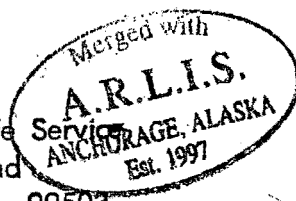


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Progress Report: 1982 Walrus
Harvest, Health, and Welfare Study at
Gambell, Alaska,

by
John Malloy

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Key Words: Pacific Walrus
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St. Lawrence Island

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ABSTRACT

The total documented retrieved harvest at Gambell for the spring of 1982 was 942 walruses (Odobenus rosmarus), including 211 adult males, 404 adult females, 29 adults of unknown sex, and 298 calves. The bull harvest was disproportionately lower and the cow and calf harvests slightly higher in 1982 than in 1981. Cow:calf ratios in the harvest did not differ significantly between years. The number of animals shot and lost was not determined. Lower canine teeth unaccompanied by soft tissue specimens were obtained from 117 animals, reproductive tracts with teeth were collected from 88 females, and stomachs with teeth were collected from 32 animals. The median age of 80 adult male walruses whose teeth were examined was 21 years. The median age of 140 adult females was 14 years.

The number of man-hrs spent per walrus retrieved was 8.91. In 1981, 2.3 man-hrs were expended per walrus retrieved. However, the overall harvest in 1981 (961 walruses) was quite close to this year's total. Little or no change in crew, boat, and motor sizes was observed.

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INTRODUCTION

In 1982, for the 3rd consecutive year, the U.S. Fish and Wildlife Service (USFWS) monitored the spring harvest and health of walruses (Odobenus rosmarus) taken by Native hunters of 6 coastal Alaskan villages. The Eskimo Walrus Commission (EWC) joined in collecting data this year. Under the terms of the Marine Mammal Protection Act of 1972, the USFWS maintains primary management responsibility for the walrus in Alaska. The USFWS continues to monitor harvest size and population size in order to assess various population parameters. This report describes the data collection effort at the village of Gambell. The objectives of the study were to:

- 1) determine the number, sex, and age of the animals retrieved or lost by Gambell hunters;
- 2) examine the reproductive status of female walruses harvested at various stages of the spring migration;
- 3) examine the food habits of migrating walruses;
- 4) document changes in Native hunting methods and hunting effort since the last study season; and
- 5) record additional observations of the wildlife resource and its use by Natives.

Objectives 2) and 3) will be completed by the University of Alaska's Institute of Marine Science in Fairbanks, under contract to the EWC. Objectives 1), 4), and 5) will be addressed in this report.

I thank J.L. Baker and S.L. Schliebe for their editorial comments on an earlier draft of this report and the hunters of Gambell for their cooperation with the harvest monitoring program.

STUDY AREA

The information presented in this report was collected at Gambell, Alaska (approximately 63° 47' N, 171° 44' W). Gambell is a village of about 500 people, almost all of whom are Siberian Yupik-speaking Alaskan Natives. The village is located on the Northwest Cape of St. Lawrence Island and has access to the sea along approximately 2 miles (3.2 km) of gravelly beach. The north and west beaches are the most important boat launching sites. These beaches and other features are shown on the map provided by Lourie (1981).

Gambell is ideally situated to take advantage of the spring walrus migration. Usually, at least 1 of the boat launching areas is free of ice when the migration is under way. The strait between St. Lawrence Island and the Siberian coast is only 45 miles (72.4 km) wide at its narrowest, so walruses migrating west of the island must pass within hunting distance of Gambell.

METHODS

The following paragraphs briefly review the field methods used in this study. An exhaustive description of these procedures is provided by Lourie (1982).

Harvest Data

Harvest data were collected by USFWS personnel stationed at Gambell from 16 April to 7 June 1982. One temporary USFWS biological technician (the author) and 1 village harvest monitor (Edna Apatiki), hired through the EWC, patrolled the beaches on harvest days and interviewed returning boat captains concerning the day's hunt. We recorded the number, sex, and approximate age (adult or calf) of retrieved walruses and attempted to obtain information on the number, sex, and age of walruses shot and lost.

Hunting Effort

When possible, the crew size, boat and motor size, direction and distance of travel, and duration of the hunt were noted. The field form on which this information was recorded is appended to this report (Appendix A).

Specimen Collection

The EWC, under contract with the Subsistence Division of the Alaska Department of Fish and Game, allocated funds for the purchase of 100 female reproductive tracts accompanied by lower canine teeth and 50 stomachs containing 5 or more lbs (2.3 kg) of food and accompanied by teeth. The USFWS allocated funds for the purchase of 100 pairs of lower canine teeth. Boat captains were provided with hunter kits containing plastic bags, specimen tags, and marking materials, along with an instruction card (Appendix B) explaining the procedures for collecting specimens. Eight dollars was paid for each pair of lower canine teeth, \$23.00 for each female reproductive tract accompanied by teeth, and \$58.00 for each stomach with teeth. The boat captains received checks drawn on an EWC account for the specimens they provided.

The prices paid for soft tissue specimens were the same as were paid in the 1980 season, the last year such specimens were purchased, but tooth prices were slightly lower than the \$10.00 paid in 1981. The specimen collecting procedures used this year differed slightly from previous seasons. Blubber thickness and tusk length measurements were not taken in 1982. It was felt that the variability in blubber thickness measurements taken by hunters was generally too great to assess animal condition accurately. Tusk length was felt to be a poor index of body condition, since bony processes are the last tissues to be affected by nutritional changes. Stomach samples collected this year were taken from the uppermost, undigested portion of the stomach contents, rather than from a homogeneous mixture of contents as in 1980.

Lower canine teeth were collected in order to age the animals by counting cementum annuli in sections taken from the teeth. The EWC aged the teeth under contract with the USFWS. Reproductive histories of female walruses can be determined by microscopic examination of the ovaries, and food habits can be investigated by examination of stomach contents.

An individual accession number was assigned to the specimens collected from each animal. Paired lower canine teeth were packaged in sealed envelopes marked with that animal's accession number, sex, and date of collection. Female reproductive tracts were prepared by tying a plastic tag with the accession number, date, and reproductive condition (i.e., collected with a fetus, with a calf, or barren) to 1 of the uterine horns or to the tissue surrounding the excised ovaries. Stomachs were prepared by weighing the total contents, removing a 5 lb (2.3 kg) sample from the least digested portion, bagging the sample in a paint strainer bag, washing the bagged sample, and

tagging the sample inside and outside with the accession number, date, and sex. Reproductive tracts and stomach samples were fixed in a 10% formalin solution until they became gray and rubbery and then were shipped to the Institute of Marine Science for analysis.

Hunter Contact

A meeting of the Gambell Boat Captains' Association was held to explain the changes in this year's collecting procedure, pass out hunter kits, and present the results of walrus health and harvest monitoring in the villages in past years. A 6 min videotape showing laboratory activities and an interview with F.H. Fay was shown at the meeting. This meeting was supplemented by informally contacting the hunters on the beach and around town to explain the program to those who did not attend the meeting or who wished more detailed information.

Incidental Observations and Ice Observations

Incidental observations of other marine mammals and birds encountered while patrolling the beach were recorded. Daily ice observations were recorded on the form included as Appendix C. Utilization of retrieved walrus parts was irregularly noted.

