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POLAR BEAR REPORT

by
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JOB PROGRESS REPORT (RESEARCH)

State: Alaska

Cooperators: Jack W.Lentfer

Project No.: W-17-1 Project Title: Big Game Investigations

W-17-2 Job Title: Polar Bear Hunter Harvest, Breeding Biology, Population Identity, and Ice Relationship

Job Nos.: R-1, R-2, R-3, 5.1R and 5.2R

Period Covered: January 1, 1969 - December 31, 1969

SUMMARY

The Alaska polar bear harvest from July 1, 1968 through June 30, 1969 was 298. Natives, most with the aid of snow machines, took 9 percent and trophy hunters, most with the aid of aircraft, took 91 percent of the harvest. Non-residents took 76 percent of the bears taken. The harvest was 72 percent males. Natives took bears from October through April, and trophy hunters took animals in February, March, and April, the period when light airplanes can best be used for hunting. Airplane guide teams numbered 32. Most airplane hunting was out of Teller, Kotzebue, Point Hope, and Barrow.

Guides furnished composition data on 780 bears: 31 percent were young, 19 percent were females with young, and 50 percent were single bears. Average litter size was 1.67. The number of bears seen per flying hour was 1.0, and the number seen per hunting hour was 1.7.

Age determination of bears, based on cementum layering, showed the mean age of males taken by non-residents in the Chukchi Sea to be 6.3 years and in the Beaufort Sea to be 7.5 years.

The Alaska Department of Fish and Game tagged 22 bears north of Barrow and 2 bears north of Barter Island. The U. S. Fish and Wildlife Service tagged seven animals out of Cape Lisburne. Of 171 tags applied in 1967 and 1968, 16 have been recovered 9 months or longer after being applied. Over half were recovered in the same general area where applied.

Bears prefer areas of moving pack ice where seals concentrate. Bears are more numerous along the Alaska coast in years when wind brings old ice to the coast in the fall. The basic current patterns in the polar basin are known. Currents and ice drift will have to be considered when considering polar bear movements.

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BACKGROUND

There is world-wide interest and a wide range of views about polar bear management. These range from the concept that bears should be hunted because they are highly desired trophies to the concept that they are a unique species and should be completely protected. Polar bears are under the jurisdiction of five nations, each with different management philosophies. The Alaska Department of Fish and Game is responsible for management of polar bears in United States territory, and therefore must conduct research in order to develop a management program. Much of the past work has been an assessment of hunter harvest and gathering of abundance and composition data. Present efforts are directed toward identifying sub-populations of bears, if they exist, and effects of ice formation and movement on bear distribution and movement. Population identity studies are coordinated with those of other nations.

OBJECTIVES

To determine magnitude, distribution, chronology, and sex, size, and age composition of the hunter harvest.

To describe breeding biology.

To determine if bears off the Alaska coast belong to one or more discrete populations and, if so, the relationship of these populations to bears throughout the polar basin.

To determine relative abundance of bears in different ice types.

To determine how changes in ice movement and formation from year to year might affect abundance of bears along the Alaska coast.

To learn of movement patterns of ice throughout the polar basin with emphasis on those movements which would have the most effect on bears off the Alaska coast.

PROCEDURES

By regulation, polar bear hides and skulls must be presented to a member of the Department for examination and sealing within 30 days after the date of kill. The greatest segment of the kill, that taken with the aid of aircraft, occurs in late February, March, and April from four hunting locations. To expedite sealing, Department personnel were stationed at three of these locations during most of the hunting period. Information obtained at time of sealing included date and location of kill, sex, hide size, and skull length, width, and condylobasal length. Specimens, including skulls, teeth, reproductive organs, blood samples, and masseter muscle samples, were collected through contact with guides and hunters. Guides were furnished forms and asked to record number, composition, and location of bears seen on hunting flights. Personnel who conducted the sealing program were Jerry Sexton and Mel Buchholtz at Barrow, Ben Ballenger and Jerry McGowan at Kotzebue, Doug Jones at Point Hope, and Bill Griffin at Barter Island. Bob Pegau at Nome obtained sealing information for bears taken out of Teller and Shishmaref.

A regulation requiring that hunters allow a lower rudimentary premolar (P_1) to be collected by the Department when a skull is presented for sealing provided teeth for age determinations of most bears harvested. In some cases, M_1 was obtained. The molar is preferred because its larger cross section provides more area for examination. The technique for treating teeth before examination was modified somewhat from that reported previously. Teeth were decalcified in 3 percent hydrochloric acid until they were flexible or felt slightly rubbery. Premolars decalcified in 18-24 hours; molars required 3-4 days. After being decalcified, teeth were washed in running tap water for a minimum of 3-4 hours to remove acid. Cross sections approximately 50 microns thick were cut with a microtome cryostat at a temperature of -15 degrees C. Sections were cut from the portion of tooth about one-third of the

distance from the root tip to the root-crown junction. It appears that the maximum number of annuli which have been formed in the cementum are present here, and that annuli here may be somewhat more distinct than in other portions of the tooth. Sections were stained for 3-5 minutes in Harris-Hematoxylin modified for Papanicolaou staining (Paragon C. and C. Co., Inc., New York, N. Y.). Details on examining cementum to assign ages are described by Lentfer et. al. (1968).

Testes were collected from bears killed by hunters before March 1 and after April 15, the period for which more specimen material is needed to supplement information on male breeding biology reported by Lentfer et. al. (1969). Female reproductive tracts were collected during the entire hunting period. Specimens were preserved and will be examined and reported on in the future.

Tagging and marking bears to obtain movement and other life history information was continued for the third year. Jack Lentfer and Lee Miller based at the Tin City Air Force facility from February 18 to March 3 to attempt to tag bears in Bering Strait. Lentfer, Miller, and Jerry Sexton based at the Naval Arctic Research Laboratory to tag bears in the Point Barrow and Barter Island areas from March 17 through April 26. Facilities provided by the Air Force, the Naval Arctic Research Laboratory, and Federal Electric Corporation greatly facilitated the work. Details on immobilizing and marking animals are given by Lentfer (1968; 1969). The U. S. Fish and Wildlife Service tagged bears in the Cape Lisburne area.

Movement and other information on tagged animals was obtained by recapturing bears tagged in previous years, checking bears killed by hunters, asking guides to report sightings of marked bears, informing Natives in coastal villages of our marking program, and asking Coast Guard icebreaker personnel to check for marked animals.

