Alaska Department of Fish and Game
Division of Wildlife Conservation
Research Progress Report

DEMOGRAPHY OF SEWARD PENINSULA GRIZZLY BEARS IN RELATION TO HUMAN EXPLOITATION AND REINDEER HERDING

by
Timothy E. Smith
Robert Nelson
Warren B. Ballard
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SUMMARY

Management and optimal population densities for grizzly bears (Ursus arctos) on the Seward Peninsula are becoming increasingly controversial topics among residents of the area. This study was initiated to provide quantitative data on population densities, habitat use, reproduction, movements, and predation within a 2,447-mi^2 area in the Seward Peninsula. This information will be used to evaluate management practices and develop management objectives.

Fifty-three grizzly bears were immobilized, sexed, weighed, ear-tagged, lip-tattooed, and measured from 3 to 10 June 1989 using standard helicopter-darting techniques; VHF radio collars were placed on 26 adult bears. Radio-collared bears were radio-located 372 times in 1989. Bears older than 2.5 years required an average 13.1 mg/kg of a mixture of Tiletamine HCL and Zolazepam HCL (Telezol, A. H. Robbins, Richmond, VA) for immobilization. We used an average 12.3 mg/kg Telezol to immobilize 8 cubs of the year. Adult bear induction time averaged 10.7 minutes (range = 2-32 min). Nine of 18 adult females were accompanied by 18 cubs 2.5 years old or younger (mean litter size = 2).

Predation by bears on reindeer (Rangifer tarandus) and moose (Alces alces) was documented. Radio-collared bears will be used to conduct a mark-recapture population estimate that will be used to generate a density estimate for a portion of the study area. Timing of the density estimation effort is dependent upon future funding.

Key Words: Grizzly bear, Brown bear, Ursus arctos, harvest rates, density, population estimates, reindeer herding, predation, Tiletamine HCL, Seward Peninsula.

CONTENTS

BACKGROUND

Grizzly bears (Ursus arctos) are an increasingly controversial species on the Seward Peninsula and in other parts of coastal Alaska; generally, residents of these areas believe that bear numbers as well as bear-human conflicts have increased in the past several decades (Appendix). Two industries occurring on the Seward Peninsula (i.e., reindeer [Rangifer tarandus] herding on open range and small-scale placer mining in remote areas) provide frequent opportunities for bear-human interactions. Subsistence food gathering and preservation lead to bear-human conflicts on the Seward Peninsula as well as in other areas of rural Alaska. Some residents of northwestern Alaska are intolerant of impacts real or perceived from the bear population and do not welcome an increase in the bear population (Loon and Georgette 1989).

The cultural heterogeneity of the human population confounds development of acceptable management objectives (Loon and Georgette 1989). Since statehood (1959), grizzly bears have been protected and managed in a manner consistent with their trophy status (Hinman 1985). Existing hunting regulations reflect a European-American sport hunting tradition; however, during the past 2 decades, Native Inupiat and Yupik residents, who compose a majority in northwest Alaska, have become increasingly assertive in demanding that management goals and regulations incorporate their philosophies and desires (Appendix). These attitudes toward grizzly bears are in opposition to traditional scientific wildlife management practices, and extraordinary cooperation will be required to achieve an acceptable compromise.

Addressing the complex social issues related to management of grizzly bears on the Seward Peninsula would be difficult enough with sound biological information; however, assessment data on bear population trends or impacts of harvests have never been collected. Although no specific population objectives have been developed, conservative harvests have been maintained, suggesting

an unstated goal of minimizing the impact of recreational hunter harvests on the population. This strategy has apparently led to a population increase. Recently, special-interest groups and other interested parties have called for a reassessment of the management objectives (Appendix), suggesting an increase in the grizzly bear harvest to halt or reverse the perceived increase in the population.

This study was initiated to provide demographic and ecological data on grizzly bears in the study area. This information will be used as a basis for developing management goals and for assessing the effects of management practices on the grizzly bear population.

Demands from segments of the Alaska public for reducing the number of grizzly bear are not a new development. Sherwood (1981) indicated that between 1900 and 1941, public and political advocacy for systematic removal of grizzly bears peaked at 10-year intervals. Territorial game regulations suggest little concern for protecting grizzly bears from overharvesting; e.g., in the 1930-31 regulatory year, there were no closed seasons or bag limits for residents, except in a few areas along the rail corridor while nonresidents were limited to 2 bears per season.

Historical data on the number of grizzly bears on the Seward Peninsula are not available; however, indirect sources suggest that bear densities were much lower between 1900 and 1959 than they are today. The discovery of gold in Council in 1897 and Nome in 1898 started a rush of thousands of gold seekers to the Seward Peninsula. Prospectors and miners traveled and lived in remote areas; historical accounts indicate a much more dispersed human population than that occuring today. As Sherwood (1981, p. 83) states: "The gold rushes threatened . . . every . . . wild creature in Alaska that was edible, saleable, or underfoot."

To relieve apparent hardships among the Native population because of a lack of wild game attributed to overhunting by nonnatives (Jackson 1895), reindeer were brought to the Seward Peninsula in 1982. Reindeer numbers increased rapidly (Figs. 1 and 2), reaching more than 600,000 by 1932 (Hanson 1952, Skoog 1967). Although Jackson (1902, 1906) provided detailed tables of reindeer mortality, no mention was made of predation by bears. Referring to the raindeer industry, Hadwen and Palmer (1922) stated that "Bears are the most numerous and destructive enemy"; however, they indicated that the scarcity of predators along the coasts of the Bering Sea or the Arctic Ocean resulted in minimal losses because of predation. Carl Lomen (1954), in his account of the Seward Peninsula reindeer industry at its peak (1913-34), did not indicate that grizzly bear predation was a problem. By contrast, modern-day Seward Peninsula reindeer herders consider bear predation to be a serious mortality factor impacting their herds. By inference, it seems likely that since herders spent much more time on the ground with their herds in the past than they do today (Lomen 1954, Olson 1969), particularly during

fawning when bears are attracted, they would have been in a position to respond to predation threats by killing bears; therfore, reindeer herds would have acted as effective "population sinks" (Knight et al. 1988). Reindeer herders continue to kill bears today to protect their herds from predation, despite fewer numbers of reindeer, less active monitoring on the ground, and a regulatory structure that discourages such killing.

Several long-time residents (D. Karmun, J. Kokochuruk, B. Hoogendorn, pers. commun.) stated grizzly bears were uncommon 30-50 years ago on the Seward Peninsula but were shot whenever possible (1) for skins that were preferred for mattresses and food, (2) to protect more desirable game, and (3) because they were perceived to be a threat to humans.

