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BLACK BEAR PREDATION ON MOOSE

BY
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Job Progress Report (Research)

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Cooperators: C. Schwartz and A. Franzmann

Project No.: W-21-2 Project Title: Big Game Investigations

Job No.: 17.3R Job Title: Black Bear Predation on Moose

Period Covered: July 1, 1980 through June 30, 1981

SUMMARY

Movements of 23 radio-collared black bears during 1980 are presented and discussed. The average home range of female bears was 16.7±7.3 km^2, varying from 12.9±6.2 km^2 for females with cubs, 24.7±2.6 km^2 for females with yearlings, to 838 ha for a juvenile female. Home ranges for adult males (98±41 km^2) were much larger than those of females. Preliminary estimates indicate a black bear density of 1 bear per 3.9±1.0 km^2. The method used to estimate density was different than in 1979, but was more conservative and probably more accurate. Morphometric, blood physiology and drugging information are listed but no assessment was available for this report.

CONTENTS

BACKGROUND

Black bear (*Ursus americanus*) studies were initiated on the Kenai Peninsula in 1977 (Franzmann and Schwartz 1979) as part of an intensive predator-prey study (Franzmann and Bailey 1977). Background and discussion were presented by Schwartz and Franzmann (1980).

OBJECTIVES

To determine the population density, age structure, and productivity of the black bear population within the study area at the Moose Research Center (MRC).

To determine seasonal movements and habitat usage by resident bears within the study area.

To evaluate seasonal, temporal, and spatial aspects of bear movements as they relate to moose calving areas at the Moose River Flats and Willow Lake areas.

To evaluate seasonal usage and avoidance of two moose browse rehabilitation areas (Willow Lake and MRC 1947) by black bears.

STUDY AREA

The Moose Research Center (MRC) study area is located within the Kenai National Wildlife Refuge (KNWR), formerly the Kenai National Moose Range, on the northwestern Kenai Peninsula lowlands (Fig. 1). Detailed descriptions of the study area appear in Oldemeyer et al. (1977), LeResche and Davis (1973) and Schwartz and Franzmann (1980).

PROCEDURES

Procedures used in 1980 were similar to those used in 1978 and 1979 (Schwartz and Franzmann 1980). Barrel traps (Fig. 2) were used to capture most bears in 1980. Several bears were also immobilized in their dens during winter using techniques

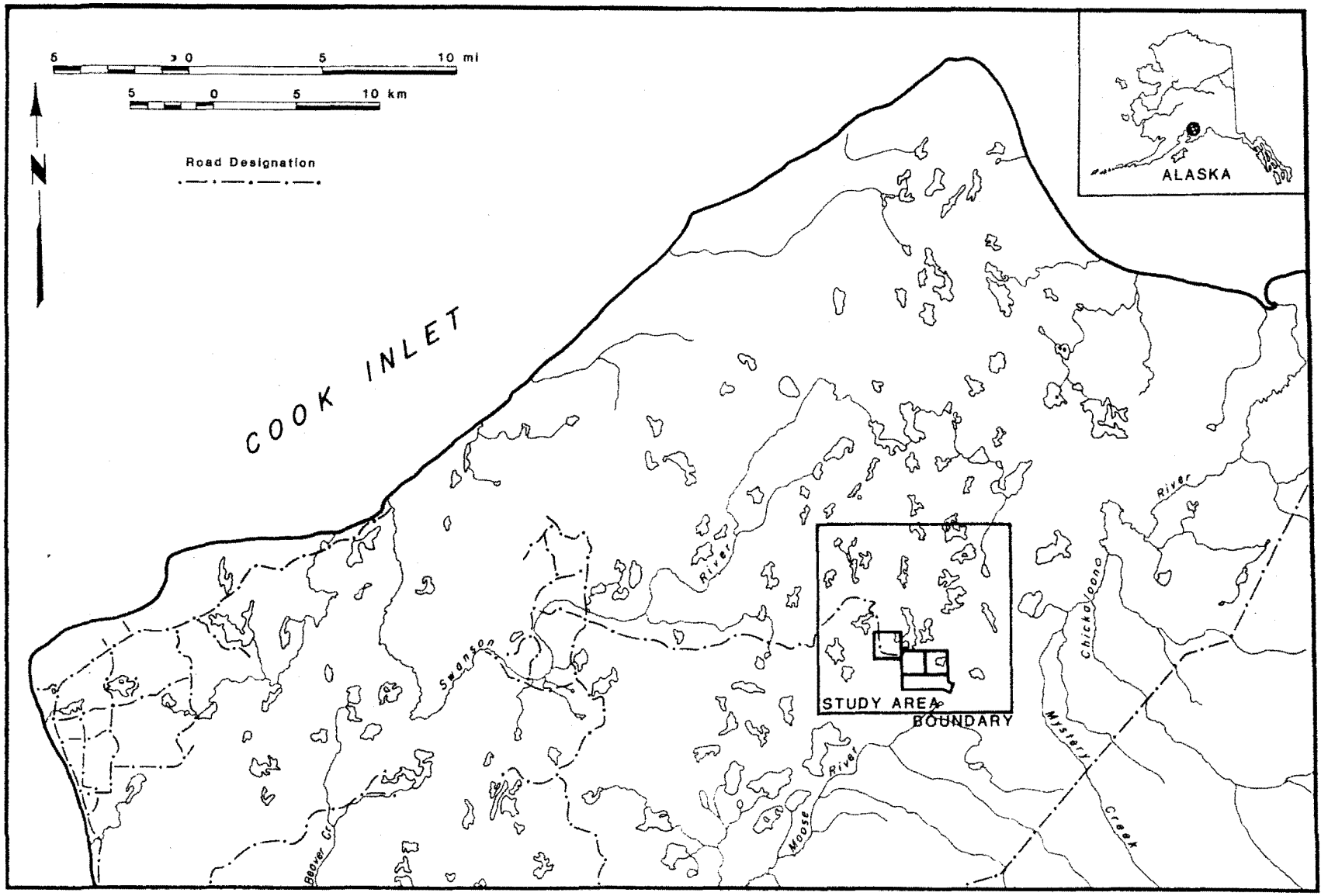

Fig. 1. Moose Research Center Study Area, Kenai Peninsula, Alaska.

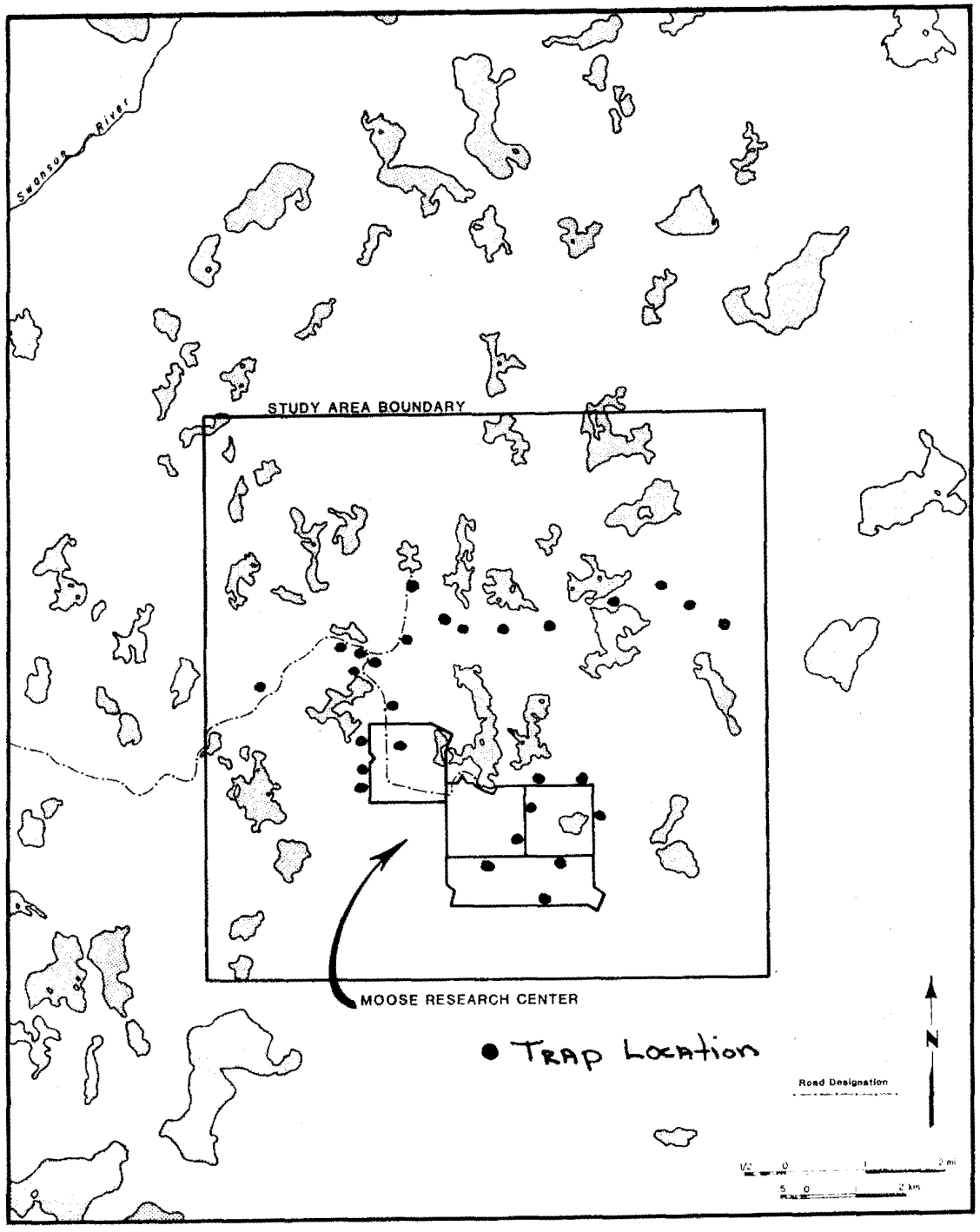

Fig. 2. Location of barrel traps used to capture black bears in the Moose Research Center Study Area, 1980.

described by Rogers (1977). Bears immobilized in winter were adult females and their yearling(s). Yearlings were fitted with expandable radio collars in hopes of monitoring them the following summer after they separate from the female.

Home range areas and density estimates were calculated using a graphics tablet and a computer program available through the KNWR.

RESULTS

Capture and Handling

Eight bears were drugged in their winter dens and processed during 1980. Two adult females (B2 and B12) and their cubs (B36, B37, B38, B39) and a 2-year-old female (B21) were processed in January; an additional 2-year-old female (B23) was processed in March 1980. We experienced problems in obtaining complete immobilization with one bear (B12) and she left her den prior to drug response. We waited for over 60 minutes and then attempted to track her in the snow, but never regained visual contact with the bear. Apparently the injected Sernylan had no effect. We had similar problems when we attempted to immobilize B23 in March, however, she did not flee her den. Subsequent injections with Sernylan from a different vial produced good results. Drugging information indicated that the four yearlings processed in winter were probably given more drug then needed to immobilize them. All four bears were given doses in excess of 2.3 mg/kg which is more than the dosage normally required to immobilize bears in summer (1.4-1.8 mg/kg).

Trapping operations were initiated on 2 June 1980 and continued through 14 July. During this period we captured 47 bears during 653 trap-days (13.9 days per bear caught). This was an improvement over our 1979 catch rate of 18.3 trap-days per bear caught.

Of the 47 bear captures, 19 were different individuals and 28 were recaptures. Thirteen of the 19 bears had been radio-collared in 1978 or 1979. The 6 remaining individuals were classified as 2 adult males (B11, B33), 2 juvenile males (B22, B40), and 2 cubs (B41, B42) of marked female B15 (Table 1). We also trapped the study area during late fall (22 Sept.-3 Oct.) and caught six bears in 158 trap-days (26.3 trap-days per bear captured). All of the bears had been previously handled in 1980. This catch rate was slightly higher than during fall 1979.

Results of immobilization attempts (Table 2) on 30 black bears indicated that 17 animals received adequate dosage levels after one injection while 13 other bears required additional drugs (Table 2). No bear was given a fatal dosage. In most cases minimal dosages were given on the first injection; if immobilization did not occur in 15-20 minutes, additional drug was administered until immobilization resulted. We did

Table 1. Capture and marking information for 10 newly captured black bears within the Moose Research Center Study Area, Kenai Peninsula, Alaska 1980.

Bear and Tattoo No.	Sex	Capture		Transmitter Frequency	Ear Tag No.	
		Date	Location		Right	Left
B11	M	12 Jun. 80	Takukak Lake	164.076	536	538
B22	M	20 Jun. 80	Chick Lake Trail	None	5	4
B33	M	9 Jul. 80	¼ mi SE of Arrow L.	164.231	540	546
B36[1/]	F	10 Jan. 80	Den SW of Pen 4	165.135	308	307
B37[1/]	M	10 Jan. 80	Den SW of Pen 4	165.045	352	351
B38[2/]	F	10 Jan. 80	Den in Pen 2	165.150	526	354
B39[2/]	M	10 Jan. 80	Den in Pen 2	165.125	321	304
B40	M	10 Jun. 80	Between Buteo and Antler Lakes	None	10	9
B41[3/]	M	27 Jun. 80	Outside NW corner of Pen 1	None	01	06
B42[3/]	F	27 Jun. 80	Outside NW corner of Pen 1	None	-	07

1/ 1979 cub of B12.
2/ 1979 cub of B2.
3/ 1980 cub of B15.

Table 2. Immobilization results for 30 black bear captures in the Moose Research Center Study Area, Kenai Peninsula, Alaska during 1980. The drug used was phencyclidine hydrochloride (Sernylan) alone or in combination with promazine hydrochloride (Sparine) as indicated.

Bear No.	Wt. (kg)	Date	Immobilization Time (min.)	Drug and Dosage (mg/kg) Sernylan	Sparine	Method of Capture	Comments
B2	54.5	10 Jan.	15	2.2	0.4	Drugged in den	Convulsed.
B2A[1/]	54.5	5 Jun.	11	0.9	0.4	Barrel trap	Good dosage.
			5	0.4	-		
B11	102.3	12 Jun.	5	1.5	0.5	Barrel trap	Convulsed once. Very deep sleep.
B12	59.1	15 Jun.	13	1.0	0.3	Barrel trap	Very deep sleep.
			11	0.3	-		
B13	50	6 Jun.	12	1.6	0.4	Barrel trap	Good dosage, very deep sleep.
B13A	-	12 Jun.	14	-	-	Barrel trap	Down time not recorded.
B15	50	1 Jul.	15	1.2	0.4	Barrel trap	Good dosage.
B16	129.5	15 Jun.		1.2	0.4	Barrel trap	Very deep sleep.
			21	0.2	-		Time of 2nd injection not recorded.
B21	40.9	9 Jan.	16	2.0	0.5	Drugged in den	Original injection with with bad drug. Sparine given with 2nd injection.
			12	1.0			
B21A	46.4	1 Jul.	3	1.7	0.4	Helicopter	Good level. Bear warm from pursuit; cooled with water.
B22	40.9	20 Jun.	11	1.0	0.5	Barrel trap	Good level, coming out of drug 20 min. after down time.
			12	0.5			
			10	0.5			
			4	0.5			
B23	36.4	14 Mar.	25	2.2	0.6	Drugged in den	Down time not recorded. First two injections appeared to have no effect. May not have gotten second. (Old drug?) Final level was good.
			10	0.6			
			16	0.6			
				0.6			
B25	104.5	28 Jun.	13	1.4	0.5	Barrel trap	Incomplete injection of first dose. Time between last injection and down time may not be exact. Down time questioned.
			9	0.2			
			11	0.2			
			12	0.2			
			9	0.2			
B27	61.4	14 Jun.	13	1.3	0.3	Barrel trap	Down time not recorded.
			9	0.3			
				0.3			
B29	68.2	6 Jun.	13	0.9	0.3	Barrel trap	First injection incomplete. 20 mg left in syringe. Down time not recorded.
				0.3			

Table 2 (cont.).