RESULTS

Harvest Data

The total documented retrieved harvest this spring was 942 walruses, including 211 adult males (22% of the total), 404 adult females (43%), 29 adults of unknown sex (3%), and 298 calves (32%). I believe we were able to document 90 to 95% of the actual retrieved harvest at Gambell. The age and sex distribution of the harvest is shown graphically in Fig. 1 and is tabulated in Appendix D. Over 83% of the harvest occurred on just 7 hunting days, and over 20% occurred on a single day.

The distribution of sex and age classes in the harvest in 1982 was significantly different from the 1981 distribution (Table 1; Chi-square test of fit, $p < 0.005$). The adult male harvest was disproportionately lower and the numbers of calves and adult females harvested were slightly higher in 1982 than in 1981. The cow:calf ratio observed in the 1982 harvest (100:74) was not significantly different (Chi-square test of fit, $p > 0.10$) from the ratio reported in 1981 (100:65).

Information about walruses shot and lost was obtainable from very few hunters. The total number of documented lost animals was only 28. In a sample of 132 hunting trips on which at least 1 walrus was taken, boat captains were asked if they had sunk any animals 61 times. Seventeen captains reported sinking a total of 20 walruses, and the remainder stated that they sank none. On the 61 trips for which boat captains responded to our questions, 251 walruses were retrieved. The total number reported killed on these 61 trips was 271. The reported retrieval rate for all walruses shot was thus 92.6%.

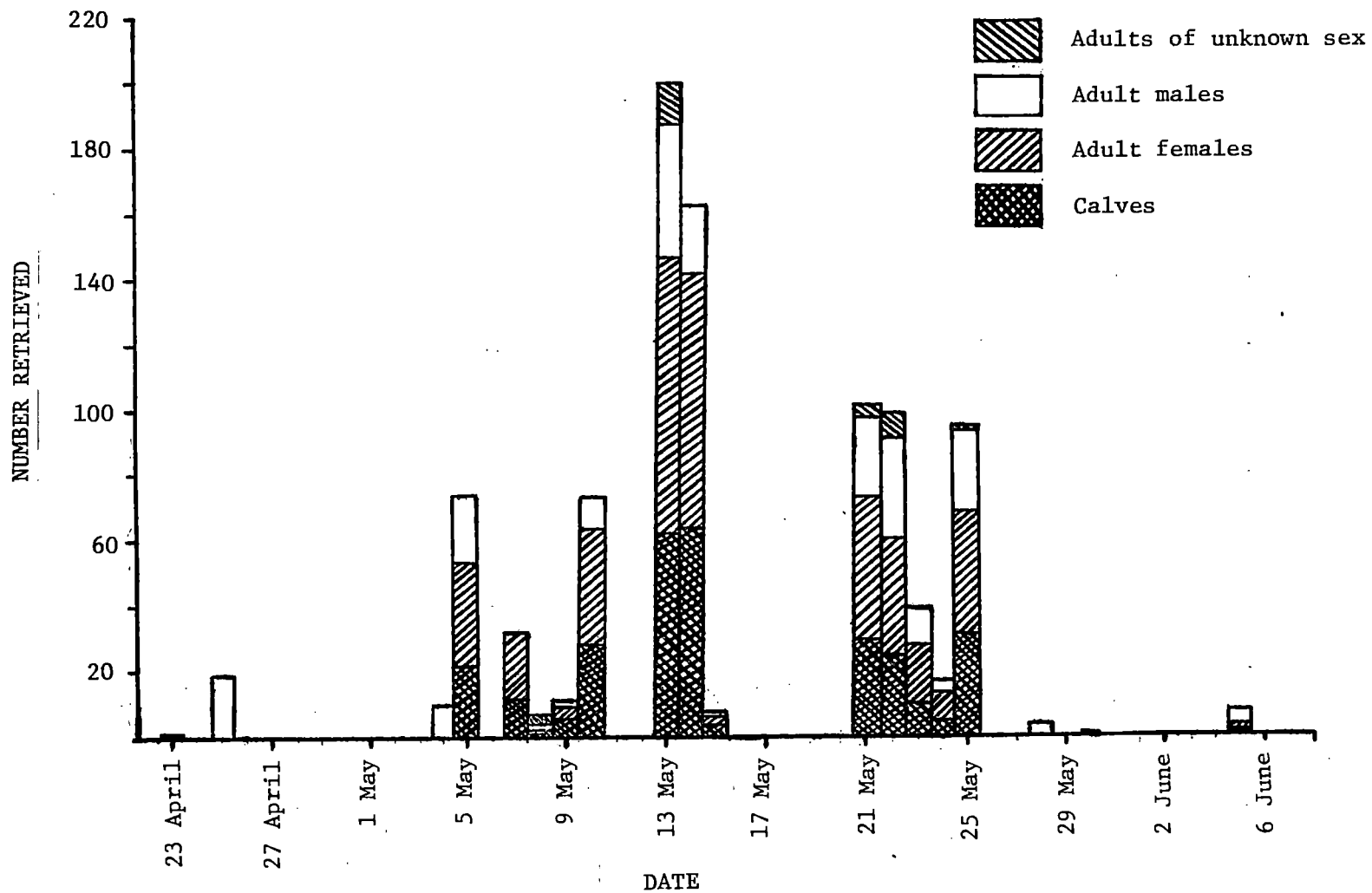


Figure 1. Retrieved walrus harvest by date for 1982. Histogram bars represent the number of each sex and age group retrieved.

Table 1. Comparison of 1981 and 1982 age and sex distributions for spring walrus harvests at Gambell. Only animals of known age/sex category are included in these figures. Data from 1981 are from Lourie (1981).

	Adult males	Adult females	Calves	Total
1981	345	373	243	961
1982	211	404	298	913

Hunting Effort

Information on duration of the hunt was obtained for 342 boat trips. During these trips of known duration, 881 walrus were retrieved, for an average take of 2.58 walrus per trip. The overall number of man-hrs spent per walrus retrieved was 8.91. The seasonal distribution of hunting effort, as measured in man-hrs per walrus, is presented in Fig. 2. Hunting effort did not exceed 30 man-hrs per walrus before 28 May but exceeded 50 man-hrs per walrus from 28 May onward.

Modal crew size (3) and boat size (15 to 17 feet; 4.6 to 5.2 m) were unchanged from last year. Outboard motor power ratings increased slightly this year. Motors or combinations of motors rated at 50 hp (37.3 kw) or greater comprised 62% of the documented total. Last year, boats powered by 50 hp (37.3 kw) or larger motors or combinations of motors made up 50% of the total (Lourie 1981). Crew, boat, and motor sizes are listed in Appendix E.

Information on distances travelled during the hunt was difficult to obtain, but the direction of travel was commonly recorded. The mean directions of travel for each of the 19 days on which records were kept are listed in Table 2. The mean direction of travel on a given day is an indication of the approximate position of walrus passing the island in migration.

Specimen Collection

One hundred seventeen pairs of lower canine teeth, 88 female reproductive tracts with teeth, and 34 stomachs, 32 of which were accompanied by teeth, were collected. Two additional reproductive tracts were purchased but lost before they could be fixed. The temporal distribution of specimens collected is shown in Fig. 3. The specimen collection was successfully distributed uniformly across the spring harvest (cf. Fig. 1).

The mean age of adult walrus harvested this year at Gambell, as estimated from counts of cementum annuli in sectioned teeth, was 16.6 years ($n=220$). The median age was 15 years and the modal age was 14 years. Adult males averaged 20.6 years (median=21 yrs; mode=25 yrs, $n=80$), and adult females averaged 14.3 years (median=14 yrs, mode=14 yrs, $n=140$). Neither male nor female ages were normally distributed (Fig. 4). Age distributions of adult males and females were significantly different (Mann-Whitney U test, $p<0.001$).

