FINAL REPORT

An Analysis of Polar Bear Predation on Ice Pinniped Population of Alaska

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INTRODUCTION

The Alaska Department of Fish and Game is presently investigating, under the aegis of the Outer Continental Shelf Environmental Assessment Program, densities, distribution, habitat selection, productivity, population structure, food habits, migration patterns and native harvests of ice-inhabiting pinnipeds. Likewise, the U.S. Fish and Wildlife Service is determining densities, distributions, population dynamics and structure, movements and denning of polar bears in Alaskan waters. Research on polar bear predation augments these other areas of investigation to give a better understanding of the biology, ecology and functional relationships of ice-inhabiting pinnipeds and polar bears in the sea ice ecosystem. These relationships must be ascertained before proper management of pinnipeds and bears can be effected.

During March 1976, the Alaska Department of Fish and Game, in conjunction with the U.S. Fish and Wildlife Service, began an intensive ice research program to assess the impact of polar bear predation upon ice-inhabiting pinniped populations of the Bering, Chukchi and Beaufort Seas of Alaska. The specific objectives of the research are:

1. To determine geographic variation in the prey taken by polar bears on sea ice.

2. To determine environmental parameters, such as ice type, that affect prey selection and hunting success of polar bears.

3. To determine characteristics of pinnipeds taken by bears; such as sex, age and physical condition, which influence vulnerability to predation.

4. To combine polar bear predation data with data on population structure, density, and characteristics of the native harvest of ice-inhabiting pinnipeds in order to determine the role of predation in influencing the diverstiy, density and structure of pinniped and polar bear populations.

5. To develop a predictive model for determination of the ecological effects of natural and man-induced changes in polar bear and ice seal populations.

This research is not completed and, hopefully, will continue for another two or three years. However, this report presents the findings of research conducted under contract between the United States Fish and Wildlife Service and the Alaska Department of Fish and Game (March 1976 to February 1977).

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BACKGROUND

Early work on predator ecology has centered on food habits of predators in relation to possible damage to wildlife, fish and livestock populations. Recent studies, however, have emphasized the role of predation in influencing prey population size and structure (Murie 1944, Mech 1966, Hornocker 1970, VanBallenberghe et al. 1975); behavioral and ecological adaptations, in both prey and predators, associated with predation (Estes and Goddard 1967, Schaller 1967, 1972, Geist 1971, Kruuk 1972); and the role of predation in the maintenance of ecosystem diversity (Paine 1966, Estes and Palmisano 1974). The works of Lowry and Pearse (1973), Estes and Palmisano (1974), Stirling (1974), Stirling and McEwan 1975, and Smith (1976) have been the only investigations of predator-prey relationships involving northern marine mammals.

Ringed seals (Phoca hispida), spotted seals (Phoca vitulina largha), ribbon seals (Phoca fasciata), bearded seals (Erignathus barbatus), walrus (Odobenus rosmarus), and belukha whale (Delphinapterus leucas) have all been reported as prey of polar bear (Stefansson 1913, 1921; Freuchen and Salomonsen 1959; Russell 1971; Lentfer 1972; Freeman 1973; Stirling 1974; Smith 1975; Stirling and McEwan 1975; Heyland and Hay 1976). However, ringed seals are the most important polar bear food throughout the bear's range, particularly in spring and early summer (Stirling and McEwan 1975). The importance of the ringed seal to polar bears is emphasized in the IUCN Polar Bear Group's Resolution 4 (1972) which says in part: "...the ringed seal is the main food item of polar bears throughout their circumpolar range, and therefore that ringed seal productivity is of direct importance to polar bear welfare...." In Alaska, polar bears on sea ice feed primarily on ringed and bearded seal although some walrus and ribbon seals are taken (James Estes pers. comm. and Daniel Alowa pers. comm.). Bears also feed on carrion, particularly seals, walrus and belukha, bowhead (Balaena mysticetus), gray (Eschrichtius robustus), and minke (Balaenoptera acutorostrata) whales. In Hudson and James Bays, Canada, during summer and autumn, island-dwelling polar bears feed on seabirds and waterfowl while mainland populations feed on terrestrial and aquatic vegetation (Russell 1971).

Judging from the reported food items, one would be tempted to call the polar bear an omnivore, but this would be overstating the point. The polar bear is a predator whose chief food source is seals.

