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BEAR INVESTIGATIONS

by

Albert W. Erickson, Leader

Volume III
Annual Project Segment Report
Federal Aid in Wildlife Restoration Act
Project W-6-R-3, Work Plan F

The subject matter contained within these reports is often fragmentary in nature and the findings may not be conclusive; consequently, permission to publish the contents is withheld pending permission of the Department of Fish and Game.

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CONTENTS

JOB COMPLETION REPORT
RESEARCH PROJECT SEGMENT
FEDERAL AID TO WILDLIFE RESTORATION

State: Alaska Name: Alaska Wildlife Investigations

Project No: W-6-R-3 Bear Investigations

Work Plan: F

Job No: 1-a Title: Brown Bear Studies Alaska Peninsula

PERIOD COVERED: August 6 - 25, 1961

ABSTRACT

During surveys of Alaska Peninsula brown bear populations during 1961 a total of 540 bears was observed and classified. These were 24 per cent cubs of the year, 19 per cent yearlings, 20 per cent sows with cubs or yearlings and 37 per cent other bears. Productivity as measured by proportions of cubs, yearlings and productive females was indicated as somewhat higher than values determined for past years. Litter size comparisons did not, however, exceed past years which suggests that if productivity was increased for 1961 it was due to an increase in total litters rather than to increases in litter sizes.

An average of 15.64 bears was observed per census hour during the 1961 surveys. While this value is slightly increased over values obtained for surveys during 1958 and 1959 it is considered to represent only that Alaska Peninsula brown bear populations are maintaining themselves at a relatively stable and presumably high level.

In light of inconsistencies indicated between year to year survey results it was recommended that effort be made during 1962 to conduct a study designed to evaluate aerial survey techniques as a basis for refining procedures for more closely assessing the status of these populations.

RECOMMENDATIONS

The results of aerial surveys of brown bears on the Alaska Peninsula for the 1961 season indicate continued maintenance of these populations at a high level. Surveys to date do not, however, permit sensitive assessment of population status. Particularily perplexing are inconsistencies between surveys for different years. These discrepancies appear attributable to factors other than population change itself and more specifically they appear attributable to survey procedures.

In light of the above it is recommended that studies of the brown bear on the Alaska Peninsula in 1962 be confined to an examination of aerial survey procedures. Procedures should include replicated surveys on selected drainages to test for differences in survey results between and within days, between observers, and to determine the efficiency of air crews to observe and classify bears. Understanding of these and other factors will provide a basis for more closely assessing the status of these populations. It is particularly desirable that this be done before these populations become subjected to heavy exploitation.

JOB COMPLETION REPORT
RESEARCH PROJECT SEGMENT
FEDERAL AID TO WILDLIFE RESTORATION

State: Alaska Name: Alaska Wildlife Investigations

Project No: W-6-R-3 Bear Investigations

Work Plan: F

Job No: 1-a Title: Brown Bear Studies Alaska Peninsula

PERIOD COVERED: August 6 - 25, 1961

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 comparisons with other areas, and to formulate management procedures.

METHODS AND PROCEDURES

Aerial composition surveys of Alaska Peninsula brown bear populations were flown between August 6 and August 25, 1961. The surveys were flown using a Piper 150 H. P. Super Cub on floats. The pilot was Fish and Game Department Protection officer Virgil Crosby. The project leader served as the observer. Observations were made from altitudes approximately 200 feet above the ground and at air speeds varying between 65-85 miles per hour. A total of 75 hours of flying time was expended on the project of which 34 hours were spent on actual surveys. During these surveys a total of 540 bears was observed.

Data recorded during the surveys included classification of bears into three categories: 1) sows with cubs of the year, 2) sows with yearlings, and 3) other bears. Family groups were recorded as to total number 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 identifiable or calculable population segments.

Productivity refers to the general well-being of the population as measured by the percentage of cubs, yearlings, litter sizes, and the proportion of females two years (30 months) and older producing and rearing cubs or yearlings to the time of the surveys.

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 bears" 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. If this assumption proves invalid, a lesser degree of productivity will be indicated than has actually been achieved since the separated groups members would be tabulated as "other bears," widening the ratio between sows with young and other bears.

Survival refers to the survival of cubs of the year (5-9 months) to the yearling age (17-21 months). It is measured by the ratio of the latter to the former, and by comparison of the yearling class obtained for one year to the cub class obtained in the previous year.

FINDINGS

Productivity and population data obtained for this year are presented in Table 1. A comparison of these data with those developed under P-R Projects W-3-R-13, W-6-R-1, W-6-R-2, and W-6-R-3 for the years 1958 through 1960, respectively, is presented in Table 2.

Productivity and Survival

As shown in Tables 1 and 2, Alaska Peninsula brown bear populations were indicated as realizing very high productivity during 1961. Cubs of the year constituted over 24 per cent of the total bears observed and together with yearlings comprised over 43 per cent of total observations. High productivity values were also indicated by the high proportion of observations made up of sows with cubs, sows with yearlings, and the extremely high proportion of productive females.

Explanation for the seeming high productivity indicated by the 1961 surveys is not immediately obvious. While the 2.35 average yearling litter was the highest yet recorded, it was not sufficient to account for the indicated productivity increase. Furthermore, this high value is not supported by an unusually high 1959 average cub litter size. The average cub litter has remained virtually constant for all surveys. From this it is apparent that if an increased productivity was realized during 1961 it was due to an increase in numbers of litters rather than increases in litter size. This could have resulted in four ways: 1) increased female breeders in the population, 2) a decreased "other bear" bear segment, 3) higher than usual litter survival, or 4) some factor making family groups more susceptable to being observed than the bears in the "other bear" category. From the data at hand it is not possible to determine for certainty which possibility is most likely.

There are no data available to argue for or against differential natural mortality or survival for any population element. However, known harvest data for bears by hunting, (Erickson, 1961, P-R report W-6-R-3), argues against the possibility of significant distortion of population composition due to a differential hunting harvest of any population element. Not only is the sex ratio of the annual kill indicated as not unduly distorted from equality but also the magnitude of the kill is not believed sufficient at this time to significantly affect population composition.

The possibility of higher than usual litter survival remains a plausible explanation for the high productivity indicated. During 1960, salmon, the principle summer food source for bears on the Alaska Peninsula, were extremely

Table 1. Summary of the 1961 Alaska Peninsula brown bear composition counts.

Sow w/1 Cub	Sow w/2 Cubs	Sow w/3 Cubs	Sow w/1 Yrl.	Sow w/2 Yrl.	Sow w/3 Yrl.	Sow w/4 Yrl.	Other Bear	Total Bear
10	37	16	4	23	13	3	201	540

Table 2. A comparison of Alaska Peninsula Brown Bear Population data, 1958 through 1961.

	1958	1959	1960*	1961
Sample Size	779	267	325	540
Per Cent Cubs	21.4	27.0	15.7	24.4
Per Cent Yearlings	14.8	9.7	17.5	18.7
Per Cent Cubs & Yearlings	36.2	36.7	33.2	43.1
Per Cent Sows with Cubs	9.9	13.1	7.7	11.7
Per Cent Sows with Yearlings	7.2	5.6	9.2	8.0
Per Cent Sows with Cubs or Yrls.	17.1	18.7	16.9	19.7
Per Cent Productive Females	53.5	59.2	50.7	69.0
Per Cent Other Bear	46.7	44.6	49.8	37.2
Mean Cub Litter Size	2.17	2.06	2.04	2.09
Mean Yearling Litter Size	2.05	1.73	1.90	2.35
Bear Per Hour of Aerial Census	14.96	12.05	....	15.64

*No actual survey; compiled from miscellaneous observation by Alaska Department of Fish & Game personnel.

abundant. Consequently, bears likely entered hibernation in good conditon and sows with litters may have realized unusual success with over-wintering litters.

