Kenyon, K.W.

# AERIAL SURVEYS OF MARINE MAMMALS IN THE BERING SEA, 6-16 APRIL 1972

Karl W. Kenyon

14 September 1972

# AERIAL SURVEYS OF MARINE MAMMALS IN THE BERING SEA, 6-16 APRIL 1972

Karl W. Kenyon
Biologist



U.S. Bureau of Sport Fisheries and Wildlife
Marine Mammal Substation
Naval Support Activity, Bldg. 192
Seattle, Washington 98115

14 September 1972

CONTENTS



Figures



Tables

Page

## SUMMARY AND CONCLUSIONS

Between 7 and 16 April 1972 a Grumman turbo conversion or "Super Goose" aircraft was flown at 145 mph, altitude 500 feet, for approximately 4,280 nautical miles over the Bering Sea ice from Bering Strait to the Alaska Peninsula and from Alaskan to Siberian coastal waters. Eight species of marine mammals were observed and the counts and estimated numbers in a 1-mile wide survey track were recorded: (sea otter, 8; walrus, 9,300; largha seal, 79; ringed seal, 29; ribbon seal, 6; bearded seal, 221; bowhead whale, 1; and beluga, 33). Two areas of abundance of walruses were observed: (1) north and south of the west end of St. Lawrence Island, and (2) in central Bristol Bay. Areas of low abundance surrounded these areas of concentration. No marine mammals were found in the Nunivak or St. Matthew areas or on the ice north and east of these areas to the east end of St. Lawrence Island. Information was available that no walruses were in the Chukchi Sea at the time of our surveys.

Estimates based on the field data indicate that the Pacific walrus may number about 136,000 animals. Statistical treatment of these data indicates that there could be as few as 93,000 or as many as 178,000 walruses.

# INTRODUCTION

Beginning in 1960 the Bureau of Sport Fisheries and Wildlife has conducted five aerial surveys of walruses and other ice inhabiting marine mammals as listed (Table 1). The primary purpose of these surveys was to obtain information on the distribution and general abundance of the Pacific walrus (Odobenus rosmarus divergens) in the Bering Sea. A secondary objective was to obtain similar information on other marine mammals. The eight species observed in the survey strip and the total numbers recorded in the 1972 surveys are listed in Table 2, and Table 3 lists daily observations of walruses and bearded seals.

Pagophilic (ice-loving) marine mammals are not distributed evenly or randomly in the Bering Sea. Our accumulated aerial surveys show that these mammals occupy certain geographically circumscribed areas. Within these geographic regions their distribution at different times is determined by the extent of the pack ice and the composition of the ice (for example; heavy old pack, young ice, expansive unbroken ice sheets, and ice-edge zone). Ultimately, when the ice leaves the Bering Sea in spring and summer the majority of pagophilic pinnipeds retreat to the Chukchi Sea with it.

Following is a presentation of all data gathered on walruses including the field record of counts and estimates of animals seen and the geographical charts to which these data were extrapolated on the basis of the recorded time of each observation. It was necessary to summarize separately the observations for the different geographical areas observed and these tables are included.

I consider that the 1972 survey was the best we have yet conducted for the following reasons: (1) weather conditions were favorable during the surveys; (2) because of the knowledge gained on distribution of walruses on previous surveys we were able to concentrate our surveys in the areas where walruses occur; (3) because of the speed and long range of the turbo goose aircraft we were able to complete transect flights through and beyond areas of high abundance to establish the approximate limits of these areas. Because of this a statistical evaluation of our data was possible.

Data on species other than the walrus are still being examined for possible statistical treatment and whatever conclusions may be drawn from it will be treated in a future report.

ITINERARY (Nome time is shown unless otherwise noted)

6 April 1972 0940-1600 (Seattle time) fly Seattle to Anchorage aboard BSFW Super Goose No. N780

7 April 1972 1700-1852 fly Anchorage to Nome aboard N780. Survey Norton Sound, Unalakleet to Nome.

8-10 April 1972 At Nome. Snow and wind, no flight possible.

11 April 1972 1140-1945 aerial survey: Nome to Bering Strait to Gulf of Anadyr to St. Lawrence Island to Nome.

12 April 1972 1215-1823 survey central Bering Sea: Nome to St. Lawrence Island to St. Matthew Island to Nunivak Island to Kuskokwim Bay to Bethel.

13 April 1972 1212-1902 survey central and south Bering Sea: Bethel to Pribilof Islands (St. Paul) to Bristol Bay to King Salmon.

14 April 1972 1150-1853 survey eastern Bering Sea: King Salmon to Bristol Bay to Port Moller to Togiak (Walrus) Islands to Cape Newenham to Kuskokwim Bay, around Nunivak Island to Bethel.

15 April 1972 1025-1610 survey central and northern Bering Sea: Bethel to St. Lawrence Island to King Island to Nome.

16 April 1972 1202-1335 survey Norton Sound.
1335-1606 flight to Anchorage
1805 (Anchorage time)-2240 (Seattle time), arrive Seattle.

Aerial Survey Crew: The following participated in all survey flights:

Don Borchert, Photographer, Institute of Arctic Biology, University of Alaska, Fairbanks, Alaska; Dr. Clyde Jones, Recorder, Bird and Mammal Laboratories, BSFW, U.S. National Museum of Natural History, Washington, D. C.; Karl W. Kenyon, Observer, Marine Mammal Substation, BSFW, Seattle, Wash.; Herman Ruess, Copilot, Aircraft Division, BSFW, Anchorage, Alaska; Karl Schneider, Observer, Alaska Department of Fish and Game, Anchorage, Alaska; and Theron A. Smith, Pilot, Aircraft Supervisor, BSFW, Anchorage, Alaska.

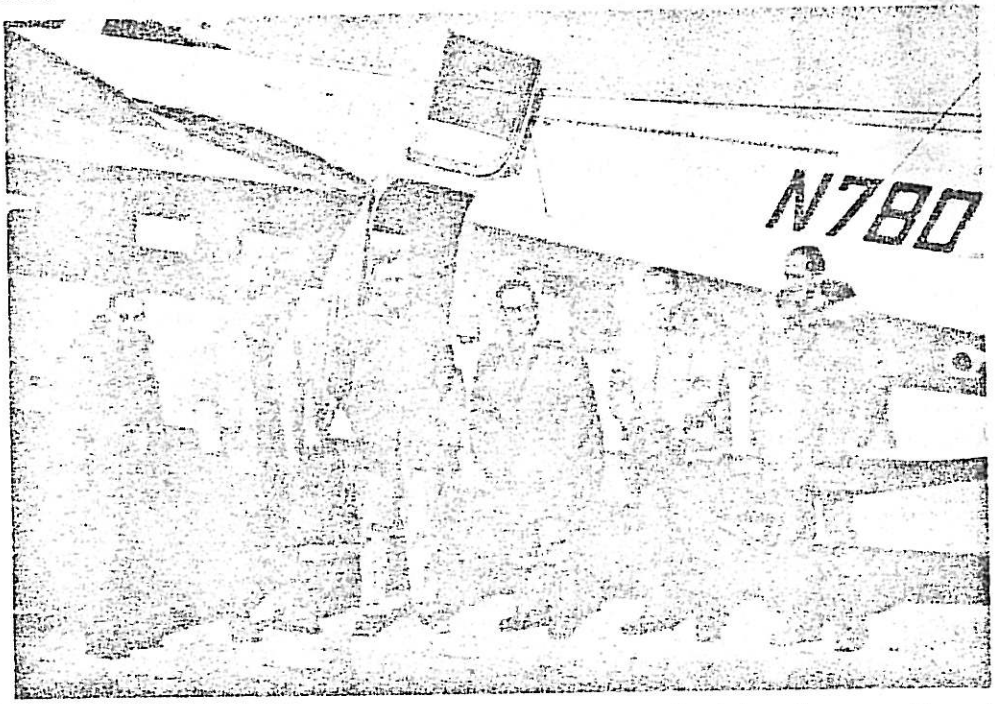



Figure 1.--Survey crew: L. to R.; Ruess, Smith, Jones, Borchert, Kenyon, Schneider. Photo No. KWK 72-5-1.

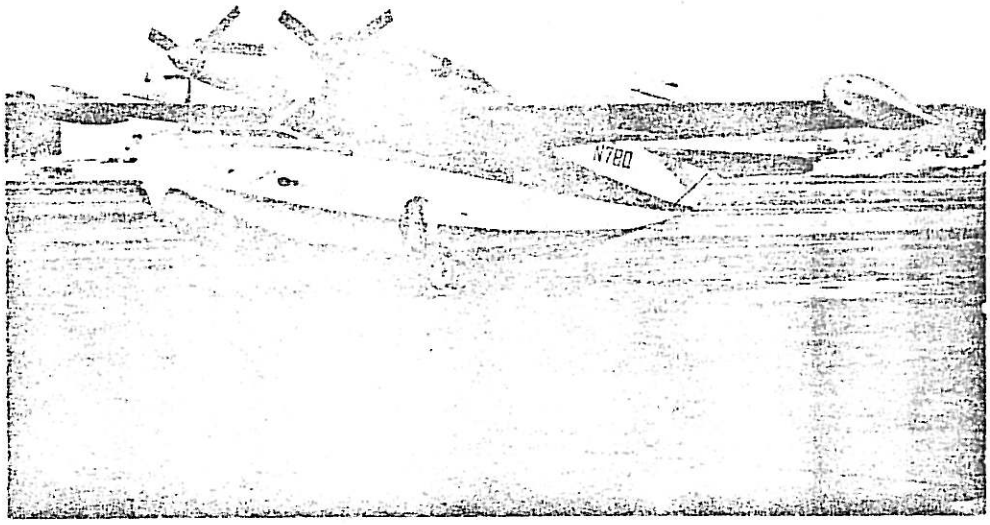



Figure 2. --The turbo conversion or "Super-Goose" aircraft (No. N780). Photo No. CL 72-6-21.

Prior to 1972 all aerial surveys of marine mammals on the Bering Sea ice and in the Aleutian Islands were made from DC-3 aircraft. Although the DC-3 is capable of adequate long-range flight, the facilities for observers in the cockpit are poor. It was necessary for observers to stand behind the pilot and copilot and bend forward to observe ahead and to the side. Observer fatigue and physical discomfort from holding this distorted position for hours on end made these surveys ordeals of endurance.

Because many of the aircraft requirements of the BSFW are unique, Aircraft Supervisor Smith set out in 1968 to design a plane that would fulfill many needs not met by conventional aircraft. He sought advice from many of us who require aircraft for specialized uses. Between 1968 and March of 1972 a Grumman Goose was completely rebuilt under Smith's supervision in the BSFW hangar, Anchorage.

This aircraft was fully certificated by the Federal Aviation Agency in early April 1972, shortly before our survey trip. The features which make this aircraft as nearly perfect as is possible for our work are: (1) Observers' seats are directly behind and slightly higher than those of the pilot and copilot. This feature gives the observers excellent visibility ahead and to each side of the aircraft from a normal sitting position. (2) The extra large windshield (adapted from two bus windshields) and side windows provide an unobstructed view in all directions. (3) The fuel capacity that provides for about 11 hours of flight is excellent for long-range aerial surveys. (4) The turbo-prop engines furnish smooth cruising at 145 knots. This speed--as opposed to 120 knots in the DC3--is highly satisfactory for over ice surveys. (5) The safety factor of having an amphibian-type aircraft for long over-water and over-ice operations is a great improvement over having to do such surveys in a nonamphibious land-type aircraft.

(6) The navigational equipment includes Loran, radio direction finder, and Omni. This equipment is superior to any previously available in a survey aircraft. We were thus able to know our exact geographical position at all times, even though several hundred miles from the nearest U.S. navigation facility or land fix. Theron Smith should be commended for recognizing the need for a specialized aircraft and then building and flying it.

# THE SURVEYS

## Definitions

Flight track. --An imaginary line directly beneath the aircraft when in flight.

Survey strip (or survey track). --This is the 1-mile strip out to 1/2 mile on either side of the flight track. Within this strip, walruses on the ice were easily seen. It was chosen as the area within which to make counts and estimates of all walruses observed. The counts thus give directly the numbers of animals per square mile along the flight track. Walruses outside the strip were also recorded--but in separate listings. In areas where walruses were abundant, some animals outside the survey strip could not be recorded because there was insufficient time to estimate and record all animals simultaneously in view. The width of the survey strip was established by flying over the center of an airstrip that was 1 mile in length. The observers' estimates of those animals "inside" and those "outside" the 1/2-mile strip are admittedly subjective in borderline cases.

Miles. --Nautical miles are used throughout this report. To obtain statute miles, multiply nautical miles by 1.15.

High abundance areas. --Areas in which we recorded from 1.0 to 24.4 walruses per square mile.

Low abundance areas. --Areas in which we recorded less than one walrus per square mile.

Vacant areas. --Large expanses of many miles of ice where no marine mammals were seen.

## Methods

It is fortunate that good weather is required for aerial surveys because it is generally true of marine mammals that they prefer to haul out, where they are most visible, and sun themselves when the weather is clear and calm. In some species, for example the Steller sea lion, the greatest numbers were seen out of water in fair weather in the afternoon (Kenyon and Rice, 1961, J. Mammal. 42(2): 223-234). We thus conducted most of our surveys from midday until mid- or late-afternoon in the hope that the maximum possible number of animals would be seen.

Our procedure during the surveys follows: The two observers sat in the seats close to the large windows directly behind the pilot and copilot. From here we had an unobstructed view directly ahead of the aircraft and in all directions on both sides. Animals that we passed directly over could be seen ahead but were not visible from the side windows.

Each observation and the time to the nearest minute that it was made were entered in a notebook by the recorder who sat between the observers. Data on numbers of animals observed were entered in four columns: inside the 1/2-mile survey strip on each side (total 1 mile) and outside the survey strip on both sides of the aircraft (see Field Records, Appendix 1). We made an effort to enter each group of animals seen rather than mentally combining several small groups before entry in the log, thus preserving data on group size.

Weather

Wind and snow prevented survey operations on 8, 9, and 10 April. During the surveys (7 April and 11 through 16 April) the weather was generally clear. We encountered minor fog patches in several areas. These did not substantially interfere with the surveys but sometimes necessitated minor course changes to avoid further fog interference.

