WORK PLAN SEGMENT REPORT
FEDERAL AID IN WILDLIFE RESTORATION

STATE: Alaska

PROJECT: W-15-R-1 TITLE: Alaska Wildlife Investigations

WORK PLAN: M TITLE: Bear

JOB NO.: 7 TITLE: Ecology of the Black Bea

PERIOD COVERED: July 1, 1965 to June 30, 1966

ABSTRACT:

Green vegetation dominated the spring diet of black bears in Interior Alaska. Equisetum was present in 86 percent of the sample units and appeared to be the main staple of the spring diet. Blueberries (Vaccinium uliginosum) are the most important item in the fall diet, although other berries, particularly low-bush cranberry (V. vitis-idea), also are used extensively. Most animal matter consumed by bears is in the form of carrion, although ants and wasps were found in several stomachs. Garbage was found more frequently in spring material than in specimen material collected in the fall.

Distribution of bears appears to be governed mainly by food availability with particular reference to the abundance and availability of berries in late summer and fall. Mean litter size for 1964 (10 litters) was 1.50 and for 1965 (20 litters) 1.85. Of 16 bears examined, 12 were found to be infested with intestinal parasites (cestodes and ascarids).

OBJECTIVES:

1. To establish population structure and welfare.
2. To determine basic food habits in relation to food abundance.

TECHNIQUES:

Much of the early field work involved contacting and alerting potential cooperators. Black bear observation forms and specimen forms were prepared and distributed in conjunction with this phase of the work. The former provided information on litter size, seasonal distribution within the various habitat types, and color phases. The latter provided general harvest data including place and date of kill, sex, approximate size, color, and condition.

Most specimen material was obtained from hunter-killed or nuisance bears, although three animals were collected by the investigator. Skulls, reproductive tracts, and complete digestive tracts were collected from each specimen. In addition, long bones, pelvis, liver, and diaphragm were collected from some bears and complete measurements and weights were taken whenever possible.

As this study ultimately emphasized food habits work, lab work involved analysis of stomach and intestinal contents, and scats almost exclusively. Stomach contents were sampled and segregated as completely as possible, and data were

recorded in terms of frequency of occurrence and percentage volume (measured). In most cases small items recognizable as individual (such as fruits) were enumerated. Contents of intestine and scats were recorded in terms of frequency of occurrence and estimated percentage volume. For the purpose of this study, the season of bear activity was divided into two seasons: 1) spring - emergence from winter dens through 15 July, 2) fall - 16 July through return to winter dens. The cut-off point, 15 July, corresponds approximately with the beginning of the ripening of many berries, an important event in the lives of Interior Alaskan black bears. Specimen material used in the food habits study includes the following: 23 stomachs (12 spring, 11 fall); 16 intestines (8 spring, 8 fall); and 44 scats (16 spring, 28 fall).

An attempt was made during the 1965 field season to evaluate berry production in each of three habitat types--deciduous forest, spruce forest, and tundra--in the Deadwood Creek drainage near Circle Hot Springs, Alaska. Plots were set up in berry patches prior to the appearance of berries, and were sampled after the ripening of blueberries in mid-August. Numbers and weights of blueberries (Vaccinium uliginosum), cranberries (V. vitis-idea) and crowberries (Empetrum nigrum) were recorded for five subplots ($.25m^2$) within the 11 plots ($25\ m^2$) established in each habitat type.

FINDINGS:

Food Habits:

Table 1 lists the food items which seemed to be the most important to Interior Alaskan bears in 1964 and 1965 (from stomachs and scats only). For a complete list of all foods consumed during these two years, the reader is referred to the thesis.

Green vegetation: Green vegetation proved to be by far the most important component of the spring diet of Interior Alaskan black bears. Various unidentified grasses (Gramineae), the shoots and succulent stems of wild rhubarb (Polygonum alaskanum), and the young stems and leaves of northern bedstraw (Galium boreale) and lousewort (Pedicularis sp.) occurred occasionally, but Equisetum, present in 86 percent of the spring sample units, was the real staple during this season. The largest stomach examined contained nearly five liters of shoots and young stems from the swamp horsetail, E. limosum. The bear involved, a large male, was standing in two feet of water feeding on this emergent when shot. A number of reports of other bears standing belly-deep in swamp water "feeding like moose", indicates that this was not an exceptional case. E. limosum was identified in the stomachs and intestines of two bears, both collected in May, and composed 90 percent (or more) by volume, of each.

