

0244 JK 1
C.2
6

3 3755 000 38254 9

ANNUAL REPORT

Contract No. R7120807
Research Unit 69
Period: 1 April 1976 to
31 March 1977
22 pages

Bowhead (Balaena mysticetus) and
Beluga (Delphinapterus leucas) whales
in the Bering, Chukchi and Beaufort Seas.

Library
U.S. Fish & Wildlife Service
Principal Investigators 1011 E. Tudor Road
Anchorage, Alaska 99503
Howard Braham
Bruce Krogman
Clifford Fiscus

Research Assistants

Teresa Bray
Geoff Carroll
Robert Everitt
Edwin Iten
Mary Nerini
David Rugh
John Smithheisler
David Withrow

Marine Mammal Division
Northwest and Alaska Fisheries Center
National Marine Fisheries Service
7600 Sand Point Way, N. E.
Seattle, Washington 98115

On Reserve

March 25, 1977

FWLB
0244

676 244

Table of Contents

List of Figures	i
List of Tables	ii
I. Abstract	iii
II. Introduction	1
III. Current State of Knowledge	2
Beluga whales	2
Bowhead whales	3
IV. Study Area	4
V. Methods and Materials	4
Aerial survey	4
Ice Camp	6
Laboratory	6
VI and VII. Results and Discussion	7
Bowhead whales	7
Beluga whales	14
VIII and IX. Conclusions and Recommendations	15
Literature Cited	18
X. Summary of 4th Quarter Activities	20

3 3755 000 38254 9

ARLIS
Alaska Resources
Library & Information Services
Anchorage, Alaska

List of Figures

	Page
Figure 1. Study area map of the Barrow, Alaska region.	5
Figure 2. Histogram of bowhead and beluga sightings, including hours of the day spend observing, during the spring 1976 ice camp census.	9
Figure 3. Area map of the southwestern Beaufort Sea, east of Pt. Barrow, where bowhead whales congregate in the fall.	10
Figure 4. Histogram of beluga whale sightings from aerial surveys and ice camp counts of the northeastern Chukchi and western Beaufort Seas in the spring 1976.	13

List of Tables

Page

Table 1.	Bowhead and beluga whale sightings from aerial and ice camp surveys near Barrow, Alaska, April-June 1976.	8
Table 2.	Sightings of bowhead and beluga whales in the Bering Sea and southern Chukchi Sea during 1976.	12
Table 3.	Marine mammal sightings, other than bowhead and beluga whales, during aerial surveys of the northeast Chukchi and western Beaufort Seas in 1976.	16

I. Abstract

Spring survey findings indicate that significantly fewer belugas than bowheads are seen using the ice camp census method. Also, for the amount of time surveyed, more of both species were seen using aerial survey than ice camp. This latter finding may be an artifact of sampling. We predict that the ice camp method of censusing bowheads would be more cost productive than the aerial method, due to the extremely high costs of the latter. Aerial survey methods are better, however, for delineating distribution, whereas fewer abundance estimate biases occur using ice camp counting methods.

Reproductive activity in the bowhead whale was observed in early May near Pt. Barrow, Alaska, indicating that this species may calf and breed during the northward migration.

Bowheads congregate in an area near-shore during September, for reasons that are not yet clear. The region from Smith Bay to Pt. Barrow should be off limits to any exploration until the area can be further studied.

A hypothesis is proposed that an unknown segment of the bowhead whale population migrates north past Pt. Barrow in the spring and continues north to Banks Island, Canada, before entering the southeast Beaufort Sea, rather than migrating east in near-shore leads along the north coast of Alaska. Circumstantial evidence is offered which supports this hypothesis.

We have evidence to indicate that beluga whales may not be as ice limited as first thought, as sightings have placed animals deep in the spring and summer pack ice. Also, numerous hummocks in thin ice (made by belugas) have been observed, indicating that (directional) movement occurs under the ice.

II. Introduction

This report represents the culmination of the first year of research on the distribution and abundance of bowhead (Balaena mysticetus) and beluga (Delphinapterus leucas) whales in the Bering, Chukchi and Beaufort Seas, as part of the Outer Continental Shelf Environmental Assessment Program. The research reported on stems from contracts under Research Units 69 (FY 1976 and 1977) and 70 (FY 1975-76) administered by the Environmental Research Laboratory, National Oceanic and Atmospheric Administration in Juneau, Alaska, and Boulder, Colorado. Funds were provided by the Bureau of Land Management, U. S. Fish and Wildlife Service.

The purpose of this report is to provide a summary of the known information on bowhead and beluga whale distribution by integrating published and unpublished accounts with sighting data collected by us during 1976. The report serves as our first annual report of combined work effort for the Bering Sea and Arctic Ocean research on the two species. Our intent is to provide a document which can be rapidly transmitted to other scientists, managers and administrators who are in a decision or policy-making position.

Bowhead and beluga whales are thought to be particularly vulnerable to the activities of oil-gas development because they migrate within a small corridor of the Chukchi and western Beaufort Seas in near-shore leads (open water in the ice). The fact that they are seasonally harvested, and that any estimate of their population size is purely conjecture, it is not only prudent but essential that these animals be intensively studied. Since the bowhead is fully protected under the Marine Mammal Protection Act of 1972 (MMPA) and the Endangered Species Act of 1973, and the beluga under the MMPA, private and public energy development groups are obligated to determine which, if any, energy-related activities might be detrimental to both species, their habitats and trophic needs. To this end, we expect that during the next two to three years, habitat requirements will be delineated relative to local movements and migration.

Research on the bowhead whale began at the Marine Mammal Division in 1974 (Fiscus and Marquette, 1975). Biological data from animals harvested by Eskimos have been essentially the only kind of information collected under this program. To date, there are no quantitative data on the numbers of bowhead and beluga whales which migrate in shore-leads from the Bering Sea into the Chukchi and Beaufort Seas. It was principally because of this data gap that our research under OCSEAP was initiated.

The experimental plan to delineate distribution and relative abundance was to combine the data collected by a census team stationed on the shore-fast ice near the Eskimo hunters, with data collected by aerial survey observers. Independent estimates by each survey method are then compared to establish overlap and/or variability and reliability of the data.

For the 1977 field season (April-June) two census crews, instead of one as in 1976, will be stationed on the ice; one in the Chukchi Sea and one at the entrance to the Beaufort Sea. An unknown component of the bowhead and perhaps the beluga population may migrate north into the northern Chukchi Sea

rather than east along the north coast of the Beaufort Sea. Hence, independent estimates of the numbers of animals which migrate past these two camps will provide a comparative data base for understanding the movements of these animals into the Arctic Ocean.

This report is divided into seven sections: Introduction, Current State of Knowledge, Study Area, Data Collection Procedures, Results and Discussion of the 1976 Field Season, and Conclusions and Recommendations. The Current State of Knowledge section will provide a brief historical account of the available information from published and unpublished literature. An update of distribution, and an estimate of how many bowhead and beluga whales were believed to pass through our census study area near Barrow in 1976 will be reviewed in the Discussion section. The Discussion section will also include heretofore unsummarized data collected on bowhead whales by other scientists during fall surveys in 1974 and 1975. In the Conclusions and Recommendations section projections are made from very limited data as to important areas of concern for each species.

III. Current State of Knowledge

Beluga whale

The beluga or belukha whale (Delphinapterus leucas) is usually found in shallow bays or estuaries north of 40° N. Latitude. In Alaskan waters there are at least two resident populations: one is localized around Cook Inlet and consists of 300-400 animals; the other is in the vicinity of Bristol Bay and numbers perhaps 1,000-1,500 individuals (Klinkhart, 1966). Belugas begin a northward migration to arctic waters in April, and tend to travel in large herds (Bailey and Hendee, 1926). Kleinenberg et al. (1964) have recorded a pod of 500-600 animals, and Johnson et al. (1966) report seeing groups of 100 animals in the southern Chukchi Sea.

