

FOOD HABITS OF BLUE GROUSE

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Food is recognized as an important limiting factor in the abundance and ecological distribution of most species of birds. Because of this, food studies of game birds such as Blue Grouse (genus *Dendragapus*) should be of considerable interest to the ecologist and ornithologist and of primary importance to the game administrator.

The present study is based on the analyses of the crop and stomach contents of 267 adult and 21 juvenal Blue Grouse. The food habits of the two closely related species of Blue Grouse, *Dendragapus obscurus* and *Dendragapus fuliginosus*, are discussed separately, chiefly because of the great difference in the vegetation found within their respective ranges, which reflects itself in the food of these birds. *Dendragapus obscurus*, sometimes called the Dusky Grouse, occurs in the Rocky Mountain region from Yukon south to New Mexico and Arizona and in a few of the higher mountains in the Great Basin. *Dendragapus fuliginosus*, known as the Sooty Grouse, is found on the coastal ranges and on the Cascades and Sierra Nevada, from Alaska south to California. In both species, no essential difference in food was noted between birds found at extreme northern and southern portions of the range.

Seasonal and geographic distribution of specimens of *Dendragapus obscurus*

	Adults													Total year		
	Spring		Early summer		Late summer		Fall			Winter						
	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.				
Arizona				2		3									5	
British Columbia					4	12	1	2	3					1	23	
Colorado				6	4	6	2								18	
Idaho		1	3	5	12	26	3		4	2	4				60	
Mackenzie			1												1	
Montana	1	2	3	2	5	5							1	1	20	
New Mexico				2	2	3	1	2							10	
Nevada			1	3	2										6	
Oregon				2	2	2		1							7	
Utah								1		1					2	
Washington								2							2	
Wyoming			1	1	8	7									17	
	4		34		101		11		21				171			
	Juveniles															
Alaska						1									1	
Colorado				1	4										5	
Idaho						8									8	
Nevada						2									2	
Utah						1									1	
Wyoming						2									2	
				1	18											19

The food data concerning *Dendragapus obscurus* were derived from the examinations of the crops and stomachs of 171 adult and 19 juvenal birds, whereas the data concerning *Dendragapus fuliginosus* were derived from the examinations of the crops and stomachs of 96 adults and 2 juvenal birds.

Grateful acknowledgment is made to A. C. Martin of the Fish and Wildlife Service, who assisted with most of the more difficult identifications of food items.

Seasonal and geographic distribution of specimens of *Dendragapus fuliginosus*

	Adults											Total year		
	Spring		Early summer		Late summer		Fall		Winter					
	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.		Mar.	
British Columbia	8							1			1	6	8	24
Alaska	2								1		2	1		6
California	11	13		1	1	2			1					29
Oregon	4	1	1	1		6			1				2	16
Washington				3		11		6	1					21
	39		6		20		7		24				96	
California	Juveniles											2		
												2		

SEASONAL ASPECT

The foods of Blue Grouse may be presented more or less naturally by means of five seasonal groupings: winter (November, December, January, February, and March); spring (April and May); early summer (June and July); late summer (August and September); and fall (October). The number of specimens examined for certain seasons for both species is meagre and under these circumstances the information may not be especially significant except to indicate in a general way the feeding tendencies. Gravel, which was generally found to occur in appreciable amounts in the stomach and occasionally in small amounts in the crops, is not included in the following summations of food habits.

WINTER DIET

Type of food	<i>D. obscurus</i> (21 birds) Volume per cent	<i>D. fuliginosus</i> (24 birds) Volume per cent
Coniferous needles	90.2	87.7
Buds and twigs	4.5	1.7
Green leaves (other than coniferous needles)	1.8	4.5
Coniferous cones	.....	.....
Flowers	.....	.....
Fruits and seeds	3.5	6.0
Undetermined plant material	.....	.....
Animal matter	.....	.1

16 crops

The needles of Douglas fir (*Pseudotsuga taxifolia*) represent the outstanding food (78.2 per cent) of *Dendragapus obscurus* during the winter. Other coniferous needles which were consumed in much smaller amounts include spruce (*Picea*) and pine (*Pinus*). The buds and twigs were of two kinds: cherry (*Prunus*) and willow (*Salix*), while the green leaves were *Anemone* and alum-root (*Heuchera*). The fruit of rose (*Rosa*) was found in fair quantity in one crop, and the fruits of manzanita (*Arctostaphylos*) and juniper (*Juniperus*) were found in very small quantities in others.