Polar bears capture seals by digging into lairs, waiting at breathing holes or by attacking basking seals. The bears appear to locate the lairs and breathing holes by olfaction. The hide and blubber are the most desired part of the seal as are the portion of the seal with the highest caloric values (Stirling and McEwan 1975).

METHODS

Surveys

Aerial, ship and ground surveys are used to determine the densities and distributions of polar bears, bear kills and pinnipeds in the ice-covered Bering, Chukchi and Beaufort Seas. These surveys are conducted at irregular intervals but by the end of this research, surveys will have been conducted during every season and will have covered all ice types. These surveys are made by both Alaska Department of Fish and Game and U.S. Fish and Wildlife Service personnel. Data on pinniped densities and distribution and bear kills are being analyzed by the Alaska Department of Fish and Game while polar bear density and distribution data are being analyzed by the U.S. Fish and Wildlife Service.

Aerial surveys are flown in both fixed-wing aircraft and helicopters. The fixed-wing aircraft is used as a survey plane; as a wideranging spotter for bears, bear kills and seals; and to carry extra fuel for the helicopter. Aircraft used for the surveys were a Cessna 185 on wheel-skis, a Cessna 180 on wheels, and Bell 206B helicopter on floats. Survey transects were 0.8 km (0.5 miles) on each side of the aircraft. Transect width was maintained with fixed reference points on the windows and wing struts or floats. Surveys were flown at altitudes of 91.5 meters (300 feet). All polar bears and seals (by species) observed on these flights were enumerated on a prepared survey form. On certain flights bears were tracked by helicopter to search for seals killed by bears, to determine distances traveled between kills, and to ascertain predatory behavior.

Locations and distances traveled along flight tracts were determined by standard aerial navigation techniques or by radar fixes from various DEW-Line stations.

Ground surveys were conducted on shorefast ice near villages or base camps either on foot or on snow machines. Shipboard surveys were conducted from U. S. Coast Guard and N.O.A.A. ships working near the ice edge.

Examination of Bear Kills

Seals killed by bears were examined to determine manner of death, physical condition, amount of prey consumed, and to collect specimens for laboratory analyses. In addition, the geographic location, specific kill site and ice type and condition were noted. Standard measurements were made on seals whenever possible.

Teeth and claws were collected to determine age of the seal (McLaren 1958, Smith 1973). Reproductive tracts were examined for sex and reproductive condition following standard laboratory techniques. Blubber, selected organs and tissues, stomachs and digestive tracts of seals were examined for parasites, diseases, pathologic conditions, and food habits, or are being provided to cooperators for analyses of pesticides, heavy metals, and petro-chemicals.

Seal lairs excavated by bears were examined and measured to determine characteristics of lairs in relation to success of predation. Observation of polar bear hunting behavior were made whenever possible.

Ice Conditions

Three general ice types (shorefast ice, pack ice and shear zone or flaw zone) were delineated and surveyed to determine the effect of ice type on bear and seal distribution and on bear predation on seals. In addition to ice type, floe sizes, ice thickness and degree of ice deformity were noted.

Polar Bear Blood Chemistry

During bear tagging operations a 45 ml sample of blood was drawn from the femoral vein of drugged bears using an 18 gauge, 38mm needle and a 50 ml disposable syringe. After removal of the needle, the syringe of blood was placed into two stoppered glass tubes and allowed to clot.

Samples were returned from the field within 2 to 3 hours after collection and the serum was further separated by centrifugation. The process yielded approximately 10 ml of serum which was immediately frozen at minus 20°C.

The frozen samples were sent to the Anchorage Medical Laboratory and were analyzed immediately, using the SMAC 20 (Technician, Inc., Tarrytown, N.Y.). The SMAC 20 analyses included the following parameters: glucose, cholesterol, triglycerides, LDH, SGOT, SGPT, akaline phosphatase, phosphorus, calcium, iron, creatinine, sodium, potassium, choloride, carbon dioxide, BUN, bilirubin, protein, albumin, uric acid and globulin.

Capture and Tagging of Polar Bears

Polar bears were captured and marked utilizing the methods pioneered by Lentfer (pers. comm., 1968, 1969).

Schedule

Field activities accomplished, thus far, under this project are presented in Table 1. However, specimen material, observations and population data collected by U. S. Fish and Wildlife Service and Alaska Department of Fish and Game, not specifically collected for this project, will be included in this report.