Like the bowhead, this species follows leads in the pack ice which extend into the Bering Sea and Arctic Ocean. Once through the Bering Strait, it appears some animals move along the Siberian coast (Kleinenberg et al., 1964) while others move along the Alaskan coast. It remains to be determined how much of the entire population moves north in the late winter in the western Bering Sea, as opposed to the eastern Bering Sea. Depending on ice conditions, the first belugas appear off Pt. Hope sometime between the end of April to the middle of May (Fiscus and Marquette, 1975), although other records for the southern Chukchi Sea exist for February and March (Kleinenberg et al., 1964). Whales are believed to be still moving north in July as evidenced from hunting records at Pt. Hope (Foote and Williamson, 1966). In the Kotzebue Sound region, belugas have been reported at Sheshalik, across Hotham Inlet north of Kotzebue (Foote and Williamson, 1966). Belugas are believed to concentrate for purposes of breeding and calving in southeastern Kotzebue Sound (U.S. Department of the Interior, 1974, in AEIDC).

By May and June, some belugas have reached the eastern Beaufort Sea and the pack ice around Banks Island (Sergeant and Hoek, 1974), as well as along the eastern Siberian coast (Klinkhart, 1966). It is unclear what portion of the

population arriving at Banks Island comes from Alaskan waters. During the summer and fall, belugas enter river estuaries as soon as the ice moves offshore (Klinkhart, 1966; Fraker, 1977). On 24 June 50 belugas were observed at the mouth of Pitmegea River just northeast of Cape Lisburne (Childs, 1969, in AEIDC). In a July aerial survey, Sergeant and Hoek (1974) reported up to 5,000 belugas near the Mackenzie River delta. Fraker (1977) reported between 5,000-6,000 animals during a July 1976 survey of the Mackenzie River delta.

The fall migration commences in September from the Mackenzie delta (Sergeant and Hoek, 1974) but the precise direction of travel is as yet unclear. Fraker (1977) supports the hypothesis that most belugas in the Mackenzie River delta area come from the east, the Canadian side, rather than from the Chukchi Sea. Since belugas are not able to maintain breathing holes in thick ice, and generally do not swim long underwater (Fraker, 1977), they probably precede the fall freeze-up (LeResche and Hinman, 1973). It is believed that the Bering Sea is the wintering ground for beluga from the Siberian, Canadian, and Alaskan arctic, although data are lacking.

Klinkhart (1966) records a seasonal shift in feeding habits. While offshore the beluga presumably feeds on a variety of fish, especially arctic cod, crustaceans and squid. It is believed that when they move inshore, they feed first on fingerlings moving down rivers, and later in the season they prey on adult salmon moving up river to spawn.

Bowhead whale

Bowhead whales (Balaena mysticetus) migrate from the Bering Sea into the Chukchi and Beaufort Seas from mid-April to early May (Berzin and Rovnin, 1966; Durham, 1972). They generally begin passing through the Bering Strait as early as late March and early April, as evidenced by sighting and harvest records at Wales (Bailey and Hendee, 1926) and at Cape Thompson (Johnson et al., 1966). Their arrival at Barrow, Alaska, can vary by two weeks (Maher and Wilimovsky, 1963; Foote, 1964; Fiscus and Marquette, 1975) and is probably dependent upon ice conditions. In the southeastern Chukchi Sea the migration is believed to occur in "waves": the first and second waves are comprised of young or smaller animals, and the third wave is made up of adults (Maher and Wilimovsky, 1966; Druham, 1975; Marquette, 1976). The end of the migration past the northwest coast of Alaska (Pt. Hope and Barrow) is unknown because ice conditions generally do not permit observers the opportunity to remain on the ice past mid-June.

Bowheads are reportedly at Banks Island in the Canadian Arctic by mid-May, where they can be found all summer (Sergeant and Hoek, 1974; Fraker, 1977). No information exists for the period from early June through August in the western Beaufort Sea, however. Fiscus and Marquette (1975) record the first catch of the fall Eskimo whaling season in September in the western Beaufort Sea. Early commercial whaling records indicate that the period of July-September was the favored time to hunt bowheads in the northern Bering-southern Chukchi Seas, and eastern Beaufort Sea. Fraker (1977) has recently completed a brief but good summary of our present knowledge with respect to bowhead commercial whaling records in the Beaufort Sea.

The population size of the bowhead whale appears to be open to conjecture. Rice (1974) estimated the population at 4,000-5,000 animals between 1868 and 1884. Since their decline brought on by the whaling industry in the early part of this century and last part of the nineteenth century, very few population estimates have been made. Sergeant and Hoek (1974) estimated the number in the Beaufort Sea to be "in the low hundreds". In August and September of 1976, Fraker (1977) reports that about 80 sightings were made (probably includes duplicate sightings) north and east of the Mackenzie delta area in the eastern Beaufort Sea.

Since there is very little evidence to suggest a precise migration route for the bowhead past Barrow, the question of timing and seasonal distribution remains open. Undoubtedly, some animals remain in the northeastern Chukchi Sea, just as some remain in the Banks Island area while others are found along the north coast of Canada. The number of animals which summer in the U.S. and Canada remains to be quantified.

Bowheads are believed to feed on copepods and euphausiids (Calanus hyperboreus, Parathemisto libellula and Thyanoessa inermis and T. rauschi). Because their numbers are so few, they are not believed to be food limited (Sergeant and Hoek, 1974).

IV. Study Area

The study area includes the northern Bering Sea from St. Lawrence Island essentially from the US-USSR 1867 Convention line east over the continental shelf, north into the Chukchi Sea to approximately 72°N. Latitude, and east into the Beaufort Sea to the U.S.-Canadian border at 141° W. Longitude.

Aerial surveys in the Beaufort Sea generally took place within 50 km of shore, because, we thought, open water leads do not normally occur far from land. In the Chukchi Sea, however, surveys were flown offshore in the spring to delineate offshore leads. The most heavily surveyed area of the Arctic Ocean was between 69° N. Latitude and 72° N. Latitude to within a few kilometers of shore.

The two census camps were located on the shore-fast ice approximately eight miles northwest of Pt. Barrow and eight miles west of the village of Barrow (Figure 1). The south ice camp was used primarily during the early part of the season (April-May) and the north camp later in the season (May-June). The two camps were only once simultaneously occupied. Working in concert, the ice-based camp and aerial surveys maximized our chances of providing the geographic coverage necessary to delineate bowhead and beluga movements along the northwest coast of Alaska.

