AGENDA D-5
JULY, 1980

MEMORANDUM

TO: Council, SSC, and AP Members

FROM: Jim H. Branson
Executive Director

DATE: July 21, 1980

SUBJECT: Walrus/Surf Clam Study

ACTION REQUIRED

None. Informational.

BACKGROUND

The Walrus/Surf Clam study was awarded to Dr. Francis (Bud) Faye, University of Alaska, from April 1, 1980 to September 1, 1981 for $87,220. The first quarterly report (July 1980) for April 1 to June 30 was submitted by Faye and Lowry and is included in your briefing books. Faye will report to both the Council and SSC this month.

CP

AGENDA D-5, July, 1980

FILE	ACT	INFO	ROUTE TO	INITIAL
			Exec. Dir.	
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			Admin. Off.	
			Exec. Sec.	
			Writer/1	
			Writer/2	
			Sec. Recep.	
			Sec. Typist	
	JUL 15 1980			

UNIVERSITY OF ALASKA, FAIRBANKS
Fairbanks, Alaska 99701

Institute of Marine Science
11 July 1980

Mr. Jim H. Branson, Executive Director
North Pacific Fisheries Management Council
P. O. Box 3136DT
Anchorage, Alaska 99510

Re NPFMC Contract 80-3

Dear Jim:

Enclosed herewith are the original and one copy of our quarterly progress report for the quarter ending 30 June 1980, in which are reported the activities and preliminary findings to date from our project "Seasonal Use and Feeding Habits of Walruses in the Proposed Bristol Bay Clam Fishery Area."

Our work has progressed reasonably well and on schedule, not without a few problems but all are solvable. The main one, we feel, is inflation of operating costs, which may require modification of our work plan or injection of additional funds. Since inflation is a universal problem these days, we assume that modification of the work plan would be the best solution, and we look forward to discussing that with you. One of us will be at the Council's July meeting, and perhaps we can discuss that subject then.

Best regards.

Sincerely,

Francis H. Fay

Lloyd F. Lowry

enclosure

QUARTERLY REPORT

TO: North Pacific Fisheries Management Council
P.O. Box 3136DT
Anchorage, Alaska 99510

CONTRACT NUMBER: 80-3

REPORTING PERIOD: 1 April - 30 June 1980

SEASONAL USE AND FEEDING HABITS OF WALRUSES IN THE PROPOSED BRISTOL BAY CLAM FISHERY AREA

PRINCIPAL INVESTIGATORS: Francis H. Fay
Associate Professor of Marine Science
Institute of Marine Science
University of Alaska
Fairbanks, AK 99701

and

Lloyd F. Lowry
Game Biologist II
Alaska Department of Fish and Game
1300 College Road
Fairbanks, AK 99701

July 1980

INTRODUCTION

A joint industry-government resource assessment program in 1976-78 identified a large stock of surf clams (*Spisula polynyma*) in southeastern Bering Sea. Abundance and yield studies indicated that a commercially viable fishery would be possible within a 2,000 nm^2 area along the north side of the Alaska Peninsula, between Uganshik Bay and Port Moller. Development of a Fishery Management Plan (FMP) for the prospective fishery began in 1977.

Early in the development of the FMP, possible effects of the fishery on other components of the marine ecosystem of Bristol Bay were considered. Some concern was expressed by State and Federal resource management agencies and environmentalist organizations that the fishery might have a significant impact on food supplies of walruses (*Odobenus rosmarus*) that inhabit Bristol Bay. Walruses are known to feed on *S. polynyma* in other parts of the Bering Sea, but their seasonal distribution pattern and feeding habits within the Bay are unknown.

The objectives of this project are to assess the degree to which walruses in Bristol Bay use the proposed clam fishery area and to determine their feeding habits in and near that area. Distributional information and relative numbers of walruses in Bristol Bay are being documented on a monthly basis by means of aerial surveys, using aircraft based in King Salmon. Feeding habits will be determined by examination of stomach contents of animals collected for this purpose, under provisions of a federal permit.