Although coniferous needles are the most important type of winter food for *Dendragapus fuliginosus* as well as for *D. obscurus*, the proportions of the various species used are considerably different. The needles of fir (*Abies*) are taken in largest quantity (64.8 per cent) by *Dendragapus fuliginosus*, and other coniferous needles taken in fair quantity include hemlock (*Tsuga*), Douglas fir (*Pseudotsuga taxifolia*), pine (*Pinus*) and spruce (*Picea*). Green leaves taken in small quantity include small cranberry (*Vaccinium oxycoccos*), foamflower (*Tiarella*), spreading wood fern (*Dryopteris dilatata*) and moss. The twigs of dwarf mistletoe (*Arceuthobium*) were found in considerable quantity in one stomach and the buds of aspen (*Populus*) were found in another. The only fruits and seeds eaten were those of salal (*Gaultheria shallon*) and Douglas fir.



Fig. 17. Typical winter habitat of Blue Grouse in Douglas firs. Photo taken in Idaho by W. H. Marshall, March 15, 1940.

SPRING DIET

Type of food	<i>D. obscurus</i> (4 birds) Volume per cent	<i>D. fuliginosus</i> (39 birds) Volume per cent
Coniferous needles	26.2	76.5
Buds and twigs	.....	9.2
Green leaves (other than coniferous needles)	34.8	3.6
Coniferous cones	21.2	10.7
Flowers	11.2	.....
Fruits and seeds	4.9	.....
Undetermined plant material	1.7	.....
Animal matter	.....	.....

The crops and stomachs of the four specimens of *Dendragapus obscurus* collected in the spring were found to contain an ample amount of coniferous needles mixed with many other types of food. The needles of Douglas fir were taken in considerable quantity and a small amount of pine needles was also represented. A considerable variety of green leaves was taken, although the only kinds taken in appreciable quantity were those of pussytoes (*Antennaria*), *Eriogonum*, and hawkweed (*Hieracium*). Flowers which were taken in rather small quantities included snowbrush (*Ceanothus*), larkspur (*Delphinium*), cherry (*Prunus*) and pussytoes. The only fruits and seeds taken in conspicuous quantities were those of pink microsteris (*Microsteris gracilis*).

The spring diet of *Dendragapus fuliginosus* continues to be made up predominantly of coniferous needles. In the central part of its range, the needles of fir (*Abies*) and Douglas fir (*Pseudotsuga taxifolia*) are the principal types taken. In the southern part of its range the needles of pine (*Pinus*) are substituted to some extent whereas toward the north the needles of other types such as spruce, especially Sitka spruce (*Picea sitchensis*) are increasingly important. The staminate cones of conifers, especially those of fir and Douglas fir, were found to be fairly important as food during this period. Green leaves were taken in small quantity, especially the leaves of ferns (Polypodiaceae)

and white clover (*Trifolium repens*). The buds and twigs of aspen (*Populus*) were taken in fair quantity by several birds.

EARLY SUMMER DIET

Type of food	<i>D. obscurus</i> (34 birds) Volume per cent	<i>D. fuliginosus</i> (6 birds) Volume per cent
Coniferous needles	12.9	1.2
Buds and twigs	.....	.....
Green leaves (other than coniferous needles)	22.0	24.1
Coniferous cones	5.1	.....
Flowers	13.2	57.4
Fruits and seeds	33.3	17.3
Undetermined plant material	1.8	.....
Animal matter	11.7	.....