V. Materials and Methods

Aerial survey

Aerial surveys over the pack ice and open leads were conducted at elevations of 200 to 1,000 feet depending upon cloud conditions. The aircraft used was a twin engine Grumman otter, chartered from the Naval Arctic Research

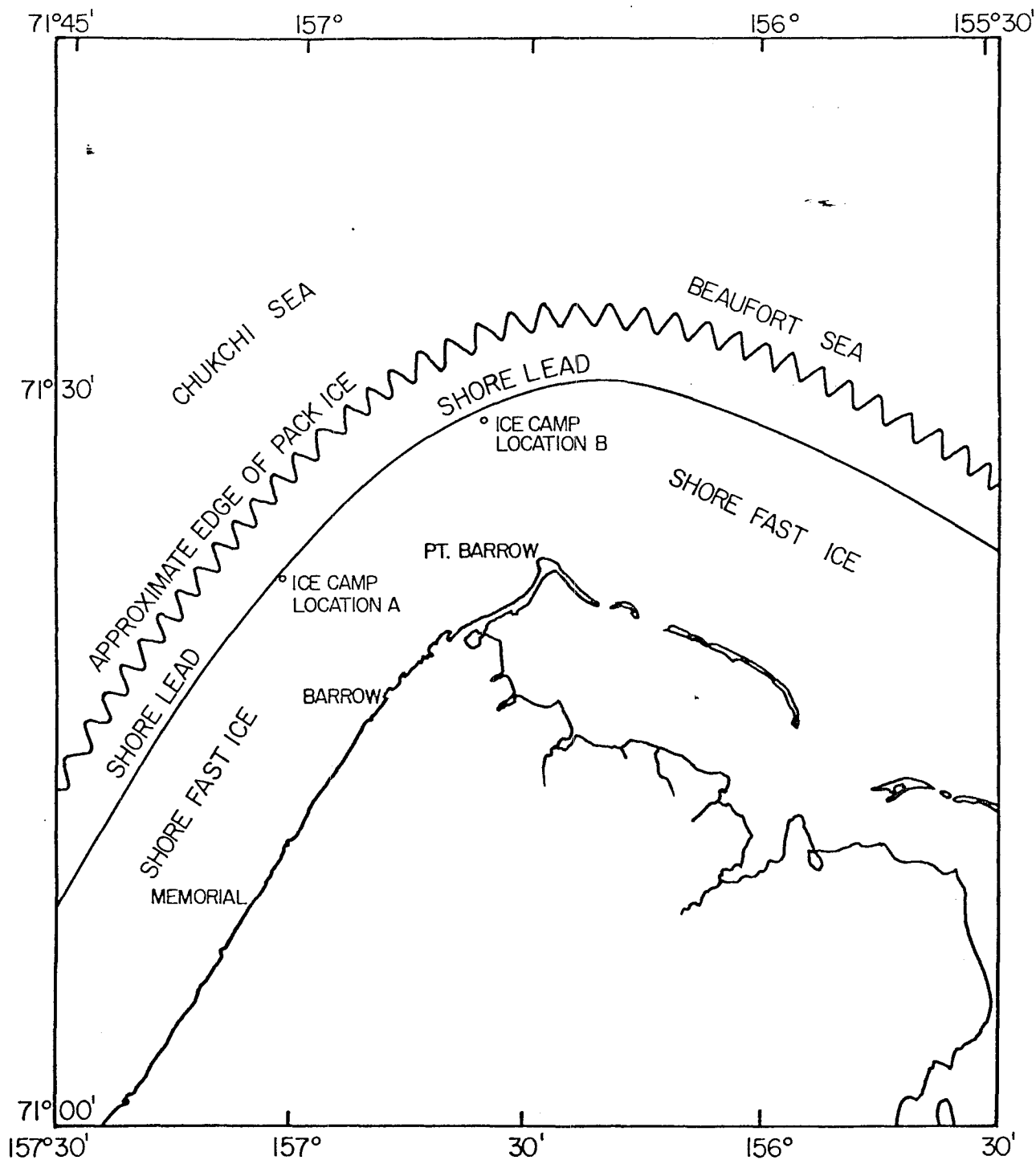


Figure 1. Study area map of bowhead and beluga whale census camps on the shore-fast ice northwest (Location A) and north (Location B) of Barrow, Alaska.

Laboratory. An on-track navigational system was available on the Otter, providing a means of locating our position to within 1 nmi². This was important because we attempted to determine the width of the lead and its geographic position in relation to the shore (for later plotting).

Two to three observers (plus the pilot) were used, each acting as his own recorder and noting the details of each sighting plus environmental conditions. Communications between observers were poor, but will be improved in FY 77 with the addition of an intercom system (see RU 67 Annual Report). One observer sat in the co-pilot's seat, and acted as the "chief spotter" and photographer. A single lens reflex 35 mm F2 Nikon camera was used with the aid of 105 and 135 mm lenses using high speed Ektachrome film (ASA 160) to verify species identification (e.g., with some seals) and group sizes (e.g., beluga).

Data scored in the field were transferred to computer abstract forms in the laboratory.

Ice camp

Counts of bowhead and beluga whales were made by observers standing on the ice next to the shore-fast lead. As whales migrated within the lead, the number of animals, direction, behavior, and other factors such as weather conditions, time of day, etc., were recorded. Two observers stood watch together, and a 24-hour watch was maintained using six to eight hours rotating shifts. Photographs were taken using the same camera system as described above to verify species and note behavior and lead conditions.

Two camps were used during the season (Figure 1), and were simultaneously occupied only once. One camp was used when the ice conditions near the other were unsafe. The camping facilities were made approximately 1/4 to 1/2 mile back from the shore-fast lead. The pair of whale counters thus were some distance from the base camp. Radio communications and emergency gear were therefore a critical part of the program as ice and weather conditions can change abruptly.

Data were scored on a standardized field log sheet and maintained on a continuous basis as each watch period changed.

Laboratory

As with all marine mammal sighting data, a system of logging, checking, editing and final processing was developed. A description of the procedures and flow diagram of the four-phase program are described in our FY 76 quarterly report for July-September 1976.

VI and VII. Results and Discussion

Aerial survey and ice station census sighting data on bowhead and beluga have been summarized in Table 1 and Figures 2 and 3. The aerial survey tracklines are covered in detail in the April-June 1976 quarterly report, as are the details of each flight.

Bowhead whales. Of the 346 bowhead whales observed at Barrow during the spring 1976 survey, 248 were seen by the ice station crew and 98 by Eskimos near the census crew's camp (Table 1, Figure 2). Eskimo sightings were considered independent of ours, yet positive in their identification. (See the October-December 1976 RU 69/70 quarterly report for a discussion of the Eskimos' role in counting bowheads.) Some 108 bowhead whales were observed from the air during approximately 93 hours (maximum) of air time. About 360 hours (minimum) were spent by the census crew on the ice counting whales. Using non-parametric chi-square analysis, it was more efficient to observe bowheads from the air than from the ice station. That is, more bowheads were seen for the time spent in the air than would be expected by chance (χ^2 : $P < 0.01$). However, aerial survey data contain duplicate sightings. Thus, the above analysis is biased.

An important component of the bowhead whale sightings during the spring related to three or four "pulses" of increased sightings (Figure 2). On about 1, 6, 18 and 22 May, larger numbers of bowhead whales passed the census camp than during other days. Although it has been suggested that "waves" of migrating animals occur, our data tend to show that the "waves" or pulses are closely related to weather. Just prior to each major increase in the numbers of animals seen, the lead was essentially closed. On 10, 11 and 12 May, no bowheads were seen. On 20 May our crew was not on the ice because the lead was closed. These dates agree with those previous days when only a few animals were seen, and with later days when maximum numbers were seen (Figure 2). Animals appeared to group up in larger pods "waiting" for the lead to re-open. This behavior was witnessed several times during the aerial surveys. Also, we have found no relationship between the amount of time or the specific time of day to the number of animals counted, which suggests that movement of whales is probably dependent upon environmental conditions. So far, we see no pattern to the ways in which these animals are moving past Barrow, but it is important to note that our data are preliminary.

Aerial survey and ice census counts show that the majority of bowheads migrating past Barrow in 1976 did so during the first half of May. Fewer animals were seen during the last half of May and first few days of June than earlier in the season, primarily because of ice conditions. Whales were still moving by in June, however, as 26 animals were seen by the aerial survey team (17% of total) after the last census camp had reduced operations considerably (after 26 May).

