locust, Melanoplus femur-rubrum De Geen.\*2 Melanoplus sp.\*2 grasshopper heads, Melanoplus sp.\*

23 grasshopper mandibles

Elytra of small Coleoptera, many grasshopper parts  
and insect chitin.

## Percentages:

Crop Seed	8.30	Unclassified	36.87
Weed Seed	38.30	Undetermined	3.26
Animal	12.77	Gravel	3.42

- - - - -

\* Determination made by L. P. Rockwood.

Total percentages of contents in stomachs collected the month of September, 1928:

Crop Seed	16.42	Unclassified	40.07
Weed Seed	19.59	Undetermined	6.61
Animal	17.30	Gravel	12.25

Total plant food 76.08

- - - - -

No. 30. Locality, Linn #23. - Male, in grain stubble 3 miles E. of Harrisburg, October 10, 1928, 4 p.m.

Plant Food:

Crop Seed	Weed Seed
1 Ryegrass, <u>Lolium</u> sp.	73 Cheat, <u>Bromus secalinus</u>
	29 Wild rose, <u>Rosa</u> sp.
	2 Bindweed, <u>Polygonum</u> sp.
	1 Sorrel, <u>Rumex acetosella</u>
	1 Grape family, <u>Vitaceae</u>

Animal Matter:

9 grasshopper mandibles

4 parts of grasshopper mandibles

1 Coleoptera mandible

Small portions of grasshoppers and Coleoptera chitin.

Percentages:

Crop Seed	.79	Unclassified	67.47
Weed Seed	15.88	Undetermined	7.93
Animal	7.93	Gravel	30.38

- - - - -

No. 31. Locality, Linn #24. - Male, in grain stubble 4  
miles E. of Halsey, October 18, 1928, 9:40 a.m.

Plant Food:

Crop Seed	Weed Seed
9 Hairy vetch, <u>Vicia villosa</u>	72 Hawthorn, <u>Crataegus doug-</u>
5 Common vetch, <u>Vicia sativa</u>	<u>lasii</u>
	5 Sedge, <u>Carex</u> sp.
	2 Black bindweed, <u>Polygonum</u>
	<u>convolvulus</u>
	1 Buttercup, <u>Ranunculus</u> sp.

Animal Matter:

11 grasshopper mandibles  
14 parts of grasshopper mandibles  
Small parts of grasshoppers.

Percentages:

Crop Seed	10.13	Unclassified	67.56
Weed Seed	16.89	Undetermined	4.06
Animal	1.36	Gravel	21.28

- - - - -

No. 32. Locality, Umatilla #14. - Male, in alfalfa and  
wheat stubble near Umapine, October 3, 1928, 8:30  
a.m.

Plant Food:

Crop Seed	Weed Seed
none	183 Hawthorn, <u>Crataegus doug-</u>
	<u>lasii</u>

## Plant Food: (Continued)

## Crop Seed

## Weed Seed

- 6 Hawthorn berries, Crataegus douglasii  
 6 Bindweed, Polygonum sp.  
 4 Wild rose, Rosa sp.  
 1 Buttercup, Ranunculus sp.

## Animal Matter:

- 44 Red-legged locust, Melanoplus femur-rubrum  
 De Geer.\*  
 3 Lesser migratory locust, Melanoplus atlantis  
 Riley.\*  
 1 Yellow-winged grasshopper, Camnula pellucida  
 Scudder.\*  
 52 grasshopper mandibles  
 1 Ground or field cricket, Remobius sp.  
 1 larva, Noctuidae  
 Coleoptera chitin, small parts of grasshoppers and  
 chitin.

## Percentages:

Crop Seed	0	Unclassified	11.24
Weed Seed	8.35	Undetermined	4.17
Animal	76.24	Gravel	1.58

- - - - -

\* Determination made by L. P. Rockwood.

No. 33. Locality, Umatilla #19. - Female, in alfalfa and wheat stubble, Havana, October 10, 1928, 12:40 p.m.

Plant Food:

Crop Seed

418 Wheat, Triticum aestivum

Weed Seed

105 Gaura sp.

24 Hawthorn, Crataegus douglasii

2 Curled dock, Rumex crispus

1 Brome, Bromus sp.

1 Sweet clover, Melilotus sp.

Animal Matter:

1 Coleoptera mandible

Chitin and small pieces of Coleoptera.

Percentages:

Crop Seed	54.05	Unclassified	33.78
Weed Seed	10.81	Undetermined	.81
Animal	.55	Gravel	6.33

- - - - -

No. 34. Locality, Malheur #14. - Male, in weeds, Bully Creek 6 miles above Vale, October 29, 1928, 8:15 a.m.

Plant Food:

Crop Seed

7 Barley, Hordeum vulgare

Weed Seed

8 Barnyard grass, Echinochloa crus-galli

## Plant Food: (Continued)

## Crop Seed

## Weed Seed

2 Wild sunflower, Helianthus  
sp.

## Animal Matter:

Remains of undeterminable insect parts.

