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Development and Improvement of Bear Management Techniques and Procedures in Southcentral Alaska
and
Impacts of Heavy Hunting Pressure on the Density and Demographics of Brown Bear Populations in Southcentral Alaska

by

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Grant W-24-2
Studies 4.24 and 4.26
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RESEARCH PROGRESS REPORTS

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Project W-24-2

Project Title: Wildlife Research and Management

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Study Title: Development and Improvement of Bear Management Techniques and Procedures in Southcentral Alaska

Project W-24-2

Study No. 4.26

Study Title: Impacts of heavy hunting pressure on the density and demographics of brown bear populations in Southcentral Alaska

Period Covered: July 1 1993 to June 30, 1994

SUMMARY

Fifty-nine brown bears were captured and marked during 1993 and 1994 in Game Management Subunit 13E. This work was done in preparation for a 1995 brown bear density estimate in a study area where density was previously estimated in 1985 and as part of ongoing studies on brown bear reproductive rates in Unit 13. The 1995 density estimate is intended as a field test designed to evaluate indirect calculations of population trend based on numbers of bears harvested and calculated sustainable harvest rates (Miller 1993*a*).

CONTENTS

BACKGROUND

Management of bears is frequently more challenging than for other species of hunted wildlife. Compared to other species, bears are difficult to count and available indices of abundance are not precise (Harris 1986). Bears typically are at low densities and can sustain only low rates of harvest without population declines (Miller 1990*a*). Bear hunting cannot be restricted to one sex, because sexes are difficult to identify. Different sex and age classes have different vulnerabilities to different seasons and kinds of hunting which complicate interpretation of harvest data (Miller 1990*a*, Miller and Miller 1988). Bears may also become nuisances or threaten humans; this leads to killings which may be both significant in number and underreported (Miller and Chihuly 1987). In some regions of Alaska, bears are considered undesired competitors with humans for preferred ungulate species; in these areas there is little political support for sustained-yield management of bears. In some rural portions of the state, compliance with harvest reporting requirements is low. Complicating management further in some areas is a reluctance to adopt restrictions on bear hunting until there is unequivocal evidence of population declines. With available technology, such evidence is seldom available or lags far behind significant changes in population status (Harris 1984, Harris and Metzgar 1987, Miller and Miller 1988, 1990).

Responsible management of exploited bear populations requires continuous effort to improve understanding the significance and use of available information sources and to develop improved indices of bear population status.

Management of exploited bear populations requires information on status of populations. Information on status of populations may be obtained through study of the population directly (e.g., Miller et al. 1987, Miller 1990*b*,*c*, Sellers and Miller 1991, Reynolds 1993) or through analysis of harvests (Miller and Miller 1988, 1990, Miller 1989, 1993*b*). Better information is usually obtained from direct studies but because of the expense of such studies, in most areas population status evaluations are based on indirect evidence obtained from harvested animals.

Information on the number of bears harvested is clearly useful. Information on the sex and age composition of harvested animals is more difficult to interpret. Although some approaches have been proposed for interpretations of sex and age composition of bear harvest data (Frazer et al. 1982, Tait 1983), most studies have not demonstrated the capability of such

data to reveal changes in population trends in a timely manner (Caughley 1974, Harris 1984, Harris and Metzgar 1987, Miller and Miller 1990).

The objective of study 4.24 is to improve ability to manage bear populations through simulaton and other studies designed to better understand currently available information and to develop improved information sources.

The objective of study 4.26 is to investigate a specific case in Unit 13 where brown bears have been intensively hunted since 1980 in an effort to reduce bear abundance in order to increase moose available for hunter harvests (Franzmann 1993). This study will evaluate differences in brown bear population density, population composition, and other parameters that may vary in response to heavy bear hunting pressure. This project is a continuation of Federal Aid study 4.21 (Miller 1993*a*).

OBJECTIVES

STUDY 4.24

1. Improve understanding of the utility of information collected from harvest monitoring programs.

2. Investigate new procedures to monitor status of exploited bear populations, using both direct and indirect means.

3. Develop and refine procedures to estimate appropriate harvest levels for bear populations.

STUDY 4.26

1. Determine effects of heavy hunting pressure on density, sex and age composition, and productivity of a bear population.

2. Evaluate, test, and refine a harvest management paradigm used to establish harvest quotas and estimate trends in bear populations managed under guidelines designed to avoid significant declines in bear numbers. This will be accomplished through intensive study of changes in density, composition, and productivity in the Unit 13 brown bear population which is being intentionally hunted in excess of sustainable levels.

RESULTS

Study 4.24

Primary accomplishments in study 4.24 were in Job 6, preparation of reports and publications.

The final draft of a wildlife monograph was completed, submitted, and accepted pending additional editing (Grizzly and black bear density estimation in Alaska using radiotelemetry and replicated capture-mark-resight techniques) (Miller et al. in prep.). This monograph describes results of 18 CMR density applications for brown and black bears in Alaska.

Final editing and submission of a manuscript to *The Journal of Wildlife Management.* ("Effort and success of brown bear hunters in Alaska" [Albert, Bowyer, and Miller]) were completed.

Final editing and submission of a report ("Grizzly bear density and population estimate for a portion of the Seward Peninsula, Alaska" [Miller and Nelson 1993]) were completed.

Final editing and submission of a report ("Brown bears in Alaska: A statewide management overview" [Miller 1993]) was completed.

A publication was prepared and submitted ("Estimating wildlife numbers in large geographic areas: Number of brown bears in Alaska").

STUDY 4.26

Capture data for bears captured in Unit 13 between 1980 and 1990 are presented in Table 1. Capture data for recaptures of bears marked as part of earlier studies, and new bears captured between 1993 and 1994 are presented in Table 2. These data will be compiled and contrasted with earlier results following completion of a density estimate using the technique of Miller et al. (1987) during spring 1995.