All soft specimens have been shipped to the Institute of Marine Science. The results of the study of female reproductive condition and food habits are not yet available. The study of these specimens should be completed and its report issued by 30 September 1982.

Hunter Contact

Whaling activity and walrus hunting frustrated early attempts to hold a meeting with the Boat Captains' Association. A meeting was finally held on 15 May, and 22 boat captains attended. The response to the videotape was generally favorable, although many hunters felt that a longer and more complete presentation of the research findings was needed.

Most boat captains were familiar with the specimen collection procedure from experience with it in previous years. Some had difficulty locating the female reproductive tract, and some did not understand the importance of providing teeth from the same animal to accompany the soft tissues. Problems with the collection procedures were largely eliminated by the end of the season.

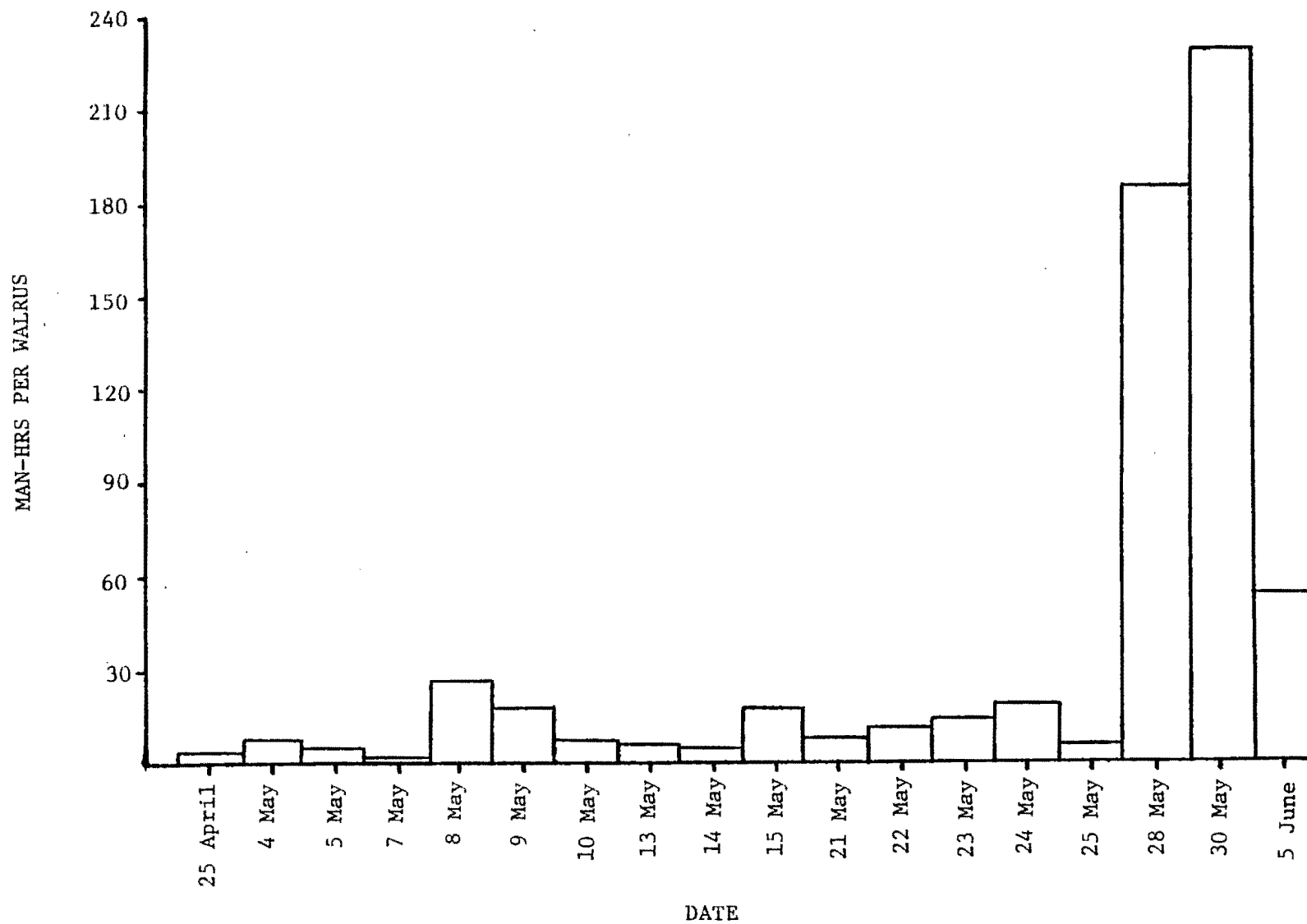


Figure 2. Seasonal distribution of hunting success. Histogram bars represent the number of man-hrs expended per walrus retrieved.

Table 2. Mean direction of travel for each of 19 hunting days.
An azimuth of 0° is due North.

Date	Direction of travel
25 April	34°
4 May	342°
5 May	331°
7 May	225°
8 May	276°
9 May	225°
10 May	243°
11 May	270°
13 May	272°
14 May	282°
15 May	286°
21 May	261°
22 May	24°
23 May	192°
24 May	257°
25 May	259°
28 May	50°
30 May	90°
5 June	78°

