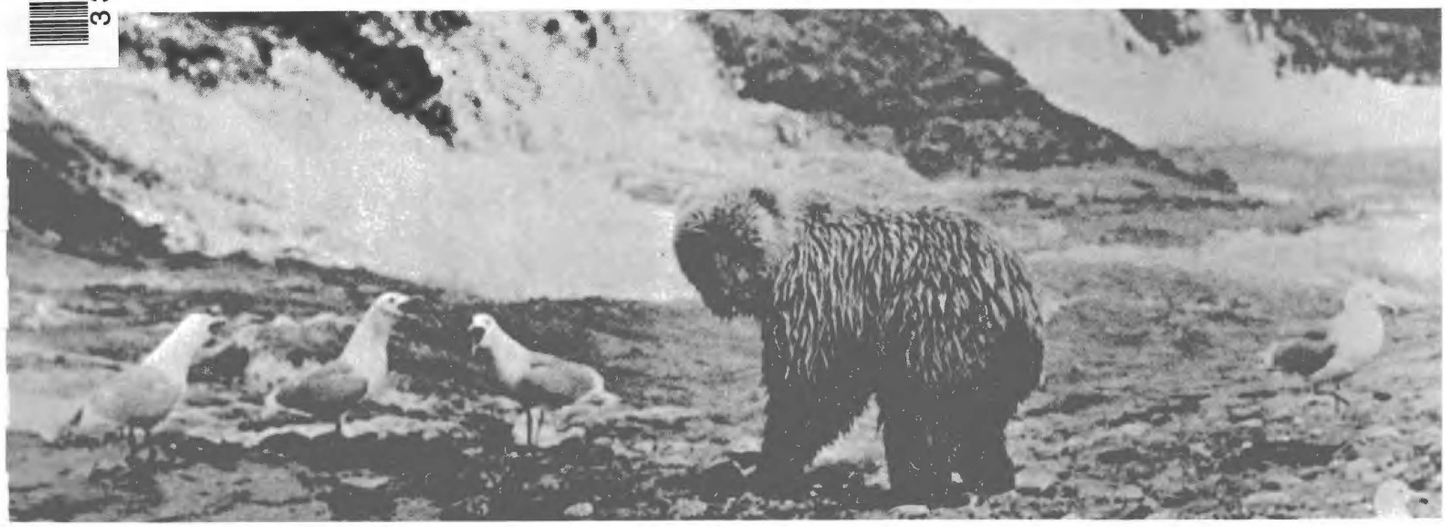
ALASKA DEPARTMENT OF FISH & GAME

1960-61 Pittman-Robertson Project Report

DIVISION OF GAME VOLUME II, NO. 6

BEAR INVESTIGATIONS

Work Plan F



Juneau, Alaska

The harvest of brown bears in Alaska totaled approximately 450 for 1961. Continued protection of cubs or females accompanied by cubs is one of the means of insuring survival of this big game species despite increasing hunting effort.
(Photo by U.S. Fish and Wildlife Service)

Residents along the Arctic coast clean polar bear hides prior to tanning by immercing them in sea water. (Photo by Sigurd T. Olson)

Volume II, Number 6 1960-1961

ANNUAL REPORT OF PROGRESS, 1960-1961

FEDERAL AID IN WILDLIFE RESTORATION PROJECT W-6-R-2

GAME INVESTIGATIONS OF ALASKA

STATE OF ALASKA

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Alaska Department of Fish and Game

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ANNUAL REPORT OF PROGRESS
INVESTIGATIONS PROJECT
COMPLETION OF 1960-1961 SEGMENT

State: Alaska

Project No: W-6-R-2 Name: Alaska Wildlife Investigations

Work Plan: F Bear Investigations

Job No: 1 Title: Brown Bear Studies, Alaska Peninsula

PERIOD COVERED: Miscellaneous observations - May 10, through October 13, 1960.

ABSTRACT:

Although no actual census of brown bears on the Alaska Peninsula was undertaken during 1960, 178 observations involving 325 bears were recorded by Department personnel. Analysis of these observations indicate some possible misclassification of family groups as to age and makes comparisons of many population characteristics with past surveys uncertain. Combined totals of cubs and yearlings, sows with cubs or yearlings, litter size frequencies and means, and the proportion of productive females indicate, however, that production and survival is essentially similar to that estimated from past surveys.

Mortality induced by humans based on meager data was judged to have inconsequential effect on Peninsula brown bear populations.

OBJECTIVES:

To determine numbers, age composition, characteristics of harvest, and population trends of brown bears on

the Alaska Peninsula. Results of the studies will be used to evaluate present status, for future comparisons, for comparison with other areas, and to formulate management procedures.

TECHNIQUES:

Aerial composition surveys of Alaska Peninsula brown bear populations were not flown during 1960, consequently population status estimates this year are based on observations of bears made incidental to other wildlife investigations. These observations were made by Glenn Davenport of the Division of Commercial Fisheries and by Ronald Skoog, Edward Keough, Ken Gilpin, and the project leader, all of the Division of Game. In all, 178 observations were obtained for 325 bears (Table 1).

The observations by Davenport and Gilpin were for the most part made during the course of salmon escapement surveys using Grumman Goose aircraft. Aerial observations were otherwise obtained with single engine Cessna 180 or Piper "Super Cub" 150 aircraft.

Data recorded during the surveys included classification of bears into three categories: 1) sows with cubs of the year, 2) sows with yearling cubs, and 3) other bears. Family groups were recorded as to total numbers of bears, and all observations were recorded as to date, time, and location.

Data obtained in this report are analyzed to show Alaska Peninsula brown bear population structure, productivity, survival, population densities, and related management considerations.