Predator control was carried out on the Seward Peninsula by federal government agents in the 1950's, using among other methods, poison bait stations (Kelly 1953) that are notoriously unselective. Since 1959 state regulations have provided significant protection for grizzly bears. With the decline of gold mining on the Seward Peninsula prior to the 1920's, prohibition of mining during World War II, the drastic decrease in reindeer numbers during the 1940's (Fig. 1), and suspension of federal predator control, human-caused pressures on grizzly bears on the Seward Peninsula decreased markedly.

The reported sport harvest of grizzly bears in Unit 22 from 1961 to 1978 was low (Fig. 3), averaging 6 bears/year. Annual survey-inventory narratives (Burris 1970; Pegau 1971, 1973, 1974A, 1974B, 1976; Grauvogel 1977, 1978, 1979) indicate that the actual total harvest was also modest. From 1979 to 1989 the annual reported harvest in Unit 22 averaged 39 bears (Fig. 3).

OBJECTIVES

To estimate density, structure, movements, and reproductive parameters of grizzly bears within a portion of the Seward Peninsula.

To investigate the effects of bear predation on reindeer.

STUDY AREA

A 2,447-mi^2 (6,338 km^2) area incorporating the city of Nome was selected as the study area (Fig. 4). Logistics were simplified because distances from the researchers' home bases are minimized; however, portions of the study area are accessible by road during summer.

According to the Cooperative Extension Service (unpubl. data, June 1989) the study area contains the largest herd of reindeer

(i.e., 5,027) in North America. This herd has also been extensively studied by researchers from the University of Alaska, Fairbanks and includes radio-collared animals (R. Dietrich pers commun.). According to ADF&G files, the study area supports approximatly 67 muskoxen (Ovibos moschatus) that have also been studied extensively, including radio-collared animals (Smith 1987). There are a substantial number of moose (Alces alces) in the area that have displayed the highest rates of calf production and survival on the Seward Peninsula in recent years (ADFG files).

There are ten river systems in the area that support summer runs of anadromous fish: pink salmon (Oncorhynchus gorbuscha), chum salmon (O. keta) arctic char, (Salvelinus alpinus), red salmon (O. nerka), silver salmon (O. kisutch), and a few king salmon (O. tshawytscha). Extensive grizzly bear denning habitat (ADFG files, Nome) is also found there.

These bears have been heavily harvested in recent years, primarily by residents of Nome; the spring hunting season was shortened by Emergency Order in 1988 to prevent overharvesting. A reduction in the hunting season was adopted by regulation in 1989 in order to reduce bear harvests. Cabins and other structures used during seasonal subsistence food gathering and preparation activities are common, and bear damage has been reported (ADFG files, Nome); however, the status and trend of the grizzly bear population is unknown, although many local residents believe they are abundant and increasing.

The topography varies from coastal lowlands to rugged mountain ranges; the maximum elevation is 1,438 m (4,714 ft). Temperature, rainfall, snow, and icing conditions are typical of maritime areas in northwestern Alaska. The climate of the peninsula's interior is more continental, with greater temperature extremes and lower precipitation. Mean annual precipitation is approximately 36 cm (14 in). Snowcover normally persists from November through May, and it can become hard-packed and include ice layers, particularly near the coast.

The vegetation is dominated by Arctic tundra communities, although treeline transects the northeastern portion of the study area and isolated spruce (Picea mariana) are present. Dense stands of 3-m-high willow (Salix spp.) are widespread, and there are few cottonwood trees (Populus balsamifera).

PROCEDURES

Grizzly bears were captured using standard helicopter-darting procedures. All bears were immobilized with a mixture of the cyclohexamine, Tiletamine Hcl, and Zolazepam Hcl, (Telezol, A. H. Robbins Richmond, VA.). For bears older than 1 year, the drug was delivered using syringe darts (Palmer Chemical & Equipment Co., Douglasville, GA or Pneudart, Williamsport, PA) propelled by

a powder charge from a dart-firing rifle (Palmer or Pneudart). Cubs of the year were captured by hand after their mothers had been immobilized by driving them toward motionless or hidden capture personnel on the ground. The cubs were held using heavy animal handling gloves and placed in military canvas duffle bags until they had been immobilized by an injection of Telezol. Once immobilized, all bears were measured, ear-tagged and lip-tattooed. Bears judged old enough to have achieved adult neck circumference were fitted with VHF radio-collars (Telonics, Mesa, AZ). Blood was collected in evacuated serum separator tubes (Corvac, Sherwood Medical, St. Louis, MO) and in tubes with an anticoagulant: sodium heparin or EDTA. Bears too large to lift for weighing were weighed using a veterinary rope sling suspended from a zero to 500-lb spring scale hung from the cargo hook of the hovering helicopter. One to 4 first premolars (PM1) were extracted with an elevator and extractor and placed in labelled envelopes for aging. Bears were given a prophylactic dose of long-lasting antibiotic (Districillin, Solvay Veterinary, Princeton, NJ) and left to recover. Cubs were placed against their mothers with the intent that they would wake up together.

Telezol is supplied in powder form and was mixed with water before use. Putting the drug in solution by hand agitation, particularly at higher concentrations, was a tedious task. To facilitate this process we used a rock tumbler with two 1-quart containers. After injecting a measured quantity of water into each vial of Telezol, the vials were allowed to tumble for 5-10 minutes. Using this method, Telezol could be dissolved at concentrations of 400 mg/ml with little effort.

Radio-collared bears were relocated from the air using Piper PA-18 and Cessna 185 aircraft fitted with VHF receiving gear and directional antennas (Telonics, Mesa, AZ). Data was stored on 1:630,360 USCGS maps and in a computer database file (DBASE III, Ashton Tate). Relocation maps will be digitized, and the resulting latitude and longitude of bear locations will be transferred to the database.

RESULTS AND DISCUSSION

Fifty-three grizzly bears, including 25 males and 28 females, were captured from 3 to 10 June 1989. Thirty-five adult bears (>2.5 yr) and 18 cubs (≤2.5 yr or younger) were handled. Twenty-six adult bears, including 6 males and 20 females, were radio-collared. Three bears (1 male, 2 females) died or shed their collars within 3 months of collaring. The radio-collars on the remaining 23 bears continued to transmit until denning. Two marked bears without collars were killed by hunters.

Half (9) of the 18 females captured that were judged to be of reproductive age were accompanied by cubs when captured (Table 2). Twelve of the 18 females (67%) were lactating, suggesting that 5 of the 9 females not accompanied by cubs had produced cubs

in 1989 but had lost them prior to the capture operation. At the time of capture, 9 females were accompanied by 18 cubs (mean litter size = 2) (Table 1). Eight of those cubs (44%) were not observed with their mothers after capture. At denning only 8 of 10 original cubs that had not been separated during capture activities were observed with their mothers (Table 1).