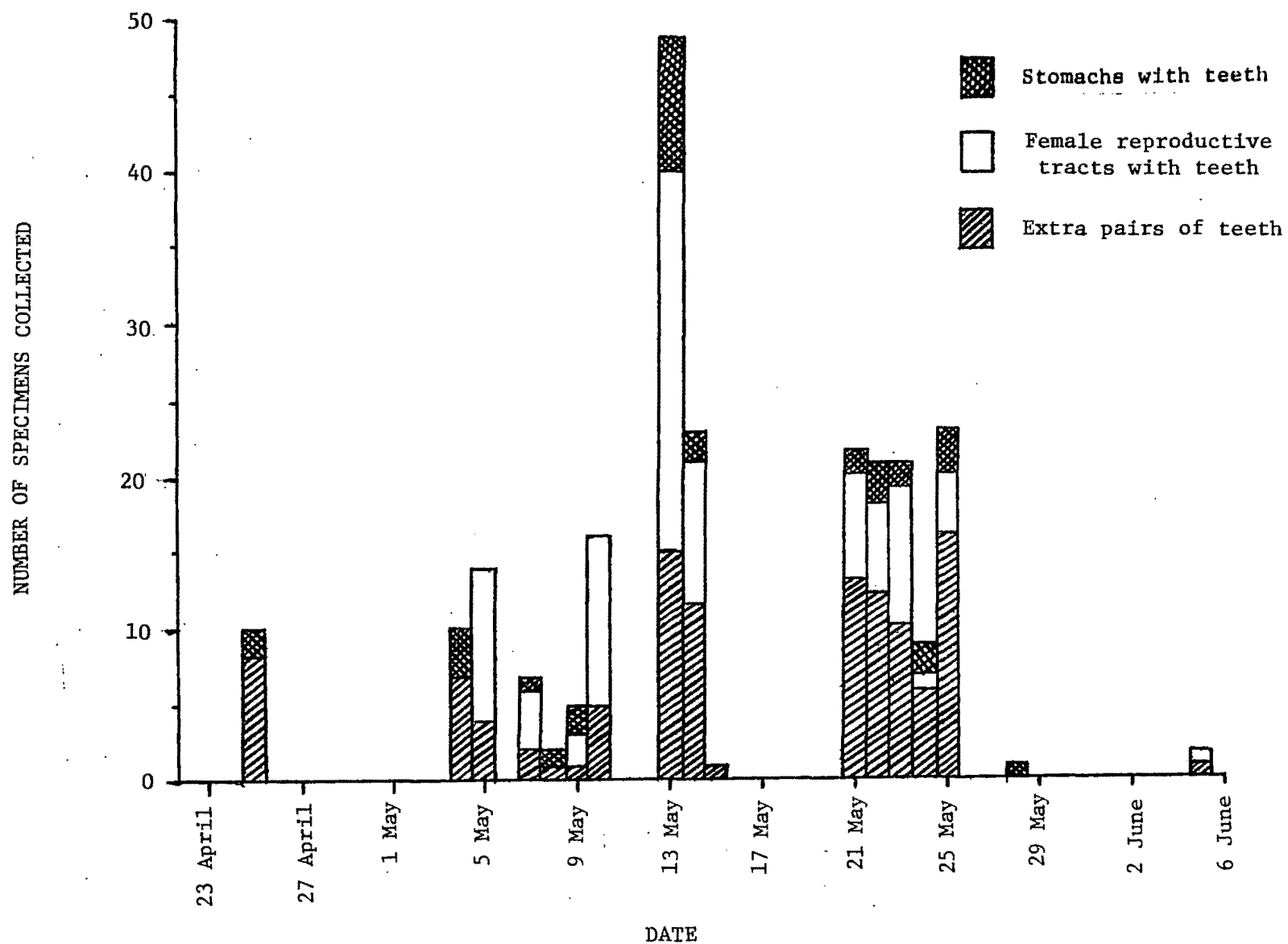


Figure 3. Chronology of specimen collection. Histogram bars represent the number of each specimen type collected on each hunting day.

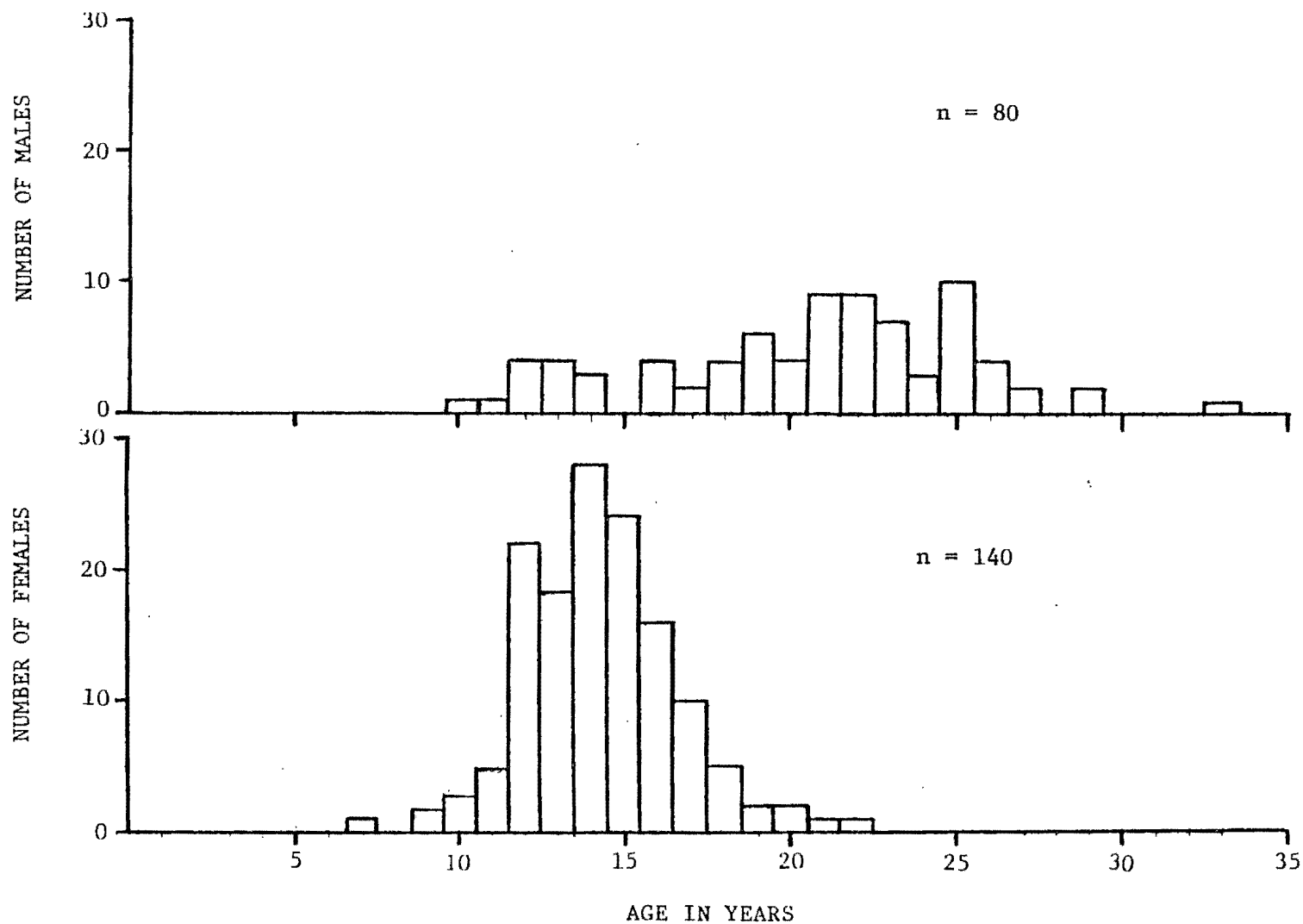


Figure 4. Age distribution of walruses harvested at Gambell as estimated from counts of cementum annuli in sectioned teeth. Histogram bars represent the number of each sex in each year class.

Incidental Observations and Ice Observations

The village of Gambell retrieved 2 bowhead whales (Balaena mysticetus) this spring. One was taken on 30 April and 1 on 1 May. Bearded (Erignathus barbatus), ringed (Pusa hispida), ribbon (Phoca fasciata), and spotted (P. vitulina largha) seals were taken during walrus hunts. The retrieved harvest of marine mammals other than walruses is presented in Appendix F. Gray whales (Eschrichtius robustus) were commonly seen from shore in late May and early June, but none were taken.

In spite of a modest trapping effort, I observed only 2 wild terrestrial mammals during 7 weeks in Gambell. Both appeared to be tundra voles (Microtus oeconomus), and both were dead.

Common Murres (Uria aalge) and Crested Auklets (Aethia cristatella) were commonly taken during walrus hunts. Other birds taken included Yellow-billed Loons (Gavia adamsii), Common Eiders (Somateria mollissima), Spectacled Eiders (Lompronetta fischeri), Sandhill Cranes (Grus canadensis), and Tufted Puffins (Lunda cirrhata). The retrieved harvest of these birds is shown in Appendix G.

I maintained a daily record of birds observed at Gambell. This record is presented graphically in Appendix H.

Few, if any, successful boats returned without at least some walrus parts in addition to tusks. Hides, intestines, flippers, livers, and flank meat (often prepared in the field as "meatballs") were brought in throughout the season. No obvious decrease in the amount of meat recovered as the season progressed was observed.