## Percentages:

Crop Seed	9.04	Unclassified	84.33
Weed Seed	1.20	Undetermined	4.82
Animal	.61	Gravel	15.30

- - - - -

Total percentages of contents in stomachs collected the  
month of October, 1928:

Crop Seed	14.80	Unclassified	52.88
Weed Seed	10.63	Undetermined	4.36
Animal	17.34	Gravel	14.97

Total plant food 78.30

- - - - -

No. 35. Locality, Linn #27. - Male, in pasture and grain  
stubble near Albany, November 5, 1928, 4 p.m.

## Plant Food:

## Crop Seed

## Weed Seed

488 Oats, <u>Avena sativa</u>	4 Brome, <u>Bromus</u> sp.
75 Oats (sprouted)	1 Darnel, <u>Lolium temulentum</u>
22 Wheat, <u>Triticum aestivum</u>	1 Plantain, <u>Plantago</u> sp.
24 Common vetch, <u>Vicia sativa</u>	



## Plant Food: (Continued)

## Crop Seed

4 Common vetch (sprouted)

1 Barley, Hordeum vulgare

## Animal Matter:

1 hind leg of grasshopper, probably Melanoplus  
femur-rubrum De Geer.

## Percentages:

Crop Seed	60.78	Unclassified	37.62
Weed Seed	.72	Undetermined	.44
Animal	.44	Gravel	7.98

- - - - -

No. 36. Locality, Linn #28. - Male, in oat and wheat land  
 near Harrisburg, November 14, 1928, 2:15 p.m.

## Plant Food:

## Crop Seed

1 Ryegrass, Lolium sp.

## Weed Seed

72 Bindweed, Polygonum sp.13 Sorrel, Rumex acetosella12 Brome grass, Bromus sp.3 Wild rose, Rosa sp.

2 Buckhorn, Plantago lanceo-  
lata

1 Snowberry, Symphoricarpos  
 sp.

1 Grape family, Vitaceae

1 Acorn, Quercus sp.

## Plant Food: (Continued)

## Crop Seed

## Weed Seed

2 Wild crabapple, Pyrus di-  
versifolia

## Animal Matter:

Several small portions of grasshoppers.

## Percentages:

Crop Seed	.65	Unclassified	51.95
Weed Seed	45.46	Undetermined	1.29
Animal	.65	Gravel	20.62

- - - - -

Total percentages of contents in stomachs collected the  
month of November, 1928:

Crop Seed	30.72	Unclassified	44.79
Weed Seed	23.09	Undetermined	.87
Animal	.55	Gravel	14.30

Total plant food 98.59

- - - - -

No. 37. Locality, Linn #32. - Male, in stubble, Tangent,  
December 2, 1928, 9:30 a.m.

## Plant Food:

## Crop Seed

## Weed Seed

none

24 Buttercup, Ranunculus sp.

11 Bindweed, Polygonum sp.

7 Brome grass, Bromus sp.

4 Bull thistle, Carduus lanceo-

## Plant Food: (Continued)

## Crop Seed

## Weed Seed

latus

## Animal Matter:

4 grasshopper mandibles.

## Percentages:

Crop Seed	0	Unclassified	92.39
Weed Seed	3.26	Undetermined	3.26
Animal	1.09	Gravel	26.98

- - - - -

No. 38. Locality, Umatilla #22. - Female, in wheat and alfalfa stubble, Pilot Rock district, December 19, 1928, 2:30 p.m.

## Plant Food:

## Crop Seed

## Weed Seed

132 Wheat, <u>Triticum aestivum</u>	3 Knotweed, <u>Polygonum aviculare</u>
	2 Goosefoot, <u>Chenopodium</u> sp.
	2 Hoarhound, <u>Marrubium vulgare</u>

## Animal Matter:

Coleoptera chitin and small pheasant feathers.

## Percentages:

Crop Seed	24.44	Unclassified	71.28
Weed Seed	.20	Undetermined	2.04
Animal	2.04	Gravel	8.40

No. 39. Locality, Umatilla #25. - Male, in wheat and alfalfa stubble, Athena district, December 23, 1928, 3:40 p.m.

Plant Food:

Crop Seed	Weed Seed
1 Wheat, <u>Triticum aestivum</u>	167 Wild rose, <u>Rosa</u> sp.
	9 Lupine, <u>Lupinus</u> sp.
	6 Sweet clover, <u>Melilotus</u> sp.
	5 Saltbush, <u>Atriplex</u> sp.

Animal Matter:

none

Percentages:

Crop Seed	1.43	Unclassified	75.00
Weed Seed	21.43	Undetermined	2.14
Animal	0	Gravel	32.69

- - - - -

No. 40. Locality, Malheur #21. - Male, in sage brush near Dunaway Station, December 30, 1928, 4:45 p.m.