Aerial Photography

Aerial photography has been considered as a means of enumerating all walruses that occur within the survey track. The reasons that this method has not been attempted are: The animals are scattered over a vast area and the volume of photos required, establishing the proper photographic techniques, and obtaining the proper equipment (both aircraft and cameras) would in itself be a major undertaking. Such a project would probably require flight along the transects at fairly high altitude and the use of telephoto lenses to obtain vertical photographs of the survey strip. Presumably the walruses would not be disturbed by a high-flying aircraft, which would be an advantage to this kind of survey. That the survey craft would often be flying above the fairly frequent patches of low stratus clouds would be a disadvantage.

The objective of our small-scale photography was to obtain sample views that might reveal age and sex composition of some of the walrus groups seen. The reasons for a low degree of success in this undertaking were: (1) The animals crowded for the water when we were in photographic range. (2) When the walruses move toward the water, most of them hold their heads bent forward so that the tusks are not visible from above. (3) Where walruses have rested on the ice for a considerable period (as most groups apparently had) the ice

is stained dark muddy brown by their excrement. In photographs, much detail is not distinguishable because the rusty brown walruses do not show up well against the dark background.

Identification of Ages and Sexes

Adult males possess heavier tusks (of greater diameter) than females and are larger. The speed of our survey craft and the fact that, at the nearest, the animals were 500 feet away made it difficult and usually impossible to quantitatively observe characteristics that would separate the sexes. We hoped that by studying photographs we might be able to ascertain to some degree the ages and sexes in sample groups. This technique met with limited success (see Aerial Photography).

I gained the general impression, however, that the large concentrations in the northwestern Bering Sea were composed to a large extent of females with young. Also, that the central Bristol Bay concentration may have been composed primarily of males.

The best information on the distribution of different age and sex classes can probably be obtained from surface observations. During aerial surveys the animals usually stampede into the water as the aircraft approaches and passes over, giving little time for careful observations or even to photograph groups or individual walruses.

Calving

On 15 April 1972, at 1302, and about 120 miles southwest of the west end of St. Lawrence Island we saw a large female walrus alone on a piece of old ice beside an open lead. She was at the edge of a patch of bright red (fresh) blood about 10 feet in diameter. Beside her lay a newly born calf. The calf lay flat on its belly and we did not see if move while we circled to take photographs. The mother, although moving about and making several false starts toward the water, did not plunge in but remained near the calf.

Although other patches of blood were seen on the ice, this was our only observation of a mother and newborn young.

The question is raised: Do parturient females leave the immediate vicinity of other walruses to bear their young in solitude? There were a number of groups in the general vicinity. If young were born to mothers in groups, the observation from the air of blood on the ice would be difficult because of staining of the ice by excrement.

Our observation at least identifies this area southwest of St. Lawrence Island as a calving area.

## Grouping of Walruses

The majority of walruses were seen in groups. Only 104 of the estimated 9,300 walruses that we recorded in the survey strip were singles.

We recorded 330 groups of 9 or fewer animals; 177 groups of 10 or more but less than 100 animals; and 45 groups of more than 100 animals. Among these, the largest group was estimated to number about 1,000 animals.

These data have not been analyzed further because the significance of doing so is not at the moment clear. The data demonstrate, however, that the walrus is a highly gregarious mammal.

## Problems in Making Aerial Surveys of Walruses

Ice conditions.--The ice in the Bering Sea is in constant motion under the influence of air and water currents. Important changes in the geographical distribution of ice and open water can occur within a few hours and, of course, vast changes occur seasonally. Since marine mammal distribution is related to ice conditions and distribution, variable factors of unknown magnitude influence the results when surveys conducted on different days are combined. Because the ice appeared to remain relatively stable and at maximum extent during

the 1972 surveys, we do not consider that ice movements introduced appreciable error in our final results.

Because walruses are large (to 3,000 pounds) and groups or individuals and the excrement-stained patches on which they rest appear dark against the snow-covered expanse that blankets much of the Bering Sea in winter and spring, they are easily seen when they are out of the water. When the weather was clear we estimated that we saw animals to a distance of about 2 miles on either side of the flight track.

When animals are in the water, however, they are difficult to detect. The water in leads appears very dark blue to almost black, so that there is little contrast between the water and the rusty-brown walruses. Most of the animals that were seen in the water were observed very near (probably none more than a quarter of a mile) on either side of the plane's flight track. Thus the 233 animals observed in the water probably represent a small (but unknown) fraction that were in the water within the survey strip.

Accuracy of Counts and Estimates

The estimates of numbers of marine mammals that we recorded are accurate counts only for those animals seen singly or in small numbers.

The recorded observations of walruses are intended to reflect the order of magnitude of the numbers of animals seen. The smaller groups were counted but when several hundred animals were in view simultaneously the number was estimated; it was impossible to count them. However, a separate estimate was recorded for each group of animals seen (Appendix 1). Thus, the records of individuals and small groups when combined with estimates of large groups give the appearance of greater accuracy of the combined total than actually exists.

Because an unknown number of walruses were in the water when the surveys were made, I have arbitrarily chosen a 10% correction factor. At the present time no data are available from which to derive a more accurate correction factor to account for the animals within the survey strip that were not seen because they were in the water. At some future time it is possible that data gathered by surface observers will furnish information on the percentage of animals

expected to be in the water at various times of day and under various weather conditions. Because general observations indicate that a significant number of animals were in the water, the estimated totals should probably be considered as conservative.

The surveys were flown in mid-April 1972 for several reasons: (1) The aircraft was available at that time. (2) The ice is usually at maximum extent in mid-April and thus the majority of walruses would be expected to be south of Bering Strait. That this was the situation was confirmed on 6 April 1972 when I spoke with Mr. James W. Brooks, BSFW, in Anchorage. He had recently returned from field studies of polar bears in the Chukchi Sea. During some hundreds of miles of flight over the ice north of Bering Strait he saw only one lone adult male walrus. Thus, in this report no correction factor is included to account for walruses that might have been in the Chukchi Sea where we did not survey. (3) It was hoped that in some way the aerial surveys might be coordinated with or profit from simultaneous observations obtained by Mr. John J. Burns (ADF&G) and Dr. Carleton Ray (The Johns Hopkins University) who observed walruses from the icebreaker USCGC Burton Island in April. Until now I have been unable to consult with these observers. In the future I plan to discuss the possibility of combining or coordinating our data if this approach seems reasonable.

## High and Low Abundance Areas

When the Bering Sea ice is at maximum extent, as it was during the 1972 surveys, we found two distinct areas of high walrus abundance. One is associated with the western end of St. Lawrence Island and off eastern Siberia and the other is approximately 400 miles to the southeast in central Bristol Bay (see chart 1). In both of these areas the action of winds and currents keep leads open and much heavy old pack ice is present. Water depths in these areas range from 30 to 50 fathoms, indicating that these are satisfactory feeding depths for the bottom-feeding walrus.

Within the areas of high abundance walruses were seen scattered singly, in small groups, or in herds of several hundred to about a thousand animals. In the areas of low abundance, individuals and small groups were widely scattered.

Our five past surveys reveal that the geographical location of areas of high and low abundance are relatively similar each year, but the geographical location of large numbers of walruses within the general areas of abundance varies in accordance with ice conditions. Young ice will not support the weight of numbers of walruses. They generally haul out on heavy compacted floe ice. This ice has been broken and then consolidated by pressures in leads among extensive ice sheets under the influence of winds and currents.

If surveys are made after a period of northerly winds, the heavy old ice may be moved many miles south of St. Lawrence Island and the intervening water covered by young ice. Under these conditions few walruses are found in the young ice area. If, on the other hand, the surveys are made following a period of southerly winds, the heavy pack ice is consolidated directly against and south of St. Lawrence Island and the walruses are concentrated there. A similar change in the geographical location of abundance areas occurs in Bristol Bay but our surveys prior to 1972 have not yielded as much information on the movement or stability of this group.

An example of how ice conditions and numbers of walruses observed in a given area may change drastically within a few days follows: On 11, 12, and 15 April 1972 overlapping but somewhat different sectors were flown west of Nome, north of St. Lawrence Island, and south of Bering Strait (see Chart 1). On 11 and 12 April the ice in this area was, for the most part, closely packed with few open leads and relatively few walruses were seen. In contrast, on 15 April, large areas of open water extended north of St. Lawrence Island off the east Siberian coast and walruses were abundant. Table 4 presents our observations.

A large percentage of the 2,763 walruses seen on 15 April were in the same geographical area (north of St. Lawrence Island) where relatively few were observed on 11 and 12 April.

In areas like the one just discussed, walruses may be scarce or abundant depending on ice conditions and amount of open water. In other areas, however, walruses are scarce or absent regardless of ice conditions or the amount of open water.

As the ice recedes in the spring the majority of walruses move north with it. Only about 2,000 adult males remain into late spring and summer in Togiak Bay, in northeastern Bristol Bay, where they usually haul out on Round Island.

It became evident during our 1972 surveys that, under the prevailing ice conditions, the St. Lawrence and Bristol Bay walrus aggregations were distinct and geographically separated (Chart 1). This raises several questions: (1) Do these two herds retain their separation throughout the year or do they mingle as the ice recedes and spend the summers together in the Arctic Ocean? (2) If this is the case, when do these two groups divide to return to their widely separated winter and spring calving, breeding, and feeding areas? (3) Do these two groups constitute two distinct breeding populations, or is it a manifestation of sexual segregation with mostly females and

young in the northwestern Bering Sea and mostly males in Bristol Bay? The males seen on Round Island later in the spring might indicate that the latter is the case. These questions indicate that we still have much to learn of the natural history of the walrus.

Analysis of Data

To study the areas of walrus distribution and abundance it was necessary to transfer all field observations to a chart to define the geographical locations where they were made. The field record of the time of each observation (see Appendix 1) was used to find the geographical location of the observation on a nautical chart to which all tracks flown were transposed from the aerial chart that was used during the survey flights (see Charts 2 through 9 and Table 5).

The areas of high abundance were encountered abruptly in most cases. Thus, these areas could be delimited on the chart when several flight tracks passed through them on different days and in different geographical locations. Although we made an effort to define these areas of high abundance during the surveys by flying transects through them, it became evident during my study of the data that more tracks through certain areas would be useful.

Computation of Walrus Population Estimates

All computations are based on the number of walruses recorded in the 1-mile wide survey strip. Separate computations were made for the four major areas where walruses were observed. These are defined as the high abundance areas for the St. Lawrence aggregation and the Bristol Bay aggregation and the two low abundance areas surrounding each of them.

Walruses per mile$^2$ were computed from the measured distances along the tracks on the nautical chart in combination with the data in Appendix 1, showing the time that each walrus observation was made These data for each survey day are summarized in tables 6 through 10.

Areas of high abundance and low abundance were defined as previously stated. From tables 6 through 10 the observations of high and low abundance were selected and combined to form tables 11 through 14. It is from these data that chart 1 was drawn to geographically define the areas of high and low abundance and absence of walruses.

From the nautical charts approximate geographical area measurements were derived (see Appendix 2) and using the data from tables 11 through 14 the following calculations were made directly:

| | Area $mi^2$ | Walrus/$mi^2$ | Total |
|---|---|---|---|
| St. Lawrence high concentration | 6,000 | 9.88 | 59,280 |
| St. Lawrence low concentration | 60,000 | 0.237 | 14,220 |
| Bristol Bay high concentration | 1,500 | 22.94 | 34,410 |
| Bristol Bay low concentration | 36,000 | 0.437 | 15,732 |
| Total | 103,500 | | 123,642 |

Statistical Evaluation of Walrus Survey Data

Under the direction of Dr. Douglas G. Chapman, Dean, School of Fisheries, University of Washington, Mr. Nelson Ehrhardt, a graduate student in biometric studies, subjected our data to statistical treatment. The results of this work are:

1. Variance of walrus/$mi^2$ for tables 11, 12, 13, and 14.

$$s_{11}^2 = 71.084;\ s_{12}^2 = 0.133;\ s_{13}^2 = 48.475;\ s_{14}^2 = 0.104$$

2. Estimated number of walrus.

$$\hat{N}\text{o. of walrus} = (6000)(9.88) + (60,000)(0.237) + (1500)(22.94) + (36,000)(0.437) = 123,642$$

3. Variance of estimated number of walrus.

$$\text{Var } \hat{N}\text{o. of walrus} = (6000)^2 s_{11}^2/10 + (60,000)^2 s_{12}^2/11 + (1500)^2 s_{13}^2/2 + (36,000)^2 s_{14}^2/7 = 371,765,250$$

4. S. D. $\hat{N}\text{o.} = \sqrt{\text{Var } \hat{N}\text{o.}} = 19,281.21$

If a range for the total number of walruses, as indicated by the statistical treatment, is desired then 123,642 $\pm$ (19,281.21 x 2) = 123,642 $\pm$ 38,562, or rounded to the nearest thousand 85,000 to 162,000 walruses.

From this, if a single figure is desired the 123,642 should be rounded to 124,000. If a correction factor is used for the unknown number of walruses missed because they were in the water, we might guess that 10% would be conservative. Thus, our estimate becomes about 136,000 Pacific walruses, range 93,000 to 178,000.

At any rate, we can conclude that the walrus is an abundant species.

## Recommendations for Future Surveys

1. A survey should be flown in the mid-May to early June period when the extent of ice in the Bering Sea is greatly reduced. This might, as previous surveys indicated, have the effect of concentrating the walruses in smaller areas, so that more transects could be flown through the areas where walruses are concentrated in less flight time. Thus, areas of abundance could be more accurately determined in order to compute and treat statistically the total population estimates.

One disadvantage to a survey later in the spring is that a substantial part of the walrus population would have moved with the retreating ice into the Chukchi Sea. Perhaps, however, these animals would also be concentrated there and could be successfully surveyed. Thus, considerable knowledge not now available on distribution could be gained.

2. Cooperation with Soviet marine mammalogists should be sought. This would be particularly useful if a survey is made after walruses have moved from the Bering into the Chukchi Sea. A substantial number habitually enter waters near the Siberian coast and haul out on Soviet lands such as Wrangel Island. Thus, either permission to fly over such areas should be obtained in advance or a Soviet biologist invited to accompany the survey.

Chart 1: Abundance and distribution of walruses in the Bering Sea in mid-April 1972. The areas of "high abundance" and "low abundance" are superimposed on the geographical tracks that were covered on the 7-16 April 1972 aerial surveys. Large, semi-permanent leads or polynya varied in size from day to day are not shown on the map. The principal areas of large leads (polynya) are: along the eastern Siberian coast; south and north of St. Lawrence Island; south of Nunivak Island, and in the vicinity of the Walrus Islands in Togiak Bay.

