TERROR LAKE HYDROELECTRIC PROJECT

REPORT ON BROWN BEAR STUDIES, 1985

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ALASKA DEPARTMENT OF FISH AND GAME

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SUMMARY OF FINDINGS

This report covers the results of the 4th year (1985) of a 5-year investigation of the impacts of the Terror Lake hydroelectric project on brown bears. The operational phase of the hydroelectric project began in 1985.

Twenty brown bears were captured (12 recaptures, 8 new captures) in 1985. One hundred thirty-three bears have been captured during the study and radio-collars have been placed on 77 bears (29 males, 48 females).

Reproduction data were collected for 35 females in 1985. Nine females were single; 10 had newborn cubs; 13 had yearling cubs; 2 had 2.5 year old cubs; and 1 had 3.5 year old cubs. Age of parturition in 1985 ranged from 9.5 to 23.5 years. Mean litter size in 1985 was 2.9. Survival of newborn cubs into the denning period was estimated at 79%. Survival of cubs born in 1984 to the 1985 denning period was estimated at 66%.

Eleven marked bears (7 males, 4 females) died in 1985. Four females died of natural causes. Cumulative mortality (1982-1985) of marked bears was 26 (16 males, 10 females). Sport harvest was the most common source of mortality (46%).

An unusually cold, late spring and early summer resulted in late initial green-up, retarded vegetative development and poor berry crops in 1985. Habitat use by bears was influenced by the state of vegetative development through late July. Alpine feeding was not extensive until late July, about 3 weeks later than usual. Salmon was a more important food source in 1985 than in previous years. Salmon escapement was high in the study area in 1985 except

in the Barabara Lake system where no spawning of sockeye salmon (Oncorynchus nerka) was observed.

The incidence of bear/human encounters was unusually high in 1985, possibly the result of reduced natural foods. Deer hunters reported numerous incidents of nuisance brown bears in hunting camps and a high incidence of bears was reported near the village of Port Lions.

Denning activities of 35 radio-collared bears were monitored throughout the 1984-85 denning period. Denning periods ranged from 0-256 days. Two males did not den. Females with newborn cubs, had the longest denning periods. Bears began entering 1985-86 dens by 1 November 1985. Unusually warm and rainy weather in December 1985 may have been a factor in the movement of 9 bears to second den sites between 17 November 1985 and 6 January 1986. Distribution and characteristics of 1985-86 dens were similar to those noted in previous years. Bears continued to exhibit a high degree of fidelity for previously used denning areas.

Movements data were collected for 48 radio-collared bears in 1985. Thirty-seven radio-collared bears were still being monitored at the end of 1985. Analysis of bear movements during the 2-year post-construction phase (1985, 1986) will be presented in the final report. Analysis of construction impacts will also be presented in the final report.

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INTRODUCTION AND ACKNOWLEDGEMENTS

Background

This report covers results of the 4th year's study (1985) in a 5-year research project to monitor the impacts of the Terror Lake hydroelectric project on brown bears (*Ursus arctos*). The purpose of the study is to document changes in use of the study area by brown bears in response to construction and operation of the Terror Lake hydroelectric project. Background information, study area description and research methods were reported in Smith and Van Daele (1984, 1986); Smith et al. (1985).

Acknowledgements

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Project Activities in 1985

The first year of the operational phase of the Terror Lake hydroelectric began in 1985. All major construction activities on the project were completed by late 1984. Electrical power was being generated throughout most of 1985. A maintenance crew was permanently stationed at the Kizhuyak River powerhouse to oversee operations. A helicopter was used periodically for maintenance activities all year but the level of activity was much lower than had occurred during the previous 3 years. Vehicular traffic was much reduced on the access road.

Water flow from Terror Lake was reduced until the reservoir was filled in August, but flows from tributary streams appeared to be sufficient for salmon spawning in the lower river. Generator failure in July resulted in increased activity at the powerhouse by repair crews. Severe weather caused damage to the transmission line near the head of Elbow Creek in mid-December and increased helicopter activity occurred while repairs were made.

RESULTS AND DISCUSSION

Sex and Age Composition of Captured Bears

Nineteen bears (12 recaptures, 7 new captures) were captured during 2 periods, 20-23 June and 4-5 July 1985 (Table 1). The new captures included 1 subadult male, 5 maternal females and 1 female yearling cub. Twelve females and 3 males were radio-collared. Two males (#s 023, 101) died during recapture attempts.

One additional bear, a female with 3 cubs-of-the-year, was captured and radio-collared at the Port Lions village

Table 1. Brown bears captured in Terror Lake study area as of December, 1985.

Bear no.	Sex	Age	Capture date	Ear tag no. (L/R)	Comments
001	F	3.5	4/22/82	1799/1784	pre-estrus; radio failed by 8/20/83
002	M	15.5	4/22/82	1833/1835/1844	ear radio attached w/duflex tag to right ear; ear radio last heard on 7/20/82; recaptured 6/06/84
003	M	5.5	4/22/82	1839/1842	collar shed by 6/02/83
004	M	6.5	4/22/82	1836/1834	Collar shed by 10/20/83; recaptured 6/21/85
005	F	13.5	4/23/82	1740/1744	w/006, 007; w/2 newborn cubs on 6/15/83
006	M	2.5	4/23/82	1825/1823	w/005, 007; killed by hunter on 5/30/82; aged at 3.5 in 1982
007	M	2.5	4/23/82	1819/1824	w/005, 006; killed by hunter on 5/18/83; aged at 3.5 in 1982
008	F	11.5	4/23/82	1739/1749	w/009, 010; radio failure by 10/20/83; recaptured 6/21/85
009	M	2.5	4/23/82	1820/1829	w/008, 010; killed by hunter on 4/29/85
010	F	2.5	4/23/82	1726/1735	w/008, 009
011	F	6.5	4/23/82	1728/1733	w/012, 013
012	F	1.5	4/23/82	1781/1732	w/011, 013
013	M	1.5	4/23/82	1814/1816	w/011, 012
014	M	6.5	4/23/82	1818/1847	suspected radio failure by 9/08/83
015	F	7.5	4/25/82	1741/1743	milk in pectoral mammae only; seen w/smaller bear, possibly weaned cub on 5/04/82; recaptured 6/06/84
016	M	11.5	4/25/82	1809/1808	w/017; collar shed by 10/20/83
017	F	21.5	4/25/82	1789/1731	w/016; signal lost between 11/12/83 and 3/19/84
018	F	5.5	4/25/82	1747/1750	w/019; probably younger than cementum age, possibly 3.5 yr. cub of #019.
019	F	6.5	4/25/82	1736/1782	w/018; pre-estrus; recaptured 7/12/84
020	F	6.5	4/25/82	1746/1738	pectoral mammae had milk; non-estrus; recaptured 7/10/84
021	M	5.5	4/25/82	—	w/022; capture mortality
022	F	7.5	4/25/82	1729/1730	w/021; possibly pre-estrus; recaptured 6/08/84
023	M	3.5	4/26/82	1805/1802	w/003; recaptured 6/02/83; radio failed by 9/04/84; capture mortality 6/22/85
024	M	7.5	4/26/82	1803/1810	shed radio-collar by 5/20/84
025	M	13.5	4/26/82	1840/1827	collar shed by 7/05/82
026	M	5.5	4/26/82	1816/1813	DLP kill on 8/15/82
027	M	13.5	4/27/82	1812/1822	collar shed by 5/21/82; recaptured on 6/02/83; killed by hunter on 10/14/83
028	M	3.5	4/27/82	1837/1817	killed by hunter on 5/03/83
029	F	17.5	4/29/82	not recorded	w/030, 031, 032; dead by 10/7/82, suspected shot by hunter

Table 1. (Cont'd). Brown bears captured in Terror Lake study area as of December, 1985.

Bear no.	Sex	Age	Capture date	Ear tag no.(L/R)	Comments
030	M	2.5	4/29/82	1801/1804/1807	w/029, 031, 032; ear radio attached to left ear with duflex tag nos. 1804, 1807; suspected radio failure by 5/10/82.
031	M	2.5	4/29/82	1843/1821	w/029, 030, 032
032	M	2.5	4/29/82	1850/1806	w/029, 030, 031
033	M	3.5	5/01/82	1852/1853	suspected radio failure by 5/20/83; radio collar found 1985
034	F	13.5	5/02/82	1757/1755	w/035, 036; probable radio failure, last located 9/08/82.
035	F	2.5	5/02/82	--/1763	w/034, 036; ear radio apparently faulty, not relocated.
036	F	2.5	5/02/82	1765/1768	w/034, 035
037	F	4.5	5/02/82	1748/1788	w/038; recaptured 6/05/84; natural mortality 1985
038	F	3.5	5/02/82	1777/1797	w/037; recaptured 7/09/84
039	M	2.5	5/02/82	--/1858	w/040, 041; ear radio; last located 5/21/82; aged at 3.5 in 1982 on 6/02/83
040	M	2.5	5/02/82	1854/1862	w/039, 041; aged at 3.5 in 1982; recaptured 6/02/83; radio failed by 9/25/84; recaptured 6/21/85
041	M	2.5	5/02/82	1864/1841	w/039, 040; aged at 3.5 in 1982
043	F	4.5	7/22/82	1793/1745	capture mortality
044	F	3.5	7/22/82	1796/1795	recaptured 7/09/84
045	M	5.5	7/22/82	1875/1863	collar shed by 8/11/83
046	F	6.5	7/23/82	1769/1762	w/047 and 1-yearling not captured
047	F	1.5	7/23/82	1764/1773	w/046 and 1-sibling not captured
048	F	23.5	7/24/82	1794/1792	w/049, 050; recaptured 6/05/84; natural mortality 1985
049	M	1.5	7/24/82	1874/1830	w/048, 050; killed by hunter 5/12/85
050	F	1.5	7/24/82	1780/1771	w/048, 049
051	F	8.5	7/24/82	1742/1791	w/052; recaptured 7/12/84
052	F	1.5	7/24/82	1759/1761	w/051
053	F	8.5	7/24/82	--	w/054; capture mortality
054	M	1.5	7/24/82	1871/1860	w/053
055	F	13.5	7/24/82	1787/1766	w/056, 057, 058; recaptured 6/08/84
056	F	0.5	7/24/82	1772/1753	w/055, 057, 058
057	M	0.5	7/24/82	1872/1867	w/055, 056, 058
058	M	0.5	7/24/82	1861/1856	w/055, 056, 057
059	M	3.5	7/25/82	1882/1887	recaptured 7/11/84; killed by hunter 5/13/85