Two probable capture-induced separations of females from their offspring occurred during 1993; none occurred during 1994. A yearling (497) was not seen again with her mother (female 496) following marking. The yearling female was not at her capture location following marking, indicating she survived the marking effort. Following marking, mother and yearling were left close together (within 200 yards). This is the first time I have had a probable capture-induced separation of a yearling from its mother in Unit 13 studies. In another case, we apparently caused separation of a female 306 and her single newborn cub which was not captured. Following capture of the female, these bears were not again seen together and the cub couldn't be located. In a third case. we caused the separation of a female (498) and her 2 uncaptured newborns on 14 May, 1993 but successfully accomplished a reunion by recapturing the female and her cubs on 18 May. During the reunion effort we gave the cubs a small dose of Telazol and left them sleeping next to their mother.

Concern over separation of females from newborn cubs caused us to delay recaptures to replace collars of females accompanied by newborns until the following year. As a consequence of this delay, the transmitter for 1 bear (396) failed before it could be replaced, following >36 months of deployment. During spring 1994, the still-functioning transmitter was replaced for a bear (460) originally radiomarked spring 1986. The signal from this transmitter became very weak the summer of 1993, but it could still be followed.

I evaluated the adequacy of premarking efforts during the years 1993 and 1994 prior to the density estimate planned for 1995 by comparing number of radiomarks currently deployed with those deployed during the density estimate in the Su-hydro study area in 1985. In 1985, unmarked bears spotted were captured and marked. The average number of radiomarks present (on independent bears) during 7 replications in 1985 was 16.3 (range = 10 during replication 1 to 22 on replication 6). The number of previously radiomarked bears present at least once in the study area during the density estimation period ranged from 16 (replication 1) to 27 (replications 6 and 7). The study area population estimate was 24.7 independent bears present on an average day during the study period (95% CI = 20-32; 80% CI = 22-29). The average proportion of the population marked during the study period was 64%, and radiomarked bears had mean sightability of 24% (Miller et al. Submitted).

Following premarking efforts during 1993 and 1994 in the study area, at least 20 bears were radiomarked whose movements suggest they will likely be in the study area during $\geq$ 1 replication during the density estimate. In or near the study area, an additional 8 bears were radiomarked whose movements suggest that some, at least, will likely never be in the study area at any time during the density estimate in 1995.

The numbers of radiomarked bears are equivalent to the number of radiomarked bears present at least once during the 1985 density estimate (16-27), suggesting that adequate bears are radiomarked to permit an estimate equivalent in precision to the density estimate of 1985.

An additional 2 radiomarked bears are part of long-term reproductive rate studies, but these bears are highly unlikely ever to be found in the Su-hydro density estimation area based on their historic movements. Four radiomarked bears (3 males, 1 female) are missing as a probable consequence of extreme movements, undocumented deaths, or radio failures.

In an earlier report I suggested an hypothesis that heavy hunting of the bears in GMU 13E may have resulted in a population sex ratio so biased against males that conception could be adversely affected (Miller 1993a). This hypothesis appears to be incorrect. Radio-marked brown bear females in GMU 13 had high production of newborn cubs (COY) in spring 1994. Of 19 radio-marked females ($\geq$ 5 years based on estimated or cementum age), 10 had newborns, 4 had yearlings, none had 2-year-old offspring, and 5 were alone during spring 1994. This suggests that the low cub production reported earlier (Miller 1993a) may have had an environmental cause, perhaps low berry production for $\geq$1 year. A good berry crop in 1993 could have resulted in an atypically large number of females that failed to produce litters in previous years, producing cubs in 1994. Estrous females observed during capture efforts during spring 1993 and 1994 were frequently with males. The suggestion that in recent years females have been less frequently seen with males than formerly (Miller 1993a) may have been a consequence of monitoring too infrequently in recent years to permit meaningful comparisons with the more frequent monitoring in the early 1980s.

ACKNOWLEDGMENTS

I gratefully acknowledge the assistance of staff who help tag bears without injury to either bears or people. Staff who assisted in capture of bears in 1993 or 1994 were Bruce Bartley, Suzan Bowen, Jeff Cain, Howard Golden, Jeff Keay (National Biological Survey), Dennis McAllister, Mike McDonald, Jim Woolington, Bill Taylor, and Bob Tobey. Much of the success of our efforts to capture bears is due to the skills of our pilots Jerry Lee (Basin Airmotive, Glennallen) and Harley McMahan (McMahan Flying Service, Gulkana) in fixed-wing and Ken Barnes and Lynn Beckhorn (Saloy Helicopters, Wasilla). The project would not exist without support from regional supervisor Ken Pitcher, research coordinator Dave Anderson, and former research coordinator-current management coordinator Karl Schneider.

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Table 1. Brown bears captured in GMU 13 studies 1980-June 1990.