Computer plotting of the spring 1976 data did not materialize for this report. Once these sighting data are plotted, we will have a better idea of the overall pattern of distribution during the spring.

Table 1. Number of bowhead and beluga whales sighted by the ice station census crew, by Eskimos, and by the aerial survey team. See text for an explanation of the Eskimos' role in the "census". Dashed spaces mean no surveys took place; blank spaces mean no animals were observed.

Date	Number of Bowheads			Number of Beluga	
	Ice Crew	Eskimos	Aerial Crew	Ice Crew	Aerial Crew
25 April	3	2	-		-
29 "	11	6	4		248
30 "	7	10	-		-
1 May	17	3	6		48
2 "	3	6	-		-
3 "	1	1	3		67
5 "	11	9	-		-
6 "	16	19	-		-
7 "	8	1	-		-
8 "	4	1	34		85
9 "	2		5		27
10 "		1	-		-
11 "			-		-
12 "			2		-
13 "	10	7	-		-
14 "	5		-		-
15 "	11	3	18		134
16 "	18	11	-	2	-
17 "	26	9	-		-
18 "	52	9	-	100	-
19 "	1		3		8
20 "	-	-		-	20
21 "	4		-		-
22 "	19		4	207	129
23 "			-		-
24 "	9		3		1
25 "	1		-		-
26 "	6		-		-
28 "	-	-	1	-	
31 "	1		4		1
1 June	1		3		144
2 "	1		-		-
4 "	-	-	15	-	35
5 "	-	-	2	-	
18 "	-	-		-	12
19 "	-	-	1	-	61
20 "	-	-		-	

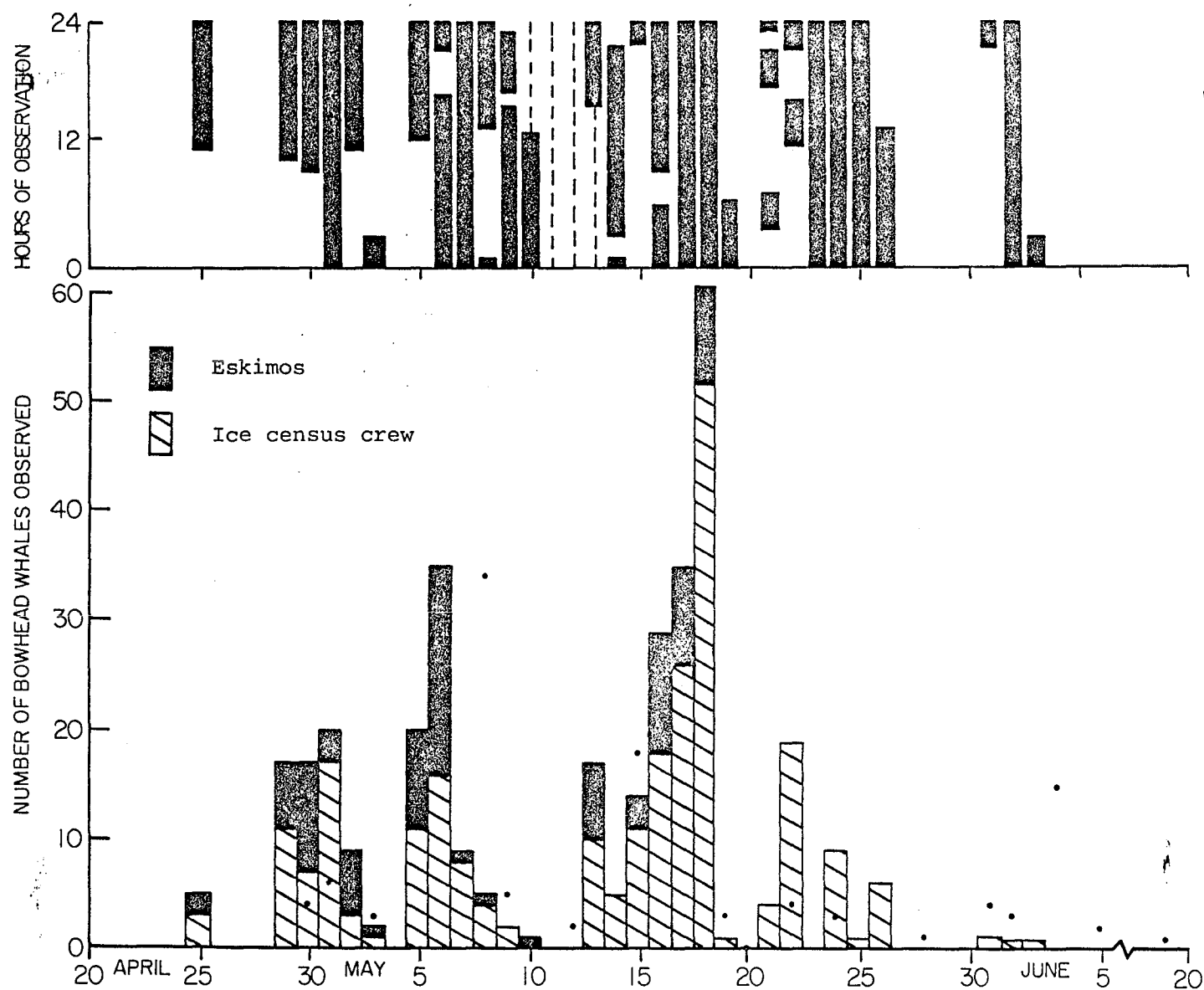


Figure 2. Histogram of the numbers of bowhead whales observed along the shore-fast ice lead at Barrow, Alaska, 1976. Sightings are related to the hours in the day when the census crew was observing. The dots (·) are the number of bowheads seen by the aerial survey team on that date.

