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BLACK BEAR MANAGEMENT TECHNIQUE DEVELOPMENT

by
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JOB PROGRESS REPORT (RESEARCH)

State: Alaska

Cooperator: Ronald D. Modafferi

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Job No.: 17.1R Job Title: Black Bear Management Techniques Development

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SUMMARY

Because of the extremely poor salmon runs in western Prince William Sound in 1975, concentrations of black bears suitable for capturing operations did not materialize. Consequently, this portion of the black bear work was postponed until summer 1976.

Reconnaissance flights were flown in Subunits 16A and 16B in fall 1975 in an effort to locate an appropriate "interior" area for future black bear studies. It now appears that the Yenlo Hills area would be a good study area.

Black bear harvest data for Prince William Sound were analyzed intensively in an attempt to identify harvest patterns and needs to modify existing regulations.

The black bear literature was intensively reviewed.

CONTENTS

BACKGROUND

Widely distributed and apparently abundant black bear (*Ursus americanus*) populations provide a full spectrum of recreational opportunities for people throughout most of Alaska. Statewide hunter harvest data and personal communications appear to indicate that black bears are rapidly becoming an important "primary" game species, in addition to being a "secondary" species taken incidental to the harvest of other game animals. The increase in hunter harvest can be attributed, in part, to a greater number of hunters, a decrease in the availability of other big game species, promotional efforts of guides and air taxi operators and perhaps the realization by many hunters that black bears provide aesthetically pleasing hunts, a respectable trophy and very flavorful meat.

Although recreational use of black bears has greatly increased in recent years, present knowledge about the biology and population ecology of this species in Alaska is still limited. Noteworthy published material on black bears in Alaska includes: studies by Rausch (1961) on dentition and growth, Erickson (1965) on general life history, Hatler (1967) on food habits, McIlroy (1970) on ecology and harvest and Frame (1974) on predation of salmon. A black bear hide and skull sealing program, initiated in July 1973 by the Alaska Department of Fish and Game, has provided a bank of data on characteristics of the harvest and the bears harvested.

In recent years there has been a general increase in hunting pressure on black bear populations throughout the state. Prince William Sound populations, in particular, have experienced a tremendous increase in hunting pressure and harvest and presently deserve close attention. The black bear harvest in Prince William Sound (Game Management Unit 6) increased by nearly 50 percent from 1974 (104) to 1975 (149). Most of this harvest and the increase in the harvest occurred in the spring seasons (79 in 1974 and 136 in 1975) when deep snow forced bears to use beach fringe areas for feeding (Appendix I). Along with the projected increase in the human populations of Anchorage, Whittier, Valdez, Cordova and Seward, a greatly expanded general recreational use of black bears in Prince William Sound can be expected.

Western Prince William Sound black bear populations are vulnerable to overexploitation because of the narrowness of the band of habitat they occupy; essentially the entire area and each bear are readily accessible to hunters. There is little or no room for the existence of unaccessible and protected segments of the population which might theoretically function as nuclei or centers for repopulation.

Since glaciers divide the northwestern portion of Prince William Sound into many "discrete" and complete ecological units, there may be numerous noninteracting subpopulations of black bears in this area. If this is the case, it is conceivable that intense hunting pressure could eliminate any such subpopulations.

Because of the "limited" nature of the habitat, increased and rapidly expanding recreational use of the area and the potential for distinct subpopulations of bears, there is an immediate need for a more restrictive management program coupled with intensive biological research of black bears in northwestern Prince William Sound.

Ultimate goals of this study will be to provide general information on the basic life history of black bears in Prince William Sound and specific information on population identity, movements, habitat use and population size, production and composition of black bears inhabiting the northwestern portion of Prince William Sound. The most desirable and efficient method of obtaining these data is through a radio telemetry study.

Evaluation and development of equipment and techniques for capturing and handling bears in the Prince William Sound are a prerequisite for comprehensive field research on black bears. Anticipated demands for more restrictive management of black bears in Prince William Sound dictate that initial field research efforts be concerned with populations in this particular geographical region.