Another marking program was started. The method, which is relatively inexpensive, is to have animals ingest a chemical which marks bones and teeth for a long period of time. The chemical marker is demethychlortetracycline (DMCT), an antibiotic which chelates with calcium ions in bones and teeth. The presence of DMCT in these tissues is indicated by the emission of characteristic golden-yellow fluorescence under ultraviolet light. Linhart and Kennelly (1967) have reviewed literature and presented data on fluorescent bone labeling of coyotes. Fluorescence was more evident in younger coyotes but could be recognized in all treated animals, the oldest of which was 12 years. Frost et. al. (1961) found fluorescence persisting for as long as 9 years after administration of the drug.

For marking polar bears, baits consisting of 2400 milligrams of DMCT (Declomycin, Lederle Laboratories, Pearl River, N. Y.) in 10-pound pieces of seal meat and blubber were placed along the coast between Point Barrow and Wainwright at locations where bears most often occur or where there were walrus carcasses to attract bears. Baits were placed on platforms above the ground so that foxes could not reach them. Specific locations and numbers of bait stations were: Point Barrow (two), Tachinisok

Inlet (one), Seahorse Islands (two), Point Franklin (two), Pingasagrvok (one), and Atanik (one). Benny Ahmaogak of Wainwright and Mel Buchholtz assisted with placement of bait stations. Mandibles and/or teeth of bears killed by hunters will be examined under ultraviolet light to determine if bears have been marked.

Efforts were continued through a cooperative effort with the University of Sidney, Australia, to attempt to have radio-tracking equipment developed. This program was unsuccessful and was discontinued. A contract was then entered into with Sensory Systems Laboratory, Tucson, Arizona, for delivery of six radio-collars and aircraft tracking equipment in February 1970. Specifications included 100-mile range, silver cadmium batteries functional at -60°F., and lifetime of 90 days.

A study of bear-ice relationships was started. Field notes for several years were reviewed to extract data on relative abundance of bears, as determined by presence of tracks and animals, in various ice types. Most observations have been made while searching for bears for tagging. Observations made by observers on guided hunting flights and information from guides supplemented the tagging observations. Eskimo hunters provided information on relationships between bears and ice formation and movements along the coast. Literature on ice movements throughout the polar basin was reviewed to determine the possible effects of such movements on bears along the Alaska coast.

FINDINGS

Characteristics of Harvest

Harvest figures presented here are for the period July 1, 1968 through June 30, 1969. There were no significant changes from preceding regulatory years in hunting regulations for this period. The open season for trophy or sport hunting extended from January 1 through April 30. The bag limit was one bear, provided a bear had not been taken during the preceding 3 regulatory years. A permit was required to take a bear. There was no limit on the number of permits issued except that imposed by a cut-off date of March 1 for permit application. Hunters who were not residents of Alaska were required to hire guides. Guides were limited to guiding six hunters and participating in six additional hunts. Residents were allowed to take bears at any time and without limit for food, provided aircraft were not used. Cubs (bears not yet 2 years old) and females with cubs were protected.

Subsistence and sport hunters reported taking 298 bears from July 1, 1968 through June 30, 1969 (Table 1). Comparative harvest figures since 1961 are listed in Table 2.

Natives, most of whom used snow machines for transportation, killed 27 bears. This is somewhat below the 37 bear average of the past 8 years, but is nearly the same as the 26 bear average when the exceptionally high kill of 111 in 1968 is not considered. Natives were

Table 1. 1969 known polar bear harvest by Alaska based hunters. Data are catagorized on the basis of area, type of hunter, and sex of bear.

Hunting Base	NON-RESIDENT			RESIDENT - WHITE			RESIDENT - NATIVE			TOTAL						
	M	F	Sex Unk.	M	F	Sex Unk.	M	F	Sex Unk.	M	F	Sex Unk.	All Bears	% of Total Kill	% Male	% Non-Res.
Teller	25	2	-	1	-	-	-	-	-	26	2	-	28	9.4	93	96
Kotzebue	77	14	-	3	-	1	-	-	-	80	14	1	95	31.9	85	96
Pt. Hope	37	14	-	12	5	-	1	-	-	50	19	-	69	23.2	72	74
Barrow	22	21	-	10	8	-	5	1	-	37	30	-	67	22.5	55	64
Shishmaref	3	3	-	-	-	-	-	-	-	3	3	-	6	2.1	50	100
Wainwright	-	-	-	-	-	-	7	9	-	7	9	-	16	5.4	44	0
Colville R.	4	1	-	-	-	-	-	-	-	4	1	-	5	1.8	80	100
Barter Is.	4	-	-	1	3	-	2	-	-	7	3	-	10	3.4	70	40
Kivalina	-	-	-	-	-	-	-	2	-	-	2	-	2	.7	0	0
Sub Total	172	55		27	16	1	15	12	-	214	83	1	298	100		
Percent	76	24	0	63	37		56	44		72	28		100	100		
TOTAL	227 (76%)			44 (15%)			27 (9%)									

Table 2. Polar bear harvest and sex ratios, 1961-1969.

Year	Non Resident		Resident White		All Sport Hunters		Resident Native		All Hunters	
	No.	% Male	No.	% Male	No.	% Male	No.	% Male	No.	% Male
1961	70	93	59	57	129	77	23	52	152	73
1962	78	85	103	60	181	70	16	50	201	69
1963	106	88	57	68	163	81	22	68	189	79
1964	142	89	86	60	228	78	23	69	253	77
1965	159	89	116	64	275	79	21	50	296	76
1966	195	89	152	66	347	79	52	46	399	74
1967	124	97	42	69	166	90	25	50	191	80
1968	184	84	56	66	240	80	111	61	351	74
1969	227	76	44	63	290	69	27	56	298	72

generally non-selective as to sex and age of bears which they took, except that cubs of the year or yearlings may not have been taken in some instances. Males formed 56 percent of the native harvest. Natives took bears each month from November through April (Table 3).

The number of permits issued to trophy hunters was 521. The number of bears taken was 271 (91 percent of total kill). This does not represent a true success figure since many of the permit holders did not hunt.

Nearly all bears taken by sport hunters were taken with the aid of aircraft. As in past years, most airplane hunting was done out of Teller, Kotzebue, Point Hope, and Barrow (Table 4). Most hunting was done with the aid of two planes flying together. There were 32 guide teams, a few more than the 25 or 26 which operated during the period before 1968.