		Capture						
Tattoo	Sex	Age	Wt.	Date	Freq.	Serial #	Ear Tags	Comments
(277)	F	10.5	225*	4/10/80			1065/1066	w/2 ylgs, not marked, collar shed 80/81 den
(278)	M	9.5	375*	4/19/80			-- --	capture mortality
(279)	M	9.5	400*	4/20/80			1100/1099	collar shed by 6/12/80, recaptured 5/18/83, shot 9/84
280	M	5.5	300*	4/20/80			1097/1098	recollar next spring, recaptured 5/94
(214)	M	4.5	300*	4/22/80			1072/1071	collar shed 9/9/80,recaptured 6/85, shot fall 91
281	F	3.5	250*	4/22/80			16175/15950	not turgid, see 5/81 & 5/94 recaptures
(282)	M	4.5	325*	4/22/80			1079/1080	see 6/82 recapture, shot spring 92
283	F	12.5	280*	4/22/80			690/689	w2 @2.5: 284 and 285
(284)	M	2.5	180*	4/22/80			1074/1073	w/283 see 5/5/81 recapture
285	M	2.5	180*	4/22/80			687/688	w/283
286	M	3.5	264	5/1/80			1081/1082	
(292)	F	3.5	174	5/2/80			1322/1321	Turgid, shot 5/89
(293)	M	(3.5)	277	5/2/80			1116/1115	recaptured 8/81, 5/83, shot spring '85
(294)	M	10.5	607	5/2/80			-- --	died on 8/6/81 recapture
(295)	M	12.5	589	5/3/80			1303/1304	collar shed by 5/4/80
299	F	13.5	285	5/4/80			1109/1110	w/2 ylgs, turgid, recaptured 5/7/81
(297)	M	1.5	65	5/4/80			(1301/1302)	w/299, shot by hunter on 9/18/81
298	M	1.5	65	5/4/80			1318/1317	w/299
306	F	3.5	163	5/4/80			1319/1320	turgid, see 5/13/93 recapture
(308A)	M	6.5	480	5/6/80			(1126/1125)	shot 9/83
(308B)	F	5.5	240	5/6/80			1096/1095	turgid(?) - died on 8/6/81 recapture
(309)	M	12.5	600	5/6/80			(1117/1118)	collar shed by 5/14/80, recaptured 6/85, shot spring '90
(312)	F	10.5	319	5/7/80			1312/1311	w/311
(311)	M	2.5	227	5/7/80			-- --	w/312, shot on 9/16/80
313	F	9.5	286	5/7/80			1119/1120	w/314 @2.5
314	F	2.5	154	5/7/80			(1049/1050)	w/313, recaptured 6/1/85, 6/87
315	F	2.5	90*	5/7/80			1127/1128	alone, recaptured 5/18/83
(284#2)	M	3.5	125	5/5/81			(1074/1073)	near 283 w/2c, shot by hunter of 5/18/81
(331)	F	6.5	172	5/5/81			(1296/1295)	w/332 and 333, died August 1982
(332)	M	2.5	79	5/5/81			(1215/1216)	w/331 and 333, shot by hunter on 9/5/82
(333)	M	2.5	67	5/5/81			(1240/1239)	w/331 and 332, shot by hunter on 9/3/81

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Table 1. Continued

Tattoo	Capture Sex	Age	Wt.	Date	Freq.	Serial #	Ear Tags	Comments
334	F	10.5	325	5/5/8			11292/1291	estrus, missing in 1982
335	F	3.5	194	5/5/81			(1220/1219)	recaptured 5/83, 6/86, and 5/94, age changed + 1 '83 tooth
281#2	F	4.5	--	5/6/81			1201/1202	estrus? recaptured 5/15/83
283#2	F	13.5	261	5/6/81			1089/1090	w/338 and 339 @ 0, recaptured 5/14/83
338	F	0.5	12	5/6/81			1224/1223	w/283, sex switched to female
(339)	M	(0.5)	13	5/6/81			1222/1221	w/283, recaptured 6/85, sex switched to male; shot 9/85
312#2	F	11.5	280	5/6/81			1300/1299	w/2c @0.5 (not captured), recaptured 5/14/83
313#2	F	10.5	284	5/6/81			1120/1119	w/336, recaptured 5/14/83
336	F	0.5	--	5/6/81			1237/1238	w/313, not drugged (abandoned)
337	F	13.5	321	5/6/81			1294/1293	w/3c reunited on 5/9/81, recaptured 5/14/83, 5/94
340	F	3.5	190	5/6/81			1225/1218	not estrus, recaptured 5/15/83, Rt. eartag replaced 5/90
280#2	M	6.5	394	5/7/81			1097/1267	w/F 341, recaptured 5/16/83
(341)	F	6.5	224	5/7/81			(1208/1207)	w/M 280, collar failed, recaptured 6/82; died in 88/89 den
299#2	F	14.5	291	5/7/81			1109/1110	w/2 @2.5 (297 and 298 - not recaptured), recaptured 8/81
(342A)	M	2.5	220	5/7/81			1228/1227	alone, see 5/25/82 recapture, died 7/84
344	F	5.5	--	5/8/81			1204/1203	w/2 cubs subsequently, recaptured 5/14/83
(345)	M	7.5	495	5/8/81			-- --	capture mortality
(308B)#2	F	6.8	--	8/6/81			-- --	recapture mortality
299#3	F	14.8	--	8/6/81			1109/1110	collar replaced, recaptured 5/18/81
(293#2)	M	(4.8)	--	8/6/81			1115/1116	collar replaced, recaptured 5/18/83, shot spring '85
(294#2)	M	11.8	--	8/6/81			-- --	recapture mortality
347	M	14.8	500*	8/6/81			(1234/1233)	collar shed 9/81, recaptured 6/9/85
(342A#2)	M	3.5	250*	5/25/82			1228/1227	collar replaced, died 7/84
(373)	M	9.5	450*	6/11/82			-- --	no tattoo, w/G283 (F), collar shed 6/83
(282#2)	M	6.5	350*	6/11/82			(529/1643)	recap. marked bear, shed collar, recap. 5/84 & 6/86, shot sp. 92
(379)	F	(5.5)	300*	6/11/82			(1595/1585)	w/2@c, Downstream study, shot 9/85
(380)	F	15.5	275*	6/12/82			(1588/532)	w/2@1, not captured, shot 9/83
(381)	F	(3.50	200*	6/12/82			(533/1592)	alone, recaptured 5/18/84 & 6/86, shot 9/89