Population structure refers to the identifiable or calculable population segments.

Productivity refers to the general well-being of the population as measured by the following indices:

1. Per cent cubs in the total population.
2. Per cent yearlings in the total population.

Table 1. Summary of 1960 Alaska Peninsula Brown Bear Composition Counts.

Sows w/1 Cub	Sows w/2 Cubs	Sows w/3 Cubs	Sows w/1 Yearl.	Sows w/2 Yearl.	Sows w/3 Yearl.	Other Bears	Total Bears
7	10	8	9	15	6	162	325

3. Per cent of females two years (30 months) and older producing and rearing cubs or yearlings to the time of the survey (sows without cubs determined as explained beyond).
4. Frequency of the several litter sizes, and average litter size.
5. By comparison of productivity data developed under P-R projects W-3-R-13 and W-6-R-1 with that developed for the present study.

The female segment of the population is determined by assuming an evenly divided sex-ratio for bears older than yearlings. The total number of females with cubs and yearlings is then added to the total of the "other bear" category and the sum divided by two to derive the calculated total female population segment. The "per cent productive females" is obtained by dividing the "total sows with cubs or yearlings" figure by the "total females" figure. It is to be understood that this method of analysis presupposes that all family groups remain intact through two summer seasons and that family breakup then ensues. If this assumption proves invalid, a lesser proportion of productive females will be indicated than has actually been achieved since the separated group members would be tabulated as "other bears", widening the ratio between sows with young and other bears.

Survival as discussed here refers to survival of cubs of the year (5-9 months) to yearlings (17-21 months). It is measured by the ratio of total yearlings to total cubs in the 1960 census and by comparison of cub data developed under P-R projects W-3-R-13 and W-6-R-1 with that of yearling data developed under the present study. The former ratio assumes equal cub production for the two years and that survival of cubs to the time of the observations for each year was comparable.

FINDINGS:

Productivity and population data obtained for this year are presented in Tables 1 and 2. A comparison of these data with those developed under P-R projects

Table 2. Per Cent Composition of Various Alaska Peninsula Brown Bear Population Elements--1960.

	Cubs in Total Sample.	Yearlings in Total Sample.	Cubs and Yearlings in Total Sample.	Sows w/Cubs in Total Sample.	Sows w/Yearl. in Total Sample.	Sows w/Cubs or Yearl. in Total Sample.	Sows w/Cubs for Female Segment of Population Sample.	Total Other Bears in Sample.	Average Cub Litter Size.	Average Yearling Litter Size.	Total Bear Observations.
Number	51	57	108	25	30	55	-	162	2.04	1.90	325
Per Cent	15.7	17.5	33.2	7.7	9.2	16.9	50.7	49.8			

W-3-R-13and W-6-R-1 for the years 1958 and 1959, respectively, is presented in Table 3. Proportions of cubs, and sows with cubs were noticeably lower this year as compared with values obtained for 1958 and 1959. Proportions of yearlings, and sows with yearlings were correspondingly higher. This observation may indicate that some cubs for this year were misclassified as yearlings. Assuming an introduced bias of this nature, productivity for 1960 is measured by comparison of the following criteria with similar statistics obtained for the 1958 and 1959 censuses: 1) combined total cubs and yearlings, 2) total sows with cubs or yearlings, 3) per cent productive females, and 4) cub and yearling litter size frequencies, and 5) mean cub and yearling litter sizes.

By these criteria productivity for the 1960 season is indicated as being essentially equal to that determined for the 1958 and 1959 seasons (Table 1-3).

Survival

In light of the possible mis-classification for family groups, survival measurement for brown bears of the Alaska Peninsula as determined for the years 1958 and 1959 (Reports W-3-R-13 and W-6-R-1) is not possible. Comparison of survival with past years is possible, however, by combining total cub and yearling proportions for all survey years (Table 3). These were essentially constant for all years.

Mortality Factors

Little information was obtained for 1960 indicating the importance of hunting and other mortality upon the Alaska Peninsula brown bear population. Records of 41 hunters who took 18 bears were obtained by conservation officer Ken Gilpin. Twenty-two of these hunters and 10 kills were for the fall hunting season, and 19 of the hunters and 8 kills were for the spring season. Kill success for these hunters was likely increased over these figures since many hunters contacted by Officer Gilpin had not yet begun to hunt or were continuing to hunt. Additional mortality determined for Alaska Peninsula

Table 3. A Comparison of Alaska Peninsula Brown Bear Population Data, 1958, 1959, and 1960.

	1958	1959	1960
Sample Size	779	267	325
Per Cent Cubs	21.4	27.0	15.7
Per Cent Yearlings	14.8	9.7	17.5
Per Cent Cubs & Yearlings	36.2	36.7	33.2
Per Cent Sows with Cubs	9.9	13.1	7.7
Per Cent Sows with Yearlings	7.2	5.6	9.2
Per Cent Sows w/Cubs or Yearlings	17.1	18.7	16.9
Per Cent Productive Females	53.5	59.2	50.7
Per Cent Other Bears	46.7	44.6	49.8
Mean Cub Litter Size	2.17	2.06	2.04
Mean Yearling Litter Size	2.05	1.73	1.90

bears included five defense of property kills, three accidental kills and seven illegal kills. No natural mortality was identified.

These meager data support the conclusion reached in P-R report W-3-R-13, that the combined hunting and other losses of Peninsula bears to humans has little significant effect upon the population.

RECOMMENDATIONS:

Results of aerial surveys as analyzed for the years 1958 through 1960 indicate that the population status of brown bears on the Alaska Peninsula may be determined in this manner. The sensitivity of such assessment awaits determination.