RESULTS

Polar Bear Predation on Seals

From March 1976 to March 1977, 25 seals killed by polar bears were examined (Table 2). Ringed seals comprised 96 percent (24) of the seals killed and one bearded seal made up the remaining 4 percent. Four cases of bears feeding in garbage dumps near human habitation were noted and numerous observations were made of bears feeding on carrion, particularly on whale carcasses north of Barrow and on the beaches of St. Lawrence Island.

Of the 24 ringed seals examined, 14 (58%) were male and 10 (42%) were of undetermined sex. Thirteen (54%) of the ringed seals were adults (greater than 6 years old; had achieved sexual maturity); 2 (8%) of the seals were subadults (older than pups yet less than 6 years old); and 9 (39%) of the seals were of undetermined age, although tenuous evidence from the kill sites indicated that these seals were probably adults or older subadults. The single bearded seal comprised the only pup and the only identified female in the sample.

At Cape Lisburne, polar bears were tracked for 3105 bear-kilometers, along which 20 seal carcasses were found. Bears killed, on the average, one seal every 155.2 kilometers at Cape Lisburne during March and April.

After killing a seal, a polar bear feeds predominantly on the hide and blubber and the meat is generally abandoned. In all seal specimens examined all hide and blubber were consumed, except for that on the head. However, Stirling (1974) found that a large part of the blubber was often not consumed. The hide and blubber of seals have the highest caloric value of any part of the seal (Stirling and McEwan 1975). The abandoned seal meat is consumed by other bears or more often by arctic foxes (Alopex lagopus) which follow polar bears for long distances (100 km+) over the ice.

When two adult bears are at a kill, the larger bear consumes the hide and blubber while the smaller bear is left with the meat. The division of a seal between a sow and her cubs has not been ascertained at this time, but in five observations of sow and cubs feeding on kills the entire kill was consumed. Two of 20 (10%) kills examined at Cape Lisburne during March and April were found cached by bears apparently for later use. The unconsumed seals were buried under about one meter of snow near the kill site and the bears (a male #1889, a sow #1883 and two one-year-old cubs #1884 and #1885) were found within 1-1.5 km of the cached seals. Stirling and McEwan (1975) found that polar bears in the eastern Canadian Arctic generally did not cache seals for later consumption.

Ice Type and Kill Sites

Approximately 35 flight hours of surveys were conducted in each of the three major ice types (shorefast ice, flaw zone and pack ice).

Fourteen (56%) of the seals were killed on flaw zone ice, six (24%) on heavy, moving pack ice, and five (20%) on shorefast ice.

Most seals (88%) were killed by bears waiting at seal breathing holes. Bears were relatively unsuccessful in obtaining ringed seals from lairs as only three seals were killed in 32 lairs (9%) excavated by bears. Eighteen lairs were excavated on shorefast ice and 14 lairs on moving pack ice. No excavated lairs were noted in the flaw zone. The densities of lairs in the various ice types are unknown, however the preferred habitat of the ringed seal is the shorefast ice. No observations or evidence were noted of bears stalking seals hauled out on the ice.

Polar Bear Tagging

Fifty-two polar bears were tagged within a 120 kilometer radius of Cape Lisburne Air Force Station, Alaska during March and April 1976 (Table 3). Of the 52 bears tagged, 25 (48%) were males and 27 (52%) were females; a sex ratio of 1:1. Nine family groups were tagged.

Bear 1854 had been previously tagged as 1511 near Barrow, Alaska during 1974 and bear 1889 had been previously tagged (as number 1195) in Barrow during 1971.

Bear 1900 was a two-year-old female in extremely poor condition. The bear apparently had just become separated from its mother and was unable to feed itself satisfactorily. The female was weak (could not run and could barely walk), extremely emaciated and being tracked by bear 1877. The death of bear 1900 appeared to be imminent although it was still alive when last seen on 17 April.

Nine bears were resighted from 2 to 13 days after original tagging (Table 4). The mean distance traveled was 8.0 kilometers per day. The sample of resightings is small and includes two family groups of three bears each, therefore few definite conclusions concerning movement patterns can be drawn. However, based on these resightings and on bear tracking, several trends were noted.

The bears were moving in a general north or northwest direction, ahead of the melting sea ice. Bears moved from the heavy pack ice onto the flaw zone ice. Similarly, there was a net movement of bears from the shorefast ice onto the flaw zone ice. This movement of bears onto the flaw zone was apparently due to the greater accessibility of seals in the flaw zone as compared to the shorefast or heavy pack ice.