8 crops

One of the outstanding features of the early summer diet is the great variety of foods that is taken. Nineteen kinds of fruits and seeds were taken by *Dendragapus obscurus*, the most important of which are listed as follows in the approximate order of their importance: manzanita (*Arctostaphylos*), strawberry (*Fragaria*), currant (*Ribes*), sedge (*Carex*), shepherds purse (*Capsella bursa-pastoris*), smartweed (*Polygonum*), buffalo berry (*Shepherdia canadensis*), and honeysuckle (*Lonicera*). A great variety of green leaves was also consumed and the more important of these are listed as follows in the order of their importance: *Eriogonum*, vetch (*Vicia*), willow (*Salix*), buffalo berry (*Shepherdia canadensis*), dandelion (*Taraxacum*), currant (*Ribes*), shootingstar (*Dodecatheon*) and aspen (*Populus*). Various kinds of flowers frequently are taken, especially those of the family Compositae. Those flowers taken in greatest quantity include cherry (*Prunus*), *Eriogonum*, *Microseris*, dandelion (*Taraxacum*) and *Agoseris*. Coniferous needles and cones are still taken in fair amount, especially those of pine (*Pinus*). An appreciable portion of the diet is now made up of animal food in the form of insects. Those which were taken in greatest quantity are scarabaeid beetles (Scarabaeidae), leafhoppers (Cicadellidae) and saw-fly larvae (Tenthredinidae). Ants (Formicidae) were taken frequently but never in large quantity.

Flowers are apparently of major importance in the early summer diet of *Dendragapus fuliginosus*. The flower of cats-ear (*Hypochaeris*) were found to comprise 35.7 per cent of the total. Other flowers of less importance were salal (*Gaultheria shallon*) and sheep sorrel (*Rumex acetosella*). Green leaves were taken in fairly large quantities, especially those of blueberry (*Vaccinium*). Other leaves taken in smaller quantities include black medic (*Medicago lupulina*) and bracken (*Pteridium aquilinum*). The fruits and seeds which were taken in largest quantity were blueberry (*Vaccinium*), red elderberry (*Sambucus callicarpa*), bramble (*Rubus*) and tarweed (*Madia*). One crop examined contained a small amount of hemlock needles.

LATE SUMMER DIET

Type of food	<i>D. obscurus</i> (101 birds) Volume per cent	<i>D. fuliginosus</i> (20 birds) Volume per cent
Coniferous needles	8.8	4.3
Buds and twigs	.....	.....
Green leaves (other than coniferous needles)	35.3	31.0
Coniferous cones	.....	.....
Flowers	2.9	15.4
Fruits and seeds	44.6	47.1
Undetermined plant material	1.1	.....
Animal matter	7.3	2.2

38 crops

The late summer is characterized by a bountiful production of food of all types and this is reflected in the varied diet of the Blue Grouse. Fruits and seeds are found in great abundance and a great variety of these is taken as food. Those eaten in greatest quantity by *Dendragapus obscurus* are listed as follows in the approximate order of their importance: blueberry (*Vaccinium*), manzanita (*Arctostaphylos*), pine (*Pinus*), rose (*Rosa*), cherry (*Prunus*), serviceberry (*Amelanchier*), snowberry (*Symphoricarpos*), mountain ash (*Sorbus*) and currant (*Ribes*). Green leaves are also taken in great variety and quantity and the more important of these are listed as follows in the approximate order of their importance: *Eriogonum*, willow (*Salix*), aspen (*Populus*), blueberry (*Vaccinium*), currant (*Ribes*), cherry (*Prunus*), vetch (*Vicia*), pussytoes (*Antennaria*) and clover (*Trifolium*). Coniferous needles were taken in small quantities, especially those of Douglas fir. The needles of spruce (*Picea*), tamarack (*Larix*) and pine were also found in a few crops and stomachs. Flowers were occasionally taken, especially those belonging to the Cichoriaceae. The most important forms of animal food taken were short-horned grasshoppers (Acrididae) and ants (Formicidae).