As a basis for refinement of the aerial surveys it is recommended that a thorough analysis of data collected to date be made and that the findings be presented in a final completion report. Such an analysis should indicate the timing, extent, and the manner in which future surveys should be flown. These should be directed toward the establishment of a series of check areas which could be flown annually to reflect significant changes in both numbers of bears and in herd composition. Significant variations might then be investigated by more intensive surveys.

In the establishment of check areas, drainage systems which indicate consistent spawning runs of salmon should be selected. Since runs of individual salmon species are characteristically cyclic in magnitude, check areas supporting multi-species runs are to be preferred over single species streams. Ascertainment of streams exhibiting salmon runs with these characters should be undertaken with the counsel of the Division of Commercial Fisheries personnel.

It is also recommended that studies be initiated to gain more precise knowledge of the hunting harvest and associated mortality suffered by bears on the Alaska Peninsula. Assessment of the hunting kill should be

determined from the numbers of bears presented for sealing as provided by Department regulations for 1961.

SUBMITTED BY:

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October 30, 1960

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Volume 2 Report No. F-3

ANNUAL REPORT OF PROGRESS
INVESTIGATIONS PROJECT
COMPLETION OF 1960-1961 SEGMENT

State: Alaska

Project No: W-6-R-2 Name: Alaska Wildlife Investigations

Work Plan: F Bear Investigations

Job No: 3 Title: Polar Bear Characteristics of Harvest

PERIOD COVERED: January 1, 1961 to June 30, 1961

ABSTRACT:

A polar bear pelt sealing program and bear observation forms supplied to guides and hunters provided most of the data used in this study.

Sport hunters killed 130 polar bears during the 1960-1961 season. Resident hunters took 60 animals and non-residents took 70. A sex ratio of 75 males : 25 females exists in the sport kill, but the kill by residents contained a greater proportion of females than did the kill by non-residents. Nearly all sport hunting occurs during the spring months of February, March, and April. Eighty seven per cent of the kill occurred during the period March 13 - May 7. Native hunters killed 26 polar bears during the winter of 1960-1961, a decrease of 36 animals from the preceeding year's take. The kill showed a sex ratio of 50 males : 50 females. The animals were taken during the period November to April, with March the most productive month. The total harvest by both natives and sport hunters was 156 animals; 107 were males, 42 were females and 7 were of undetermined sex. The sport kill occurred an average distance of 55 miles from Alaskan shores. The value of the polar bear

harvest was approximately $310,000.

An area northwest of St. Lawrence Island and south of King Island was the southern limit of polar bear distribution during the study period. An adult female was killed on the beach near Cape Nome on June 29, 1960, nearly three weeks after the pack ice had departed.

The number of bears seen per hour of flying reported on the observation forms decreased for the second consecutive year. The change probably reflects a change in bear population densities along the Arctic coast. Bear population densities were greater in the Bering Straits area than they were in the Point Hope or Barrow areas. The difference, significant at the one per cent level, perhaps was due to ice conditions.

OBJECTIVES:

To develop a program involving the systematic recording of guide and hunter observations of polar bear; to determine the magnitude of the polar bear harvest and types of animals included; and to gather additional information on the breeding biology of the polar bear.

TECHNIQUES:

Various individuals aided in the collection of data for this study.

A regulation requiring that a Department seal be affixed to each polar bear pelt taken in Alaska within 30 days after the date of kill was instituted during 1961. The regulation specified that Department personnel attach the seal and that information concerning the date and location of kill, the animal's sex, the condition and measurements of the pelt, and certain other particulars about the hunters and guides be submitted with the pelt. A biological aide and an enforcement aide, stationed during March and April at Kotzebue and Barrow, respectively, conducted most of the sealing operations. Bears taken at other localities were sealed by other Department personnel as time and conditions permitted. With the possible exception of a few native-killed bears, all of the animals harvested were sealed, and information pertaining

to each obtained.

Polar bear observation forms, similar to those employed during previous years (Harbo, 1960), but containing an additional notation pertaining to tracking conditions, were supplied to guides at Kotzebue, Barrow, and Teller. The guides recorded the sex of all kills, the number of bears sighted, the number of hours flown and the number of hours actually spent searching for bears, the hunter's name and address, and any other pertinent information. Department representatives at Kotzebue and Barrow insured that the guides completed the forms soon after returning from each hunt.

Harvest information from the small, coastal villages was acquired by various individuals through hunter interviews during the sealing operation.

FINDINGS:

In the past, polar bears were harvested for the commercial value of their hides as well as a source of meat for the Eskimo. With the advent of sport hunting the hide has assumed considerable trophy value and Eskimos now market polar bear hides for processing as rug mounts and resale by taxidermists and furriers.

Harvest

Two methods of polar bear hunting are employed in Alaska. White sport hunters prefer to use aircraft for locating bears and for placing the hunter in a suitable location. Hunting by natives is accomplished predominantly by dog sled or foot travel on the pack ice. Most of the annual kill is taken through the use of aircraft.

Kill by trophy hunters. Non-native sport hunters accounted for all of the bears killed for trophy purposes with the exception of two taken by air-borne Eskimos from Kotzebue and Point Hope.

All of the trophy hunters except one utilized aircraft during their hunting forays. The lone exception was a non-native Wales resident who patrolled the nearby shore ice in

a tracked vehicle and was successful after repeated hunting expeditions.

Size and composition of the sport kill. Trophy hunters killed 130 bears during the 1961 spring hunting period, with resident hunters accounting for 60 animals and non-residents for 70. A breakdown of the sport harvest is shown in Table 1.