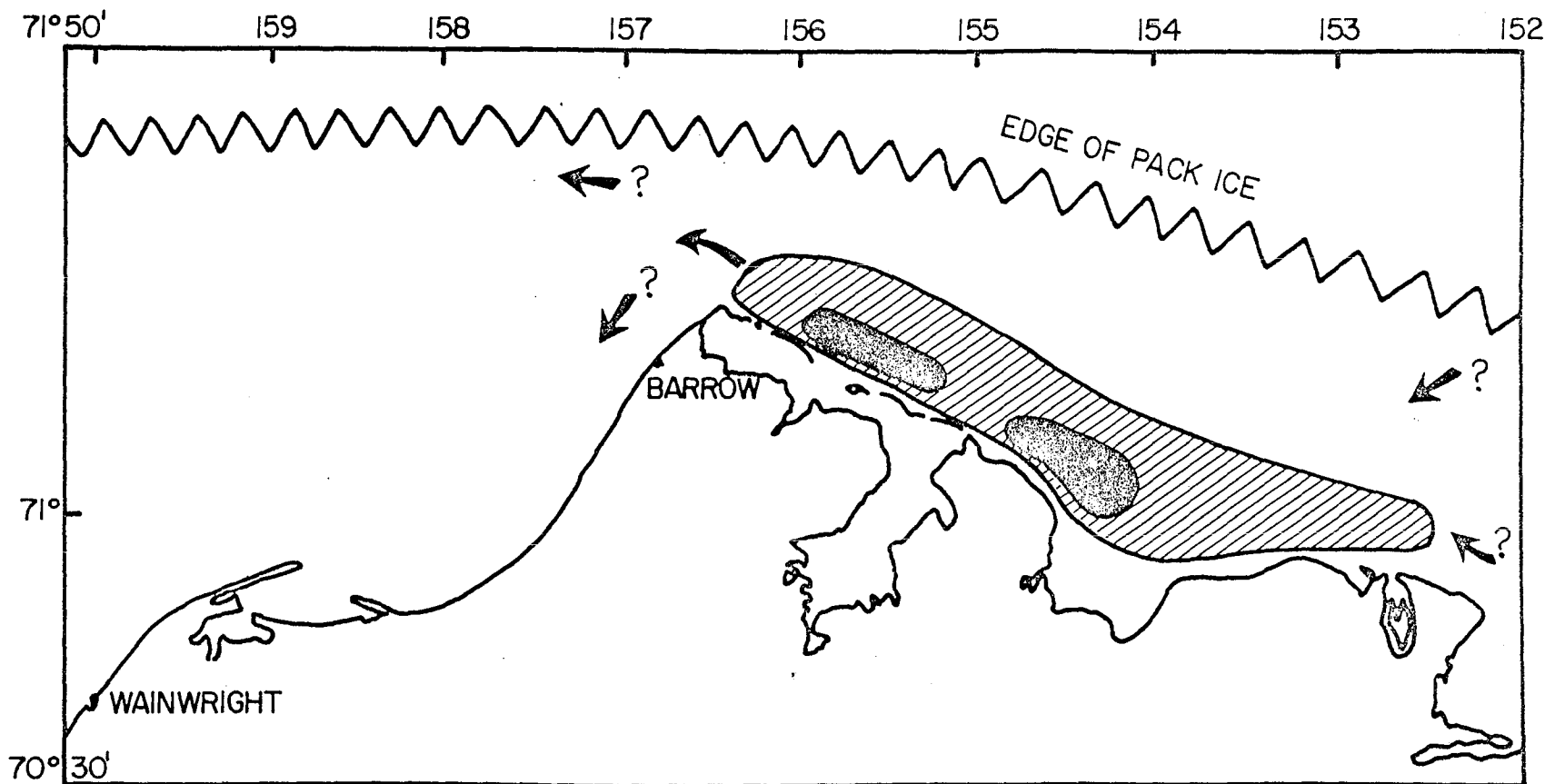


Figure 3. Area map of the northwest coast of Alaska depicting the region where bowhead whales are concentrated during the fall. Darkened areas are areas of highest density; hatched areas, where animals are less dense. Movement into and out of this region remains unclear.

Bowhead sighting data during the fall are minimal. Fiscus (unpublished) sighted bowheads near Cape Simpson between 12 and 22 September 1974. The highest number seen was 57 on 18 September. No sightings occurred during the fall of 1975 because of poor ice conditions. Between 16 and 26 September 1976, Robert Everitt sighted over 100 bowhead whales in the same general area as the 1974 sighting by Fiscus. The greatest single day's sighting was 47 on 21 September 1976. From these sightings it would appear that the Smith Bay to Pt. Barrow area represents a very important area of congregation for bowheads prior to their southern migration. This apparent "critical" area is outlined in Figure 3. The darkened areas are where the greatest numbers of animals were seen in both 1974 and 1976; hatching marks the areas where bowheads were less dense, yet numerous.

Sighting data exist from other OCSEAP contractees as well. In August 1975 C. Ray (pers. comm.; RU 34) sighted 74 bowheads northeast of Icy Cape (about 70°30' N. Latitude, 161°00' W. Longitude). He also observed large concentrations of bowhead between Smith Bay and Pt. Barrow, and, in October 1975, Ray (pers. comm.) saw six bowheads in the Chukchi Sea at about 70°30' N. Latitude, 163°-169°30' W. Longitude. Although the data are sparse, they suggest that bowheads move west and south from Pt. Barrow during the fall, probably in September. We have, as does Ray (pers. comm.), some sightings that put bowheads east along the north coast within 100 km of Pt. Barrow, south of Barrow along the coast to Peard Bay, and west into the Chukchi Sea by as far as 100 km -- all within a one-month period. Data collected by Ray in 1975 would suggest that because of the heavy ice year, bowheads moved farther south (Icy Bay) than usual, or that they began their southward movements earlier.

Eleven bowhead whale sightings were reported to us from the southern Chukchi Sea and the Bering Sea during 1976 (Table 2). Two sightings totalling three animals occurred in the western end of Bristol Bay and St. George Basin region. The remaining sightings occurred farther north. Townsend (1935) records bowheads being taken in the central Bering Sea but not generally as far east as the Pribilof Islands and the west end of Bristol Bay.

Berzin (pers. comm.) reports seeing the following bowhead whales on the Soviet side of the 1867 Convention line, 8-11 October 1974-75 (the conflict between these dates has not been resolved).

<u>General location</u>	<u>Number seen</u>
N. W. St. Lawrence Is.	3
S. Bering Strait	5
Bering Strait	2
N. W. Bering Strait	4
N. W. of Shishmaref	3
N. E. Chukotski Pen.	
Cape Serdzekamen	1
Cape Chautau	20
Kolyuchin Is.	60
Cape Vankarem	60
Cape Syeverni	23

Table 2. Summary of the number of bowhead and beluga whale sightings in the Bering and southern Chukchi Seas by date from aerial (A) or vessel (V) surveys during 1976. The general location of each sighting and the individual or survey group reporting the data are included. RU 67 or 69 denotes the OCSEAP research team conducting the survey.

Date	Species	Number of Animals	General Location	Survey	
				Type	Observer
15 March	Beluga	8	N. Bering Sea	A	RU 69
18 "	Beluga	18	N. Bering Sea	A	RU 69
19 "	Beluga	2	N. Bering Sea	A	RU 69
9 April	Beluga	33	E. Bristol Bay	A	RU 67
9 "	Bowhead	1	W. Bristol Bay	A	J. Hall ¹
14 "	Bowhead	1	W. Bering Sea	A	G. Fedoseev ¹
15 "	Bowhead	1	S.W. St. Matthew Is.	A	G. Fedoseev
18 "	Bowhead	1	W. St. Lawrence Is.	A	G. Fedoseev
19 "	Bowhead ²	2	W. Pribilof Is.	V	P. McGuire ¹
19 "	Bowhead	1	E. St. Lawrence Is.	A	RU 67
19 "	Beluga	4	E. St. Lawrence Is.	A	RU 67
19 "	Beluga	79	N.W. St. Lawrence Is.	A	C. Ray ¹
20 "	Bowhead ²	2	W. Pribilof Is.	V	P. McGuire
20 "	Bowhead	1	N.W. St. Lawrence Is.	A	RU 69
20 "	Beluga	4	N. Bering Sea	A	RU 69
21 "	Bowhead ²	2	W. Pribilof Is.	V	P. McGuire
21 "	Bowhead	2	S. Bering Strait	A	RU 69
21 "	Beluga	118	S. Chukchi Sea, N. St. Lawrence Is.	A	RU 69
22 "	Beluga	25	N.W. St. Lawrence Is.	A	RU 69
23 "	Bowhead	1	W. Bristol Bay	A	J. Burns ¹
23 "	Beluga	1	N.E. Norton Sound	A	RU 69
6 May	Beluga	10	W. Bering Sea	A	G. Fedoseev
7 "	Beluga	2	W. Bering Sea	A	G. Fedoseev
12 June	Bowhead	2	S. Chukchi Sea	A	RU 69
13 "	Beluga	18	S.W. Norton Sound	A	RU 67
26 August	Beluga	4	W. Norton Sound	A	RU 67

¹ John Burns, Alaska Dept. of Fish and Game, Fairbanks, AK
 Genadi Fedoseev, TINRO, Magadan, USSR
 John Hall, U. S. Fish and Wildlife Service, Anchorage, AK
 Patrick McGuire, Marine Mammal Division, Seattle, WA
 Carleton Ray, Johns Hopkins University, Baltimore, MD

² Probably the same animals.