Table 1. (Cont'd). Brown bears captured in Terror Lake study area as of December, 1985.

Bear no.	Sex	Age	Capture date	Ear tag no. (L/R)	Comments
060	F	14.5	7/25/82	1718/1767	w/061, 062, 063; radio failed by 3/19/84, recaptured 7/05/85
061	F	0.5	7/25/82	1725/1723	w/060, 062, 063
062	F	0.5	7/25/82	1714/1716	w/060, 061, 063
063	F	0.5	7/25/82	1722/1715	w/060, 061, 062
064	F	20.5	7/25/82	1724/1719	w/065, 066; recaptured 6/04/84; signal lost by 11/1/85
065	F	1.5	7/25/82	1798/1751	w/064, 066
066	F	1.5	7/25/82	1754/1758	w/064, 065
067	F	20.5	7/25/82	1785/1783	w/068, 069; recaptured 7/09/84
068	F	1.5	7/25/82	1737/1775	w/067, 069
069	F	1.5	7/25/82	1760/1720	w/067, 068
070	F	4.5	7/26/82	1711/1706	recaptured 7/10/84
071	F	8.5	7/26/82	1707/1702	w/a 0.5 yr. old cub not captured
072	F	18.5	7/26/82	1786/1756	w/073 and a 0.5 yr. old cub not captured; recaptured 6/08/84; natural mortality 10/14/85
073	M	0.5	7/26/82	1870/1892	w/072 and a sibling not captured
074	F	17.5	7/26/82	1727/1752	w/075, 076; recaptured 7/09/84; DLP mortality 10/28/84
075	F	1.5	7/26/82	1717/1703	w/074, 076
076	M	1.5	7/26/82	1873/1845	w/074, 075
077	F	20.5	7/26/82	1779/1705	w/3-1.5 yr. old cubs not captured; radio failure by 8/31/83; killed by deer hunter on 10/28/84
023*	M	4.5	6/02/83	1950/1802	w/080; recapture; capture mortality on 6/22/85
027*	M	14.5	6/02/83	1812/1822	w/078; recapture killed by hunter on 10/12/83
040*	M	3.5	6/02/83	1854/1862	recapture; radio failed by 9/25/84; recaptured 6/21/85
078	F	8.5	6/02/83	2025/2001	w/027; estrus; recaptured 6/21/85
079	M	14.5	6/02/83	1928/1933	breeding w/077; recaptured 7/09/84; collar removed
080	F	25.5	6/02/83	2065/2066	w/023; estrus; collar shed by 7/21/83
081	F	10.5	6/03/83	2067/2064	w/082, 083; non-estrus; recaptured 6/21/85
082	F	2.5	6/03/83	2012/2015	w/081, 083
083	M	2.5	6/03/83	1930/1929	w/081, 082; killed by hunter on 5/07/84
084	M	12.5	6/03/83	1927/1926	collar shed by 10/12/83
085	F	4.5	6/03/83	2055/2054	non-estrus; recaptured 6/20/85
086	F	8.5	6/03/83	1776/1712	w/087; non-estrus; recaptured 6/23/85
087	F	1.5	6/03/83	2073/2058	w/086

Table 1. (Cont'd). Brown bears captured in Terror Lake study area as of December, 1985.

Bear no.	Sex	Age	Capture date	Ear tag no. (L/R)	Comments
088	F	9.5	6/04/83	2071/2072	w/089, 090; non-estrus; signal lost by 9/04/84
089	F	2.5	6/04/83	2016/2007	w/088, 090
090	F	2.5	6/04/83	2024/2005	w/088, 089
091	F	8.5	6/04/83	2056/2075	w/unmarked adult; estrus; natural mortality 5/85
092	F	5.5	6/05/83	2052/2074	w/093, 094; did not rejoin cubs; non-estrus; signal lost by 10/09/84
093	F	1.5	6/05/83	2006/2020	w/092, 094; aged by dentition; abandoned
094	F	1.5	6/05/83	2003/2023	w/092, 093; aged by dentition; abandoned
095	M	4.5	6/05/83	1907/1921	w/unmarked adult; apparently killed by another bear between 5/09/84 and 5/20/84
096	F	7.5	6/05/83	2062/2069	estrus; recaptured 6/23/85
027*	M	14.5	6/05/83	1812/1822	w/078; recaptured to adjust radio-collar; killed by hunter on 10/12/83.
098	M	7.5	6/04/84	1865/1910	hunter kill 4/27/85
064*	F	22.5	6/04/84	1724/1719	recapture; estrus
048*	F	25.5	6/05/84	1794/2034	recapture; estrus; natural mortality 1985
099	F	10.5	6/05/84	2030/2035	estrus
100	M	5.5	6/05/84	1949/1877	
011*	F	8.5	6/05/84	1728/---	recapture; w/2 newborn cubs not captured
101	M	9.5	6/05/84	1831/1883	capture mortality 6/21/85
037*	F	6.5	6/05/84	1748/1788	recapture; estrus; natural mortality 1985
102	M	5.5	6/05/84	1890/1915	
103	M	6.5	6/06/84	1880/1938	lost signal by 3/85; faint signal 12/29/85
002*	M	17.5	6/06/84	1833/1948	recapture; radio-collar removed
015*	F	9.5	6/06/84	1741/1743	recapture; estrus; recently nursed, suspect lost newborn litter
104	M	4.5	6/08/84	1889/1924	lost signal by 3/85; signal heard on Afognak Island on 12/5/85 and 12/17/85
022*	F	9.5	6/08/84	1730/1729	recapture; estrus
072*	F	20.5	6/08/84	1786/1756	recapture; estrus; natural mortality 10/14/85
055*	F	15.5	6/08/84	---/---	recapture; estrus
105	M	5.5	6/08/84	1935/1939	killed by hunter on 11/04/84
018*	F	7.5	6/08/84	1747/1750	recapture; estrus; recently nursed, suspect lost newborn litter
044*	F	5.5	7/09/84	1796/1795	recapture; estrus
046*	F	8.5	7/09/84	1769/1762	recapture; w/106, 107 and one 0.5 yr old cub not captured

Table 1. (Cont'd). Brown bears captured in Terror Lake study area as of December, 1985.

Bear no.	Sex	Age	Capture date	Ear tag no. (L/R)	Comments
106	F	0.5	7/09/84	2044/2032	w/046, 107 and one sibling not captured
107	M	0.5	7/09/84	1916/1898	w/046, 106 and one sibling not captured
038*	F	5.5	7/09/84	1777/1797	recapture; possible estrus
067*	F	22.5	7/09/84	2017/2219	recapture; estrus
074*	F	19.5	7/09/84	1727/1752	recapture; w/108, 109, 110; killed by deer hunter on 10/28/84
108	M	0.5	7/09/84	1914/1932	w/074, 109, 110
109	M	0.5	7/09/84	1918/1832	w/074, 108, 110
110	F	0.5	7/09/84	2031/2042	w/074, 108, 109
079*	M	15.5	7/09/84	1928/---	recapture; radio-collar removed
020*	F	8.5	7/10/84	1746/2049	recapture; estrus; lactating; suspect recently lost newborn cubs
071*	F	10.5	7/10/84	1707/2045	recapture; w/111, 112, 113
111	F	0.5	7/10/84	2018/2215	w/071, 112, 113
112	F	0.5	7/10/84	2219/2213	w/071, 111, 113
113	F	0.5	7/10/84	2019/2022	w/071, 111, 112
070*	F	6.5	7/10/84	2224/1706	recapture; w/2-0.5 yr old cubs not captured
114	F	6.5	7/10/84	1925/1922	w/2-1.5 yr old cubs not captured; shed collar by 8/28/84
005*	F	15.5	7/11/84	2059/1740	recapture; w/2-1.5 yr old cubs not captured
059*	M	5.5	7/11/84	1822/1920	recapture; killed by hunter 5/13/85
019*	F	8.5	7/12/84	1736/1782	recapture; w/115, 116
115	M	0.5	7/12/84	1917/1911	w/019, 116
116	M	0.5	7/12/84	1866/1923	w/019, 115
051*	F	10.5	7/12/84	1742/1791	recapture; w/117, 118
117	F	0.5	7/12/84	2039/2029	w/051, 118
118	F	0.5	7/12/84	2043/2041	w/051, 117
119	F	6.5	7/13/84	2205/2208	estrus
120	M	12.5	7/13/84	1946/1945	
121	F	13.5	7/13/84	2203/2202	w/122 and 1 uncaptured yearling
122	F	1.5	7/13/84	2014/2002	w/121 and 1 uncaptured sibling
123	F	13.5	7/13/84	2009/2037	w/124, 125, 126
124	F	2.5	7/13/84	2027/2201	w/123, 125, 126
125	F	2.5	7/13/84	2223/2036	w/123, 124, 126
126	F	2.5	7/13/84	2046/2033	w/123, 124, 125
127	F	8.5	7/13/84	2217/2038	estrus; killed by hunter on 11/03/84

Table 1. (Cont'd). Brown bears captured in Terror Lake study area as of December, 1985.