Seven cases of bear moving onto the land were noted based on tracking or direct observations. One bear was found feeding at the Cape Lisburne A.F.S. dump. Five other bears remained on the land only for 2 to 7 kilometers along the beach and then moved directly offshore across the shorefast ice to the flaw zone. One bear traversed about 25 kilometers of land and moved inland as much as 2 kilometers. This bear apparently stampeded a herd of about 400 caribou feeding approximately 1.5 kilometers inland from the beach. After traveling 25 kilometers of land, this bear also moved directly offshore to the flaw zone.

Blood Chemistry

Mean physiologic values obtained from polar bears captured near Cape Lisburne are listed according to sex in Table 5. Again the small sample size results in difficulties in drawing specific conclusions. These physiologic values will be combined with those values from samples collected by Mr. Jack Lentfer (U.S.F.W.S.) and analyzed by Dr. U. S. Seal (Veterans Hospital, Minneapolis). The significance of the various physiologic values will be assessed jointly and presented in a separate publication.

Physiologic values of polar bear blood serum generally are similar to those of black (*Ursus americanus*) and grizzly (*Ursus arctos*) bears and other holarctic carnivores. The exception to this carnivore trend is cholesterol level which is significantly higher in polar bears (range 212–452 mg/dl) than in other bears (range 190–312 mg/dl) or carnivores. This high level of cholesterol is undoubtedly due to the polar bear preference for seal blubber. The cholesterol levels of polar bears captured on or near seal kills was significantly higher than those of bears not captured near kills. The blood sera of bears that were captured while feeding or soon after feeding had a thick, opaque lipid layer at the top of the serum after centrifugation.

Serum glutamic oxalacetic transaminase (SGOT) values reflect cell necrosis and this value increases with muscular activity and stress. The SGOT values of various sex and reproductive classes of polar bears are as follows: males 65; non-lactating, non-estrous females 44;

lactating females 71; and estrous females 181. As expected, bears apparently under the greatest physiological and psychological stress (lactating females, estrous females and males - most of which were coming into breeding condition) had significantly higher SGOT values.

Surprisingly, blood serum physiological values of bear 1900 did not reflect the bear's poor condition. All blood values for bear 1900 were approximately mean values for females. The significance of these observations is unknown.

Density of Ringed Seal

Successful feeding and reproduction are tantamount to the survival of all species. Therefore, the goal of seal management should be to protect these critical feeding and reproduction areas from unnecessary disturbance or disruption. These critical areas change temporally and spatially and, considering the dynamic state of the sea-ice ecosystem, there can be large spatial changes in the location of critical areas in a short period of time. Habitat selection by ice-inhabiting pinnipeds has been aptly discussed by Fay (1974) and Burns (1972), and the reader is referred to those papers for a fuller discussion. Breeding adult ringed seals are found primarily (but not entirely) associated with shorefast ice, while the bearded seal is associated with many ice types and overlaps with all ice-associated pinnipeds in the study area. Since the ringed seal is the dominant prey species of the polar bear the remainder of this discussion will be on ringed seal densities.

Critical areas are ascertained first by determining seal densities in various locations and by correlation of densities with observed or measured ice, behavioral, ecological or oceanographic conditions. In June 1970, 1975 and 1976, ringed seal surveys were conducted by airplane over the shorefast ice from Barter Island to Point Lay. In addition, the 1976 survey was expaned to cover the shorefast ice from Pt. Hope to Cape Krusenstern and Kotzebue Sound. The results of these surveys are presented in Table 6. The areas of highest mean densities (Cape Krusenstern-Point Hope; Cape Lisburne-Point Lay; Wainwright-Barrow; Barrow-Lonely) are normally areas of very stabile shorefast ice during late winter and spring. Within these larger areas there are variations in the density of ringed seals which appear to be dependent on the quality of shorefast ice. For example, between Cape Krusenstern and Point Hope the mean density was 2.3 ringed seals per square mile yet within this larger area the densities varied from 0.2 seals per square mile near Kivalina (early break up of shorefast ice) to 3.8 seals per square mile near Cape Thompson (stable shorefast ice).