A sex ratio of 75 males : 25 females exists for the total sport kill. A preponderance of males is usual in this segment of the kill, due to the selective hunting involved, but the per cent of males in the 1961 harvest was slightly lower than the 84 : 16 and 86 : 14 ratios tallied during 1959 and 1960, respectively (Harbo, ibid). The apparent ratio change probably resulted from improved data collecting methods used during this study period. All pelts were inspected by Department personnel, with the sex composition based on the results of this inspection. During 1959 and 1960, however, guides or hunters supplied nearly all of the data. As Harbo (ibid) indicates, a stigma is associated with the taking of female bears, which probably influenced the accuracy of the sex data supplied by guides and hunters. In reality, the ratios for all three years probably are similar.

A difference exists in the male : female ratio for the kills effected by resident and non-resident hunters. The 60 resident killed bears showed a 55 male : 45 female ratio, whereas a 93 male : 7 female ratio was obtained in the non-resident kill. These dissimilar ratios cannot be attributed to geographical or chronological differences in the hunting patterns of residents and non-residents, for they hunted in the same areas and during similar periods. The hunting methods, or degree of selectivity, apparently produced the differences.

Non-residents normally pay from $1,500 to $2,000 for a guided polar bear hunt; they are virtually assured by the guides of bagging a large bear. Resident hunters normally pay $500 to $1,000 for a guided hunt, but with this low price the guides feel less obligated in insuring that hunters obtain large bears. As one guide stated, "We must get a large bear for our non-resident hunters, for they pay the full price with the understanding they get a big bear. We take

Table 1. Summary of the polar bear kill by sport hunters during the period February 1 - May 7, 1961.

Area	Residents			Non-residents				Total			
	M	F	M : F	M	F	?	M : F	M	F	?	M : F
Nome - Teller	1	2	25 : 75	4	1	0	80 : 20	5	4	0	56 : 44
Wales	0	1		0	0	0		0	1	0	
Kotzebue - Pt. Hope	22	18	55 : 45	48	2	0	96 : 4	70	20	0	78 : 22
Barrow	10	5	67 : 33	12	2	1	86 : 14	22	7	1	76 : 24
Total	33	27	55 : 45	64	5	1	93 : 7	97	32	1	75 : 25

residents at a reduced price, but they can't expect to shop around for a large bear." Thus, the non-residents are guided until they kill a fine trophy, whereas the resident must shoot one of the first few bears he sights.

The size of the bears killed by residents and non-residents reflects the difference in selectivity. The average squared measurements (length plus width) of 35 pelts from resident-killed bears is 16 feet 10 inches, but for 62 non-resident kills it is 17 feet 8 inches. As is true of many other endeavors, high price and high quality are related.

Geographical distribution of the sport kill. The sport kill of polar bears occurred in an offshore area extending from the Bering Straits to approximately 125 miles east of Point Barrow, with the majority of the kill effected in the Bering Straits, Point Hope-Cape Lisburne, and Point Barrow vicinities. The geographical distribution is shown in Figures 1 and 2.

The distance of the kill sites from Alaskan shores ranged from 2 to 165 miles, with the average distance 55 miles. This average is much less than the 79 mile average during the 1960 season, but very similar to the 52 mile average reported by Olson (1959) for the 1959 hunt.

The data also revealed that females were taken closer inshore than were males; the average distances were 48 and 57 miles for females and males, respectively. According to many native hunters and guides, such a condition is expected, for they claim that females and young bears frequent inshore areas more often than do males. Another consideration, however, is the difference in hunting methods employed by resident and non-resident hunters. As mentioned previously, most females are taken by residents, perhaps due to the fact that these hunters generally pay reduced guiding fees and thus must take one of the first few bears sighted. As a result, the kills by residents occur closer inshore than do the kills by non-residents. It seems debatable whether the difference in kill locations is due to a non-representative abundance of females in the coastal areas or to hunter selectivity.

Fifty eight of 128 bears whose kill locations are known were taken in the Bering Straits area, 40 in the Point Hope-