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Table 1. Continued

Tattoo	Capture Sex	Age	Wt.	Date	Freq.	Serial #	Ear Tags	Comments
313#3	F	12.5	300*	5/15/83		6259	same	w/2@1
(382)	M	1.5	66	5/14/83		12546	2135/2134	w/313 and 383, recapt. 5/18/84, implant, shot 5/93
(383)	F	1.5	53	5/14/8		3	12542	(2490/2491) w/313/ and 382, died unknown causes, implant
283#3	F	15.5	--	5/14/83		(6340)	same	w/cub #3, recaptured 6/86
(003)	F	0.5	--	5/14/83		1024	(1360/1359)	w/283, special cub collar, no tattoo, cub eaten
337#2	F	15.5	--	5/14/83		6309	same	w/385@2
385	F	2.5	60	5/14/83		(15210-12548)	(1695/1694)	w/337, breakway & implant, recaptured 6/85, tags replaced
(312#2)	F	13.5	350*	5/14/83		(6342)	(1299/1300)	w/386@2, died 5/16/84
386	M	2.5	200*	5/14/83		15212-12545(Imp)	2146/2141	w/312, breadway 5B collar, dispersed, implant
344#2	F	7.5	325*	5/14/83		10445	same	w/2@0, not captured
335#2	F	5.5	--	5/14/83		-- same	no radio in chopper	
335#3	F	5.5	236	5/16/83		(15276)	same	alone, one year added to '81 age based on '83 tooth
388	F	14.5	450*	5/14/83		(6988)	(2478/2477)	w/389 and 390@2, recap. 5/84 & 6/86, ear tags gone 5/90, shot 9/93
(389)	M	(2.5)	135	5/14/83		(15214-12544)	2170/2171	w/388 and 390, breakaway 5B collar, died 10/83, implant
390	M	2.5	125*	5/14/83		15211-12543	2148/2147	w/38 and 389, breakaway 5B collar-shed, implant
340#2	F	5.5	250*	5/15/83		(15285)	same	recaptured 5/17/84, collar replaced 6/85
384	F	12.5	300*	5/15/83		15279	2499/2500	w/391, 392, 393@2
(391)	M	2.5	140*	5/15/83		(15213)	(2078/2079)	w/384 et al., breakaway 5B collar, shot 9/84
(392)	M	2.5	140*	5/15/83		(15246)	(2111/2110)	w/384 et al., breakaway 4B collar, shot 5.84
393	F	2.5	105	5/15/83		15247	1589/1598	w/384 et al., breakaway 4B collar
(293#3)	M	(6.5)	439	5/15/83		15291	same	--, shot spring '85
(394)	F	6.5	250*	5/15/83		(15277)	(1693/1692)	w/cub #4, shot 9/84
(004)	F	0.5	10	5/15/83		--	(1358/1357)	w/394-chewed on, no tattoo, died later
(395)	F	3.5	175*	5/15/83		(15289)	(2415/2416)	alone, regular 6B collar, shot 9/4/83
281#3	F	6.5	325*	5/15/83		(15284)	same	w/2@0 (#5 and #6), recollared 5/17/84, 9/94
(005)	M	0.5	8.5	5/15/83		(1023)	(1350/134)	w/281, expandable cub collar, no tattoo, eaten
(006)	F	0.5	8.3	5/15/83		(1026)	(1346/1345)	w/281, expandable cub collar, no tattoo, eaten
280#3	M	8.5	482	5/16/83		(15290)	same	recaptured 6/85
396	F	13.5	274	5/16/83		(14885)	1685/1684	w/2@2, (397, 398), recaptured 6/86, 9/94
(397)	F	(2.5)	132	5/16/83		--	(2493/2492)	w/396, recaptured 6/4/85, shot 9/85
(398)	F	(2.5)	135*	5/16/83		--	2105/2104	w/396, shot 6/86

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Table 1. Continued

Tattoo	Capture Sex	Age	Wt.	Date	Freq.	Serial #	Ear Tags	Comments
(399)	M	(9.5)	600*	5/17/83		(15278)	2087/2108	recaptured 5/15/84, shot 5/87
(400)	M	(20.5)	542	5/17/83		(15281)	2132/2133	recaptured 5/18/84, shot 5/93
299#4	F	16.5	275*	5/18/83		15283	same	w/3@0, darted in den, recaptured 5/15/84
418	M	0.5	13*	5/18/83		1024	1347/1348	w/G299, special cub collar, shed 10/83, old #7
419	M	0.5	13*	5/18/83		1025	1342/1343	w/G299, special cub collar, old #8
(417)	M	0.5	13*	5/18/83		1022	(536/535)	w/G299, special cub collar, shed 7/83, old #9
(279#2)	M	12.5	700*	5/18/83		(10339)	1653/1100	recapture, previous shed collar, recaptured 5/16/84
315#2	F	5.5	203	5/18/83		15288	same	estrus, alone, just marked previously
403	F	6.5	275*	5/18/83		15275	1564/1565	w/2@0, not captured, Downstream
407	F	4.5	220*	5/19/83		2905	2401/1543	alone, downstream, recaptured 6.85
299#5	F	17.5	308	5/15/84		same	w/3@1,	417-419
(417#2)	M	1.5	94	5/15/84		12080	same	w/G299 & siblings, small implant, shot 5/86
418#2	M	1.5	86	5/15/84		12081	same	w/G299 & siblings, large implant
419#2	M	1.5	84	5/15/84		12076	same	w/G299 & siblings, small implant
(399)#2	M	(10.5)	662	5/15/84		(6405)	same	alone, shot 5/87
(388#2)	F	15.5	400*	5/16/84		same	same	w/2c. replaced 6/86, shot 9/93
(16)	M	0.5	--	5/16/84		(1389)	(1389/1390)	w/G388, capture-induced separation, died/shed 6/84
(17)	F	0.5	00	5/16/84		(1623)	(40/50)	w/G388, capture induced separation, died 5/84
312#3	F	14.5	300*	5/16/84		(6332)	same	w/3c, old and new radio failures, capt. mortality on 5/84
(279#3)	M	13.5	800*	5/16/84		(6339/18884)	same	large implant, shot 9/84
281#4	F	(7.5)	350*	5/17/84		(6407)	same	w/2c, recaptured 6/87, 5/94
(21)	M	0.5	14	5/17/84		(1703)	1386/1383	w/G281, drowned?
(22)	M	0.5	14	5/17/84		(1710)	(1385/1384)	w/ G281, killed by BrB
337#3	F	16.5	325	5/17/84		same	same	w/2c, recaptured 6/85
(08)	F	0.5	12	5/17/84		1708	(1338/1337)	w/337, shot spring '90
09	F	0.5	12	5/17/84		1711	1340/1339	w/337
340#3	F	6.5	375*	5/17/84		same	same	w/2c, recaptured 6/85, 6/87
(23)	F	0.5	17	5/17/84		1713	45/28	w/340, shot 4/89, sex determined @ sealing
(24)	M	0.5	14	5/17/84		1706	44/27	w/340, shot, Clearwater Mts. 9/91, sex determined at sealing