Non-residents (persons not residing in Alaska) took 76 percent of the total harvest and 78 percent of the airplane harvest. This is a greater portion than has been taken by non-residents in the past and is probably a result of the six-bear limit for guides which became effective July 1, 1966. With a restriction on the number of hunters per guide, guides booked as many non-residents as possible and charged them higher fees than they thought most resident hunters would be willing to pay. Alaska residents who said they were not guided used aircraft to take 22 bears. In some cases these appeared to be guided hunts which were not designated as such in order to circumvent the six-bear limit on guides.

The percent of males taken by non-resident and resident hunters using aircraft was 76 and 63 percent, respectively. Guides put forth more effort to find larger animals which are males for the higher-paying non-residents.

Chronology of the harvest (Figure 1) was similar to that of the past 2 years. The hunting period during these 3 years has been somewhat earlier than in the past. The pattern of earlier hunting west of Alaska than north of Alaska has been consistent.

Guides reported number and composition of bears seen on hunting flights (Tables 5 and 6). Tables 7, 8, and 9 present comparative data for 1966-68.

Age composition of the harvest as determined by examination of cementum layering is presented in Table 10. Table 11 presents comparative data since 1966. Skull size data for 1969 are given in Table 12, along with comparative data from 1966, 1967, and 1968. It is hypothesized that bears taken west of Alaska by Teller, Kotzebue, and Point Hope hunters belong to a different sub-population than bears taken north of Alaska by Wainwright, Barrow, and Barter Island hunters, and data are therefore grouped by area. Bears taken south and west of a line extending northwest from Point Lay are designated as Chukchi Sea animals, and bears taken north and east of this line are designated as Beaufort Sea animals.

There has been a gradual lowering of average age and skull size of bears harvested during the period for which age data are available. This

Table 3. Chronology of 1969 native polar bear harvest.

Hunting Site	Nov.		Dec.		Jan.		Feb.		Mar.		Apr.	
	M	F	M	F	M	F	M	F	M	F	M	F
Kivalina												2
Pt. Hope					1							
Wainwright			6	5	4	1						
Barrow		1	1		1		2		1			
Barter I.			2									
Total		1	9	5	6	1	2		1			2

Table 4. 1969 polar bear airplane hunting data.

Hunting Base	No. of Guide Teams	No. of Bears Killed on Guided Hunts	No. of Bears Killed on Unguided Resident Hunts	Percent of Airplane Kill
Teller	5	26	1	10
Shishmaref	1	6	0	2
Kotzebue and Point Hope	16	151	10	60
Barrow	7	50	10	23
Colville River	1	5	0	2
Barter Island	2	7	1	3
Total	32	245	22	100

Figure 1. Chronology of Polar Bear Harvest by Hunters Using Aircraft, 1969.

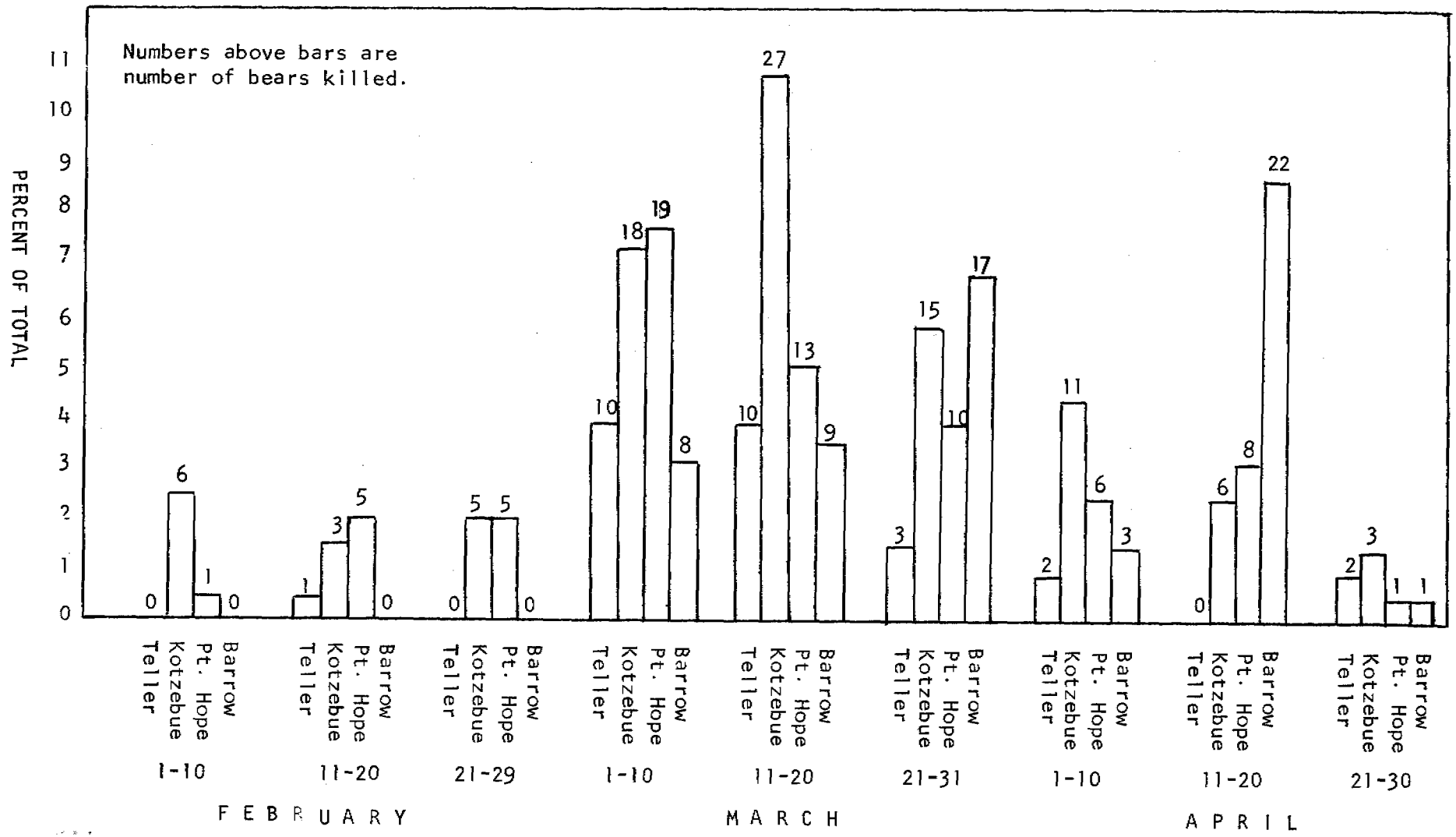

Table 5. Number of polar bears seen as reported by airplane hunting guides, 1969.