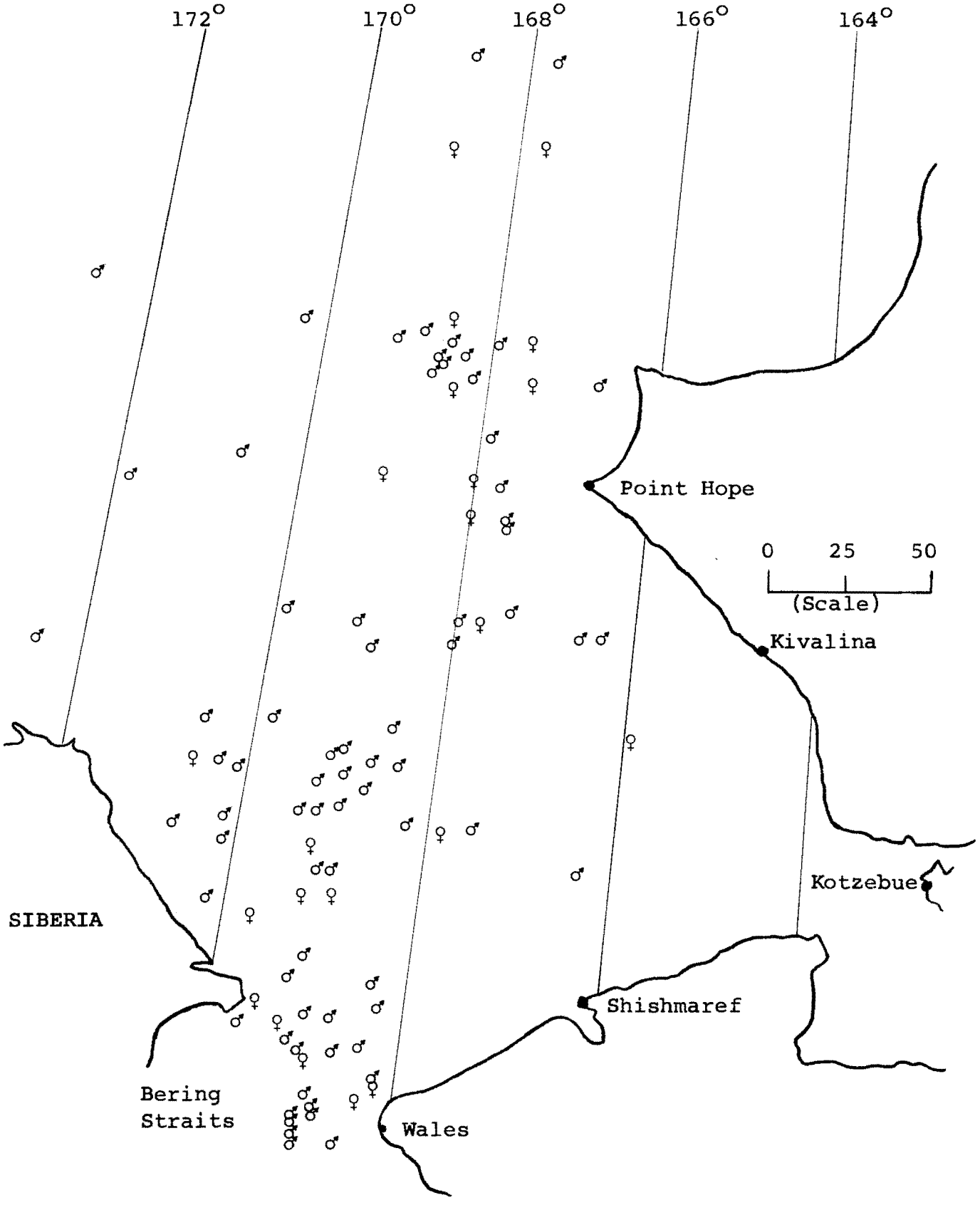


Figure 1. Kill locations of polar bears taken by sport hunters in the Bering Straits-Kotzebue-Point Hope area during 1961.

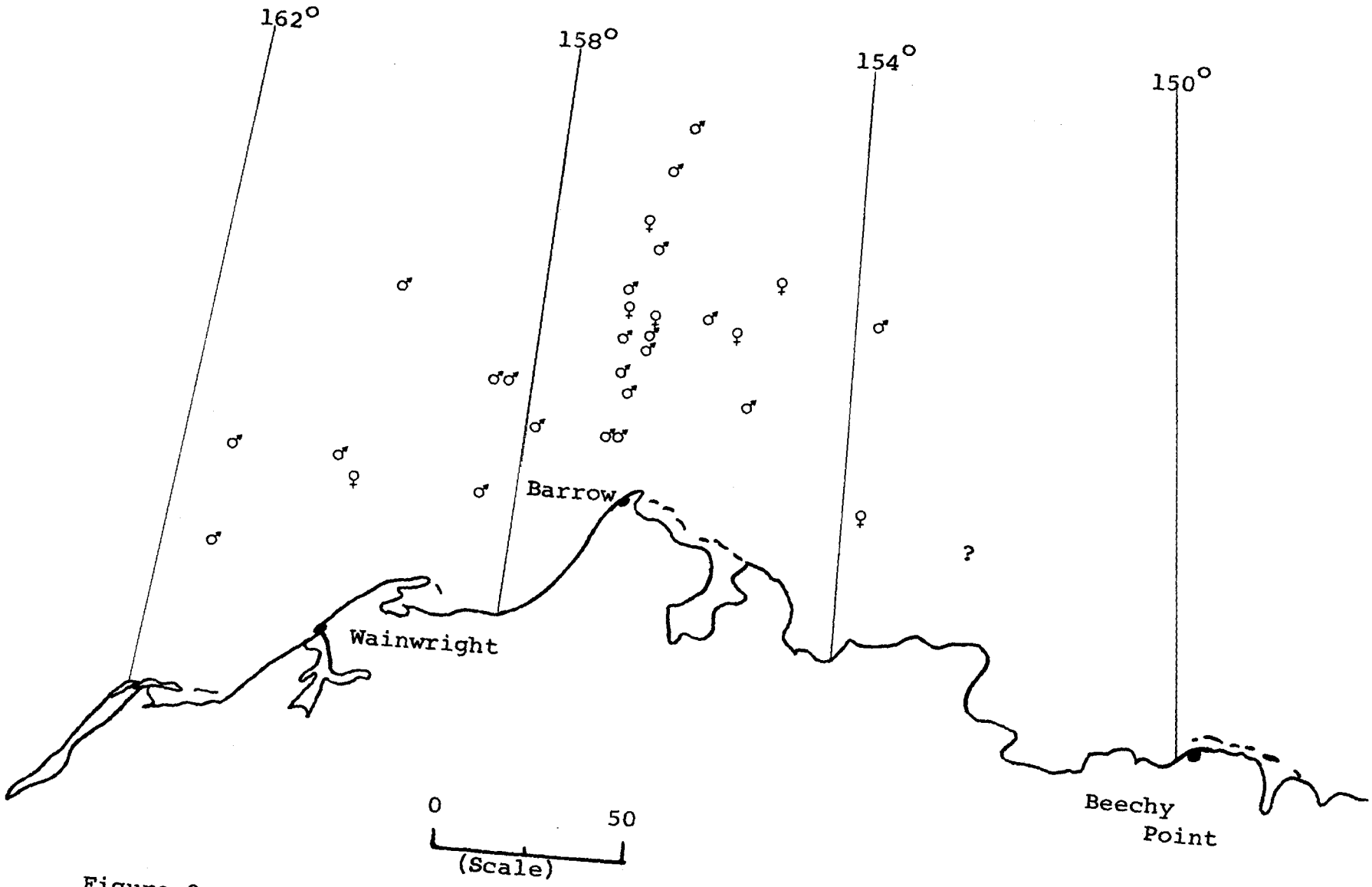


Figure 2. Kill locations of polar bears taken by sport hunters in the Barrow area during 1961.