Eleven of 45 bears were darted twice, and two required 3 darts for immobilization. One of the problems in effectively delivering Telezol is that the recommended concentration is 100 mg/ml but maximum dart capacity is 10 ml or less. For this study we used darts having 6 ml capacity or smaller, because we have found larger darts to perform poorly both ballistically and in their ability to fully inject their contents. With a required effective drug dose up to 2240 mg, the drug must be either put into a more concentrated solution or the animals darted with multiple darts. We chose to increase the concentration up to 400 mg/ml for large male bears; however, at this concentration, and to a lesser extent at 300 mg/ml, Telezol tended to form viscous or crystalline deposits inside the dart barrels over time. These deposits interfered with the movement of the internal dart plunger and sometimes resulted in incomplete injections. We found that best results were obtained when darts were loaded immediately before use and not stored after loading.

Bears older than cubs of the year required an average 13.1 mg/kg of Telezol for immobilization (Table 2). Several bears that were too active to handle were given additional small doses of Telezol by hand injection.

Induction time for bears older than cubs of the year averaged 10.7 minutes (range = 2-32 min, Table 2). Longer induction times were associated with multiple darts and probably resulted more from mechanical problems in introducing the drug, dart failures, or incomplete absorption of the drug, rather than with physiological factors.

Eight cubs of the year were successfully immobilized by an average 12.3 mg/kg of Telezol, usually injected in the muscles of the back of the neck. Although effective drug doses used in this study were higher than the 7-9 mg/kg recommended by Taylor et al. (1989), effects on body temperature and respiration were as minimal as those reported by them. One adult female (No. 126) died as a result of capture. Although she received a high drug dose (31.4 mg/kg, Table 4) from 3 darts, necropsy indicated that a dart needle may have punctured a lung.

Physical characteristics of captured grizzly bears are provided in Table 3 and the Appendix. Sample sizes are too small for meaningful comparisons with other Alaska populations. In-depth analyses will occur when age data are obtained and sample sizes are increased.

Movements and Status

Three hundred seventy-two locations were obtained for 26 radio-collared adult grizzly bears during 1989. Adverse weather during 1989 precluded more frequent monitoring.

Radio-collared bears were observed feeding on freshly killed reindeer and moose carcasses. Although they were observed in proximity to muskoxen, no muskox carcasses were observed.

CONCLUSIONS

Historical information is inadequate to reconstruct the fluctuations in numbers of grizzly bears on the Seward Peninsula; however, it appears improbable that a large bear population could have survived the combined effects of unregulated killing by multitudes of gold seekers during the gold rush and predator control associated with the huge reindeer industry that occurred from the turn of the century to the mid-forties. Bears were not afforded much regulatory protection until statehood in 1959. Considering the slow growth rate of bear populations, if the above scenario is accurate, it appears that bear numbers probably have increased significantly over the past 2 or 3 decades. Subjective opinions of Department management staff, as voiced in annual survey-inventory reports, support this view. Nevertheless the current trend in bear numbers is unknown. The reported harvest has increased substantially in the past decade. This study will provide a means to assess impacts of harvests on the bear populations for at least a portion of the Seward Peninsula and provide baseline data with which to compare future changes in bear numbers.

RECOMMENDATIONS

Research should continue, depending on subsequent funding.

ACKNOWLEDGEMENTS

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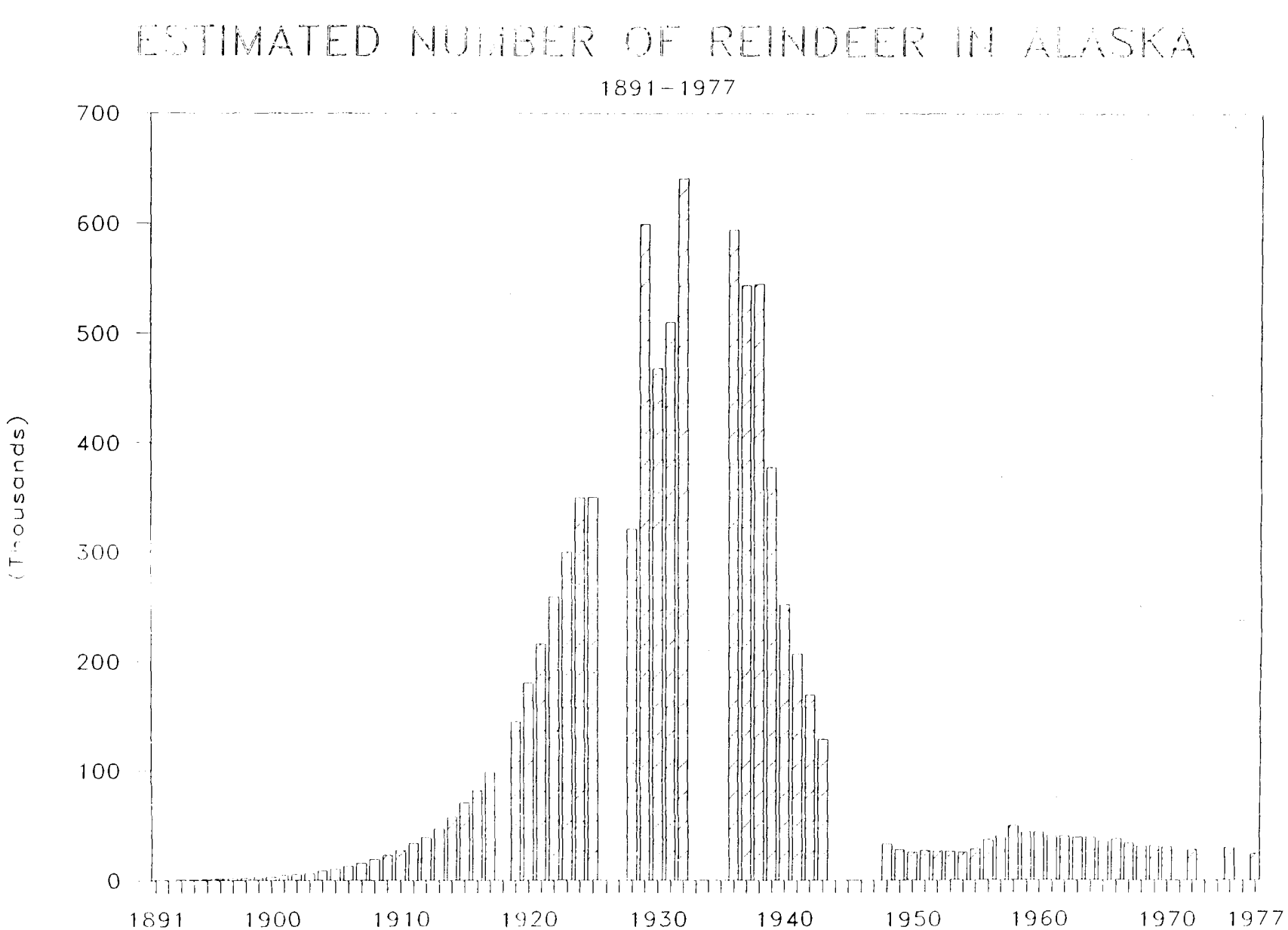

Fig. 1. Estimated number of reindeer in Alaska 1891-1977. Data from Hanson (1952), Skoog (1967), Stern et al. (1980).