No walruses were seen in the blank areas of central, eastern, and northeastern Bering Sea.

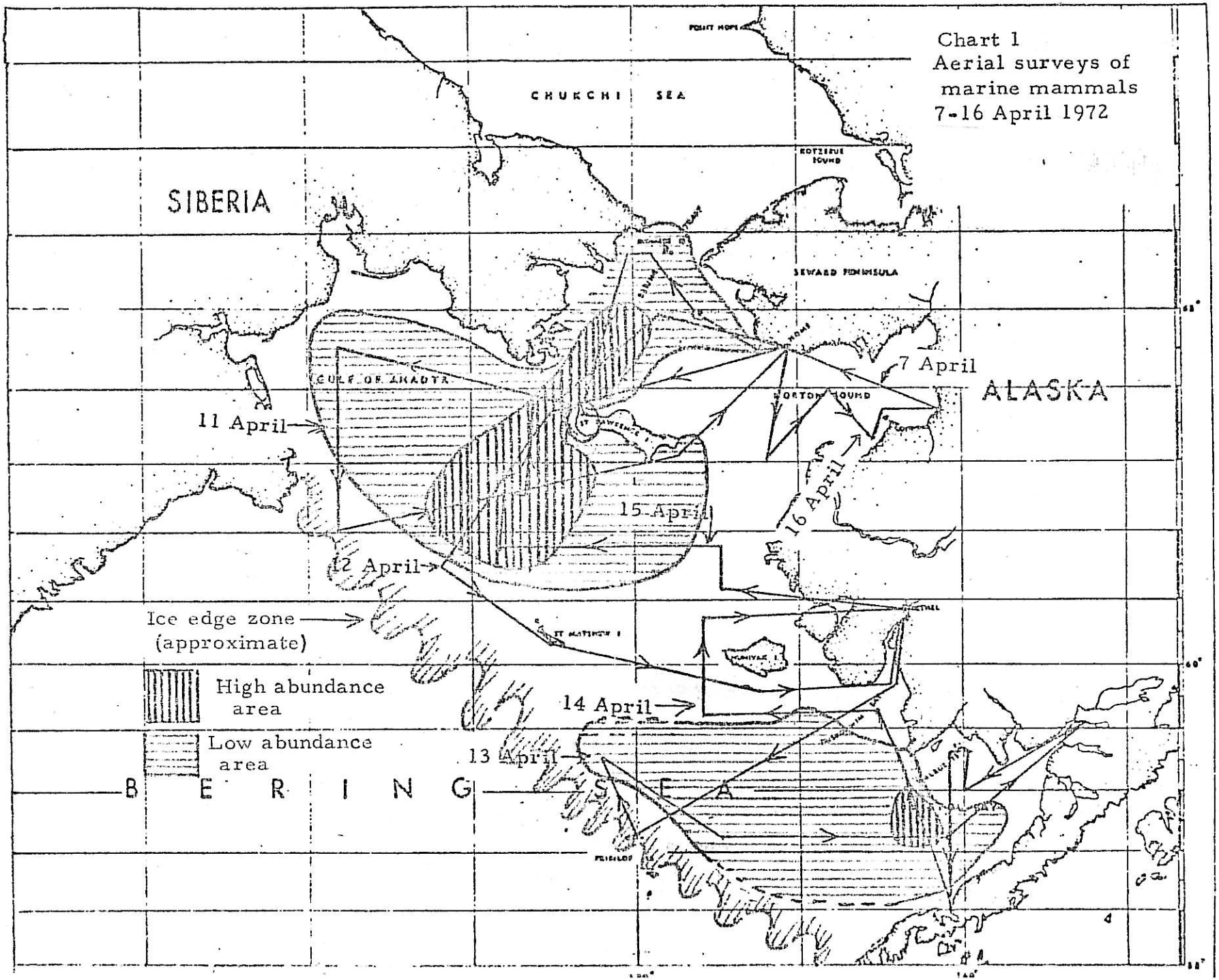


Chart 1
Aerial surveys of
marine mammals
7-16 April 1972
CHUKCHI SEA
SIBERIA
SEWARD PENINSULA
ALASKA
7 April
11 April
15 April
16 April
12 April
14 April
13 April
Ice edge zone
(approximate)
High abundance
area
Low abundance
area
B E R I N G S E A

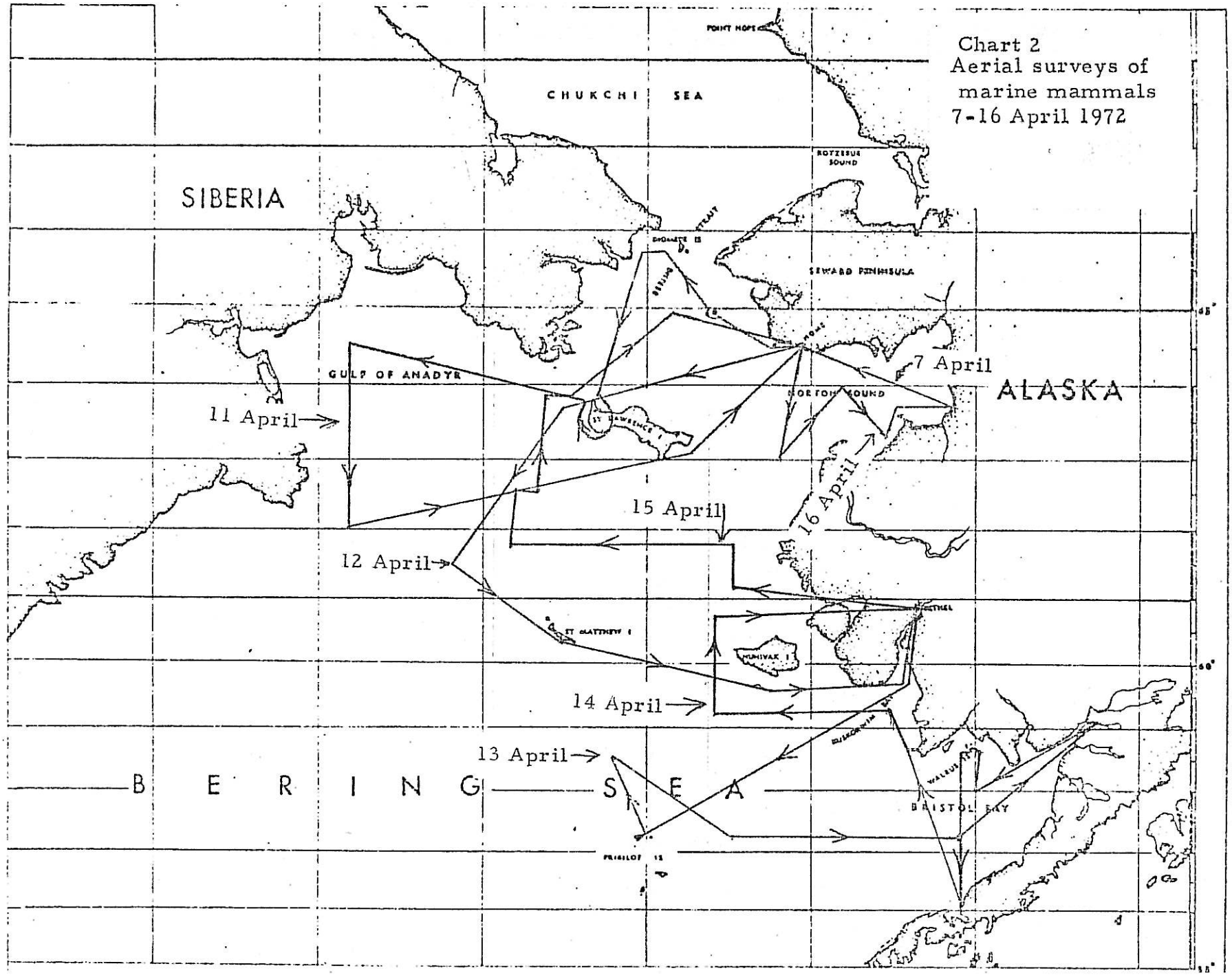


Chart 2
Aerial surveys of
marine mammals
7-16 April 1972
CHUKCHI SEA
SIBERIA
POINT HOPE
KOTZEBUE SOUND
SEWARD PENINSULA
BERING STRAIT
DIOMEDE IS.
GULF OF ANADYR
ALASKA
NORTON SOUND
ST. LAWRENCE I.
ST. MATTHEW I.
HOOPER BAY
WALRUS IS.
BRISTOL BAY
PRIBILOF IS.
7 April
11 April
12 April
13 April
14 April
15 April
16 April
B E R I N G S E A

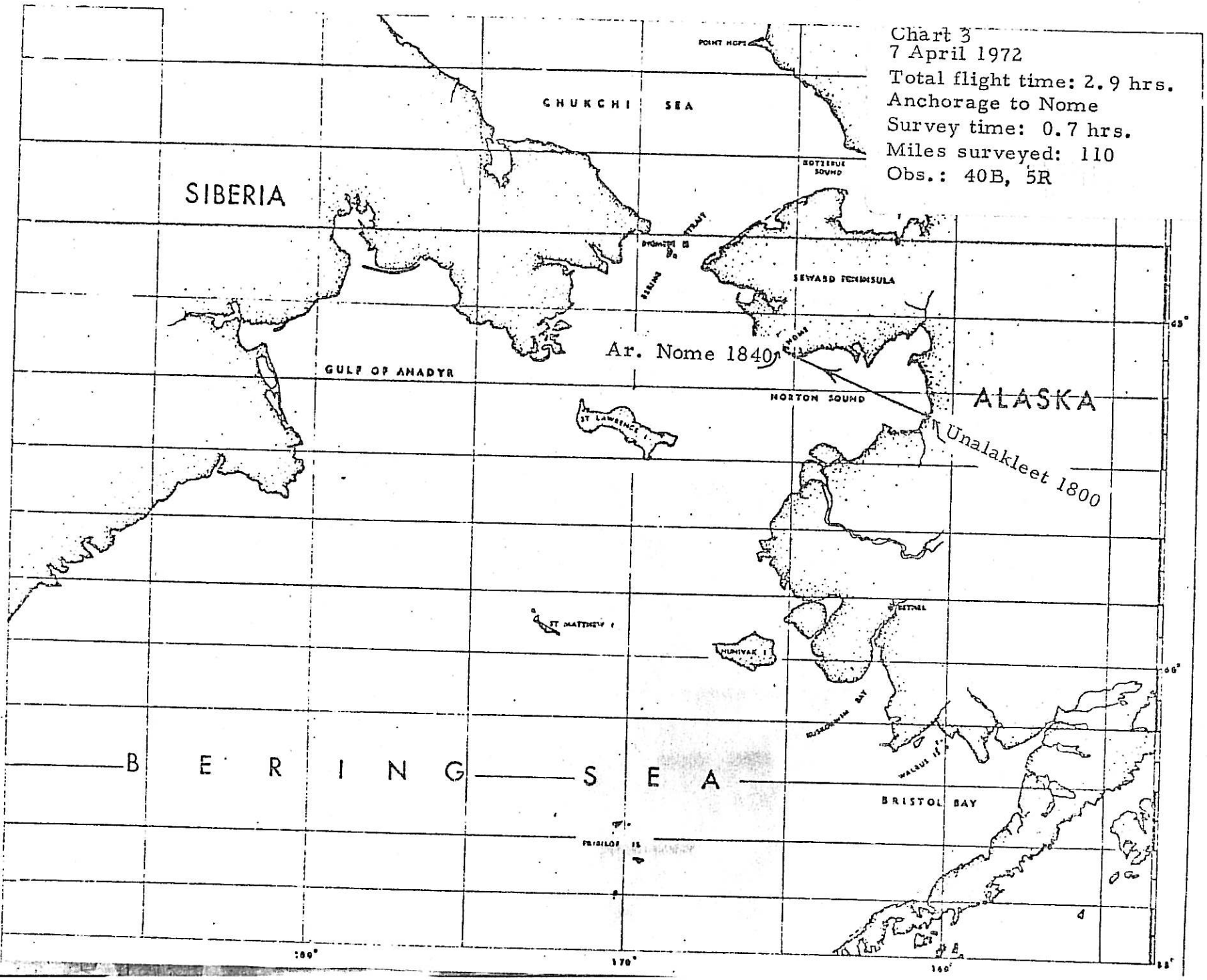


Chart 3
7 April 1972
Total flight time: 2.9 hrs.
Anchorage to Nome
Survey time: 0.7 hrs.
Miles surveyed: 110
Obs.: 40B, 5R
CHUKCHI SEA
SIBERIA
SEWARD PENINSULA
Ar. Nome 1840
GULF OF ANADYR
NORTON SOUND
ALASKA
Unalakleet 1800
ST LAWRENCE I
ST MATTHEW I
NUNIVAK I
BERING SEA
BRISTOL BAY
PRIBILOF IS
180°
170°
160°