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Table 1. Continued

Tattoo	Capture Sex	Age	Wt.	Date	Freq.	Serial #	Ear Tags	Comments
420	F	19.5	350*	5/17/84		6335	2447/2057	w/2@1, one is 421
(421)	M	1.5	78	5/17/84		3984/1886	1644/2086	w/420 & 437. Implant shot 9/88
422	M	4.5	205	5/18/84		18716	2136/2137	alone near camp
381#2	F	(5.5)	263	(5/18/84)		(6341)	same	alone, collar replaced on 6/86, shot 9/89
(400#2)	M	(21.5)	600*	5/18/84		(6325)	same	alone, shot 5/93
(382#2)	M	2.5	148	5/18/84		(15289)	same	w/G313, old implant breakaway, picked up 6/86, shot 5/93
423	F	21.5	300*	5/18/84		(6306)	none	w/4c, drug problem, recaptured 6/86
25	M	0.5	7	5/18/84		1712	39/32	smallest cub w/G423
--	F	0.5	--	5/18/84		--	49/48	other sibling w/G423 not marked or sexed
425	F	14.5	--	6/01/84		(6344)	2486/2413	w/282 M, recaptured 6/86, 3 teeth misplaced
(282#3)	M	8.5	--	6/01/84		(--)	same	w/425, recap. of shed collar, recap. 6/86, shot spring, 92
342#3	M	5.6	--	7/28/84		--	--	capture mortality
(427)	M	(3.5)	195	6/01/85		(6322)	(1697/2113)	rot-away canvas spacer used, shot spring 92
(398#2)	F	(4.5)	200*	6/01/85		(6315)	same	396's offsprint @2 in 1983, shot 6/86
314#2	F	7.5	285*	6/01/85		(6352)	same/2498	w/1@1, @2w/G313 on 5/80; litter at age 6, replaced 6/87
(429)	F	(1.5*)	104	6/01/85		--	(1514/1518)	w/G314 breakaway collar, shot 9/86
(341#2)	F	10.5	--	6/03/85		(6287)	2174/1372	old collar failed, added new tags to old, replaced 6/87
(214#2)	M	9.5	600*	6/03/85		(xx46)	(1071/1649)	previously shed collar, recaptured 5/86, shot fall 91
437	F	2.5	175*	6/03/85		1036	2082/2083	w/G421, probably sibling, rot-away collar
(309/440#2)	M	17.5	700*	6/04/85		(6298)	(2193/1523)	old collar shed,tattoo 440, RA , shot spr.90
(442)	M	(13.5)	750*	6/04/85		--	(1627/2117)	"Harley" yellow flag in rt. ear, shot 9/86, ear tag gone
443	M	8.0*	400*	6/04/85		--	2172/--	red flat in right, blond
(397#2)	F	(4.5)	300*	6/04/85		6449	(1534/1597)	estrus w/443, was w/G396 in 1983@2, shot 9/85
447	F	7.5	400*	6/05/85		10337	2430/2429	--, breakaway
347#2	M	18.5	650*	6/09/85		--	2184/2181	orange flags in ears, old eartags gone
(339/. 450#2)	M	(4.5)	150*	6/09/85		--	(1221/2130)	originally captured in 1981 @0 w/G283, sexed as F, switched w/sex of sibling? tattoos = 450, shot 9/85
385#2	F	4.5	130*	6/09/85		--	1507/1592	green flag on visual drop-off, old ear tags replaced
407#2	F	6.5	200*	6/09/85		same	same	alone drop-off feature added to collar

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Table 1. Continued

Tattoo	Capture Sex	Age	Wt.	Date	Freq.	Serial #	Ear Tags	Comments
337#4	F	17.5	200*	6/09/85		6440	same	w/2@1 - these have no collars
273#2	F	9.5	200*	6/09/85		(6342)	same	age = 3 in 1979, transported, returned,, see 6/87
340#3	F	17.5	250*	6/10/85		(6333)	same	replaced collar, w/2@1, recaptured 6/87
280#4	M	10.5	400*	6/10/85		--	same	collar removed
388#3	F	17.5	425*	6/05/86		(6348)	same	w/2@1, not captured, collar replaced, shot 9/93
335#4	F	8.5	300*	6/05/86		(6288)	same/2481	w/1@2 = G466, collar replaced
466	F	2.5	150*	6/05/86		--	2097/2056	w/mom-335
396#2	F	16.5	300*	6/06/86		(6343)	same	estrus, collar replaced
(381#3)	F	(7.5)	225*	6/06/86		(15285)	--/same	w/2@1, not captured, collar replaced, shot 9/89
(214#3)	M	10.5	600*	6/06/86		--	none/2062	collar removed, shot fall 91
283#4	F	18.5	300*	6/06/86		(6340)	same	w/2@1, not captured, collar replaced
423#2	F	22.5	275*	6/06/86		(6306)	1540/1541	w/3@2, not captured, collar replaced
425#2	F	16.5	250*	6/06/86		6449	same	w2@1, not captured, last tooth pulled, lost 9/89
(282#4)	M	10.5	550*	6/06/86		--	(2129/same)	alone, collar removed, neck bad, shot spring 92
340#4	F	19.5	342	6/05/87		(6293)	same	alone, replaced collar
337#5	F	19.5	288	6/05/87		(27816)	same	estrus, replaced collar, recaptured 5/90
281#5	F	10.5	300*	6/05/87		(27814)	same	estrus, replaced collar
314#3	F	9.5	320*	6/05/87		(6295)	2498/3071	w/3@0, L. ear tag replaced, recap. 5/93
273#3	F	11.5	300*	6/05/87		(27821)	676/3082	w/3@0, replaced left ear tag, replaced collar
(001)	F	0.5	16	6/05/87		--	581/584	w/273 & uncaptured sibling, shot 4/92
(002)	M	0.5	18	6/05/87		--	585/578	w/273 & uncaptured sibling, shot 4/92
341#3	F	12.5	313	6/05/87		(6324)	same	w/1@1, replaced collar, died in 88/89 den
340#5	F	22.5	---	5/27/90		6350	215/214(R)	replaced collar and rt. eartag, recaptured 5/93
(388#4)	F	21.5	---	5/27/90		6440	181/183(R)	replaced collar and 2 missing eartags, shot 9/93
335#5	F	12.5	---	5/27/90		15286	same	w/2@1, not captured; replaced radio, recaptured 5/94
281#6	F	13.5	---	5/27/90		19048	same	Estrus, replaced collar, recaptured 5/94
273#4	F	14.5	---	5/27/90		19049	same/320(Y)	Estrus, replaced collar & rt. eartag, recaptured 5/93
314#4	F	12.5	---	5/27/90		19045	same	w/1 coy capt.-induced separation, replaced collar
423#3	F	26.5	---	5/27/90		6353	same/212(W)	estrus, replaced collar & rt. eartag, see 5/93 recapture
337#6	F	22.5	---	5/27/90		6346	304/213(W/R)	alone, replaced collar & both eartags, recaptured 5/94