PROGRESS TO DATE

The project work was initiated in April 1980 with further designing of the aerial surveys, in conjunction with development of computer programs for checking, listing, plotting, and analyzing the survey data. Programming was done by L. Miller, using the Alaska Department of Fish and Game's (ADF&G) DEC UT-78 microprocessor, linked with the University of Alaska's Honeywell 6620 system. Aerial surveys were conducted in April, May, and June by the PI's and C. Smith, with assistance from other ADF&G and U.S. Fish and Wildlife Service (USFWS) personnel. In addition, Lowry organized a 1-week cruise in June *via* the R/V *Resolution* for collection of walruses in the clam fishery area. Preliminary results of those efforts are as follows:

Survey Design and Programming

As indicated in the contract for this project, 12 aerial surveys are scheduled to be conducted within a 15-month period. Each of these is to be flown along a set of north-south transects, 20 nm apart, east of 161°W longitude. In addition, each survey will begin with a northeast-southwest nearshore flight through the length of the proposed clam fishery area (Fig. 1). Each straight leg of the transects has been assigned a number, and the start and end positions, length, and magnetic compass bearing for each have been determined (Table 1). Each survey will duplicate every other, in terms of flight track and area covered, within acceptable limits of the aircraft's navigational system and pilot error, and with allowances for weather.