The Aldrich foot snare has been successfully used to capture black bears in a number of studies (Miller et al. 1970, Jonkel and Cowan 1971, and Poelker and Hartwell 1973). Foot snares could probably be as effective in capturing black bears along salmon spawning streams in Prince William Sound as they were for capturing brown bears in Southeastern Alaska (Wood 1973). This study will determine the feasibility of this method for capturing black bears in northwest Prince William Sound.

Since information obtained from studying black bears in Prince William Sound may only apply to "coastal" populations, additional efforts will be made to develop and evaluate techniques required for management of "interior" populations of black bears. Reconnaissance work for the latter research will be conducted in Game Management Units 7, 15 and 16.

Game Management Unit 16, in particular, has historically supported both a relatively high and a variable fall harvest of black bears (Table 1) and may be the most fruitful "interior" area in which to study black bears.

Techniques for processing specimen material and analysis of data collected from the hide and skull sealing program have been continually been improved since 1973; further technical refinements are possible.

OBJECTIVE

To develop and evaluate techniques for monitoring black bear population status and determining the effects of hunting on selected black bear populations in Southcentral Alaska.

PROCEDURES

Trapping sites will be selected in mid-July while watching for bear and salmon activity. Aldrich foot snares will be set in bear trails along streams used by spawning salmon.

Captured bears will be immobilized with Sernylan, measured for standard body parameters, weighed using a portable tripod, tattooed on the lip, ear-tagged and flagged. A premolar tooth will be extracted and a blood sample taken.

A few bears may be fitted with radio-collars and monitored from a boat during the summer and from light aircraft during the fall until they den.

Reconnaissance flights were flown in fall 1975 in the Mt. Susitna, Beluga Mountain, Yenlo, Peters and Dutch Hills areas and in the spring on the Kenai Peninsula in the Moose River Flats, Chickaloon River Flats and Mystery Creek uplands.

Procedures for collecting and recording data on black bear skull and hide sealing certificates were reviewed and clarified.

Procedures for collecting, processing, mounting and deposition of premolar teeth extracted from black bears and used for age determination were evaluated.

Information from approximately 2,000 black bear sealing certificates was entered into a computer program similar to that used for analysis of brown/grizzly bear data (Glenn 1974).

Photographs of stained, mounted promolar teeth, accompanied by requests for comments on age determination by counting cementum annuli, were sent to other biologists involved in black bear research. These photographs will also be used to make a study guide explaining age determination techniques.

Several types of measurements were made on a small sample of bear skulls to appraise their value as accessory determinants of sex.

Literature on black bears is being gathered and reviewed.

Harvest data for the 1974 and 1975 spring seasons in Game Management Unit 6 were analyzed.

FINDINGS

Because of the extremely poor salmon runs in western Prince William Sound in 1975 and the scarcity of spawning fish in tributary streams, black bears were not concentrated in these areas and conditions were not suitable for capturing animals. Field operations were cancelled in view of these poor trapping conditions.

An extremely good salmon run was predicted for Prince William Sound in summer 1976 which should make for ideal trapping conditions. In view of poor trapping conditions in 1975, every attempt should be made to radio-collar captured bears.

Appendix I is a report summarizing the number and distribution of black bears harvested in Unit 6 in springs 1974 and 1975.

As a result of black bear reconnaissance flights flown on October 3 and October 7 in Game Management Subunits 16A and 16B, prospective locations for the study of an "interior" population of black bears, appear in Table 1.

In the flight on October 3, very few black bears were seen in the Dutch and Peters Hills relative to the number seen on Mt. Sustina and the Yenlo Hills. Perhaps the flight was too late in the year and many bears in the Dutch and Peters Hills may have already been in dens. Although one would not expect a great difference in denning behavior between bears in areas that are less than 62 km apart, this may have been the case. The Yenlo Hills, the second most northerly mountain surveyed, had a preponderence of single bears and it has been reported that sows with cubs den before other bears. Perhaps sows with cubs in the Yenlo Hills had already entered their dens and phenological events there were behind those in the Dutch and Peters Hills but ahead of those events in more southerly areas. It is also possible that the preponderance of single bears in the Yenlo Hills was not the result of differential denning behavior but resulted from poor production and/or survival of cubs. A follow-up flight on October 7 again revealed a high proportion of single black bears in the Yenlo Hills and further indicated it was not simply a chance observation.