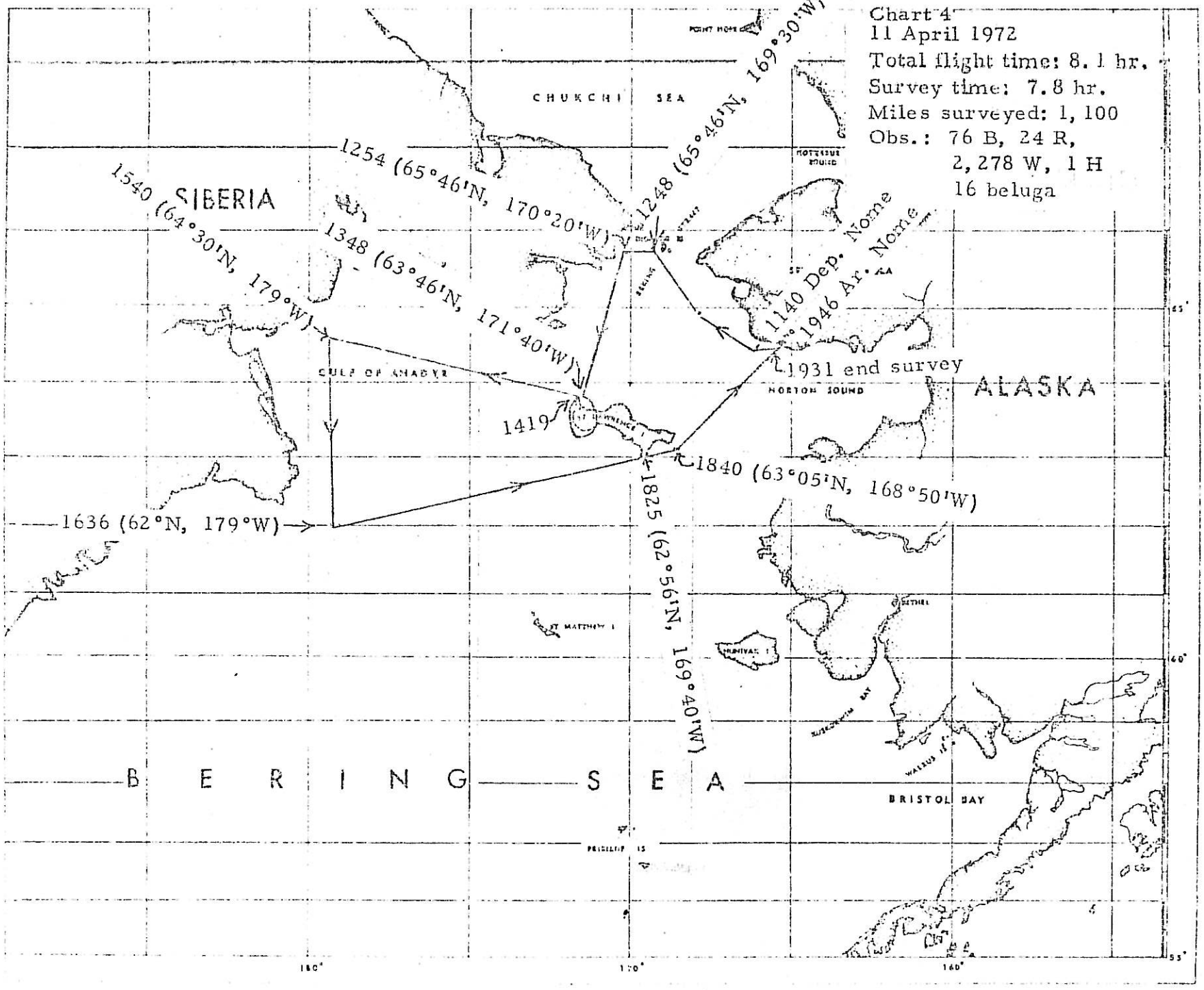


Chart 4
11 April 1972
Total flight time: 8.1 hr.
Survey time: 7.8 hr.
Miles surveyed: 1,100
Obs.: 76 B, 24 R,
2,278 W, 1 H
16 beluga
CHUKCHI SEA
SIBERIA
1254 (65°46'N, 170°20'W)
1248 (65°46'N, 169°30'W)
1540 (64°30'N, 179°W)
1348 (63°46'N, 171°40'W)
1140 Dep. Nome
1946 Ar. Nome
1931 end survey
ALASKA
GULF OF ANADYR
NORTON SOUND
1419
1840 (63°05'N, 168°50'W)
1636 (62°N, 179°W)
1825 (62°56'N, 169°40'W)
BERING SEA
BRISTOL BAY
180°
170°
160°

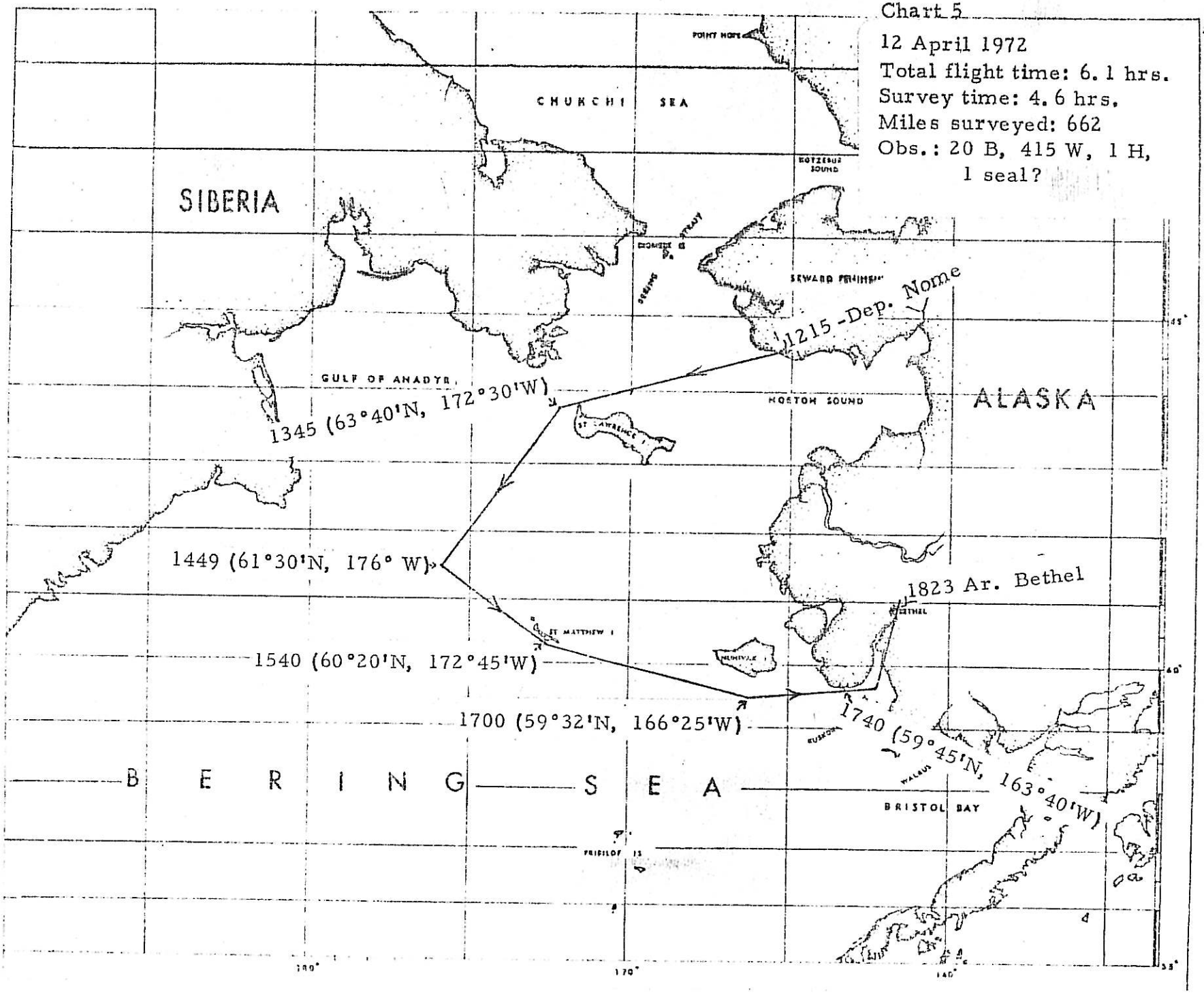


Chart 5
12 April 1972
Total flight time: 6.1 hrs.
Survey time: 4.6 hrs.
Miles surveyed: 662
Obs.: 20 B, 415 W, 1 H,
1 seal?
CHUKCHI SEA
POINT HOPE
KOTZEBUE SOUND
SIBERIA
SEWARD PENINSULA
1215 - Dep. Nome
GULF OF ANADYR
1345 (63°40'N, 172°30'W)
NORTON SOUND
ALASKA
ST LAWRENCE I
1449 (61°30'N, 176° W)
1823 Ar. Bethel
BETHEL
ST MATTHEW I
NUNIVAK I
1540 (60°20'N, 172°45'W)
1700 (59°32'N, 166°25'W)
1740 (59°45'N, 163°40'W)
KUSKOKWIM
WALRUS
BERING SEA
BRISTOL BAY
PRIBILOF IS
180°
170°
160°

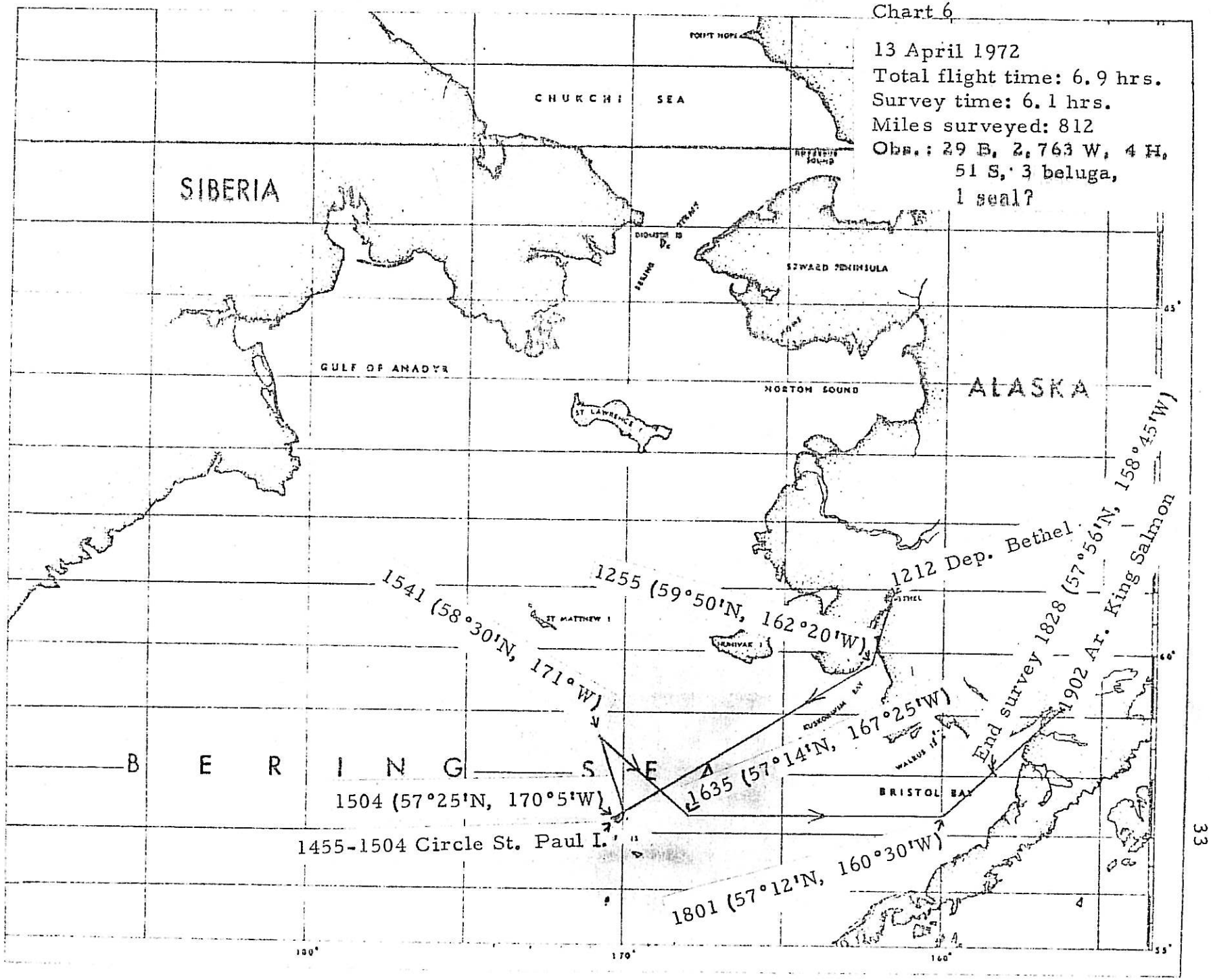
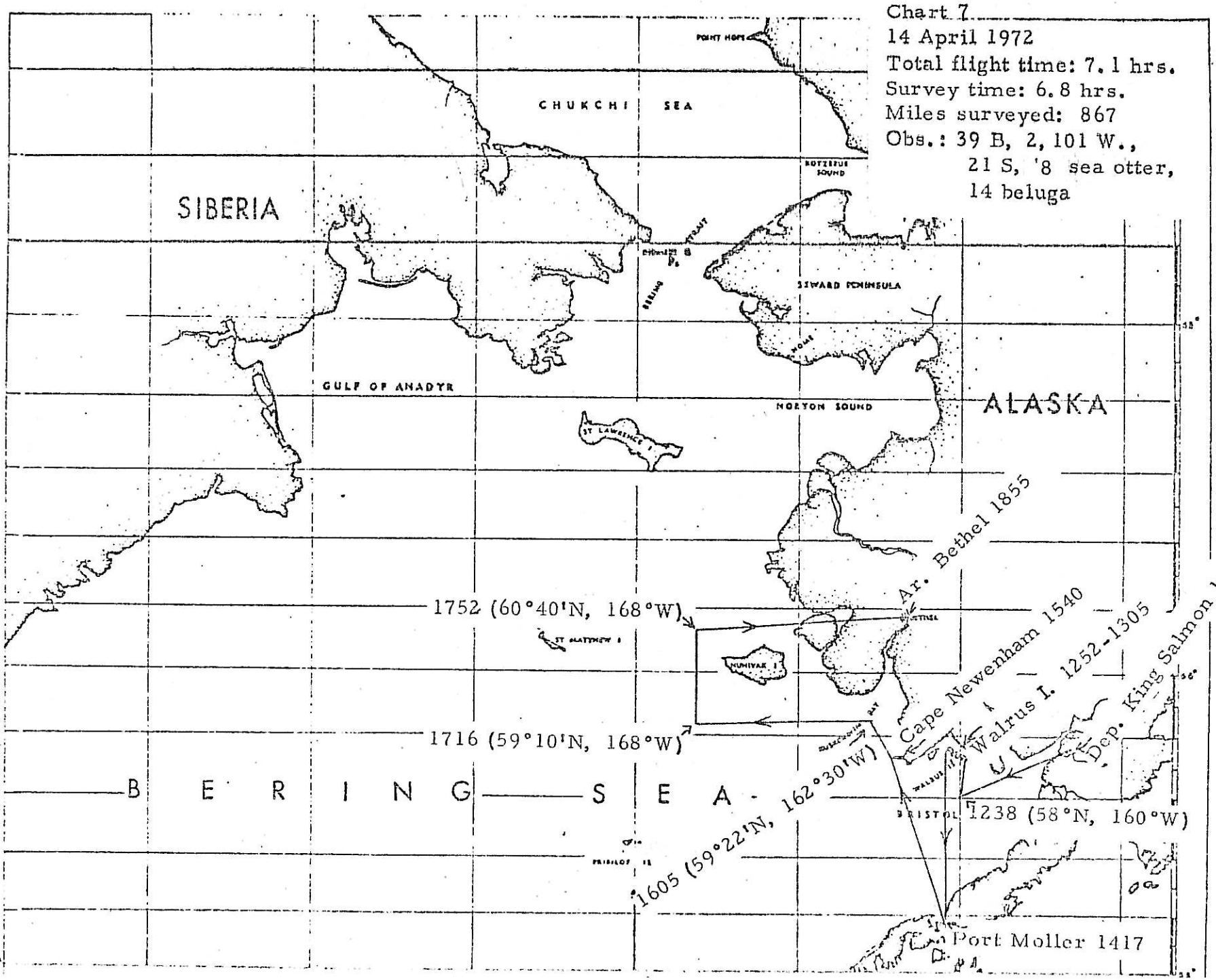