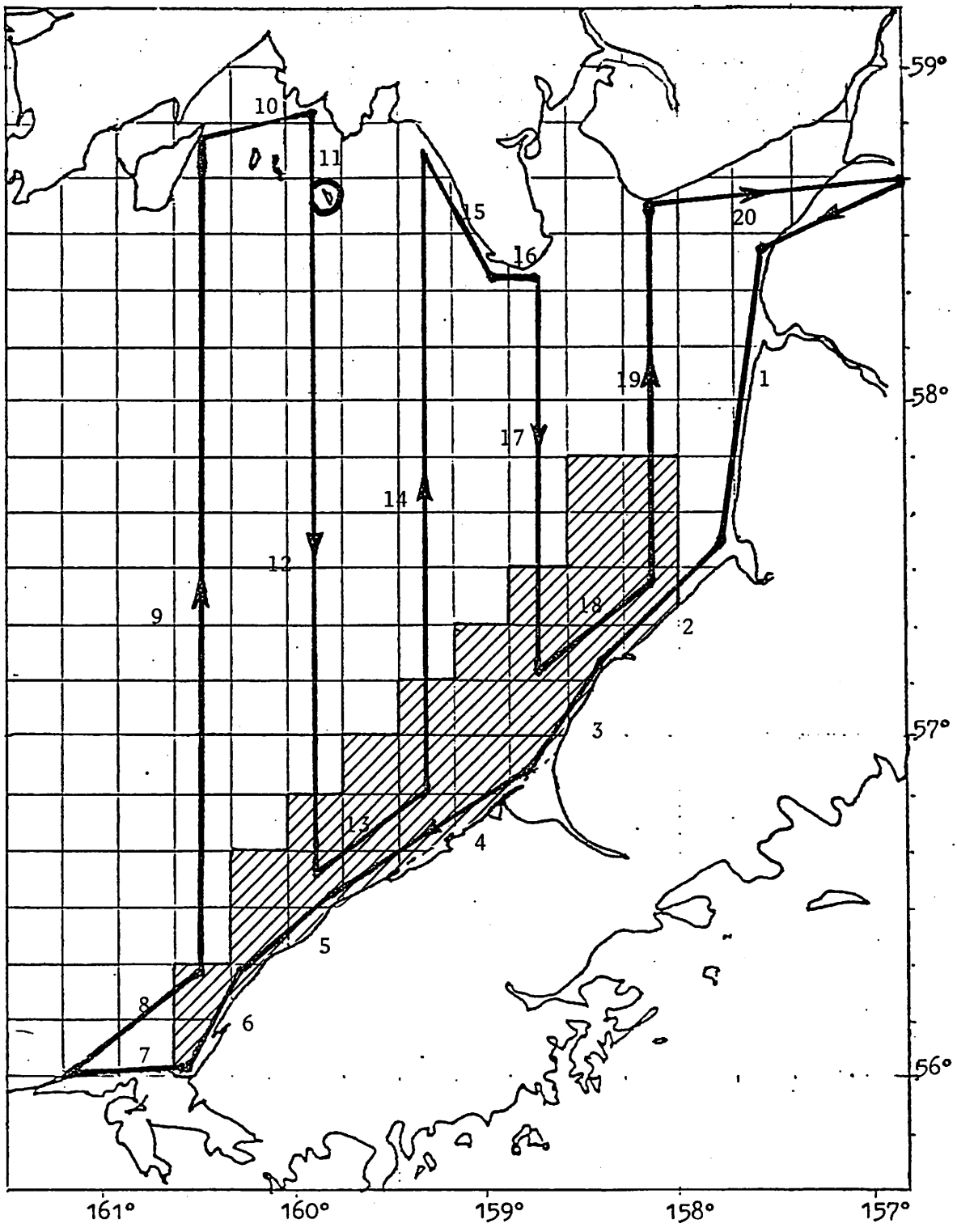

Fig. 1. Aerial survey transects in Bristol Bay, showing leg numbers and direction of travel. Prospective surf clam fishery area is indicated by cross-hatching.

TABLE 1

Bristol Bay Walrus Survey Transects

Leg	Location	Start position	Distance and course (°mag.)
1	Cape Chichagof to south Ugashik Bay	58 24.9 157 32.0	50.3 nm 170°
2	South Ugashik Bay to point southwest of Cinder River	57 35.0 157 44.0	27.2 nm 212°
3	Southwest of Cinder River to Stroganof Point	57 17.0 158 22.0	28.4 nm 198°
4	Stroganof Point to Three Hills	56 53.7 158 52.0	39.3 nm 220°
5	Three Hills to Cape Kutuzof	56 32.2 159 52.0	21.7 nm 212°
6	Cape Kutuzof to north of Entrance Point	56 18.0 160 21.6	16.8 nm 189°
7	Entrance Point to west end of Lagoon Point	56 03.0 160 35.0	24.5 nm 244°
8	Lagoon Point to 9 miles WNW Cape Kutuzof	55 59.0 161 18.2	30.7 nm 033°
9	WNW Cape Kutuzof to northeast Hagemeister Island	56 19.0 160 36.5	147.3 nm 341°
10	Northeast Hagemeister Island to point east of Summit Island	58 45.8 160 43.5	20.9 nm 056°
11	Point east of Summit Island to west side of Round Island	58 52.0 160 05.0	15.8 nm 163°
12	West side of Round Island to 9 miles NNE Cape Seniavin	58 36.5 160 00.0	122.5 nm 163°
13	NNE Cape Seniavin to 8 miles north of Seal Islands	56 34.0 160 00.0	24.0 nm 033°
14	North of Seal Islands to 7 miles east of Kulukak Point	56 48.0 159 23.5	119.5 nm 342°

TABLE 1

Continued

Leg	Location	Start position	Distance and course (°mag.)
15	East of Kulukak Point to west end Cape Constantine	58 47.5 159 27.0	26.1 nm 134°
16	West end Cape Constantine to southeast end Cape Constantine	58 24.6 159 03.0	8.2 nm 084°
17	Southeast Cape Constantine to 14 miles north of Port Heiden	58 23.0 158 47.6	73.5 nm 163°
18	North of Port Heiden to 5 miles north of Cinder River	57 09.5 158 47.0	26.8 nm 033°
19	North of Cinder River to Etolin Point	57 26.8 158 09.0	70.6 nm 343°
20	Etolin Point to King Salmon	58 37.4 158 10.0	30.8 nm 068°
	End survey at coast	58 40.0 15 711.0	

The aircraft is flown at an altitude of 500 ft, which was chosen on the basis of Kenyon's (1972), Estes and Gilbert's (1978), and our previous experience. Walruses and other large marine mammals are easily sighted and identified from that altitude, whether on land, ice, or in the water. The aircraft selected from those available is the Piper "Navajo", which flies at a speed of 160 to 180 kt. In that aircraft, one observer can be accommodated in the co-pilot's seat (right front) and up to four additional observers in the rear, aft of the wings. One observer on each side of the aircraft records all sightings on that side, using a standard recording form (Appendix 1). An intercommunication system (provided by the ADF&G) linking all observers permits in-flight exchange of information.