It seems more likely, however, that the higher than usual productivity indicated for 1961 may have been attributable to some factor lending them more susceptable to observation than usual. There is, however, no proof for or against this possibility.

Population Density

During surveys for the 1961 season an average of 15.64 bears was observed per hour of aerial survey. While this value is slightly increased over the 14.96 and 12.05 bears observed per hour for the 1958 and 1959 surveys, respectively, it is considered only to represent that Alaska Peninsula brown bear populations are maintaining themselves at a relatively stable and presumably high level.

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JOB COMPLETION REPORT
RESEARCH PROJECT SEGMENT
FEDERAL AID TO WILDLIFE RESTORATION

State:	Alaska	Name:	Alaska Wildlife Investigations
Project No:	W-6-R-3		Bear Investigations
Work Plan:	F		
Job No:	1-b	Title:	Final Report on Alaska Peninsula Brown Bear Research

PERIOD COVERED: July 1 to September 1, 1961

ABSTRACT

A 43 page report was prepared summarizing brown bear population data compiled under project segments W-3-R-13, W-6-R-1, W-6-R-2 and W-6-R-3. The population data obtained for these segments was found to be markedly inconsistent; therefore publication of the composite findings was considered inadvisable until studies could be made which would perhaps explain the discrepancies between the several studies. It was recommended that these studies give particular emphases to the refinement of aerial survey procedures, and to tests determining the efficiency and representativeness of counts between and within days and between observers.

RECOMMENDATIONS

It is recommended and planned to conduct a study in 1962 designed to evaluate and refine the aerial survey tehcnique as a means for evaluating the population status of brown bears. Consideration should particularly be given to determining when and to what degree brown bears concentrate along salmon streams, to the efficiency and representativeness of counts between and within days and between observers. Studies should also be made to determine the effect upon bear numbers and concentrations of variable environmental factors, such as the magnitude and the periodicity of salmon runs and other phenological conditions.

JOB COMPLETION REPORT
RESEARCH PROJECT SEGMENT
FEDERAL AID TO WILDLIFE RESTORATION

State:	Alaska	Name:	Alaska Wildlife Investigations
Project No:	W-6-R-3		Bear Investigations
Work Plan:	F		
Job No:	1-b	Title:	Final Report on Alaska Peninsula Brown Bear Research

PERIOD COVERED: July 1 to September 1, 1961

OBJECTIVES

To review, compile, analyze and prepare a final report on all composition data obtained to date on Alaska Peninsula Brown Bear populations.

TECHNIQUES (See Objectives Above)

FINDINGS

A 43 page report was prepared for this project segment summarizing all Alaska Peninsula brown bear population data as compiled under Pittman-Robertson projects W-3-R-13, W-6-R-1, W-6-R-2 and W-6-R-3. These studies all concerned attempts to evaluate the population abundance and composition of Alaska Peninsula brown bear populations as measured by aerial survey procedures.

Analyses of findings revealed inconsistencies in the population data compiled for the several studies indicated. It was therefore considered inadvisable to publish the composite findings for these investigations until further studies could be conducted which might provide insight into the variability of survey results.

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JOB COMPLETION REPORT
RESEARCH PROJECT SEGMENT
FEDERAL AID TO WILDLIFE RESTORATION

State: Alaska

Project No: W-6-R-3

Work Plan F

Job No: 2

Name: Alaska Wildlife Investigations

Bear Investigations

Title: Characteristics of the Brown and Grizzly Bear Harvest

PERIOD COVERED: September 1, 1961 to June 30, 1962

ABSTRACT

During 1961, 468 brown-grizzly bears were taken by sport hunting in Alaska, 215 of these during the spring and 253 during the fall season. Spring kills were confined largely to Kodiak-Afognak Islands, the Alaska Peninsula, and to Admirality, Baranof, and Chichagof Islands in Southeastern Alaska. Fall kills were more widely distributed. This difference is attributed to many fall kills being taken incidental to other hunting.

Kill chronologies for the two seasons show spring kills to have been made primarily during the month of May. Fall kills were heaviest at the beginning of the season with 44 per cent of the kill accomplished after only 2 weeks of hunting.

Fifty-two per cent of the 1961 brown-grizzly harvest was by non-resident hunters who enjoyed a hunter success of 74 per cent. Resident hunter success could not be calculated.

The sex composition of the kill was determined to be 68 per cent males for the spring season and 40 per cent for the fall season. The ratio for both seasons combined was 58 per cent males. Size comparisons of bears in the kill showed a mean squared hide size of 6.7 feet for fall kills and 7.2 feet for spring kills. Skull sizes for fall and spring kills were 24.6 and 21.1 inches, respectively. Both measures of size comparison show the average size of bears killed in the spring to be larger. Of spring hides

33 per cent were rubbed as compared to only 5 per cent for fall hides.

RECOMMENDATIONS

Harvest data obtained for brown-grizzly bears in 1961 provides, for the first time, detailed information of importance to the future management of the species.

A most significant finding was the apparent lack of harvest for bears in Interior Alaska, Game Management Unit 10 and for all of Southeastern Alaska except for Game Management Unit 4. As shown by kill chronology data, most effective liberalization would result from an earlier opening of the fall season. The following is recommended for various locations: 1) Interior Alaska - season open concurrent with the sheep season and continue inclusive until June 30; 2) Southeastern Alaska - season open concurrent with the deer and goat season; 3) Unit 10 - season be changed to conform with the season established for Southeastern Alaska; and 4) the remainder of Alaska - existing seasons be continued. However, if changes of seasons are considered it is recommended that liberalizations favor the spring season and restrictions the fall seasons in effort to reduce the harvest of females.

JOB COMPLETION REPORT
RESEARCH PROJECT SEGMENT
FEDERAL AID TO WILDLIFE RESTORATION

State: Alaska

Name: Alaska Wildlife Investigations

Project No: W-6-R-3

Bear Investigations

Work Plan: F

Title: Characteristics of the Brown and Grizzly Bear Harvest

Job No: 2

PERIOD COVERED: September 1, 1961 to June 30, 1962

OBJECTIVES

To secure information relative to the total bears killed, and to determine the area and chronological distribution of the kill; to determine biological and physical characteristics of the kill: sex and age composition, the size of the bears taken, pelt quality and related biological data; and to determine hunter success.

TECHNIQUES

Harvest information presented in this report was obtained from affidavits of hunters who submitted the hides of bears to the Department of Fish and Game for sealing as prescribed by a regulation instituted in 1961. The affidavits provide, for the first time, reliable harvest data for brown-grizzly bears in Alaska, together with meaningful data concerning the biological and physical characteristics of the harvest.

In analyzing these data the State was arbitrarily divided into five geographical units as follows: Southeastern (Game Mgmt. Units 1 through 6); Southcentral (Game Mgmt. Units 7, and 13 through 16); Kodiak-Afognak Islands (Game Mgmt. Unit 8); the Alaska Peninsula (Game Mgmt. Units 9 and 10); and Interior Alaska (Game Mgmt. Units 11, 12, and 17 through 26). Hunting seasons within geographical units were generally alike and except for most of Southcentral Alaska, the entire State had both a spring and a fall season. Southcentral Alaska, except for Game Management Unit 16, was limited to a fall season.

FINDINGS

Harvest

The sport hunting kill of brown-grizzly bears in Alaska for calendar year 1961 numbered 468. Kills were divided 215 for the spring and 253 for the fall season (Table 1).