Area	Report Forms Rec'd.	Flying Time (Hrs.)[1]	Hunting Time (Hrs.)	Bears Seen[2]	Bears Killed	Bears/ Flying Hour	Bears/ Hunting Hour
Teller	5	47	9	99	6(6%)	2.1	11.6
Shishmaref	8	42	28	55	6(11%)	1.3	2.0
Kotzebue	33	261	131	346	28(8%)	1.3	2.6
Pt. Hope	24	137	97	97	21(22%)	0.7	1.0
Barrow	62	262	192	183	56(31%)	0.7	1.0
Total	132	749	457	780	117(15%)	1.0	1.7

[1] Flying and hunting times are for hunting teams, usually two aircraft, and not the combined flying time of both aircraft.

[2] Includes bears killed.

Table 6. Composition of polar bears seen as reported by airplane hunting guides, 1969.

Area	Sows W/Young			Other Bears			Bears Killed	Total
	1 Young	2 Young	3 Young	Small	Medium	Large		
Teller	7	16	-	15	15	1	6	99
Shishmaref	6	9	-	5	5	-	6	55
Kotzebue	13	49	1	23	81	37	28	346
Pt. Hope	5	11	-	6	21	6	21	97
Barrow	18	11	-	12	24	22	56	183
Total	49	96	1	61	146	66	117	780

Composite Summary

Young	244	31%
Sows W/Young	146	19%
Other bears seen including bears killed	390	50%
Total	780	100%

Table 7. Number of polar bears seen as reported by airplane hunting guides, 1966-1969.

	Flying Time (Hours)	Hunting Time (Hours)	Bears Per Flying Hour	Bears Per Hunting Hour
1966				
Teller	240	153	1.5	2.4
Kotzebue	439	156	1.2	3.3
Barrow	250	210	0.7	0.9
Total	929	519	1.1	2.1
1967				
Teller	197	77	0.8	2.1
Kotzebue	179	42	0.9	3.9
Barrow	140	106	0.8	1.0
Total	516	225	0.8	1.9
1968				
Teller	159	100	1.9	3.0
Kotzebue	163	68	1.4	3.4
Barrow	228	176	1.0	1.3
Total	550	344	1.4	2.2
1969				
Teller	47	9	2.1	11.6
Kotzebue	261	131	1.3	2.6
Barrow	262	192	0.7	1.0
Total	580	331	1.1	1.9

Table 8. Composition of polar bears seen as reported by airplane hunting guides, 1966-1969.

	Females With			Other Bears			Bears	
	1 Young	2 Young	3 Young	Small	Medium	Large	Killed	Total
1966								
Teller	31	52	2	51	55	11	27	370
Kotzebue	37	62	1	47	108	32	65	516
Barrow	18	15	1	3	29	2	61	180
Total	86	129	4	101	192	45	153	1066
1967								
Teller	14	21	1	26	25	7	22	175
Kotzebue	12	13	0	7	62	34	23	189
Barrow	5	7	0	14	20	9	31	105
Total	31	41	1	47	107	50	76	469
1968								
Teller	24	44	2	28	49	12	21	298
Kotzebue	11	23	0	7	67	44	22	231
Barrow	19	15	0	31	57	4	47	222
Total	54	82	2	66	173	60	90	751
1969								
Teller	7	16	0	15	15	1	6	99
Kotzebue	13	49	1	23	81	37	28	346
Barrow	18	11	0	12	24	22	56	183
Total	38	76	1	50	120	60	90	628

Table 9. Composition of polar bears seen as reported by airplane hunting guides (data combined for all hunting locations shown in Table 8).

	Total	Single Bears	Females W/Young	Young	Average Litter Size
1966	1066	491 (46%)	219 (21%)	356 (33%)	1.6
1967	469	280 (60%)	73 (16%)	116 (25%)	1.6
1968	751	389 (52%)	138 (18%)	224 (30%)	1.6
1969	628	310 (49%)	120 (19%)	193 (31%)	1.6

Table 10. Age composition of polar bears harvested in 1969 based on tooth cementum layering (229 bears aged of 298 harvested).

	NUMBER OF BEARS				
	MALE			FEMALE	
	Airplane				
AGE	Non-Res.	Res.	Ground	Airplane	Ground
Chukchi Sea					
1					
2				1	1
3	9	2		3	
4	19	2		7	
5	26	4		8	
6	8	2		2	
7	15			1	1
8	12			1	
9-10	12			3	
11+	5			1	
Mean Age	6.3	4.6		5.4	4.5
Range	3-17	3-6		2-12	2-7
Beaufort Sea					
1					1
2		1	1	1	1
3			3	3	
4	4	2		5	1
5	2	1	4	6	2
6	3	2	1	4	1
7	4		3	3	2
8	3	1	1	4	
9-10	7			2	
11+	2	1	2		
Mean Age	7.5	5.8	6.0	5.6	4.6
Range	4-12	2-11	2-14	2-10	1-7

Table 11. Average age based on tooth cementum layering of polar bears in hunter harvest, 1966-69.

	MALE			FEMALE	
	Airplane				
	Non-Resident	Resident	Ground	Airplane	Ground
Chukchi Sea					
1966	9.1(64)[1]	7.0(13)	—	7.2(14)	3.0(1)
1967	7.0(39)	7.0(7)	—	6.0(12)	—
1968	8.2(76)	5.8(21)	—	8.3(8)	4.0(3)
1969	6.3(106)	4.6(10)	—	5.4(27)	4.5(2)
Beaufort Sea					
1966	10.1(16)	7.2(13)	10.6(4)	6.6(8)	5.0(6)
1967	7.7(17)	6.0(10)	4.5(2)	7.0(8)	5.0(2)
1968	8.1(21)	6.4(7)	5.6(28)	5.8(22)	6.2(23)
1969	7.4(25)	5.8(8)	6.0(15)	5.6(28)	4.6(8)

[1] Numbers in parentheses are numbers in sample.