The most stable shorefast ice is found either along complex coasts or along coasts where the 10 fathom line lies far offshore. The edge of the shorefast ice tends to coincide with the 10 fathom curve. The higher densities in the Chukchi Sea are probably reflective of the better ice conditions together with higher overall biological productivity of the Chukchi as compared to the Beaufort Seas.

DISCUSSION

From the small sample size of seals killed by bears examined to date, it is impossible to adequately assess the quantitative and ecological impact of polar bear predation on ice-inhabiting pinniped populations. However, several trends have become apparent. The polar bear on sea ice is a predator whose main prey is the ringed seal. Other species of seals are taken, as well as carrion, but apparently not to the extent that ringed seals are taken. Ringed seals are generally killed at breathing holes in refrozen leads of the flaw zone and pack ice. Polar bears appear to be less effective predators in the shorefast ice and in digging seals out of subnivean lairs. Bears consume first the hide and blubber which have the highest energetic value of any part of a seal. The nutrient values of seals are largely unknown.

The main impact of polar bear predation from March through breakup of sea ice appears to be on the adult males. This contrasts sharply with the findings of Stirling and McEwan (1975) in Canada where the impact centered on the "early adolescent (1+ to 2+) age-classes," which appeared to be more abundant and more easily caught. The preponderance of adult male ringed seals as polar bear prey is not significantly (P 0.05) different from harvest composition of ringed seals taken by Eskimo hunters at Point Hope during this season (Table 7). It appears that polar bears are probably killing the most readily available individuals which, during the spring in this area, are the adult males. Females would be less available as they are in their subnevian lairs. In future studies we will elucidate seasonal and geographical changes in prey. In addition we hope to ascertain the impact of bear predation upon the structure and densities of a pinniped population.

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Table 1. Field activities 1976-1977.

Location	Date	Activity	Agency[a]
Cape Lisburne	March-April, 1976	Surveys of bears, bear tagging and collection of seals killed by bears.	ADF&G
Barrow	March-April, 1976	Surveys of bears, bear tagging and collection of seals killed by bears.	F&WS
OSS _Surveyor_ (Bering Sea ice edge)	March-April, 1976	Surveys of bears, bear tagging and collection of seals killed by bears.	ADF&G
Kotzebue Sound to Barter Is.	June, 1976	Sea survey	ADF&G
Barter Island	July, 1976	Survey for bear kills	ADF&G
Barrow	July, 1976	Survey for bear kills	ADF&G
OSS _Discoverer_ (Chukchi Sea ice edge)	August, 1976	Survey for bear kills	ADF&G
USCGC _Glacier_ (Chukchi and Beaufort Sea ice edges)	August-September, 1976	Survey for bear kills	ADF&G
R/V _Natchik_	September, 1976	Survey for bear kills	ADF&G
Nome	January, 1977	Survey for bear kills	ADF&G
Barrow to Point Lay	February, 1977	Survey for bear kills	ADF&G

Agency[a]
ADF&G - Alaska Department of Fish and Game
F&WS - Fish and Wildlife Service

Table 2. Seal examined during 1976 that were killed by polar bears.