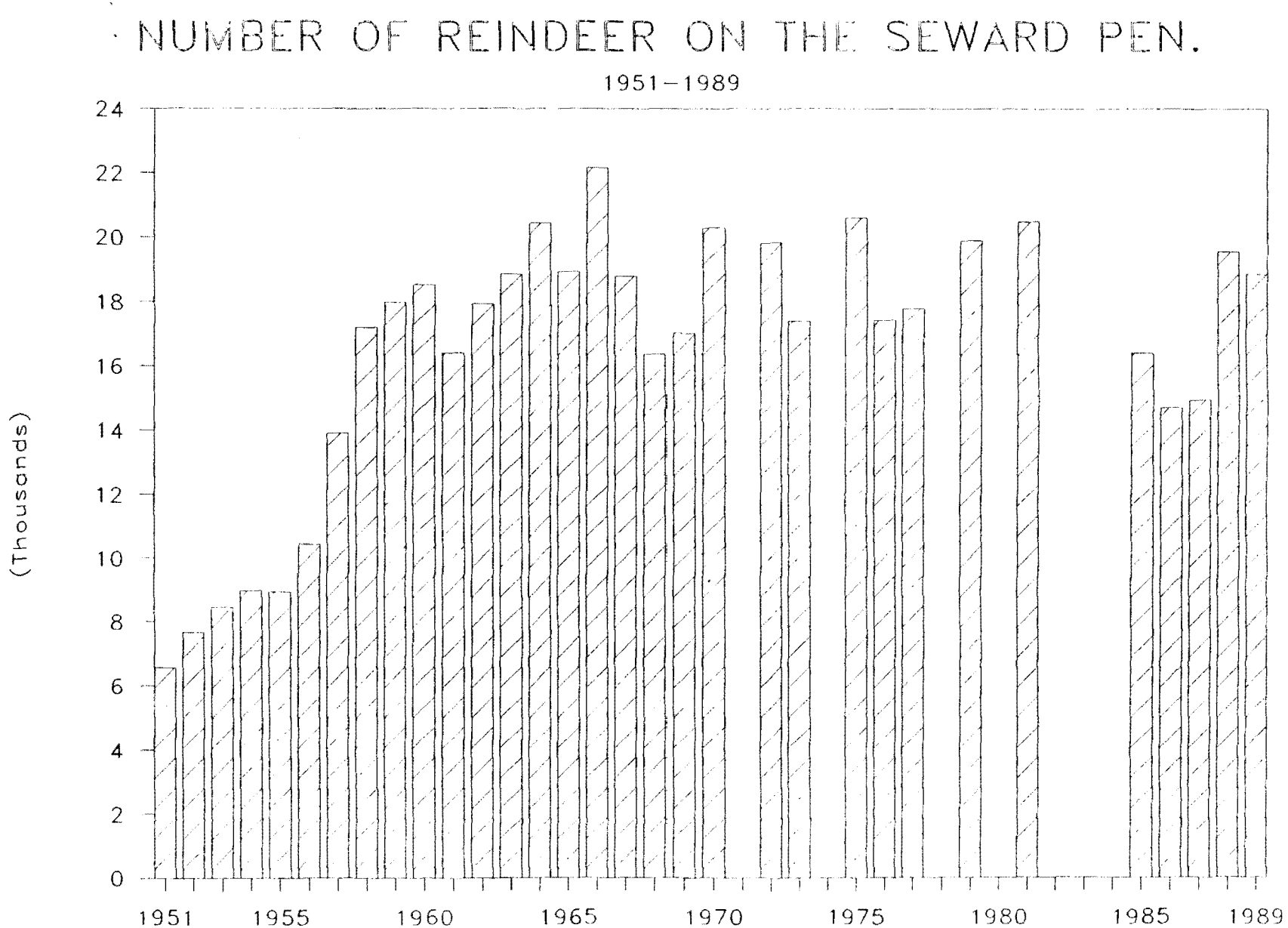

Fig. 2. Estimated number of reindeer on the Seward Peninsula 1951-1989. Data from Stern (1980), U. S. Cooperative Extension Service.