On an area basis the 1961 kill was divided 26 per cent for the Alaska Peninsula, 25 per cent for Kodiak-Afognak Islands, 20 per cent for Southcentral Alaska and 15 and 13 per cent, respectively, for Interior and Southeastern Alaska. However, the geographical distribution of the kill was markedly different, for the two seasons. Spring kills were confined largely to Kodiak-Afognak Islands (38 per cent), the Alaska Peninsula (33 per cent), and to Admiralty, Baranof, and Chichagof Islands in Southeastern Alaska (13 per cent). Kills for the fall season were more widely distributed. This difference is attributed to a large segment of the fall kill being taken incidental to other hunting.

The Chronology of the Kill

As reported on sealing documents, the kill pattern for the spring and fall season developed as shown in Figure 1. Most of the spring take (80 per cent) occurred during May. Six per cent of the kill was for April and 14 per cent for June. The earliest spring kill was made on April 4.

The pattern of kill for the fall season was heaviest at the beginning of the season and progressively diminished thereafter. Over 26 per cent of the fall take was for the opening week of the season and 44 per cent of the total kill was accomplished after only two weeks of hunting. The latest fall kill occurred on November 27.

Hunter Residence

As shown in Table 2, 55 per cent of the 1961 bear kill was by non-resident hunters. Spring kills were only 52 per cent for non-residents as compared to 57 per cent for fall kills. Hunter success for non-residents was 74 per cent as judged by comparison of bears sealed to tag sales. Resident hunter success could not be

Table 1. 1961 harvest of brown-grizzly bears.

Area District	Mgmt. Unit	SPRING SEASON Number	%	FALL SEASON Number	%	BOTH SEASONS Number	%
Southeast	1	6		7		13	
	2	0		1		1	
	3	0		0		0	
	4	28		9		37	
	5	4		5		9	
	6	6		7		13	
		44	20	29	12	73	16
Southcentral	7	no season		1		1	
	11	0		5		5	
	13	no season		41		41	
	14	no season		15		15	
	15	no season		4		4	
	16	8		20		28	
		8	4	86	34	94	20
Kodiak-Afognak	8	82	38	36	14	118	25
Alaska Peninsula	9	69		51		120	
	10	1		0		1	
		70	33	51	20	121	26
Interior	12	3		11		14	
	17	0		2		2	
	18	0		0		0	
	19	0		13		13	
	20	6		9		15	
	21	0		4		4	
	22	0		1		1	
	23	0		5		5	
	24	0		3		3	
	25	1		3		4	
	26	1		0		1	
		11	5	51	20	62	13
Total		215	100	253	100	468	100

Figure 1. Chronology of the 1961 brown-grizzly kill.

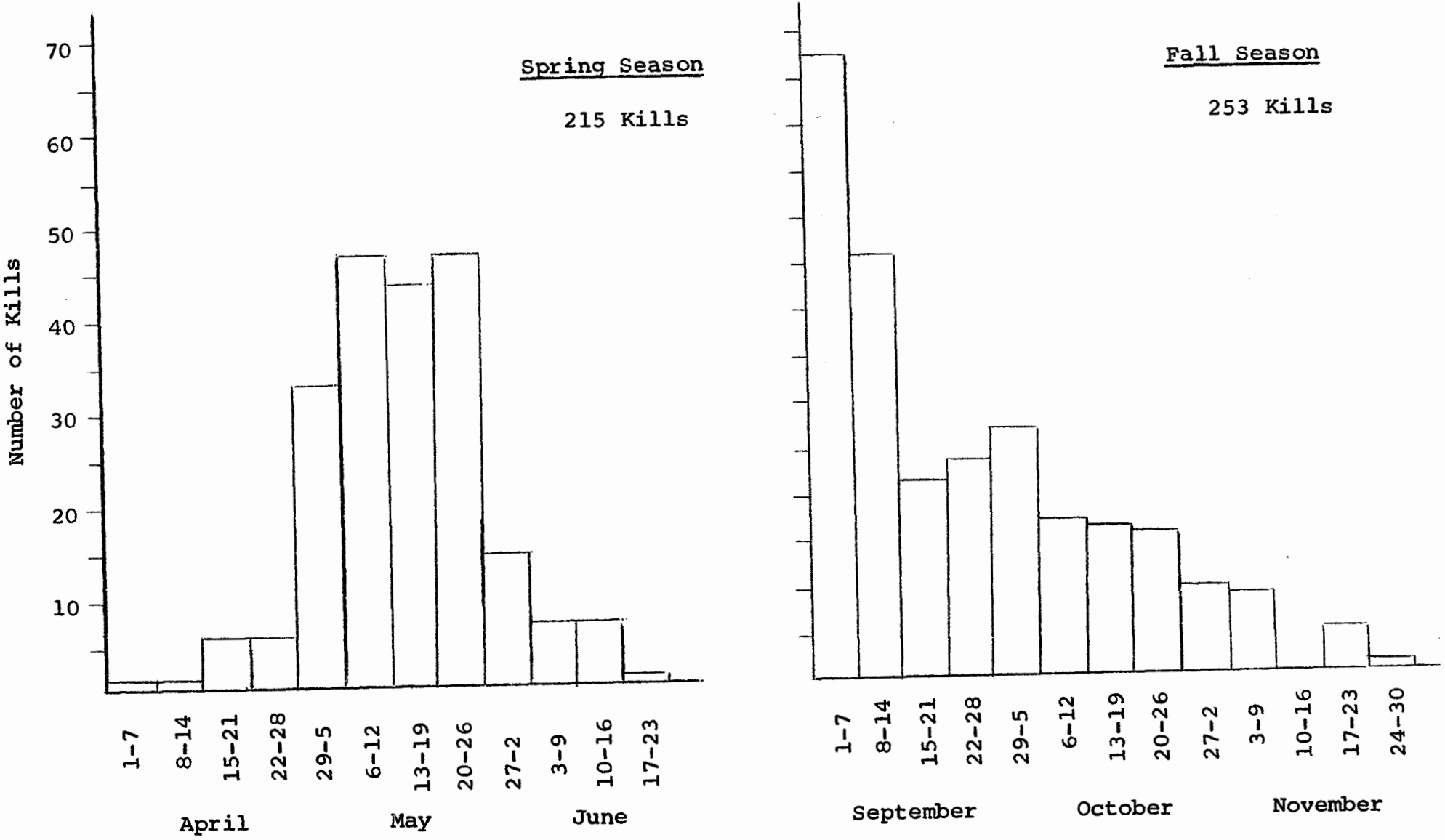

Table 2. 1961 Brown-Grizzly Kill by Hunter Residence

Spring Season	License Sales	Number of Kills	% of Kill	% Success
Resident Hunters	--	102	48	--
Non-resident Hunters	??	112	52	??
		215	100	
Unknown	--	1	-	--
Fall Season				
Resident Hunters	--	108	43	--
Non-resident Hunters	??	145	57	??
		253	100	
Both Seasons				
Resident Hunters	--	210	45	--
Non-resident Hunters	347	257	55	74
		468	100	
Unknown	--	1	-	
		468	100	

calculated since species tags are not required by residents.

As a point of interest the 1961 non-resident kill of brown-grizzly bears was divided among hunters of 38 states and 8 foreign countries.

The Sex Composition of the Kill

Sex ratio reports for bears killed during the 1961 season are shown in Table 3. The reports are listed as verified or unverified. Verified reports are those where the sexes of bears were confirmed by the project leader or an assistant from hide examinations. These examinations revealed a number of female bears to be reported as males. No discrepancies of the opposite nature were noted.

Verified reports show 68 per cent of the spring and 40 per cent of the fall kills to be males. Unverified reports for the same seasons were 81 and 61 per cent, respectively. Assuming verified reports to accurately reflect sex ratios resulting in the kill, adjustment of sex ratios for the 2 seasons indicates 58 per cent of the total kill for 1961 to have been males.