Cape Lisburne area, and 30 in the Point Barrow vicinity. Of interest is the observation that non-residents accounted for 66 per cent of the bear kills in the Bering Straits area but only 38 per cent of those in the Point Hope-Cape Lisburne vicinity, although most of the hunters were based at the same village, Kotzebue. A firm belief by most guides that the Straits area contained many large bears, a belief generally substantiated by the hunting results, prompted the guides to take their non-resident clients to this area. It seems peculiar that the same treatment was not accorded the residents.

Chronological distribution of the sport kill. Nearly all of the sport hunting occurs during the late winter and spring months of February, March and April. At this time the ice pack offers innumerable landing sites for small planes, and the increasing day length permits extended light plane operation.

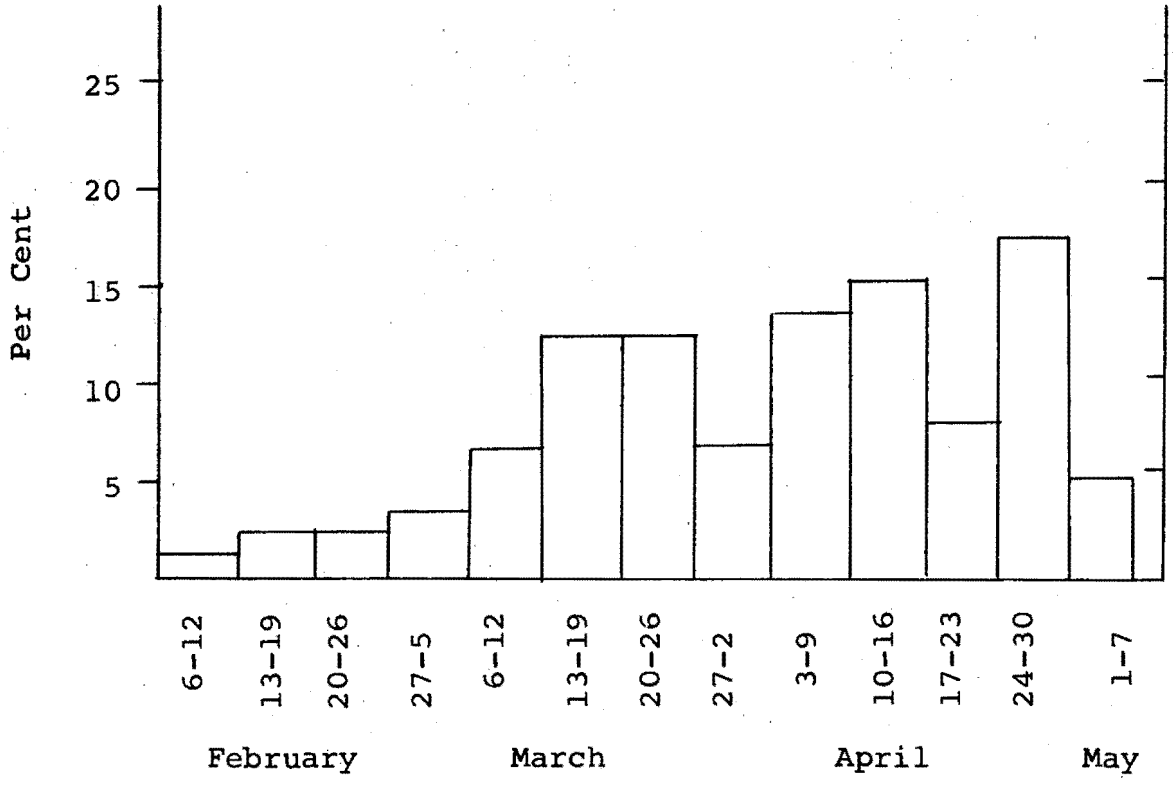
The first polar bear killed by a sport hunter during the spring hunting activity was on February 8 by a Kotzebue based hunter. This kill predated the main hunting period by three weeks for widespread hunting did not start until the first week in March. The last sport kill by a Kotzebue hunter occurred on May 5, two days prior to the close of the legal season

The hunting of polar bears at Barrow normally commences three weeks to a month later than it does at Kotzebue. The first kill occurred on March 11, and the last on May 7, the close of the legal season.

The chronology of the 1961 sport kill is shown in Figure 3.

March 13 - May 7, the most productive period, accounted for 87 per cent of the total sport kill; the kill distribution was relatively uniform throughout that period. The most productive two-week period, April 3-16, accounted for 28 per cent of the kill, only 4 percentage points higher than the second most productive period, March 13-26. These periods correspond to the most productive two-week periods during 1960 (April 10-23) and 1959 (March 15-28). The shifts in harvest peaks undoubtedly reflect unevenly distributed hunter bookings and adverse weather or ice conditions, and not changes in the

Figure 3. The chronology of the polar bear harvest by sport hunters during spring, 1961.



bear population.