In accordance with the recommendation by Dr. Michael F. Tillman (8 November 1979 review of project proposal), the width of the area to be sampled on each side of the aircraft was established as 1/2 nm. Our results from the first survey (see below), however, indicated that animals in the water could not be sighted reliably beyond 1/4 nm from the flight track. This will be taken into account in the final analysis of the survey data. Width of the sampling area was determined by each observer, using a hand-held clinometer (PM-5/360 PV: Suunto Instruments, Helsinki) to determine the correct angles (Fig. 2), noting their intercepts with structural features of the aircraft for use in quick reference.

During each survey, the observers synchronize their watches at the start, and all data are recorded thereafter in relation to time and transect leg. For analysis of the data, we have adopted the 10 nm^2 block system used by the National Marine Fisheries Service in their clam resource surveys (Anonymous, 1977; Hughes and Nelson, 1978). A computer program has been

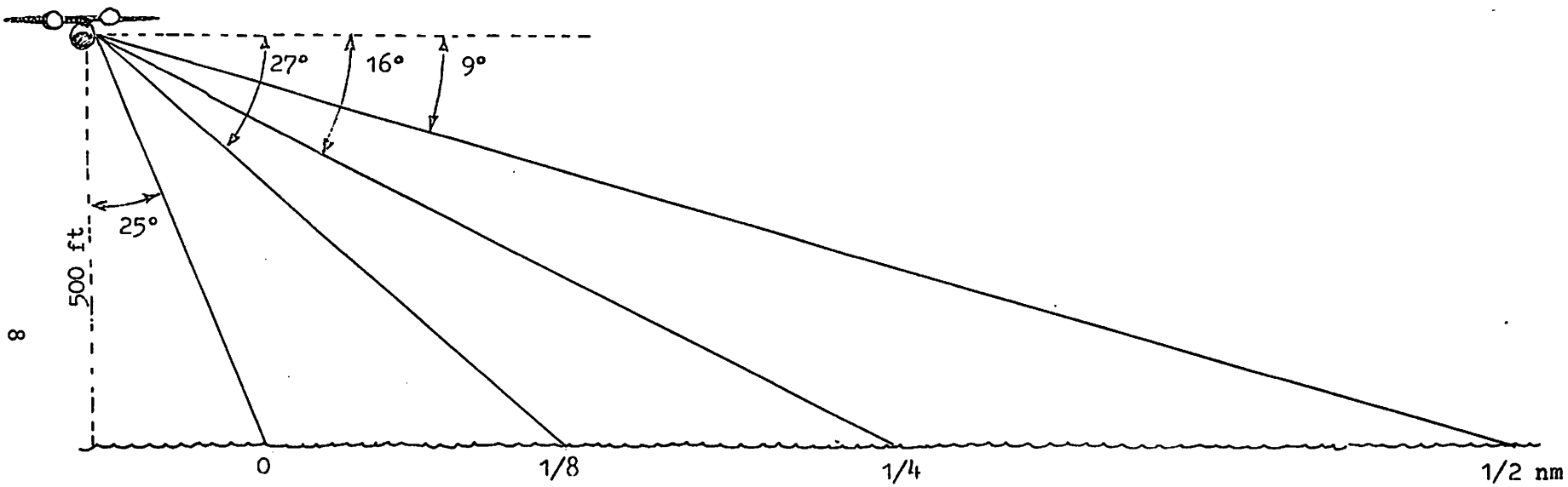

Fig. 2. Diagrammatic view of sighting angles delimiting the 1/8- , 1/4- , and 1/2-nm-wide survey strips on one side of the aircraft, flown at an altitude of 500 ft (not to scale). The area beneath the aircraft cannot be seen, since the maximal viewing angle from the aircraft side windows is 65° from the horizontal.

developed for locating each walrus sighted on the basis of time/leg, and for determining in which block the animal was situated. The program computes total numbers sighted and average numbers/nm^2 within blocks crossed by the survey; it also estimates numbers and densities between blocks (i.e., in the blocks not crossed by the survey) and summarizes the data and estimates separately for blocks within and outside of the proposed clam fishery area.