Bear No.	Wt. (kg)	Date	Immobilization Time (min.)	Drug and Dosage (mg/kg) Sernylan	Sparine	Method of Capture	Comments
B30	60.4	8 Jun.	14	1.3	0.3	Barrel trap	Fairly active; not completely immobile.
			12	0.3			
			5	0.3			
B31	56.8	6 Jun.	8	1.0	0.3	Barrel trap	First injection incomplete.
			6	0.3			Probably no dosage.
			7	0.3			No down time recorded.
			7	0.3	0.3		
			22	0.3			
			9	0.3			
B 32	25.9	3 Jun.	6	1.2	0.4	Barrel trap	Good dosage. Deep sleep.
B32A	-	11 Jun.	5	-	-	Barrel trap	Good dosage.
B33	111.4	9 Jul.	14	1.3	0.4	Barrel trap	Very deep, no convulsions. Immobilization time may not be exact. Down time questioned.
B34	44.5	8 Jun.	9	1.6	0.7	Barrel trap	Needle might have broken off. Given 8cc. Flocillin.
B36	15.9	10 Jan.		2.5	1.2	Drugged in den	No times recorded. One slight convulsion.
B37	16.8	10 Jan.		2.3	1.2	Drugged in den	Time of first injection
			20	2.3			not recorded. Convulsions.
B38	13.6	10 Jan.	10	2.9	1.5	Drugged in den	Convulsions.
B38A	20.4	9 Jun.	5	1.5	0.5	Barrel trap	-
B39	15	10 Jan.	10	2.7	1.3	Drugged in den	Convulsions
B40	41.4	10 Jun.	4	1.4	0.5	Barrel trap	-
B40A	41.4	12 Jun.	3	1.4	0.5	Barrel trap	Deep sleep.
B41	21.8	30 Sep.	4	1.4	-	Barrel trap	Didn't get full dose.
B42	19.1	1 Oct.	7	1.6	-	Barrel trap	-

1/ An A indicates a later capture.

experience convulsions in four yearlings drugged in the den during winter. All four bears were given high levels of Sernylan (>2 mg/kg). Seal et al. (1970) also noted convulsions in *Ursidae* when levels of Sernylan exceeded 2 mg/kg. As in 1979, we experienced some variation in dosage levels required to immobilize individuals. In general, smaller bears and fat bears required more drugs, although, this was not the case with all bears.

In some instances it was difficult, or impossible, to determine the exact dosage administered. Small bears were quite mobile in the barrel traps and usually bolted when stuck with the jab-stick syringe. This resulted in incomplete injection of the drug, breakage of the syringe and/or needle, and doubt as to the amount of drug administered. Consequently, drug dosages listed in Table 2 must be conservatively interpreted.

Morphometric, Blood, and Hair Data

No attempt was made to assess the morphometric data collected during this report period (Table 3); they were recorded on a computer input file for future analyses.

Blood chemistry, protein electrophoresis and hematological data (Tables 4 and 5) analyses are complete on all samples collected in winter 1979-80 and summer 1980. These data have been entered on a computer file and will be analyzed in the final report. Hair sample analyses have not been completed.

Current Status, Movements, and Home Range

We are currently monitoring 15 black bears (Table 6). No contact was made with B1 during the 1980 field season. We lost contact with her on August 6, 1979 after she moved to her summer feeding area in the Swanson River oil field. At that time we suspected radio failure. This probably was the case, because an adult female with two yearlings was sighted near a den in Pen 1 in 1981. The female had yellow ear tags indicating that she had been previously handled and marked within the study area. All other marked females with yearlings had been previously located on the same day.

Radio contact was also lost with 2-year-old female B21 in August shortly after she went to her summer feeding area in the Swanson River oil field. Her status is unknown.

B13, B26, B28, and B30 were all harvested during the hunting season and B29 was found dead in early September. This bear was commonly sighted along the Swan Lake road during routine bear surveys. He was aerially located on 26 August and observed alive. On 11, 17 and 24 September, B29 was aerially located in the same place less than 10 m from the road surface. Visual contact was not made. A ground search on 25 September revealed a carcass almost entirely consumed by maggots. One fractured rib

Table 3. Age and morphometric data for 24 black bears captured 27 times at the Moose Research Center Study Area, Kenai Peninsula, Alaska, 1980. Measurements are in centimeters.

Bear No.	Wt. (kg)	Age (years)	Total Length	Circumference		Hind Foot		Skull		Left Canine[1/]					
										Upper			Lower		
				Chest	Neck	Length	Width	Length	Width	L	A-P	L-L	L	A-P	L-L
B2	54.5	5	160.0	88.0	48.0	16.8	8.5	25.6	15.4	2.8	1.8	1.0	2.3	1.4	1.1
B2A	54.5	5	153.7	74.0	45.0	16.0	8.5	26.2	15.5	2.6	1.7	1.0	2.4	1.7	0.9
B11	102.3	10	179.0	100.0	66.0	19.5	11.0	28.8	18.7	3.0	1.9	1.2	2.7	1.7	1.2
B12	59.1	5	164.5	78.0	42.0	18.0	10.0	27.0	15.7	2.5	1.6	1.0	2.3	1.5	0.8
B13	50	5	148.0	84.0	43.0	17.0	8.5	25.0	16.0	2.5	1.6	0.9	2.2	1.5	0.9
B15	50	4	142.0	75.0	43.0	17.0	8.2	26.0	14.3	2.3	1.4	1.0	2.2	1.5	0.9
B16	129.5	9	177.0	112.0	61.0	21.0	12.0	29.5	20.0	3.1	1.7	1.1	2.7	1.8	1.1
B21	40.9	2	135.0	77.5	39.5	16.5	7.8	23.4	13.0	2.4	1.4	1.2	2.4	1.5	1.3
B21A	46.4	2	129.5	81.0	43.0	16.0	8.5	24.5	13.8	2.6	1.5	1.0	2.4	1.7	1.0
B22	40.9	2	134.0	76.0	39.0	18.0	9.0	24.0	12.5	1.9	1.1	0.9	2.1	1.1	0.8
B23	36.4	2	135.7	74.5	37.5	15.0	8.5	23.0	13.0	2.4	1.2	0.9	2.3	1.4	1.0
B25	104.5	6	175.0	101.0	61.0	19.2	11.0	29.8	18.6	3.0	2.0	1.3	2.8	1.7	1.2
B27	61.4	3	149.0	80.0	52.0	19.8	10.0	26.5	16.0	3.0	1.8	1.1	2.8	1.8	1.2
B29	68.2	3	154.5	88.0	49.0	19.5	10.0	26.5	15.9	2.8	1.7	1.2	2.6	1.6	1.1
B30	60.4	5	134.0	88.0	50.0	17.5	8.7	24.6	15.5	2.9	1.6	0.9	2.4	1.2	0.9
B31	56.8	5	147.5	95.0	43.5	16.5	9.0	25.0	15.0	2.4	1.6	0.9	2.2	1.3	0.9
B32	25.9	1	122.0	68.0	33.0	14.5	8.0	21.4	12.2	1.8	1.1	0.8	1.7	1.0	0.8
B33	111.4	6	176.0	102.0	62.0	21.0	11.0	31.3	18.0	3.4	1.9	1.2	2.4	1.9	1.2
B34	44.5	3	144.5	74.5	42.0	18.0	8.5	27.2	14.8	2.8	1.7	1.2	2.7	1.8	1.5
B36	15.9	1	102.0	51.5	30.5	13.3	7.3	17.3	10.6	-	-	-	-	-	-
B37	16.8	1	106.5	56.0	33.5		6.8	19.0	11.0	-	-	-	-	-	-
B38	13.6	1	98.0	57.0	31.5	12.0	6.0	18.2	10.2	-	-	-	-	-	-
B38A	20.4	1	111.0	55.0	31.5		6.9	18.2	11.3	1.4	0.8	0.6	1.2	0.7	0.6
B39	150.4	1	100.0	62.0	34.0	12.4	7.0	19.2	10.5	-	-	-	-	-	-
B40	41.4	2	139.0	70.5	-	17.2	9.4	22.9		2.8	1.4	1.1	2.8	1.5	1.2
B41	21.8	0.75	99.0	54.0	31.5	11.2	7.0	18.1	10.5	-	-	-	-	-	-
B42	19.1	0.75	96.5	56.3	36.0	11.1	6.0	17.8	10.5	-	-	-	-	-	-

[1/] L = total length, A-P = maximum anterior-posterior thickness, and L-L = maximum labial-lingual thickness for the canine tooth specified.

Table 4. Black bear blood chemical data collected from October 1979 to July 1980 on the Kenai Peninsula, Alaska.

Bear Number	Date	Age (mo.)	Sex	Glucose mg/dl	Choles- terol mg/dl	Trigly- ceride mg/dl	LDH U/L	SGOT U/L	SGPT U/L	Alkaline Phos- photase mg/dl	P mg/dl	Ca mg/dl	Ca/P ratio	Na mE8/L	K mE8/L	Cl mE8/L	CO_2 mE8/L	BUN mg/dl	Creat. mg/dl	Bili- rubin mg/dl	Uric Acid mg/dl
B-2	06/05/80	64	F	84	218	249	597	96	57	19	3.4	8.8	2.58	139	5	105	23	10	1.1	0	1.0
B-2	01/10/80	59	F	64	275	199	588	82	22	4	4.0	8.9	2.23	143	5	102	18	10	3.1	0.1	1.2
B-11	06/12/80	124	M	124	212	224	734	130	61	104	4.9	9.0	1.82	139	4	106	20	12	1.0	0	1.1
B-12	06/12/80	64	F	69	237	271	636	69	54	43	6.4	9.3	1.45	135	5	101	18	7	0.9	0	1.7
B-13	10/03/79	53	F	98	293	371	428			29	3.9	8.3	2.13	144	4	104	15	9	1.1	0	1.3
B-13	06/06/80	64	F	91	303	442	580	72	61	38	5.2	8.9	1.71	141	5	103	21	26	1.3	0.1	1.8
B-13	06/12/80	64	F	69	321	490	816	113	75	28	4.3	9.0	2.09	140	5	103	20	10	1.2	0	1.3
B-15	07/01/80	52	F	57	300	216	624	69	19	13	4.1	8.6	2.09	145	5	107	20	15	0.8	0	1.4
B-16	06/15/80	112	M	96	233	193	837	375	132	52	4.3	8.8	2.04	140	4	100	23	6	1.3	0	1.7
B-21	01/09/80	23	F	132	288	226	482	65	9	21	3.6	8.2	2.28	144	4	100	14	9	3.7	0.1	1.0
B-21	07/01/80	28	F	34	300	342	763	97	38	136	8.3	9.6	1.15	140	5	101	7	42	1.0	0.1	2.7
B-22	06/20/80	28	M	108	244	199	530	57	22	100	7.1	10.0	1.40	139	5	105	21	15	0.7	0	1.8
B-23	03/14/80	25	F	96	302	178	454	62	6	24	2.2	10.1	4.58	142	4	96	15	3	3.2	0.1	1.2
B-25	06/28/80	87	M	108	265	203	616	73	37	25	5.1	9.0	1.76	138	5	105	17	23	1.2	0	1.2
B-27	06/14/80	40	M	56	370	267	972	132	66	42	5.7	9.0	1.58	142	4	101	24	16	0.9	0.1	1.6
B-29	06/08/80	52	M	88	302	336	835	130	54	143	7.4	9.6	1.29	140	5	106	17	40	0.9	0.1	1.4
B-30	10/09/79	56	F	112	259	227	538	59	24	15	3.5	9.3	2.65	145	4	103	12	15	1.3	0.1	0.9
B-30	06/08/80	40	F	104	344	356	790	167	101	43	4.8	10.0	2.08	144	6	110	18	29	0.9	0	2.0
B-31	06/06/80	40	F	65	300	333	704	80	27	53	5.2	8.9	1.71	140	5	105	16	19	0.8	0.1	1.4
B-32	10/09/79	8	M	97	268	262	633	142	123	74	4.4	9.1	2.07	144	5	104	13	1	0.8	0	1.6
B-32	06/03/80	16	M	48	381	387	731	85	33	71	10.1	10.4	1.03	147	6	103	22	25	1.1	0.1	1.7
B-33	07/09/80	78	M	100	289	280	992	278	163	49	4.5	9.2	2.04	139	5	104	20	23	1.2	0	1.3
B-34	10/09/79	32	M	126	249	168	502	82	19	39	5.1	9.1	1.79	142	4	103	14	4	1.3	0	1.0
B-34	06/08/80	40	M	87	274	606	675	78	52	72	5.5	9.7	1.76	139	5	103	19	14	1.2	0.2	1.4
B-36	01/10/80	11	F	60	293	352	688	107	27	11	3.2	9.3	2.91	156	4		16	25	2.7	0.1	0.8
B-37	01/10/80	11	M	98	301	454	675	55	14	13	2.6	8.3	3.19	150	4	104	13	20	2.7	0.1	1.1
B-38	01/10/80	11	F	56	249	195	541	55	8	12	2.2	8.5	3.86	148	4	106	16	21	2.9	0.1	1.0
B-38	06/09/80	16	F	78	247	348	739	67	46	176	7.1	10.0	1.40	133	5	100	22	14	0.6	0.1	1.7
B-39	01/10/80	11	M	69	252	242	699	77	8	16	3.3	9.0	2.72	148	4	105	14	24	2.1	0.1	1.2
B-40	06/12/80	28	M	103	309	283	739	72	46	108	5.8	9.5	1.63	143	4	110	18	14	0.8	0	1.0

Table 5. Black bear blood protein, electrophoresis and hematologic data collected from October 1979 to July 1980 on the Kenai Peninsula, Alaska.

Bear Number	Date	Age (mo.)	Sex	Total Protein g/dl	Albumin g/dl	Globulin g/dl	Alpha 1 g/dl	Alpha 2 g/dl	Beta g/dl	Gamma g/dl	A/G ratio	Hb g/dl	PCV %
B-2	06/05/80	64	F	6.4	3.7	2.7	0.4	0.5	0.8	0.9	1.4	16.0	38
B-2	01/10/80	59	F	8.0	4.4	3.6	0.7	0.8	1.1	1.0	1.2	25.0	52
B-11	06/12/80	124	M	7.7	4.0	3.7	0.4	0.3	1.2	1.8	1.1	18.8	41
B-12	06/12/80	64	F	6.1	3.6	2.5	0.5	0.5	0.9	0.7	1.4	18.0	39
B-13	10/03/79	53	F	7.2	4.0	3.2	0.6	0.6	1.0	0.9	1.3	19.5	53
B-13	06/06/80	64	F	6.5	3.8	2.7	0.5	0.6	1.0	0.5	1.4	18.0	41
B-13	06/12/80	64	F	6.2	3.8	2.4	0.5	0.4	1.0	0.5	1.6	19.8	43
B-15	07/01/80	52	F	6.7	4.3	2.4	0.5	0.6	1.0	0.3	1.8	18.6	48
B-16	06/15/80	112	M	8.1	4.2	3.9	0.5	0.8	0.8	1.9	1.1	18.0	43
B-21	01/09/80	23	F	7.8	4.8	3.0	0.7	0.8	0.7	0.7	1.6	26.0	59
B-21	07/01/80	28	F	6.8	4.4	2.4	0.6	0.5	0.8	0.6	1.8	17.0	42
B-22	06/22/80	28	M	6.0	3.9	2.1	0.5	0.2	0.8	0.5	1.9	18.5	38
B-23	03/14/80	25	F	7.3	4.6	2.7	0.7	0.7	0.6	0.8	1.7	22.0	49
B-25	06/28/80	87	M	7.1	4.1	3.0	0.5	0.5	0.2	1.0	1.4	18.0	43
B-27	06/14/80	40	M	6.8	3.8	3.0	0.5	0.7	1.2	0.7	1.2	16.0	40
B-29	06/08/80	52	M	6.6	3.9	2.7	0.5	0.5	1.0	0.6	1.5	19.0	46
B-30	10/09/79	56	F	6.8	3.8	3.0	0.7	0.5	1.0	0.9	1.3	22.0	54
B-30	06/08/80	40	F	8.7	4.5	4.2	0.5	0.9	1.1	1.7	1.1	20.0	48
B-31	06/06/80	40	F	6.5	3.9	2.6	0.5	0.4	0.9	0.9	1.5	18.0	38
B-32	10/09/79	8	M	6.3	3.9	2.4	0.6	0.4	0.9	0.5	1.6	20.0	48
B-32	06/03/80	16	M	5.8	3.8	2.0	0.6	0.8	0.8	0.3	2.0	14.0	38
B-33	07/09/80	78	M	6.5	3.9	2.6	0.4	0.5	1.0	0.6	1.5	19.0	40
B-34	10/09/79	32	M	6.4	3.6	2.8	0.6	0.6	0.8	0.8	1.3	20.0	49
B-34	06/08/80	40	M	6.5	3.7	2.8	0.8	0.4	0.8	0.9	2.3	19.5	47
B-36	01/10/80	11	F	7.7	4.4	3.3	0.9	0.9	0.7	0.9	1.4	24.0	48
B-37	01/10/80	11	M	7.4	4.5	2.9	0.7	1.0	0.6	0.6	1.6	22.0	50
B-38	01/10/80	11	F	7.0	4.2	2.8	0.7	0.6	0.7	0.6	1.5	20.0	46
B-38	06/09/80	16	F	5.7	3.7	2.0	0.7	0.8	0.1	0.3	1.9	19.5	43
B-39	01/10/80	11	M	7.4	4.5	2.9	0.7	0.7	0.9	0.6	1.6	19.0	44
B-40	06/12/80	28	M	6.1	3.7	2.4	0.5	0.5	0.7	0.7	1.5	17.0	36

Table 6. Aerial tracking data for 1980 and current status of all black bears captured at the Moose Research Center study area, 1977-1980.