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Table 1. Continued

Tattoo	Capture Sex	Age	Wt.	Date	Freq.	Serial #	Ear Tags	Comments
283#5	F	22.5	---	5/27/90		19020	same/193(R)	w/2@1, replaced collar & rt. eartag, recaptured 5/93
396#3	F	20.5	---	5/27/90		19046	same	w/3@1, replaced collar
460#2	F	15.5	---	5/27/90		6322	same	w/2@1, replaced collar, recaptured 5/93

Brown bears captured in upper Susitna River studies, 1986 and 1987.

Tattoo	Capture Sex	Age	Wt.(lbs.)	Date	Freq.	Serial #	Ear Tags	Comments
453	F	4	250*	6/3/86		6345	2443/2363	w/2@0, lost 1c but successfully reintroduced next day
(468)	F	0.5	15	6/3/86		--	562/561	w/G453, shot spring 91
--	F	0.5	17	6/3/86		--	558/559	w/G453
454	F	4	175*	6/3/86		6278	2358/2353	alone, no tattoo
(455)	M	8	525	6/3/86		6351	(2058/1700)	alone, drop-off collar, removed all tags 6/87, shot 9/89
(456)	F	6	250*	6/4/86		(15290)	(2441/2352)	w/2@0, one captured, shot 5/87
--	M	0.5	33	6/4/86		--	551/552	w/uncaptured sibling & 456
457	M	7	525	6/4/86		15291	(2129/2066)	w/458, drop-off collar, removed all tags 6/87
(458)	F	17	200*	6/4/86		6443	2421/2446	w/457, drop-off collar, shed, shot spring 1990
459	F	3	100*	6/4/86		--	2435/2407	alone, recaptured 6/87
460	F	7	300*	6/4/86		6349	560/564	w/2@0, no ear flags, roto tags, recaptured 5/90
--	M	0.5	30	6/4/86		--	--	capture mortality
(--)	F	0.5	30	6/4/86		--	553/554	w/460 & sibling, shot 9/88
461	F	5	275*	6/5/86		15284	(1529)/2427	w/1@0
--	M	0.5	26	6/5/86		--	567/555	w/461
462	F	7	275*	6/5/86		6298	2412/2487	w/1@1, magnet left on? in '86, okay in '87
463	M	1.5	90*	6/5/86		--	2193/2198	w/G462
(464)	M	2	150*	6/5/86		--	2185/2177	alone, recaptured 5/93 when cementum aged at 10, shot 9/94
465	F	3	250*	6/5/86		(6309)	1525/2442	alone, collar removed 6/87

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Table 1. Continued

Tattoo	Capture Sex	Age	Wt.	Date	Freq.	Serial #	Ear Tags	Comments
(466)	F	2	150*	6/5/86		--	2097/2056	offspring w/G335 (Su-Hydro), shot spring 91
467	M	3	190	6/5/86		--	2144/2138	alone
468	F	1	70	5/30/87		27826	558/559	w/mom 453 & sibling, glue-on transmitter
459#2	F	4	198	5/30/87		6344	(same)	alone, rot-away collar, shed summer '88
							27827	glue-on radio (mod. 300)
469	F	6	275*	5/30/87		19053	2364/2424	w/2@1, '85 radio
						1023		glue-on transmitter (mod. 200), 19-50ppm
(470)	M	2	185	5/30/87		(3.930**)	2176/2179	alone, glue-on transmitter
(470#2)	M	2	--	6/8/87		--	--	removed transmitters, shot 9/87
471	M	5	450*	5/30/87		--	2099/1699	w/girlfriend 472
471#2	M	5	--	6/8/87		--	--	removed radio
472	F	12	375*	5/30/87		--	3076/3045	estrus, w/boyfriend (471) and 1@1 (475)
472#2	F	12	--	6/8/87		--	--	removed radio
473	F	6	295	5/30/87		--	3075/3045	alone
(473#2)	F	6	--	6/8/87		--	--	removed radio, shot 9/88
474	M	3	335	5/31/87		6302	2512/2658	alone, '85 radio
						27828	--	glue-on radio (mod. 300)
475	M	1	70*	5/31/87		1022	2637/2504	w/472 and stepdad, glue-on radio
475#2	M	1	--	6/8/87		--	--	removed transmitter, checked teeth
476	M	2	150*	5/31/87		19048	2067/2065	w/477 (sibling?)
						27852	--	glue-in radio
476#2	M	2	--	6/8/87		--	--	removed transmitters
477	F	2	125*	5/31/87		--	2654/2699	w/476 (sibling?)
(477#2)	F	2	--	6/8/87		--	--	removed radio, shot 9/87
478	F	9	340*	6/1/87		X988	3026/3046	w/2@1
						1700	--	glue-on radio (mod. 300)
479	M	2	224*	6/4/87		--	2503/2681	alone
479#2	M	2	--	6/8/87		--	--	removed collar
480	M	2	205	6/4/87		--	2649/2635	alone
480#2	M	2	--	6/8/87		--	--	removed collar
481	F	14	282	6/5/87		6287	3016/3064	w/3@1, old '85 radio
482	F	7	300*	6/6/87		--	3093/3080	w/3@1

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Table 1. Continued

Tattoo	Capture Sex	Age	Wt.	Date	Freq	Serial #	Ear Tags	Comments
482#2	F	7	--	6/8/87		--	--	removed radio
457#2	M	8	600*	6/7/87		--	--	removed collar & ear tags, both badly infected
455#2	M	9	550*	6/8/87		--	--	removed collar & ear tags, both badly infected
465	F	4	310*	6/8/87		--	(same)	alone, removed collar

* Weight estimated, ( ) indicates shed, or removed collar or dead bear, # recapture, - collar or mark replaced subsequently, last tattoo = 425, last cub = #25.