Despite the disparity noted for sex ratio reports, there appears to be little doubt that males predominated among bears taken in the spring. In contrast fall kills appeared to favor females but less strongly than was the case for males in the spring. As a consequence, males predominated in the total take.

It is interesting to speculate as to reasons for the reversing of sex ratios between the spring and fall seasons. This may in part be a reflection of more selective hunting in the spring. However, the regulation which affords protection to sows accompanied by cubs or yearlings likely affects kill sex ratios also. As a consequence of this regulation a large proportion of the female population segment is not subjected to hunting during either season. Nevertheless, a larger female segment is subjected to hunting in the fall than during the spring, since yearlings separate from the sows between the spring and the fall season.

Table 3. Verified and unverified sex ratio reports for bears.*

	Number of Reports		Per cent Males	
Spring Season	Verified	Unverified	Verified	Unverified
Resident Hunters	11	89	64	81
Non-resident Hunters	20	92	70	80
	31	181	68	81
Fall Season				
Resident Hunters	47	56	38	62
Non-resident Hunters	68	72	41	60
	115	128	40	61

*Excludes 13 kills unreported as to sex.

The Size Composition of the Kill

The mean hide size reported for bears killed during the spring season was 15.5 feet and for the fall season 13.6 feet (Table 4). These measurements are the sum of the total length plus total width. By classical reference to the size of bears by squared hide sizes, these values amount to 7.2 and 6.7 feet, respectively, for the spring and fall season.

The skull sizes of bears as a measure of size show mean spring and fall season values to be 24.6 and 21.1 inches, respectively (Table 5). However, the number of skulls presented for measuring was only 127 and these were likely biased to larger animals.

Both skull and hide measurement data show the sizes of spring killed bears to exceed those of fall kills. While this is perhaps reflection of greater selection for trophies during the spring, an additive effect is the slightly larger average size of males which predominated in the spring harvest.

Although these measurement data are of limited value at this time, they should, when compared with similar data for subsequent years, serve as an index of harvest intensity; the thought being that a trend toward smaller skull and hide measurements should signify closer harvests.

The Quality of Bear Hides as Trophies

As shown in Table 6, 33 per cent of bears killed during the spring were reported as rubbed as compared to only 5 per cent for fall killed specimens. For spring hides the greatest proportion of rubbed hides was for Southeastern Alaska where 50 per cent were rubbed. Approximately 30 per cent of the hides from spring kills from the rest of the State were rubbed except for Interior Alaska where hides were too few to be of comparative significance. Fall hides regardless of area were uniformly good.

It was interesting to note that the proportion of hides rubbed was high for even the very first of spring kills. This finding indicates that shedding begins and is well progressed

Table 4. The sizes of sealed bear hides.*

AREA	SPRING SEASON No. of Hides	SPRING SEASON Ave. Size	FALL SEASON No. of Hides	FALL SEASON Ave. Size
Southeastern	41	14.9	24	13.4
Southcentral	8	12.1	78	12.6
Kodiak-Afognak	81	15.8	36	16.3
Alaska Peninsula	66	16.5	47	14.9
Interior	11	12.7	50	12.1
	207	15.5	235	13.6

*Total of width and length; excludes 26 hides lacking meas. data.

Table 5. The skull sizes of sealed bear.*

AREA	SPRING SEASON No. of Hides	SPRING SEASON Ave. Size	FALL SEASON No. of Skulls	FALL SEASON Ave. Size
Southeastern	18	24.3	5	21.3
Southcentral	2	20.0	5	20.5
Kodiak-Afognak	40	24.0	12	23.8
Alaska Peninsula	33	26.1	3	21.1
Interior	2	21.5	7	19.6
	95	24.6	32	21.1

*Skull length plus width; data from limited skulls accompanying hides.

Table 6. The condition of sealed bear hides.

Spring Season

Area	No. Rubbed	No. Not Rubbed	% Rubbed
Southeastern	22	22	50
Southcentral	3	8	27
Kodiak-Afognak	24	58	29
Alaska Peninsula	23	47	32
Interior	0	8	0
	72	143	33

Fall Season

Southeastern	2	27	7
Southcentral	6	80	7
Kodiak-Afognak	2	34	5
Alaska Peninsula	2	51	4
Interior	2	47	4
	14	239	5

while bears are still in hibernation. The data also show slightly earlier shedding for males.

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JOB COMPLETION REPORT
RESEARCH PROJECT SEGMENT
FEDERAL AID TO WILDLIFE RESTORATION

State: Alaska

Name: Alaska Wildlife Investigations

Project No: W-6-R-3

Bear Investigations

Work Plan: F

Title: Polar Bear Characteristics of Harvest

Job No: 3

PERIOD COVERED: February 1, 1962 to May 30, 1962

ABSTRACT

During 1962, 196 polar bears were taken by Alaskan-based hunters. Resident hunters, excluding Natives, accounted for 50 per cent of the kill, an increase of 66 per cent over their 1961 kill; non-resident hunters made 43 per cent of the kill and Native hunters 7 per cent.

The sex and size composition of the kill were determined to closely correspond to that for the 1961 season. Seventy-one per cent of the total harvest was males. The take of bears by non-resident hunters was 86 per cent males. Kills by Native and other resident hunters were 58 and 59 per cent males, respectively. The high proportion of male kills for non-resident hunters is attributed to selective hunting.

The average squared hide size for bears in the 1962 harvest was 8.2 feet and the average skull size 23.7 inches. Similar values were determined for the 1961 season. The similarity shown between the sex and size composition of the polar bear kill for the 1961 and 1962 season indicate that the kills for the two seasons were drawn from a population similar in composition. This conclusion is further supported from the finding that identical numbers of bears were observed by hunters per unit of effort in 1961 and 1962.

The geographical distribution of the 1962 polar bear kill was quite widely spread. A large number of kills extended in a wide band running northwesterly from Pt. Hope. The average distance of kill sites from Alaskan shores was 74 miles. Kills by non-resident hunters averaged 88 miles from shore and Native kills 21 miles. Most kills by non-residents were for hunters based at Kotzebue; most resident hunters were based at Pt. Hope.

The chronology of the 1962 polar bear kill showed low success for the early part of the season. However, a heavy late season take made up for this deficiency, with peaks of harvest shown for the weeks March 20-26, and April 10-16.

During the 1962 season hunters reported seeing an average of 1.0 bears per hour of aerial hunting. This value is identical with the average reported numbers seen during the past two seasons and is slightly above the average number reported for the seven years such records have been compiled.

RECOMMENDATIONS

On the basis of the heavy preponderance of large male bears in the harvest and the continued indication of sound population density, it is indicated that existing seasons for polar bears can be continued, or even extended, without detriment to the polar bear population. It is further recommended that a regulation be instituted requiring that bear skulls accompany bear hides. Such a regulation would allow more sensitive evaluation of the age composition of bears in the harvest together with assisting in the enforcement of the regulation protecting cub and yearling bears.

JOB COMPLETION REPORT
RESEARCH PROJECT SEGMENT
FEDERAL AID TO WILDLIFE RESTORATION

State: Alaska

Name Alaska Wildlife Investigations

Project No: W-6-R-3

Bear Investigations

Work Plan: F

Title: Polar Bear Characteristics of Harvest

Job No: 3

PERIOD COVERED: February 1, 1962 to May 30, 1962

OBJECTIVES

To develop a program involving the systematic recording of guide and hunter observations of polar bears, and to determine the magnitude and character of the polar bear harvest including the chronology of the kill, sex and age composition, hunter success, and related harvest information.