Bear no.	Sex	Age	Capture date	Ear tag no. (L/R)	Comments
085*	F	6.5	6/20/85	2228/2054	recapture; estrus
004*	M	9.5	6/21/85	1967/1972	recapture
078	F	10.5	6/21/85	2025/3026	recapture; w/2-1.5 yr old cubs not captured
008*	F	14.5	6/21/85	2004/2048	recapture; w/1-1.5 yr old cub not captured
081*	F	12.5	6/21/85	2067/2237	recapture; w/3-1.5 yr old cubs not captured
101*	M	10.5	6/21/85	---/---	recapture; capture mortality
040*	M	5.5	6/21/85	1854/1955	recapture
023*	M	6.5	6/22/85	---/---	recapture; capture mortality
086*	F	10.5	6/23/85	1776/2249	recapture; estrus; lactating; suspect recently lost newborn litter
096*	F	9.5	6/23/85	2062/2021	recapture; w/2-0.5 yr old cubs; poor condition
128	F	8.5	7/04/85	2216/2078	w/2-1.5 yr old cubs not captured
129	F	11.5	7/04/85	2233/2234	w/3-0.5 yr old cubs not captured
130	M	3.5	7/04/85	1952/1953	
131	F	12.5	7/04/85	2204/2245	w/2-1.5 yr old cubs not captured
132	F	16.5	7/05/85	2229/2227	w/3-1.5 yr old cubs not captured
133	F	11.5	7/05/85	2019/2240	w/134
134	F	1.5	7/05/85	2222/2226	w/133
060*	F	17.5	7/05/85	2094/2050	recapture; estrus; lactating
135	F	9(est.)	12/5/85	2060/2085	w/3-0.5 yr old cubs not captured; Port Lions dump capture

* Recaptures

dump on 4 December 1985 during an investigation of nuisance bear complaints.

A total of 133 individual bears has been captured in the first 4 years of the study. Radio-collars have been put on 77 different bears, including 29 males and 48 females. Including recaptures, 159 bears have been captured during the study.

Reproduction and Cub Survival

Reproductive data were collected for 35 radio-collared females in 1985 (Table 2). Ten females (29%) had litters of newborn cubs in 1985. Thirteen females (37%) had litters of yearling cubs, 2 females (6%) had litters of 2.5 year old cubs, and one female (3%) had a litter of 3.5 year old cubs. Nine females (26%) were single.

Ten females cubs had a total of 29 newborn cubs and an initial mean litter size of 2.9 (range=2-3). Twenty-three of those cubs (79%) were believed to have survived until the fall denning period. A total of 6 cubs was lost by 5 females, a mortality rate of 21%. Two females (#s 015, 018) lost their entire litters of 2 cubs each. Two females (#s 020, 055) each lost 1 cub from their 3-cub litters. The losses of newborn cubs occurred throughout the year.

The 10 females with newborn cubs ranged in age from 9.5 to 23.5 years old.

The survival rate of cubs born in 1984 through fall 1985 was 66% (18/ 27). Two females (#s 011, 051) each lost 1 cub between their last sighting in 1984 and their first sighting in 1985. Both lost their remaining litter members in 1985. Female #078 also lost her litter of 2 yearlings in

Table 2. Reproductive status of radio-collared female brown bears in Terror Lake study area, 1985

Bear no.	Age	No. cubs	Age of cubs	Status of Cubs	Comments
005	16.5	2	2.5	2 seen on 10/14/85	---
008	14.5	1	1.5	1 seen on 9/06/85	---
011	9.5	1	1.5	1 seen on 11/1/85; alone on 11/17/85	lost 1 of 2 cubs between 10/20/84 and 5/29/84
015	10.5	2	0.5	2 seen on 6/27/85; 1 seen on 7/20 and 10/4/85; alone on 10/14/85	---
018	8.5	2	0.5	2 seen on 9/2/85; alone on 11/1/85	---
019	8.5	2	1.5	2 seen on 9/12/85; 1 seen on 10/14/85	---
020	9.5	3	0.5	2 seen on 6/27/85; 2 seen on 11/17/85; alone on 11/24/85	--- cubs may be in den
022	10.5	3	0.5	3 seen on 9/12/85	---
038	6.5	0	---	---	seen w/male #102 on 5/20/85
044	6.5	0	---	---	seen w/adult on 7/20/85
046	9.5	0	---	---	seen w/unmarked large adult on 6/20/85
051	10.5	1	1.5	1 seen on 5/29/85; alone on 6/15/85	lost 1 of 2 cubs between 10/26/84 and 5/29/85
055	16.5	3	0.5	3 seen on 9/12/85; 2 seen on 10/14/85	---
060	17.5	0	---	---	estrus and lactating on 7/05/85
064	23.5	0	---	---	seen w/adult on 5/20/83
067	23.5	3	0.5	3 seen on 9/12/85	---
070	7.5	2	1.5	2 seen on 11/01/85	---
071	11.5	3	1.5	3 seen on 9/25/85; 2 seen on 11/01/85	---
072	21.5	0	---	---	seen w/1 adult on 5/29 and 6/15/85; natural mortality by 10/14/85
078	10.5	2	1.5	2 seen on 9/12/85; alone on 9/25/85	---
081	12.5	3	1.5	3 seen on 11/01/85	---
085	6.5	0	---	---	estrus on 6/20/85
086	9.5	0	---	---	on 6/23/85 in estrus; lactating; recently nursed; w/male #004; suspect lost cubs recently

Table 2. (Continued). Reproductive status of radio-collared female brown bears in Terror Lake study area, 1985

Bear no.	Age	No. cubs	Age of cubs	Status of Cubs	Comments
091	10.5	1-3(?)	1.5	1 yearling seen on 4/24/85 at den	female died in den between 4/24 and 6/27/85
096	9.5	2	0.5	2 seen on 12/05/85	poor condition when recaptured on 6/23/85
099	11.5	0	---	---	w/male #004 on 6/21/85
119	7.5	2	0.5	2 seen on 9/02/85	---
121	14.5	2	2.5	between 6/20 and 7/25/85 cubs weaned	---
123	14.5	3	3.5	between 6/23 and 6/27/85 cubs weaned	---
128	8.5	3	1.5	3 seen on 6/23/85; 2 seen on 7/20/85	3 cubs seen only when female captured on 6/23/85
129	11.5	3	0.5	3 seen on 12/29/85	---
131	12.6	2	1.5	2 seen on 10/04/85	---
132	16.5	3	1.5	3 seen on 10/14/85	---
133	11.5	1	1.5	1 seen on 10/14/85	female cub #134 captured
135	9(est.)	3	0.5	3 seen on 12/29/85	captured at Port Lions dump on 12/04/85

1985. Four of 11 females (36%) with litters born in 1984 had lost their entire litters by fall 1985.

Female #091, which had a litter of 3 newborn cubs in 1984, died in her den between 24 April and 27 June 1985. At least one cub was seen with her at the den on 24 April, but the ultimate fate of the cubs is unknown.

Two of 3 females with 2.5 year or older cubs separated from their litters in 1985. Female #060 separated from her 3.5 year old litter early in 1985. Female #123 weaned her litter of 3-3.5 year old cubs by 27 June. Female #005 had not weaned her litter of 2-2.5 year old cubs by 14 October and it was assumed that she entered the den with them.

Thirteen cases of family break-up have been documented in 4 years of study. In 6 cases (46%) cubs were weaned when they were approximately 3.5 years old. In 7 cases (54%) cubs were weaned at 2.5 years old. Barnes (1985) also reported a high incidence of females keeping their cubs until the third year of life on southwest Kodiak Island.

Among the 9 females that were single in 1983, 3 (#s 038, 044, 085) were 6.5 years old, possibly too young to have bred successfully. Two females (#s 046, 060) were accompanied by cubs until well after the breeding season in 1984. Female #072 (21.5 years old) had not produced since 1982 when she lost a litter of 2 newborn cubs. Female #099 (11.5 years old) was single in 1984 and 1985. Female #064 (23.5 years old), was in estrus when recaptured in 1984 and was expected to produce cubs.