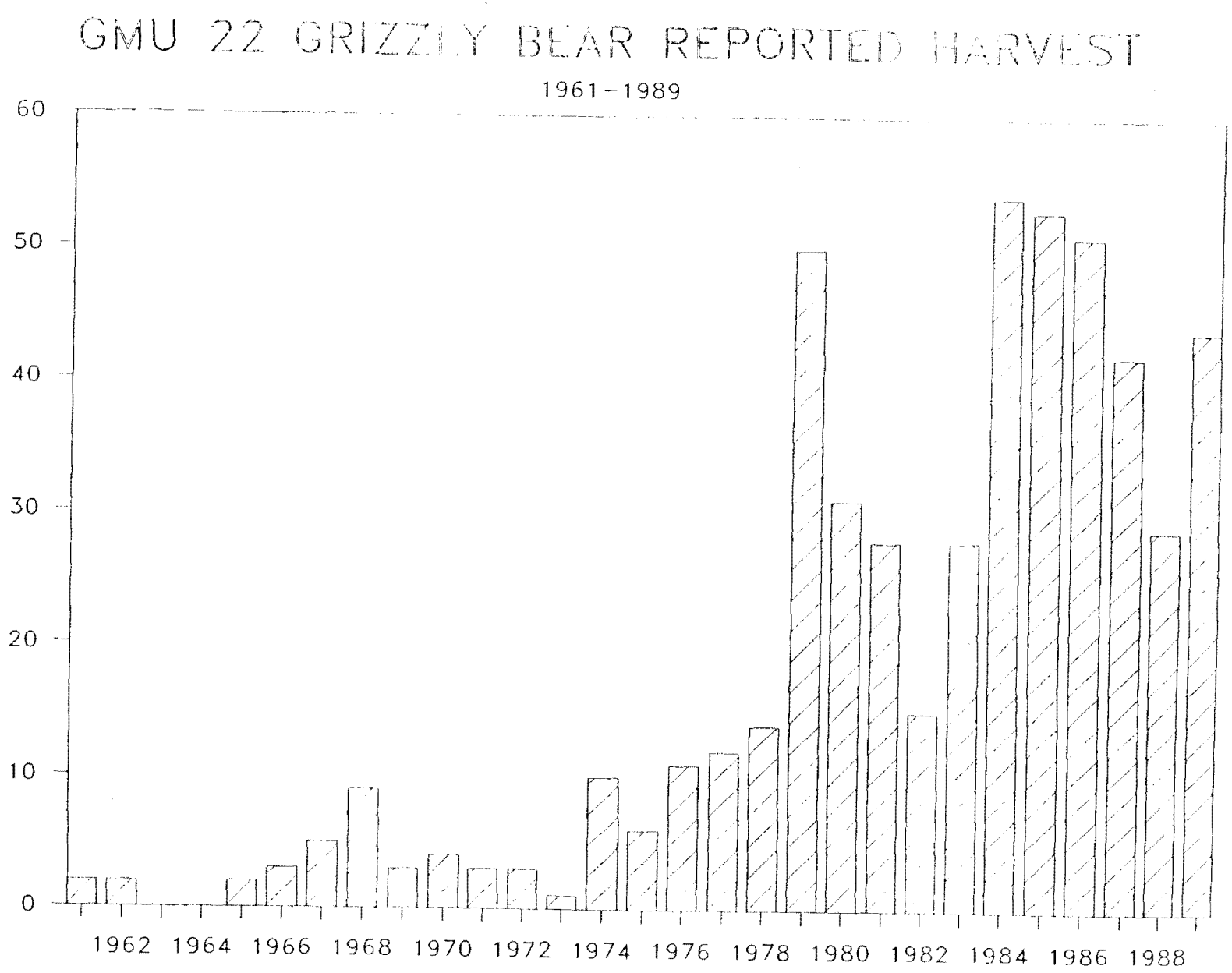

Fig. 3. Unit 22 reported harvest of grizzly bears 1961-1989. Data from sealing records.

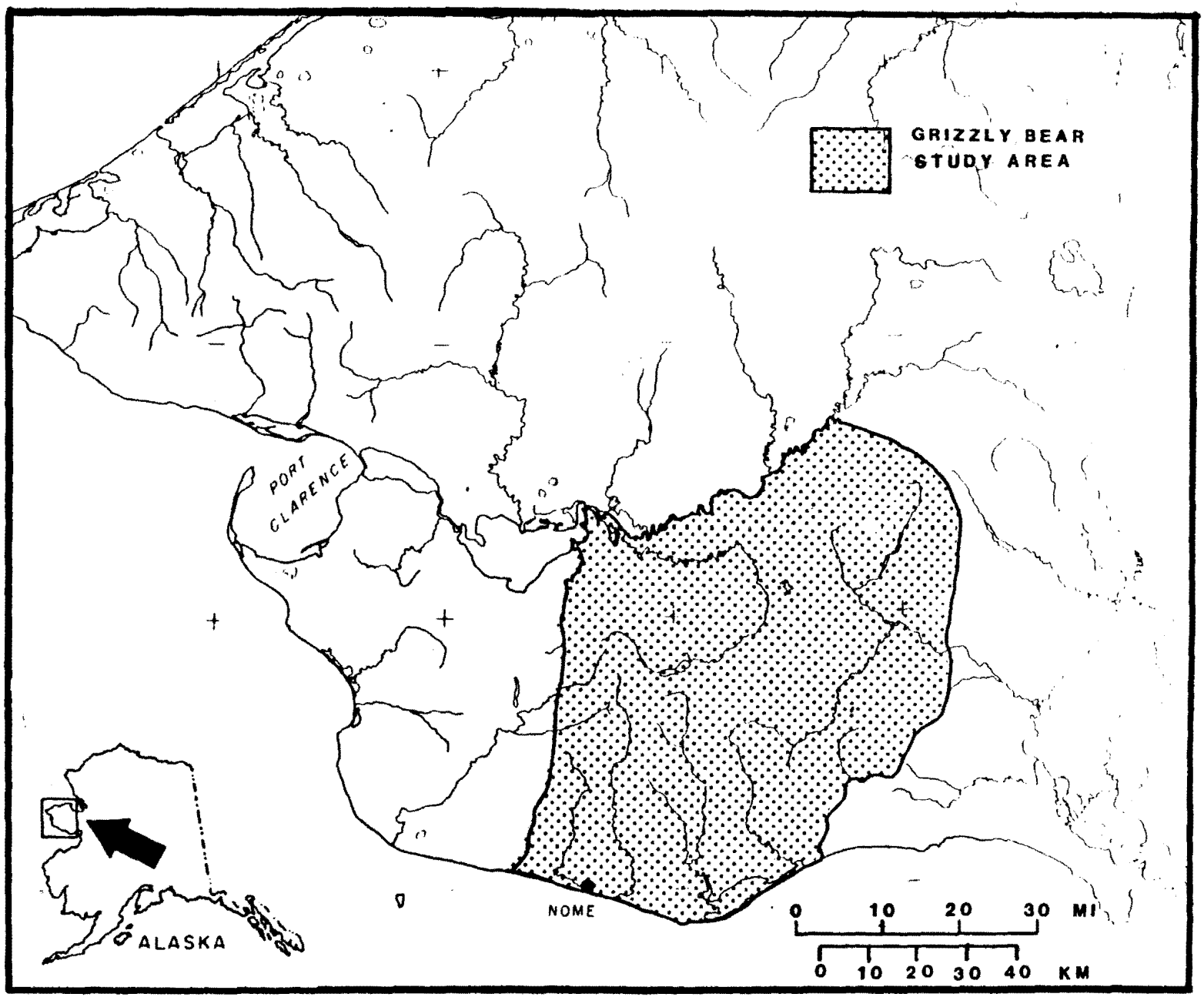

Fig. 4. Seward Peninsula grizzly bear study area.

Table 1. Reproductive status and number of cubs observed with adult female grizzly bears on the Seward Peninsula, Alaska 1989.