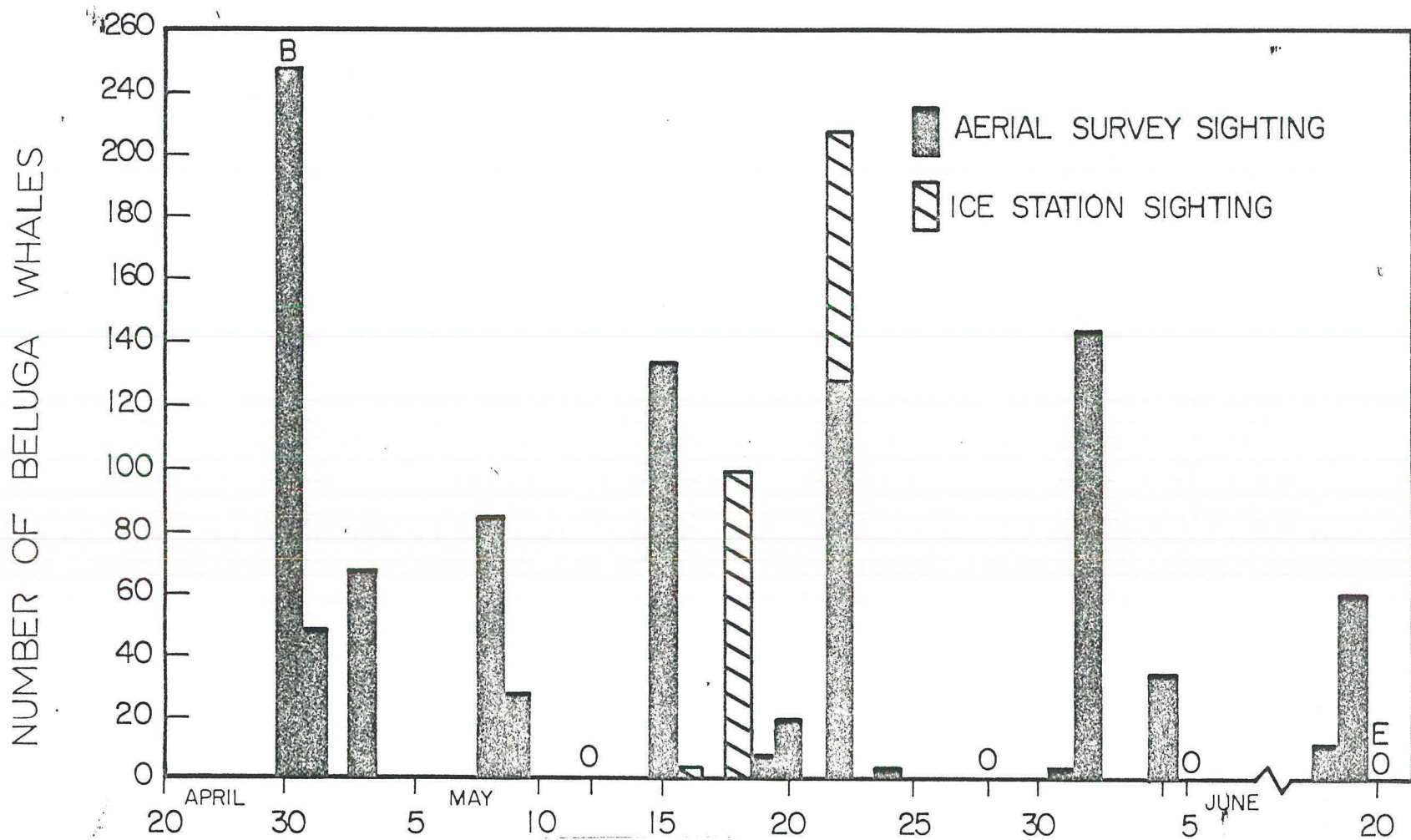


Figure 4. Numbers of beluga whales observed during aerial and ice-based surveys along the shore-fast ice lead between Barrow and Wainwright, Alaska, during the spring of 1976. B and E denote the dates of first and last aerial survey.

From these sightings it would appear that many animals migrate to the northern coast of Siberia before moving south through the Bering Strait. Since few bowhead whales are reported along the Siberian coast during the spring (Fedoseev, Golt'sev and Berzin, pers. comm.), it would appear that the majority of animals during the spring migration move north in the eastern Chukchi Sea, and during the fall (perhaps) move south in the western Chukchi Sea. Additional fall sighting data from the Chukchi Sea is necessary to clarify this point.

Beluga whales. Aerial survey and ice station data on beluga whale sightings during the spring of 1976 are reported in Table 1 and Figure 4. More belugas were seen during aerial surveys (1020) for the amount of time spent sampling (about 93 hours) than were observed by the ice crew (309 animals; about 300 hours) than could be expected by chance (χ^2 : $P < 0.001$). Hence, aerial surveys were considered a more "efficient" means of observing (counting and delineating) this species. A test for goodness-of-fit between the numbers of bowheads observed by aerial survey and ice camp censusing, compared to beluga observations, indicates that more bowheads were seen from the ice and more beluga from the air than expected (χ^2 : $P < 0.001$).

At this time, no extrapolation can be made on the number of beluga whales which passed Barrow. The variability in the numbers of animals seen by day (Figure 4) and the fact that some duplication in sightings probably occurred, make it difficult to quantify our sightings. Experiments are being developed for the spring 1977 season using aerial surveys which may prove to be useful for estimating abundance of beluga.

Beluga whale sightings in the Bering Sea and southern Chukchi Sea are reported in Table 2. Most observations occurred in the northern Bering Sea, probably because more surveys were conducted there. C. Ray (pers. comm.); RU 34) reports seeing over 300 beluga whales northwest of Port Moller in Bristol Bay on 13 April 1976. Whether this group, and perhaps the group observed on 9 April (Table 2), are part of the "resident" population in Bristol Bay remains to be explored. The 9 April group was observed in a small polynya within the pack ice. We do not know if the 13 April group was at the ice front or in the pack ice. Ray (pers. comm.) reports that approximately 47 beluga whales were observed northwest of St. Matthew Island during April 1975.

Fall sightings of belugas have been minimal during our 1975 and 1976 aerial surveys of the Chukchi and Beaufort Seas. Sightings from other researchers have been more frequent. In September 1974, Ray (pers. comm.; RU 34) sighted 23 beluga in the western Beaufort Sea northeast of Pt. Barrow. His most significant observation occurred in the pack ice in the area of 73°00' N. Latitude, 162°00' W. Longitude, where "a thousand or more" belugas were seen over the continental slope, where depths of 80-200 m occur. No other details are known. In October 1975 Ray (pers. comm.) reported seeing 175-180 beluga in the southern Chukchi Sea just east of the 1867 US-USSR Convention line.

These data clearly indicate that belugas have the potential to be spread throughout the Chukchi Sea in the fall and the Bering Sea during the spring.

It remains to be seen how much, if any, division occurs between groups of animals during the spring and summer migration north. Belugas are known to occur in rivers and estuaries in Bristol Bay, Norton Sound (Yukon River delta), Kotzebue Sound, and along the northwest coast of Alaska. However, what we need to determine is whether these local population divisions are just that - local - or whether they intermix during the winter months in the Bering Sea.

Sightings of other marine mammals were scored during RU 69 surveys (Table 3) but are not discussed in this report.