Female #086 (10.5 years old) was first visually observed on 23 June 1985. At that time she was swimming across Baumann Creek closely pursued by male #004. When captured that same day she was in estrus and also was

lactating. An infected wound about 6" above her hind pad was noted. This bear changed den sites between 13 and 27 March 1985, moving less than 1 km. It was suspected that she lost a litter of newborn cubs, possibly to predation by another bear, prior to her capture. Smith and Van Daele (1986) previously suspected predation by males on newborn cubs.

Mortality

Mortality of Marked Bears in 1985

Eleven marked bears (7 males, 4 females) were known to have died in 1985. Five bears, all males, were legally killed by sport hunters, 4 females died from natural causes; and 2 males died as a result of capture operations.

Bear #098, an 8.5 year old male, was shot by a sport hunter on 27 April 1985 in Pestchani Creek, 6.7 km west of his 4 June 1984 capture site. Bear #009, a 5.5 year old male, was shot by a sport hunter on 29 April 1985. This bear was tagged on 23 April 1982 with his mother (#008) and a sibling north of Watchout Creek, 2.1 km northeast of the kill site. Bear #030, a 5.5 year old male, was shot by a sport hunter on 6 May 1985. This bear was tagged on 29 April 1982 with its mother (#029) and 2 siblings near Sharatin Bay, 13.1 km north of the kill site. Bear #049, a 4.5 year old male, was shot by a sport hunter at the head of Terror Bay on 12 May 1985. He was captured as a yearling with female #048 and 2 siblings on 24 July 1982, 11.0 km southeast of the kill site. Bear #059, a 6.5 year old male, was killed by a sport hunter southwest of the study area near Uganik Lake on 13 May 1985. He was originally captured in upper Falls Creek near Terror Bay on 25 July 1982.

Table 3. Brown bear mortality in the Terror Lake study area, Alaska, 1985.

Sealing Cert. No.	Age	Kill Date	Location	Cause of Death
Males				
57128	5.5	4/08/85	Hidden Basin	hunter kill
57133	6.5	4/24/85	Wild Creek	hunter kill
57149	8.5	4/27/85	Pestchani Creek	hunter kill (#098)
57148	5.5	4/29/85	Watchout Creek	hunter kill (#009)
58414	6.5	5/02/85	Watchout Creek	hunter kill
57073	5.5	5/06/85	Watchout Creek	hunter kill (#030)
58444	4.5	5/06/85	Terror Bay	hunter kill
58417	7.5	5/09/85	Sharatin Mtn.	hunter kill
58424	5.5	5/10/85	Rough Creek	hunter kill
58439	4.5	5/12/85	Terror Bay	hunter kill (#049)
58440	4.5	5/12/85	Wild Creek	hunter kill
58446	7.5	5/14/85	Viekoda Bay	hunter kill
59960	10.5	6/21/85	Baumann Creek	capture mortality (#101)
60040	10.5	6/22/85	Baumann Creek	capture mortality (#023)
59979	5.5	10/27/85	Pestchani Creek	hunter kill
59978	7.5	10/28/85	Hidden Basin	hunter kill
60003	20.5	11/08/85	Pestchani Creek	hunter kill
60016	7.5	11/11/85	Sharatin Bay	hunter kill
60034	4.5	11/25/85	Elbow Mtn.	hunter kill
		mean age	= 7.1 years (n=18)	
		range	= 4.5-20.5 years	
Females				
58445	5.5.	4/12/85	Terror Bay	hunter kill
59962	24.5	5/00/85	Terror River	natural (#048)
58420	4.5	5/07/85	Hidden Basin	hunter kill
---	7.5	6/00/85	Den Mtn.	natural (#037)
59959	9.5	6/00/85	Kizhuyak River	natural (#091)
59967	1.5	10/13/85	Port Lions	illegal kill
59993	21.5	10/14/85	Falls Ck (Terror)	natural (#072)
59972	4.5	10/23/85	Viekoda Bay	dlp*
59998	3.5	10/31/85	Sharatin Bay	hunter kill
60014	6.5	11/07/85	Kizhuyak River	hunter kill
60030	12.5	11/10/85	Terror Bay	hunter kill
60028	5.5	11/18/85	Sharatin Bay	hunter kill
		mean age	= 8.9 years (n=12)	
		range	= 1.5-24.5 years	

* killed under State of Alaska "defense of life or property" provisions (5AAC 92.410)

Table 4. Mortality of tagged brown bears in the Terror Lake study area, Alaska, 1982-1985.

Bear	Age	Sex	Date of Kill	Cause	Location
006	2.5	M	5/30/82	hunter	Kizhuyak Bay
007	3.5	M	5/18/83	hunter	Kizhuyak Bay
009	5.5	M	4/29/85	hunter	Watchout Creek
021	5.5	M	4/25/82	capture	Falls Creek (Terror)
023	10.5	M	6/22/85	capture	Baumann Creek
026	5.5	M	8/16/82	dlp	NE Arm Uganik Bay
027	14.5	M	10/14/83	hunter	Saltery Lake
028	4.5	M	5/03/83	hunter	Kizhuyak Bay
029	17.5	F	Fall '82	unknown	Sharatin Bay
030	5.5	M	5/06/85	hunter	Watchout Creek
037	7.5	F	Spring '85	natural	Den Mtn.
043	4.5	F	7/22/82	capture	Barabara Flats
048	26.5	F	Spring '85	natural	Terror River
049	4.5	M	5/12/85	hunter	Terror Bay
053	8.5	F	7/24/82	capture	Falls Creek (Terror)
059	6.5	M	5/13/85	hunter	NE Arm Uganik Bay
072	21.5	F	11/05/85	natural	Falls Creek (Terror)
074	19.5	F	10/28/84	dlp	Pestchani Creek
077	22.5	F	10/28/84	dlp	Barabara Hill
083	3.5	M	5/07/84	hunter	Kizhuyak Bay
091	10.5	F	6/00/85	natural	Kizhuyak River
095	5.5	M	5/00/84	natural	Sharatin Bay
098	8.5	M	4/27/85	hunter	Pestchani Creek
101	10.5	M	6/21/85	capture	Baumann Creek
105	5.5	M	11/04/84	hunter	Barling Bay
127	8.5	F	11/03/84	hunter	Barabara Hill

Table 5. Summary of the causes of mortality of tagged brown bears in the Terror Lake study area, Alaska, 1982-1985.

Cause	Male (%)	Female (%)	Total (%)
Hunter	11 (69%)	1 (10%)	12 (46%)
Defense life/ property	1 (6%)	2 (20%)	3 (12%)
Capture	3 (19%)	2 (20%)	5 (19%)
Natural	1 (6%)	4 (40%)	5 (19%)
Unknown	0 (0%)	1 (10%)	1 (4%)
TOTAL	16 (62%)	10 (38%)	26 (4%)

Four radio-collared females died of natural causes in 1985 (#s 037, 048, 072, 091). Bear #048, a 26.5 year old female, moved about 1 km from her Den Mountain den site between 15 and 24 April 1985, but did not move subsequently. On 28 August 1985 her skeletal remains were recovered from the base of an avalanche. Other bears had fed on her carcass. Her death could have resulted from old age, accident or predation. She was originally captured 1.9 km east of her kill site on 24 July 1982.

Bear #037, a 7.5 year old female, apparently died between 15 and 23 June 1985. She may have been killed when her den in the north bowl of Den Mountain was destroyed in an avalanche. Her radio collar, ear tag and skeletal remains were recovered from the avalanche debris. There was also evidence that bears had fed on the carcass, so predation was a possible cause of death. She was originally captured on 2 May 1982 on Den Mountain less than 2 km from her kill site.

Bear #091, a 10.5 year old female with 2 yearling cubs, died in her den in upper Kizhuyak River during May or June 1985. She was observed at the entrance to her den with at least 1 cub on 24 April 1985. The den was closed with no tracks around it on 20 May 1985. By 27 June 1985 the snow melted enough to see her carcass in the collapsed den. No evidence of her cubs was found at the den. Injuries were not evident and it appeared that she had died prior to the collapse of the den. Bears had not disturbed the carcass, although foxes (Vulpes fulva) had fed on it. No cause of death could be established. She was originally captured on 4 June 1983 about 3.6 km south of the den.

Bear #072, a lone 21.5 year old female, died in early October 1985 near Falls Creek in the Terror Bay drainage. A large bear was observed feeding on her carcass on 14

October. An investigation on 17 October 1985 confirmed that she had been killed by another bear. Extensive hemorrhaging and crushed cervical vertebrae suggested that a bite or blow to the neck caused her death. She was originally captured on 26 July 1982 south of Falls Creek.

Two adult males (#s 023, 101) died during re-capture attempts. Bear #101, a 10.5 year old male, died in lower Baumann Creek on 21 June 1985 near his original 5 June 1984 capture site. Male #023, a 10.5 year old, died near upper Baumann Creek on 22 June 1985. He was originally captured on 26 April 1982 near Barabara Lake. Both bears died 10 minutes or less after being drugged with Etorphine (M-99) at dosages of 7cc and 20cc respectively. Both bears were relatively thin with little subcutaneous fat. Both were observed with smaller adults just prior to capture indicating they were actively involved in breeding activities. Their relatively poor condition may have contributed to an adverse reaction to the drug.