The shore ice on the North Beach disappeared by 19 May. By 26 May, the shore ice was gone from the West Beach, too. In both cases, the disappearance was caused by extremely rough seas. The results of the daily ice observations are presented in Appendix I.

DISCUSSION

Harvest Data

The 1982 spring harvest was nearly identical to the 1981 harvest in size and distribution. The 1981 documented retrieved harvest of 961 walruses was slightly higher than this year's 942, but the percentage of the harvest documented in 1981 (Lourie 1981) was possibly greater than in 1982. In 1981, the spring harvest began on 21 April and ended on 2 June, with the last day on which more than 15 animals were taken falling on 27 May. In 1982, the spring harvest began on 23 April and ended on 5 June, with the last day on which more than 15 animals were taken falling on 25 May. The course of the harvest in the 2 years was remarkably similar. I believe that the higher proportion of calves and lower proportion of adult males in this year's harvest was the result of more time spent hunting this year to the north and west of the island, toward the main female migration route.

Although cow:calf ratios derived from summer surveys in the Chukchi Sea were higher in 1982 than in 1981 (J.L. Baker, pers. comm.), cow:calf ratios among animals harvested at Gambell showed no significant difference between years. Any true increase in the proportion of cows with dependent young would probably be masked in the harvest by the Gambell hunters' preference for cows with calves.

The total of 28 documented lost animals is unrealistically low, and the reported retrieval rate of 92.6% is certainly too high (Buckley 1958, Fay 1982:222). Boat captains were obviously uncomfortable when asked to report the number of animals lost. At least 1 captain was openly resentful. The

question was apparently seen as a challenge to the crew's hunting prowess. In a controlled experiment, Sen (1973) concluded that non-Native sport hunters were similarly unreliable reporters of their own success on waterfowl.

Hunting Effort

The overall number of man-hrs spent per walrus retrieved in 1982 (8.9) was much greater than in 1981 (2.3). In spite of this, the harvest in the 2 years was approximately equal. Interestingly, the end of the hunting season shortly followed the 2 days (28 and 30 May) of extremely high effort per walrus retrieved.

The rate of increase of outboard motor horsepower appears to have slowed since 1980-1981. Since my accounting of motor sizes was incomplete, the undocumented motors used in 1982 may have been smaller than the motors I listed. The undocumented motors belonged to boat captains who hunted infrequently and who may not have invested as heavily in equipment as the more avid hunters. Boat size and crew size have stabilized, perhaps because a 17 to 18 foot (5.2 to 5.5 m) boat is the largest that can be hauled ashore with the available manpower.

Directions of travel fell into roughly 2 groups. Before 28 May, mean directions were north or west of Gambell. On and after 28 May, mean directions of travel were east, toward Savoonga. The early trips were directed toward sea ice passing west of the island, and later trips were directed toward late-breaking shore ice.

Specimen Collection

The greater age of male walruses in the harvest probably reflects selection by the hunters for males with larger tusks. There is also some evidence to suggest that different age groups of males are geographically segregated during autumn migration (Fedoseev and Gol'tsev 1969). It is possible that male walruses available to Gambell hunters belong predominantly to older year classes. Females from the most productive year classes were probably taken preferentially by hunters because they are more likely to be accompanied by calves (F.H. Fay, pers. comm.). In addition, the greater difficulty of distinguishing cementum annuli in female teeth probably biased female age estimates in favor of the lower year classes.

Discussion of the study of food habits and female reproductive condition awaits the completion of the Institute of Marine Science's report.

Hunter Contact

The village harvest monitor was particularly valuable in contacting boat captains and disseminating information about the specimen collection program. Edna's ability to speak Siberian Yupik and her familiarity with the boat captains and crews greatly facilitated spreading the word about midseason changes in procedures. The meeting with the Boat Captains' Association was held too late to be of help in explaining the collection program.

A longer video presentation is currently being prepared for broadcast in the Nome area next spring. It will include footage on laboratory techniques and research results. A longer presentation should at least partially satisfy village demands for more information.

Incidental Observations

The reported harvests of marine birds and mammals other than walruses are certainly minimum counts. We made no attempt to document all bird hunts. Hunts occurring on land or on Troutman Lake were not followed at all. On many hunts, the species but not the number of birds taken was recorded.

The whale harvest was of course completely documented. Documentation of the seal harvest was presumably as complete as for the walrus harvest, 90 to 95%.

Ornithological investigation of St. Lawrence Island began over a century ago (Nelson 1883), and as a result of frequent visits by biologists in the ensuing years, the avifauna is extremely well-known. Gambell's reputation as a stopping place for Asiatic migrants is such that commercial birding tours bring dozens of bird watchers to the island each spring. The 34 species of birds observed at Gambell (Appendix H) are a fraction of the 141 species recorded from St. Lawrence Island (Sealy et al. 1971). Only 1 of the bird sightings recorded in Appendix H is at all remarkable. The Merlin (Falco columbarius) seems not to have been previously recorded from St. Lawrence Island.

Ice Observations

Hunters stated that the time of breakup of sea ice was later than normal this year. This was borne out by the late date (23 April) this year at which whaling began. Last year, whaling started before 5 April and ended on 14 April. Walrus hunting, however, was little delayed by ice conditions. The final passage of ice west of the island and beyond range of Gambell's hunters occurred at about the same time this year as last.

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CODE: _____

Appendix A. Field data form.

DATE _____ CREW SIZE _____ CAPTAIN _____

LOCATION _____ TIME LV _____ O/H _____ DIRECTION _____

OBSERVER _____ TIME AR _____ O/H _____ DISTANCE _____

BOAT: ALUM., WOOD, SKIN, <15, 15-17, 18-20, >20 MOTOR: _____

OBSERVED HERDS: _____

HUNTING CONDITIONS (WEATHER & ICE) _____

SEX	NUMBER RETRIEVED		NUMBER LOST		NOT ASK	COMMENTS
	ICE	WATER	ICE	WATER		
MALE						
FEMALE						
CALF						
UNKNOWN SEX						

SEX	SPECIMEN NUMBER	TEETH	STOM.	REPRO.	DIR.	DIST.	PAID	COMMENTS

OTHER ANIMALS AND BIRDS - NUMBERS HARVESTED:

BOWHEAD	GRAY	BELUKHA	OTHER	POLAR	BEARDED	SPOTTED	RINGED	RIBBON	OTHER	OTHER
WHALE	WHALE	WHALE	WHALE	BEAR	SEAL	SEAL	SEAL	SEAL	SEAL	

BIRDS (#, TYPE): _____

COMMENTS: _____

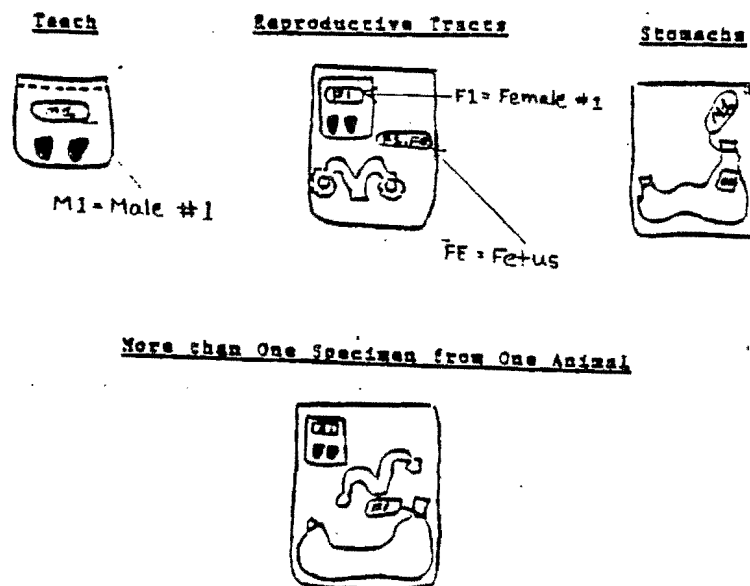
Appendix B. Hunter instruction card.