Table 12. Average skull size[1] in inches of polar bears taken by airplane hunters based in Alaska, 1966-1969.

	Non-Resident		Resident-White		Total	
	Male	Female	Male	Female	Male	Female
Chukchi Sea						
1966	25.1(139)[2]	21.0(9)	24.1(48)	21.4(20)	24.8(187)	21.5(29)
1967	24.9(79)	21.2(6)	23.1(14)	22.1(4)	24.6(93)	21.6(10)
1968	25.2(121)	21.3(12)	24.5(24)	19.1(4)	25.0(145)	20.8(16)
1969	24.5(119)	21.3(24)	24.0(10)	21.3(3)	24.4(129)	21.3(27)
Beaufort Sea						
1966	24.1(25)	20.5(6)	22.4(44)	19.9(26)	23.0(69)	20.0(32)
1967	23.6(22)	20.0(5)	22.6(14)	19.9(7)	23.2(36)	19.9(12)
1968	23.7(23)	21.1(12)	23.0(5)	19.7(10)	23.6(28)	20.4(22)
1969	23.4(20)	21.2(20)	22.5(10)	20.0(7)	23.1(30)	20.9(27)

[1] Skull size is greatest length without lower jaw plus greatest width.

[2] Numbers in parentheses are numbers in sample.

may reflect changes in the population because of hunting, and may also be a result of hunting conditions. Smaller and younger bears were taken in 1967 and 1969 than in 1968. Ice conditions were such in 1967 that there were but few places to land, and hunters were not as selective as in years of better ice. More unflyable weather than usual in 1969 caused hunters to be less selective than usual. No matter what the reason, however, the harvesting of smaller and younger bears indicates the need for a conservative management approach.

Identity of Populations

A helicopter and a fixed-wing plane were based at the Tin City Air Force facility from February 18 to March 3 to attempt to tag bears in Bering Strait. High winds, blowing snow, and white-out conditions prevented flying over the ice, and no bears were tagged.

Operations were based at Barrow from March 17 to April 4 and from April 12 to 26, and at Barter Island from April 5 to 11. Twenty-two bears were tagged north of Barrow, two were tagged out of Barter Island, and one which had been tagged a year earlier at Barrow was recaptured at Barter Island. Seven bears were tagged by the U. S. Fish and Wildlife Service in a cooperative effort out of Cape Lisburne (Table 13). The total number of animals now tagged off of the Alaska coast is 202 (Table 14).

Three marked animals have been recaptured and fifteen have been killed by hunters. A number of resightings have also been made, most during the period immediately following tagging. Recovery data not including resightings are summarized in Table 15. There are not yet enough tag recoveries to draw conclusions about movements and population identity. Nearly half the recoveries made 9 months or longer after tagging have been in the same general area where tagged. Animals have also been recovered west and east of their tagging site. The longest movement has been by a male tagged north of Barrow and recovered 2 years later approximately 450 nautical miles to the southwest off the Russian coast. There was also a long movement to the east by a female with two cubs marked north of Barrow. She was recaptured a year later with two yearlings northeast of Barter Island, 310 nautical miles from where tagged. In considering these movements as indicated by tag recovery, it should be noted that recovery effort is not uniform and is intensive in areas where tags have been applied.

Table 16 presents data on condition of marks on bears which have been recaptured or taken by hunters. Neither the nylon nor the metal tag appears to have a distinct advantage over the other. Some metal tags were gone when animals were recaptured or skins presented for examination, and some nylon tags were broken so that numbers could not be read.

Alaskan studies and the studies of other nations have been confined for the most part to coastal areas. As studies progress to determine identity of populations, it will be necessary to study the distribution,

Table 13. Polar bear tagging data, Alaska, 1969.

	Ear Tag No.	Tattoo No.	Collar	Location		Date	Sex	Age Class
Lisburne	1201-02	None	Radio	69°22'N	166°05'W	3- 4	M	Ad.
	1203	None	None	69°32'N	166°05'W	3-12	M	Ad.
	1204	None	Green	68°59'N	168°51'W	3-13	F	Sub-Ad.
	1205	None	None	69°15'N	165°05'W	3-14	M	Ad.
	1206	1206	None	70°11'N	165°05'W	3-15	M	Sub-Ad.
	1207	1207	Red	70°54'N	166°05'W	3-18	M	Ad.
	1208	1208	None	70°02'N	166°05'W	3-18	F	Sub-Ad.
Barrow	1002	1002	Blue	71°34'N	157°25'W	3-23	M	Ad.
	1004	1004	White	71°37'N	157°33'W	3-23	F	Ad.
	1005	1005	None	71°41'N	158°00'W	3-23	M	Sub-Ad.
	1006	1006	White	72°00'N	159°00'W	3-23	F	Ad.
	1007[1]	1007	White	71°39'N	158°02'W	3-24	F	Ad.
	1008	1008	None	71°39'N	158°02'W	3-24	F	2
	1009	1009	None	71°35'N	157°30'W	4- 4	F	Sub-Ad.
	1010	1010	White	71°35'N	158°17'W	4- 4	F	Ad.
	1011	1011	White	71°39'N	157°14'W	4-19	F	Ad.
	1013	1013	None	71°39'N	157°14'W	4-19	F	2
	1014	1014	White	71°41'N	157°08'W	4-19	F	Ad.
	1015	1015	None	71°41'N	157°08'W	4-19	F	1
	1016	1016	White	71°37'N	156°52'W	4-19	F	Ad.
	1018	1018	None	71°37'N	156°52'W	4-19	F	2
	1019	1019	None	71°37'N	156°52'W	4-19	F	2
	1020	1020	None	71°43'N	156°07'W	4-20	M	Sub-Ad.
	1021	1021	White	72°01'N	157°37'W	4-21	F	Sub-Ad.
	1022	1022	White	71°42'N	156°17'W	4-22	F	Ad.
	1023	None	None	71°42'N	156°17'W	4-22	?	Cub of year
	1024	None	None	71°42'N	156°17'W	4-22	?	Cub of year
	1025	1025	Blue	71°42'N	155°22'W	4-22	M	Ad.
	1026	1026	None	71°30'N	155°29'W	4-26	F	Sub-Ad.
Barter I.	222 [2]	222	White	70°13'N	140°39'W	4- 8	F	Ad.
	1051	1051	None	70°13'N	140°39'W	4- 8	M	1
	1054	1054	None	70°13'N	140°39'W	4- 8	F	1

[1] Brackets indicate family groups.
[2] Recapture. Originally tagged 4-16-68, Pt. Barrow.