TECHNIQUES

Harvest information presented in this report was obtained from affadivits prepared by hunters who presented polar bear hides to the Department of Fish & Game for sealing as prescribed by regulation. The regulation, instituted in 1961, specifies that this be done within 30 days after the date of kill. The affadavits attest to the dates and locations bears were killed, their sexes, and the condition and size measurements of hides.

To expedite the sealing of polar bears during the 1961-1962 season, hereafter referred to as the 1962 season, a biological aide was stationed at Kotzebue and another at Pt. Hope. These personnel together with the project leader sealed over 82 per cent of the total bear harvest.

Information was also obtained concerning the origin, duration and success of hunts from hunters and guides who filled out hunt forms provided by the Department of Fish and Game. Data recorded included: hunt course, hours flown and the numbers and kinds of bears seen.

In analyzing harvest data hunters were classed as non-resident, resident and Native hunters. The separation of Native hunters from other residents is deemed desirable since their hunting effort is directed toward harvest of bears for food and sale of pelts rather than for the taking of bears for sport.

Harvest

During the 1962 hunting season 196 polar bears were harvested by Alaskan based hunters (Table 1). This kill is a 26 per cent increase over the 1961 kill.

Resident hunters accounted for 50 per cent of the total kill with 43 and 7 per cent of the kills reported for non-resident and Native hunters, respectively. The kill of bears by residents was an increase of 66 per cent over that for the previous year and the take by non-residents an increase of 22 per cent. The kill by Native hunters dropped from 27 to 14.

All kills with the exception of 11 by Native hunters were made with the use of aircraft.

Composition of the Kill

The sex and size composition of the 1962 polar bear harvest (Tables 1, 2 and 3) correspond closely with that determined for the 1961 season. Seventy-one per cent of the total take was males as compared to 73 per cent males for the previous season. Kills by non-resident hunters were 86 per cent males, by resident hunters 59 per cent males, and by Native hunters 58 per cent males. Similar values were obtained for 1961.

The high proportion of male bears killed by non-resident hunters is due largely to selective hunting. They pay a large guide and trophy fee and naturally seek top trophies, usually large males. The proficiency of some guides in choosing trophies is demonstrated by one guide team who during the past season took 17 large male bears without taking a single female. Resident hunters paying lesser hunt fees are not generally afforded great opportunity to select trophies. Native hunters take all bears available to them but show little inclination to purposely hunt for them. The regulation which protects females accompanied by

Table 1. Summary of the 1962 polar bear kill.

AREA	Residents			Non-residents			Native Hunters*			All Hunters		
	No.	Per cent Kill	Males	No.	Per cent Kill	Males	No.	Per cent Kill	Males	No.	Per cent Kill	Males
Kotzebue	6	6	100	47	56	87				53	27	89
Pt. Hope & Lisburne	69	70	59	15	18	87	1	7	-	85	43	65
Pt. Barrow	21	22	52	13	16	85	11	79	50	45	23	61
Nome-Teller	2	2	-	7	8	86				9	5	67
Pt. Ley							1	7	-	1	T	-
Wainwright							1	7	-	1	T	-
Colville R.				2	2	-				2	1	-
	98	50	59	84	43	86	14	7	58	196	100	71

* Two kills of undertermined sex

Table 2. Comparative hide measurements of polar bears taken during the 1961 and 1962 seasons.

Year	Non-resident		Resident		Native		All Hunters	
	No.	Ave. Size	No.	Ave. Size	No.	Ave. Size	No.	Ave. Size
1960-61	68	8.7	57	7.9	24	7.3	149	8.2
1961-62	77	8.8	98	7.9	14	7.6	189	8.2

Table 3. Comparative skull measurements of polar bears taken during the 1961 and 1962 seasons.*

Year	Non-resident		Resident		Native		All Hunters	
	No.	Ave. Size	No.	Ave. Size	No.	Ave. Size	No.	Ave. Size
1960-61	56	25.0	41	22.7	10	21.8	107	23.8
1961-62	59	24.7	54	22.9	2	20.0	116	23.7

* Data from limited skulls presented with hides.

cubs or yearlings also influences a harvest favoring males.

As with the sex composition, the size composition of the 1962 polar bear kill was similar to that developed for the previous season. The average hide size for each season was 8.2 feet squared (Table 2); the average skull size was 23.8 inches for the 1961 season and 23.7 inches for the 1962 season.

The average hide sizes of bears taken by non-resident, resident and Native hunters during the 1962 season were 8.8, 7.9 and 7.6 feet squared, and the average skull sizes 24.7, 22.9 and 20.0 inches, respectively. Both measures of size reflect the decreasing selectivity exercised in the taking of bears by non-resident, resident and Native hunters.

The similarity shown between the sex and size composition of polar bears taken during the 1961 and 1962 seasons indicates that the kills for the two seasons were drawn from a population similar in composition (Tables 1, 2, & 3).

Geographical Distribution of the Kill

The geographical distribution of the 1962 polar bear harvest is shown in Figure 1. Generally the 1962 kill was more widely dispersed than was the 1961 kill which showed a heavy take of bears for the Bering Strait area and for the areas immediately surrounding Pt. Hope and Pt. Barrow. The 1962 kill was predominantly centered in a broad band extending northwestward from Pt. Hope. Kills were also widely scattered throughout the Lower Chukchi Sea and in the area surrounding Pt. Barrow.

The average distance of kill sites from Alaskan shores was 74 miles (Table 4). This value exceeds the 55 mile average determined for the 1961 season but agrees closely with the 79 mile average established for the 1960 season.

The distance bears were killed from shore by non-resident, resident and Native hunters averaged 88, 68 and 21 miles, respectively. Native kills excluding three bears taken with aircraft averaged only seven miles from shore.

As has been the case for previous years, females were taken closer in-shore than was the average for males. This difference is not attributed to a difference in distribution, however.