All other occurrences of Equisetum were from samples collected in non-marsh situations and involved the common horsetail (E. arvense) and/or the meadow horsetail (E. pratense). Distinction between these two species could not be made with certainty. However, on the basis of silica spicule characteristics as described in Gray's Manual of Botany, approximately 50 percent of these occurrences probably involved the former of these two species only, and the rest

involved either or both. This E. arvense-pratense complex then, comprised the most important spring food in upland habitats, and it continued to be important through the first two or three weeks of the fall season. With respect to fall, the leaves of arctic lupine (Lupinus arcticus) proved to be the only other green item of even minor importance.

A number of items such as the leaves of Labrador tea (Ledum decumbens), dwarf birch (Betula glandulosa), and willow (Salix spp.), and the needles of spruce (Picea sp.) had high frequencies of occurrence, particularly in the fall, but nearly always occurred at the trace level. These are believed to have been ingested incidentally to other foods, especially berries.

Fruit: Among the various fruits available in Interior Alaska, two species of Vaccinium, V. vitis-idea (lowbush cranberry) and V. uliginosum (blueberry) are the most important. The former overwinters well and contributes much to the spring diet in some areas. In addition, in the late fall cranberries become important after the first few frosts (which effectively reduce the availability of blueberries and increase the sugar content of the cranberries themselves). But blueberries, when they are available, are by far the most important fall food. Highbush cranberries (Viburnum edule), crowberries (Empetrum nigrum), and rose hips (Rosa acicularis) are occasionally taken in fairly substantial amounts, particularly in better-drained habitats in the fall.

Animal: Most vertebrate material reported here appeared to be carrion. Snowshoe hare (Lepus americanus), the most common item in this category, was found throughout both seasons but seemed to be slightly more important in the spring. Hind feet and pieces of hide are the most persistent remains of hare kills, and these were the Lepus parts involved in most occurrences. Moose (Alces alces) meat in one stomach contained hundreds of maggots, thus attesting to its carrion nature. Many other moose occurrences were suspected carrion because of proximity of specimen collection points to known moose kills. The wing of a female goldeneye (Bucephala sp.), both wings and feet of a varied thrush (Ixoreus naevius), and pieces of fish skin in one stomach suggested that the bear involved had been cleaning up after a smaller carnivore or perhaps a raptor. A fledgling white-crowned sparrow (Zonotrichia leucophrys) and two species of microtines found in my analyses were probably captured by the bears involved, but these were one-time occurrences.

Insects of the order Hymenoptera constituted an important proportion of the animal food consumed. Adults, eggs, and pupae of ants (Formicidae) and wasps (Vespidae) occurred frequently, the former family being more important in the spring season and the latter in the early fall.

Other: Garbage, material discarded by human beings, was taken more often in the spring than it was in the fall. Bears that ate garbage usually ate large amounts. Debris refers to naturally occurring items that were obviously accidental, or at least incidental. Pieces of rotten wood, which often occurred when ants were present, wasp nest material, and small stones were common debris items.

Seasonal distribution and activities:

In 1965, the first reported bear sighting of the year was on 1 May and the last occurred on 2 October, thus the 1965 bear season was at least 154 days long. No reports were received in the spring of 1964, but the last sighting during that year was 4 October. These data plus interviews with experienced outdoorsmen indicate that the season of activity for an Interior Alaskan black bear is usually five to five and one-half months in duration, beginning in early May and ending in early to mid-October. It follows that six and one-half to seven months of the year are spent in the winter den.