VIII. Conclusions and Recommendations

Although a limited amount of data exist from one year of field work, circumstantial evidence indicates that bowhead whales might not migrate in large numbers near shore along the north coast of Alaska into the eastern Beaufort Sea. Instead, we feel that some, at least, continue migrating north into the pack ice to Banks Island and then move south to the coast in the summer. This hypothesis is based on three clues: 1) NOAA satellite photographs indicate that leads form farther off shore than the scope of our surveys (Marko, 1975); 2) bowheads are believed to arrive farther north at Banks Island earlier in the year (May) than south by the Mackenzie River delta (Sergeant and Hoek, 1974; Fraker, 1977); and 3) very little positive sighting data exist for the near shore leads along the north coast of Alaska (although, admittedly, weather has prevented extensive surveys). Also, fall whaling occurs along the northeast coast of Alaska (although limited) in the fall, but not during the spring. This hypothesis needs testing, because, if true, then bowheads would be more vulnerable to oil and gas development activities in the fall than in the spring. This, of course, assumes that the fall migration is westerly through the Beaufort Sea basin, and that the spring migration is northerly, away from the Beaufort Sea basin.

On 8 May 1976, copulatory behavior was photographed by one of our research team (Krogman). To our knowledge, this is the first evidence of this type of reproductive activity in bowheads. This incident took place just northwest of Pt. Barrow, where, on the same day, an apparent female and calf (less than half the size of the cow) were photographed. While we do not know how important the northern Bering-southern Chukchi Seas and Beaufort Sea areas are for bowhead reproduction, the fact remains that these activities have now been observed in or adjacent to the oil lease areas.

Fewer bowhead whales are believed to occur in the Banks Island-Mackenzie River delta area than might be expected given a minimum population of "a few thousand animals" (Rice, 1974). The summer range of the remainder of the bowhead population is unknown.

The Cape Simpson area near Smith Bay, south and east of Pt. Barrow, should be considered, at least temporarily, a "critical" habitat for bowheads, until we can determine why these animals congregate there in the fall.

General survey type studies on beluga whales should probably shift to localized studies after the FY 77 field season. It would seem to be more

Table 3. Marine mammals, other than bowhead and beluga whales, observed in 1976 during aerial surveys of the northeastern Chukchi (C) and western Beaufort (B) Seas. The surveys were conducted out of the Naval Arctic Research Laboratory, Barrow, Alaska. Blanks represent no sightings. (Note: these data include replicate sightings, e.g., polar bears on 20 and 22 May.)

Date	Survey Location	Pinnipeds				Cetaceans		Polar Bear
		Bearded Seal	Ringed Seal	Walrus	Unid.	Gray Whale	Unid.	
30 April	C	60	6					
1 May	B	11						
3 "	B		6					
8 "	B	46						4
9 "	B	20	8					
12 "	B	1	15					
14 "	B				3			
15 "	C	4	2					2
19 "	C	2	13					2
20 "	B	2						34
22 "	B	5	10		2			35
24 "	C	1	1		2			7
28 "	C	7	78					1
31 "	C	5	81					10
1 June	C	1	63					
4 "	B	5	69					
5 "	C		245					
18 "	C		9	619				
19 "	C	4	77	2600	1	2		1
20 "	B		66					
20 August	B					1	2	
21 "	C					4		
23 "	C					6		
16 September	C					1		
20 "	C			2*	38	4		
21 "	B				10	1		
22 "	B			166	4			
23 "	B				1			
24 "	B			28				
26 "	B			1				

* 8 single sightings of dead animals on the beach were made.

cost productive in terms of specific abundance and distribution projections to study specific areas (e.g., Kotzebue Sound, Norton Sound, or Bristol Bay). An alternative would be to develop a tagging or radio tracking program to determine the extent of local movement, or to see if some animals do in fact migrate from the southern Bering Sea to the eastern Beaufort Sea. Another alternative (short-term) study would be fall sampling of the three oil lease areas mentioned above (Kotzebue and Norton Sounds and Bristol Bay) for breeding activities of beluga whales.

Literature Cited

- Alaska Environmental and Information Data Center.
Map 27. Biota. Distribution and migration of important whales. Series:
Chukchi Sea: Bering Strait - Icy Cape. Physical and Biological
Character of Alaskan Coastal Zone and Marine Environment.
- Bailey, Alfred M., and Russell W. Hendee.
1926. Notes on the mammals of northwestern Alaska. J. Mammal. 7 (1):
9-28.
- Berzin, A. A., and A. A. Rovnin.
1966. Raspredelenie i migratsii kitov v severo-vostochnoi chasti
Tikhogo okeana, v Beringovom i Chukotskom moyakh (Distribution and
migration of whales in the northeastern part of the Pacific Ocean,
Bering and Chuckchee Seas). Izv. Tikhookean. Nauchno-issled. Inst.
Morsk. Rybn. Khoz. Okeanogr. 58:179-207. In Russian. (Transl. by
Dep. Int., Bur. Commer. Fish., Seattle, Washington, 1966, in K. I. Panin
(ed.), Soviet Research on Marine Mammals of the Far East, p. 103-136).
- Childs, H. E., Jr.
1969. Birds and mammals of the Pitmegea River region, Cape Sabine,
northwestern Alaska. Univeristy of Alaska Biological Papers, no. 10.
- Durham, F. E.
1972. History of bowhead whaling and Greenland or bowhead whale. U. S.
Govt. Rep. No. AD-759 592 NTIS, 13 p.
1975. The catch of bowhead whales (Balaena mysticetus) by Eskimos
in the western Arctic. (Unpub. Manuscr.) 18 p.
- Fiscus, Clifford H., and Willman M. Marquette.
1975. National Marine Fisheries field studies relating to the bowhead
whale harvest in Alaska, 1974. Processed rep., U. S. Dep. Commer.,
Natl. Oceanic Atmos. Admin., Natl. Mar. Fish. Serv., Seattle, WA, 23 p.
- Foote, D. C.
1964. Observations of the bowhead whale at Pt. Hope, Alaska. (Unpub.
Manuscr.) 70 p.
- Foote, D. C., and H. A. Williamson.
1966. A human geographical study. In, N. J. Wilimovsky and J. N. Wolfe
(eds.), Environment of the Cape Thompson region, Alaska. U. S. Atomic
Energy Comm. Rep. PNE-4 1, p. 1041-1108.
- Fraker, M. A.
1977. The 1976 white whale monitoring program, Mackenzie Estuary, N.W.T.
Imperial Oil Ltd., F. F. Slaney & Co., Ltd., Vancouver, B. C. 73 p.

Johnson, Murray L., Clifford H. Fiscus, Burton T. Ostenson, and Myron L. Barbour.

1966. Marine mammals. In, N. J. Wilimovsky and J. N. Wolfe (eds.), Environment of the Cape Thompson region, Alaska. U. S. Atomic Energy Comm., Rep. PNE-4 1, p. 877-923.

Kleinenberg, S. E., A. V. Yablokov, B. M. Bel'kovich, and M. N. Tarasevich.

1964. Belukha. Opyt monograpicheskogo issledovaniya vida (Beluga. (Delphinapterus leucas) investigation of the species) Izd. "Nauka", Moscow. In Russian. (Transl. by Israel Program Sci. Transl., 1969, 376 p.

Klinkhart, Edward.

1966. The beluga whale in Alaska. Project rep., Fed. Aid Wildl. Restoration, Vol. VII, Alaska Dep. Fish Game, 11 p.

LeResche, R. E., and R. A. Hinman.