The late summer diet of *Dendragapus fuliginosus* is in most respects closely similar to that of *Dendragapus obscurus*. Fruits and seeds are represented by a considerable number of species, the more important of which are listed as follows in the order of their importance: blueberry (*Vaccinium*), manzanita (*Arctostaphylos*), bramble (*Rubus*), and mountain ash (*Sorbus*). The most important green leaves taken are blueberry (*Vaccinium*), clover (*Trifolium*), ferns (Polypodiaceae), *Eriogonum*, and hawkweed (*Hieracium*), all of which are listed in order of their importance. Flowers are consumed in considerable quantities during this period, especially those of the cats-ear (*Hypochaeris*). Animal matter, which is consumed in small quantities, is made up principally of three groups: short-horned grasshoppers (Acrididae), leaf beetles (Chrysomelidae) and ants (Formicidae).

FALL DIET

Type of food	<i>D. obscurus</i> (11 birds) Volume per cent	<i>D. fuliginosus</i> (7 birds) Volume per cent
Coniferous needles	51.0	.....
Buds and twigs	.....	.....
Green leaves (other than coniferous needles)	26.5	41.1
Coniferous cones	.....	.....
Flowers	.....	12.7
Fruits and seeds	22.3	45.3
Undetermined plant material	.....	.6
Animal matter	.2	.3

The fall diet of *Dendragapus obscurus* in many ways represents a transition between the summer and winter diet. Coniferous needles are again consumed in large amounts, especially those of Douglas fir, although pine needles were taken in fair quantity too. Green leaves continue to be taken in ample amounts, those of *Erysimum*, blueberry (*Vaccinium*) and alum-root (*Heuchera*) being taken in greatest quantity. Fruits and seeds continue to hold an important place in the diet, those taken in greatest quantity being mountain ash (*Sorbus*), blueberry (*Vaccinium*) and elderberry (*Sambucus*). One bird was found to have fed almost exclusively on the grain of oats (*Avena sativa*). Animal matter in the fall diet is apparently of negligible importance.

Fruits and seeds and green leaves make up the greater part of the fall diet of *Dendragapus fuliginosus*. The fruits and seeds which were taken in greatest abundance are Douglas fir, sedge (*Carex*), manzanita (*Arctostaphylos*) and blueberry (*Vaccinium*). The more important green leaves taken were alum-root (*Heuchera*), willow (*Salix*),

3 crops



Fig. 18. Fall feeding area of Blue Grouse. Boise National Forest, December 8, 1939.
Photo by W. H. Marshall.

ferns and clover. One bird was found to have consumed a considerable quantity of the flowers of the cats-ear (*Hypochaeris*).

DIET OF JUVENILES

All the young birds collected in July and August had grown beyond the "downy" stage and are considered as juveniles. No specimens representing the downy stage were available for study.

Type of food	<i>D. obscurus</i> (19 birds) Volume per cent	<i>D. fuliginosus</i> (2 birds) Volume per cent
Coniferous needles	2.6	.....
Buds and twigs	.....	.....
Green leaves (other than coniferous needles)	30.6	.....
Coniferous cones	.....	.....
Flowers	5.4	47.0
Fruits and seeds	26.9	40.5
Undetermined plant material	.3	8.0
Animal matter	34.2	4.5

The diet of juveniles of *Dendragapus obscurus* is about equally divided between green leaves, fruits and seeds, and insects. The leaves of *Eriogonum* were taken in large quantities and those of blueberry, dandelion and cherry were taken in fair amounts as well. Other species of leaves were represented by very small quantities. The more important fruits and seeds are listed as follows: cherry, blueberry, manzanita, serviceberry (*Amelanchier*), smartweed (*Polygonum*) and currant. A great variety of insects was taken, although only the short-horned grasshoppers (Acrididae) and ants (Formicidae) were taken frequently and in large quantity. Flowers were taken occasionally, especially those of the Cichoriaceae. Needles of the Douglas fir were taken a few times in small quantity.

The two specimens of *Dendragapus fuliginosus* examined were found to contain a large quantity of the flowers of the cats-ear (*Hypochaeris*) and a considerable quantity of the fruit of blueberry and sheep sorrel (*Rumex acetosella*). A relatively small amount of animal matter was found, chiefly in the form of short-horned grasshoppers (Acrididae) and ground beetles (Carabidae).