No.	Est. age	Lactating	With when captured	No. of young when captured	Age of young	No. of young following capture	No. young at denning
123	15.0	Y	124	1	0.5	0	0
127	11.0	Y	128,129	2	1.5	2	2
131	13.0	Y	132,133	2	0.5	0	0
134	14.0	Y	135,136,137	3	2.5	0	0
138	4.0	Y	Alone	0	0.0	0	0
143	6.0	N	142	0	0.0	0	0
144	4.0	Y	145,130?	0	0.0	0	0
145	9.0	Y	144,130?	0	0.0	0	0
146	10.0	Y	147	0	0.0	0	0
151	7.0	Y	Alone	0	0.0	0	0
152	4.0	N	142	0	0.0	0	0
153	0.0	Y	154,155,156	1	1.5	0	0
158	12.0	Y	Alone	0	0.0	0	0
160	12.0	N	159,161	2	1.5	2	2
163	12.0	N	164,165	2	2.5	2	2
167	10.0	Y	168,169,170	3	0.5	1	1
171	8.0	N	172	0	0.0	0	0
173	16.0	Y	174,175	2	0.5	1	1

Table 2. Telezol doses and induction times for grizzly bears older than 0.5 years immobilized on the Seward Peninsula, June 1989.

No.	Sex	Weight Kg	Condition[b]	MG1[a]	MG2	MG3	MG/KG	Induction time
123	F	113	-	1200	1200	0	21.2	12
125	M	127	1	2240	0	0	17.6	7
125	M	127	1	1350	0	0	10.6	14
126	F	91	2	1200	1200	450	31.4	32
127	F	109	2	1200	0	0	11.0	9
128	M	39	3	450	0	0	11.7	15
129	M	43	3	450	0	0	10.4	3
130	M	249	2	2240	0	0	9.0	7
131	F	104	2	1200	0	0	11.5	8
134	F	102	4	1200	450	0	16.2	22
136	M	79	2	450	0	0	5.7	
137	M	79	2	450	0	0	5.7	
138	F	84	-	1200	450	0	19.7	13
139	F	120	3	1200	0	0	10.0	4
140	M	41	3	450	0	0	11.0	
141	F	45	3	450	0	0	9.9	6
142	M	193	1	1200	1200	0	12.4	6
143	F	125	2	450	1200	0	13.2	18
144	F	113	1	1200	0	0	10.6	6
145	F	134	3	1200	1200	0	17.9	18
146	F	125	2	1350	450	450	18.0	26
147	M	175	2	2240	0	0	12.8	4
148	M	250	1	2240	0	0	9.0	14
149	F	166	1	1350	0	0	8.2	19
150	M	136	1	1200	1200	0	17.6	15
151	F	150	2	1680	0	0	11.2	11
152	F	118	1	450	450	0	7.6	
153	F	104	1	1200	0	0	11.5	9
154	F	61	2	450	0	0	7.3	
155	M	79	2	450	0	0	5.7	5

Table 2. Continued

No.	Sex	Weight Kg	Condition[b]	MG1[a]	MG2	MG3	MG/KG	Induction time
156	M	70	-	450	0	0	6.4	
157	F	50	4	2240	0	0	44.9	2
158	F	127	-	1200	0	0	9.4	9
159	M	18	4	450	0	0	24.8	
160	F	102	-	1200	0	0	11.8	4
161	M	18	4	450	0	0	24.8	4
162	F	63	3	450	450	0	14.4	14
163	F	95	-	1200	0	0	12.6	
164	M	70	-	450	450	0	12.8	
165	M	64	3	450	0	0	7.0	
166	M	272	1	1800	0	0	6.6	10
167	F	113	3	1200	0	0	10.6	2
171	F	136	1	600	450	0	7.7	14
172	M	136	1	1200	0	0	8.8	4
173	F	113	5	1200	0	0	10.6	7
					AVG		13.1	10.7

[a] Mgl = Milligrams Telezol Dart 1.

B Condition: 1 = poor; 5 = good.

Table 3. Measurements of bears captured on the Seward Peninsula, June 1989.

No.	Head/L[a]	Head/W[b]	Neck	Girth	T/Length[c]	UCLNG[d]	UCAP[e]	UCLL[f]	LCLNG[g]	LCAP[h]	LCLL[i]	UC	LC
123	34.1	22.4	66.0	112	165	0.0	0.0	0.0	0	0.0	0.0		
124	19.1	11.4	33.0	58	90	0.0	0.0	0.0	0	0.0	0.0		
125	34.8	20.2	66.0	109	184	35.3	21.7	141.0	32	22.5	13.2	R	R
126	31.5	20.5	68.0	104	0	32.0	12.0	14.0	28	17.0	12.0	R	R
127	31.9	19.7	55.9	117	183	33.1	17.8	0.0	33	19.2	0.0	R	R
128	26.0	14.0	44.0	76	131	0.0	0.0	0.0	0	0.0	0.0		
129	24.5	14.0	42.0	71	144	0.0	0.0	0.0	0	0.0	0.0		
130	38.0	23.5	84.0	148	204	0.0	0.0	0.0	0	0.0	0.0		
131	31.1	20.8	64.1	123	163	29.5	19.4	14.1	30	18.2	0.0	L	R
132	16.5	9.8	26.0	40	78	0.0	0.0	0.0	0	0.0	0.0		
133	15.5	11.0	26.0	39	77	0.0	0.0	0.0	0	0.0	0.0		
134	35.0	20.5	58.0	0	0	33.0	20.0	14.0	31	19.0	14.0	L	L
135	33.5	17.6	55.9	107	151	0.0	0.0	0.0	0	0.0	0.0		
136	34.0	19.1	54.6	94	152	0.0	0.0	0.0	0	0.0	0.0		
137	32.7	18.4	53.3	0	155	0.0	0.0	0.0	0	0.0	0.0		
138	32.0	19.3	61.0	40	64	30.0	15.0	12.0	27	16.0	12.0	R	R
139	36.0	20.5	67.0	107	192	32.0	19.0	15.0	31	20.0	15.0	L	L
140	30.5	16.2	48.3	81	114	0.0	0.0	0.0	0	0.0	0.0		
141	46.5	14.5	49.0	90	129	17.0	0.0	0.0	11	0.0	0.0	R	R
142	0.0	0.0	76.2	122	190	0.0	0.0	0.0	0	0.0	0.0		
143	35.4	20.0	66.0	113	0	32.0	0.0	0.0	30	0.0	0.0	L	L
144	31.0	18.0	59.0	110	155	0.0	0.0	0.0	0	0.0	0.0		
145	32.7	20.3	66.0	123	171	0.0	0.0	0.0	0	0.0	0.0		
146	33.0	20.3	70.0	108	183	0.0	0.0	0.0	0	0.0	0.0		
147	37.0	22.0	79.0	125	193	37.0	20.6	15.5	33	23.3	14.5	R	R
148	40.2	24.4	83.8	155	221	38.7	24.8	16.8	35	25.3	15.0	R	R
149	34.5	21.3	76.0	131	179	0.0	0.0	0.0	0	0.0	0.0		
150	37.5	21.7	0.0	0	0	36.7	21.7	13.9	34	21.7	15.0		
151	34.8	21.0	62.2	149	178	32.4	16.5	13.1	29	17.9	14.2	R	R
152	32.9	20.0	60.3	114	155	31.6	12.2	13.8	30	16.1	14.9	R	R
153	33.7	20.5	0.0	0	0	0.0	0.0	0.0	0	0.0	0.0		
154	27.9	15.9	50.2	102	145	31.2	15.5	13.8	30	17.2	13.3	R	R
155	31.0	18.0	57.0	100	152	0.0	0.0	0.0	0	0.0	0.0		

Table 3. Continued.