Plant Food:

Crop Seed	Weed Seed
692 Barley, <u>Hordeum vulgare</u>	261 Wild rose, <u>Rosa</u> sp.
53 Barley (sprouted)	2 Tumbling amaranth, <u>Amaranthus graecizans</u>
	1 Lamb's quarter, <u>Chenopodium album</u>

No. 40. (Continued)

Animal Matter:

none

Percentages:

Crop Seed	69.65	Unclassified	24.87
Weed Seed	3.49	Undetermined	1.99
Animal	0	Gravel	4.28

- - - - -

No. 41. Locality, Hood River #16. - Female, in old orchard, Odell, December 5, 1928, 2:35 p.m.

Plant Food:

Crop Seed	Weed Seed
3 Ryegrass, <u>Lolium</u> sp.	2983 Barnyard grass, <u>Echinochloa crus-galli</u>
	550 Nightshade, <u>Solanum</u> sp.
	8 Goosefoot, <u>Chenopodium album</u>
	3 Amaranth, <u>Amaranthus</u> sp.
	1 Wild rose, <u>Rosa</u> sp.
	1 Labiateae

Animal Matter:

none

Percentages:

Crop Seed	.36	Unclassified	30.71
Weed Seed	64.29	Undetermined	4.64
Animal	0	Gravel	12.66

Total percentages of contents in stomachs collected the month of December, 1928:

Crop Seed	19.18	Unclassified	58.85
Weed Seed	18.53	Undetermined	2.81
Animal	.63	Gravel	17.00
Total plant food		96.56	

- - - - -

No. 42. Locality, Umatilla #26. - Female, in wheat and alfalfa stubble, Hermiston, January 8, 1929, 10:30 a.m.

Plant Food:

Crop Seed	Weed Seed
1 Wheat, <u>Triticum aestivum</u>	207 Russian thistle, <u>Salsola pestifer</u>
	33 Saltbush, <u>Atriplex</u> sp.
	1 Brome, <u>Bromus</u> sp.
	1 Black seeded plantain, <u>Plantago rugellii</u>

Animal Matter:

1 Coleoptera mandible

Small parts of grasshoppers, and Coleoptera.

Percentages:

Crop Seed	.90	Unclassified	67.57
Weed Seed	24.78	Undetermined	6.30
Animal	.45	Gravel	15.24

- - - - -

No. 43. Locality, Umatilla #29. - Male, in alfalfa and  
wheat stubble, Hermiston, January 13, 1929,  
4:00 p.m.

Plant Food:

Crop Seed

none

Weed Seed

768 Sweet clover, Meli-  
totus sp.

13 Barnyard grass, Echi-  
nochloa crus-galli

3 Russian thistle, Sal-  
sola pestifer

3 Verbena sp.

1 Yellow foxtail, Chaeto-  
chloa glauca

1 Prunus sp.

1 Brome grass, Bromus sp.

Animal Matter:

none

Percentages:

Crop Seed	.25	Unclassified	85.99
Weed Seed	9.83	Undetermined	3.93
Animal	0	Gravel	13.77

- - - - -

No. 44. Locality, Malheur #25. - Female, in willows along  
ditch, Upper Dead Ox Flat, January 30, 1929,  
4:20 p.m.

No. 44. (Continued)

## Plant Food:

## Crop Seed

none

## Weed Seed

11,200 White sage, Kochia  
sp.1 Brome grass, Bromus  
sp.

## Animal Matter:

none

## Percentages:

Crop Seed	0	Unclassified	62.93
Weed Seed	33.57	Undetermined	3.50
Animal	0	Gravel	3.38

- - - - -

No. 45. Locality, Hood River #23. - Male, in orchard,  
Odell, January 16, 1929, 12:10 p.m.

## Plant Food:

## Crop Seed

none

## Weed Seed

157 Wild rose, Rosa sp.  
115 Snowberry, Symphori-  
carpos sp.  
38 Mint, Labiateae  
6 Leguminosae  
5 Prunus sp.

## Animal Matter:

none



No. 45. (Continued)

## Percentages:

Crop Seed	0	Unclassified	67.56
Weed Seed	31.36	Undetermined	1.08
Animal	0	Gravel	9.75

-----

Total percentages of contents in stomachs collected the  
month of January, 1929:

Crop Seed	.28	Unclassified	71.01
weed Seed	24.89	Undetermined	3.70
Animal	.11	Gravel	10.71

Total plant food 96.19

-----

No. 46. Locality, Malheur #27. - Male in sage brush near  
Holiday bridge, February 9, 1929, 9:50 a.m.

## Plant Food:

Crop Seed	Weed Seed
2 Barley, <u>Hordeum vulgare</u>	931 Sweet clover, <u>Melilotus</u> sp.
	20 Wild rye, <u>Elymus</u> sp.
	12 Wild rose, <u>Rosa</u> sp.
	2 Blackberry, <u>Rubus</u> sp.
	2 Buttercup, <u>Ranunculus</u> sp.
	1 Dog fennel, <u>Anthemis</u> <u>cotula</u>

No. 46. (Continued)

## Animal Matter:

none

## Percentages:

Crop Seed	9.01	Unclassified	45.04
Weed Seed	43.25	Undetermined	2.70
Animal	0	Gravel	43.93

- - - - -

Total percentages of contents in stomachs collected the  
month of February, 1929:

Crop Seed	9.01	Unclassified	45.04
Weed Seed	43.25	Undetermined	2.70
Animal	0	Gravel	43.93

Total plant food 97.30

- - - - -

No. 47. Locality, Linn #33. - Male, in wheat, Albany,

April 16, 1929, 9:40 p.m.