Table 14. Location and sex and age composition of polar bears tagged in Alaska, 1967-69.

	Cub-of-Year[1]	Yearling			2-yr-old		Sub-Adult		Adult		Total
		M	F	Unk.	M	F	M	F	M	F	
Bering Strait											
1968		1				2			4	3	10
Lisburne											
1968		2	3	1	3	4	8	7	7	15	50
1969							1	2	4		7
Barrow											
1967		3	3		4	2	2	4	4	9	31
1968		8	1		3	7	6	11	7	37	80
1969	2		1			4	2	2	2	9	22
Barter Island											
1969		1	1								2
Total	2	15	9	1	10	19	19	26	28	73	202
Percent	1		12		14		22		50		100

[1] Cubs-of-year not sexed.

Table 15. Recovery data on polar bears tagged in Alaska.

Location Tagged	Location Recovered	Direction of Movement	Distance Between (Nautical Miles)	Time Interval	Sex	No. of Recoveries
Bering Strait	W. of Kotzebue	N	75	1 Mo.	M	1
Lisburne	W. of Pt. Hope	W	100	1 Yr.	M	1
Lisburne	Wainwright	NE	160	9 Mos.	M	1
Lisburne	Franklin Pt.	NE	180	1 Yr. 9 Mos.	M	1
Lisburne	Barrow	NE	300	1 Yr.	M	1
Barrow	N. of Van Karem, Russia Coast	SW	450	2 Yrs.	M	1
Barrow	W. of Pt. Hope	SW	350	1 Yr.	M	2
Barrow	Wainwright	SW	90	9 Mos.	M	1
Barrow	Barrow	--	0	4 Days	M	1
Barrow	Barrow	--	0	1 Yr.	M	3
Barrow	Barrow	--	0	1 Yr.	F	4
Barrow	Barter Is.	E	310	1 Yr.	F	1

Table 16. Condition of marks on recovered polar bears.[1]

Tagging Recovery Time	No. of Recoveries	Nylon Tag		Metal Tag			Collar		Tattoo		
		Intact	Broken	Present Without Infection	Present With Infection	Missing	Collar Retained	Not Collared	Legible	Illegible	Not Tattooed
4 days	1	1		1				1	1		
1 mo.	1	1		1			1		1		
9 mo.	2	1	1	1		1		2		1	1
1 yr.	11	5	6	7	2	2	4	7	5	4	2
1 yr. 9mo.	1	1		1				1			1
2 yr.	1	1		1				1			1

[1] Does not include one hunter-killed bear for which data are incomplete.

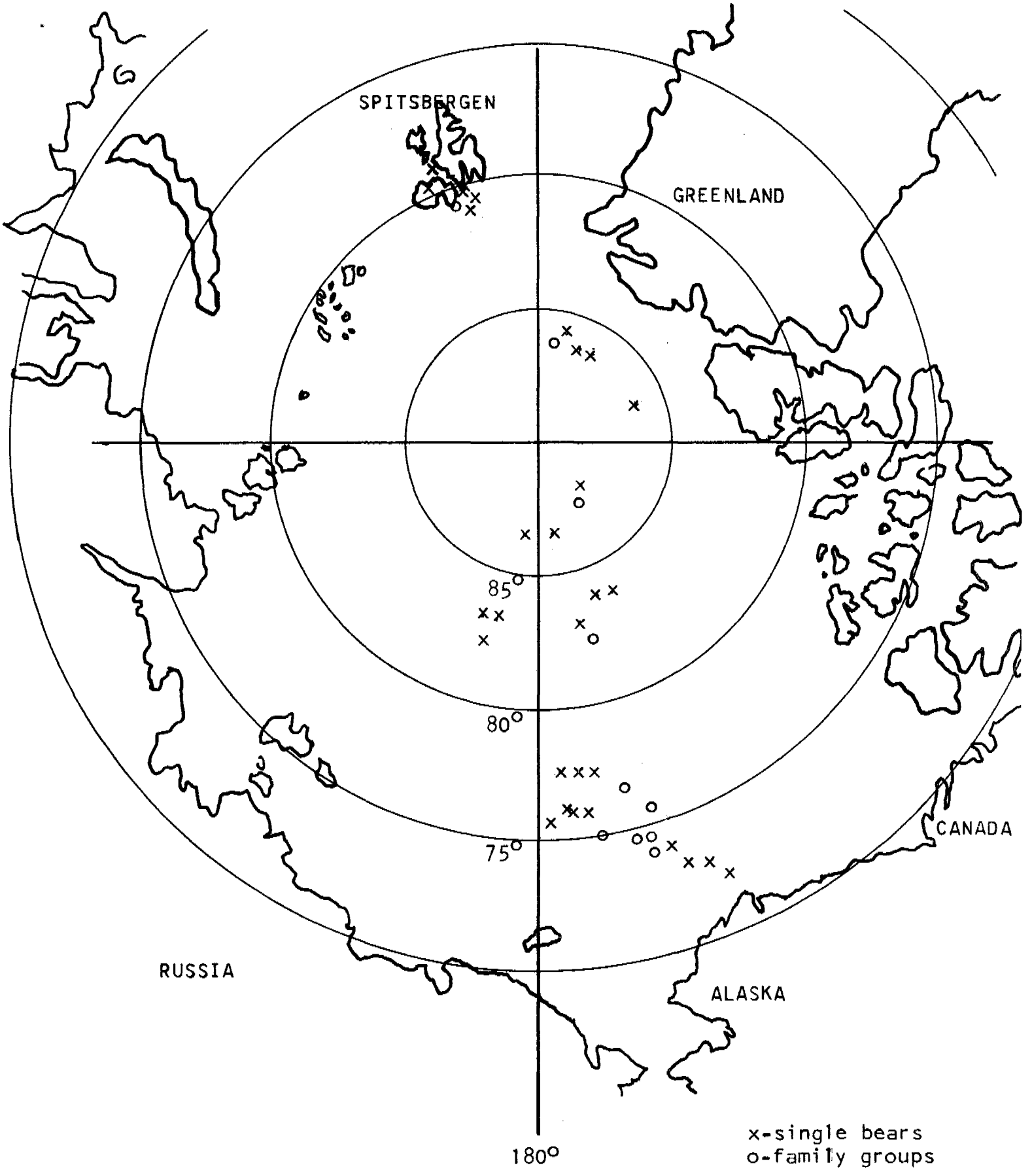

Figure 2. U.S. Ice Island and British Trans-Arctic Expedition Polar Bear Sightings.

movements, and abundance of bears throughout the polar basin. Drifting ice stations may provide bases for studies away from shore and have provided some very preliminary information on distribution. Figure 2 shows locations of bears seen and recorded at the United States Ice Islands ARLIS II and T-3 and also by the British Trans-Arctic Expedition (records on file at Naval Arctic Research Laboratory, Barrow, Alaska).