1973. Alaska's wildlife and habitat. Alaska Dep. Fish Game. 144 p.

Maher, W. J., and N. J. Wilimovsky.

1963. Annual catch of bowhead whales by Eskimos at Point Barrow, Alaska, 1928-1960. J. Mammal. 44(1):16-20.

Marko, J.

1975. Satellite observation of the Beaufort Sea ice cover. Tech. Rep. No. 34, Beaufort Sea Project, Dep. Environ., Victoria, B. C., 137 p.

Marquette, W.M.

1976. Bowhead whale field studies in Alaska, 1975. Mar. Fish. Rev. 38(8): 9-17.

Rice, Dale W.

1974. Whales and whale research in the eastern North Pacific. In W. E. Schevill (ed.), The whale problem, p. 170-195. Harvard Univ. Press, Cambridge, Mass.

Sergeant, D. E., and W. Hoek.

1974. Seasonal distribution of bowhead and white whales in the eastern Beaufort Sea. In J. C. Reed and J. E. Sater (eds.), The coast and shelf of the Beaufort Sea, p. 705-719, Arctic Inst. N. Am., Arlington, VA.

Townsend, C. H.

1935. The distribution of certain whales as shown by logbook records of American whaleships. Zoologica 19(1):3-50.

U. S. Dep. of the Interior, Alaska Planning Group.

1974. Proposed Selawik National Wildlife Refuge. Final environmental statement. 632 p.

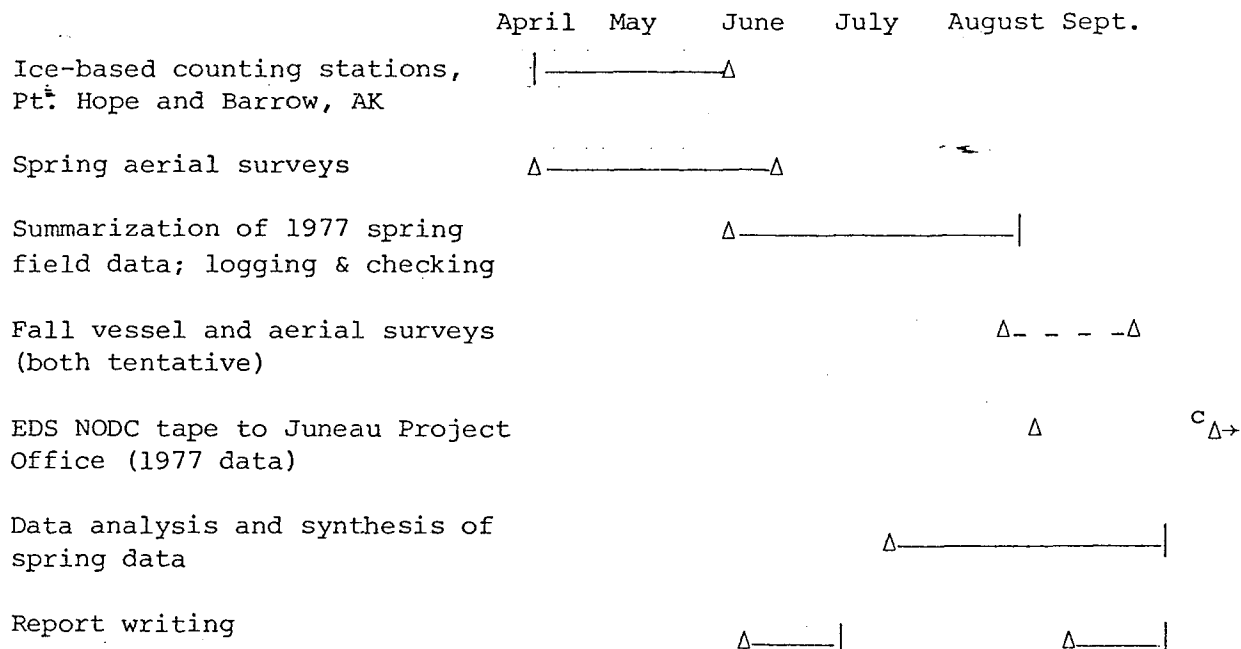
X. Summary of quarterly activities ending 31 March 1977

A. Ship or laboratory activities

1. Ship or field trip schedule. (No activities.)
2. Scientific party. N/A
3. Methods
 - a. Final logging, transformation and computerization of all data collected in 1976.
 - b. Several complex programs were developed for transformational purposes, and for statistical analysis on the data (in conjunction with research units 67 and 68).
 - c. Inventory evaluation, and purchasing of new equipment for the spring 1977 field season.
 - d. Development of experimental design for sampling from the ice station and by means of aerial survey.
 - e. Arrangements made for logistic needs; equipment sent to Barrow; personnel hired for both camps (pending NMFS hiring freeze).
4. Sample localities/ship or aircraft tracklines. N/A
5. Data collected or analyzed.
 - a. All data collected under RU 69 and RU 70 in FY 76 were reviewed for accuracy -- a total of 5,895 marine mammals were seen (undoubtedly including some replicates) covering 102 separate survey days.
 - b. Non-parametric tests on sighting data were performed to determine 1) if a cost-benefit ratio exists between ice station censusing and aerial surveys, and 2) appropriateness of the two survey methods with respect to collecting sighting data on bowhead and beluga whales. Plotting (by hand and computer) of sighting data was performed to delineate distribution, and to determine if specific areas of the Arctic Ocean are "more important" to these species than other areas.
 - c. Trackline miles. N/A

6. Milestone chart and data submission schedules,

a. Activity milestones.



B. Data submission schedule. All data collected during 1976, with the following exceptions, are to follow this report. Exceptions -- fall 1975 aerial data (no important marine mammal sightings) and fall 1976 (not transformed with EDS code). These data plus fall 1974 (non-OCSEAP) aerial survey data will be transmitted to the Juneau Project Office on NODC format by the end of June. The reason for the delay was that these data are not of sufficient quality (except fall 1974) or in a form amenable to satisfactory interpretation (i.e., the data are poor). Any delays in data submission (FY 76 data) were a result of 1) difficulty on our part of formatting and processing the large volume of data; 2) holdups at our computer facilities (labor contracts for card punching were not renewed), and 3) some problems in EDS-NODC-Marine Mammal (027) format finalization. All of these problems have, essentially, been resolved.

Data submission schedule for FY 77 field season:

<u>Activity</u>	<u>Est. date of data submission</u>
Ice camp census	1 September 1977
Aerial survey	
Spring data	1 September 1977
Fall data (tent.)	1 November 1977

B. Problems encountered/recommended changes. We recommend that a one page abstract be submitted with each quarterly and annual report. Each principal investigator can then receive a summary update (upon request) of each specific RU that he is interested in--long before the published accounts of the entire reports. This would increase the flow of important information between research units.

C. Estimate of funds expended.

Salaries	\$ 8,569.00
Travel/per diem	279.98
Equipment	1,159.31
Computer/misc.	405.71
	<hr/>
Total	\$10,414.00

D. Other activities.

1. US-USSR Marine Mammal Agreement on Environmental Protection. Howard Braham, U. S. Delegate, representing OCSEAP research. San Diego, California, 18-23 January 1977.
2. Chukchi-Beaufort Sea, OCSEAP Synthesis Meeting. Bruce Krogman, Marine Mammal Division representative for RU 69. NARL, Barrow, Alaska, 7-10 February 1977.
3. David Rugh, David Withrow, Mary Nerini and Bruce Krogman received University of Washington training by taking an advanced course on marine mammals.

Library
U.S. Fish & Wildlife Service
1011 E. Tudor Road
Anchorage, Alaska 99503