Bear Number	Sex	Times Located 1980	Last Observed		Current Status
B1	F	-	6 August	1979	Status unknown
B2	F	21	7 November	1980	Active
B3	M	-	22 August	1978	Status unknown
B4	M	-	2 May	1978	Dead, drug overdose, 1978
B5	M	-	3 October	1978	Status unknown
B6	M	-	23 June	1978	Dead, hunter kill, 1 Sept. 1978
B7	F	-	9 May	1978	Dead, drug overdose, 1978
B8	M	-	1 May	1979	Dead, natural causes 1979
B9	M	18	7 November	1980	Active
B10	M	10	7 November	1980	Active
B11	M	15	7 November	1980	Active
B12	F	22	7 November	1980	Active
B13	F	12	26 August	1980	Dead, hunter kill, 4 Sept. 1980
B14	F	21	7 November	1980	Active
B15	F	22	7 November	1980	Active
B16	M	14	7 November	1980	Active
B17	M	-	8 November	1978	Status unknown
B18	F	1	15 May	1980	Active
B19	M	-	21 August	1979	Status unknown
B20	F	19	7 November	1980	Active
B21	F	6	26 August	1980	Status unknown
B22	M	-	20 June	1980	Status unknown, assumed alive, ear tagged only
B23	F	-	14 March	1980	Status unknown, shed radio collar
B24	F	22	7 November	1980	Active
B25	M	21	7 November	1980	Active
B26	M	-	26 June	1979	Dead, hunter kill, 24 May 1980
B27	M	-	14 June	1980	Status unknown, assumed alive, ear tagged only
B28	M	-	20 June	1979	Dead, hunter kill, 18 May 1980
B29	M	11	26 August	1980	Dead, hunter crippling loss, see text for details
B30	F	13	26 August	1980	Dead, hunter kill, 3 September 1980
B31	F	21	7 November	1980	Active
B32	M	5	18 June	1980	Dead, black bear predation, see text for details
B33	M	10	7 November	1980	Active
B34	M	-	8 June	1980	Status unknown, assumed alive, eag tagged only

Table 6 (cont.).

Bear Number	Sex	Times Located 1980	Last Observed	Current Status
B36	F	3	15 May 1980	Status unknown, shed radio collar
B37	M	15	17 September 1980	Status unknown, transmitter failed
B38	F	21	7 November 1980	Active
B39	M	21	7 November 1980	Active
B40	M	-	12 June 1980	Status unknown, assumed alive, ear tagged only
B41	M	-	7 November 1980	Active, cub of B15
B42	F	-	7 November 1980	Active, cub of B15

was found in the bone pile suggesting that this bear was killed by a hunter but not recovered. The carcass was located in an extremely thick stand of birch regrowth which would have made it difficult for the hunter to find his kill.

As suspected in our previous report, the transmitter on B16 was found to have failed when we recaptured him in 1980. The old collar package was in very poor condition, with the antenna separated from the transmitter.

We lost contact with B23 after she slipped off her new radio-collar sometime in April, 1980. She was radio-collared in her winter den on 9 March 1980, and apparently the collar was not fitted tightly enough.

Yearling male B32, the 1979 cub of B13, was presumed killed and eaten by another black bear on 17 or 18 June 1980. B32 was trapped on 17 June 1980, and released undrugged. We detected a slow (mortality) mode for B32 on 18 June, 2 miles north of the trap site. A ground search on 21 June revealed that only the radio collar, skull and hide had not been consumed. Site investigation revealed at least four beds, two of which contained remains of B32 (one ear at each bed). Several scats (15) were located in and around the kill area. All were bear type and three contained bones and hair. One scat contained moose calf hooves. Black bear hairs were collected from these beds. The hairs were clinging to the vegetation of the bed and were uniformly distributed throughout the bed. It appeared the hairs had come from the individual using the bed and not from the carcass of B32. Also, since remains of B32 were found in two of the four beds we assumed the beds were made by the predator rather than by B32.

We lost contact with both of B12's yearlings (B36 and B37) in 1980. B36 shed her collar 1 month after she emerged from her den in the spring. The transmitter on B37 probably failed in late September 1980. This bear was radio-tracked from its summer feeding area back to the MRC study area in early fall before we lost contact with it. We should be able to recapture this bear in routine trapping operations in 1981.

During the 1980 field season, 23 radio-collared black bears were relocated 344 times (Table 6). An additional 24 uncollared black bears were sighted in 1980, all were outside the study area.

Analysis of home range data for female bears (age >1 yr) (Figs. 3-12) indicated that the average home range was 16.9± 7.3 km^2 (Table 7). Female home range sizes varied with reproductive status. Females accompanied by cubs (n=4) occupied a total home range of 12.9±6.2 km^2 (Figs. 7-9). Females with yearlings (n=3) occupied the largest area with total home range of 22.7±2.6 km^2 (Figs. 3 and 4). As discussed in our previous annual report (Schwartz and Franzmann 1980), females with cubs remained near the den several weeks after den emergence, were

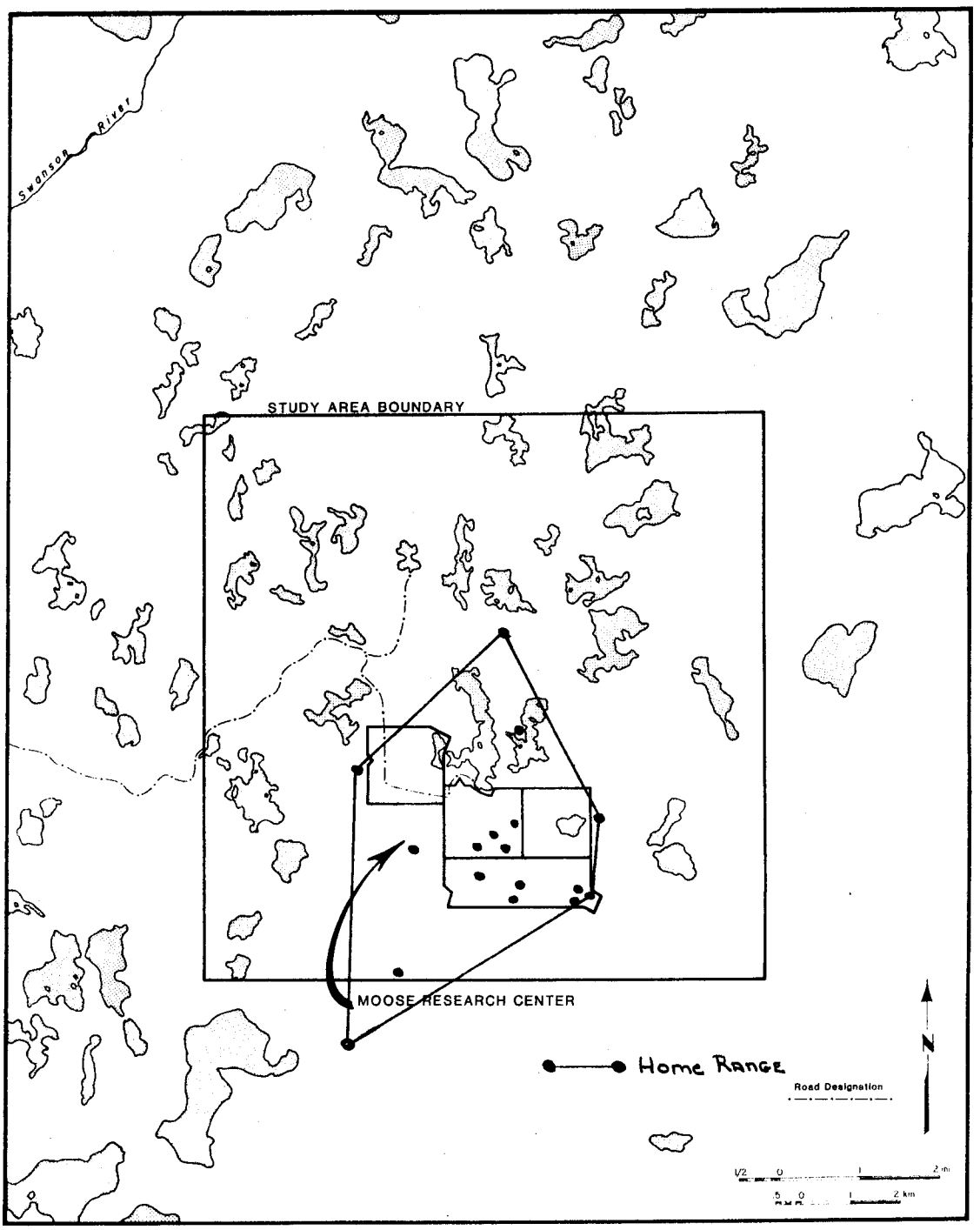

Fig. 3. Home range and movements of adult female B2 and her two yearlings in 1980.

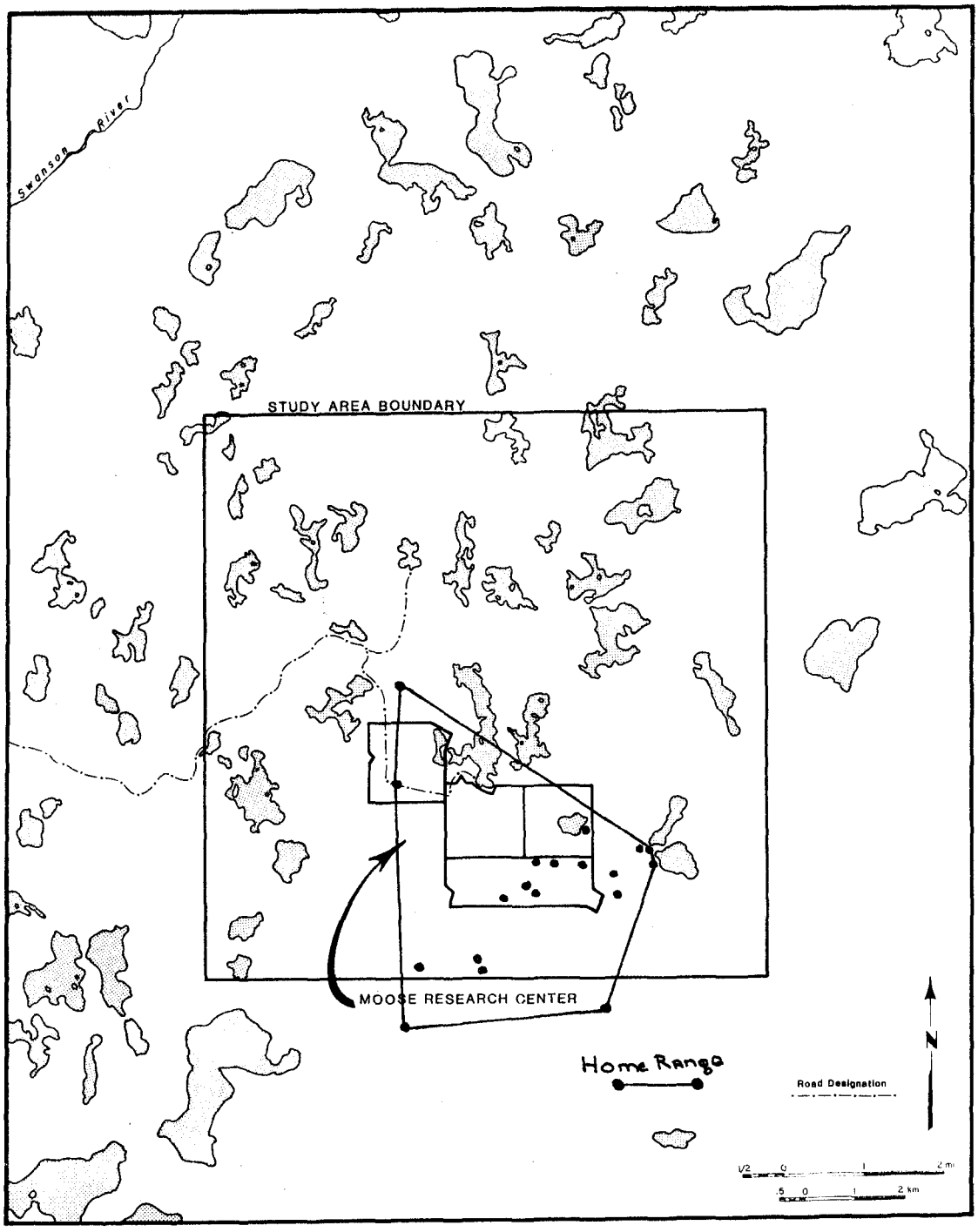

Fig. 4. Home range and movements of adult female B12 in 1980.

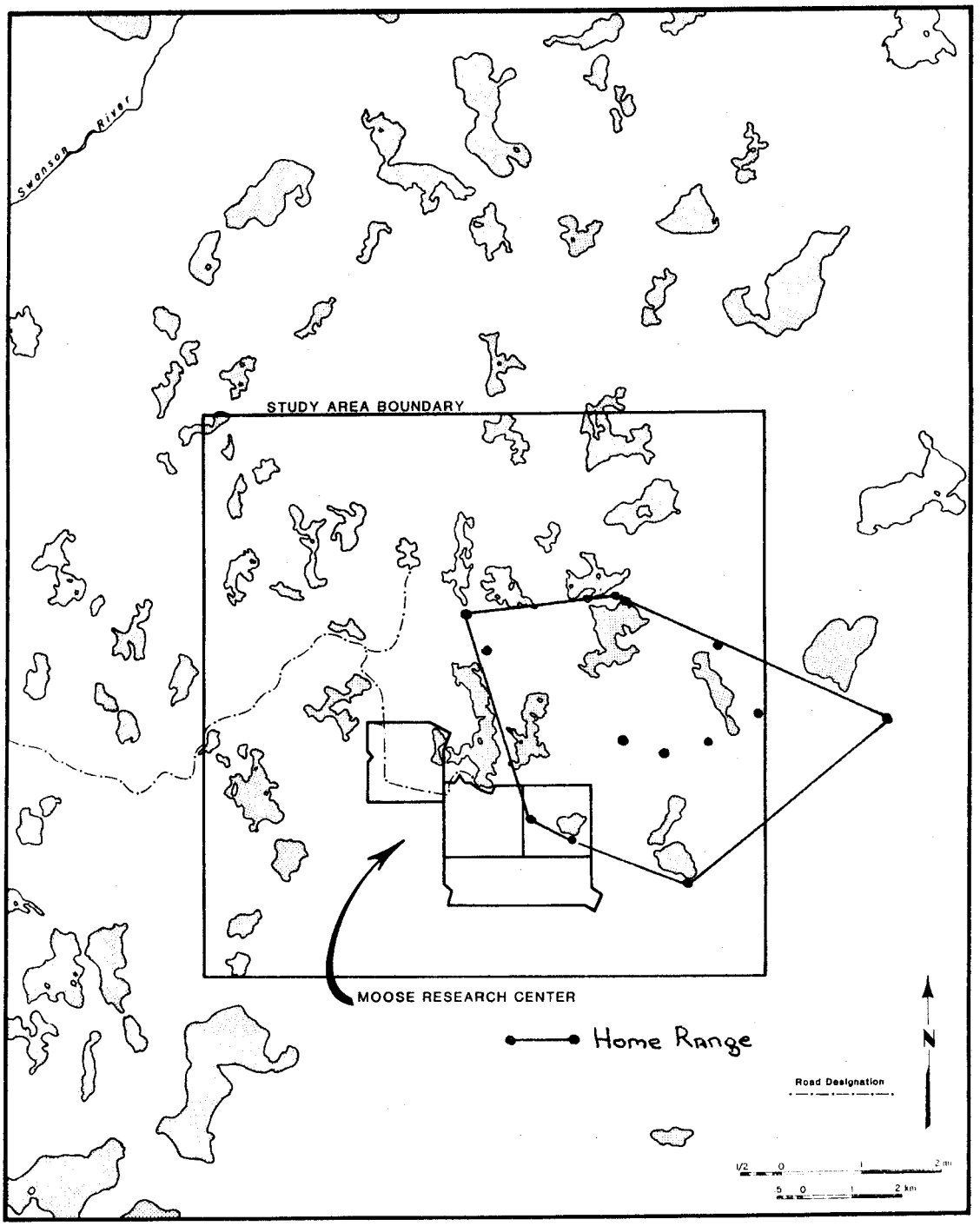

Fig. 5. Home range and movements of adult female B13 and her yearling in 1980.