Sport Harvest and Other Mortality

Thirty-one bear mortalities (19 males, 12 females) were recorded from all sources in the Terror Lake study area during 1985 (Table 3). Twenty-three bears (74%) were legally killed by sport hunters, 4 (13%) died of natural causes, 2 (6%) were capture mortalities, 1 (3%) was illegally killed and 1 (3%) was killed in defense of life or property. The locations of these mortalities by major drainage were: Kizhuyak Bay - 9 (29%); Terror Bay - 9 (29%); Ugak Bay - 6 (19%); Sharatin Bay - 5 (16%); Viekoda Bay - 2 (6%). The mean age of these bears was 7.8 years (n=30; range=1.5-21.5 years). Unconfirmed reports were received that several bears were killed illegally in the vicinity of Port Lions at the northern edge of the study area.

Brown bear sport harvest in the Kodiak archipelago (Game Management Unit 8) in 1985 totaled 187 bears, slightly lower than the 1984 harvest of 191 bears. The fall harvest of 85 bears was the highest on record, well above the 1984 fall harvest of 54 bears. The kill of 23 bears in the study area in 1985 was closely comparable to the 1984 kill of 24 bears and above the 1983 and 1982 kills of 17 and 18 bears respectively. Mean age of brown bears killed by sport hunters in the study area was 6.8 years (n=23; range=3.5-20.5 years) in 1985, 6.5 years in 1984, 5.5 years in 1983 and 5.8 years in 1982.

Cumulative Mortality of Marked Bears

One hundred thirty-three brown bears (50 males, 83 females) have been tagged since the study began in April 1982 (Table 1). Forty-six of these bears (9 males, 37 females) were known to be alive at the end of 1985. Twenty-six bears (16 males, 10 females) were known to be dead (Tables 4 and 5). The fate of the remaining 61 bears (25 males, 36 females) is unknown.

Seasonal Habitat Use

Seasonal Activities and Feeding

Chronology and intensity of use of preferred habitats in 1985 differed from previous years. Unusually cold temperatures in late spring and early summer (Table 6) resulted in later initial green-up and retarded development of vegetation in 1985. Heavy snows occurred in early April and by mid-May a winter-like aspect still prevailed in the study area. By 1 June a hint of green herbaceous vegetation appeared on southerly exposures but neither alder (Alnus crispa sinuata) nor cottonwoods (Populus balsamifera) had begun to leaf-out. By 15 June alders were beginning to

Table 6. Mean monthly ambient temperatures, Kodiak city, Alaska, spring and summer 1985.

Month	Mean Ambient Temperature	Departure from Normal
April	-0.1°C	-3.2°C
May	5.3	-0.9
June	7.9	-1.9
July	11.3	-0.8
August	12.3	-0.4

leaf-out at lower elevations, but the overall green-up was 3-4 weeks later than usual. Sedges (Carex spp) in the Kizhuyak River flats still appeared grey-brown by 20 June. Vegetative green-up lagged behind that of 1982 when Smith and Van Daele (1984) reported that bears concentrated on greening lower slopes near sea level in late May and June.

Height of herbaceous vegetation was reduced and normally verdant meadows still appeared brown by early July. Salmonberry (Rubus spectabilis) fruits were small, late developing and relatively scarce. Elderberry (Sambucus callicarpa) fruits also appeared to be less abundant in 1985. Fireweed (Epilobium angustifolium), usually one of the most abundant and conspicuously flowering forbs, was largely vegetative throughout the study area in 1985. Alpine vegetation developed much later as much of the study area above 300 m was still snow-covered by early July.

Habitat use by bears mirrored the chronology of the vegetative development to a great extent. Most radio-collared bears remained at relatively high elevations near the snow-melt line until early June when vegetation began to develop. On 15 June several unmarked bears were seen feeding on sedges in the Terror River tidal flats and several radio-collared bears were observed feeding on herbaceous vegetation elsewhere in the study area. Most radio-collared bears remained at lower elevations through mid-July. Feeding on alpine vegetation was not extensive until late July, about 3 weeks late.

By 6 August several radio-collared bears had left alpine habitat and moved to Terror River where chum and pink salmon (Oncorhynchus keta, O. gorbuscha) had appeared in good numbers. Although few salmon were visible by that date in Kizhuyak River, several bears had begun frequenting the stream. Radio-collared bears were approximately evenly

distributed between alpine and stream habitat by 6 August. By the third week of August most radio-collared bears were near salmon streams.

Overall bear use of salmon streams appeared to have been more intensive and of longer duration in 1985 than during the 3 previous years. Several bears remained near Terror River through mid-September, about 2-3 weeks later than occurred in previous years. Radio-collared bears were consistently located near Kizhuyak River salmon spawning areas from 6 August through 25 September, an earlier arrival than usual.

The relatively poor berry crop and the late development of vegetation probably resulted in heavier reliance on salmon for food. Salmon escapement into Terror River and Kizhuyak River was equal to or greater than that recorded in the 3 previous years of this study (Alaska Department of Fish and Game files). Peak salmon escapement counts for study area streams in 1985 are shown in Table 7.

The Barabara Lake system which was previously noted to be used heavily by bears feeding on sockeye salmon (*O. nerka*) by late July (Smith and Van Daele 1984, 1986; Smith et al. 1985) was not a significant source of salmon in 1985. Although up to 1100 salmon were reported from aerial surveys of the lake, no salmon were seen in the tributary streams or in shoal spawning areas of the lake. None of the radio-collared bears which had frequented these tributaries in previous years was located there in 1985. The lack of bear trails, salmon carcasses and insignificant activity by bald eagles (*Haliaeetus leucocephalus*) further confirmed the observation that salmon did not arrive in the tributary streams.

Table 7. Peak salmon escapement counts in Terror Lake study area, Alaska, 1985[A].

Stream name and number	Survey dates	No. pinks	No. chums	No. sockeye	No. coho[AA]
Terror River 253-331	8/23	80,000	3,000	---	---
Baumann Creek 253-332	8/23	21,000	---	---	---
E. Viekoda 253-322		No Survey			
S. Viekoda 253-321		No Survey			
Clara's Creek 253-333	8/23	4,100	---	---	---
Pestchani Creek 259-366	8/23	1,600	---	---	---
Hilary Creek 250-364	8/23	2,500	---	---	---
Kizhuyak River 259-365	8/23	35,000	28,500	---	---
Elbow Creek 259-371	7/24	3,000	---	---	---
	8/23	37,900	5,500	---	---
Saltery Creek 259-415	7/10	400	---	26,000	---
	8/15	---	6,000	---	---
	8/22	28,000	---	---	---
	9/20	---	---	---	2,646
Barabara Creek	8/23	---	---	900	---

[A] from unpublished files of Alaska Department of Fish and Game
[AA] coho counts partial

Bear encounters in the village of Port Lions were unusually frequent in 1985. Several brown bears were seen frequenting the Port Lions dump by villagers and a high incidence of bears raiding trash containers, garden compost and stored foods at residences was reported. One radio-collared bear, female #018, made an unusual move from her previous activity area in Baumann Creek to near the Port Lions dump in December 1985. The late green-up, poor berry crop and failure of sockeye salmon at nearby Barabara Lake probably contributed to the increased bear activity at Port Lions.

The incidence of encounters between deer hunters and brown bears was unusually high according to reports from deer hunters and air taxi operators. One maternal female bear was killed by a deer hunter on 1 January 1986 near Barabara Lake. One radio-collared female (#078) was observed feeding on a freshly killed deer in the Kizhuyak River drainage on 2 separate occasions. The relatively poor food supply may have aggravated this source of bear/human encounters.

Another unusual occurrence was the movement of 9 radio-collared females to second den sites between 17 November 1985 and 6 January 1986. Mild temperatures and a record rainfall in December (50.3 cm) may have been a factor in these movements. Bears may have been seeking additional feeding opportunities as the relatively poor food supply may have resulted in bears entering dens in poor condition.

Bears captured in late June and July 1985 appeared to be relatively thin compared to bears captured in previous years. Female #096, a sow with 2 newborn cubs, appeared emaciated with visibly protruding pelvis and ribs when captured on 23 June. Bears probably relied heavily on

stored fat through mid-June when herbaceous vegetation began to appear.

Habitat Use as Indicated by Elevations of Radio-collared Bear Locations

Although climatic variations in 1985 affected bear habitat use, the mean elevations of radio-located bears did not clearly reflect those changes. No statistically significant ($p > 0.1$) differences were detected between the annual habitat use patterns exhibited by radio-collared brown bears during the 4 years of this study (1982-1985) (Figure 1). Analysis of seasonal habitat use patterns in 1985 by reproductive status revealed that mean seasonal elevations of radio-collared males were significantly lower ($p < 0.01$) than those of either lone females or maternal females. No statistically significant differences ($p > 0.1$) were evident between mean seasonal elevations of lone females and maternal females.

Mean seasonal elevations of radio-collared males have been significantly lower ($p < 0.01$) than those of radio-collared maternal females every year from 1982 to 1985. Mean seasonal elevations were also lower for males than lone females, but statistical differences were noted only in 1984 and 1985 ($p < 0.05$). Lone females were observed at slightly lower seasonal mean elevations than maternal females during the study, but these differences were not statistically significant. Smith et al. (1985) reported on possible reasons for these seasonal variations by reproductive status.