Kill by native hunters. The known kill of polar bears by native hunters during the winter and spring of 1960-1961 was 21 animals. The actual kill probably exceeded the known kill by approximately five animals, however, for the Point Lay harvest data are unknown, and one or two kills in other areas may have gone undetected. A summary of the take is shown in Table 2.

The 1961 estimated kill of 26 animals is considerably less than the 1960 total of 62 animals (Harbo, ibid) or the 1959 total of 55 (Olson, ibid). Unsuitable ice conditions and a decrease in hunting effort probably caused the decrease.

Frequent easterly winds during early winter kept the pack ice well offshore in the Point Hope-Point Lay area, creating ubiquitous open leads and unsafe new ice. The hunting of polar bears virtually ceased with such conditions, which lasted until mid-January. The impact on the total take is obvious when the chronology of past harvests is inspected. For instance, during 1959-1960, 75 per cent of the native kill occurred prior to February 1; during 1960-1961, the percentage for this period decreased to 48 per cent.

Another factor affecting the size of the 1960-1961 native harvest is the change in hunting effort. The effort apparently is decreasing yearly, and the situation at Little Diomede Island during 1961 illustrates this change. Air-borne guides and hunters sighted many polar bears close to the island during February, March and April, and a large kill of bears by Little Diomede hunters was expected. On one occasion, a guide saw two polar bears pass undetected between a two-man seal-hunting party located one mile from the island, and the island itself. During the entire season, however, only two bears were killed by Diomede hunters, and those two were taken incidental to a National Guard training excercise on the ice. The Diomede hunters admitted that the take would have increased substantially with increased hunting effort.

Of the 20 known-sex animals, a sex ratio of 50 males : 50 females prevailed. Essentially the same ratio, 48 males : 50 females occurred in the 1959-1960 harvest.

Table 2. Summary of the polar bears taken by native hunters during winter and spring, 1960-1961.

Area	Males	Females	Sex ?	Males : Females
Wales	1	2	0	33 : 67
Little Diomede Island	1	1	0	50 : 50
Point Hope	2	3	0	40 : 60
Wainwright	3	3	1	50 : 50
Barrow	3	1	0	75 : 25
	10	10	1	50 : 50

The first native-killed bear was taken during November at Wainwright, and the last during April at Barrow. The latter kill, a male cub, was taken accidentally in a fox trap. March was the most productive month, accounting for 24 per cent of the known take.

Total harvest. The total harvest by both native and sport hunters during the winter and spring of 1960-1961 consisted of approximately 156 animals; 107 were males, 42 were females, and 7 were of undetermined sex. The 1960-1961 harvest is nearly equal to the 1959-1960 take of 163 bears.

Population

Polar bear observation forms submitted by guides, and observations made during a Fish and Wildlife Service sponsored walrus survey of the Bering Sea provided information on polar bear distribution and abundance.

Distribution. During walrus surveys over the Bering Sea in March 1961, polar bear tracks were noted in the area northeast of St. Lawrence Island and south of King Island. During one flight from Nome to Gambell, I counted 8 sets of tracks in a relatively small area approximately 20 miles south of King Island. Fairly thick pack ice containing numerous leads formed the ice cover in the area. This was essentially the southern limit of polar bear distribution during the winter of 1960-1961.

During spring, the southern limit shifts northward with the retreating pack ice. Generally the animals preceed the ice edge, but infrequently an animal is stranded ashore when the ice departs. Such a situation apparently occurred during the early 1950's at Koyuk; a female bear was killed on a sandbar near the village during late June, nearly a month after the last sea ice had vanished.

Nearly a repeat performance occurred on June 29, 1960. During mid-morning, I sighted a polar bear on a sandy beach near Cape Nome, approximately 20 miles east of Nome. The bear was lying in the grass bordering the beach and seemed relatively unconcerned when I approached to within 150 feet. After a period of approximately 15 minutes, the bear arose and walked slowly and rather aimlessly in the area for a short time and again bedded down. At times it would raise

its head and bite or chew some nearby grass shoots. I observed the bear for approximately one hour before departing from the area. Some six hours later I returned to the site and found the animal in essentially the same position. I drove a vehicle to within 100 feet of the animal, but the bear refused to move from its prone position. I observed the bear for 20 minutes and returned to Nome. Two hours later a member of an Army Detachment Unit in Nome informed me that the bear had just been killed after three soldiers, walking to within six feet of the animal, realized the animal did not have sufficient strength to raise itself.

Upon autopsy, I learned that the female had been severly injured in the thorax by a small caliber bullet. The bear's mammae were enlarged, and secreting milk. Apparently the animal had recently nursed a cub or cubs; the cubs probably were illegally killed during the incident that wounded the mother.

Density. The polar bear observation forms provided information concerning the number of bears seen per hour of flying. Tracking conditions and other features influencing the ease of bear detection undoubtedly affect this crude index of population density, but nonetheless it probably reflects density changes. The data for 1961, and for the five preceeding years, are shown in Table 3.

The number of bears seen per hour declined for the second consecutive year, although the rate of change was less for 1961 than for 1960. The reason for the fewer sightings per hour is unknown, but poor tracking conditions that prevailed during the last two years probably influenced the decrease from the peak year of 1959 when tracking conditions were ideal. Changes in bear population densities along the Arctic coast also may have contributed to the decrease; however, that such changes occur is indicated by different sighting rates within the Kotzebue area.