## Plant Food:

## Crop Seed

none

## Weed Seed

9 Mint, Labiateae

5 Rhus sp. (probably poison  
oak)3 Buttercup, Ranunculus sp.1 Bachelor button, Centaurea  
cyanus

No. 47. (Continued)

## Animal Matter:

1 Ladybird beetle

1 small Carabiidae (crushed)

5 Coleoptera mandibles (probably Carabiidae)

Parts and chitin of Coleoptera.

## Percentages:

Crop Seed	0	Unclassified	90.00
Weed Seed	3.00	Undetermined	2.00
Animal	5.00	Gravel	46.25

- - - - -

No. 48. Locality, Linn #35. - Male, in wheat stubble,

Lebanon, April 26, 1929, 3:10 p.m.

## Plant Food:

## Crop Seed

## Weed Seed

1541 Ryegrass, Lolium sp.630 Sanguisorba sp.1 Wheat, Triticum aestivum18 Cheat, Bromus secalinus1 Common vetch, Vicia sati-7 Velvet grass, Holcus lan-vaatus3 Rat-tail fescue, Festucamyuros2 Wild blackberry, Rubus

sp.

1 Prunus sp.1 Lupine, Lupinus sp.

No. 48. (Continued)

## Animal Matter:

1 Flea-beetle

1 Coleoptera mandible

Small portions of Coleoptera.

## Percentages:

Crop Seed	31.71	Unclassified	44.40
Weed Seed	17.45	Undetermined	6.34
Animal	.10	Gravel	16.67

- - - - -

No. 49. Locality, Umatilla #30. - Male, in wheat, alfalfa  
and weeds, Pilot Rock, April 17, 1929, 1:30 p.m.

## Plant Food:

Crop Seed	Weed Seed
1 Alfalfa, <u>Medicago sativa</u>	none

## Animal Matter:

2 grasshopper mandibles

Parts and small pieces of chitin of grasshoppers.

## Percentages:

Crop Seed	.69	Unclassified	97.23
Weed Seed	0	Undetermined	.69
Animal	1.39	Gravel	36.28

- - - - -

No. 50. Locality, Umatilla #32. - Female, in wheat and  
weeds, Pilot Rock, April 17, 1929, 3:10 p.m.

No. 50. (Continued)

## Plant Food:

## Crop Seed

none

## Weed Seed

220 Barnyard grass, Echi-  
nochloa crus-galli14 Nightshade, Solanum sp.

8 Tumbling amaranth,

Amaranthus graecizans

## Animal Matter:

Small pieces of insect parts and chitin.

## Percentages:

Crop Seed	0	Unclassified	81.96
Weed Seed	13.12	Undetermined	2.46
Animal	2.46	Gravel	32.96

- - - - -

No. 51. Locality, Yamhill #7. - Male, in alfalfa, Sheridan  
April 18, 1929, 2:15 p.m.

## Plant Food:

## Crop Seed

none

## Weed Seed

81 Wild rose, Rosa sp.24 Wild vetch, Vicia sp.10 Cheat, Bromus secalinus4 Lupine, Lupinus sp.

2 Buckhorn plantain,

Plantago lanceolata

## Animal Matter:

4 snouts of Cucurlio beetles

5 heads of Cucurlio beetles

2 March flies, Bibio nervosus Loew.1 elytra of Western twelve-spotted cucumber beetle,  
Diabrotica soror Lec.

Parts of Carabiidae beetle and Coleoptera chitin.

## Percentages:

Crop Seed	0	Unclassified	88.16
Weed Seed	8.82	Undetermined	.69
Animal	2.33	Gravel	3.36

- - - - -

Total percentages of contents in stomachs collected the  
month of April, 1929:

Crop Seed	6.48	Unclassified	30.35
Weed Seed	8.48	Undetermined	2.44
Animal	2.26	Gravel	27.10

Total plant food 95.31

- - - - -

Total percentages of contents in stomachs collected during  
the season of 1928 and 1929:

Crop Seed	17.91	Unclassified	54.75
Weed Seed	14.69	Undetermined	4.12
Animal	8.45	Gravel	15.34

Total plant food 87.35

SUMMARY OF CROP SEEDS, WEED SEEDS, AND INSECTS CONSUMED

List of first 30 kinds of seeds:

Seeds	Number	Frequency
Green foxtail, <u>Chaetochloa</u> sp.	17,028	7
White sage, <u>Kochia</u> sp.	11,200	1
Sorrel, <u>Rumex</u> sp.	4,208	3
Wheat, <u>Triticum</u> sp.*	3,578	23
Barnyard grass, <u>Echinochloa</u> sp.	3,304	6
Wild blackberry, <u>Rubus</u> sp.	2,840	8
Ryegrass, <u>Lolium</u> sp.*	2,063	10
Nightshade, <u>Solanum</u> sp.	1,918	4
Sweet clover, <u>Melilotus</u> sp.	1,710	6
Barley, <u>Hordeum</u> sp.*	947	8
Goosefoot, <u>Chenopodium</u> sp.	916	4
Oats, <u>Avena</u> sp.*	819	8
Wild rose, <u>Rosa</u> sp.	796	11
Chickweed, <u>Cerastium</u> sp.	746	2
<u>Sanguisorba</u> sp.	630	1
Hawthorn, <u>Crataegus</u> sp.	614	5
Prickly lettuce, <u>Lactua</u> sp.	558	3
Darnel, <u>Lolium</u> sp.	506	3
Lady's thumb, <u>Polygonum</u> sp.	253	3
Brome grass, <u>Bromus</u> sp.	216	13

\* Crop seed.

## List of first 30 kinds of seeds: (Continued)

Seeds	Number	Frequency
Russian thistle, <u>Salsola</u> sp.	210	2
Tarweed, <u>Nadia</u> sp.	190	1
Yellow foxtail, <u>Chaetochloa</u> sp.	177	3
Snowberry, <u>Symphoricarpos</u> sp.	177	5
Amaranth, <u>Amaranthus</u> sp.	145	3
Common vetch, <u>Vicia</u> sp.*	110	5
Bindweed, <u>Polygonum</u> sp.	106	7
<u>Gaura</u> sp.	105	1
Cheat, <u>Bromus</u> sp.	101	3
Buttercup, <u>Ranunculus</u> sp.	99	10

## List of first 18 kinds of insects:

Insects	Number	Importance
Grasshoppers (60 heads, 714 mandibles)	195	Injurious
Eggs (probably Hemiptera)	131	
Larvae (Diptera)	34	
<u>Eurymus eurytheme</u> Bdv.	27	Injurious
<u>Aphodius</u> sp.	19	Neutral
Cucurlios (7 heads)	19	Injurious
<u>Diabrotica soror</u> Lec. (4 heads)	14	Injurious
<u>Eleodes</u> sp. (12 heads)	13	Injurious
Hemiptera (5 heads)	9	

\* Crop seed.



## List of first 13 kinds of insects: (Continued)

Insects	Number	Importance
<u>Lygus pratensis</u> Linn. (4 heads)	8	Injurious
Arachnida (small)	8	Beneficial
Membracids	5	Injurious
Cicadellidae (3 heads)	3	Injurious
Oecanthinae	2	Injurious
Reduviidae	2	Beneficial
<u>Geocoris</u> sp.	2	Injurious
<u>Draeculacephala</u> sp.	2	Injurious
<u>Bibio-nervous</u> Loew.	2	Neutral

Note: (heads) are included in total number of individual insects listed.

SUMMARY OF ANALYSES

1. The volume of total plant food represents 87.35% of the pheasants' diet, based on analyses of 51 stomachs.
2. Of the volume of total plant food, 17.91% is crop seeds, 14.69% is weed seeds, and 54.75% is unclassified plant food.
3. The volume of crop seed is larger than the volume of weed seeds, but the number and kinds of weed seeds greatly exceeds the crop seeds.
4. Five crop seeds are among the first 30 kinds of seeds listed.
5. Green foxtail seeds, Chaetochloa viridis are the largest number of one kind of seeds found in the stomachs.
6. Wheat seeds, Triticum aestivum are fourth in the list of seeds consumed; ryegrass, barley, and oats are seventh, tenth, and twelfth respectively.
7. The volume of weed seeds and animal matter are 5.23% greater than the volume of crop seeds.
8. Grasshoppers are found most frequently among the insects consumed.
9. Most of the insects consumed may be classed as injurious, although a few were neutral or beneficial.
10. Most all animal matter found is insect.

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Gravel Separated From Stomach Contents

Fig. 1 Stomach previous to analysis.

Fig. 2 Remaining total plant food and animal matter.

Fig. 3 Gravel segregate.