The program has been tested with data obtained in the first three surveys. The results of those tests were satisfactory. We also tested our data collection methods (see below) and found that some further refinements of those will be required before the analysis will yield reliable estimates of numbers of walruses using the clam fishery area.

Aerial Surveys

April - The first survey was conducted on 15 April by four observers. Total flying time was about 7 h, including 5.6 h of survey and 1.4 h in transit to and from King Salmon and in a refueling stop at Port Heiden. Weather and sea state were very good for observation, and the entire Bay was ice-free.

The 1/2-nm-wide sampling area on each side of the flight track was divided into inner and outer strips of 1/4 nm width. The purpose of this was to test our ability to sight walruses in the water at different distances from the aircraft. In previous surveys of walruses, Kenyon (1972), Estes and Gilbert (1978), and we (unpublished data) had recognized that walruses in the water were not readily detectable at distances greater than 1/4 nm from the aircraft, whereas those on the ice were detected with equal

facility out to at least 1/2 nm. In this survey, we sighted 93 walruses in the water, 89 of which were within the inner 1/4-nm-wide strips on each side of the aircraft, and 4 were in the outer strips. These results indicate that the probability of sighting walruses in the water was very significantly greater ($\chi^2_{(1)} = 47.65$, $p<.001$) in the inner than in the outer strips. None was sighted in the water beyond 1/2 nm from the flight track.

Of the 93 walruses sighted in the water, 86 were within or adjacent to the proposed surf clam fishery area; the other 7 were in the northwestern part of the Bay, near Round Island (Fig. 3A). Also within the clam fishery area was a herd of about 1,500 walruses on the beach at Cape Seniavin, 26 nm northwest of Port Moller. A herd of about 3,000 was on Round Island, in the northern part of the Bay.

May - The second survey was conducted on 27 May by three observers. Conditions for observation were excellent. A total of 7.1 h of flying time included 6 h of survey and 1.1 h in transit and refueling.

In this survey, the inner 1/4 nm strip on each side of the flight track was further divided. Of the 151 walruses sighted in the water, 84 were in the inner 1/8 nm and 67 in the outer 1/8 nm. The difference between these counts was not significant ($\chi^2_{(1)} = 2.30$, $p>.10$). The number sighted by the two observers on the left side of the aircraft (101), however, was significantly greater ($\chi^2_{(1)} = 8.86$, $p<.005$) than the number sighted by the one observer on the right (50), indicating that the number of observers per side has a major influence on the quantity of walruses sighted.

Only 12 walruses were sighted in the water within the proposed clam fishery area, whereas 139 were sighted in the water elsewhere, mainly