IT IS VERY IMPORTANT TO KEEP ALL SPECIMENS FROM THE SAME ANIMAL TOGETHER. EACH BOAT CAPTAIN WILL BE GIVEN COLLECTING BAGS AND TAGS TO DO THIS.

1. TEETH. PLACE THE 2 FRONT LOWER JAW TEETH IN A SMALL ZIPLOCK BAG WITH A TAG WITH THE SEX OF THE ANIMAL (M OR F) AND THE NUMBER (IN ORDER TAKEN) WRITTEN ON IT. FOR EXAMPLE: THE FIRST ANIMAL TAKEN WAS A MALE (M1). THE SECOND A FEMALE (F1) AND THE THIRD A MALE (M2), AND SO ON. USE A BAG FOR EACH PAIR OF TEETH.
2. FEMALE REPRODUCTIVE TRACTS. THE FEMALE WALRUS' REPRODUCTIVE TRACT IS LOCATED UNDERNEATH THE GUTS, ALONG THE BACK, JUST BELOW THE KIDNEYS. BRING IN BOTH HORNS FROM WHERE THEY ATTACH, ALL THE WAY UP INCLUDING THE OVARIES. PUT THE TRACT IN A MEDIUM SIZED PLASTIC BAG WITH A TAG LISTING F1, OR F2, ETC. (FOR FEMALE 1, FEMALE 2, ETC.) AND FE OR C IF THE FEMALE HAD A FETUS OR A CALF. PUT THE BAG OF TEETH FROM THAT ANIMAL IN THE BAG ALSO.
3. STOMACHS. PLACE THE TEETH BAG IN THE ESOPHAGUS END OF THE STOMACH AND TIE OFF BOTH ENDS WITH A STRING. USE ONE OF THE STRINGS WITH A TAG ATTACHED AND WRITE M1, M2, OR F1, F2, ETC. TO IDENTIFY THE ANIMAL. LARGE HEAVY WEIGHT BAGS ARE INCLUDED TO USE FOR THE STOMACHS.
4. MORE THAN ONE SPECIMEN FROM AN ANIMAL. IF YOU GET A FEMALE WITH FOOD IN HER STOMACH AND YOU COLLECT THE STOMACH, REPRODUCTIVE TRACT, AND TEETH THEN PUT THE TEETH IN A ZIPLOCK BAG AND ALL THE SPECIMENS TOGETHER IN A LARGE HEAVY WEIGHT PLASTIC BAG WITH A TAG LISTING THE ANIMAL'S NUMBER (F1, F2, OR M1, M2, ETC.) IN THE BAG TO IDENTIFY IT.

WHEN YOU RETURN FROM HUNTING THE BIOLOGIST OR VILLAGE MONITOR WILL BUY YOUR SPECIMENS QUOTA. COLLECT OTHER NEEDED INFORMATION. YOUR VILLAGE MAY HAVE A SPECIMEN QUOTA. IF SO THE BIOLOGIST AND VILLAGE MONITOR WILL EXPLAIN WHAT SPECIMENS THEY WILL BE BUYING, WHEN, AND HOW MANY.

Side 1



Side 2

Appendix C. Ice observation form.

STATION

PROVEN

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ICE OBSERVATIONS WORKSHEET (6/72)

Appendix D. Retrieved walrus age and sex information for the 19 days on which walruses were taken in 1982.

Date	Adult males	Adult females	Calves	Adults of unknown sex	All groups combined
23 Apr	1				1
25 Apr	19				19
4 May	11				11
5 May	19	32	21		72
7 May		20	12		32
8 May	1	1	1	3	6
9 May	2	4	5		11
10 May	6	37	28		71
13 May	37	85	62	13	197
14 May	19	78	64		161
15 May	1	3	3		7
21 May	20	44	29	4	97
22 May	27	35	25	8	95
23 May	12	17	10		39
24 May	3	9	5		17
25 May	24	38	31	1	94
28 May	3				3
30 May			1		1
5 Jun	6	1	1		8
Total	211	404	298	29	942

Appendix E. Crew, boat, and motor sizes.

Boat captain	Modal crew size	Boat length	Type	Motor
Tommy Antoghame	3	15-17	alum	55
Leonard Apangolook	3-4	"	"	50-70
Preston Apangolook	3	"	"	35
Anders Apassingok	4	"	"	?
Hugo and/or Jerome Apatiki	3-5	"	"	35+15
Bruce Boolowon	4	"	"	35+25
Wayne Booshu	3	"	wood	55
Wilbur Booshu	3-4	"	alum	40
Iver Campbell	3	"	"	40
Victor Campbell	3	"	"	40+35
Hanson and/or Clarence Irrigoo	4	"	"	?
Farrel and/or Lane Iyakitan	4	"	"	55
Dennis James	4	"	"	50
Winnie James	4	18-20	"	55
Franklin Kaningok	2-3	15-17	"	?
Willard Kaningok	3	"	"	25
Merlin Koonooka	4	"	"	55
Ned Koozaata	3	"	"	35
Allen and/or Leroy Kulukhon	3	"	"	40
Woodrow Malewotkuk	2	"	"	?
Leonard Nowpakahok	4-5	>20	skin	40
Hiram Ohktokiyuk	2	15-17	alum	45?
Aaron Oseuk	2	"	"	?
Alex Oozeva	2-3	"	"	50
Conrad Oozeva	3	"	"	55
Duane Oozeva	3	"	"	40
Wilson Oozeva	2	"	"	50
Gordon/Bert/Raymond Oozevaseuk	3	"	"	55
Barry Silook	3	"	"	?
John Silook	3	"	"	55
Roger Silook	3	"	"	?
H. Vernon Slwooko, Jr.	3	"	"	55
Vernon K. Slwooko	4	18-20	"	50
William Soonagrook	4	15-17	"	?
Branson and/or Jerry Tungiyen	4	"	"	40
James Uglowook	3	"	"	?
Clement Ungott	3	"	"	70
Donald Ungott	3	"	"	40
Marvin Walunga	3	"	"	?