Bear-Ice Relationships

The relative abundance of bears in different ice types has been recorded for several years, mostly while searching for animals for tagging. Bears are most abundant in areas where currents and/or winds keep ice in motion so that many relatively narrow leads are constantly opening and freezing. Bears are attracted to these areas because of the availability of seals, their main food. Seals probably prefer these areas because of the open water and relative ease of keeping breathing holes open in thin ice. Few bears are found in areas of heavy stable polar ice. The few tracks that are found in such areas indicate that bears tend to travel straight through them without spending an appreciable amount of time. Bears also appear to avoid areas of broken ice which occur along the edge of the pack in the spring, and appear to make definite movements to more solid ice prior to breakup. Guides report a pronounced northward movement of animals, as indicated by direction of tracks, north of Bering Strait and through the Chukchi Sea in late March and April. Department personnel observed this northward movement in mid-March 1968, about the time a persistent south wind started and a few days before ice became quite broken. Along the north coast of Alaska, Eskimos and guides report a spring movement of bears to the east. Department personnel observed an eastward movement past Point Barrow during the last half of April 1968 and 1969. This was from an area where the ice was starting to break up to an area where the ice was still quite solid. Bears are found only occasionally on shore-fast (fast) ice. When they are found on fast ice, it is probably because they are attracted by ringed seal dens in the spring or happen to get on the shoreward side of the lead which is often present on the seaward side of the fast ice. Bears also cross fast ice on occasional travels to and from the beach.

Eskimo hunters provide information on bear abundance and movements in relation to ice formation and movements. They report that fast ice generally does not form in place along the shore but forms out at sea and is brought to the beach by wind and currents. The first fast ice along the northern Alaska coast in the fall is to the east of Point Barrow. Fast ice is then reported to form from Point Barrow southwestward toward Cape Lisburne. It is difficult to obtain precise chronological information on appearance of bears on the coast, but apparently bears appear when fast ice provides a means of travel from pack ice to the beach. Apparently bears first appear to the east of Point Barrow and then to the southwest. Eskimos report that bears travel from north to south in the fall along the coast between Point Barrow and Lisburne. Considering the two good bear hunting areas along this section of coast, bears first occur in the northernmost Point Franklin area and then in the Icy Cape area to the south.

Eskimos also report that bears are more numerous along the coast in years when winds from the north bring heavy ice to the coast than in years when newly frozen ice is brought in. This is verified by Bailey and Hendee (1926). They report that in the fall of 1921, old ice failed to come in, and new ice formed for miles out from the shore, and consequently few bears were killed between Barrow and Point Hope. In the fall of 1967, Department personnel observed that winds brought more old ice south than usual, and there were more bears along the coast than usual.

Various sources provide information on ice drift throughout the polar basin. The earliest comprehensive reports are from the drift of the "Fram" as reported by Nansen (1898) and the drift of the "Sedov" as reported by Zubov (1953). More recent information has come from Russian and United States drifting ice stations. Figure 3 shows the most widely accepted pattern of current movement. It can be seen that bears off the Alaska coast could be affected in various ways by ice movements. Bears could reach the Bering Strait area, normally the southernmost limit of their range off Alaska, by drifting on ice carried by the current moving in a southeasterly direction from the vicinity of Wrangel Island to Bering Strait. Bears could then be carried north and then northwesterly toward Wrangel Island, or north and northeasterly past Point Hope and Cape Lisburne and then along the Alaska coast toward Point Barrow. Bears north of Point Barrow could drift west toward Wrangel Island, or could drift north and then in a clockwise movement easterly and then southerly past the west side of the Canadian archipelago and then northwest from the vicinity of Banks Island back toward Point Barrow. It is thus possible that ice drift could provide all manner of mixing of bears off the Alaska coast; i. e., bears from the vicinity of Wrangel Island could be carried to Bering Strait, then past Cape Lisburne to Point Barrow and the Canadian archipelago. Bears from the northwestern section of Canada could drift past northeastern Alaska on their way toward Wrangel Island. On the other hand, currents could tend to keep populations west and north of Alaska discrete. Bears west of Alaska could drift back and forth between Wrangel Island and Bering Strait. Bears north of Alaska could be part of a population that remains in the area north of Alaska east to the Canadian islands.

It should be pointed out that this discussion has been only to indicate possible ways by which ice drift could cause passive movements of bears without taking into account active movements which animals themselves can make. These include travel in search of food, travel by females to denning areas, travel by males in a search of females in the breeding season, and travel to areas of solid ice at time of ice breakup. Both active and passive movements will have to be considered when analyzing tag return and related data to determine discreteness of populations.