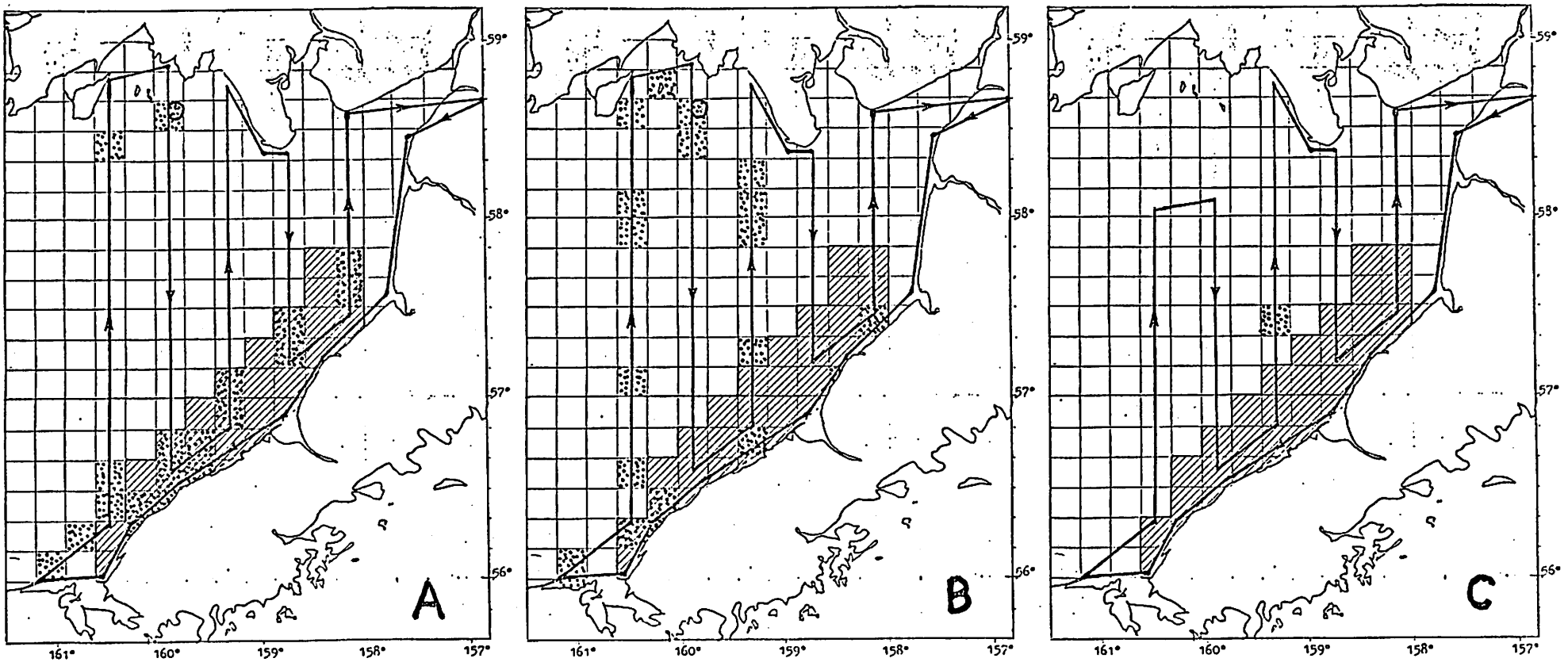

Fig. 3. Distribution of walruses in Bristol Bay on 15 April (A), 27 May (B), and 23 June (C) 1980, as indicated by aerial survey along the indicated transects. Stippling indicates 10 nm^2 blocks in which walruses were sighted. Cross-hatching is the prospective surf clam fishery area.

within 40 nm of Round Island (Fig. 3B). In addition, about 8,500 animals were on the beach at Round Island.

June - The third survey was conducted on 23 June by two observers. Weather and sea state in the southern and eastern parts of the Bay ranged from fair to excellent for observation; fog in the northwestern sector prevented us from surveying that part. Total flight time was about 5.7 h, including 4.7 h of survey and 1 h in transit and refueling.

Only 10 walruses were sighted, all of which were outside the clam fishery area, about 35 nm northwest of Port Heiden (Fig. 3C). Radio reports from observers on Round Island indicated the presence there of about 1,000 animals.

Specimen Collections

On 10 June, a 5-man scientific party headed by J. J. Burns and including E. Muktoyuk, C. Smith, R. Nelson, and B. Dinneford, all of the ADF&G, set out from Naknek in search of walruses in the clam fishery area. Logistic support was provided by the ADF&G *via* R/V *Resolution* at no cost to this project.

The fishery area was traversed from northeast to southwest, 2 to 5 nm offshore, on 11 June under excellent conditions for observation. No walruses were sighted. The vessel was stormbound in Port Moller during 12 and 13 June but continued the search of the proposed fishery zone on 14 and 15 June. Again, no living walruses were sighted. The group disembarked at Naknek on 16 June and returned to their duty stations in Nome, Fairbanks, and King Salmon.

PROBLEMS

Only two major problems have been encountered thus far. One of these was the failure of our specimen collection effort. The collecting trip had been scheduled to follow immediately after the May aerial survey, provided that some walruses were found in the clam fishery area. Due to late arrival of the federal permit and unpredictable conflicts with the scheduled activities of the research vessel, the cruise was delayed two weeks. In that time, the walruses apparently moved out of the clam fishery area. The total costs for that trip amounted to at least $30,000, most of which were contributed by the ADF&G in ship time and salaries. Another attempt may not be feasible this year, because of the scarcity of vessels available on short notice, whether for charter or contributed, during the salmon fishery, and because of the apparent lack of walruses in the clam area at this time. Plans for a collecting trip in early spring 1981 are being made, in the event that a second trip in 1980 cannot be arranged.