As would be expected, the distribution of bears in space seems to be governed largely by food availability. Throughout May and June and into July, bears are observed most often in river bottom, lakeshore, and other lowland situations where they are feeding largely on succulent green vegetation. In addition, Rausch (personal communication) says that in the early spring, bears are commonly seen in these same areas feeding on winter-killed moose. When they are not in the wetter areas, bears seem to spend much of their time in spring in deciduous forests where lowbush cranberries left over from the previous year seem to be the main attraction. Also, it is at this time of year that bears seem to be the most wide-ranging in search of food, and garbage dumps, campground trash cans, and human habitations are common objects of bear visits.

Observations show that between mid-July and early August a major shift of local bear populations occurs, with most bears moving from the lowland spring areas to higher country. The shift is almost certainly related to the ripening of berries, particularly blueberries, in the higher areas. From this time until mid-September, frosts reduce blueberry availability (if the blueberry crop has been adequate), bears remain mostly in alpine situations. After the blueberry season is over, it appears that many bears move back down into forested areas where scats and stomach contents show that other fruits which have been largely ignored until this time, especially cranberries and crowberries, are utilized. Denning follows; it is not known for sure where most Interior Alaskan bears den, but the three dens and den areas I have heard of were at low (valley bottom or near valley bottom) elevations.

Litter Size:

Table 2 lists Interior Alaskan black bear litter sizes for the two years studied. The mean litter sizes given compare with 1.96 for 23 Southcentral Alaskan litters and 2.15 for 20 Michigan litters as given by Erickson, et. al. (1964). These comparisons plus comparisons with literature from other areas indicate that Alaskan litters (speaking primarily in terms of the number of cubs which emerge from the winter den), are typically smaller than litters in areas farther south. As has been discussed in the thesis, the condition of the female at the beginning of the denning period and the duration of the denning period are probably the two most important factors governing the size of the litter which actually emerges from the den in Interior Alaska. It seems likely that condition is related to the abundance of blueberries in the fall. The relative "earliness" or "lateness" of the spring is the important aspect of denning duration.

Parasites:

Parasites encountered during this study were intestinal helminths discovered incidentally to the food habits work. Of 16 bears examined, 12 (75 percent) were infested with cestodes and/or nematodes. All cestodes examined proved to be cyclophillideans, probably Taenia spp. All nematodes appeared to be ascarids. Some heavy infestations were found as an examination of Table 3 will show.

Berries:

Results of the berry sampling done in 1965 are shown in Table 4. Much more work is needed to provide between year and between area comparisons before anything conclusive can be said about berry production in Alaska. At Deadwood Creek, deciduous forest proved to be the most productive habitat, due largely to its excellent lowbush cranberry production. Within the deciduous forest, mature, relatively open forest with little shrub understory provided the best crops.

Open spruce forest, including some muskeg situations, was the best blueberry-producing habitat in this area. However, the most productive patches occurred at the edge of a 20 year-old burn.

Tundra produced poorly in this area in 1965, and this was likely because two violent thunderstorms, which occurred on 27 and 28 June, knocked most of the flowers from the relatively unprotected alpine blueberry plants in this area.

Blueberries, shown by food habits studies and observation to be the most used food in the fall, provided the greatest weight of material per berry in all habitats.

Population density:

Aerial transects flown over the Minto Flats on 26 May 1965 revealed an exceedingly minimal figure of one bear for each 10-13 square miles of this lowland area. New foliage on deciduous trees in the area limited visibility which had been good on a reconnaissance flight a few days earlier.

Table 1.