When bears are available in alpine areas in the fall, it may be feasible to capture them by immobilization with Sernylan-filled darts shot from a helicopter; a technique used on other big game species in Alaska.

Black bear sealing certificates were modified to include questions asking hunters whether they took their bears incidental to other activities and whether they salvaged the meat.

Data from sealing certificates, which were entered on a computer print out program, are currently being cross-checked for accuracy. Analysis of these data will commence in the near future.

Correspondence with other black bear research biologists suggested there may be inconsistencies between biologists in counting cemental annuli in stained, thin sections of premolar teeth from black bears. These inconsistencies revolve around the distinction between the interface, a cub annulation (annual line laid down before 3 months of age) and the first winter annulation (annual line laid down at 9-12 months of age). It is obvious that this distinction is critical for proper age determination.

Table 1. Fall Black Bear Reconnaissance Flights - 1975.

SIGHTINGS

Area	October 3			October 7			
	1*	1/1	1/2	1	1/1	1/2	1/3
Mt. Susitna	2	1	1	3	1	3	
Little Susitna			1	1			1
Beluga Mt.	1		1	3		1	
Yenlo Hills	5		1	9			
Peters Hills		1		NOT SURVEYED			
Dutch Hills				NOT SURVEYED			
TOTALS	8	2	4	16	1	4	1
(Survey time)	(120 minutes)			(88 minutes)			

* 1 = single bear

1/1 = one older bear and a cub

1/2 = one older bear and two cubs

1/3 = one older bear and three cubs

** Flights were conducted in a Cessna - 185.

Because there appear to be inaccuracies in determining the sex of black bears from external genitalia on sealed bear hides (Irvine 1975), several types of measurements were made on a small sample of skulls to appraise their value as accessory determinants of sex. Several studies have shown that molar and canine tooth measurements (Gordon and Morejohn 1975) and canine tooth measurements (Sauer 1966) are useful determinants of sex in black bears. However, since many of the sealed skulls are frozen, it would be a tremendous benefit to have a sex determining technique that didn't require an open mouth. The distance between and including the upper canines and the distance between and including opposite and distal upper incisors were two of the measurements recorded for analysis. Although the sample size was small these measurements may be useful as an accessory determinant of sex.

The relative success (bear observed per unit of flight time) of the fall survey flights, along with the fact that surveys conducted in interior areas in the spring (May 26, June 2, 3, 4 and 8) totaling more than 15 hours of flight time, furnished less than 25 individual black bear observations strongly suggest that fall survey flights would be the most appropriate method of assessing black bear population status and trends, providing we had some knowledge of where these bears came from and why they come to alpine areas in the fall.

Observations from fall surveys indicated there are sufficient numbers of black bears in areas closer to Anchorage than the Peters and Dutch Hills in which to conduct a study of an "interior" population of black bears. Relative inaccessibility to hunters, proximity to Anchorage and relatively good flying weather make these areas especially attractive for a radio telemetry study.

Radio-collars on a dozen bears of different sex and age and in one or two areas (Mt. Susitna and Yenlo Hills) could produce a great deal of information on seasonal habitat use, annual movement patterns, denning areas and general ecology of "interior" black bears.

Since survey techniques for determining the status and trend of populations of black bears have not yet been perfected, these population parameters must be determined indirectly through data gathered from sealing hides and skulls. Information on number, age structure, sex and skull size of the harvest will be the basic information used to appraise the status and trend of various black bear populations. Much of this information is currently being entered into a computer program which will facilitate rapid and accurate retrieval of data and enable sophisticated statistical analysis. Data presented in Table 2 indicate that the black bear harvest in 1975 was greater than in 1974. In nearly all Game Management Units, and in each season, more bears were harvested in 1975 than in 1974. The harvest was greater in the spring in the "coastal" Units 6 and 7 and greater in the fall in the remaining "interior" units.