Chart 6
13 April 1972
Total flight time: 6.9 hrs.
Survey time: 6.1 hrs.
Miles surveyed: 812
Obs.: 29 B, 2, 763 W, 4 H,
51 S, 3 beluga,
1 seal?
CHUKCHI SEA
SIBERIA
SEWARD PENINSULA
GULF OF ANADYR
NORTON SOUND
ALASKA
ST LAWRENCE I.
ST MATTHEW I.
BERING SEA
BRISTOL BAY
1212 Dep. Bethel
1255 (59°50'N, 162°20'W)
1541 (58°30'N, 171°W)
1504 (57°25'N, 170°5'W)
1455-1504 Circle St. Paul I.
1635 (57°14'N, 167°25'W)
End survey 1828 (57°56'N, 158°45'W)
1902 Ar. King Salmon
1801 (57°12'N, 160°30'W)
180°
170°
160°
55°
65°




NATIONAL MARINE MAMMAL LABORATORY, NWAFC
7600 SAND POINT WAY N.E., BUILDING 32
SEATTLE, WASHINGTON 98115

Chart 8

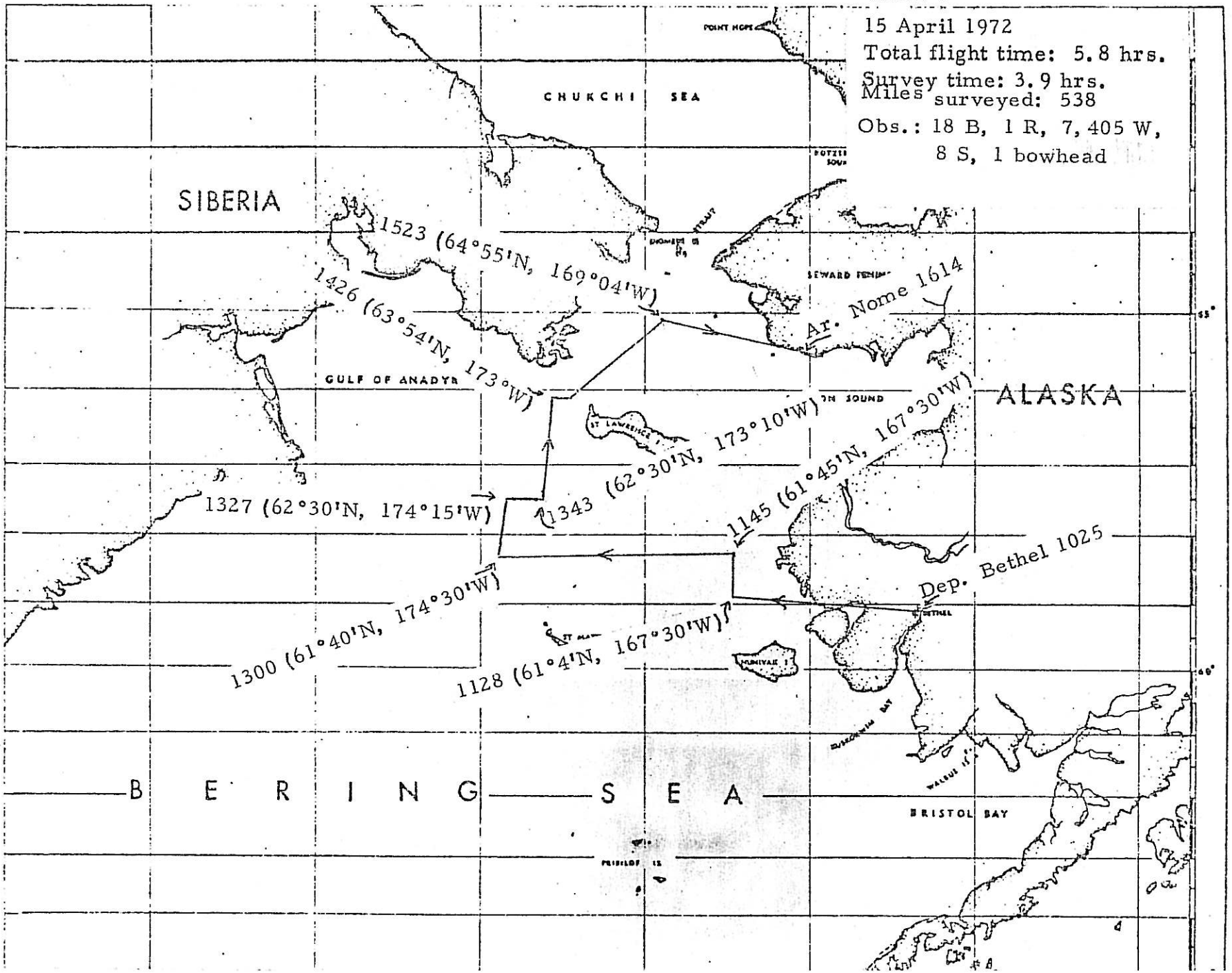
15 April 1972

Total flight time: 5.8 hrs.

Survey time: 3.9 hrs.

Miles surveyed: 538

Obs.: 18 B, 1 R, 7, 405 W, 8 S, 1 bowhead



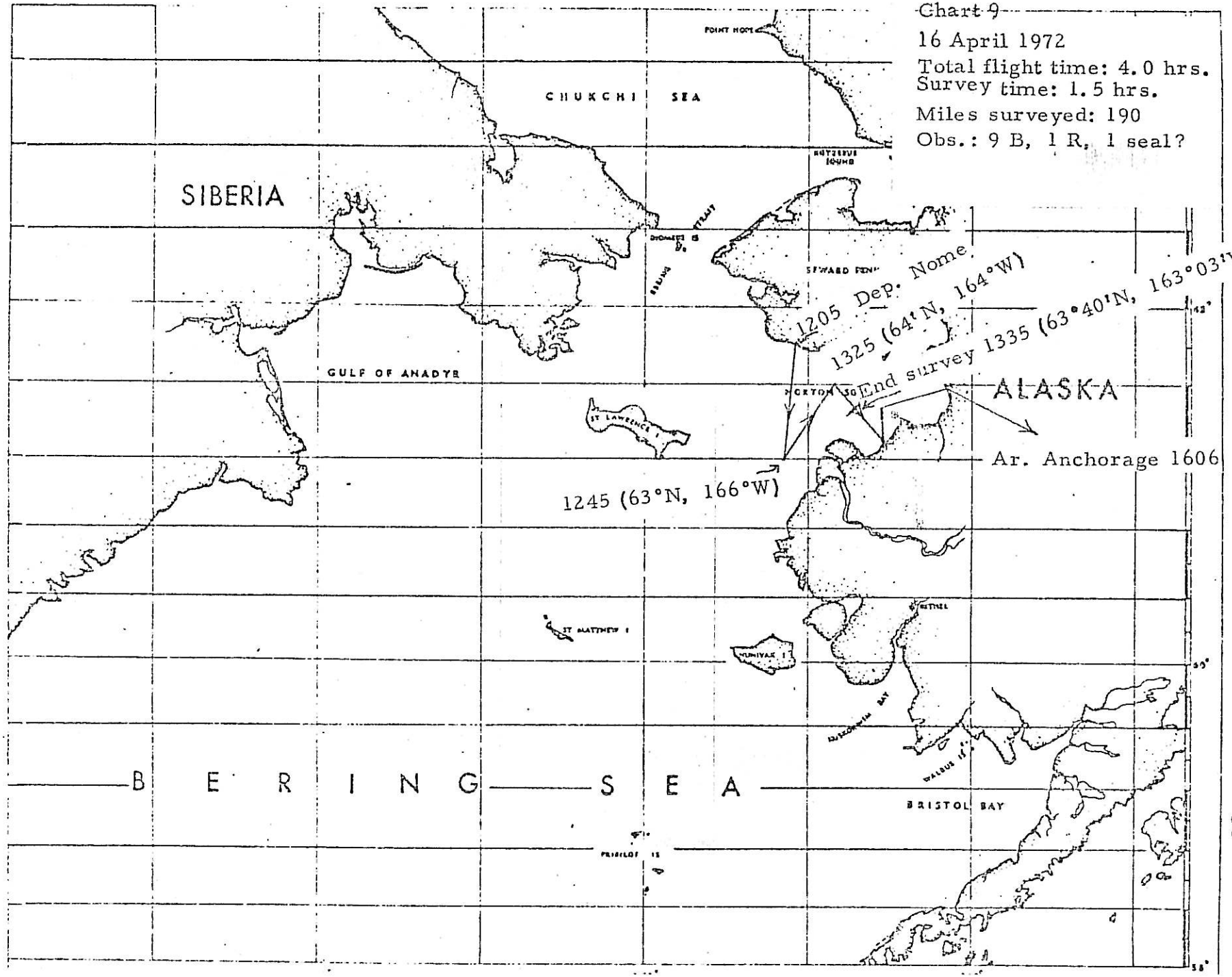


Chart 9
16 April 1972
Total flight time: 4.0 hrs.
Survey time: 1.5 hrs.
Miles surveyed: 190
Obs.: 9 B, 1 R, 1 seal?
CHUKCHI SEA
SIBERIA
GULF OF ANADYR
ST LAWRENCE I
ST MATTHEW I
PRIBILOF IS
BERING SEA
ALASKA
BRISTOL BAY
1205 Dep. Nome
1325 (64°N, 164°W)
End survey 1335 (63°40'N, 163°03'W)
1245 (63°N, 166°W)
Ar. Anchorage 1606

Table 1.--Aerial surveys of walruses, 1960-72

| Dates | Flt. hrs. (total) | Seen in 1-mi. strip | Total recorded | Total estimate |
|---|---|---|---|---|
| 23 Feb.-2 Mar. 1960 | 31.7 | 3,914 | 4,382 | 78,000-117,000 |
| 23-30 April 1960 | 33.3 | 3,323 | 5,223 | 73,000-110,000 |
| 20-30 March 1961 | 61.3 | 4,929 | 5,475 | Same |
| 16-23 April 1968 | 37.5 | 4,666 | 8,547[1/] | Same |
| 7-16 April 1972 | 40.9 | 9,299 | 14,963 | 85,000-162,000 |

1/ In a preliminary statement announcing our survey it was reported that we saw about 9,000 walruses during our operation.

Table 2.--Marine mammals observed in a 1-mile survey strip, Bering Sea, 7-16 April 1972

| Species | Number recorded |
|---|---|
| Sea otter (Enhydra lutris) | 8 |
| Walrus (Odobenus rosmarus divergens) | 9,300 |
| Largha seal (Phoca largha) | 79 |
| Ringed seal (Pusa hispida) | 29 |
| Ribbon seal (Histriophoca fasciata) | 6 |
| Bearded seal (Erignathus barbatus) | 221 |
| Bowhead whale (Balaena mysticetus) | 1 |
| Beluga (Delphinapterus leucas) | 33 |
| Total | 9,677 |

Table 3.--Summary aerial survey of walruses and bearded seals, Bering Sea, 7-16 April 1972
(Nome time throughout)

| Date | Total flight time (hrs.) | Survey time | Miles surveyed (nautical) | Walruses observed | | | Bearded seals observed | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | In 1-mi. survey strip | Outside 1-mi. survey strip | Total | In 1/2-mi. track | Outside 1/2-mi. track | Total |
| 7 April | 2.9 | 0.7 | 110 | - | - | - | 40 | - | 40 |
| 11 April | 8.1 | 7.8 | 1,100 | 1,664 | 615 | 2,279 | 74 | 2 | 76 |
| 12 April | 6.1 | 4.6 | 662 | 285 | 129 | 415 | 20 | - | 20 |
| 13 April | 6.9 | 6.1 | 812 | 1,101 | 1,662 | 2,763 | 30 | - | 30 |
| 14 April | 7.1 | 6.8 | 867 | 1,944 | 157 | 2,101 | 39 | - | 39 |
| 15 April | 5.8 | 3.9 | 538 | 4,305 | 3,100 | 7,405 | 16 | 2 | 18 |
| 16 April | 4.0 | 1.5 | 190 | - | - | - | 9 | - | 9 |
| Total | 40.9 | 31.4 | 4,279 | 9,299 | 5,663 | 14,963 | 228 | 4 | 232 |

Table 4.--Comparison of numbers of walruses recorded in one survey area in the northern Bering Sea on 3 days[1/]

| Date 1972 | Time of day on sectors (Nome time) | Time in area (hours) | Miles flown | Walruses in 1-mile sector | Walrus/mi.$^2$ |
|---|---|---|---|---|---|
| 11 April[2/] | 1148-1348 | 2.0 | 260 | 176 | 0.68 |
| 12 April | 1215-1345 | 1.5 | 190 | 17 | 0.084 |
| 15 April | 1426-1523 | 1.0 | 120 | 2,719 | 22.6 |

1/ Discrepancies in miles flown per hour are caused by winds and because we circled for photographs on 15 April. To account for this, about 10 to 15 miles could be added to the mileage for this flight but this would not affect the overall results.

2. From 1159 to 1215 we went through fog patches and thus discontinued our regular survey. Glimpses through the fog, however, indicated that we probably did not miss a significant number of walruses.