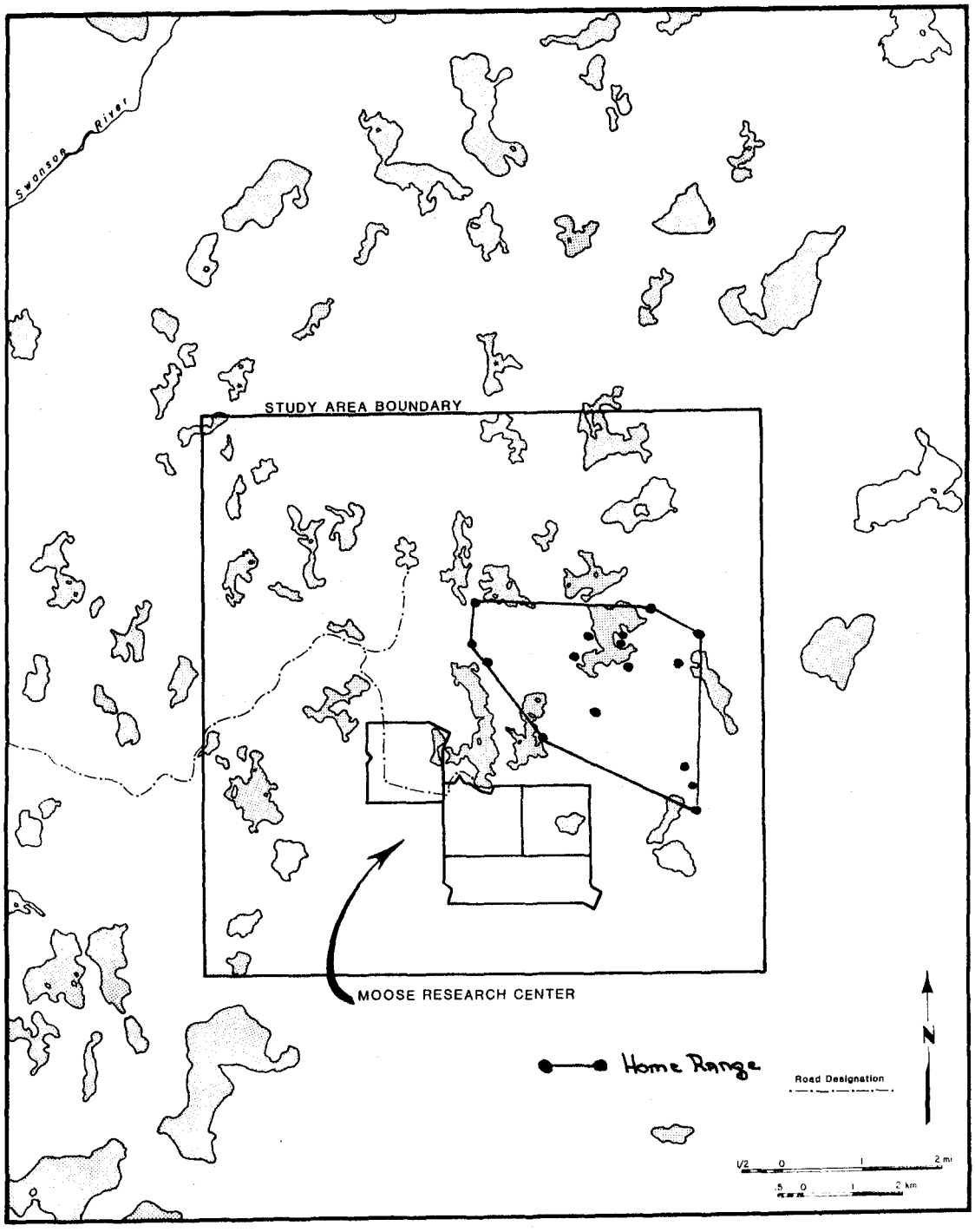

Fig. 6. Home range and movements of adult female B14 and her two cubs in 1980.

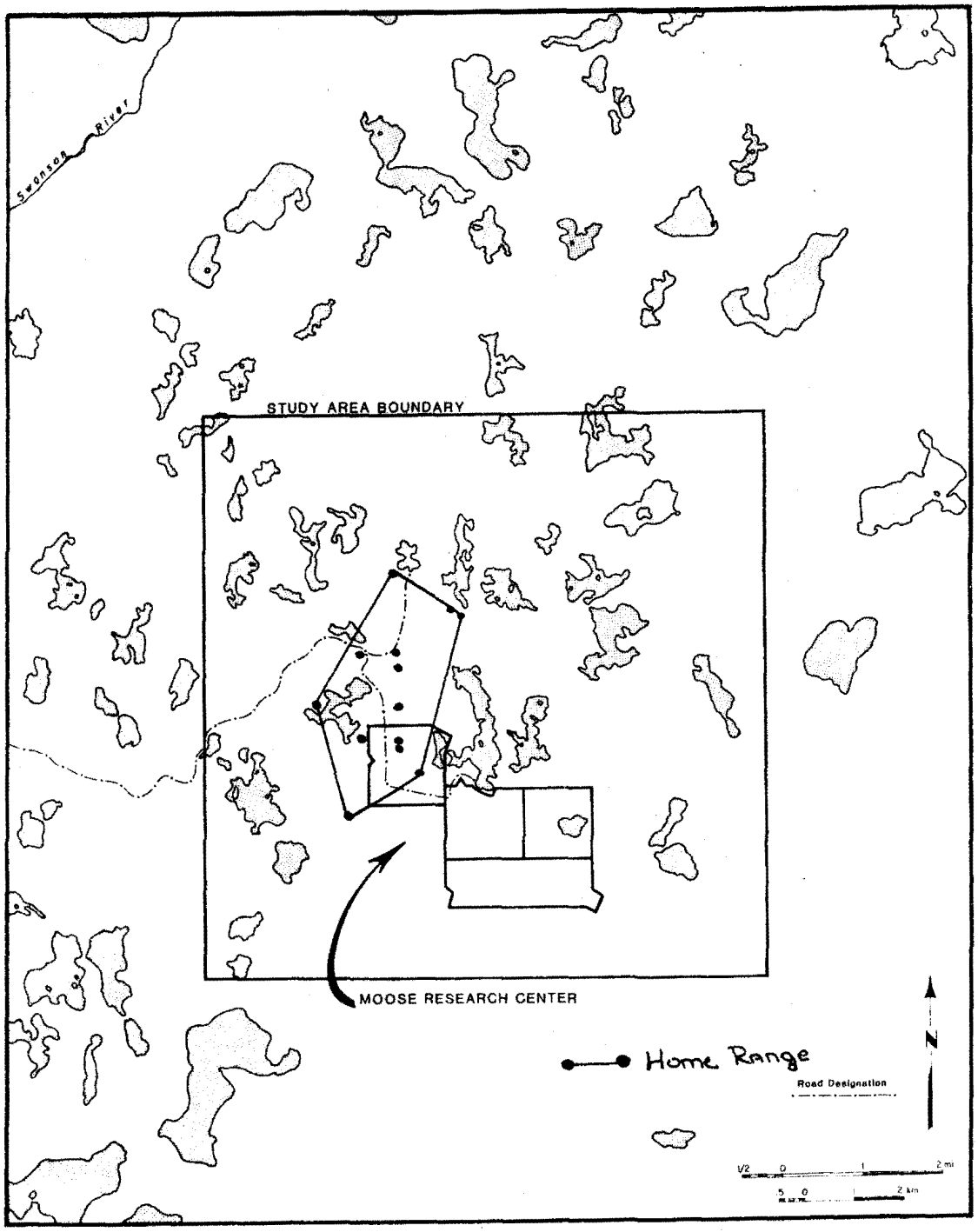

Fig. 7. Home range and movements of adult female B15 and her two cubs in 1980.

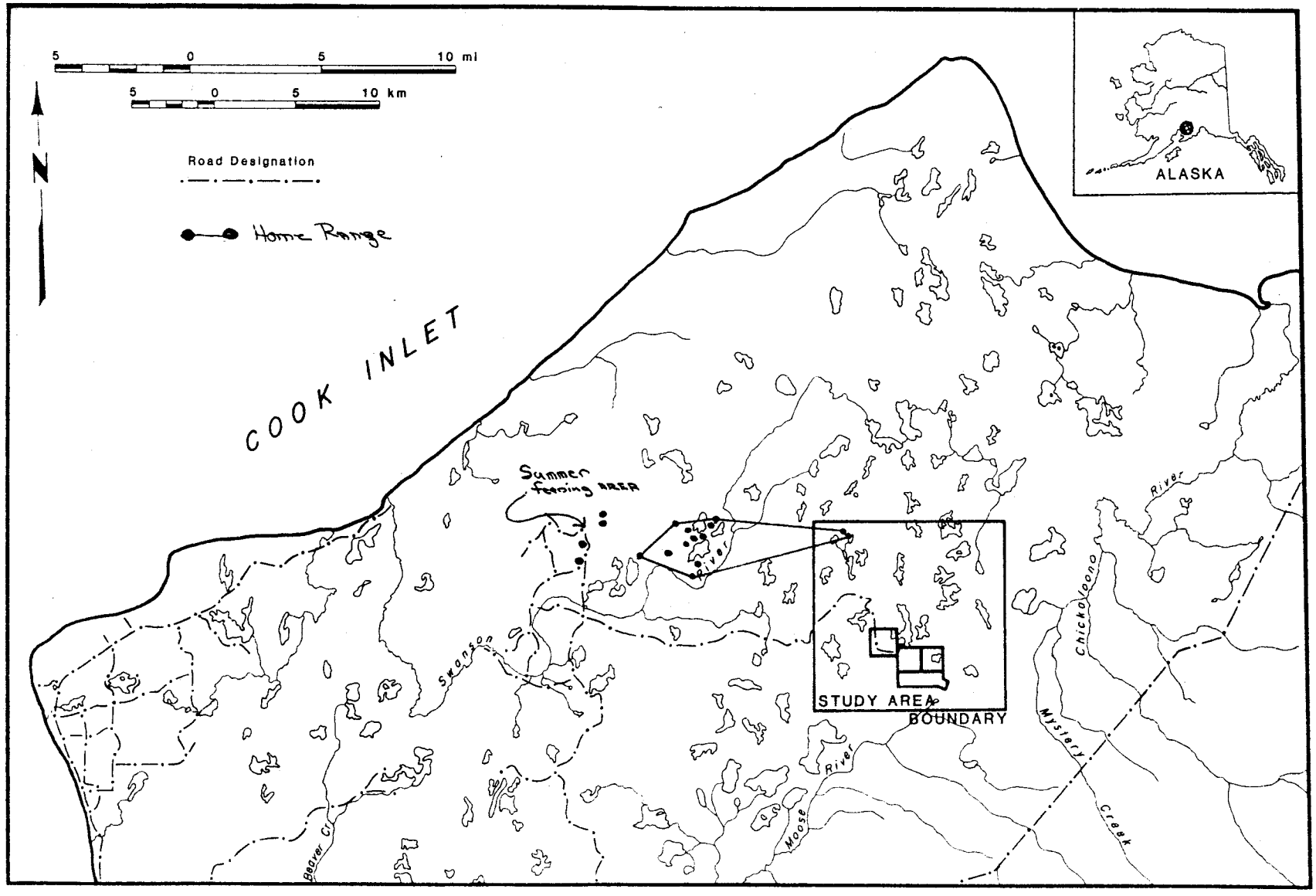

Fig. 8. Home range, movements and summer feeding area of adult female B20 and her two cubs in 1980.

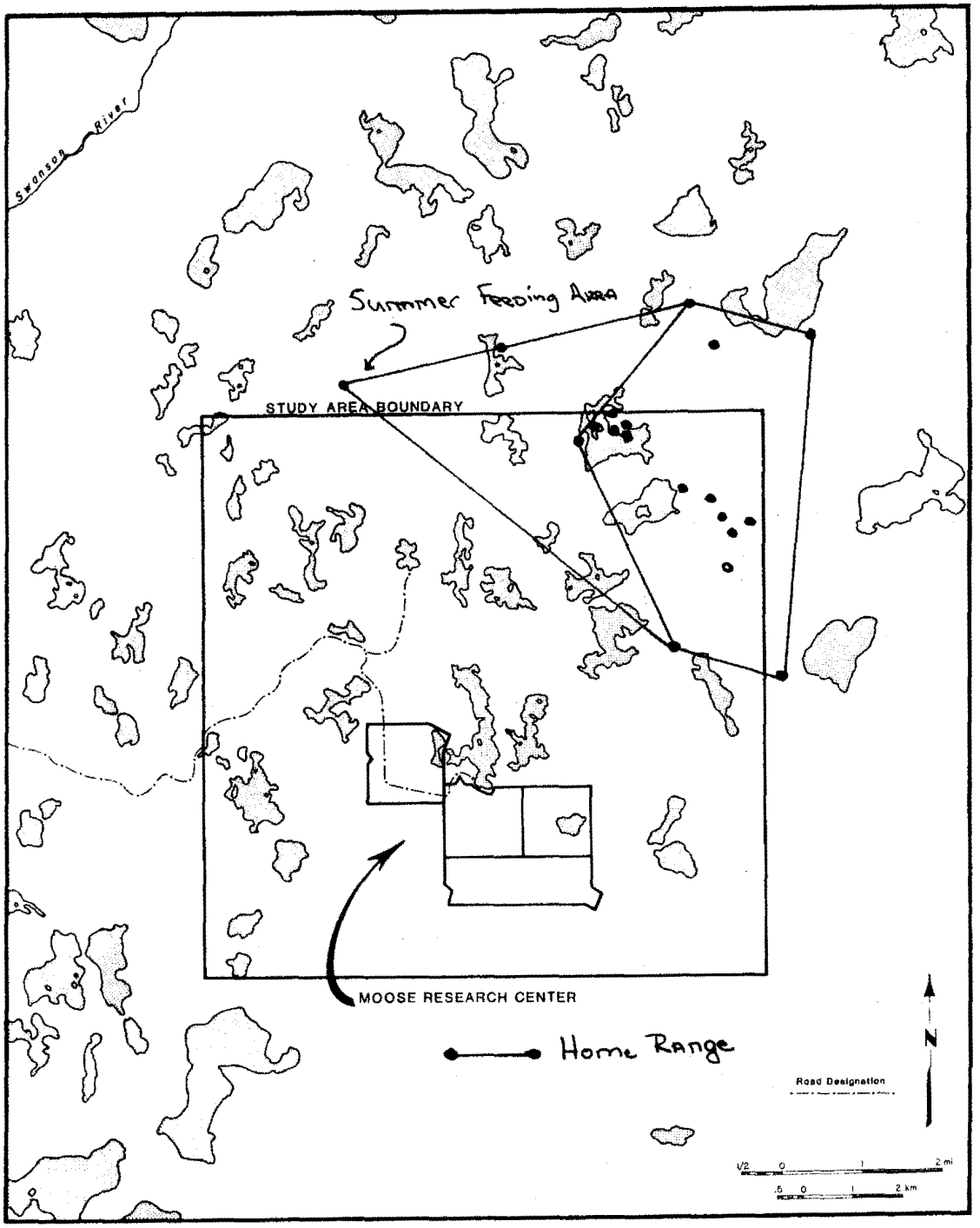

Fig. 9. Home range and movements of adult female B24 and her two cubs in 1980. Two home range areas are shown. The larger area contains the summer feeding area while the smaller one excludes it.