Future efforts should be directed at explaining the apparent low harvest in 1974 relative to 1973 and 1975, the tremendous variation in the fall harvests in Unit 16 and the ecological effects of the 1975 spring harvest in Unit 6.

Table 2. Black Bear Harvest in Southcentral Alaska as Derived from Hide and Skull Sealing Certificates*

Unit	1973	1974		1975	
	Fall	Spring	Fall	Spring	Fall
6	18	79	25	136	13
7	38	28	12	39	23
11	31	2	9	1	6
13	69	8	42	21	50
14	73	9	17	26	68
15	69	12	54	31	53
16	156	30	28	38	81
Season Totals by Year	454	168	187	292	294
Annual Totals	454	355		586	

* Totals preliminary to computer print out summary.

A more detailed review of the 1974 and 1975 spring harvest in Unit 6 is presented in Appendix I.

RECOMMENDATIONS

If trapping conditions appear suitable to capture six or more bears, radio-collars should be attached to all those captured. Under ideal trapping conditons and if a limited number of radio-collars are available, special consideration should be given to the sex and age of bears that are radio-collared.

A radio telemetry study should be conducted in an "interior" area to determine the ecological basis of aggregations of black bears in alpine areas in the fall. Potential study areas are Mt. Susitna, Beluga Mountain and Yenlo Hills. This study should complement the telemetry study proposed for black bears in northwest Prince William Sound.

Investigation and appraisal of age determination techniques should be continued.

Computer analysis of data available from sealing certificates should be conducted, after entries have been verified for accuracy. Analysis of harvest data from Game Management Units 6 and 16 should be of high priority.

LITERATURE CITED

Erickson, A.W. 1965. The black bear in Alaska, it's ecology and management. ADF&G Juneau. 19pp.

Frame, G.W. 1974. Black bear predation on salmon at Olsen Creek, Alaska. Z. Tierpsychol. 35:23-38.

Glenn, L. P. 1974. Report on 1973 brown bear studies, Alaska Fed. Aid. in Wildl. Rest. Rep. Project W-17-5 and W-17-6.

Gordon, K. R. and G. V. Morejohn. 1975. Sexing black bear skulls using lower canine and lower molar measurements. J. Wildl. Manage. 39(1):40-44.

Hatler, D.F. 1967. Some aspects in the ecology of the black bear (Ursus americanus) in Interior Alaska. Unpub. M.S. Thesis, Univ. of Alaska, Fairbanks. 111pp.

Irvine, C. A. 1975. Report on black bear studies, Alaska Fed. Aid in Wildl. Rest. Rep. Project W-17-7, Job 17.1R.

Jonkel, C.J. and I. Mct. Cowan, 1971. The black bear in a spruce-fir forest. Wildl. Monogr. No. 27. 57pp.

Miller, R.L., E.R. McCaffrey and G.B. Will. 1970. Recent capture and handling techniques for black bears in New York. Environmental Cons. Delmar, N.Y. 26pp. mimeo.

McIlroy, C.W. 1970. Aspects of the ecology and hunter harvest of the black bear in Prince William Sound. Unpub. M.S. Thesis, Univ. of Alaska, Fairbanks. 69pp.

Poelker, R.J. and H.D. Hartwell. 1973. Black bear of Washington. Washington Biol. Bulletin No. 14, Fed. Aid Proj. W-71-R. 180pp.

Rausch, R.L. 1961. Notes on the black bear, Ursus americanus Pallas, in Alaska with particular reference to dentition and growth. Zeitschrift Saugetierk. 26:65-128.

Sauer, P. R. 1966. Determining sex of black bears from the size of the lower canine tooth. N. Y. Fish and Game Jour. 13(2):140-145.

Wood, R.E. 1973. Southeastern brown bear studies. Alaska Fed. Aid in Wildl. Rest. Rep. Project W-17-4. 13pp.