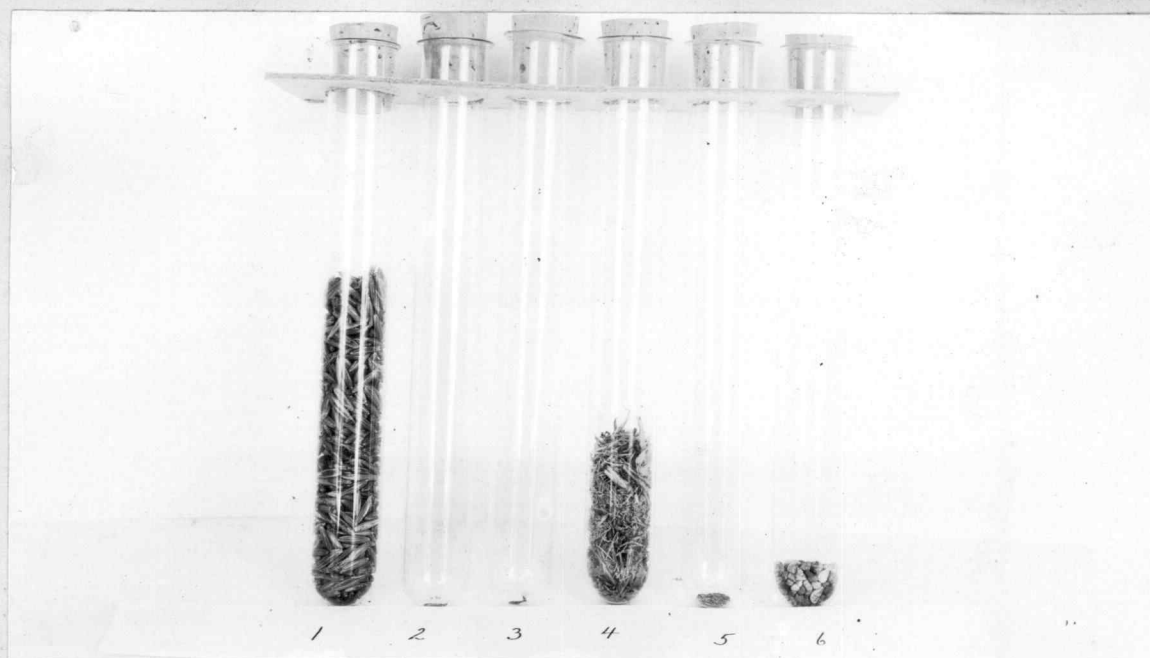


Fig. 1

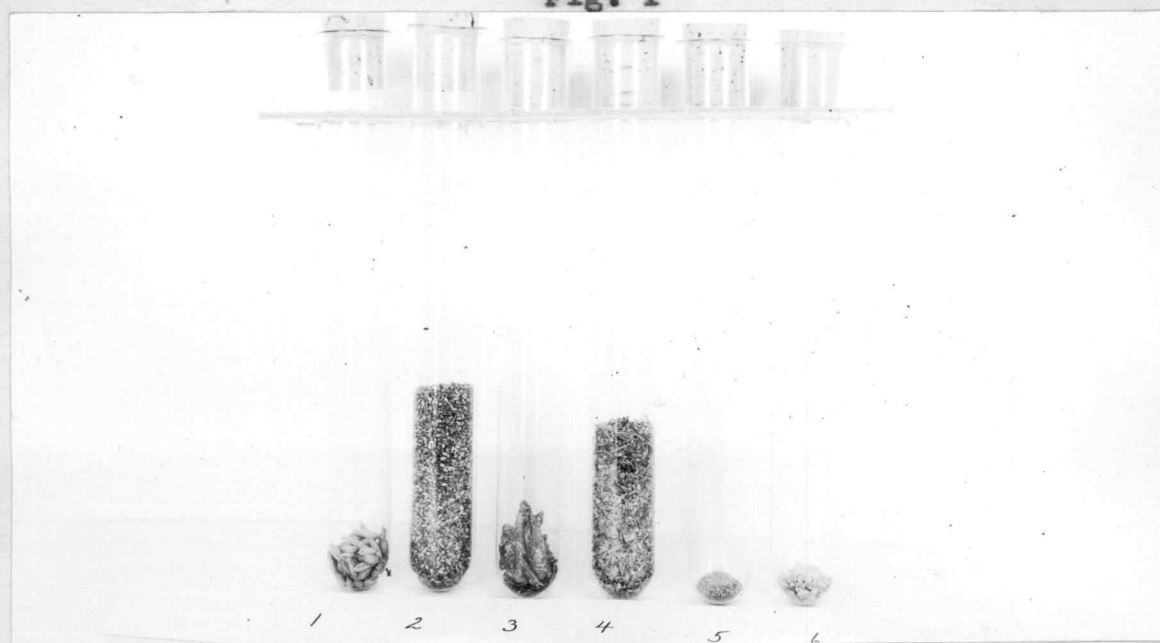


Fig. 2

### Segregated Portions of Stomach Contents

Fig. 1 Stomach containing a large per cent of crop seeds.

Fig. 2 Stomach containing a large per cent of weed seeds.