While tabulating the harvest data and sighting records, I noted that the number of bears seen per hour in that part of the Bering Straits area lying south of an east-west line drawn through a point 30 miles north of Kotzebue, was greater than the number per hour for the area north of this line; the difference was significant at the one per cent level. The

Table 3. Comparison of bear density indices based on numbers of bears seen per hour by aerial hunters and numbers of square miles per bear for the years 1956 through 1961.

Area	Year	No. Flying Hours	No. Bear Sighted	Bears Seen Per Hour	No. Sq. Miles Scanned*	Sq. Mile Per Bear
Kotzebue	1956	84	33	0.4	1,888	57
	1957	222	175	0.8	4,971	28
	1958	106	111	1.0	2,387	22
	1959	160	344	2.2	3,600	10
	1960	118	145	1.2	2,655	18
	1961	270	308	1.1	6,075	20
Total		960	1,116	1.2	21,576	19
Barrow	1956	-	-	-	-	-
	1957	161	47	0.3	3,379	72
	1958	79	90	1.2	1,764	20
	1959	105	154	1.5	2,363	15
	1960	46	34	0.7	1,035	30
	1961	86	32	0.4	1,935	60
Total		477	357	0.7	10,476	29
Above Combined	1956	84	33	0.4	1,888	57
	1957	383	222	0.6	8,350	37
	1958	185	201	1.1	4,151	21
	1959	265	498	1.9	5,963	12
	1960	164	179	1.0	3,690	22
	1961	356	340	1.0	8,010	24
Total		1,437	1,473	1.0	32,052	22

* Based on a flight speed of 90 miles per hour and an effective scanning width of one-fourth mile.

guides and hunters generally reported similar tracking conditions for both areas, which implies that the bears in both areas would have equal chances of being seen. Therefore, the data must mean that very different population densities exist in the two areas.

The different densities probably are related to ice conditions. In the Point Hope area during late January and early February, cold temperatures and calm weather contributed to form a relatively thick and unbroken ice cover. During aerial survey flights over that area in late March, K. W. Kenyon, a Fish and Wildlife Service biologist, noted only four or five open leads in several hundred miles of surveying. In nearly the entire area within a 100 mile radius of Point Hope, the ice cover was complete and unbroken. In the Bering Straits area, however, guides and hunters consistently reported numerous, but small, leads. For an animal subsisting on a seal diet, the Point Hope area probably seemed barren, for seals would be difficult to obtain in the consolidated ice pack. In the Bering Straits area, however, seals consistently hauled out along the narrow leads; these hauled-out pinnipeds presumably are easily obtained by a polar bear.

The difference in the number of bears seen per hour in the Kotzebue and Point Barrow areas also was significant at the one per cent level, indicating different population densities. Insufficient data are available concerning the ice pack in the Barrow vicinity to permit an evaluation of ice condition-bear density relationships.

A chi square test was applied to the number of cubs seen per adult in the Kotzebue and Barrow areas, but no significant difference occurred. Similar conclusions resulted when the test was applied to other sex and age composition data for the two areas. Apparently no significant segregation of sexes or age classes occurs in the population.

Value of the Harvest

Wildlife forms the basis of the economy in many villages of Alaska. Along the Northwestern Alaska coast the natives historically have subsisted on wildlife. Today, the coastal residents still subsist on fish and game, but the direct economic and monetary values of certain species are gaining

increasing importance. With the advent of sport hunting of polar bears, the immediate monetary value of the species outweighs its subsistence value.

The value of the polar bear harvest cannot be determined with an accuracy of one or two dollars, for too many variables exist. By computing the value of the harvest on a native, resident and non-resident basis, however, the variables are minimized.

The value to Alaska of a native-killed bear essentially is the price the hunter gets for the pelt. Usually the price varies from $15 to $20 per linear foot. Thus a 7-foot hide is worth $105 to $140. I have compromised at $120 per pelt. On that basis, the value of the 26 native-killed bears is $3,120.

I have based the value of each bear taken by resident and non-resident sport hunters on the cost required to obtain a trophy. The costs vary considerably, but through conversations with hunters and guides, I have arrived at the following averages:

	Non-resident	Resident
Guiding fee	$ 1,750	$ 1,000
Transportation	250	150
Lodging	280	200
License and tag	170	7
Fleshing and trans. hide	50	50
Mounting (only part done in Alaska)	100	200
Misc. (souvenirs, etc.)	300	100
Total	$ 2,900	$ 1,707

If the above averages are realistic, the value of the 1961 harvest by residents and non-residents was approximately $103,000 and $203,000, respectively.

The value of the entire 1961 harvest totaled nearly $310,000. The principles of economics dictate that such a valuable, renewable resource be treated wisely.

RECOMMENDATIONS:

The decline during the past two years in the number of bears seen per hour of flying is reason for concern. We must determine if the change is due to hunting pressures or to other factors. In order to evaluate the factors involved, however, we need additional information concerning polar bear ecology.

A systematic method of obtaining polar bear distribution and population density data, and ice condition information should be instituted. The analysis of such data should aid in our understanding bear-ice relationships.

Growth studies are needed for use in assessing growth rates and for regulation enforcement. For instance, we need to know if yearling and two-year-old bears can be distinguished, on the basis of size, from older bears. Selected individuals should be collected for this phase of the investigations, perhaps by biologists temporarily stationed aboard a Coast Guard vessel during a pack ice cruise.

Reproductive organs should be collected from as many animals as possible in order to assess the productivity, reproductive potential and breeding chronology of the bear population.

Accurate age determination methods should be developed for use in assessing the age structure of the harvest. The skulls and other skeletal parts of hunter-killed bears should be collected and then analyzed for age-specific features.

The tabulation of the harvest, and of bear sightings, should be continued.

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