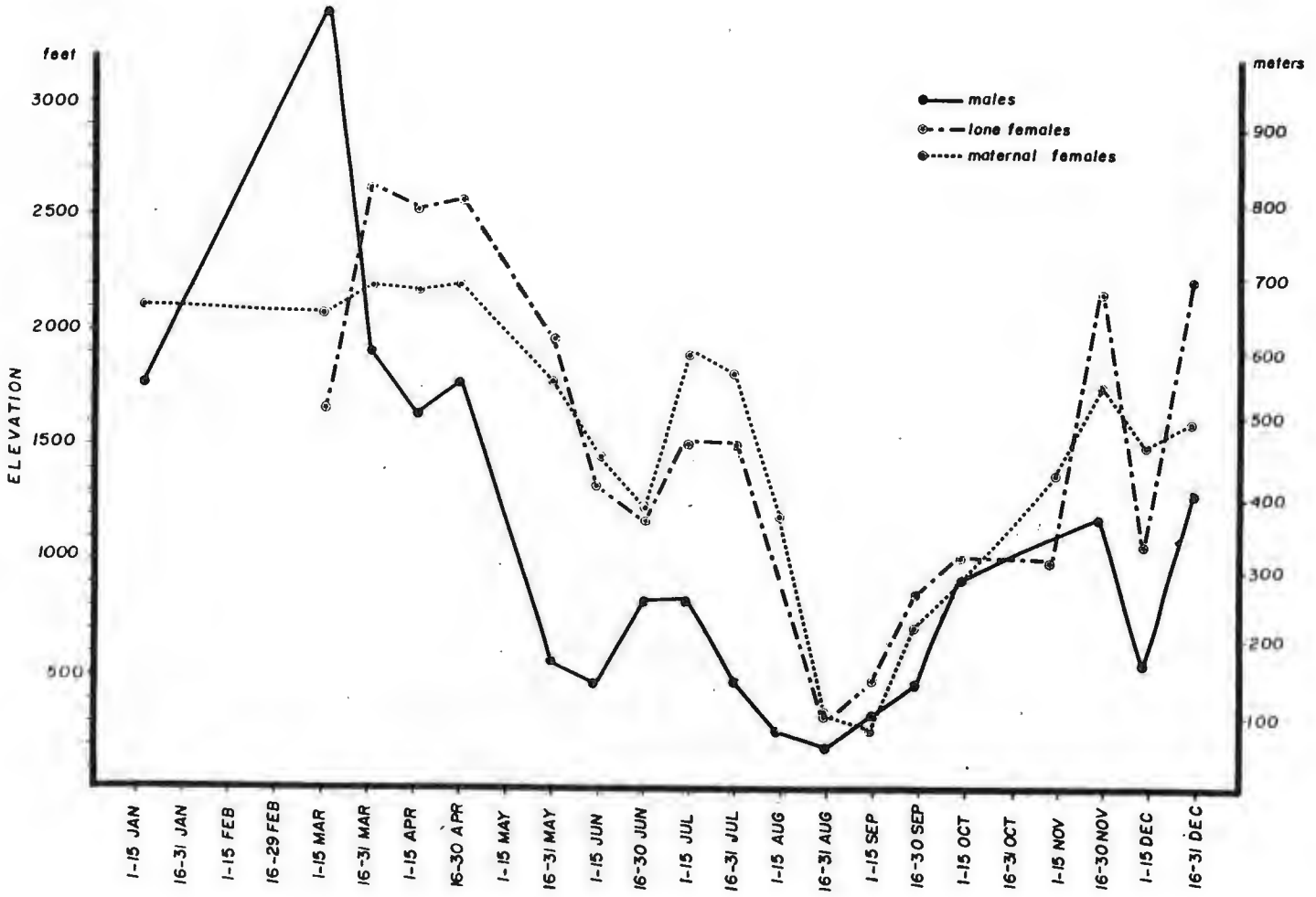

Figure 1. Mean seasonal elevations of radio-collared bears in the Terror Lake study area, Alaska, 1985.

Movements and Home Ranges

Movements data were collected for 48 radio-collared bears, including 12 males and 36 females in 1985. A total of 898 locations of radio-collared bears was recorded in 1983. Thirty-seven radio-collared bears (32 females, 5 males) were still being monitored by the end of 1985.

Two hundred twenty-eight observations of unmarked or unidentified marked bears were made incidental to radio-tracking flights or other field activities in 1985.

A complete analysis of bear movements during the 2-year post-construction phase of this study (1985, 1986) will be presented in the final report.

Denning

Thirty-five radio-collared brown bears (29 females, 6 males) were monitored throughout the 1984-85 denning season. Data on 1984-85 den locations and approximate den entrance dates were reported in Smith and Van Daele (1986). Emergence dates from 1984-85 dens, locations and approximate den entrance dates for 1985-86 dens are listed in Table 8.

Denning Chronology

Denning periods of radio-collared bears during the 1984-85 season ranged from 0 to 256 days. Two males (#s 101, 120) did not enter dens. The longest denning periods were recorded for #067, a 23.5 year old female, (241-252 days) and #018, an 8.5 year old female (226-256 days). Both sows emerged with cubs-of-the-year and were not observed away from their den sites until 20 July 1985. Figure 2 depicts the chronology of emergence from 1984-85 dens.

Table 8. Denning characteristics of brown bears in the Terror Lake study area, Alaska, (as of 6 January 1986).

FEMALES

Bear (age)	Emergence date 1984-5 den	Entrance date 1985-6 den	Elevation in meters (ft) 1985-6 den	Location by drainage 1985-6 den	Comments
005a(16.5)	24 Apr-20 May	14 Oct-1 Nov	762 (2500)	Kizhuyak Bay	
005b	---	24 Nov-23 Dec	853 (2800)	Kizhuyak Bay	
008 (14.5)	---	14 Oct-1 Nov	122 (400)	Kizhuyak Bay	
011 (9.5)	20 May-29 May	24 Nov-5 Dec	975 (3200)	Terror Bay	
015 (10.5)	15 Apr-24 Apr	1-17 Nov	366 (1200)	Terror Bay	
018 (8.5)	27 Jun-20 Jul	---	---	---	had not denned by 6 Jan 86
019 (9.5)	15 Apr-24 Apr	1-17 Nov	610 (2000)	Terror Bay	
020 (9.5)	13 Mar-27 Mar	24 Nov-5 Dec	381 (1250)	Terror Bay	
022 (10.5)	29 May-15 Jun	14 Oct-24 Nov	579 (1900)	Terror Bay	
037 (7.5)	---	---	---	---	died in 1984-85 den
038 (6.5)	24 Apr-20 May	14 Oct-17 Nov	945 (3100)	Terror Bay	
044 (6.5)	29 May-15 Jun	1-17 Nov	853 (2800)	Terror Bay	
046 (9.5)	24 Apr-20 May	1-17 Nov	1006 (3300)	Terror Bay	
048 (26.5)	15 Apr-24 Apr	---	---	---	died in May 1985
051a(11.5)	24 Apr-20 May	14 Oct-17 Nov	396 (1300)	Terror Bay	
051b	---	23-29 Dec	914 (3000)	Terror Bay	
055a(16.5)	23 Jun-27 Jun	14 Oct-1 Nov	945 (3100)	Terror Bay	
055b	---	1-17 Nov	945 (3100)	Terror Bay	
060a(17.5)	---	1-17 Nov	716 (2350)	Kizhuyak Bay	
060b	---	24 Nov-23 Dec	610 (2000)	Kizhuyak Bay	
064 (23.5)	27 Mar-24 Apr	---	---	---	lost in Oct 1985
067 (23.5)	5 Jul -20 Jul	---	---	---	had not denned by 6 Jan 86
070a(7.5)	24 Apr-16 May	1-17 Nov	579 (1900)	Sharatin Bay	
070b	---	17-23 Dec	732 (2400)	Kizhuyak Bay	
071a(11.5)	20 May-29 May	1-17 Nov	579 (1900)	Kizhuyak Bay	
071b	---	17 Nov-23 Dec	686 (2250)	Kizhuyak Bay	
072 (21.5)	24 Apr-20 May	---	---	---	died in Nov 1985
078a(10.5)	24 Apr-16 May	5-23 Dec	732 (2400)	Kizhuyak Bay	
078b	---	23-29 Dec	686 (2250)	Kizhuyak Bay	
081a(12.5)	20 May-29 May	1-17 Nov	732 (2400)	Kizhuyak Bay	
081b	---	17 Nov-23 Dec	716 (2350)	Kizhuyak Bay	
085 (6.5)	24 Apr-20 May	---	---	---	den not located by 6 Jan 86
086 (10.5)	15 Apr-24 Apr	1-17 Nov	335 (1100)	Terror Bay	
091 (10.5)	---	---	---	---	died in 1984-85 den
096 (9.5)	29 May-15 Jun	1-17 Nov	320 (1050)	Viekoda Bay	
099 (11.5)	24 Apr-16 May	14 Oct-17 Nov	671 (2200)	Terror Bay	
119 (7.5)	24 Apr-20 May	14 Oct-1 Nov	503 (1650)	Kizhuyak Bay	
121 (14.5)	24 Apr-16 May	14 Oct-24 Nov	853 (2800)	Kizhuyak Bay	
123 (14.5)	24 Apr-20 May	14 Oct-1 Nov	914 (3000)	Terror Bay	

Table 8. (Cont.) Denning characteristics of brown bears in the Terror Lake study area, Alaska, (as of 6 January 1986).