Food Items	Season	23 Stomachs Freq.	% Trace	Mean % Vol.	44 Scats Freq.	% Trace	Mean % Vol.
GREEN VEGETATION:							
Equisetum spp.	Spring	0.92	9.1	61.8	0.94	0.0	51-75
	Fall	0.45	20.1	36.2	0.21	16.7	26-50
Polygonum spp.	Spring	0.17	50.0	2.4	0.00		
	Fall	0.00			0.00		
Lupinus arcticus	Spring	0.08	100.0	trace	0.00		
	Fall	0.36	50.0	12.0	0.18	80.0	1-5
Pedicularis spp.	Spring	0.17	0.0	16.0	0.00		
	Fall	0.09	100.0	trace	0.00		
Gramineae	Spring	0.33	0.0	12.0	0.44	42.9	1-5
	Fall	0.27	33.3	1.6	0.39	63.6	6-25
FRUITS:							
Vaccinium uliginosum	Spring	0.17	100.0	trace	0.13	50.0	76-100
	Fall	1.00	9.1	49.9	0.79	0.0	51-75
Vaccinium vitis-idea	Spring	0.58	14.3	22.5	0.75	8.3	6-25
	Fall	0.64	85.7	10.4	0.39	36.4	51-75
Rosa acicularis	Spring	0.17	100.0	trace	0.00		
	Fall	0.73	50.0	24.8	0.29	12.5	6-25
Empetrum nigrum	Spring	0.00			0.06	0.0	6-25
	Fall	0.36	25.0	8.0	0.25	50.0	6-25
Viburnum edule	Spring	0.08	100.0	trace	0.00		
	Fall	0.18	0.0	4.25	0.18	0.0	6-25
ANIMAL:							
Lepus americanus	Spring	0.33	0.0	13.4	0.38	0.0	6-25
	Fall	0.45	40.0	5.6	0.36	20.0	6-25
Alces alces	Spring	0.08	0.0	2.5	0.00		
	Fall	0.18	50.0	43.7	0.14	50.0	6-25
Formicidae	Spring	0.33	50.0	11.6	0.31	0.0	6-25
	Fall	0.27	66.7	1.4	0.11	33.3	6-25
Vespidae	Spring	0.08	100.0	trace	0.00		
	Fall	0.45	20.0	17.5	0.18	20.0	1-5
OTHER:							
Garbage	Spring	0.25	33.3	93.3	0.00		
	Fall	0.09	0.0	10.8	0.18	60.0	26-50
Debris	Spring	0.33	0.0	5.6	0.06	0.0	26-50
	Fall	0.64	14.3	16.0	0.18	0.0	6-25

Table 2. Black bear litter sizes, 1964 and 1965.

Year	Total Litters No.	%	One-cub Litters No.	%	Two-cub Litters No.	%	Three-cub Litters No.	%	Cubs per Litter Mean
1964	10	100	5	50	5	50	0	0	1.50
1965	20	100	6	30	11	55	3	15	1.85
	30	100	11	37	16	53	3	10	1.73

Table 3. Intestinal parasites from 16 Interior Alaskan black bears.

Specimen No.	Date Taken	Parasites Present	Number	Vol. (cc)	Wt. (g)
2-64	VI-28-64	nematodes	4	-	-
3-64	VII-8-64	none	0	-	-
105-65	V-26-65	none	0	-	-
109-65	V-31-65	none	0	-	-
110-65	V-31-65	cestodes	1-2	-	-
112-65	VI-5-65	none	0	-	-
114-65	VI-9-65	nematodes	1	-	-
		cestodes	-	19	13.9
118-65	VI-25-65	cestodes	-	78	40.4
126-65	VII-30-65	cestodes	-	125	72.0
7-64	VIII-24-64	nematodes	13	1	-
		cestodes	-	8	-
8-64	VIII-25-64	nematodes	18	11	11.3
		cestodes	-	62	63.0
9-64	VIII-27-64	nematodes	29	8	7.6
10-64	IX-4-64	nematodes	4	-	-
		cestodes	-	-	-
12-64	IX-12-64	nematodes	249	101	106.8
131-65	IX-17-65	nematodes	1	-	-

Table 4. Results of the berry sampling, 1965.

	Blueberry		Cranberry		Crowberry		Total Berries
	No.*	Wt./100	No.*	Wt./100	No.*	Wt./100	No.
DECIDUOUS FOREST							
Total (11 plots)	821		1726		529		3074
Mean per plot	74.6	29.6	156.9	15.8	48.1	20.7	279.5
SPRUCE FOREST							
Total (11 plots)	1060		517		575		2152
Mean per plot	96.4	28.4	47.0	15.8	52.3	20.2	195.6
TUNDRA							
Total (11 plots)	381		256		59		694
Mean per plot	34.6	25.6	23.3	14.2	5.4	14.8	63.1

*Number of berries per m^2.

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