(1) crop seeds (3) animal matter (5) undetermined material

(2) weed seeds (4) unclassified plant food (6) gravel

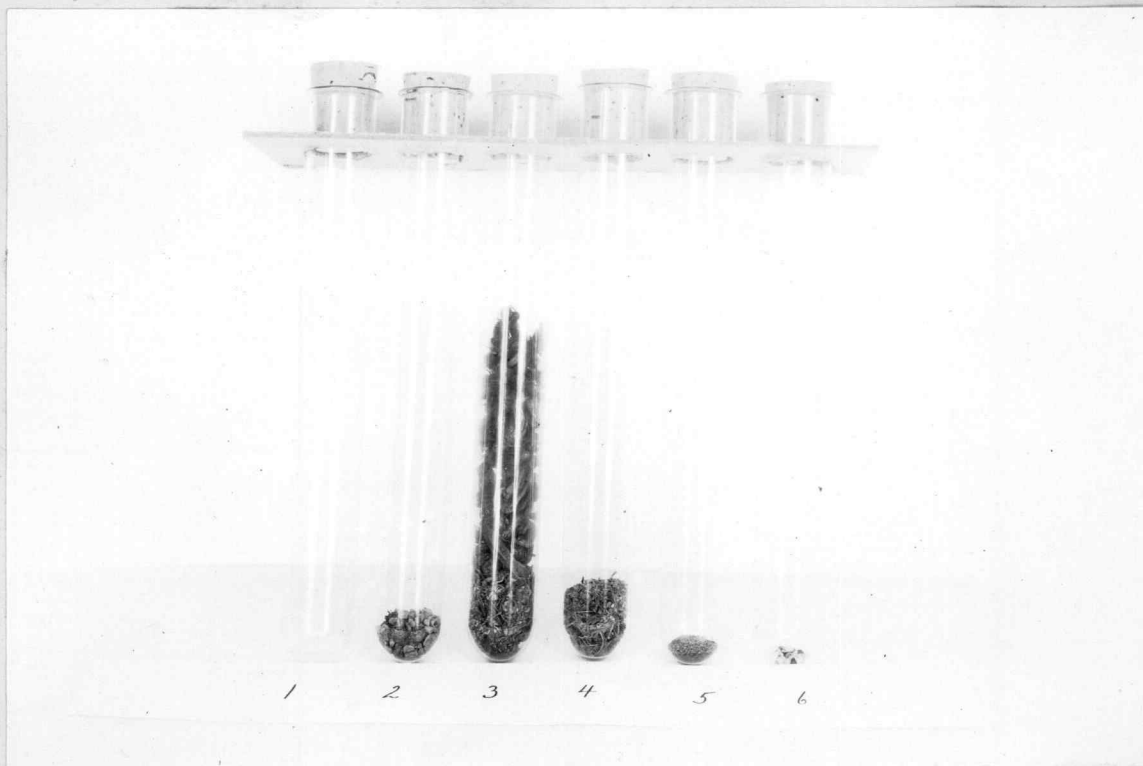


Fig. 1

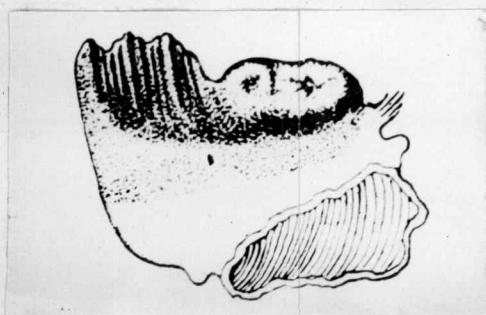


Fig. 2

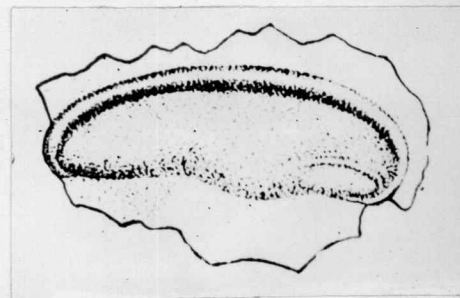


Fig. 3

Segregated Portions of Stomach Contents

Fig. 1 Stomach containing a large per cent of animal matter

Fig. 2 A grasshopper mandible

Sketch from U.S.D.A., Biological Survey.

Fig. 3 Tibio-femoral plate (knee) of grasshopper.

Sketch from U.S.D.A., Biological Survey.