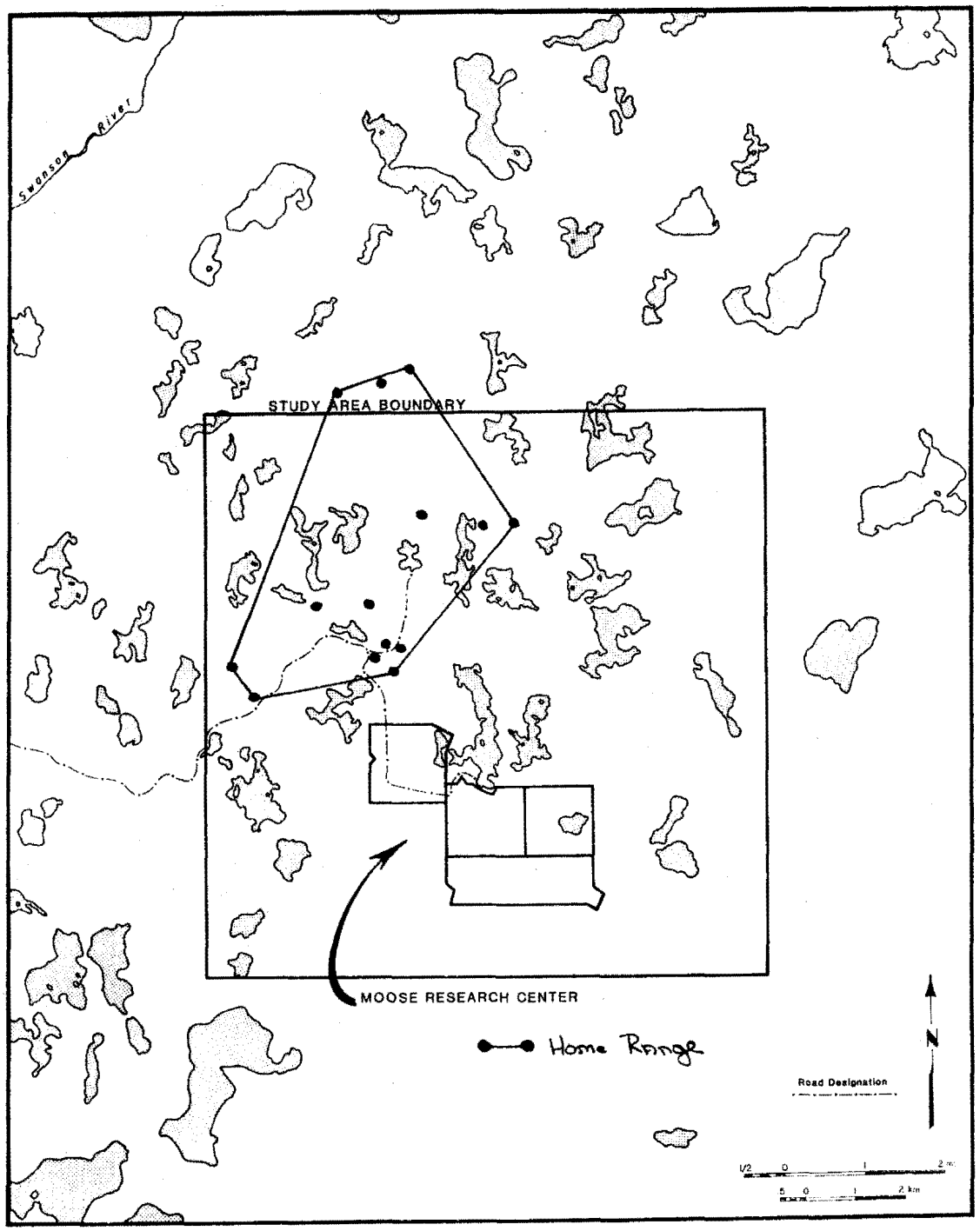

Fig. 10. Home range and movements of adult female B30 in 1980.

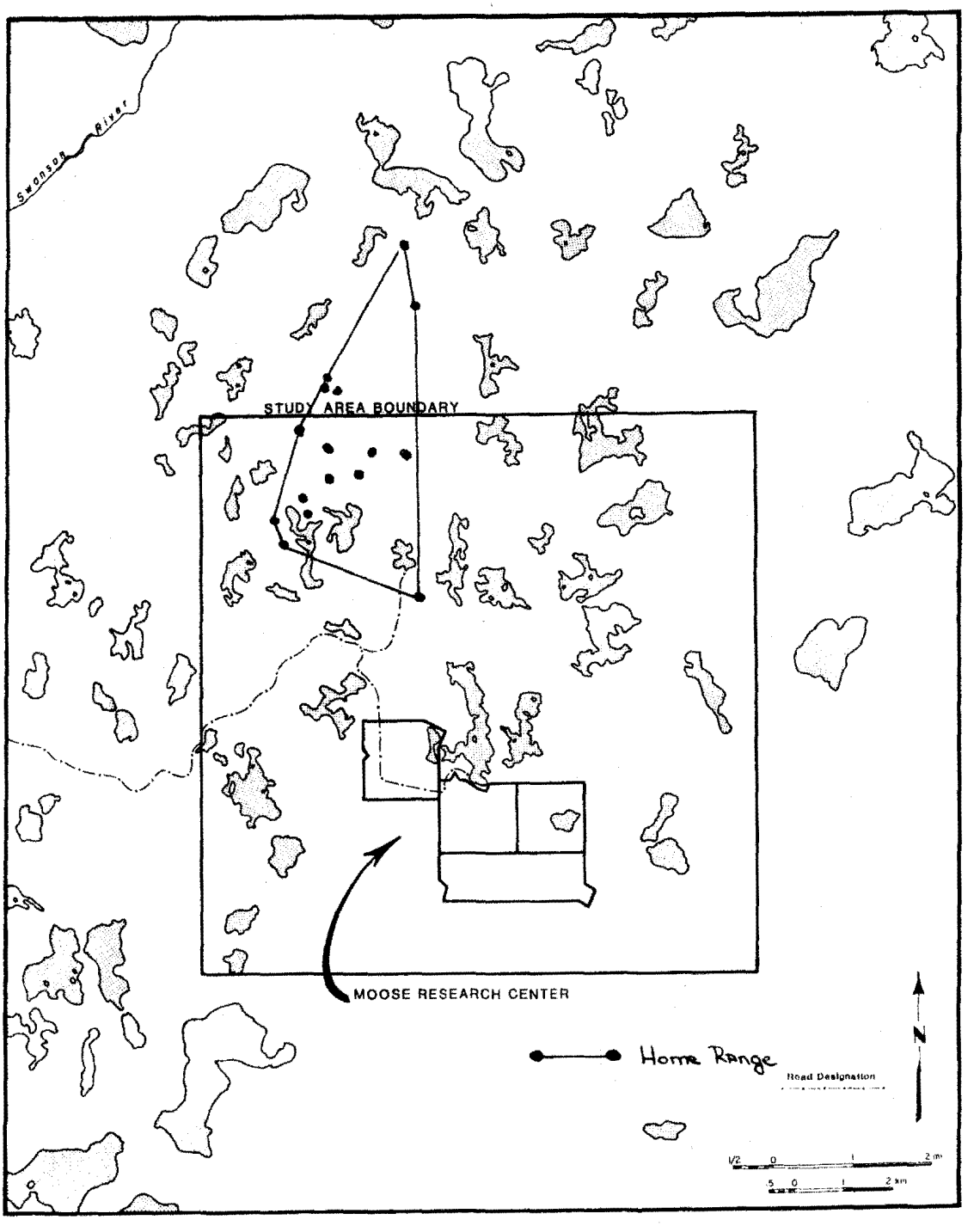

Fig. 11. Home range and movements of adult female B31 in 1980.

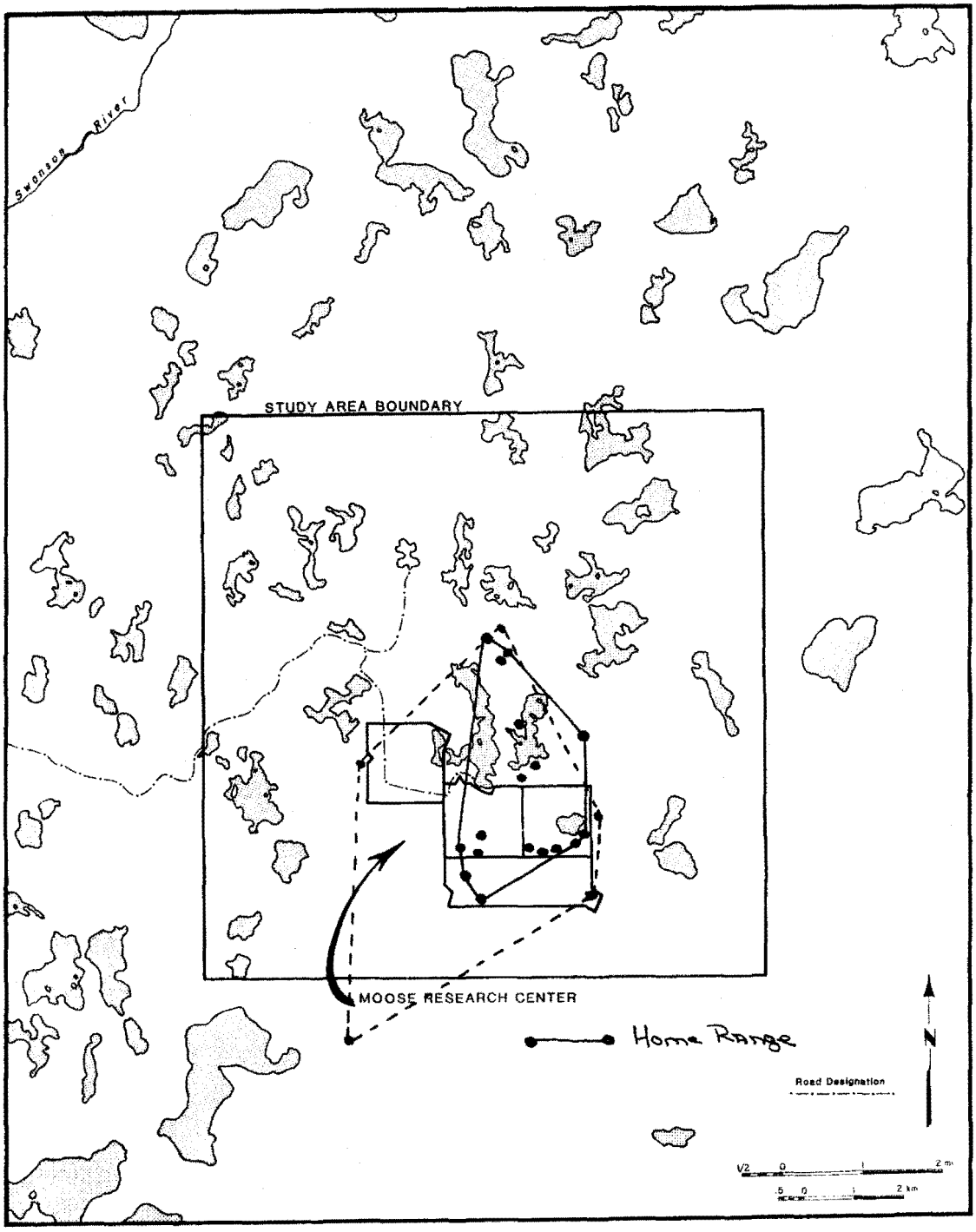

Fig. 12. Home range and movements of yearling female B38 in 1980. The dotted line represents her mother's (B2) home range in 1980.

Table 7. Home range size and reproductive status for 10 female black bears in the Moose Research Center Study Area, 1980.

Bear No.	Age	Reroductive Status	Home Range Size (ha)
B2	5	2 yearlings	2194
B12	5	2 yearlings	2495
B13	5	1 yearling	2708
B14	4	2 cubs	1221
B15	4	2 cubs	804
B20	8 or 9	2 cubs	938
B24	11	2 cubs	2176
B30	5	open	2182
B31	5	open	1370
B38	1	open	838

difficult to see from the aircraft, and used mature forests or regrowth areas associated with large trees.

Average home range size (Table 8) of four adult male black bears (98± 41 km^2) (Figs. 13-16) was much larger than that of females. We also radio-tracked two yearling males before and after they separated from their mothers in 1980. Their home ranges were quite small (8.7± 3.1 km^2), and generally within the home range occupied by their mothers (Figs. 17 and 18).

During 1980, all resident bears that were radio-collared, left the MRC study area in late July and early August and traveled to "summer feeding areas" (Figs 19 and 20). Females generally traveled north of the study area, while adult males moved west. Yearlings (B37, B38, B39) went to areas used by their mother in the previous year. We have no explanation as to why the adult males traveled west through the Swanson River oil field, which is a good summer feeding area, crossed the 1969 burn which contains little summer bear food, and then relocated in the mature forest north of the city of Kenai. It is interesting that five of six radio-collared males all moved to the same general area. At this time, we can only generate questions as to "why" such sexual segregation occurs. It will take many more years of study to sort out the potential variables involved.

Most bears returned to the MRC study area in early September in 1980, this was earlier than they returned 1978, but similar to 1979. The abundance of lowbush cranberry (*Vaccinium vitis-idaea*) within the study area in fall 1980 was about "average," and similar to 1979. However, compared to 1978 when bears returned later, lowbush cranberry was more abundant in 1980. These movements appeared keyed to food abundance within the study area and nearby summer feeding areas.

Population Density, Age Structure, and Reproductive Success

Our estimates of the 1980 population density of black bears in the MRC study area was 0.72± 0.20 bears/mi^2 (1.86±0.5 bears/ km^2) or one bear per 1.5± 0.4 mi^2 (3.9± 1.0 km^2). These estimates were obtained by calculating bear density in six 1 mi^2 areas located near the center of the study area (Fig. 21). These six sections were chosen because we felt all resident bears utilizing these areas were radio-collared and because the overlap of uncollared bears into these sections was minimal (except for resident juvenile males). These areas were also representative of the general habitat within the study area. Bear density per section was calculated by determining the percent of a radio-collared bear's home range within each section. For example, female B2 had a total home range of 2.2 km^2, with 0.2 km^2 of the 2.2 km^2 within section 1. She therefore, utilized section 1 (assuming equal usage throughout her home range) 9 percent of the time. B2's density for section 1 was therefore assigned at 0.09 bears/mi^2 (0.09 bears/2.59 km^2). Total density was then determined by summing all individual

Table 8. Home range size and age of 6 male black bears in the Moose Research Center Study Area, 1980.