Table 5. --Aerial survey, April 1972--geographical fixes

| Date | Time | N. lat. | W. long. | Miles on leg | Geog. fix |
|---|---|---|---|---|---|
| | | | Norton Sound | | |
| 7 April | 1759 | 63°53' | 160°45' | | Unalakleet |
| | 1840 | 64°30' | 165°20' | 110 | Nome |
| | | | Bering Sea | | |
| 11 April | 1140 | 64°30' | 165°20' | | Nome |
| | 1148 | 64°28' | 166°16' | 20 | Sledge I. |
| | 1215 | 65° | 168° | 55 | King I. |
| | 1247 | 65°46' | 169°30' | 60 | 10 mi. W of Big Diomede |
| | 1254 | 65°46' | 170°20' | 22 | 6 mi. E of Siberia |
| | 1348 | 63°46' | 171°40' | 124 | Gambell-St. Lawrence I. |
| | 1400-1416 | | | 65 | Circle west end of St. Lawrence I. |
| | 1419 | 63°46' | 171°40' | | Dep. Gambell |
| | 1540 | 64°30' | 179° | 192 | Gulf of Anadyr-near cent |
| | 1636 | 62° | 179° | 150 | 53 mi. SE Cape Navarin |
| | 1825 | 62°56' | 169°40' | 266 | SE Cape St. Lawrence I. |
| | 1840 | 63°05' | 168°50' | 26 | Punic I. St. Lawrence I. |
| | 1931 | 64°30' | 165°20' | 120 | Nome |
| Total survey miles: 1,100<br>Total survey time: 7 hr. 50 min. = 7.8 hrs.<br>Total flight time: 8.1 hr. | | | | | |
| 12 April | 1215 | 64°30' | 165°20' | | Nome |
| | 1345 | 63°40' | 172°30' | 190 | 20 mi. SW of Gambell |
| | 1449 | 61°30' | 176° | 160 | 120 mi. NW St. Matthew (center of I.) |
| | 1540 | 60°20' | 172°45' | 120 | St. Matthew I. |
| | 1700 | 59°32' | 166°25' | 192 | 18 mi. S of Nunivak I. (center of I.) |
| | 1740 | 59°45' | 163°40' | 90 | Mouth of Kuskokwim Bay |
| | 1823 | 60°48' | 162° | | Ar. Bethel |
| Total survey miles: 662<br>Total survey time: 4 hr. 25 min. = 4.4 hr.<br>Total flight time: 6.1 hr. | | | | | |

Table 5.--Aerial survey, April 1972--geographical fixes (Con.)

| Date | Time | N. lat. | W. long. | Miles on leg | Geog. fix |
|---|---|---|---|---|---|
| | | | Bering Sea | | |
| 13 April | 1214 | 60°48' | 162° | | Dep. Bethel |
| | 1255 | 59°50' | 162°20' | | Edge of sea ice Kuskokwi Bay |
| | 1455 | 57°25' | 170°05' | 290 | St. Paul I. (1454-1504) |
| | 1504 | 57°25' | 170°05' | | Leave St. Paul I. |
| | 1541 | 58°30' | 171° | 80 | NW of St. Paul I. |
| | 1635 | 57°14' | 167°25' | 140 | 90 mi. E St. Paul I. |
| | 1801 | 57°12' | 160°30' | 232 | 70 mi. N Port Moller |
| | 1828 | 57°56' | 158°45' | 70 | Central Bristol Bay, fog and dark, terminate survey |
| | 1904 | 58°44' | 156°40' | | Ar. King Salmon |
| Total survey miles: 812 | | | | | |
| Total miles covered: 145 kts. x 6.9 hrs. = 1,000 | | | | | |
| Total survey time: 6 hr. 5 min. = 6.1 hr. | | | | | |
| Total flight time: 6.9 hr. | | | | | |
| 14 April | 1150 | 58°44' | 156°40' | | Dep. King Salmon |
| | 1209 | 58°30' | 158° | | Over pack ice, head of Bristol Bay begin survey |
| | 1238 | 58° | 160° | 68 | NE central Bristol Bay |
| | 1252 | 58°40' | 159°50' | 38 | Ar. Walrus (Togiak) I. survey Round, Crooked, and High Is. |
| | 1305 | 58°46' | 160°30' | 22 | Dep. Togiak I. |
| | 1408 | 56° | 160°30' | 165 | Alaska Peninsula, E sho Pt. Moller |
| | 1417 | 56° | 160°30' | | (Over shore) Dep. Alaska Peninsula, near Pt. Mol |
| | 1454 | 57°14' | 161°45' | 85 | Central Bristol Bay |
| | 1540 | 58°40' | 162°10' | 100 | Cape Newenham |
| | 1605 | 59°22' | 162°30' | 45 | Lower Kuskokwim Bay |
| | 1716 | 59°10' | 168° | 168 | 60 mi. SW Nunivak I. |
| | 1752 | 60°40' | 168° | 90 | 32 mi. NW Nunivak I. |
| | 1815 | 60°45' | 165° | 86 | Off Hazen Bay, Nelson I. terminate survey |
| | 1855 | 60°45' | 162° | | Ar. Bethel |
| Total survey miles: 867 | | | | | |
| Total survey time: 6 hr. 46 min. = 6.8 hr. | | | | | |
| Total flight time: 7.1 hr. | | | | | |

Table 5.--Aerial survey, April 1972--geographical fixes (Con.)

| Date | Time | N. lat. | W. long | Miles on leg | Geog. fix |
|---|---|---|---|---|---|
| | | | Bering Sea | | |
| 15 April | 1025 | 60°45' | 162° | | Dep. Bethel |
| | 1128 | 61°04' | 167°30' | | Over ice, fog, no survey |
| | 1142 | 61°40' | 167°30' | | Begin survey, out of fog |
| | 1145 | 61°45' | 167°30' | 12 | 155 mi. N Cape Mohican, Nunivak I. |
| | 1300 | 61°40' | 174°30' | 200 | 70 mi. NW Hall I. |
| | 1327 | 62°30' | 174°15' | 53 | 102 mi. SW Gambell, St. Lawrence I. |
| | 1343 | 62°30' | 173°10' | 30 | 75 mi. SSW Gambell, St. Lawrence I. |
| | 1401 | 63°14' | 173°10' | 40 | Fog, climb, next 40 mi. this leg no survey |
| | 1417 | | | | W. St. Lawrence I, still partial fog, no survey |
| | 1426 | 63°54' | 173° | | 36 mi. NW Gambell, beg: survey |
| | 1429 | 63°54' | 172°40' | 10 | |
| | 1512 | 64°40' | 170°30' | | 40 mi. E Kayne I. circle for photos |
| | 1523 | 64°55' | 169°04' | 103 | |
| | 1600 | 64°36' | 164°15' | 90 | Pass Sledge I., terminat survey |
| | 1614 | 64°30' | 165°20' | | Ar. Nome |
| Total survey miles: 538 | | | | | |
| Total survey time: 3.9 hr. | | | | | |
| Total flight time: 5.6 hr. | | | | | |
| 16 April | 1205 | 64°30' | 165°20' | | Dep. Nome to survey Norton Sound |
| | 1245 | 63° | 166° | 90 | 45 mi. W Kwikpak, mouth Norton Sound |
| | 1325 | 64° | 164° | 80 | Center of Norton Sound |
| | 1335 | 63°40' | 163°30' | 20 | 30 mi. NW Stuart I. terminate survey, fog. |
| | 1606 | | | | Ar. Anchorage |
| Total survey miles: 190 | | | | | |
| Total survey time: 1 hr. 30 min. = 1.5 hr. | | | | | |
| Total flight time: 4.0 hr. | | | | | |

Table 6.--Walruses observed in 1-mile track broken down to subsegments according to abundance, 11 April 1972

| Primary sectors | | | | | Subsectors | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Time | | Elapsed time | Miles on | Miles per | Time | | Elapsed time | Miles on | Number of | Walrus/ |
| From | To | (min.) | leg | min. | From | To | (min.) | leg | walrus | mile$^2$ |
| 1148 | 1215 | 27 | 54 | 2.0 | | | | | | |
| | | | | | 1148 | 1159 | 11 | 22 | 3 | 0.27 |
| | | | | | 1159 | 1215 | 16 | 32 | fog | |
| 1215 | 1247 | 22 | 55 | 2.5 | No subsect. | | 22 | 55 | 0 | 0 |
| 1247 | 1254 | 7 | 20 | 3.3 | No subsect. | | 7 | 20 | 1 | 0.05 |
| 1254 | 1348 | 54 | 120 | 2.2 | | | | | | |
| | | | | | 1254 | 1311 | 17 | 37 | 0 | 0 |
| | | | | | 1311 | 1348 | 37 | 81 | 173 | 2.13 |
| 1348 | 1419 | 31 | 65 | | No subsect. | | 31 | 65 | 0 | 0 |
| 1419 | 1540 | 91 | 200 | 2.2 | No subsect. | | 91 | 200 | 77 | 0.35 |
| 1540 | 1636 | 56 | 150 | 2.7 | No subsect. | | 56 | 150 | 3 | 0.02 |
| 1636 | 1825 | 108 | 250 | 2.3 | | | | | | |
| | | | | | 1636 | 1700 | 24 | 55 | 0 | 0 |
| | | | | | 1700 | 1730 | 30 | 69 | 345 | 5.0 |
| | | | | | 1730 | 1800 | 30 | 69 | 948 | 13.7 |
| | | | | | 1800 | 1825 | 25 | 58 | 56 | 0.97 |
| 1825 | 1840 | 15 | 25 | | No subsect. | | 15 | 25 | 23 | 0.92 |
| 1840 | 1931 | 51 | 120 | 2.4 | | | | | | |
| | | | | | 1840 | 1850 | 10 | 24 | 35 | 1.5 |
| | | | | | [1850 terminated survey] | | | | | |
| | | | | | 1850 | 1931 | 41 | 96 | 0 | 0 |
| Total | | | | | | | | | 1,664 | |

Table 7.--Walruses observed in 1-mile track broken down to subsegments according to abundance, 12 April 1972

| Primary sectors | | | | | Subsectors | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Time | | Elapsed time | Miles on | Miles per | Time | | Elapsed time | Miles on | Number of | Walrus/ |
| From | To | (min.) | leg | min. | From | To | (min.) | leg | walrus | mile$^2$ |
| 1215 | 1345 | 90 | 185 | 2.05 | | | | | | |
| | | | | | 1215 | 1307 | 52 | 105 | 0 | 0 |
| | | | | | 1307 | 1345 | 38 | 78 | 16 | 0.20 |
| 1345 | 1449 | 64 | 160 | 2.5 | | | | | | |
| | | | | | 1345 | 1405 | 20 | 50 | 252 | 5.04 |
| | | | | | 1405 | 1449 | 44 | 110 | 17 | 0.31 |
| 1449 | 1540 | 51 | 120 | | No subsect. | | 51 | 120 | 0 | |
| 1540 | 1700 | 80 | 190 | | No. subsect. | | 80 | 190 | 0 | |
| 1700 | 1740 | 40 | 95 | | No subsect. | | 40 | 95 | 0 | |
| Total | | | | | | | | | 285 | |

Table 8.--Walruses observed in 1-mile track broken down to subsegments according to abundance, 13 April 1972

| Primary sectors | | | | | Subsectors | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Time | | Elapsed time | Miles on | Miles per | Time | | Elapsed time | Miles on | Number of | Walrus/ |
| From | To | (min.) | leg | min. | From | To | (min.) | leg | walrus | mile$^2$ |
| 1239 | 1454 | 135 | 255 | 1.9 | | | | | | |
| | | | | | 1239 | 1322 | 43 | 82 | 0 | 0 |
| | | | | | 1322 | 1418 | 56 | 106 | 98 | 0.92 |
| | | | | | 1418 | 1454 | 36 | 68 | 0 | 0 |
| 1454 | 1504 | At St. Paul I. | | | 1454 | 1504 | 10 | Circle St. Paul I. | | |
| 1504 | 1541 | 37 | 70 | 1.9 | | | | | | |
| | | | | | 1504 | 1530 | 26 | 49 | 0 | 0 |
| | | | | | 1530 | 1541 | 11 | 21 | 59 | 2.8 |
| 1541 | 1635 | 54 | 125 | 2.3 | | | | | | |
| | | | | | 1541 | 1629 | 48 | 110 | 4 | 0.0036 |
| | | | | | 1629 | 1635 | 6 | 14 | 28 | 2.0 |
| 1635 | 1801 | 86 | 185 | 2.2 | | | | | | |
| | | | | | 1635 | 1735 | 60 | 132 | 1 | |
| | | | | | 1735 | 1801 | 26 | 57 | 878 | 15.4 |
| 1801 | 1828 | 26 | 90 | 3.5 | | | | | | |
| | | | | | 1801 | 1814 | 13 | 46 | 33 | 0.72 |
| | | | | | 1814 | 1828 | 14 | 49 | 0 | 0 |
| Total | | | | | | | | | 1,101 | |

Table 9.--Walruses observed in 1-mile track broken down to subsegments according to abundance, 14 April 1972

| Primary sectors | | | | | Subsectors | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Time | | Elapsed time (min.) | Miles on leg | Miles per min. | Time | | Elapsed time (min.) | Miles on leg | Number of walrus | Walrus/mile$^2$ |
| From | To | | | | From | To | | | | |
| 1150 | 1238 | 48 | 130 | 2.7 | No subsect. | | 48 | 130 | 0 | 0 |
| 1238 | 1252 | 14 | 40 | 2.9 | No subsect. | | 14 | 40 | 0 | 0 |
| 1252 | 1305 | 13 | 38 | 2.9 | Survey of Walrus Islands | | | | 0 | 0 |
| 1305 | 1408 | 63 | 162 | 2.6 | | | | | | |
| | | | | | 1305 | 1331 | 26 | 68 | 0 | 0 |
| | | | | | 1331 | 1408 | 37 | 94 | 33 | 0.35 |
| | | | | | 1408 | 1417 | 9 | Port Moller | 0 | 0 |
| 1417 | 1540 | 83 | 165 | 2.0 | | | | | | |
| | | | | | 1417 | 1447 | 30 | 60 | 15 | 0.25 |
| | | | | | 1447 | 1519 | 32 | 64 | 1,893 | 29.6 |
| | | | | | 1519 | 1540 | 21 | 42 | 2 | 0.05 |
| 1540 | 1605 | 25 | 45 | 1.8 | Cape Newenham-Kuskokwim Bay | | | | 0 | 0 |
| 1605 | 1716 | 71 | 160 | 2.3 | Nunivak area | | | | 1 | 0.006 |
| 1716 | 1752 | 36 | 92 | 2.6 | Nunivak area | | | | 0 | 0 |
| 1752 | 1815 | 23 | 85 | 3.7 | Nunivak area | | | | 0 | 0 |
| Total | | | | | | | | | 1,944 | |