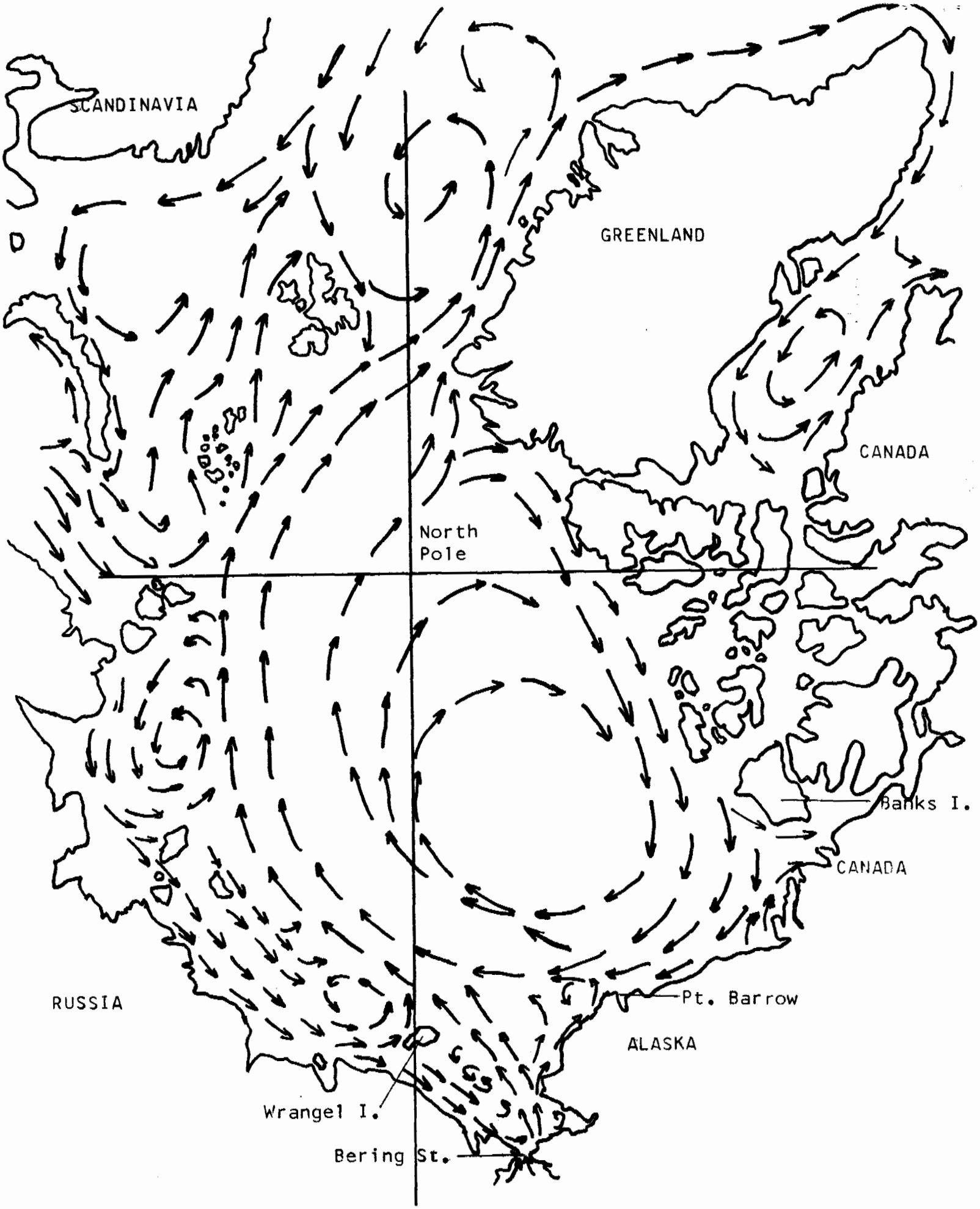

Figure 3. General Surface Circulation, North Polar Basin.

RECOMMENDATIONS

The regulation limiting a guide to six bears and participation in twelve hunts has not been adhered to by some guides and appears to be unenforceable. If challenged, it would probably be declared invalid based on what has happened to a similar regulation for brown bears. It is recommended that this regulation and the unlimited (other than the limitation imposed by a March 1 cutoff date) issuance of polar bear permits be changed so that restriction would be by issuance of a limited number of permits. If applicants exceeded permits those to receive permits would be chosen by drawing.

It is possible that bears west and bears north of Alaska form different populations. Characteristics of the harvest are different for the two areas. It is recommended that two management areas be established, one west and south of a line running northwest from Point Lay and the other north and east of this line. It is recommended that each area have a permit quota, 200 for the west area and 100 for the north area.

It is desirable for individual polar bear hunters to know as far in advance as possible if they will be able to hunt. It is recommended that no permit applications be accepted after September 1, and permits issued as soon thereafter as possible.

Few bears are taken by trophy hunters early and late in the season, yet is is desirable to have Department personnel in the field at these times to enforce regulations and obtain complete harvest data and related specimens. In order to shorten the period when the harvest must be monitored, it is recommended that the season extend from February 15 through April 15 in the area west and south of Point Lay and that the season extend from March 1 through April 30 in the area north and east of Point Lay.

Hunting of bears by natives for subsistence is now secondary to obtaining hides for sale. Three bears per year is judged to be adequate for a family's subsistence needs, and it is recommended that the present unlimited bag for subsistence hunters be reduced to three.

Seismic, oil, and other workers along the Arctic coast should be informed of polar bear regulations, especially those pertaining to transportation of unsealed skins from the state. A special effort should be made to enforce these regulations.

Contacts should be maintained with other countries that have polar bears regarding management practices and characteristics of harvests. Contact should be maintained with the International Union for the Conservation of Nature regarding international aspects of management.

LITERATURE CITED

Bailey, A. M. and R. W. Hendee. 1926. Notes on mammals of northwestern Alaska. J. Mamm. 7:9-28.

Frost, H. M., A. R. Villaneuva, H. Roth, and S. Stanisavljevic. 1961. Tetracycline bone labeling. J. New Drugs 1(5):206-216.

Lentfer, J. W. 1968. A technique for immobilizing and marking polar bears. J. Wild. Mgmt. 32(2):317-321.

Lentfer, J. W., S. H. Eide, L. H. Miller, and G. N. Bos. 1968. Report on 1967 polar bear studies. Alaska Fed. Aid in Wildl. Restoration Rpt., Proj. W-15-R-2 and 3, Work Plan M.

Lentfer, J. W. 1969. Polar bear tagging in Alaska, 1968. Polar Record 14(91):459-462.

Lentfer, J. W., and L. H. Miller. 1969. Polar bear studies. Alaska Fed. Aid in Wildl. Restoration Rpt., Proj. W-15-R-3 and W-17-1, Work Plan M and R.

Linhart, S. B. and J. J. Kennelly. 1967. Fluorescent bone labeling of coyotes with demethychlortetracycline. J. Wild. Mgmt. 31(2):317-321.

Nansen, F. 1898. Farthest north. George Newnes, Ltd., London.

Zubov, N. N. 1953. The ice-drift of the central part of the Arctic basin. Amer. Met. Soc. Translation, Cambridge, Mass.

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