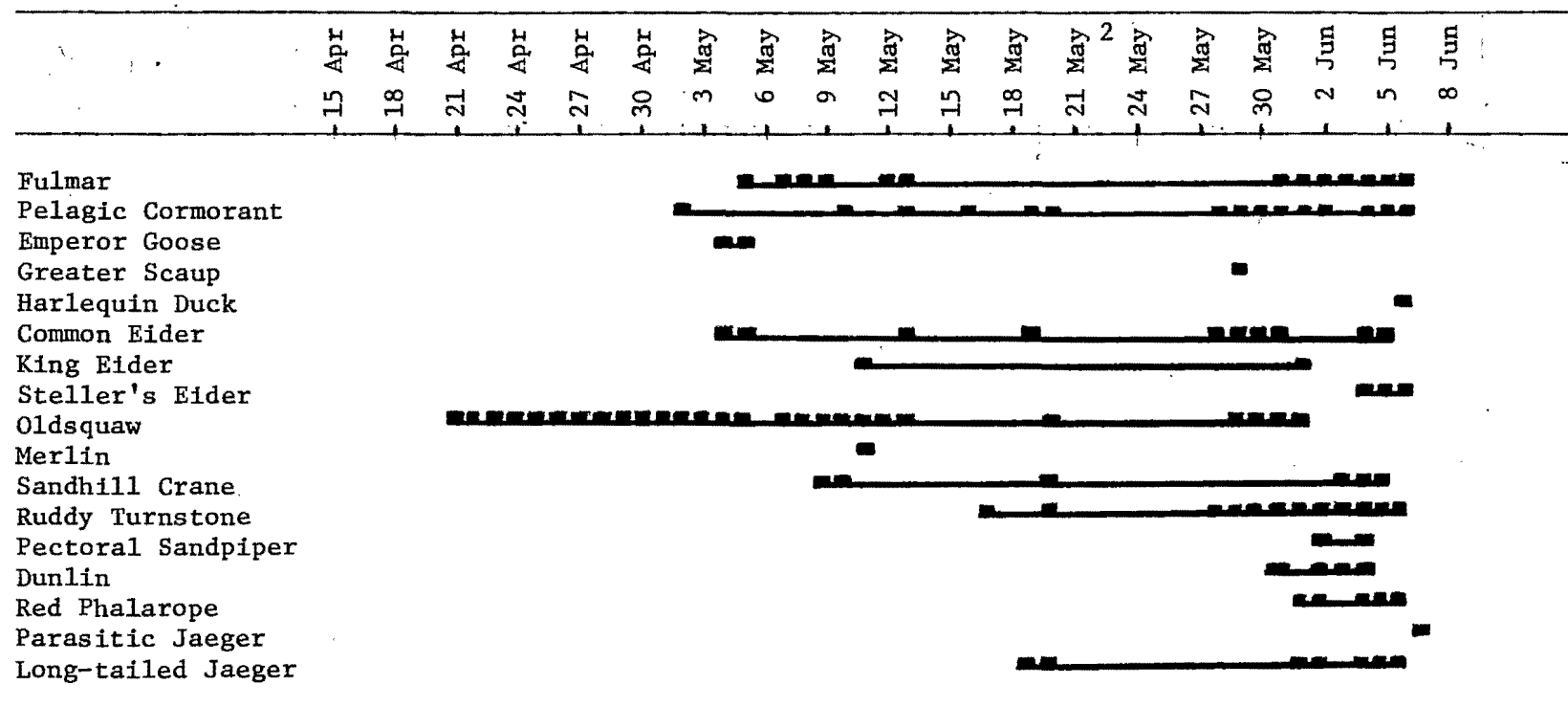
Appendix F. Harvest of marine mammals other than walruses.

	22 Apr	25 Apr	30 Apr	1 May	8 May	9 May	10 May	13 May	14 May	15 May	22 May	24 May	25 May	28 May	30 May	1 June	5 June	Spring totals
Bowhead whale			1	1														2
Bearded seal	1				1	1	2	12	6	1	3	1	7	1			5	41
Ringed seal		1						1			2	1	1					6
Ribbon seal								1										1
Spotted seal															2	1	2	5

Appendix G. Harvest of marine birds. Asterisks indicate presence in the day's bag in unknown numbers.

	9 May	10 May	13 May	14 May	21 May	22 May	23 May	24 May	25 May	28 May	30 May	1 June	5 June	Spring totals
Yellow-billed Loon					1	1								2
Eider spp.	1									1				2
Unidentified Anatid spp.							*							*
Sandhill Crane										1				1
Common Murre	17	11+	5	2	*	20+	52+	*	18	8	26		42+	201+
Tufted Puffin												1		1
Crested Auklet											33	1	28	62

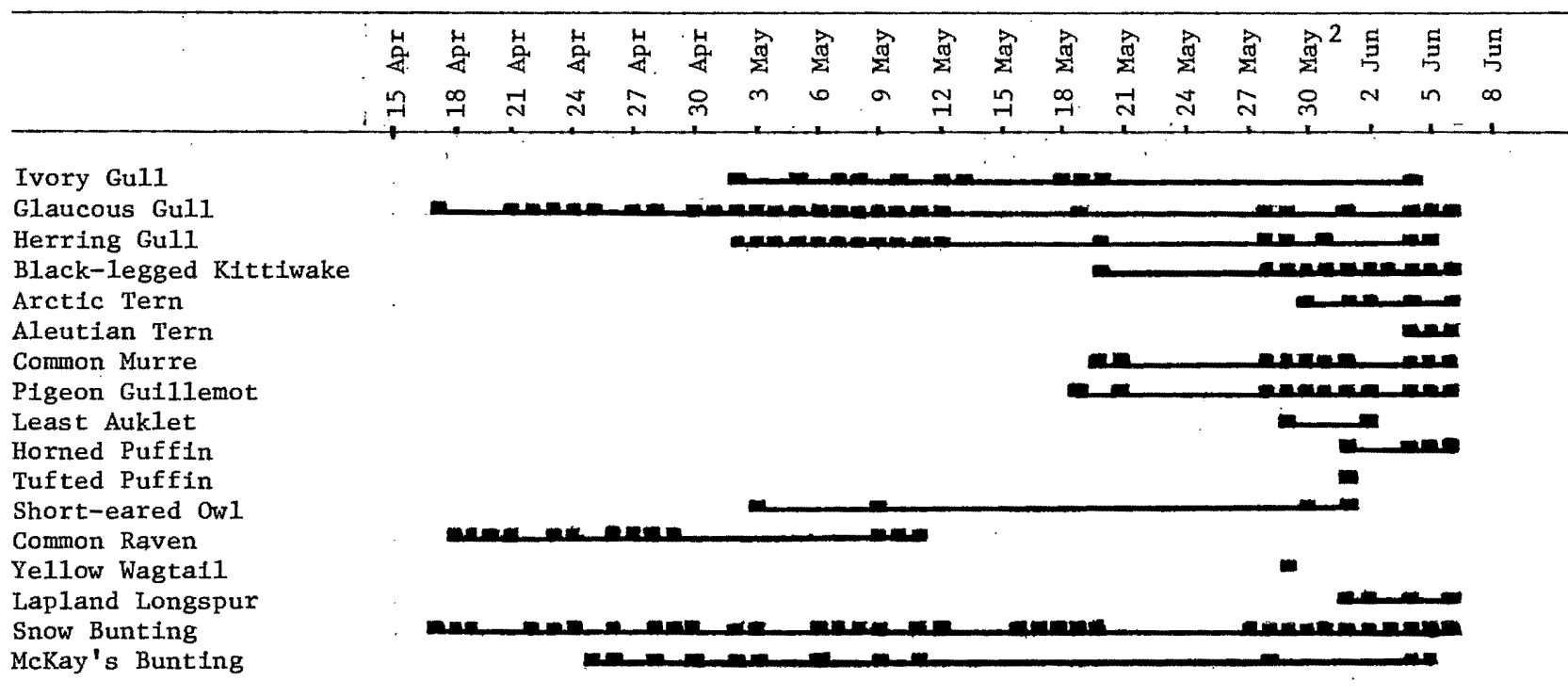
Appendix H. Daily bird observations (fulmars through jaegers). Solid squares indicate days on which the species was observed.¹ Lines connect first and last observations.