Table 10.--Walruses observed in 1-mile track broken down to subsegments according to abundance, 15 April 1972

| Primary sectors | | | | | Subsectors | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Time | | Elapsed time (min.) | Miles on leg | Miles per min. | Time | | Elapsed time (min.) | Miles on leg | Number of walrus | Walrus/mile$^2$ |
| From | To | | | | From | To | | | | |
| 1025 | 1128 | 63 | 160 | 2.5 | Fog--no survey | | | | | |
| 1128 | 1145 | 17 | 37 | 2.2 | | | | | | |
| | | | | | 1128 | 1135 | 7 | 15 | Fog--no survey | |
| | | | | | 1135 | 1145 | 10 | 22 | 0 | 0 |
| 1145 | 1300 | 75 | 195 | 2.6 | | | | | | |
| | | | | | 1145 | 1228 | 43 | 112 | 6 | 0.054 |
| | | | | | 1228 | 1300 | 32 | 83 | 166 | 2.0 |
| 1300 | 1327 | 27 | 50 | 1.9 | No subsect. | | 27 | 50 | 1,219 | 24.4 |
| 1327 | 1343 | 16 | 30 | 1.9 | No subsect. | | 16 | 30 | 118 | 3.9 |
| 1343 | 1426 | 43 | 80 | 1.9 | | | | | | |
| | | | | | 1343 | 1400 | 17 | 32 | 32 | 1.0 |
| | | | | | 1400 | 1426 | No survey--in fog | | 1 | |
| 1426 | 1523 | 57 | 120 | 2.1 | No subsect. | | 57 | 120 | 2,719 | 22.6 |
| 1523 | 1600 | 37 | 70 | 1.9 | | | | | | |
| | | | | | 1523 | 1536 | 13 | 25 | 43 | 1.7 |
| | | | | | 1536 | 1600 | 24 | 46 | 1 | 0.022 |
| Total | | | | | | | | | 4,305 | |

Table 11.--Walrus numbers in northern Bering Sea in high abundance areas, mid-April 1972

| Date | Time on track From | Time on track To | Miles on track | Walruses observed | Walrus/mi.$^2$ |
|---|---|---|---|---|---|
| 11 April | 1311 | 1348 | 81 | 173 | 2.13 |
| 11 April | 1700 | 1730 | 69 | 345 | 5.0 |
| 11 April | 1730 | 1800 | 69 | 948 | 13.7 |
| 12 April | 1345 | 1405 | 50 | 252 | 5.04 |
| 15 April | 1228 | 1300 | 83 | 166 | 2.0 |
| 15 April | 1300 | 1327 | 50 | 1,219 | 24.4 |
| 15 April | 1327 | 1343 | 30 | 118 | 3.9 |
| 15 April | 1343 | 1400 | 32 | 32 | 1.0 |
| 15 April | 1426 | 1523 | 120 | 2,719 | 22.6 |
| 15 April | 1523 | 1536 | 25 | 43 | 1.7 |
| Totals | | | 609 | 6,015 | 9.88 |

Table 12.--Walrus numbers in northern Bering Sea, including the Gulf of Anadyr, in low abundance areas, mid-April 1972

| Date | Time on track From | Time on track To | Miles on track | Walruses observed | Walrus/mi.$^2$ |
|---|---|---|---|---|---|
| 11 April | 1148 | 1159 | 22 | 3 | 0.27 |
| 11 April | 1215 | 1254 | 75 | 1 | 0.01 |
| 11 April | 1254 | 1311 | 37 | 0 | 0 |
| 11 April | 1419 | 1540 | 200 | 77 | 0.35 |
| 11 April | 1540 | 1618 | 85 | 3 | 0.035 |
| 11 April | 1800 | 1825 | 58 | 56 | 0.97 |
| 11 April | 1825 | 1840 | 25 | 23 | 0.92 |
| 12 April | 1307 | 1345 | 80 | 16 | 0.20 |
| 12 April | 1405 | 1449 | 115 | 17 | 0.31 |
| 15 April | 1145 | 1228 | 112 | 6 | 0.054 |
| 15 April | 1536 | 1600 | 46 | 1 | 0.022 |
| Totals | | | 855 | 203 | 0.237 |

Table 13.--Walrus numbers in southern Bering Sea (Bristol Bay) in areas of high abundance, mid-April 1972

| Date | Time on track From | Time on track To | Miles on track | Walruses observed | Walrus/mi.$^2$ |
|---|---|---|---|---|---|
| 13 April | 1735 | 1801 | 57 | 878 | 15.4 |
| 14 April | 1447 | 1519 | 64 | 1,898 | 29.6 |
| Totals | | | 121 | 2,776 | 22.94 |

Table 14.--Walrus numbers in southern Bering Sea (Pribilof Islands area and Bristol Bay) in areas of low abundance, mid-April 1972

| Date | Time on track From | To | Miles on track | Walruses observed | Walrus/mi.$^2$ |
|---|---|---|---|---|---|
| 13 April | 1322 | 1418 | 106 | 98 | 0.92 |
| 13 April | 1530 | 1635 | 145 | 91 | 0.63 |
| 13 April | 1635 | 1735 | 132 | 1 | 0.0076 |
| 13 April | 1801 | 1814 | 46 | 33 | 0.72 |
| 14 April | 1331 | 1408 | 94 | 33 | 0.35 |
| 14 April | 1417 | 1447 | 60 | 15 | 0.25 |
| 14 April | 1519 | 1540 | 42 | 2 | 0.05 |
| Totals | | | 625 | 273 | 0.437 |

Appendix 1

Field Data, 7-16 April 1972

MARINE MAMMAL SURVEY

| Date and Time | Beyond 1/2 mile | Within 1/2 mile | Within 1/2 mile | Beyond 1/2 mile | Remarks |
|---|---|---|---|---|---|
| 7 Apr. 72--140 kts. at 500-700 ft. Alt., lt. overcast | | | | | |
| 1800 | | 1 R | | | 4 mi. out of Unalacl |
| 1800 | | 1 R | | | on fast ice of Norton |
| 1805 | | 5 B | | | Leads |
| | | 2 B | | | Broken-light pack. |
| | | 1 B | 10 B | | 0.9 cover. |
| | | 1 B + pup | 2 R | | 25 mi. out continuou |
| | | 1 B | | | broken pack with lea |
| | | 1 B | | | 29 mi. out |
| | | 1 B | | | |
| | | | | | 30-37 mi. out flat ic |
| | | | | | no breaks. |
| 1814 | | 1 B | | | 42 mi. -broken packs |
| | | 1 B + pup | | | |
| | | 1 B | 11 B | | |
| 1817 | | 1 B | | | |
| 1830 | | 1 R | | | Leads |
| 1831 | | 1 B | | | Broken-leads |
| 1840 | | | | | Over land near Nom |
| 1852 | | | | | Land Nome |
| Total | | 19 B | 21 B | | |
| | | 3 R | 2 R | | |

Grand total = 40 B
5 R

# MARINE MAMMAL SURVEY

| Date and time | Beyond 1/2 mile | Within 1/2 mile | Within 1/2 mile | Beyond 1/2 mile | Remarks |
|---|---|---|---|---|---|
| 11 Apr. 72--145 kts. at 500 ft. alt. depart Nome 1140, return 1945 | | | | | |
| 1142 | | | | | Over pack 1.0 cover |
| 1143 | | 1 B | 1 B | | |
| 1144 | | | 1 B | | |
| 1145 | | 2 B | 2 B | | |
| | | | 1 R | | |
| 1146 | | 1 B | 1 B | | |
| | | | 1 B | | |
| 1147 | | 1 B | 1 B | | |
| 1148 | | | | 2 B | Pass Sledge Island |
| 1149 | | 1 R | | | |
| 1150 | | 1 B | 1 R | | |
| | | 1 B | 1 B | | |
| | | 1 R | | | |
| 1152 | | 1 R | 1 R hole | | |
| 1154 | | 2 B | | | |
| 1155 | | 1 B | 1 R | | |
| | | 1 R | | | |
| 1156 | | 1 B | 1 R | | |
| | | | 1 R | | |
| 1157 | | | 1 B | | 0.9 cover |
| 1158 | | 1 W | 3 R | | |
| | | 1 R | 2 W | | |
| 1159 | | 1 R | 2 B | | Terminating--fog |
| | | 1 B | | | |
| 1215 | | 2 B | | | Begin survey at King Island -5° C |
| 1216 | | 1 B | | | |
| 1217 | | 2 B | | | |
| 1222 | | | 1 B | | |
| 1224 | | 1 B | | | |
| | | 1 R hole | | | |
| 1225 | | 1 B | | | |
| 1232 | | | | | 90 murres |
| 1233 | | 1 B | | | |
| | | 2 B | | | |
| 1236 | | | | | 35 W, new heading |
| 1242 | | 2 B | | | New heading |
| 1243 | | 1 B | 1 B | | |
| | | | 1 R | | |
| Total | | 25 B | 13 B | 2 B | |
| | | 7 R | 10 R | | |
| | | 1 W | 2 W | | |

# MARINE MAMMAL SURVEY

| Date and time | Beyond 1/2 mile | Within 1/2 mile | Within 1/2 mile | Beyond 1/2 mile | Remarks |
|---|---|---|---|---|---|
| 11 Apr. 72--Cont. | | | | | |
| 1244 | | | 1 R | | |
| 1245 | | 1 B | 1 B | | |
| 1246 | | 1 B | 1 B | | New heading near Diomedes |
| | | 1 B | | | |
| 1247 | | | 1 R | | New heading |
| 1252 | | | | | Siberia coast, new heading |
| 1254 | | | 1 W | | In water |
| 1307 | | 15 W holes | | | |
| 1309 | | W hole & haul out--old | | | |
| 1310 | | | 1 B | | |
| 1311 | | | 1 B | | |
| | | | 1 W | | |
| 1314 | | 1 B | | | |
| 1315 | | 1 B | 1 B | | |
| 1317 | 2 W | | 2 W | | |
| | | | 2 W | | |
| 1318 | 2 W | 2 W | 2 W | | |
| | | 6 W | | | |
| 1319 | | 4 W | 16 W | | |
| | 30 W | 12 W | 50 W | | |
| | | 20 W | 4 W | | |
| | | 3 W | 15 W | | |
| | | 5 W | 3 W | | |
| 1320 | 30 W | 8 W | | | |
| | | 2 W | | | |
| 1322 | | | 1 R | | |
| 1326 | | | | | Big lead, 0.6 cover young ice |
| 1327 | | 1 W | | | In water |
| | | 2 W | | | |
| 1328 | | | 3 W | | |
| 1332 | | | | | 0.1 cover |
| 1334 | | 1 W | | | In water |
| 1336 | | 2 W | 2 W | | In water |
| Total | | 5 B | 5 B | | |
| | | | 3 R | | |
| | 64 W | 68 W | 101 W | (of these 7W in water) | |
| | | 15 W hole | | | |

MARINE MAMMAL SURVEY

| Date and time | Beyond 1/2 mile | Within 1/2 mile | Within 1/2 mile | Beyond 1/2 mile | Remarks |
|---|---|---|---|---|---|
| 11 Apr. 72--Cont. | | | | | |
| 1337 | | 1 W | | | |
| | | 2 W | | | In water |
| 1338 | | 1 W | 1 B | | Walruses in water |
| 1339 | | | 1 R | | Terminate--snow, fo new heading |
| 1344 | | | | | New heading |
| 1400 | | | | | St. Lawrence Is. |
| 1405 | | | | | South shore |
| 1410 | | | 1 B | | |
| 1413 | | 1 R hole | | | |
| 1416 | | | | | Gambell |
| 1422 | | | | 4 W | |
| 1423 | | 1 W | | | |
| 1425 | | 3 W | | | 0.6 cover |
| 1427 | | 3 W | 1 W | | |
| 1428 | 2 W | | | | |
| 1430 | | 2 W | | | |
| 1431 | | | 2 W | | |
| 1432 | | 1 W | | | In water |
| 1435 | | | 2 W | 1 W | |
| 1436 | 1 W | | 2 W | | |
| | | | 5 W | | |
| 1437 | 2 W | | 1 W | | |
| | | | 2 W | | |
| | | | 1 W | | |
| 1438 | | 7 W | 3 W | | |
| 1439 | | 8 W | | | |
| 1440 | 4 W | | 1 W | | 0.5 cover |
| 1451 | | 1 R | | | Heavy fog |
| 1453 | | | | | 1.0 cover |
| 1455 | 2 W | | | 3 W | |
| 1457 | | 2 W | | | 0.5 cover |
| 1502 | | | | 1 W | 0.9 cover |
| 1505 1507 | | 1 W 1 W | | | In water |
| 1514 | | 1 B | | | 0.8 cover |
| 1515 | | 3 W | 4 W | | Perhaps more in |
| | | | 3 W | | group 4 W |
| Total | 11 W | 36 W | 27 W | 9 W | (of these 5 W in water) |
| | | 1 R | 1 R | | |
| | | 1 R hole | | | |
| | | 1 B | 2 B | | |

MARINE MAMMAL SURVEY

| Date and time | Beyond 1/2 mile | Within 1/2 mile | Within 1/2 mile | Beyond 1/2 mile | Remarks |
|---|---|---|---|---|---|
| 11 Apr. 72--Cont. | | | | | |
| 1519 | | | 1 B | | 0.7 cover |
| 1525 | | 1 R hole | | | |
| 1529 | | 1 B | | | |
| 1530 | | | | | Very large lead |
| 1533 | | 6 W | | 6 W | |
| 1534 | | 1 B | 12 W | | 0.7 cover |
| 1535 | | | | | 1.0 cover |
| 1540 | | | | | Due south, new heading |
| 1541 | | | 1 B | | |
| 1552 | | | | | 0.9 cover since last observation |
| 1600 | | | | | 0.9 cover, broken pack |
| 1604 | | 1 W | | | 4 yrs |
| 1606 | | | | | About 40 mi. from Siberia, 0.3 cover broken pack (ice edge?) |
| 1610 | | | | | 0.2 cover |
| 1614 | | | 1 B | | |
| 1615 | | | | | 0.7 cover, slush small pack |
| 1618 | | 2 W | | | 12" tusks 4 yrs? ♂♂ |
| 1624 | | | | | 0.8 cover, loose pa ice |
| 1626 | | | 1 B? | | small |
| 1630 | | | 1 B | | |
| 1631 | | | | | 1.0 cover, refrozen pack |
| 1635 | | | 1 H | | 77° new heading |
| 1637 | | | 2 B | | -8° C |
| 1646 | | 6 W holes | | | 0.9 cover, beluga holes? |
| 1650 | | | 6 beluga | | In a lead |
| Total | | 9 W<br>2 B<br>1 R hole<br>6 W holes | 12 W<br>7 B<br>1 H<br>6 belugas | 6 W | |