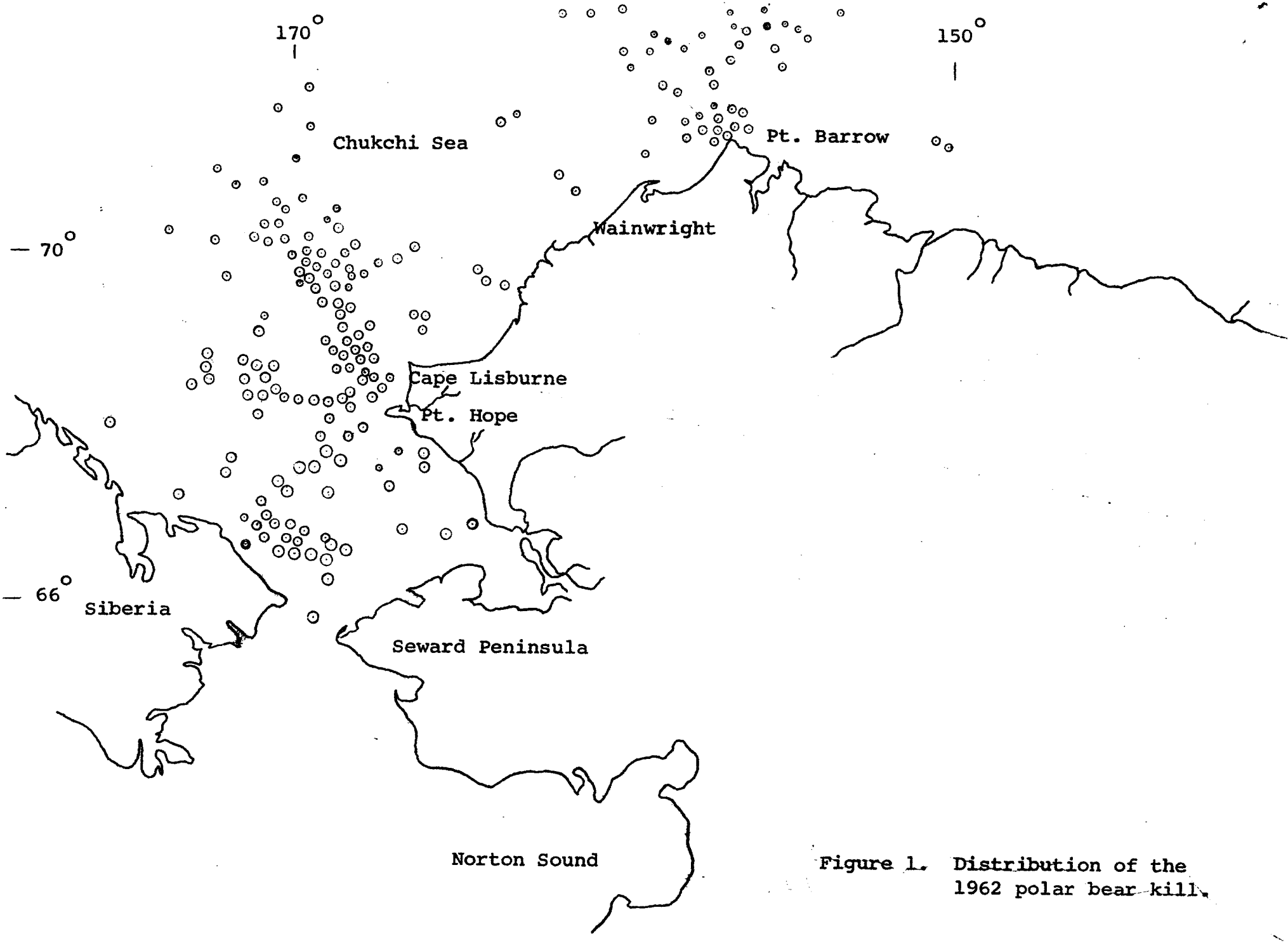


Figure 1. Distribution of the 1962 polar bear kill.

Table 4. Distances Polar Bears were Killed from Alaskan Shores--1962 Season

Sex	Resident Hunters		Non-resident Hunters		Native Hunters*		All Hunters	
	No.	Ave. Dist. From Shore	No.	Ave. Dist. From Shore	No.	Ave. Dist. From Shore	No.	Ave. Dist. From Shore
Males	59	77	71	91	7	22	137	81
Females	37	55	14	72	5	20	56	56
Totals	96	68	85	88	12	21	193	74

*Average for native hunters on foot seven miles

Rather trophy hunters hunt further in search of large bears raising the average distance for males. As shown in Table 1, 43 per cent of the 1962 polar bear kill was for Pt. Hope-Cape Lisbourne hunters. Kotzebue based hunters made 27 per cent of the kills and Pt. Barrow hunters 23 per cent. Other sport hunting kills were recorded for Nome-Teller, and Colville River.

It is interesting to note the separation of resident and non-resident hunting activity. For resident hunters 70 per cent of kills were made from Pt. Hope. For non-resident hunters 56 per cent of the kill was for Kotzebue based hunters. Native kills were with three exceptions all for Pt. Barrow.

The Chronology of the Kill

The chronology of the 1962 polar bear harvest developed as shown in Figure 2. The first sport kill was made on February 13; only 12 kills were made prior to March 20, however. By this date in 1961, 28 per cent of the kill had already been attained. The depressed kill during this period for the 1962 season was due to inclement weather which prevented the use of aircraft in hunting.

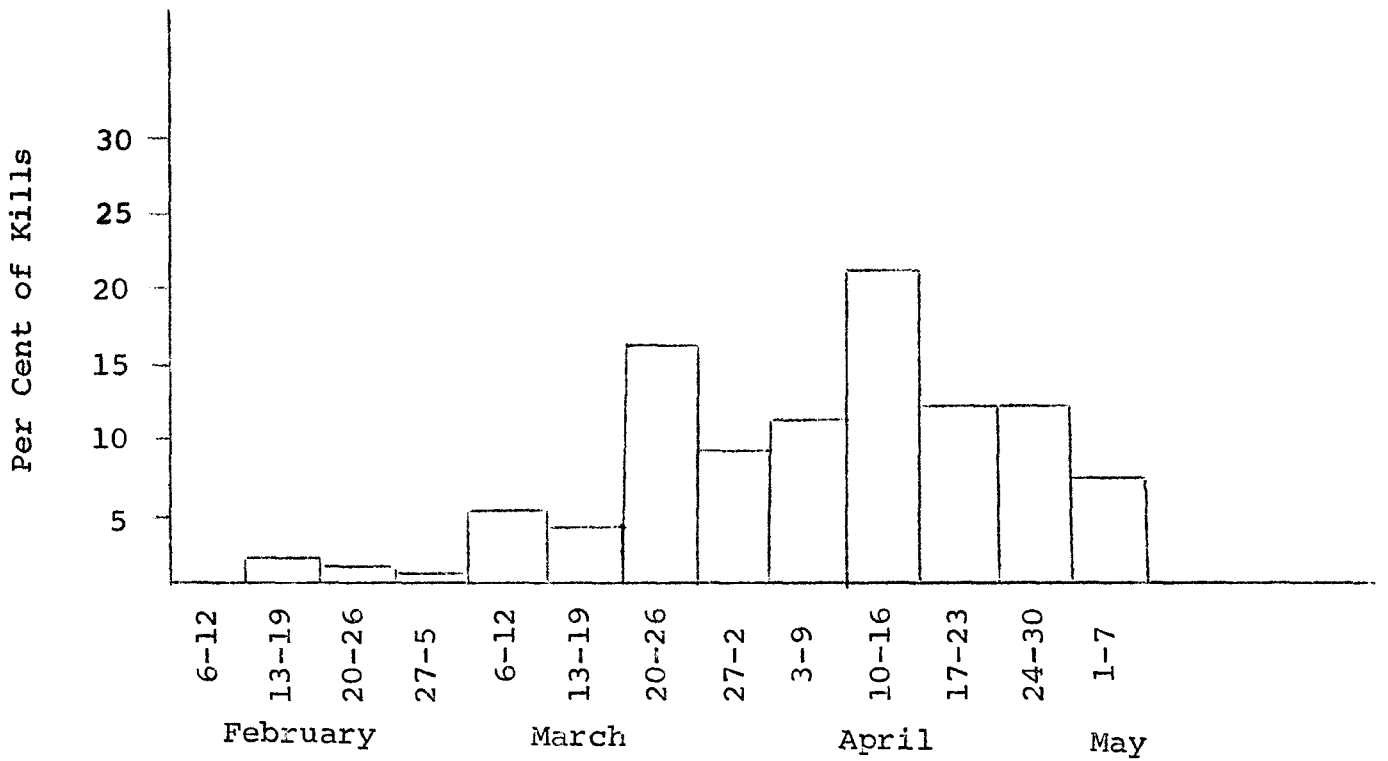
Two peaks of hunting success occurred during the 1962 season during which 37 per cent of the harvest was made: these were March 20-26 and April 10-16. The success realized for these periods is attributed to weather favorable for aerial hunting. As has been true for past seasons, major hunting effort for polar bears in 1962 began in early March and continued until the season's close on May 7. The kill over this period is characteristically determined by the suitability of flying weather, although the conditions also exert an important influence.

In addition to the kills shown in Figure 2, one additional bear was killed in November by a Native hunter. Native kills were otherwise for the same hunting period as for sport hunters.

Population Density

During the 1962 season hunters reported seeing an average of 1.0 bears per hour of aerial hunting. This value is almost identical with the numbers of bears seen by hunters during the past two seasons and is slightly above the average number seen for the seven years during which such records have been compiled (Table 5).