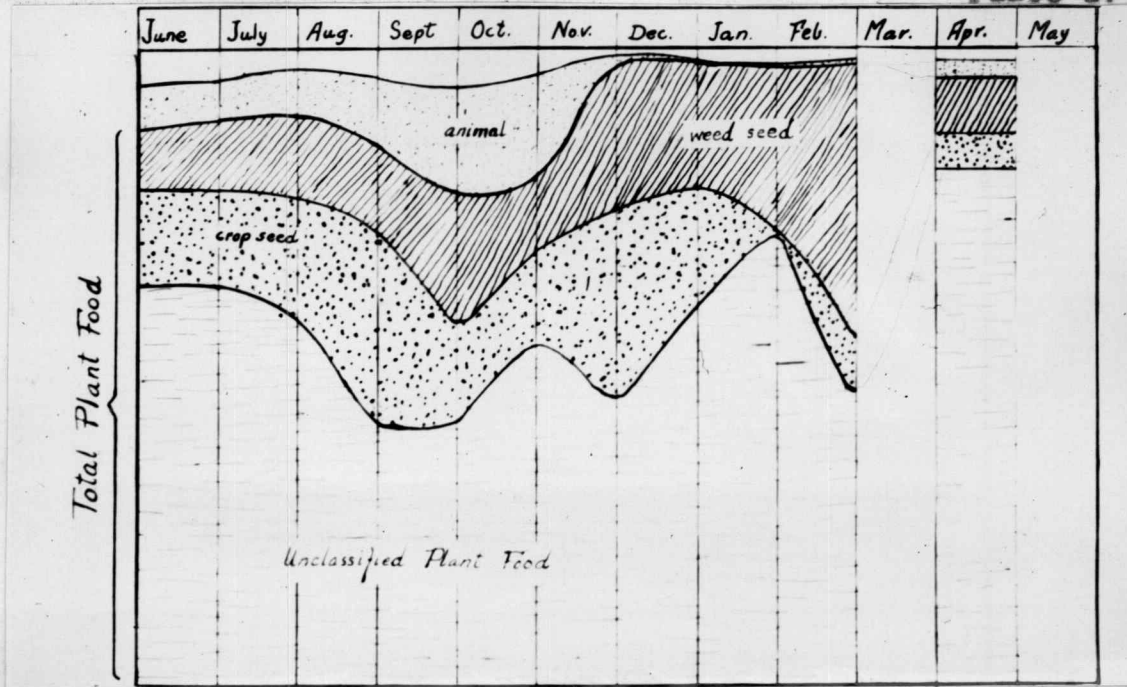


Fig. 1

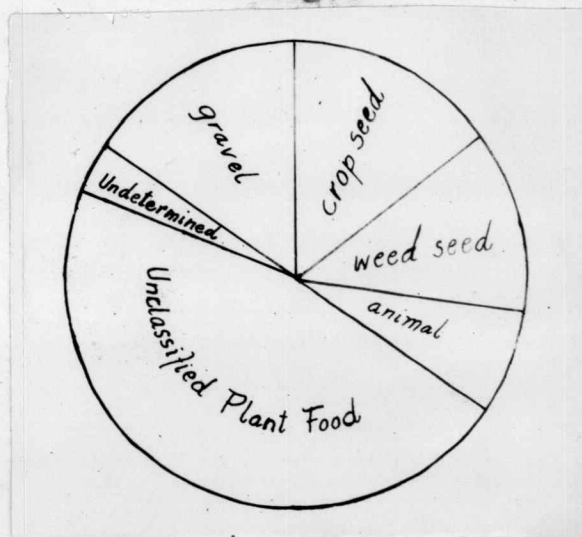


Fig. 2

### Comparison of Volume-percent of Stomach Segregates

Fig. 1 Chart showing food consumed by months. Number of stomachs representing each month are: June, six; July, seven; Aug., ten; Sept., six; Oct., five; Nov., two; Dec., five; Jan., four; Feb., one; Mar., none, Apr., five and May none.

Fig. 2 Average segregates of 51 stomachs analyzed.



OREGON AGRICULTURAL COLLEGE EXPERIMENT STATION  
PHEASANT STOMACH ANALYSIS

Collector No. 6 Station No. Umatilla 7  
 Name Chinese Pheasant Locality Umatilla County Sex male  
 Where killed Athens, Ore. Date Aug. 20, 1928. Hour 8:20 A.M.  
 Condition of crop GOOD : of gizzard GOOD : of gullet --  
 Percentage of animal matter 18.00 : of vegetable 73.25 : of gravel 8.04  
 Crop contents 5 grasshopper mandibles  
16 larvae of Alfalfa Butterfly Eurymus eurytheme Bdv.  
11 pupae " " " " " "  
152 mandibles " " " " " "  
1 Nymphaeidae (crushed)  
1 Reduviidae (crushed)  
 Gizzard contents 1 Spider Arachnida  
Parts of Curculio beetles  
Parts of Carabid beetles  
Small parts of insects and chitin in remaining portion.  
 Examination made by T.C. Allen Date April 23, 1929.

Fig. 1

State number Linn 35 Date analyzed June 21, 1929  
 Date received June 18, 1929 Analyzed by Mrs. C.E. Schuster  
 Remarks 1. Character of unclassified plant food  
Chaff from grasses and many pieces of Sanguisorba sp.  
2. Many of grass seeds had sprouted.

Crop Seeds		Weed Seeds		Weed Seeds	
<u>Lolium sp.</u>	<u>1541</u>	<u>Sanguisorba sp.</u>	<u>630</u>	<u>Prunus sp.</u>	<u>1</u>
<u>Ryegrass</u>		<u>Bromus secalinus</u>	<u>18</u>	<u>Lupinus sp.</u>	<u>1</u>
<u>Triticum aestivum</u>	<u>1</u>	<u>Cheat</u>		<u>Lupine</u>	
<u>Wheat</u>		<u>Holcus lanatus</u>	<u>7</u>		
<u>Vicia sativa</u>	<u>1</u>	<u>Velvet grass</u>			
<u>Common vetch</u>		<u>Festuca myuros</u>	<u>3</u>		
		<u>Rat-tail fescue</u>			
		<u>Rubus sp.</u>	<u>2</u>		
		<u>Wild blackberry</u>			

Fig. 2

## Forms For Keeping Data

Fig. 1 Cards for tabulating animal matter.

Fig. 2 Plant food tabulation card (opposite side fig. 1.)