No.	Head/L[a]	Head/W[b]	Neck	Girth	T/Length[c]	UCLNG[d]	UCAP[e]	UCLL[f]	LCLNG[g]	LCAP[h]	LCLL[i]	UC	LC
156	29.2	16.5	27.9	97	0	0.0	0.0	0.0	0	0.0	0.0		
157	29.5	15.6	47.0	81	133	27.6	13.6	10.8	25	12.8	10.2		
158	32.1	20.3	70.5	121	167	34.3	15.8	13.0	29	19.1	12.6		
159	20.6	12.1	33.0	53	93	0.0	0.0	0.0	0	0.0	0.0		
160	34.0	21.5	60.0	107	167	0.0	0.0	0.0	0	0.0	0.0		
161	21.0	12.0	31.0	55	0	0.0	0.0	0.0	0	0.0	0.0		
162	26.7	15.6	53.0	80	140	0.0	0.0	0.0	0	0.0	0.0		
163	38.7	21.3	62.9	112	170	0.0	0.0	0.0	0	0.0	0.0		
164	31.1	17.8	55.9	92	150	0.0	0.0	0.0	0	0.0	0.0		
165	29.8	17.1	53.3	97	150	0.0	0.0	0.0	0	0.0	0.0		
166	39.5	26.8	103.0	152	214	40.7	20.4	15.0	33	22.4	14.0	L	L
167	34.0	20.0	62.0	110	165	0.0	0.0	0.0	0	0.0	0.0		
168	16.2	10.5	26.0	41	79	0.0	0.0	0.0	0	0.0	0.0		
169	17.1	10.2	30.5	46	81	0.0	0.0	0.0	0	0.0	0.0		
170	14.6	8.9	22.9	33	63	0.0	0.0	0.0	0	0.0	0.0		
171	36.3	20.5	67.0	120	184	0.0	0.0	0.0	0	0.0	0.0		
172	35.6	19.7	67.9	122	175	0.0	0.0	0.0	0	0.0	0.0		
173	35.3	21.4	65.0	111	180	38.9	21.6	15.5	32	19.8	13.8	L	L
174	16.8	10.5	29.9	43	69	0.0	0.0	0.0	0	0.0	0.0		
175	15.6	10.5	27.9	43	69	0.0	0.0	0.0	0	0.0	0.0		

[a] Head length/cm. [b] Head width/cm. [c] Total length/cm. [d] Length upper canine/mm. [e] Upper canine anterior posterior/mm. [f] Upper canine labial-lingual/mm. [g] Length lower canine/mm. [h] Lower canine anterior-posterior/mm. [i] Lower canine labial-lingual/mm.

APPENDIX

Proposals for regulatory changes for hunting Unit 22 grizzly bears. Submitted by Unit residents for consideration by the Alaska Board of Game, March 1990.

Proposal 89 - 5 ACC 85.020. HUNTING SEASONS AND BAG LIMITS FOR BROWN BEAR. Change Unit 22 brown bear bag limit as follows:

We would like to change the bag limit from one bear every four years to one bear every two years for subsistence, resident, and nonresident hunters.

Unit 22(A), 22(B), 22(D), 22(E) -- one bear every two years.

PROBLEM: Local residents and ADF&G biologist agree that bear populations have been increasing over a number of years in GMU 22. Local residents are seeing more bears now with increased complaints to ADF&G on destruction of property. Bears are becoming accustomed to feeding on fish racks and near villages. Because seasons are so short, bag limits so restrictive, and defense of life and property regulations so burdensome, local residents are hesitant to dispose of these problems bears. Therefore, the problem bears are not deterred.

WHAT WILL HAPPEN IF NOTHING IS DONE? Exploding bear populations and problem bears accustomed to feeding on fish racks and storage caches will continue to increase.

WHO IS LIKELY TO BENEFIT? All hunters and control of over populated bears.

WHO IS LIKELY TO SUFFER? No one.

OTHER SOLUTIONS CONSIDERED? We have given the Board of Game solutions -- in the form of proposals -- but they have continually rejected our proposals.

Proposed by: Kawerak, Inc. (SE-390)

Proposed by 90 - 5 AAC 85.020. HUNTING SEASONS AND BAG LIMITS FOR BROWN BEAR. Change Unit 22 brown bear hunting seasons as follows:

	Subsistence open seasons:
Units 22(A), 22(B), 22(C):	Aug. 15-Oct. 31
Unit 22(C), 22(D), 22(E):	May 1-May 31

PROBLEM: Grizzly bears have increased in GMU 22 over the past several years, local residents are having more problems with nuisance bears in their fish camps and in near villages. Some people take these bears in defense of life and property, which must be surrendered to the state. Because local residents are reluctant to report and surrender the bear, Alaska Department of Fish and

Game biologists do not hear all the bears which are taken in defense of life and property. Rural residents use the grizzly bear for food, handicrafts, and other purposes. Problem bears are still around fish camps in August when area residents could utilize them for food, handicrafts, and other purposes.

WHAT WILL HAPPEN IF NOTHING IS DONE? Bears will continue to feed on fish camps and defense of life and property bears will not be put to good use. Some defense of life and property bears will not be reported.

WHO IS LIKELY TO BENEFIT? Subsistence users in GMU 22.

WHO IS LIKELY TO SUFFER? No one

OTHER SOLUTIONS CONSIDERED? We have given the Board of Game solutions -- in the form of proposals -- but they continually rejected our proposals.

Proposed by: Kawerak, Inc. (SE-389)

Proposal 91 - 5 AAC 85.020. HUNTING SEASONS AND BAG LIMITS FOR BROWN BEAR. Change Unit 22 brown bear hunting seasons as follows:

Open subsistence season from Aug. 15 - Oct. 31 for GMU 22(A), 22(B), 22(C), 22(D), 22(E).

Open subsistence season from May 1 - May 31 for GMU 22(C).

PROBLEM: Grizzly bears have increased in GMU 22 over the past several years. Local residents are having more problems with nuisance bears in their fish camps and near villages. Some people take these bears in Defense of Life and Property (DLP), reluctant to report and surrender the bear, ADF&G biologists do use the grizzly bear for food, handicraft and other purposes. Problem bears are still around fish camps and near villages in August when area residents could utilize them.