Bear No.	Age	Home Range Size mi^2	km^2
B9	6	15.6	40.4
B10	11	52.4	135.7
B16	9	38.0	98.4
B25	6	45.56	118.0
B37	1	2.5	6.5
B39	1	4.2	10.9

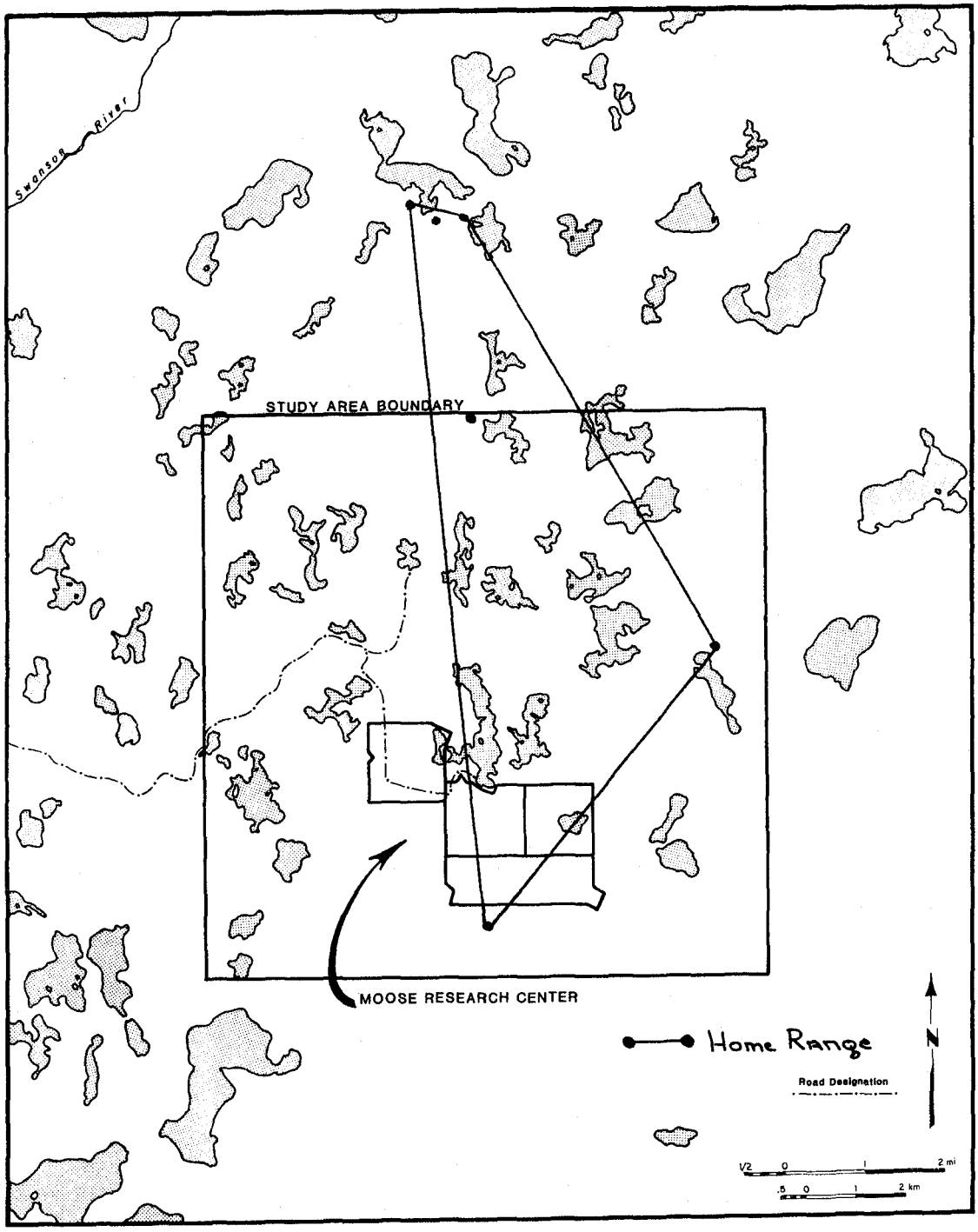

Fig. 13. Home range and movements of a 6-year-old male black bear (B9) in 1980.

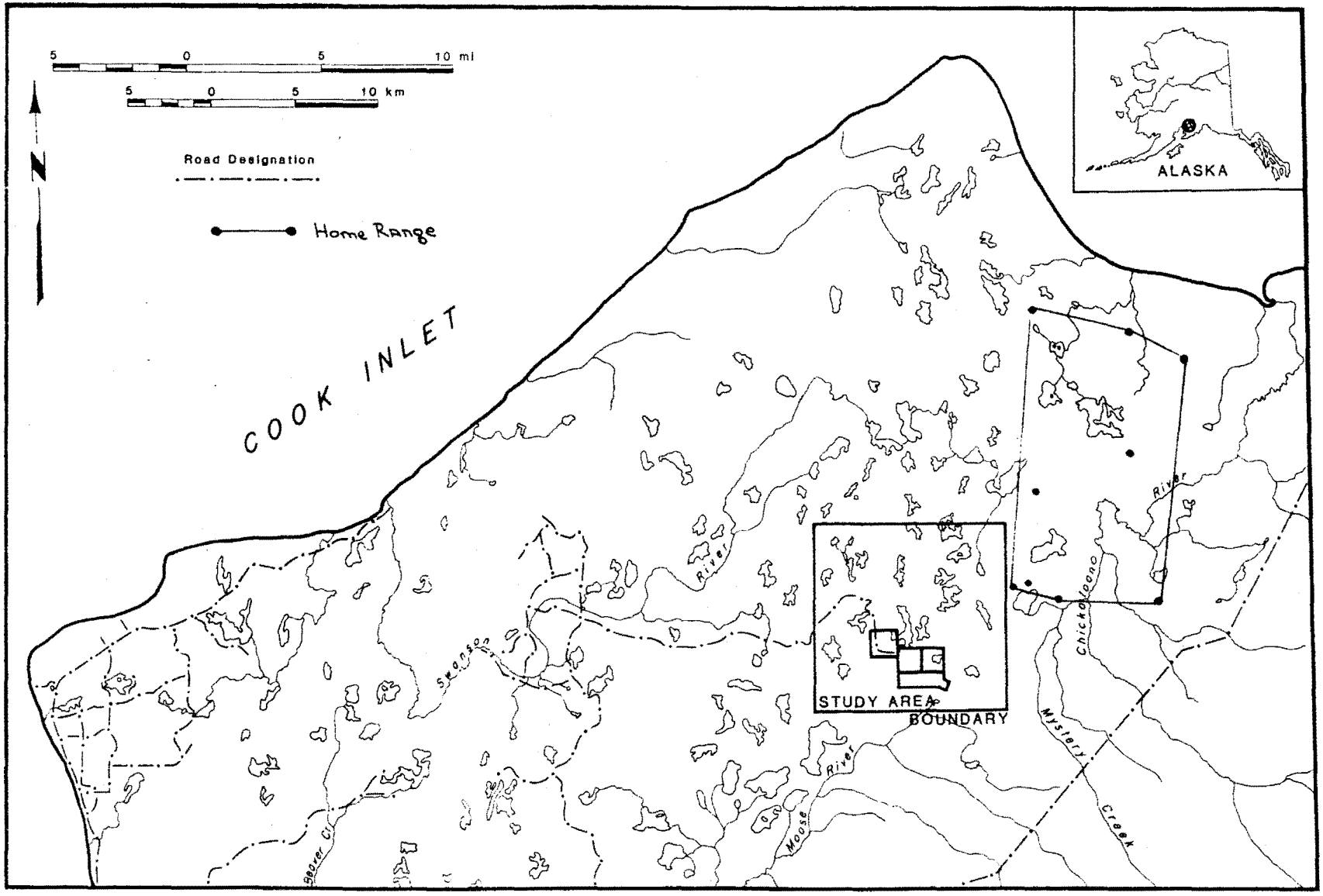

Fig. 14. Home range and movements of an 11 year old male black bear (B10) in 1980.

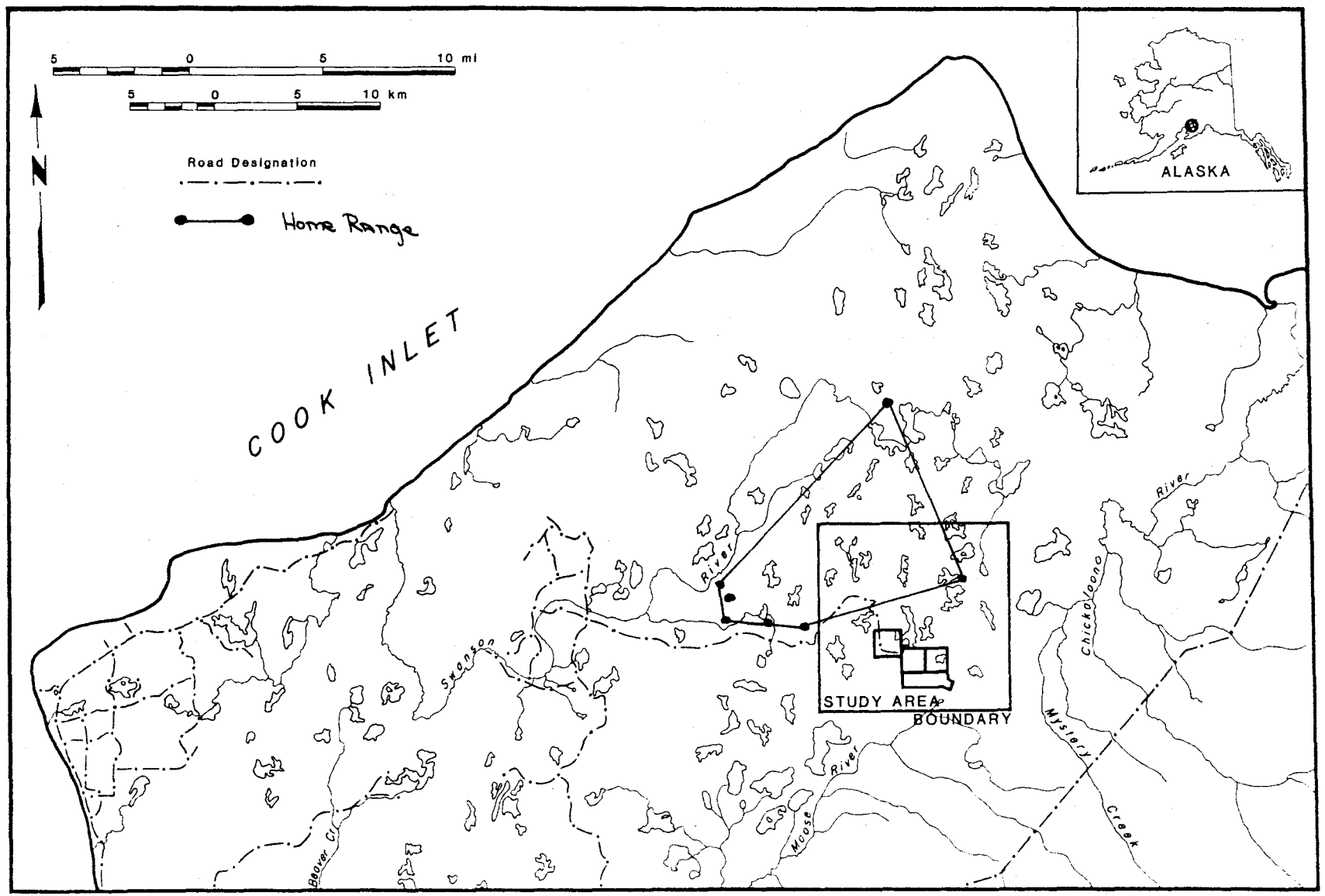

Fig. 15. Home range and movements of a 9 year old male black bear (B16) in 1980.

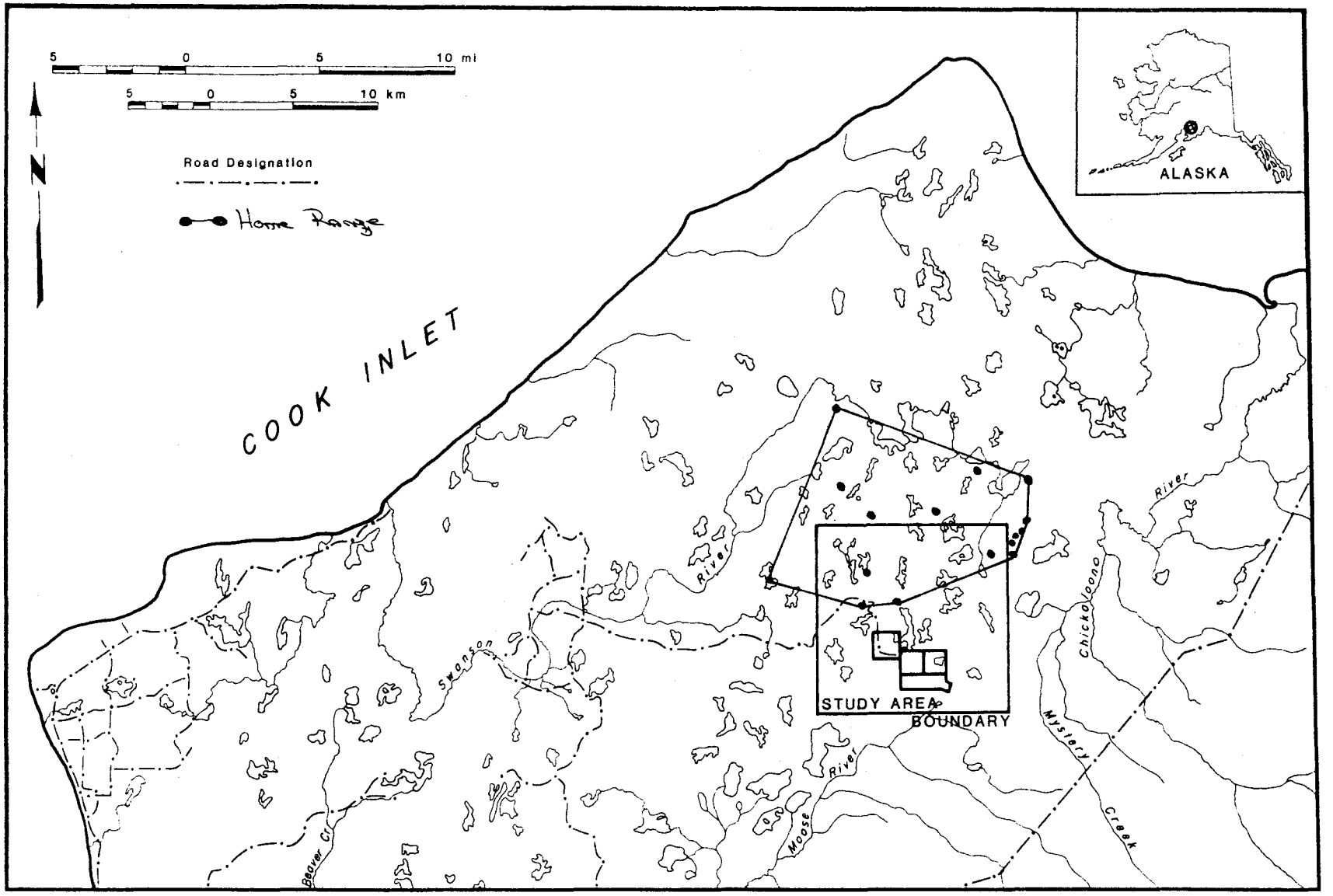

Fig. 16. Home range and movements of a 6 year old male black bear (B25) in 1980.

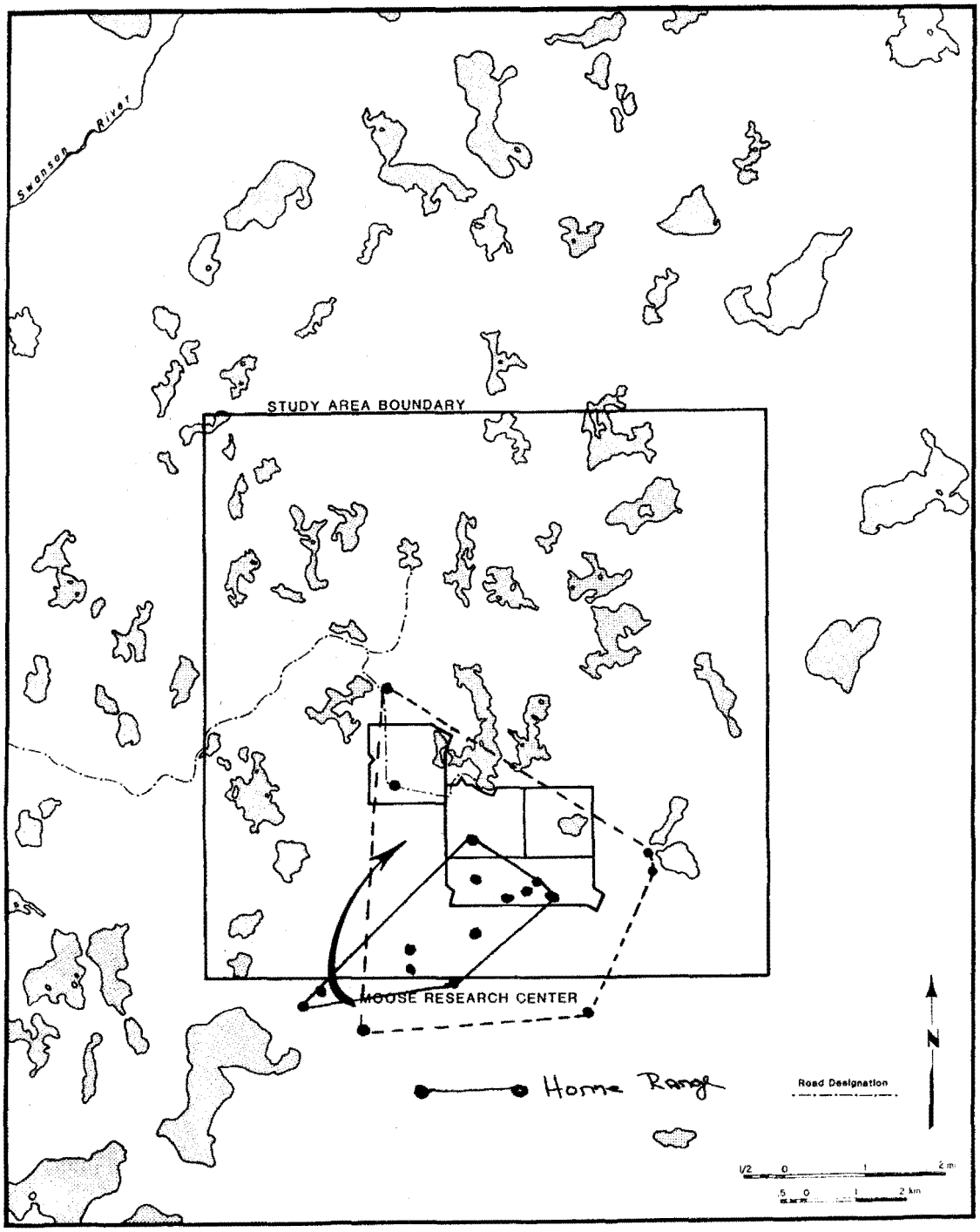

Fig. 17. Home range and movements of yearling male B37 in 1980. The dotted line represents his mother's (B12) home range in 1980.