MAJOR TYPES OF FOOD

Coniferous needles.—Coniferous needles probably represent the most important type of food of Blue Grouse since they comprise a predominant portion of the food during the critical winter months; they are fed on in large quantities during the spring and fall and even in small quantities during the summer, when many other types of food are available. The needles of Douglas fir are the outstanding food of this type for *Dendragapus obscurus* whereas *Dendragapus fuliginosus* feeds to a large extent on fir (*Abies*) needles, although needles of Douglas fir are consumed in appreciable quantities too. Both species of Blue Grouse also feed to a considerable extent on the needles of pines and to a somewhat smaller extent on those of spruce. The needles of other conifers which were taken in very small amounts are hemlock (*Tsuga*), tamarack (*Larix*) and yew (*Taxus brevifolia*). Leaf buds enclosing newly formed coniferous needles were frequently taken, indicating some preference for the younger, more tender needles.

Beer (Jour. Wildlife Manag., 6, 1943:32-44) mentions that on Silver Star Mountain, and on East Moscow Mountain, Idaho, Blue Grouse in the winter sought *Abies* almost exclusively although many *Pseudotsuga* were present. He states that the needles of larch were a favorite food during July, August and September. Near Wheatland, Wyoming (Neilson, Condor, 28, 1926:99-100), birds were found feeding largely on needles of pines, in the spring and fall. In central California, Belding (Zoe, 3, 1892: 232-233) found that conifers used were firs (*Abies concolor* and *A. magnifica*) and hemlock spruce (*Tsuga pattoniana* [= *mertensiana*]), the latter apparently being preferred. On Kupreanof and Kuiu Islands, Alaska (Swarth, Univ. Calif. Publ. Zool., 7, 1911:56-58), the males remain in the hemlock trees during April, feeding on the foliage and sometimes not leaving a tree for days at a time. Simpson (Amer. Game Conf. Trans., 21, 1935:218-219) found that Blue Grouse in captivity eat many fir and pine needles and some hemlock needles in winter; but they pass up spruce needles if any of the others are available.

Staminate cones.—The staminate cones of conifers are consumed in fairly large quantities in spring and in small quantities in early summer. Those which were positively identified to genus or species are pine (*Pinus*), fir (*Abies*), Douglas fir (*Pseudotsuga taxifolia*), and spruce (*Picea*). The small pistillate cones of some conifers, such as hemlock and certain spruce were also taken in very small amounts.

In central California, Belding (*loc. cit.*) found that in one year, when late summer frosts had destroyed the berry and seed crop, the grouse were feeding almost exclusively on the fallen dried staminate cones of the yellow pine (*Pinus ponderosa*) during the fall.

Buds and twigs.—Buds and twigs are eaten in small amounts in winter and spring. The prevailing types are aspen, cherry and willow.

Green leaves.—Leaves, other than needles of conifers were fed on in fairly large quantities in all seasons except winter, when they represent a very small portion of the diet. A surprisingly great variety of leaves is used as food but those which were eaten most frequently and in greatest quantity are listed as follows in the approximate order of their relative importance: blueberry, *Eriogonum*, ferns, clover, willow, alum-root (*Heuchera*), pussytoes (*Antennaria*), hawkweed (*Hieracium*), dwarf mistletoe (*Arceuthobium*), vetch (*Vicia*), aspen, and currant or gooseberry. With a few minor variations, such as the greater consumption of *Eriogonum* by *Dendragapus obscurus* and the greater consumption of ferns by *Dendragapus fuliginosus*, the types of leaves used as food by the two species of Blue Grouse are similar.

Flowers.—Flowers are consumed in appreciable quantities throughout the warmer months of the year. Flowering heads of species of plants belonging to the Cichoreaceae

represent the principal type used as food and are apparently taken in greater quantities by *Dendragapus fuliginosus* than by *Dendragapus obscurus*. The cats-ear (*Hypochaeris*) is by far the most important flower of this type consumed by *Dendragapus fuliginosus* and it is frequently taken in such ample amounts that it must be one of the preferred foods of that species. Composite flowers which are occasionally taken in fairly large quantities by *Dendragapus obscurus* include: *Agoseris*, *Microseris*, Dandelion, hawkweed (*Hieracium*), and sowthistle (*Sonchus*). Other types of flowers which are infrequently taken include: cherry, *Eriogonum*, salal, snowbrush, and manzanita.