Bear(age)	Emergence date 1983-4 den	Entrance date 1985-6 den	Elevation in meters (ft) 1985-6 den	Location by drainage 1985-6 den	Comments
128 (8.5)	---	5-23 Dec	274 (900)	Viekoda Bay	
129a(11.5)	---	14 Oct-1 Nov	518 (1700)	Viekoda Bay	
29b	---	29 Dec-6 Jan	244 (800)	Viekoda Bay	
131 (12.5)	---	14 Oct-17 Nov	732 (2400)	Terror Bay	
132 (16.5)	---	14 Oct-17 Nov	1097 (3600)	Terror Bay	
33 (11.5)	---	14 Oct-17 Nov	732 (2400)	Terror Bay	
35	---	---	---	---	had not denned as of 6 Jan 86
bles					
004 (9.5)	---	---	---	---	had not denned as of 6 Jan 86
040 (6.5)	---	1-17 Nov	610 (2000)	Kizhuyak Bay	
059 (6.5)	15 Apr-24 Apr	---	---	---	died May 1985
098 (8.5)	24 Apr-27 Apr	---	---	---	died April 1985
100 (6.5)	24 Apr-20 May	5-23 Dec	1128 (3700)	Terror Bay	
101 (10.5)	---	---	---	---	did not den in 1984-85; died June
102 (6.5)	24 Apr-20 May	---	---	---	lost in Oct 1985
120 (13.5)	---	---	---	---	did not den in 1984 or 1985
30 (3.5)	---	14 Oct-17 Nov	366 (1200)	Terror Bay	

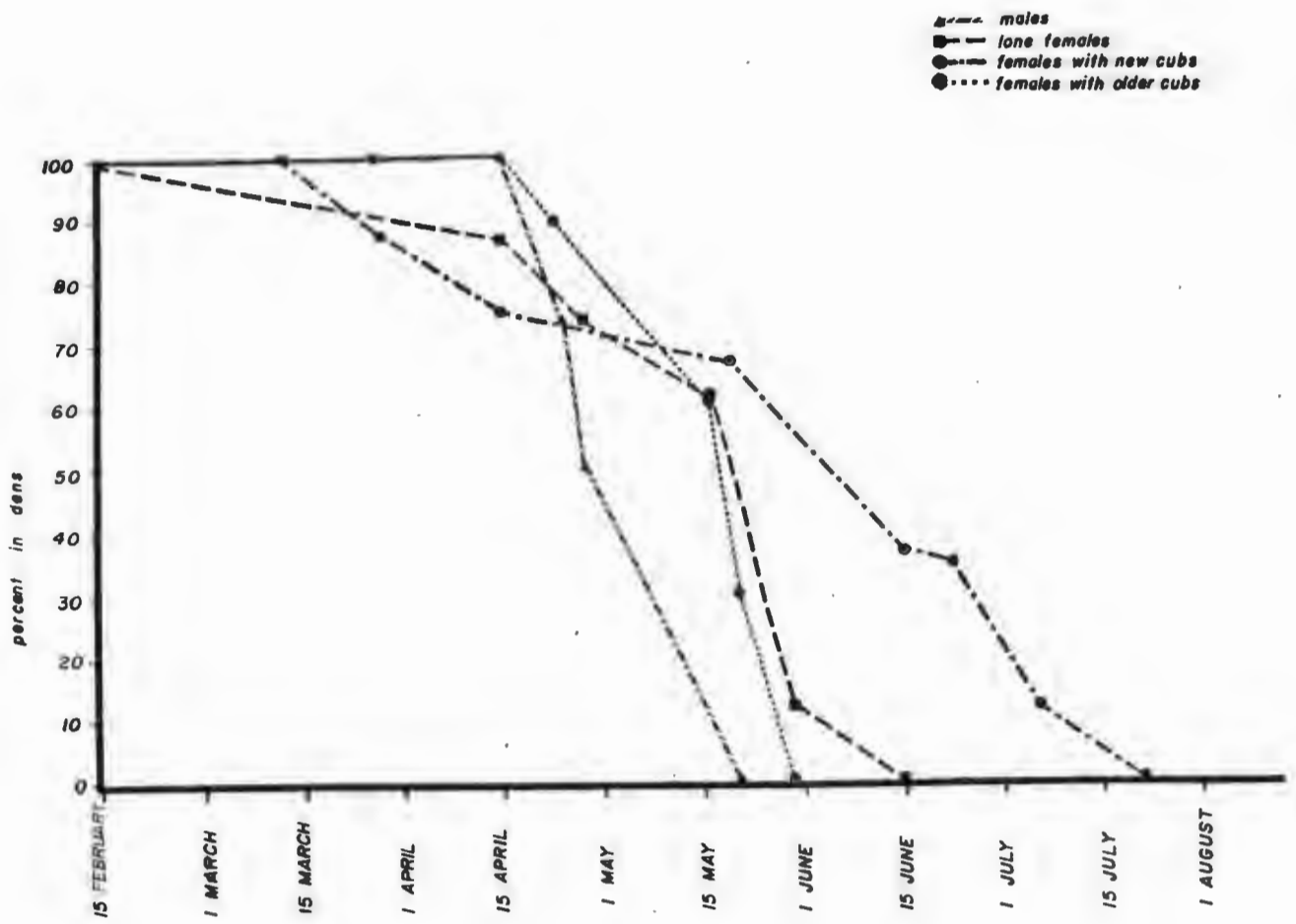

Figure 2. Chronology of den emergence by radio-collared brown bears in the Terror Lake study area, Alaska, 1985.

Three females (#'s 005, 020, 022) changed den sites during the winter of 1984-85. Between 2 January and 13 March 1985 bear #005, a 16.5 year old with 2-2 year old cubs, moved from her den at 671 m on Pestchani Mountain to a site 0.9 km to the northwest at 835 m. She made a similar movement between 11 November 1983 and 13 March 1984 when she moved approximately 0.4 km between den sites on Pestchani Mountain. Female #020, a 9.5 year old who later emerged with cubs-of-the-year, moved 0.9 km southeast from her Baumann Creek den site at 213 m between 21 November 1984 and 13 March 1985 to a new site at 396 m. Bear #022, a 10.5 year old who emerged with cubs-of-the-year, moved from her den at 518 m near Falls Creek (Terror Bay) between 27 March and 15 April 1985 to a new den at 366 m, 1.6 km southwest of her previous den.

Radio-collared bears began entering 1985-86 dens by 1 November 1985. Ninety percent (27/30) of the radio-collared females were in dens by 6 January 1986. Three of 5 (60%) radio-collared males were denned by that date. Although den entrance dates were similar to those noted in previous years (Smith and Van Daele 1984 and 1986, Smith et al. 1985), at least 9 radio-collared females moved to second den sites between 17 November 1985 and 6 January 1986.

Den Locations and Site Characteristics, 1985-86 Dens

Thirty bears (27 females, 3 males) were located at 40 den sites by 6 January 1986. There were 20 dens (50%) in Terror Bay drainage, 15 (38%) in Kizhuyak Bay, 4 (10%) in Viekoda Bay and 1 (3%) in Sharatin Bay. Den Mountain, lower Baumann Creek and Pestchani Mountain were important denning areas as was previously reported (Smith and Van Daele 1984 and 1986, Smith et al. 1985). Figure 3 depicts the den locations of radioed bears recorded by 6 January 1986.