* estimated

** glue-on transmitter

Table 2. Brown bears captured during 1993 and 1994 in the Su-hydro study area.

TATTOO	SEX	AGE	CC**	WT.	DATE	FREQ.	SERIAL #	EAR TAGS	COMMENTS
483	M	11	A	525*	5/12/93	152.027	10636	155R/--	CANVAS SPACER
484	F	2	A	270	5/12/93	152.350	10666	168Y/168R	
485	F	5	A	250	5/12/93	152.730	19040	151Y/171Y	
486	F	6	A	270	5/12/93	152.210	10652	180Y/180R	
487	M	5	A	475	5/12/93	152.680	19054	160Y/160R	Recaptured 6/94
488	F	12	A	325*	5/13/93	152.040	18099	088Y/089Y	W/ 2@O, COLLAR SHED OR BEAR DEAD POST CAPT.
306#2	F	16.5		390	5/13/93	152.640	6349	163/170Y	w/1 COY, INDUCES SEPERATION, OLD TAGS GONE, SEE 5/80 CAPTURE
489	M	4	A	380	5/13/93	152.240	10655	241R/242R	CANVAS SPACER
490	M	2	A	160	5/13/93	--	--	(178R/179R7)	W/491 SIBLING, SHOT 4/94
491	F	2	A	100	5/13/93	--	--	93Y/94Y	W/490 SIBLING
423#4	F	29.5		290	5/13/93	152.850	19052	165Y/212W	W/ 492, REPLACED COLLAR, 1 TAG GONE
492	M	3	A	350*	5/13/93	--	--	135/186R	W/423, BREEDING
493	M	6	A	390	5/13/93	153.740	27816	227/226	CANVAS SPACER
494	M	5	A	390	5/13/93	(153.480)	(6446)	(372/356R)	CANVAS SPACER, SHOT 9/93
495	F	2	A	210	5/13/93	152.870	19054	216/3033Y	CANVAS SPACER, recaptured 5/94
496	F	7	B	265	5/14/93	153.720	27814	221/098Y	W/497 @ 1
497	F	1.5	K	80	5/14/93	--	--	158/162Y	W/MOM 496, APPARENT CAPT.-INDUCED SEPARATION
498	F	20	A	390*	5/14/93	152.630	6348	176/179Y	W/2 COY, UNCAPTURED--SEPARATED
498	"	"		"	5/18/93	"	"	"	reunited family
511	F	0.5	K	18	5/18/93	--	--	214/213G	reunited family
512	M	0.5	K	21	5/18/93	--	--	216/215G	reunited family
499	F	6	A	280	5/14/93	153.450	6443	(274/215Y)	NO PREVIOUS LITTER, recaptured 5/94
500	M	3	A	270	5/15/93	153.870	6293	159/177R	CANVAS SPACER
340#6	F	25.5		355	5/15/93	153.830	6288	213Y/214W	W/MM 487 & 3 @2, REPLACED COLLAR
501	F	2.5	K	185	5/15/93	152.230	10654	154/164Y	CANVAS SPACER, W/340, 2 SIBS., & MALE 487
502	F	2.5	K	175*	5/15/93	--	--	191/192Y	W/340 (MOM), 2 SIBS., recaptured 5/94
503	F	2.5	K	180	5/15/93	--	--	166Y/170R	W/340 (MOM), 2 SIBS., & MALE 487
504	F	5	A	310	5/16/93	152.570	6342	161/167Y	CANVAS SPACER
314#4	F	15.5		NA	5/16/93	153.760	27821	207/208Y	COLLAR REPLACED, W/ 3 @ 2