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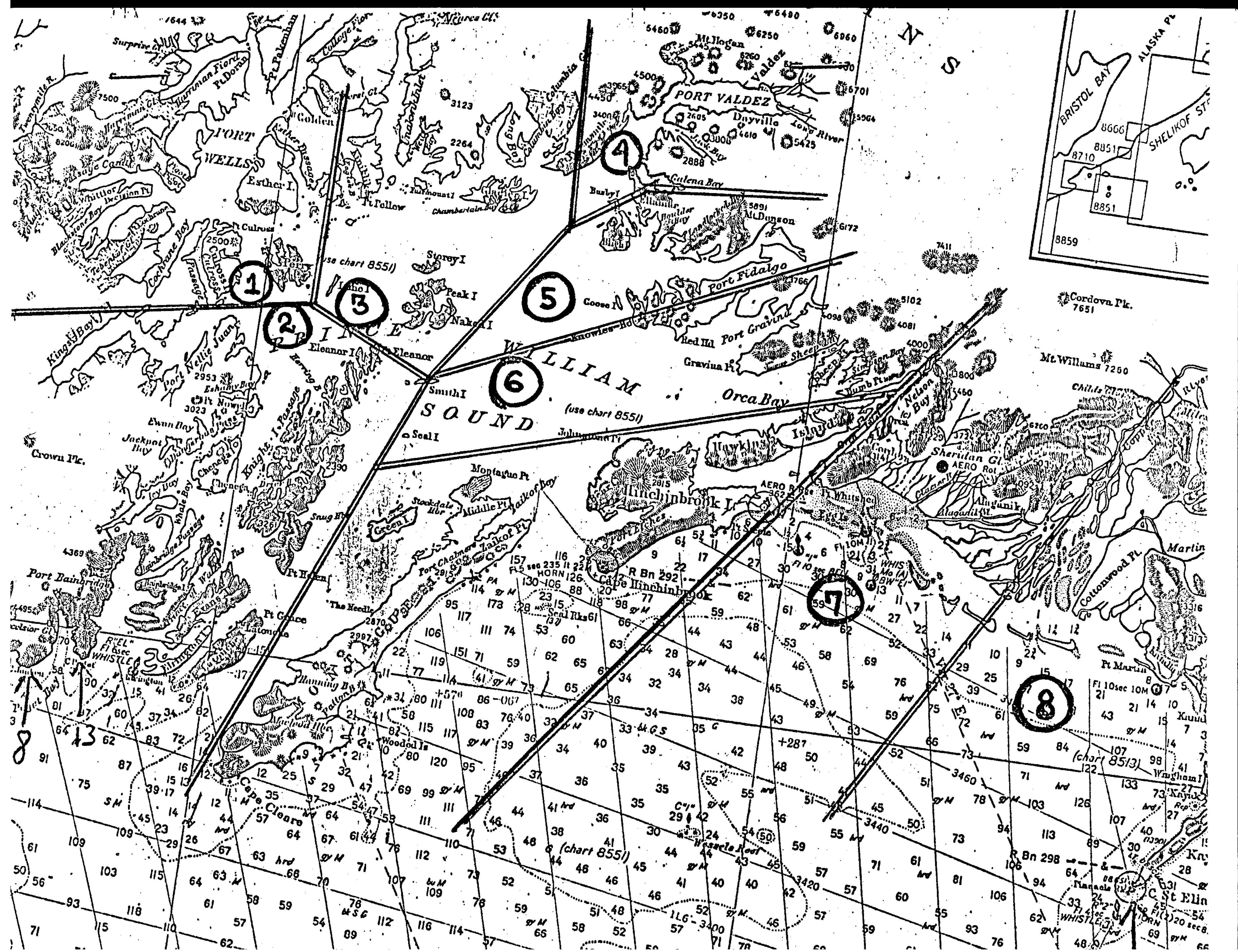
APPENDIX I

DISTRIBUTION OF UNIT 6 BLACK BEAR

HARVEST IN SPRING OF 1974 and 1975

	1974	1975
1 - Applegate Island to Ragged Point	21	39
2 - Applegate Island to Montague Strait	5	14
3 - Ragged Point to Point Freemantle	14	22
4 - Point Freemantle to Rocky Point (Port Valdez and Valdez Arm)	4	25
5 - Rocky Point to Knowles Head	9	2
6 - Knowles Head to Rude River	11	7
7 - Rude River to Copper River	10	4
8 - Copper River to Icy Cape	3	22