Figure 2. The chronology of the 1961-62 polar bear harvest.*



* Excludes 1 November Native kill.

Table 5. 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 Seen
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
	1962	287	267	.9	6,457	24
Total		1,247	1,383	1.1	28,033	20
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
	1962	26	37	1.4	585	16
Total		503	394	0.8	11,061	28
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
	1962	313	304	1.0	7,042	23
Total		1,750	1,777	1.0	39,094	22

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

These records, although providing general information of population density, are subject to many influences such as tracking condition, ice pack movement and the like. Year to year changes in indicated population density cannot therefore be considered a reliable measure of population status at any one time, rather they should be viewed over a span of years as revealing population trends. Viewed in this light there is no indication at this time that polar bear numbers have undergone any appreciable change for the seven years over which records have been kept.

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JOB COMPLETION REPORT
RESEARCH PROJECT SEGMENT
FEDERAL AID TO WILDLIFE RESTORATION

State: Alaska

Name: Alaska Wildlife Investigations

Project No: W-6-R-3

Bear Investigations

Work Plan: F

Job No: 4

Title: Breeding Biology and Productivity

PERIOD COVERED: July 1, 1961 to June 30, 1962

ABSTRACT

Reproductive tracts obtained for studies of bear breeding biology and productivity included 22 for black bears, 13 for brown-grizzly bears and 94 for polar bears. Only data obtained for male polar bears were extensive enough to warrant study. Gross testicular measurement comparisons for these indicated a possible peak of breeding activity during late March and early April. However, specimens judged sexually viable were identified throughout the February-April period for which specimens were obtained.

RECOMMENDATIONS

Specimen collections of bear reproductive tracts should be continued in an attempt to accumulate sufficient numbers for a meaningful analysis of study objectives. It is recommended that the present collection of polar bear testes be prepared for histological examination and that a report be prepared describing those factors relating to the breeding biology of the male polar bear as is feasible considering the limited period of the year for which specimens are available.

JOB COMPLETION REPORT
RESEARCH PROJECT SEGMENT
FEDERAL AID TO WILDLIFE RESTORATION

State: Alaska

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Bear Investigations

Work Plan: F

Job No: 4

Title: Breeding Biology and Productivity

PERIOD COVERED: July 1, 1961 to June 30, 1962

OBJECTIVES

To investigate the breeding biology and productivity of black, brown-grizzly, and polar bears.

TECHNIQUES

Specimens for studies of bear breeding biology and productivity were obtained incidental to other game investigations. Most specimens were from hunter kills. A few were from bears killed as nuisances. Gross measurements were taken on all reproductive organs collected and ovaries, uterii, and sections of testes and epididymides were fixed and preserved in 10 per cent formalin solution for possible future use in histological studies.

FINDINGS

A tabulation of bear reproductive tracts obtained for study is presented in Table 1. Of 129 specimens, 22 were for black bears, 13 were for brown-grizzly bears and 94 were for polar bears.

Of these data only the gross testicular weight measurements for polar bears (Tables 2 and 3) were extensive enough to warrant review. These specimens were collected during the 1961 and 1962 hunting seasons and cover only the period February 13 through

Table 1. Reproductive Tracts Obtained for Studies of Bear Breeding and Productivity.

	Males	Females	Total
Black	14	8	22
Brown-grizzly	4	9	13
Polar	89	5	94
Total	107	22	129

Table 2. Weights of Polar Bear Testes Collected During the 1961 Hunting Season

Specimen Number	Date	Testes Weight Left	Testes Weight Right	Hide Size* Ft.	Hide Size* In.	Specimen Number	Date	Testes Weight Left	Testes Weight Right	Hide Size* Ft.	Hide Size* In.
83	3/2/61	102.7	109.0	18	0	62	4/6/61	82.5	86.1	16	7
58	3/10/61	100.2	102.3	18	4	22	4/6/61	114.5	113.2	18	11
65	3/11/61	32.1	31.4	14	11	36	4/8/61	39.1	37.7	14	3
77	3/12/61	65.8	70.6	16	6	21	4/15/61	17.3	34.0	14	0
19	3/14/61	68.2	72.0	18	2	71	4/15/61	63.4	70.2	16	0
61	3/17/61	72.2	79.7	19	5	67	4/16/61	70.0	59.4	14	2
60	3/18/61	43.5	45.5	14	9	69	4/16/61	108.3	103.4	18	4
56	3/14/61	99.1	95.5	17	8	72	4/18/61	100.6	101.7	18	0
51	3/22/61	115.3	109.0	19	8	64	4/18/61	83.2	--	16	10
63	3/23/61	13.0	14.5	13	0	70	4/20/61	124.0	114.5	19	6
37	3/23/61	9.6	11.4	14	4	75	4/20/61	31.2	26.9	14	0
55	3/23/61	65.4	67.1	19	1	66	4/20/61	--	103.2	18	2
76	3/24/61	93.1	89.6	16	8	18	4/25/61	68.5	70.0	15	0
78	3/25/61	85.3	88.9	16	10	17	4/26/61	39.2	57.9	16	10
57	3/25/61	44.9	45.0	15	2	16	4/26/61	105.8	106.8	18	4
49	3/26/61	115.2	111.0	18	0	20	4/27/61	59.3	58.4	15	3
48	3/26/61	65.9	71.1	17	0						
50	3/29/61	40.5	39.4	16	7						
68	3/29/61	114.2	120.7	17	10						
53	4/4/61	87.1	102.7	18	4						
54	4/4/61	112.9	113.8	18	9						
47	4/4/61	108.6	119.3	20	0						
52	4/5/61	89.5	100.8	19	9						
23	3/30/61	117.9	125.5	17	10						

*Combined hide length plus hide width measurement.

Table 3.Weights of Polar Bear Testes Collected During the 1962 Hunting Season

Specimen Number	Date	Testes Weight Left	Right	Hide Size* Ft.	In.	Specimen Number	Date	Testes Weight Left	Right	Hide Size* Ft.	In.
145	2/13/62	115.0	106.8	--	--	171	4/12/62	71.0	67.0	14	5
142	3/7/62	101.7	105.9	20	6	209	4/12/62	118.2	113.8	18	4
143	3/7/62	68.2	71.8	19	2	210	4/12/62	120.5	122.7	17	10
211	3/8/62	--	81.8	18	4	211.a	4/12/62	123.6	124.2	19	5
147	3/9/62	94.0	96.9	18	5	208	4/12/62	74.3	74.8	17	6
148	3/9/62	91.1	95.5	20	6	168	4/13/62	27.8	22.8	14	7
144	3/15/62	76.8	76.2	18	4	170	4/13/62	31.0	32.3	15	3
149	3/15/62	85.1	84.0	19	9	214	4/14/62	81.3	119.6	18	6
150	3/19/62	--	104.8	17	5	216	4/14/62	110.0	111.2	18	4
110	3/19/62	--	111.7	18	1	212	4/14/62	81.8	74.8	18	5
152	3/19/62	96.0	93.0	17	11	173	4/14/62	103.4	102.0	19	11
186	3/20/62	41.0	47.2	13	7	172	4/14/62	109.9	110.9	18	4
196	3/20/62	41.2	23.7	13	5	179	4/15/62	112.0	111.8	18	9
155	3/21/62	94.6	99.1	19	4	174	4/15/62	--	132.8	19	6
153	3/21/62	96.8	100.5	18	1	177	4/16/62	98.4	98.4	18	9
190	3/22/62	69.6	74.1	15	7	178	4/16/62	83.4	84.9	18	5
189	3/22/62	--	88.0	17	8	180	4/16/62	37.9	51.1	15	11
156	3/22/62	140.0	134.0	19	9	181	4/17/62	65.8	70.6	15	11
158	3/23/62	71.8	72.1	18	0	184	4/20/62	101.4	97.2	17	0
157	3/23/62	--	138.9	20	2	220	4/20/62	101.4	101.3	18	6
192	3/26/62	74.0	72.5	15	3	183	4/20/62	75.0	74.8	17	3
201	3/30/62	102.8	104.8	18	4	185	4/21/62	75.0	75.4	16	6
160	4/4/62	123.1	127.0	18	6	164	4/11/62	69.1	73.0	15	8
161	4/7/62	97.0	91.1	18	10	229	5/6/62	64.2	58.8	14	9
206	4/8/62	--	121.0	19	2						

* Combined hide length plus hide width measurement.