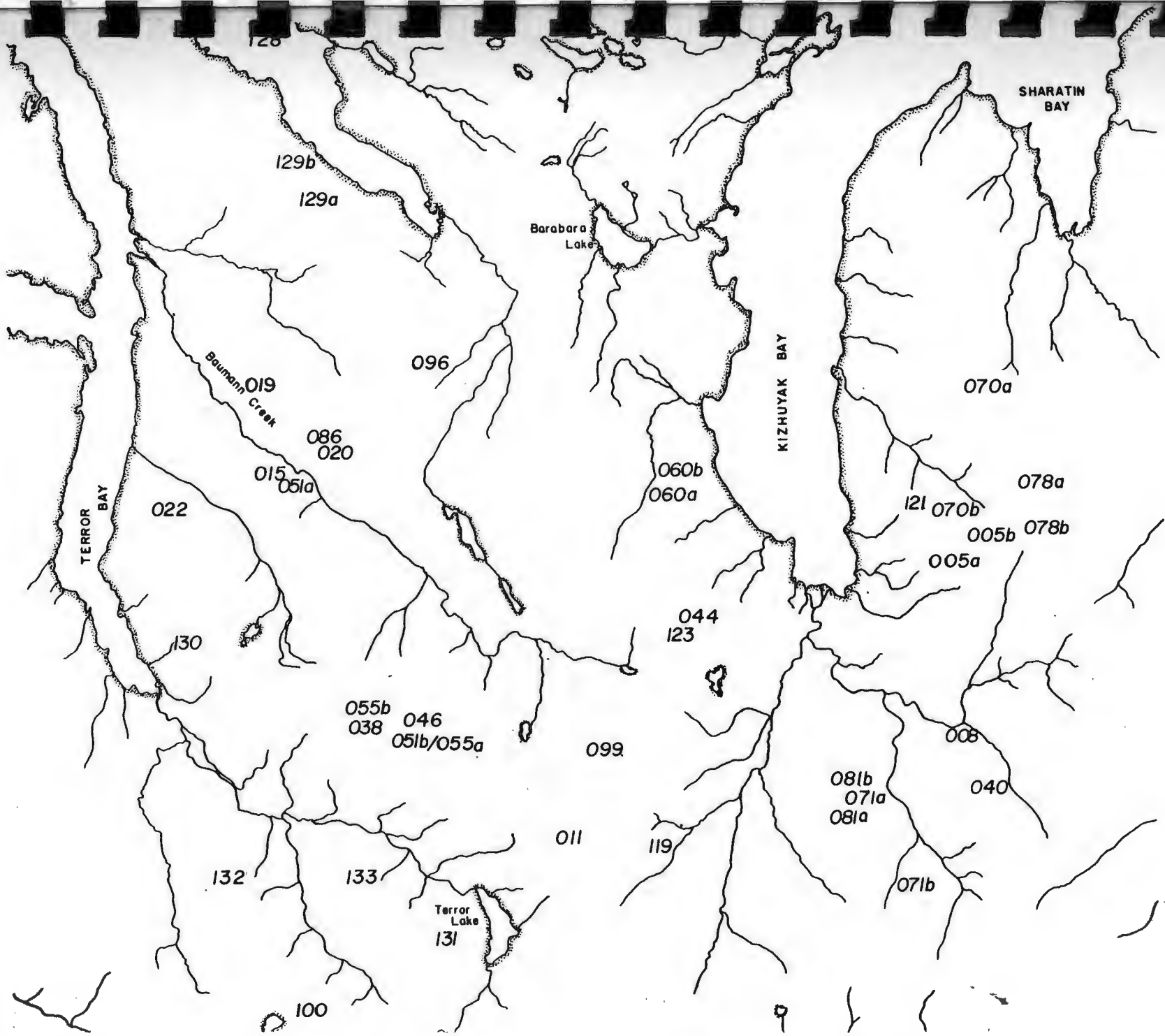

Figure 3. Den locations of radio-collared brown bears in the Terror Lake study area during the 1985-86 denning period (to 6 January 1986).

Most dens were located in alpine or subalpine habitats (70%; n=28) with the remainder in brushlands (30%; n=12). the same relative distribution by habitat type reported for 1984-85 dens (Smith and Van Daele 1986). Steep slopes (>45°) were the most common locations for dens (50%; n=20) followed by moderate slopes (30°- 45°) (40%; n=16) and gentle slopes (<30°) (10%; n=4). Ninety percent (n=18) of the dens on moderate and gentle slopes were associated with cliffs or rock outcrops, similar to patterns observed previously (Smith and Van Daele 1986). A slight preference for den sites with a northerly aspect is indicated by present data (Table 9).

Den elevations ranged from 122 to 1128 m with a mean of 668 m. Thirteen dens (33%) were higher than 750 m, 26 (65%) were between 240 and 750 m and 1 (3%) was below 240 m. The mean elevation for the dens of females was 665 m (n=37; range=122-1097 m). The dens of males were at a mean elevation of 701 m (n=3; range=336-1128 m). Mean den elevations noted during the 1985-86 season were within the ranges previously observed (Table 10).

Fidelity to Denning Areas

Radio-collared bears continued to favor previously used denning areas (Table 11). Fifty percent (11/22) of the radioed bears occupied dens less than 1 km from their 1984-85 sites. Two females (#046, #121) had virtually identical den locations in both years and 2 other females (#096, #099) occupied the same dens in successive years. Female #096 re-excavated her previously used den and female #099 occupied the same rock crevice for 2 successive denning periods. Twenty-three percent (5) of the radioed bears had den sites 1-3 km apart and 23% (5) occupied dens more than 3 km apart during the 2 years. Two females, #051 and #070, which

Table 9. Aspects of den sites used by brown bears in the Terror Lake study area, Alaska, 1982-86.

Den year	North	Northeast	East	Southeast	South	Southwest	West	Northwest	Total
1982-83	6 (18)	8 (24)	5 (15)	2 (6)	1 (3)	7 (21)	2 (6)	3 (9)	34
1983-84	11 (31)	5 (14)	1 (3)	2 (6)	7 (19)	7 (19)	2 (6)	1 (3)	36
1984-85	7 (19)	7 (19)	2 (5)	4 (11)	5 (14)	8 (22)	4 (11)	0 (0)	37
1985-86[a]	10 (25)	7 (18)	4 (10)	3 (8)	5 (13)	4 (10)	4 (10)	3 (8)	40
Total	34 (23)	27 (18)	12 (8)	11 (7)	18 (12)	26 (18)	12 (8)	7 (5)	147

a - to 6 January 1986

Table 10. Mean den elevations of radio-collared brown bears in the Terror Lake study area, Alaska, 1982-1986

	Mean Den Elevation in meters (feet) (sample size)		
Den year	Males	Females	All bears
1982-83	566 (1857)(n=10)	642 (2106)(n=24)	620 (2034)(n=34)
1983-84	588 (1929)(n=5)	738 (2421)(n=31)	717 (2352)(n=36)
1984-85	786 (2579)(n=5)	686 (2251)(n=32)	699 (2293)(n=37)
1985-86[a]	701 (2300)(n=3)	665 (2182)(n=37)	667 (2191)(n=40)

a - to 6 January 1986.

Table 11. Distance between den locations of individual brown bears in the Terror Lake study area, 1982-1986.

Bear	Distance between 1982/3 and 1983/4 dens	Distance between 1983/4 and 1984/5 dens	Distance between 1984/5 and 1985/6 dens	Maximum distance between 1982/3, 1983/4, 1984/5 and 1985/6 dens
FEMALES				
005	1.2 km (1.1 km)[a]	1.8 km (0.6 km)[b]	0.8 km (0.6 km)[c]	1.8 km
011	0.5	4.1	5.5	6.7
015	0.5	0.4	0.3	0.5
017	0.5	---	---	---
018	1.1	1.9	---	---
019	2.0	3.4	3.4	4.5
020	---	0.8	1.4	---
022	0.2	3.4	1.0	3.4
037	4.0	3.7	---	---
038	0.4	0.6	0.1	0.8
044	1.7	0.9	0.5	2.1
046	1.2	0.0	0.0	1.2
048	0.1	0.1	---	---
051	0.2	0.8	9.2 (0.9)[c]	9.2
055	0.2	0.3	0.3 (0.3)[c]	0.7
060	3.6	---	---	---
064	0.1	0.1	---	---
067	2.5	2.3	---	---
070	0.1	0.0	3.7 (0.2)[c]	3.9
071	2.2	1.8	2.9 (1.1)[c]	3.2
072	2.3	0.2	---	---
074	2.5	---	---	---
078	---	0.0	3.2 (2.3)[c]	---
081	---	0.4	3.3 (3.5)[c]	---
085	---	0.4	---	---
086	---	1.0	0.8	---
091	---	0.1	---	---
096	---	1.8	0.0	---
099	---	---	0.0	---
119	---	---	0.8	---
121	---	---	0.0	---
123	---	---	1.3	---
Males				
024	12.4	---	---	---
059	20.0	2.0	---	---
100	---	---	1.3	---

a - distance from 1982/3 den to second 1983/4 den
b - distance from 1983/4 den to second 1984/5 den
c - distance from 1984/5 den to second 1985/6 den

initially denned more than 3 km from their 1984-85 dens later moved to dens less than 1 km from their previous sites.

The mean distance between individual den sites for females in 1984-85 and first dens in 1985-86 was 1.8 km (n=21; range=0.0-9.2 km). That compares closely with distances noted between 1982-83 and 1983-84 den sites ($\bar{x}$ = 1.2; n=22; range=0.1-3.6 km) and between 1983-84 and 1984-85 den sites ($\bar{x}$=1.3 km; n=25; range=0.0-4.1 km).

Den sites of 12 radio-collared bears, all females, have been located for 4 consecutive years. The mean maximum distance between dens of individual bears was 3.2 km (n=12; range=0.5-9.2). Twenty-five percent (3) of those bears had all 4 dens within 1 km, 25% (3) had dens 1 to 3 km apart and 50% (6) had dens more than 3 km apart.

Proximity of Dens to Project Activities

Five radio-collared brown bears (17%) denned relatively close to major project features in 1985. Female #011 denned approximately 2.3 km north of the access road near Terror Lake. Female #119 denned in Shotgun Creek canyon about 0.5 km northeast of the Shotgun Creek dam. Females #005 and #078 occupied dens north of Watchout Creek within 3.2 km of the Kodiak transmission line. Female #008 denned near Watchout Creek, 1.3 km south of the transmission line. Female #131 denned 1.5 km southwest of the Terror Lake dam, the closest location of a radio-collared bear's den to the dam recorded during the study.

Preliminary Analysis of Construction Impacts

Construction activities in the vicinity of the Terror Lake hydroelectric project were greatly reduced in 1985. the first year of the 2 year post-construction phase of this investigation. Analysis of project impacts and comparison of construction and post-construction data will be presented in the final report.

RECOMMENDATIONS

Continuation of existing research methods is recommended for 1986. the final scheduled year of this investigation.

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