Fruits and seeds.—Fruits and seeds were taken in small quantities during winter and spring, but during summer and fall a great variety was taken in large quantities. The fruits of blueberry and manzanita were generally taken in larger quantities and more frequently than any of the others. Other fruits which were occasionally taken in considerable amounts are: strawberry (*Fragaria*), serviceberry (*Amelanchier*), snowberry (*Symphoricarpos*), currant or gooseberry, mountain ash (*Sorbus*), cherry, bramble, elderberry and rose. The small quantities of fruit consumed in winter and spring were largely made up of the more persistent types such as rose and salal. The seeds of smartweed (*Polygonum*) and sedge (*Carex*) were taken quite frequently during the warmer months but never in large quantities. The seeds of conifers, especially those of pine and Douglas fir, were taken a few times in fairly large quantity.

The seeds of *Pinus ponderosa* (Beer, *loc. cit.*) composed 7.17 per cent of the food in eastern Washington and northern Idaho in August, whereas Munro (Auk, 36, 1919: 65-67) mentions that Blue Grouse feed chiefly on the seeds of this species between September 1 and the middle of October in the Okanagan Valley, British Columbia. In central California, Belding (*loc. cit.*) found that the thimbleberry (*Rubus nutkanus*) appears to be the favorite article of diet and next to this the serviceberry (*Amelanchier alniifolia*). He states further that several kinds of currants and gooseberries (including *Ribes sanguineum* and *Ribes menziesii*) and red elderberries (*Sambucus racemosa*) are hardly less acceptable. Beer (*loc. cit.*) states that preference is given to fruits of *Rubus* over nearly any other food and that they formed 17.5 per cent of the yearly diet in western Washington. He also mentions that where hawthorns (*Crataegus*) are abundant they probably form a major part of the diet during the period when they are available. Beer found that salal berries were eaten in large quantities in the coastal areas of Washington, British Columbia and Oregon. In June and July he found that the seeds of *Balsamorhiza* were taken in large quantities.

Insects.—Animal food, which is made up almost entirely of insects, was found to comprise a sizable portion of the diet during the summer but was either totally absent or of negligible importance at other seasons. A great variety of adult and larval forms of insects is taken. In the early summer, scarabaeid beetles (Scarabaeidae), leafhoppers (Cicadellidae) and saw-fly larvae (Tenthredinidae) head the list of those taken, whereas in late summer short-horned grasshoppers (Acrididae), ants (Formicidae) and leaf beetles (Chrysomelidae) are the most important. Short-horned grasshoppers, when taken, are generally consumed in larger quantity than the others, while the ants (Formicidae) generally have the highest frequency of occurrence.

The food of juveniles of the species *Dendragapus obscurus* was found to be quite similar to the late summer diet of the adults except that the animal food comprises a much larger proportion while the proportion of fruits and seeds is noticeably reduced. Short-horned grasshoppers (Acrididae) were found to comprise nearly two-thirds of the animal food of juveniles. In the case of juvenal *Dendragapus fuliginosus*, the number of specimens examined was too small to make any generalizations concerning food habits.

In the Powell District of the Lolo Forest in northern Idaho (Cooney, U. S. Forest Service, Northern Rocky Mountain Region, Field Notes on Wildlife, 1, 1938:4-5) the crops of 30 Blue Grouse were collected and examined in September and the most important single item of food appeared to be grasshoppers.

SUMMARY

The food habits of Blue Grouse vary from a simple winter diet that is made up predominantly of coniferous needles to a complex diet during the summer months, characterized by great variety of foods including green leaves, fruits and seeds, flowers, animal matter and coniferous needles. The spring and fall, which represent the transition periods between these two, are characterized by feeding habits that are generally intermediate. The diets of the two species of Blue Grouse, *Dendragapus obscurus* and *Dendragapus fuliginosus*, are quite similar as far as major types of food are concerned, but they differ considerably in the species that are taken. Such differences reflect differences in the vegetation within the ecologic and geographic ranges occupied by the two species.

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