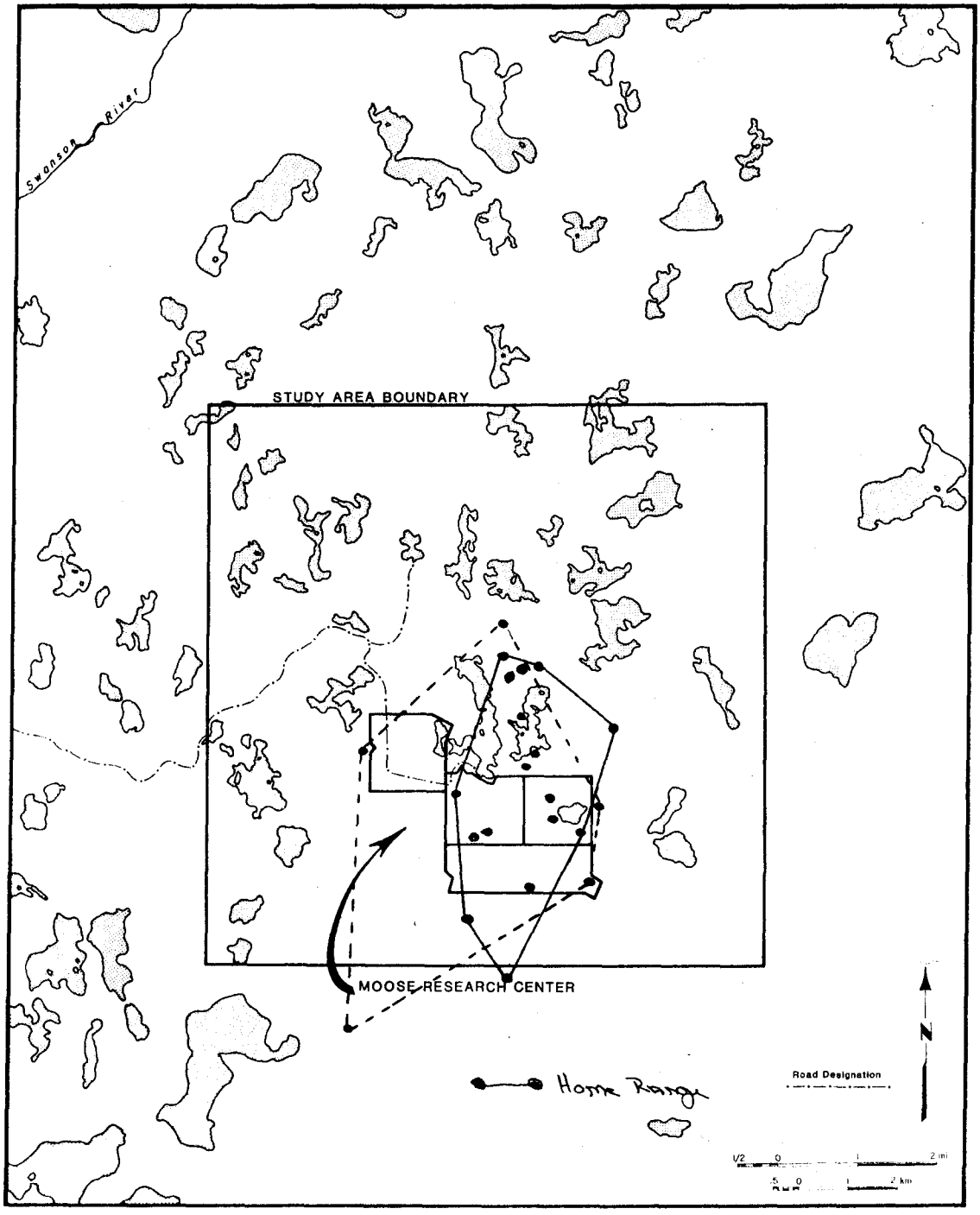

Fig. 18. Home range and movements of yearling male B39 in 1980. The dotted line represents his mother's (B2) home range in 1980.

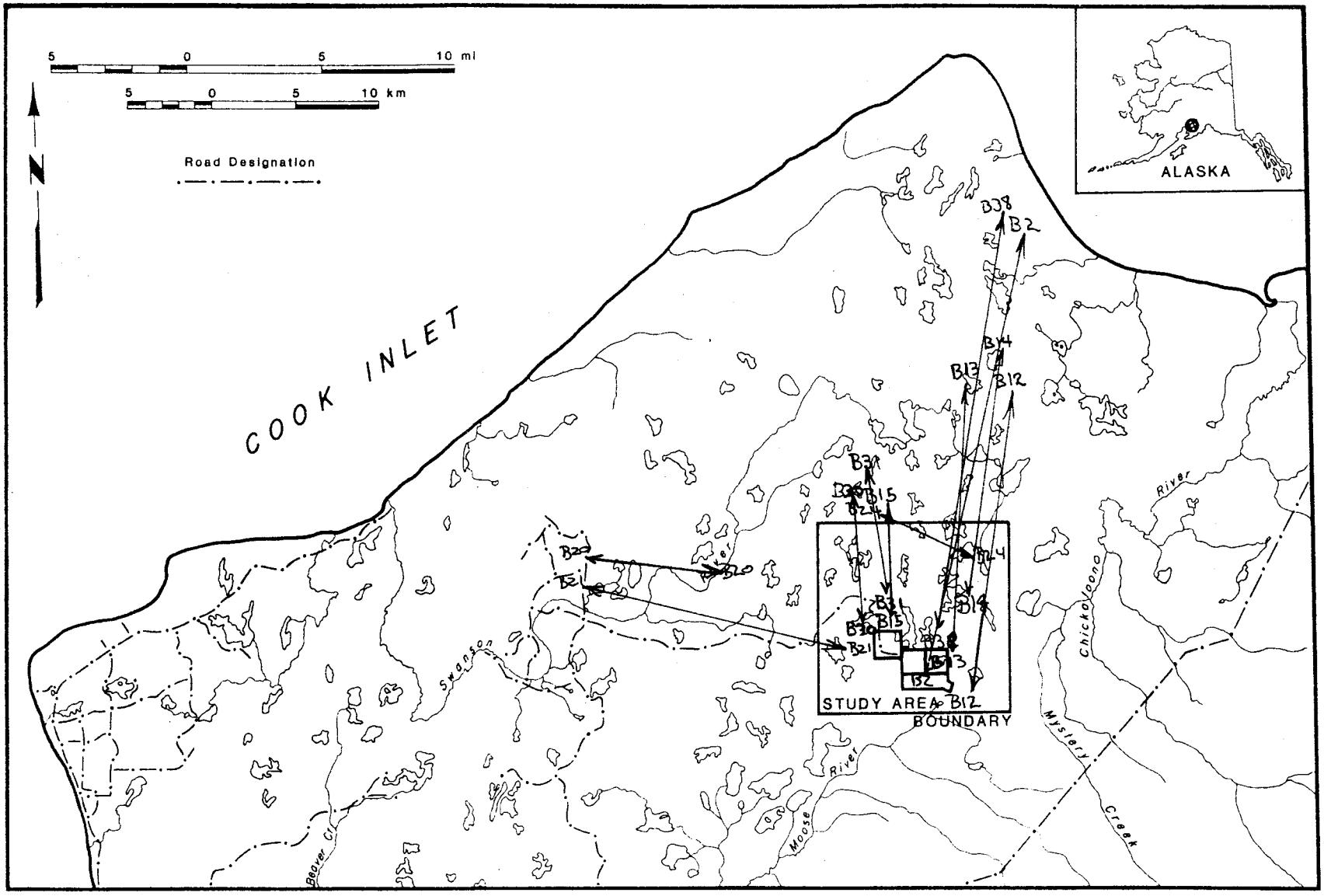

Fig. 19. Direction of movement and general location of summer feeding areas of resident female black bear in 1980.

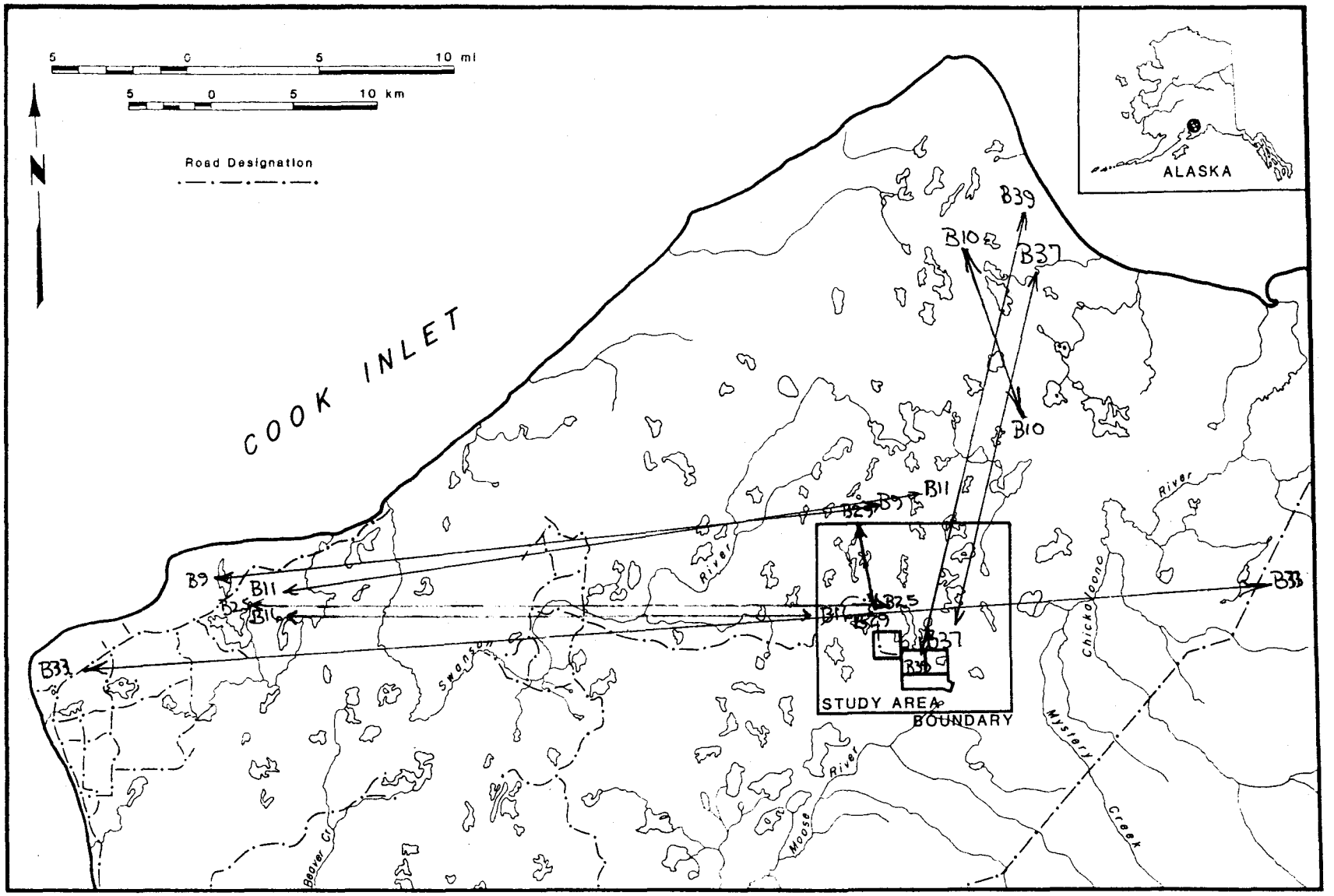

Fig. 20. Direction of movement and general location of summer feeding areas of resident male black bear in 1980.

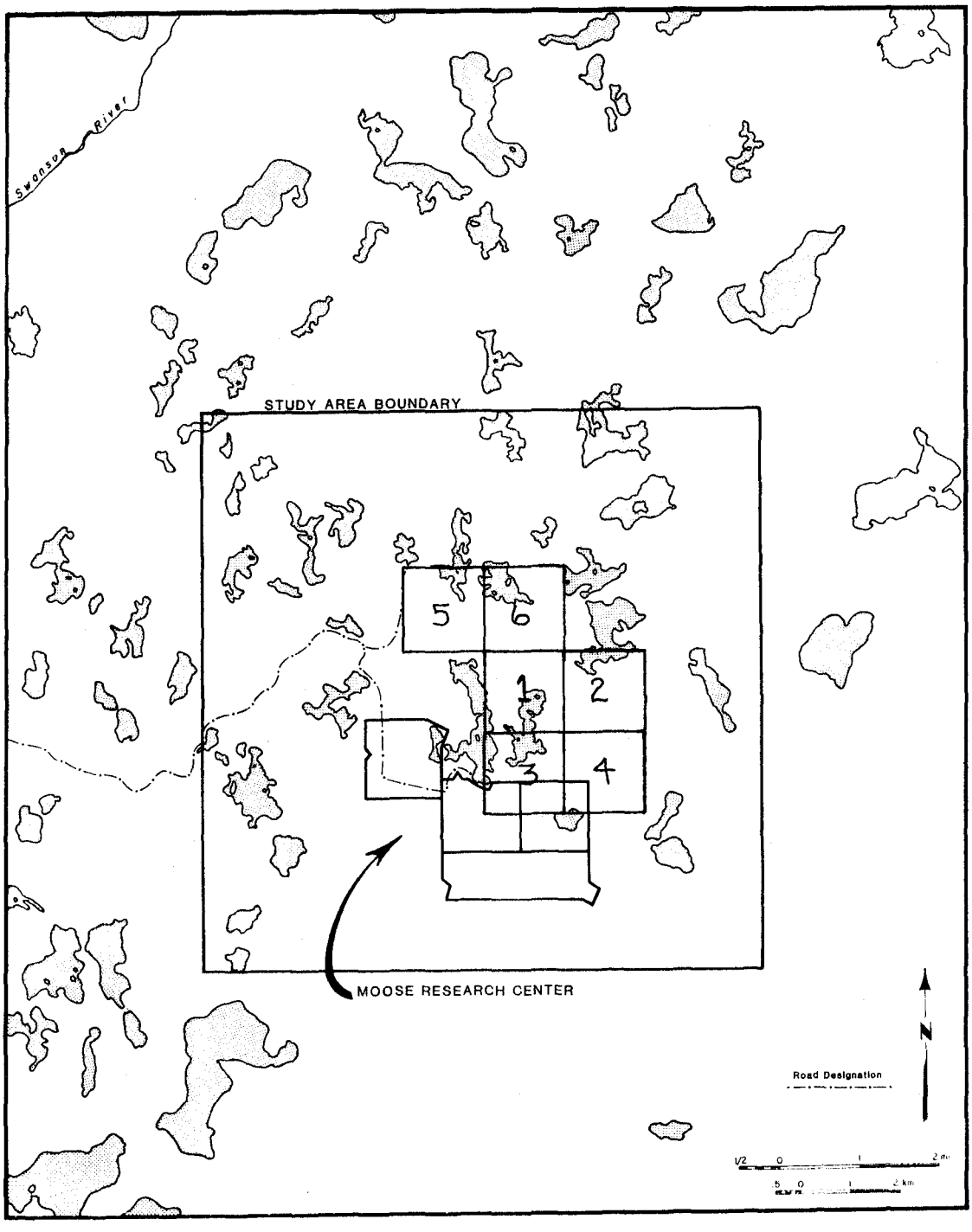

Fig. 21. Location of six 1 mi^2 areas used to estimate black bear density within the MRC study area in 1980.

densities (Table 9) of known radio-collared bears. The projected density of one bear per 3.9± 1.0 km^2 represented the mean and standard deviation of the six sections. These estimates probably somewhat underrepresent real densities because: (1) juvenile males within the study area were not included (B22, B27, B34, B40), (2) resident females B23, B36, and yearling male B37 all shed their radio collars precluding delination of their home ranges, and (3) likely not resident adult males using the MRC study area were collared. Nevertheless, we believe these estimates are much more accurate than those of 1979. Likewise, we believe the 1980 estimate can be further improved by radio-collaring juvenile males within the study area. Estimates are based on home ranges excluding summer feeding areas, and therefore are seasonal (June-September) in nature rather than estimated at one month of the year (June, in 1979). Therefore, bears within the study area for part of the year, but either dead (B34, B29), or dispersed prior to September were not counted.