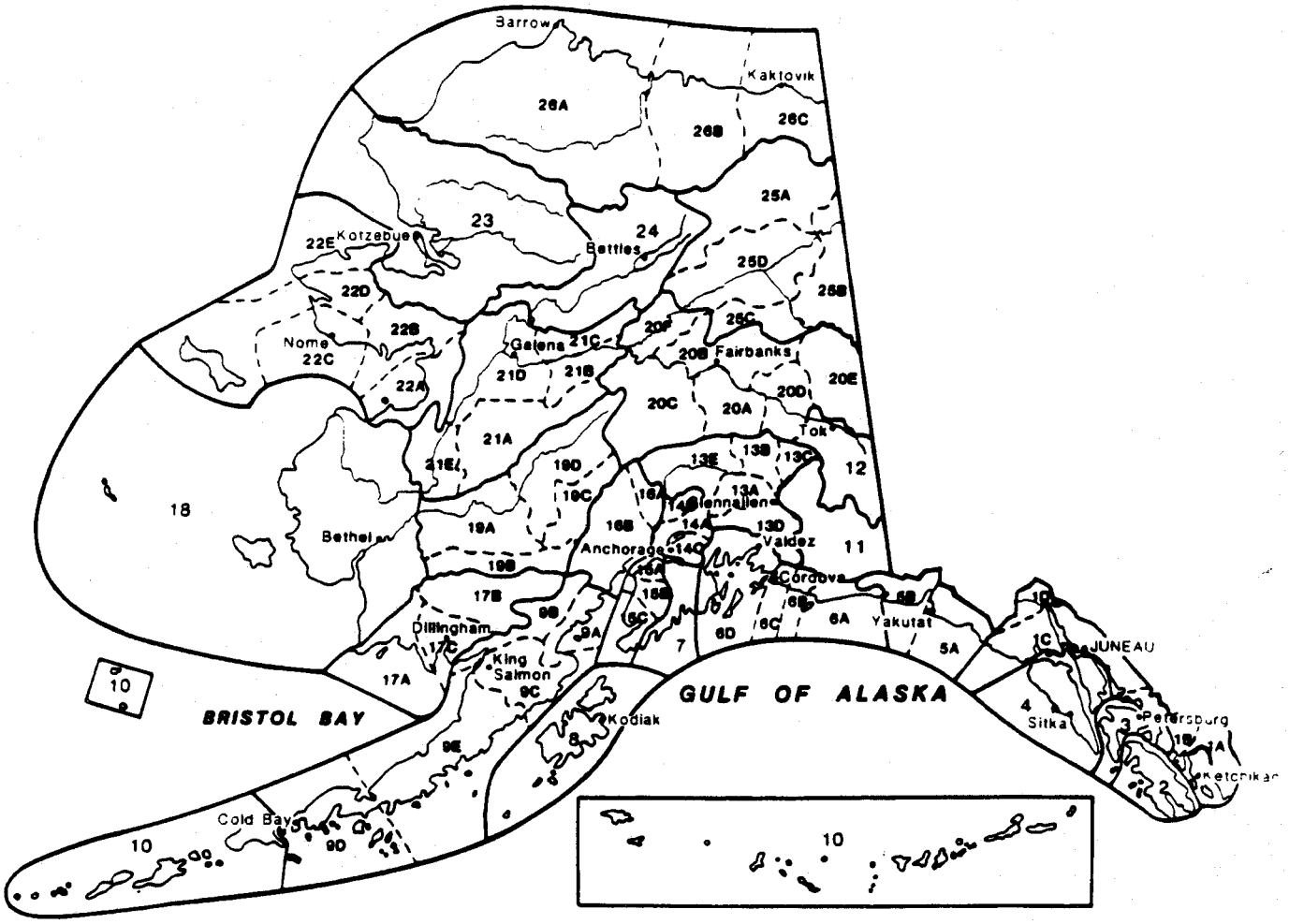
Continued on next page

Table 2, continued.

TATTOO	SEX	AGE	CC**	WT.	DATE	FREQ.	SERIAL #	EAR TAGS	COMMENTS
505	M	2.5	K	200*	5/16/93	--	--	176/288R	W/314 (MOM) AND 2 SIBS
506	F	2.5	K	180*	5/16/93	153.890	6275	206/205Y	W/314 (MOM) AND 2 SIBS, SPACER
507	F	2	A	170*	5/16/93	--	--	199/200	W/314 (MOM) AND 2 SIBS, SHED COLLAR
273#5	F	17.5		285	5/16/93	152.670	6352	210Y/273	W/ MM 464, REPLACED COLLAR, L. EARTAG
464#2	M	9.5		550*	5/16/93	(152.720)	(6309)	(292/291R)	W/ FF 273, NO EARTAGS LEFT, SHOT 9/93
460#3	F	14.5		300	5/16/93	152.660	6351	560/564R	REPLACED COLLAR, W/ 2 @ 4
513	F	4	K	240	5/19/93	153.840	6305	283/156Y	W/460 AND 1 SIB, SHOT DLP SUMMER '93
508	F	6	B	370	5/17/93	152.920	15290	202/201Y	ALONE
509	F	3	A	205	5/17/93	152.930	15291	295/294Y	ALONE, recaptured 5/94
283#6	F	25.5		290	5/17/93	152.580	6343	284Y/193R	REPLACED COLLAR AND L. EARTAG, W/ M 483
510	M	20	A	650	5/17/93	152.560	6341	249/250R	W/FF 273
280#4	M	19		680	5/20/94	152.690	5464	300/298R	w/281
281#7	F	17		375*	5/20/94	152.540	5460	2484/2474Y	Replaced collar & eartags
514	M	~4	*	375*					w/ F 502
502#2	F	3	K	240	5/20/94	152.490	5455	same	w/ Male 514
516	M	~3	*	260	5/20/94	--	--	285/285R	eartag error?, RA
518	F	~5	*	240	5/20/94	152.700	5465	243/244Y	loose collar, 23.5"
507#2	F	3	K	210	5/20/94	152.550	5461	same	w/ F 518
487#2	M	6		550	5/20/94	same	same	same	New RA spacer
495$2	F	3		245	5/20/94	same	same	same	New RA spacer
509#2	F	4		240	5/21/94	same	same	same	w/ lg. uncaptured M, new RA, expanded 1"
515	M	~5	*	375*	5/21/94	152.510	5457	226/223R	RA, w/ F499
499#2	F	7		300	5/21/94	same	same	288/289Y	w/ M 515, ears infected, collar expanded
335#6	F	16		290	5/21/94	152.760	5469	182/181Y	Replaced collar, w/1@1
506#2	F	3	K	210	5/21/94	same	same	same	Alone, new RA, expanded 1"
501#2	F	3	K	230*	5/21/94	152.530	5459	same	Alone, RA applied
337#7	F	26	*	350*	5/22/94	152.750	5468	same	Alone
517	F	~17	*	330	5/22/94	152.650	5463	243/252Y	w/ 2 @ 1, not captured
519	M	~3	*	270	5/22/94	152.710	5466	232/236R	Alone, RA spacer
461#2	F	12		294	5/22/94	152.740	5467	same/251Y	Replaced '86 collar, w/ 3 @ 1, uncaptured

* = ESTIMATED VALUE, FOR AGE = CEMENTUM AGE PENDING
** = Matson's certainty code, K = known age

Alaska's Game Management Units



The Federal Aid in Wildlife Restoration Program consists of funds from a 10% to 11% manfacturer's excise tax collected from the sales of handguns, sporting rifles, shotguns, ammunition, and archery equipment. The Federal Aid program distributes funds to states using a formula based on each state's geographic area and number of paid hunting license holders. Alaska receives a maximum of 5% of revenues collected each year. The Alaska Department of Fish and Game uses its funds to help restore, conserve, and manage wild birds and mammals. These funds are also used to educate hunters to develop skills and attitudes for responsible hunting. Federal Aid funds paid for 75% of this study.

Alaska Dep of Fish & Game