¹ No observations were recorded from 21 May to 27 May due to heavy work load.

² Yellow-billed Loons were not observed, but 2 appeared in hunters' bags on 21 May and 22 May.

Appendix H (continued). Daily bird observations (gulls through buntings). Solid squares indicate days on which the species was observed.¹ Lines connect first and last observations.



¹ No observations were recorded from 21 May to 27 May due to heavy work load.

² Crested Auklets were not observed but were commonly encountered in hunters' bags beginning on 30 May.

Appendix I. Daily ice observations. Data are summarized from worksheets held on file. Abbreviations are defined in Lourie (1982).

Date	Amount	Form	Features	Motion Processes
18 Apr	10	CK/SF/MF	RDG	? Ridging
19 Apr	10	CK/SF/MF	RDG	?
20 Apr	9	CK/SF/MF	RDG	Ridging
21 Apr	8	SMCK/SF	RDG/LEAD	DCRG NE DRFT
22 Apr	6	SMCK/CK/SF	RDG/LEAD	DCRG NE DRFT
23 Apr	5	SMCK/CK/SF	LEAD	INCR SW DRFT
24 Apr	7	SMCK/CK/SF/MF	LEAD/RDG	None
25 Apr	3	SMCK/CK/SF/MF	LEAD/RDG	None
26 Apr	7	SMCK/CK/SF	LEAD/RDG	INCR SW DRFT
27 Apr	3	SMCK/CK	LEAD	DCRG SW DRFT
28 Apr	8	SMCK/CK/SF	LEAD	DCRG SW DRFT
29 Apr	7	SMCK/CK/SF	LEAD/RDG	None
30 Apr	2	SMCK/CK	LEAD	None
1 May	1	SMCK/CK	-	None
2 May	<1	SMCK/Ck	-	DCRG W DRFT
3 May	5	SMCK/CK	LEAD	INCR S DRFT
4 May	3	SMCK/CK	-	INCR S DRFT
5 May	<1	SMCK	-	None
6 May	2	SMCK/CK	-	INCR S DRFT
7 May	7	SMCK/CK/SF	RDG/LEAD	INCR S DRFT
8 May	5	SMCK/CK/SF	LEAD	INCR S DRFT
9 May		Visibility too poor		
10 May	2	SMCK/CK	-	None
11 May	6	SMCK/CK/SF	LEAD	INCR S DRFT
12 May	6	SMCK/CK/SF	LEAD	Stable
13 May	3	SMCK/CK/SF	-	Stable
14 May	1	SMCK/CK	-	None
15 May	1	SMCK/CK	-	None
16 May	<1	SMCK	-	S DRFT
17 May	4	SMCK/CK	-	INCR S DRFT
18 May	<1	SMCK	-	S DRFT
19 May	<1	SMCK	-	S DRFT
20 May	<1	SMCK	-	S DRFT
21 May	<1	SMCK	-	None
22 May	<1	SMCK	-	None
23 May	<1	SMCK	-	None
24 May	<1	SMCK	-	NE DRFT
25 May	<1	SMCK	-	None
26 May	<1	SMCK	-	SW DRFT
27 May	<1	SMCK	-	SW DRFT
28 May	<1	SMCK	-	None
29 May	0	-	-	None
30 May	0	-	-	None

Appendix I (continued). Daily ice observations. Data are summarized from worksheets held on file. Abbreviations are defined in Lourie (1982).

Date	Amount	Form	Features	Motion Processes
31 May	0	-	-	None
1 Jun	0	-	-	None
2 Jun	0	-	-	None
3 Jun	0	-	-	None
4 Jun	0	-	-	None
5 Jun	<1	-	-	None
6 Jun	0	-	-	None
7 Jun	0	-	-	None

ADDENDUM
Recommendations for Future Field
Operations at Gambell

Lodging and storage - The housing and storage facilities rented for the use of the biological technician were the least satisfactory parts of this year's program. The USFWS paid \$40/day for the use of a house for lodging, a shed for lab work, and (ostensibly) utilities. Winnie James, Sr. agreed verbally to provide all of these things and was named the local contractor. In the course of the field season, it developed that the local contractor (1) could not provide heat or electrical power for the house and (2) planned to house his son in the building, as well as transient white people, who were charged \$50/night for the use of a room. The actual ownership of the lab shed proved to be in doubt as well. Although he apparently sold the shed to another man last fall, Winnie still intended to use it to store food. Because he feared that his food would be contaminated by formalin, he forced the evacuation of the shed before the field season ended.

Electricity was eventually provided for the house, but it could be used only for lighting and for powering Winnie Jr.'s carving tools. Winnie Sr. became frantically upset when he found me boiling water with the electric range. He pointedly and forcefully explained that the range was only for the use of people who could pay the bill (he had in mind a group of visiting construction workers remodeling the Health Clinic in town, but they wisely decided to lodge elsewhere).

An anthropologist from the John Muir Institute, Lynn Robbins, rented a new house from Gerard Koonooka for \$750/month, utilities included. The house had running water but no sewage facilities. In contrast, the house rented by the USFWS cost \$1,200/month and required about \$160/month in heating oil. The cost of heating oil was not subtracted from rent payments, as the USFWS originally planned to do.

If a biological technician is stationed in Gambell next spring, I strongly suggest that Winnie James, Sr. not be selected to provide lodging. Winnie has a certain amount of roguish charm, and I actually like the guy. But, the fact remains that he is the only man in Gambell universally acknowledged to be "a crook."

Vehicle rental - It is virtually impossible to rent a vehicle in Gambell and get a functional piece of machinery. The National Marine Fisheries Service (NMFS) has dealt with this problem longer than the USFWS and has taken the drastic step of flying a machine in and out for use during the 2 or 3 week whaling season. The NMFS enforcement officer, Skip Walch, told me that the freight bill for shipment from Nome and return was \$900.

I cannot recommend so radical a solution to the problem. Rather, I suggest that someone other than Winnie be selected to provide the machine. It would also be helpful to clearly stipulate in the contract the responsibilities of the contractor in the event of almost certain mechanical failure.

I got along quite well without any transportation, but Edna balked at the prospect of dragging a toboggan-load of specimens from the beach to the lab shed. The only technical recommendation I can make is that a 3-wheeler be favored over a snow machine for May-June conditions.

Village harvest monitor - Edna Apatiki was eminently satisfactory as a village harvest monitor. We divided the work load so that she covered the West Beach while I covered the North Beach. She documented approximately 1/3 of the harvest and collected about 40% of the specimens. In all of this, she was essentially unsupervised.

The 2 factors that seem to have reduced the effectiveness of village harvest monitors in the past are (1) lack of understanding of biological field methods and (2) conflicting duties in the village. Most young people with high school training understand the field methods employed. Most men in the village participate in the hunt and are unavailable for employment during our field season. Women in the village are expected to care for children and prepare meals, but female college students do not have an established role in their families, since they spend most of the year at school off the island. Such a person would be the most desirable candidate.

If the USFWS continues the program in Gambell next year, I recommend that Edna be rehired -- if possible, as the biological technician. She should have completed her bachelor's degree by next spring, with a minor in biology. A second village resident could be hired as her assistant. I should add here, as a cautionary note, the prediction that if Edna is rehired as a village harvest monitor next year and is supervised by a temporary biological technician with no previous experience on the walrus project, she will be very upset. It doesn't strike me as a good idea to hire an adult male resident as Edna's assistant if she is hired as the biological technician, either.

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