May 6. Specimens largely consisted of older bears due to their greater value as trophies as well as to protection afforded younger age classes by regulation. It is thus evident that only the cursory understanding of polar bear breeding biology is to be gained from the study of the materials at hand.

Figure 1 shows the close relationship which exists between bear hide sizes and testicular weights. This observation suggests that any increase in testicular sizes which might be attributed to a peak in breeding activity was not necessarily limited to sexually mature animals. Testicular weights do not, therefore, appear to be suitable criterion for the separation of sexually mature and immature specimens. On the other hand, the considerable variations noted between testicular weights for bears of all hide sizes does suggest changes in testicular weights which may be attributed to breeding activity.

To test this possibility chronological testicular weight comparisons were made for bears exhibiting hide and testes measurements exceeding 16 feet and 65 grams, respectively (Table 4). These measurements, while not suggested as criteria for separating sexually mature and immature specimens, were considered sufficiently great to exclude most immature bears.

Ten-day group averages of bears showing these minimal standards are presented in Table 4. As is to be noted, testicular weights vary markedly within all time periods. It would thus appear that at least a few sexually mature specimens were capable of breeding at all times within the February-April date span for which specimens were collected. Average testicular weights do, however, indicate a slight peaking of activity for the March 31-April 9 period although largest individual testes measurements were recorded for time periods to either side of these dates.

There is no obvious explanation for the wide variations exhibited in testicular weights within hide size groups, nor between date chronology groupings. However, variances exhibited may in part be attributed to pooling of age classes. Thus early-prime, mature, and post-prime specimens were likely combined, each of which may have exhibited a different sexual activity pattern. The variations are on the other hand, so extreme as to indicate

Figure 1. Polar bear testis weights as a function of hide size.

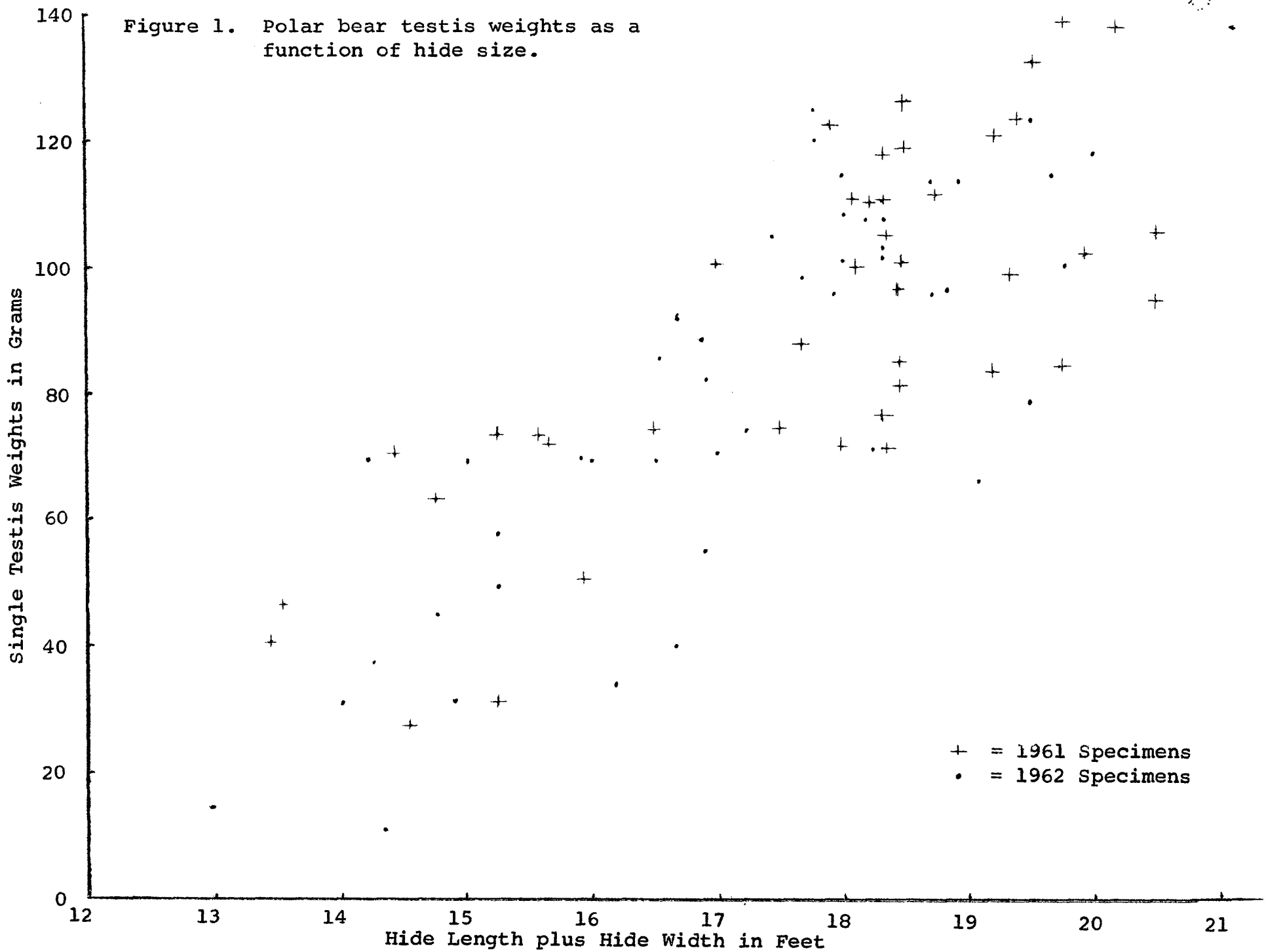

Table 4. Single testes weights for polar bears as relates to date chronology.*

DATE CHRONOLOGY						
2/13	3/1-3/10	3/11-3/20	3/21-3/30	3/31-4/9	4/10-4/19	4/20-4/29
115.0	105.9	76.8	99.1	127.0	118.2	101.4
	71.8	85.1	100.5	97.0	122.7	101.4
	96.9	104.8	88.0	121.0	124.2	75.0
	95.5	96.0	140.0	102.7	74.8	75.4
	81.8	111.7	72.0	113.8	119.6	124.0
	109.0	70.6	138.9	119.3	111.2	108.2
	102.3	72.0	104.8	100.8	81.8	106.8
		79.7	115.3	86.1	103.4	
		99.1	67.1	114.5	110.9	
			93.1		112.0	
			88.9		132.8	
			115.2		98.4	
			71.1		84.9	
			120.7		108.3	
			125.5		101.7	
					83.2	
Average						
115.0	94.7	88.4	102.7	109.1	105.5	98.9

Testes Weights in Grams

* Includes bears with hide length and width measurements exceeding 16' and with testes exceeding 60 grams.

wide variation even within close age-class groupings.

In summary, the testes data as obtained for polar bears in this study suggest that at least few bears were sexually viable throughout the February-April period for which specimens were obtained. Peak breeding activity as assumed on the basis of greatest average testicular measurements was for the period March 31 through April 9.

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