WHAT WILL HAPPEN IF NOTHING IS DONE? Bears will continue to feed on fish camps and defense of life and property bears will not be put to good use. Some defense of life and property bears will not be reported.

WHO IS LIKELY TO BENEFIT? Subsistence users in GMU 22.1

WHO IS LIKELY TO SUFFER? No one.

OTHER SOLUTIONS CONSIDERED? None.

Proposed by: Nome Eskimo Community. (SE-546)

Proposal 92 - 5 AAC 85.020 HUNTING SEASONS AND BAG LIMITS FOR BROWN BEAR. We would like to change the bag limit from one bear every four years to one bear every two years for subsistence, resident, and non-resident hunters. Unit 22(A), 22(B), 22(C), 22(D), 22(E) -- One bear every two years.

PROBLEM: local residents and ADF&G biologists agree that bear populations have been steadily increasing over a number of years in GMU 22. Local residents are seeing more bears now with increased complaints of ADF&G on destruction of property. Bears are becoming accustomed to feeding on fish racks and near villages. Because seasons are so short, bag limits so restrictive, and defense of life and property regulations so burdensome local residents are hesitant to dispose of these problem bears Therefore, the problem bears are not deterred.

WHAT WILL HAPPEN IF NOTHING IS DONE? Exploding bear population and problem bears accustomed on feeding off of fish racks and storage caches will continue to increase.

WHO IS LIKELY TO BENEFIT? All hunters and control of over populated bears.

WHO IS LIKELY TO SUFFER? Nobody.

OTHER SOLUTIONS CONSIDERED? None.

Proposed by: Nome Eskimo Community. (SE-548)

Proposal 93 - 5 AAC 85.020. HUNTING SEASONS AND BAG LIMITS FOR BROWN BEAR. Increases Units 22(B-E) brown bear drawing permits as follows:

One bear every four regulatory years by drawing permit only. 30 permits will be issue for this hunt: 10 fall permits and 20 spring permits

PROBLEM: The restrictive number of permits issued to nonresidents for brown/grizzly bear in Unit 22 (B), (C), (D), (E).

WHAT WILL HAPPEN IF NOTHING IS DONE? The surplus bear population will continue to be shot and left unreported at an alarming rate. This is a waste of a resource that could easily be utilized with the proper regulation.

WHO IS LIKELY TO BENEFIT? Several different groups would benefit from this proposal; they include: nonresident hunters, guides & employees, reindeer herders, fishermen, and subsistence users.

WHO IS LIKELY TO SUFFER? To the best of my knowledge no one will suffer from this solution.

OTHER SOLUTIONS CONSIDERED? I considered both removal and modification of the present permit system and decided that liberalizing the current system is the best solution at this time. I also considered not increasing the current number of permits available, but it is ridiculous to sit back and do nothing when there is such an obvious problem and there will not be another opportunity to correct it for another two years. To do nothing at this time is to condone wanton waste.

Proposed by: Bob Hannon. (SC-072)

Proposal 220 - 5 AAC 92.014. BROWN BEAR TAG FEE EXEMPTION. Eliminate the brown bear tag fee as follows:

No resident tag or tag fee is required for taking brown or grizzly bear in Unit 20(E) and Unit 22(B), (C), and (D).

PROBLEM: Elimination of $25.00 bear tag fee.

WHAT WILL HAPPEN IF NOTHING IS DONE? Over population of bears in Unit 22(B), (C), and (D).

WHO IS LIKELY TO BENEFIT? Seward Peninsula residents.

WHO IS LIKELY TO SUFFER? No one seriously affected.

OTHER SOLUTIONS CONSIDERED? None

Proposed by: Teller Traditional Council and City Council of Teller (SE-241).

Proposal 226 - 5 AAC 92.014. BROWN BEAR TAG FEE EXEMPTION. Change the Unit 22 brown bear tag fee as follows:

Eliminate $25 tag fee for subsistence users in GMU 22. Increase nonresident fee (to compensate for small amount of lost revenue to the department). Tags and tag fees would still be required in GMU 22 for resident hunters.

No resident tag or tag fee are required for taking brown or grizzly bear subsistence harvest in GMU 22.

PROBLEM: Grizzly bears are abundant and increasing in GMU 22. Rural residents use the bear for food, handicrafts, and other purposes. The $25 tag fee discourages harvest reporting and is inconsistent with customary and traditional practices in some communities. Low income residents and elder Alaska residents qualify for reduced or free licenses, but they must pay an additional $25 to take a brown bear.

WHAT WILL HAPPEN IF NOTHING IS DONE? Defense of life and property harvests will increase. Harvest reporting will not improve. Rural

residents who use bear in customary and traditional ways will be frustrated by regulations.

WHO IS LIKELY TO BENEFIT? Subsistence users in GMU 22. Also, the state must pay for shipping, storage, tanning, and auction of defense of life and property bear hides. The state does not get a good return on defense of life and property hides and the money goes to the general fund no Alaska Department of Fish and Game.

WHO IS LIKELY TO SUFFER? No one.

OTHER SOLUTIONS CONSIDERED? We have given the Board of Game solutions -- in the form of proposals -- but they have continually rejected our proposals.

Proposed by: Kawerak, Inc. (SE-388)

Proposal 227 - 5 AAC 92.014. BROWN BEAR TAG FEE EXEMPTION. Eliminate $25 tag fee for subsistence users in GMU 22. Increase nonresident tag (to compensate for small amount of lost revenue to Department). Tags and tag fees would still be required in GMU 22 for resident hunters. Non resident tag fees are required for taking brown or grizzly bear subsistence harvest in GMU 22.

PROBLEM: Grizzly bears are abundant and increasing in GMU 22. Rural residents use the bear for food, handicrafts, and other purposes. The $25 tag fee discourages legal subsistence harvest and use of grizzly bear, discourages harvest reporting, and is inconsistent with customary and traditional practices in some communities. Low income residents and elder Alaska residents qualify for reduced or free licenses, but they must pay an additional $25 to take a brown bear.

WHAT WILL HAPPEN IF NOTHING IS DONE? Defense of Life and Property (DLP) harvests will increase. Harvest reporting will not improve. Rural residents who use bear in customary and traditional ways will be frustrated by regulations.

WHO IS LIKELY TO BENEFIT? Subsistence users in GMU 22. Also, the state must pay for shipping, storage, tanning, and auction of DLP bear hides. The state does not get a good return on DLP hides, and the money goes to the general fund not ADF&G.

WHO IS LIKELY TO SUFFER? Nobody.

OTHER SOLUTIONS CONSIDERED? None.

Proposed by: Nome Eskimo Community (SE-547)