Age and sex data (Table 3 and 6) are presented for resident bears of the MRC study area. Since data are preliminary in nature and represent only a portion of the total study area population, no discussion of this information is presented at this time.

Reproductive information from three marked females indicated an average of 2.0 cubs per female surviving at time of den emergence in the spring; all of these cubs survived the summer and entered the den with their mothers in the fall.

Denning Ecology

Between 1977 and 1980, we examined 21 winter dens of black bears within the MRC study area. Twenty dens were located by radio-tracking study area bears to their dens in winter; one additional den was found from an aircraft in the spring when an unmarked bear was sighted at its den entrance. Measurements of all dens were made in the spring and summer after the bears had left them.

The general shape and design of the dens investigated (Fig. 22) consisted of: (1) an entrance, (2) a tunnel of varying length, and (3) a nest chamber which was usually lined with vegetation. Dimensions of these three den components (Table 10) varied considerably. In general, yearlings constructed small dens which were not deep or extensive in design. Adult females generally constructed more elaborate dens with a long tunnel and large nest chamber. Dens of adult males were variable. Several dens investigated were "old" (not constructed that year) and had been used by bears in preceding years. Female B15, which was radio-collared as a 2-year-old in 1977, used the same den for the 1978-79, 1979-80, and 1980-81 denning seasons. Other bears went to "old" dens, but denned in different locations each year; the individual that constructed these dens was not known. Dens were classified as "new" if the tailing pile at the entrance was fresh, and no "old" tailing pile could be found below the fresh

Table 9. Individual black bear density estimates for six 1 mile^2 areas within the Moose Research Center study area in 1980.

Bear Number	Sex	1	2	3	4	5	6
B2	F	0.090	0.001	0.118	0.037	-	0.002
B12	F	-	-	0.055	0.002	-	-
B13	F	0.084	0.096	0.051	0.096	0.010	0.054
B14	F	0.124	0.212	0.012	0.097	0.003	0.114
B14 cub	?	0.124	0.212	0.012	0.097	0.003	0.114
B14 cub	?	0.124	0.212	0.012	0.097	0.003	0.114
B15	F	-	-	-	-	0.145	-
B15 cub (B41)	M	-	-	-	-	0.145	-
B15 cub (B42)	F	-	-	-	-	0.145	-
B30	F	-	-	-	-	0.046	-
B31	F	-	-	-	-	0.015	-
B38	F	0.245	0.015	0.309	0.085	-	0.007
All females	F	0.543	0.324	0.545	0.317	0.219	0.177
All cubs	-	0.248	0.424	0.024	0.194	0.296	0.228
Females & cubs	-	0.791	0.748	0.569	0.511	0.515	0.405
B39	M	0.133	0.015	0.238	0.080	-	-
B9	M	0.064	0.064	0.064	0.030	0.028	0.064
All males	M	0.197	0.079	0.302	0.110	0.028	0.064
All bears	-	0.988	0.827	0.871	0.621	0.543	0.469
mi^2/bear		1.01	1.21	1.15	1.61	1.84	2.13

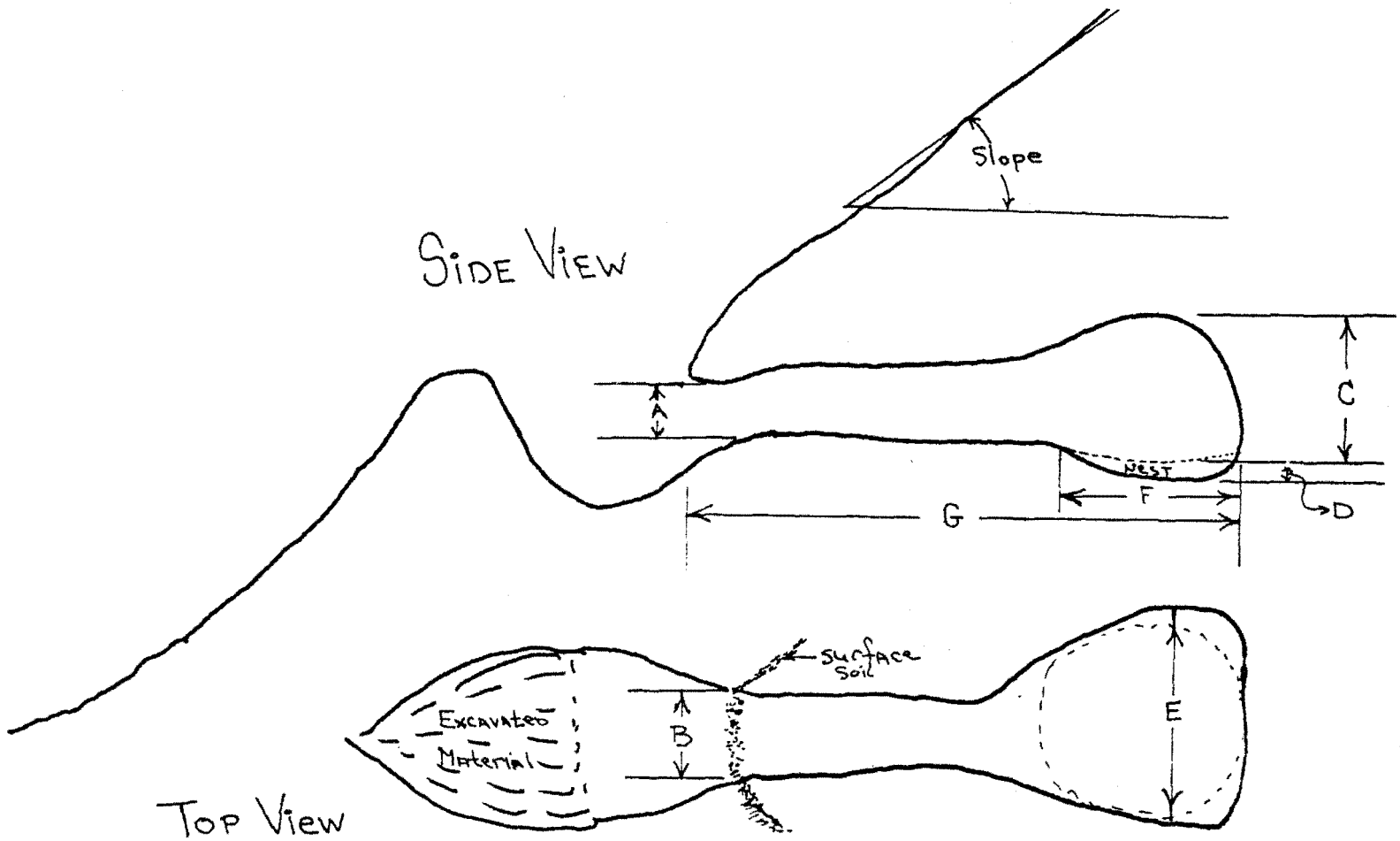

Fig. 22. Schematic of a typical black bear den on the Kenai Peninsula, Alaska showing locations of measurements listed in Table 10.

Table 10. Dimensions, slope, aspect, nesting material and habitat type of 21 black bear dens examined on the Kenai Peninsula, Alaska, 1977-1980. Dimensions follow those shown in Fig. 22.

Bear Number	Sex	New or Used[1/]	Year	Dimension (cm) A	B	C	D	E	F	G	Slope (degrees)	Aspect (degrees)	Bedding Material	Habitat[3/]
B1	F	used	1978-79	33	76	56	18	107	104	162	15.4	325	Spruce	MH-MS
B2	F	new	1978-79	53	66	76	8	91	101	254	<1	115	Spruce & leaves	RS-RH
B15	F	used	1978-79	43	63	70	3	130	132	163	27.7	345	Spruce	RS-RH
B18	F	used	1978-79	30	60	75	-	150	150	160	25.9	5	Ledum, vacc, moss grass, sticks	
Unid	?	new	1978-79	76	67	-	18	-	-	163	-	61	Vacc, moss, grass	MH-RS
B13	F	new	1978-79	58	81	53	20	79	172	282	8.3	35	Vacc & spruce	RS-RH
B7	F	new	1977-78	36	51	61	20	109	175	175	10.4	245	Vacc & birch sticks	RH
B12	F	used	1978-79	53	63	41	25	107	107	172	6.7°	95	Vacc & spruce	RS-MH-MS
B16	M	new	1978-79	43	63	56	none	89	124	124	21.4	275	none	RS-RH
B14	F	used	1978-79	38	56	61	15	101	69	182	<1	25	Vacc & sticks	MH-MS
B21	F	new	1979-80	34	43	33	4	89	74	112	27.7	175	Vacc & spruce	RS-RH
B15	F	used	1979-80	47	63	70	-	120	130	159	27.2	345	Vacc (dug out of den)	RS-RH
B23	F	new	1979-80	30	62	51	5	97	67	122	168	225	Spruce	RS-RH
B30	F	?	1979-80	40	60	66	8	125	68	153	17.3	335	Leaves & sticks	RS-RH
B13	F	new	1979-80	54	53	78	16	136	106	215	18.4	225	Grass	MH-MS
B2	F	?	1979-80	34	39	78	7	89	63	131	37.9	195	Grass	RS-RH
B12	F	?	1979-80	31	78	63	9	135	100	210	<1	205	Grass, vacc	MS
B25	M	new	1979-80	48	65	-	-	-	96	140	28.6	295	Spruce	RH-RS
B9	M	used	1979-80	49	49	85	2	133	121	208	27.2	85	Vacc, sticks, leaves	RH-RS
B24	F	used	1979-80	53	70	71	13	100	79	152	12.0	330	Moss, vacc, leaves & sticks	MH
B14	F	new	1979-80	64	52	-	-	104	106	266	<1	190	Vacc & spruce	RS-RH

1/ Some dens were used more than one time; a used den is one that was constructed in a year previous to its use.
2/ Aspect listed represents true north which is a 25° approximate mean declination from magnetic north.
3/ M = mature, R = Regrowth of 1947 burn, H = hardwoods, S = spruce.

diggings. To be sure, we excavated a small channel through these tailings until we were at the original ground level. Refurbished dens could usually be distinguished from new dens because of a definite layer of organic matter between old tailings and those extracted fresh that year. Dens were considered old if no tailing pile could be located, or if the tailing pile were revegetated. In most cases it was fairly obvious whether a den was new or used, but in a few cases we were unsure so no determination was made (Table 10).

Dens were constructed in almost all habitat types, available within the study area. Bears tended to avoid low wet places for obvious reasons, but B12 dug a den on a small hummock in an area totally surrounded by spruce bog. The slope on which the dens were located varied from flat ground to hillsides with a fairly steep incline (38°) (Table 10). Likewise, the aspect varied considerably, and no obvious trend could be detected (Fig. 23, Table 10).

Nesting material within the nest chamber was similar to the vegetation around the den. Lowbush cranberry and black and white spruce (*Picea glauca, P. mariana*) were the most common plant species utilized. A few dens were lined with leaves, sticks, grass and moss. One den had no bedding.

Two dens visited in 1979-80 were heavily infested with fleas. Glenn E. Haas, Department of Environmental Conservation, identified 25 specimens collected as *Chaetopsylla tuberculaticeps* (Bezzi). These were the first fleas collected from bear dens in Alaska. Jellison and Kohls (1939) and Jellison and Senger (1976) collected this species from a black bear at the Funny River, Kenai Peninsula, Alaska and Hopla (1965) reported this species on a black bear from the Chickaloon Bay-Chickaloon River area of the Kenai Peninsula, Alaska. We have never seen fleas on the black bears that we routinely drug.

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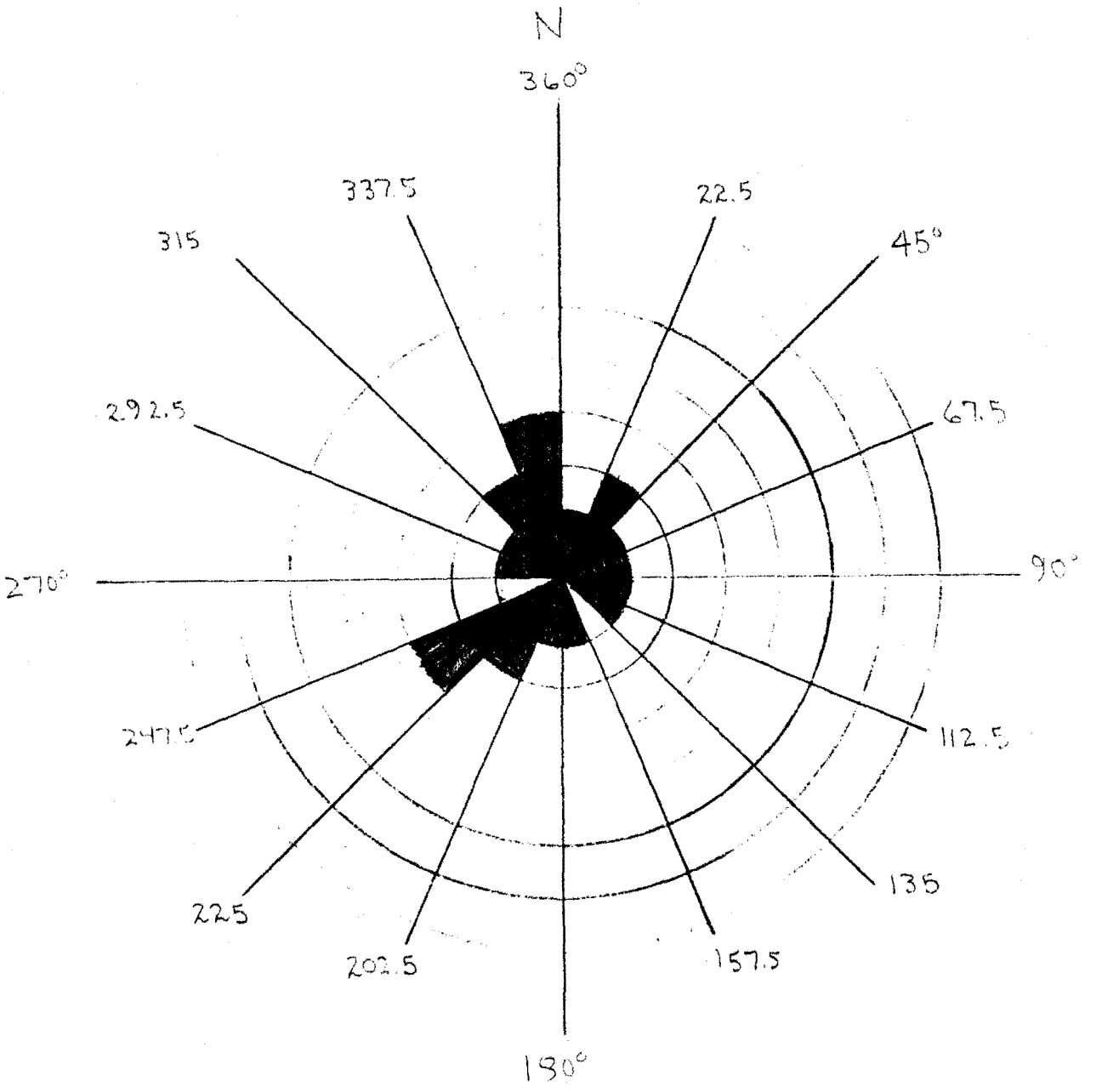

Fig. 23. Aspect of 21 black bear dens on the Kenai Peninsula, 1977-1980. A black wedge in each concentric circle represents one den.

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