Rising costs in all operational aspects of the project are forseen as our main problem in the months ahead. In the 10 months elapsed between submission of the proposal and start of the field work, overall costs rose at least 20% and have continued to climb since then. At present, we forsee that the funds available will be sufficient to cover only 8 of the projected 12 aerial surveys, unless we greatly reduce our coverage on each survey to approximately the southern half of the Bay.

LITERATURE CITED

Anonymous. 1977. A joint industry-government research venture - S.E. Bering Sea surf clam assessment. Operations Manual. Northwest and Alaska Fisheries Center, NOAA/NMFS, Seattle. Typewritten. 18 pp.

Estes, J. A. and J. R. Gilbert. 1978. Evaluation of an aerial survey of Pacific walruses (*Odobenus rosmarus divergens*). *J. Fish. Res. Bd. Can.* 35:1130-1140.

Hughes, S. and R. W. Nelson. 1978. Preliminary results of joint industry-government venture on surf clams in the S.E. Bering Sea - 1978. Northwest and Alaska Fisheries Center, NOAA/NMFS, Seattle. Typewritten. 25 pp.

Kenyon, K. W. 1972. Aerial surveys of marine mammals in the Bering Sea, 6-16 April 1972. Bureau of Sport Fisheries and Wildlife, USDI/FWS, Seattle. Typewritten. 79 pp.

BUDGET ANALYSIS

Contract: 80-3 Walruses in Bristol Bay clam fishery area

Date: 30 June 1980

Category	Working Budget	Expenses this quarter	Balance
Salaries	$19,306	$ 2,222.26	$17,083.74
Benefits	4,074	468.90	3,605.10
Travel	3,447	614.89	2,832.11
Equipment	-0-	-0-	-0-
Supplies	500	89.10	410.90
Services	44,796	13,705.24	31,090.76
Overhead	15,097	1,737.81	13,359.19
Total	$87,220	$18,838.20	$68,381.80

SUMMARY

In the first quarter's work, aerial survey design was refined and tested, and computer programs for analysis of the survey data were developed. Aerial surveys were conducted in mid-April, late May, and Late June. The results indicated that a large number of walruses was using the prospective surf clam fishery area in April, lesser numbers were using it in May, and they apparently were absent from that area by mid-June. A 1-week cruise for collection of walruses in early June was unpredictably delayed 2 weeks, by which time the animals apparently had vacated the clam fishery area.

MARINE MAMMAL SURVEY

FILE ID_____

PLATFORM_____ DATE__/__/__ LEG_____ OBSERVER_____ SIDE__R__L__

Track Width: #1_____nm #2_____nm Altitude_____ft Setting: open water pack ice Visibility_____nm

Wind: speed____kt direction____° Cloud Cover___/10 Temp: air___°C water___°C Sea State_____ Bar. Press_____mb

TIME	LOCATION	ICE	SIGHTINGS Track 1 ON ICE	SIGHTINGS Track 1 IN WATER	SIGHTINGS Track 2 ON ICE	SIGHTINGS Track 2 IN WATER

Codes

SS - Spotted Seal
HS - Harbor Seal
BS - Bearded Seal
RB - Ribbon Seal
RS - Ringed Seal
US - Phocid, Unid.
WA - Walrus
FS - Fur Seal
SL - Sea Lion
UO - Otariid, Unid.
UP - Pinniped,Unid.
SO - Sea Otter
PB - Polar Bear
BH - Bowhead Whale
GW - Gray Whale
MW - Minke Whale
HW - Humpback
UW - Whale, Unid.
BL - Belukha
DP - Dall Porpoise
HP - Harbor Porp.
UP - Porpoise,Unid.

p = pup
(adult w/pup = 1+p)

APPENDIX I. Aerial Survey Data Sheet