1
2
3
4
5
6
7
8
PORT WELLS
Esther I.
Harriman Fiord
Pt Doran
Pt Pakenham
College Fiord
Unakwik Inlet
Columbia Bay
Long Bay
PORT VALDEZ
Valdez
Mt Hogan
Dayville
Galena Bay
Busby I
Mt Denson
Port Fidalgo
Port Gravina
Goose I
Knowles Hd
Red Hd
Gravina Pt
Storey I
Peak I
Naked I
Eleanor I
Pt Eleanor
Smith I
Seal I
(use chart 8551)
PRINCE WILLIAM SOUND
Orca Bay
Johnstone Pt
Hawkins Island
Hinchinbrook I
Cape Hinchinbrook
Port Etches
Montague Pt
Middle Pt
Zaikof Bay
Zaikof Pt
Stockdale Hbr
Green I
Port Chalmers
Snug Hbr
Pt Helen
The Needle
Pt Gilmour
Hanning B
Patton B
Macleod Hbr
Cape Cleare
Woody Is
Wessels Reef
Seal Rks
Knight I. Passage
Herring B
Port Nellie Juan
Kings Bay
Culross
Pt Culross
Perry I
Cochrane Bay
Blackstone Bay
Pt Pellow
Chamberlain Bay
Golden
Esther Passage
Passage Canal
Whittier
Twentymile R.
Surprise Inlet
Eshamy Bay
Pt Nowell
Ewan Bay
Jackpot Bay
Dangerous Pass
Chenega
Icy Bay
Whale Bay
Crown Pk.
Bainbridge Passage
Port Bainbridge
Evans I
Elrington I
Latouche
Pt Grace
Excelsior Gl
Puget Bay
Nelson Bay
Sheep Bay
Simpson Bay
Mt Williams 7250
Cordova Pk. 7651
Sheridan Gl
Copper
Alaganik
Cottonwood Pt.
Pt Martin
Martin
Wingham I
Kayak I
C. St Elias
R Bn 292
R Bn 298
(chart 8513)
(chart 8551)
BRISTOL BAY
ALASKA PE
SHELIKOF ST
8666
8851
8710
8851
8859

UNIT 6 BLACK BEAR HARVESTS FOR SPRINGS 1974 AND 1975

Subdivision of Unit 6

Unit 6 has been subdivided to reveal aspects of the black bear harvest and black bear hunter. This analysis illustrates the intensity of the harvest in relation to the three main locations from which hunters depart: (A) Whittier - 1, (B) Valdez - 4 and (C) Cordova - 7. The harvest in areas 2, 3, 5, 6 and 8 may illustrate the desires of hunters to take "good" bears; a scarcity of bears in areas 1, 4 and 7, or simply the location of guide camps.

Annual Variation in Harvest

From 1974 to 1975 the black bear harvest in the western portion of Unit 6 (Valdez to Whittier) more than doubled (44 to 100). The harvest in areas near Cordova (5, 6, 7) decreased considerably (30 to 13) except for the extreme southeastern portion of Unit 6 where the harvest increased tremendously (3 to 22).

Areal Variation in Harvest

As expected, the harvest of black bears was greatest in close proximity to Whittier and Valdez. Likewise, it is apparent that hunting pressure on black bears will increase considerably in these areas next year.

Why the Increased Hunting Pressure on Black Bears in Unit 6?

1. Its proximity to the increasing populations of people in Anchorage and Valdez. When the road to Cordova opens one can expect a greatly increased harvest in that area also.

2. After a long winter, it's the first big game animal a person can get out to hunt.

3. Spring black bear hunts tend to be more successful than hunts for other species.

4. Black bear rugs are rather attractive and with more people having them - many more want them.

5. The hunts are relatively easy. Many bears are shot on beaches.

The following suggestions by Paul LeRoux in an S&I report should be incorporated into sealing forms.

a. Species hunting
b. Whether bear taken for meat or trophy
c. Whether meat was salvaged
d. Degree of selectivity exercised

We should also explore possibilities of determining sex of bears by skull measurements since there is an estimated 25 percent error in determining sex from external genitalia.