Location	Specimen Number	Species	Sex	Age (Years)	Ice Type	Kill Site	Date
Cape Lisburne	CLP-1-76	Ringed Seal	Male	10+	Flaw Zone	Breathing Hole	3/24/76
Cape Lisburne	CLP-2-76	Ringed Seal	Male	9+	Flaw Zone	Breathing Hole	3/24/76
Cape Lisburne	CLP-3-76	Ringed Seal	Male	3	Flaw Zone	Breathing Hole	3/25/76
Cape Lisburne	CLP-4-76	Ringed Seal	Male	11+	Flaw Zone	Breathing Hole	3/25/76
Cape Lisburne	CLP-5-76	Ringed Seal	Male	11	Flaw Zone	Breathing Hole	3/27/76
Cape Lisburne	CLP-6-76	Ringed Seal	Male	8	Shorefast Ice	Breathing Hole	3/31/76
Cape Lisburne	CLP-7-76	Ringed Seal	Male	10+	Flaw Zone	Breathing Hole	4/1/76
Cape Lisburne	CLP-8-76	Ringed Seal	Male	8+	Flaw Zone	Breathing Hole	4/1/76
Cape Lisburne	CLP-9-76	Ringed Seal	Unknown	Unknown	Moving Pack	Breathing Hole	4/7/76
Cape Lisburne	CLP-10-76	Ringed Seal	Unknown	Unknown	Flaw Zone	Breathing Hole	4/10/76
Cape Lisburne	CLP-11-76	Ringed Seal	Male	9	Flaw Zone	Breathing Hole	4/10/76
Cape Lisburne	CLP-12-76	Ringed Seal	Unknown	Unknown	Moving Pack	Lair	4/15/76
Cape Lisburne	CLP-13-76	Ringed Seal	Male	10	Shorefast Ice	Lair	4/16/76
Cape Lisburne	CLE-14-76	Bearded Seal	Female	Pup	Flaw Zone	Breathing Hole	4/16/76
Cape Lisburne	CLP-15-76	Ringed Seal	Unknown	Unknown	Shorefast Ice	Breathing Hole	4/16/76
Cape Lisburne	CLP-16-76	Ringed Seal	Unknown	Unknown	Moving Pack	Breathing Hole	4/16/76
Cape Lisburne	CLP-17-76	Ringed Seal	Unknown	Unknown	Flaw Zone	Breathing Hole	4/17/76
Cape Lisburne	CLP-18-76	Ringed Seal	Unknown	Unknown	Shorefast Ice	Lair	4/17/76
Cape Lisburne	CLP-19-76	Ringed Seal	Male	6	Flaw Zone	Breathing Hole	4/17/76
Cape Lisburne	CLP-20-76	Ringed Seal	Male	7	Flaw Zone	Breathing Hole	4/17/76
Barrow	BP-8-76	Ringed Seal	Male	8+	Flaw Zone	Breathing Hole	3/23/76
Barrow	BP-9-76	Ringed Seal	Male	Unknown	Moving Pack	Breathing Hole	3/25/76
Barrow	BP-10-76	Ringed Seal	Unknown	4	Moving Pack	Breathing Hole	4/22/76
Barrow	BP-14-76	Ringed Seal	Unknown	Unknown	Moving Pack	Breathing Hole	4/22/76
Barter Island	BIP-6-76	Ringed Seal	Unknown	12	Shorefast Ice	Breathing Hole	7/27/76

Table 3. Polar bears tagged at Cape Lisburne, Alaska, March-April, 1976.

Number	Sex	Estimated Age	Date	Comments
1851	Female	unknown	15 March 76	
1852	Male	1	15 March 76	Family group
1853	Female	1	15 March 76	
1854	Male	unknown	17 March 76	Previously tagged (1511) in Barrow during 1974
1855	Male	5	21 March 76	
1856	Female	6	24 March 76	
1857	Female	1	24 March 76	Family group
1858	Female	1	24 March 76	
1859	Female	9	25 March 76	
1860	Male	2	25 March 76	Family group
1861	Female	2	25 March 76	
1862	Female	4	27 March 76	Together on a seal carcass
1863	Female	8	27 March 76	
1864	Male	9	27 March 76	
1865	Male	6	28 March 76	
1866	Male	5	28 March 76	
1867	Male	7	29 March 76	
1868	Male	9	31 March 76	
1869	Male	12	31 March 76	
1870	Male	5	31 March 76	
1871	Female	3	1 April 76	
1872	Male	3	1 April 76	
1873	Female	10	1 April 76	Family group
1874	Female	1	1 April 76	
1875	Male	4	1 April 76	
1876	Female	7	2 April 76	Traveling together
1877	Male	4	2 April 76	
1878	Female	5	3 April 76	
1879	Female	11	7 April 76	
1880	Male	2	7 April 76	Family group
1881	Female	2	7 April 76	
1882	Female	5	7 April 76	
1883	Female	unknown	7 April 76	
1884	Male	1	7 April 76	Family group
1885	Male	1	7 April 76	
1886	Female	3	8 April 76	
1887	Male	7	8 April 76	
1888	Female	3	10 April 76	
1889	Male	10	10 April 76	Previously tagged (1195) in Barrow during 1971
1890	Male	7	15 April 76	
1891	Female	6	15 April 76	
1892	Female	cub-of-year	15 April 76	Family group
1893	Female	cub-of-year	15 April 76	
1894	Female	2	15 April 76	Tagged at Cape Lisburne A.F.S. dump
1895	Female	7	16 April 76	
1896	Male	cub-of-year	16 April 76	Family group
1897	Male	cub-of-year	16 April 76	

1898	Male	9	16 April 76	
1899	Male	13	16 April 76	
1900	Female	2	17 April 76	Poor condition, apparently starving, being tracked by bear 1877.
1901	Female	unknown	17 April 76	Family group
1902	Male	cub-of-year	17 April 76	

Table 4. Distances traveled between re-observations of tagged polar bears, Cape Lisburne, Alaska, March-April 1976.

Specimen Number	Sex	Approximate Age (years)	Date Tagged	Date Resighted	Time (days) Elapsed	Distance Traveled (KM)
1855	Male	5	21 March	1 April	11	4.8
1871	Male	5	1 April	3 April	2	40.3
1877	Male	4	2 April	17 April	13	22.5
1883	Female	Unknown	7 April	10 April	3	78.9
1884	Male	1	7 April	10 April	3	78.9
1885	Male	1	7 April	10 April	3	78.9
1891	Female	6	15 April	17 April	2	8.1
1892	Female	cub-of-year	15 April	17 April	2	8.1
1893	Female	cub-of-year	15 April	17 April	2	8.1

Table 5. Blood serum chemistry value for polar bears.

Constituent	Males			Females		
	n	Mean	Range	n	Mean	Range
Glucose mg/dl	18	151	80-290	21	151	89-315
Cholesterol mg/dl	18	331	212-460	21	366	299-452
Triglycerides mg/dl	18	145	28-269	21	142	66-222
LDH U/L	18	413	59-654	21	459	69-1240
SGOT U/L	18	65	24-135	21	93	12-277
SGPT U/L	18	48	1-375	21	58	1-284
Alkaline Phosphatase U/L	18	37	10-120	21	53	8-213
Phosphorus mg/dl	18	6.0	2.8-16.2	21	5.1	2.3-12.6
Calcium mg/dl	18	11.0	7.8-14.9	21	11.4	8.2-16.5
Iron Ug/dl	18	194	131-320	21	192	138-364
A/G	2	4.57	3.69-5.45	8	4.52	2.89-6.67
Creatinine/BUN	18	0.30	0.02-1.15	21	0.12	0.01-0.33
Sodium meq/L	18	157	139-228	21	155	140-192
Potassium meq/L	18	4.6	3.9-5.4	21	4.4	3.2-6.1
Chloride meq/L	18	112	97-159	21	112	99-129
Carbon Dioxide meq/L	18	14	1-34	21	16	9-28
BUN mg/L	18	12	4-61	21	21	4-74
Creatinine mg/dl	18	1.8	1.2-2.9	21	1.3	0.8-2.0
Total Bilirubin mg/dl	18	0.2	0.0-1.3	21	0.2	0.0-0.6
Total Protein g/dl	18	8.2	6.1-11.4	21	7.6	6.3-9.1
Albumin g/dl	17	7.3	5.9-9.6	21	6.7	5.2-8.7
Uric Acid mg/dl	18	2.8	0.1-6.3	21	1.9	0.0-4.8
Globulin	2	1.4	1.1-1.6	9	1.2	0.4-1.9
Balance	14	27.0	3.0-48.0	14	26.0	16.0-35.0

Table 6. Ringed seal densities (observed seals/mile^2) calculated from June 1970, 1975, and 1976 surveys.

Location	1970	1975	1976
Barter Island to Flaxman Island	2.4	1.8	0.4
Flaxman Island to Oliktok	1.4	1.0	1.4
Oliktok to Lonely	1.0	1.4	1.1
Lonely to Point Barrow	2.3	2.8	1.4
Point Barrow to Wainwright	3.7	6.2	3.8
Wainwright to Point Lay	5.4	2.9	1.9
Point Lay to Cape Lisburne	-	-	4.9
Cape Lisburne to Point Hope	-	-	0.9
Point Hope to Cape Krusenstern	-	-	2.3
Kotzebue Sound	-	-	0.7
Chukchi Sea (moving pack ice)	-	-	0.2
Beaufort Sea (moving pack ice)	-	-	0.1

Table 7. Sex and age composition of ringed seals taken at Point Hope, March-April 1976.

Age (years)	Male	Female	Unknown
Pup	–	–	–
1	–	–	–
2	1	1	1
3	1	2	–
4	2	1	–
5	3	–	–
6	4	1	–
7	2	–	–
8	6	–	–
9	2	–	–
10	5	–	–
11	–	–	–
12	5	1	–
13	–	–	–
14	1	–	1
15+	5	1	1