MARINE MAMMAL SURVEY

| Date and time | Beyond 1/2 mile | Within 1/2 mile | Within 1/2 mile | Beyond 1/2 mile | Remarks |
|---|---|---|---|---|---|
| 11 Apr. 72--Cont. | | | | | |
| 1659 | | Holes? | 1 B | | |
| 1700 | | | | | Numerous small hol ? |
| 1701 | | 1 W | | | 4 yrs. |
| 1702 | | 4 W | | | |
| 1707 | | 2 W holes? | 6 W | | |
| 1708 | | 10 W " | | | |
| 1715 | | W " | | | |
| 1716 | | 10 W " | | | |
| 1717 | | 2 W | | | |
| 1720 | | | 1 W | | |
| 1721 | | 3 W | | | |
| 1722 | | | 3 W | | |
| 1723 | | 5 W | 3 W | | Lots of manure |
| 1725 | | | 1 W | | |
| | | | 45 W | | |
| 1727 | | 10 beluga | | 10 W | 12 W in water |
| | | (1 small animal) | | 60 W | |
| | | 12 W | | | |
| 1729 | | 100 W | 4 W | 20 W | |
| | | | 50 W | | |
| | | | 30 W | | |
| | | | 45 W | | |
| 1730 | | 30 W | | | In water, new heading, fog |
| 1732 | | 1 W | | 20 W | |
| 1733 | | 1 W | 2 B | | |
| 1735 | 20 W | | 15 W | | |
| | | | 2 B | | |
| 1736 | 10 W | 6 W | 6 W | 100 W | |
| | 25 W | 100 W | | | |
| 1737 | | 120 W | 75 W | | |
| | | 30 W | | | |
| 1738 | 2 W | 10 W | 30 W | | 10 W in water |
| | 20 W | 5 W | 50 W | | |
| | | 300 W | 50 W | | |
| Total | 77 W | 740 W | 414 W | 210 W | (of these 52 W in water) |
| | | 22+W holes | | | |
| | | 10 beluga | 5 B | | |

MARINE MAMMAL SURVEY

| Date and time | Beyond 1/2 mile | Within 1/2 mile | Within 1/2 mile | Beyond 1/2 mile | Remarks |
|---|---|---|---|---|---|
| 11 Apr. 72--Cont. | | | | | |
| 1739 | | | 15 W | | |
| | | | 30 W | | |
| | | | 60 W | | |
| 1740 | | | | 75 W | |
| 1741 | 2 W | | | | |
| 1742 | 5 W | | | 100 W | 5 W in water |
| 1747 | | | | | 0.8 cover, fog new heading |
| 1750 | | | | | 1 Glaucous-winged gull |
| 1751 | | 1 B | 1 B | | |
| 1753 | | | | | Fog |
| 1755 | | | 12 W | | |
| 1756 | | | 15 W | | |
| 1757 | | W holes | | | |
| 1759 | | | 6 W | | |
| 1800 | | 1 W | | | In water |
| 1801 | | | 8 W | | |
| 1802 | 2 W | 7 W | | | 1 yearling |
| | | 1 W | | | 1 W in water |
| 1803 | | 2 W | | | |
| 1805 | 20 W | 8 W | 4 W | | |
| | 2 W | | 6 W | | |
| | 6 W | | | | |
| 1806 | | 3 W | 8 W | | |
| 1808 | | | 1 W | | |
| 1809 | 5 W | 2 B | 2 W | | |
| 1814 | 20 W | | | | |
| 1820 | | | | | 200 auklets, 0.8 cover, large leads |
| 1824 | | | | | 1 Glaucous-winged gull, 10 auklets |
| 1825 | | 6 W | | | St. Lawrence, new heading |
| Total | 62 W | 28 W + holes<br>3 B | 167 W<br>1 B | 175 W | (of these 1 W in water) |

# MARINE MAMMAL SURVEY

| Date and time | Beyond 1/2 mile | Within 1/2 mile | Within 1/2 mile | Beyond 1/2 mile | Remarks |
|---|---|---|---|---|---|
| 11 Apr. 72--Cont. | | | | | |
| 1826 | | | | | 4 Pigeon Guillemots<br>20 Stellar eiders, v<br>large lead |
| 1827 | | | | | 50 gulls, 100 Stella<br>eiders |
| 1832 | | 3 W | | | Much open water,<br>new heading |
| 1838 | | | | | Punuck Is. |
| 1840 | | | 20 W | | New heading |
| 1842 | | ♀W + calf | 15 W | | |
| 1843 | | 2 W | | | |
| 1844 | | | 16 W | | 0.9 cover, young ic |
| 1846 | | | | | 0.8 cover, broken<br>pack |
| 1847 | | | 1 W | | |
| 1848 | 1 W | | | | |
| 1904 | | | 1 B | | 0.9 cover-large ic<br>sheets, few breaks |
| 1905 | | 1 B | | | |
| 1914 | | 1 R | | | |
| 1920 | | 1 B | | | |
| 1921 | | 1 R | | | |
| 1926 | | 1 B | | | |
| | | 1 B | | | |
| 1931 | | | | | Terminate survey,<br>shore ice, 5° in No |
| Total | 1 W | 7 W<br>4 B<br>2 R | 52 W<br>1 B | | |

Grand total = 76 B
24 R
2,279 W (of these 65 W in water)
1 H

16 belugas

# MARINE MAMMAL SURVEY

| Date and time | Beyond 1/2 mile | Within 1/2 mile | Within 1/2 mile | Beyond 1/2 mile | Remarks |
|---|---|---|---|---|---|
| 12 Apr. 72, | leave Nome 1215 | | | | 0.8 cover, close pa ice with leads |
| 1237 | | | | | Wind NW 15-20 kts -9° C air |
| 1255 | | 20 W holes | | | |
| 1302 | | 15 W " | | | |
| 1304 | | 1 B | | | |
| 1307 | | 30 W holes | Hundreds | | |
| | | 30 W " | W holes | | |
| 1308 | | | 4 W | | |
| 1311 | | | 2 W | | |
| 1312 | | | 4 W | | In water |
| 1321 | | | | | 0.6 cover, young ic |
| 1324 | | 1 W | | | In water |
| | | 1 W | | | |
| 1325 | | | | | New heading |
| 1327 | | 2 W | | | |
| 1330 | | 1 W | | | W in water, 8 aukle (crested?) |
| 1331 | | 1 W | | | |
| | | 1 B | | | |
| 1332 | | | | | Pass Gambell, new heading |
| 1333 | | | | | Boat with sail |
| 1335 | | | | | New heading |
| 1337 | | | 1 W | | |
| 1343 | | | 1 B | | 0.7 cover, young ic |
| 1345 | | | | | 217 T, new heading |
| 1351 | | | 2 W | | |
| 1352 | | | 1 W | | In water |
| 1355 | | 100 W | 10 W | 50 W | 0.6 cover, young ic broken pack |
| 1356 | | | 1 W | | |
| 1358 | | 10 W | 20 W | | |
| | | | 5 W | | |
| | | | 5 W | | |
| | | | 10 W | | |
| | | | 30 W | | |
| | | | 40 W | | |
| Total | | 116 W | 135 W | 50 W | (of these 7 W in water) |
| | | 95 W holes | Hundreds W. holes | | |
| | | 2 B | 1 B | | |

MARINE MAMMAL SURVEY

| Date and time | Beyond 1/2 mile | Within 1/2 mile | Within 1/2 mile | Beyond 1/2 mile | Remarks |
|---|---|---|---|---|---|
| 12 Apr. 72--Cont. | | | | | |
| 1359 | 2 W | | | 10 W | |
| 1400 | | 4 W | 9 W | | |
| 1401 | 50 W | | | 2 W | |
| 1404 | | | 5 W | | |
| 1405 | | Hundreds of W. holes | | | |
| 1418 | | | | | Cross vast lead |
| 1420 | | Hundreds of W. holes | | | |
| 1425 | | 1 B | | | |
| 1428 | | Hundreds of W holes | 4 W | | |
| 1430 | | | | 15 W | |
| 1431 | | | 4 W | | |
| 1435 | | | 1 W | | Loose pack, 0.8 cov |
| 1438 | | 1 W | | | |
| 1442 | | 20 W holes | | | |
| 1444 | | 1 B | | | |
| 1445 | | 1 W | | | |
| | | 6 W | | | |
| 1449 | | | | | 127, new heading |
| 1455 | | | 3 B | | |
| 1457 | | | 1 B | | |
| 1458 | | 1 B | | | |
| 1505 | | 20 W holes | | | |
| 1506 | | | 2 B | | ♀ and pup |
| 1510 | | 1 B | | | |
| 1517 | | | 1 B | | |
| 1520 | | | | | 0.9 cover, close pac few leads |
| 1528 | | | 1 B | | |
| 1530 | | | 1 B | | Hall Is. |
| 1535 | | | | | Open water, St. Mathew |
| 1540 | | | | | 102, new heading |
| 1545 | | | 1 B | | 200 Old Squaw |
| 1551 | | | 1 B | | |
| Total | 52 W | 12 W | 23 W | 27 W | |
| | | 4 B | 11 B | | |
| | | Hundreds of W holes | | | |

# MARINE MAMMAL SURVEY

| Date and time | Beyond 1/2 mile | Within 1/2 mile | Within 1/2 mile | Beyond 1/2 mile | Remarks |
|---|---|---|---|---|---|
| 12 Apr. 72--Cont. | | | | | |
| 1553 | | | 1 B | | |
| 1555 | | | | | 0.9 cover, close pa |
| 1610 | | 1 B | | | |
| 1612 | 1 seal | | | | |
| 1618 | | 1 H (♀?) | | | |
| 1638 | | | | | 0.9 cover, mostly unbroken, few lead |
| 1700 | | | | | New heading |
| 1717 | | | | | Young ice, 0.9 cove |
| 1740 | | | | | Terminate survey a mouth of Kuskokwi |
| Total | 1 seal | 1 B<br>1 H | 1 B | | |

Grand total = 20 B
415 W
1 H (of these 7 W in water)
1 seal?

# MARINE MAMMAL SURVEY

| Date and time | Beyond 1/2 mile | Within 1/2 mile | Within 1/2 mile | Beyond 1/2 mile | Remarks |
|---|---|---|---|---|---|
| 13 Apr. 72, leave Bethel 1214 | | | | | 0° C |
| 1239 | | | | | 235, new heading |
| 1255 | | | | | Edge of sea |
| 1301 | | 1 B | | | Loose pack, 0.6 co |
| 1305 | | 1 B | | | |
| 1306 | | | 1 B | | |
| 1314 | | 30 W holes | | | |
| 1315 | | | 1 B | | |
| 1320 | | 1 S | | | Blood on ice |
| 1322 | | 2 S | | | |
| | | 2 S + pup | | | |
| 1328 | | 4 W | | | Old ice, 0.9 cover consolidated pack |
| 1331 | | 1 B | | | Looks like ice blow back from edge |
| 1335 | | 4 W | | | |
| 1336 | | | 50 W | | |
| | | | 30 W | | |
| 1337 | 200 W | | 1 W | | |
| 1344 | | 5 W | | | |
| 1351 | 1 W | | | | |
| 1356 | | 1 B | | | |
| 1357 | 1 W | | | | |
| 1358 | | | 1 W | | |
| 1359 | | 1 B + pup | | | |
| 1405 | | 1 B | | | |
| 1406 | | | 1 B | | |
| 1407 | | 1 B | | | Not near a lead |
| 1408 | | 2 S | | | |
| 1409 | | 2 B | | | |
| 1411 | | 2 B | | | |
| 1413 | | | 1 B | | |
| 1415 | | 1 H♂ | | | |
| 1417 | | | 3 W | | |
| 1418 | | | 1 B | | |
| 1419 | | | 1 B | | Broken pack, 0.9 cover |
| Total | 202 W | 13 W | 85 W | | |
| | | 30 W holes | | | |
| | | 12 B | 6 B | | |
| | | 8 S | | | |
| | | 1 H | | | |

MARINE MAMMAL SURVEY

| Date and time | Beyond 1/2 mile | Within 1/2 mile | Within 1/2 mile | Beyond 1/2 mile | Remarks |
|---|---|---|---|---|---|
| 13 Apr. 72--Cont. | | | | | |
| 1421 | | 1 S+ pup | 1 S | | Blood on ice at 1 S and pup |
| 1424 | | | 1 S + pup | | |
| 1430 | | 1 B | | | |
| | | 1 S | | | |
| | | 1 S + pup | | | |
| 1432 | | 2 S + 1 pup | 1 B | | 0° C |
| 1435 | | | 1 S | | Ice looks like ice edge zone |
| 1438 | | | | | Ship track |
| 1440 | | | | | Loose pack ice, 0.6 cover, ice edge |
| 1441 | | | 1 B | | |
| 1442 | | | 1 S | | |
| 1449 | | 3 beluga | | | Brash ice, 0.8 cove |
| 1452 | | | | | 100--flock of auklet |
| 1454 | | | | | Pribilof Islands |
| 1504 | | | | | 20 Common Eiders, 2 Pigeon Guillemot new heading |
| 1510 | | | 1 S | | |
| 1518 | | 1 S + pup | | | |
| 1522 | | | 1 S | | |
| 1524 | | | | | 3 Red-legged Kittiw |
| 1526 | | | 1 Hσ | | |
| 1528 | | | 1 S | | |
| 1529 | | | 2 S | | |
| 1530 | | | 1 Hσ | | |
| 1532 | | 2 W | 1 W | | |
| 1533 | | 1 Hσ | | 1 W | |
| 1534 | | | 5 W | | |
| 1535 | 1 W | 25 W | | | |
| | 20 W | | | | |
| 1536 | 5 W | | 10 W | | |
| | 10 W | | | | |
| Total | 36 W | 27 W | 16 W | 1 W | |
| | | 10 S | 10 S | | |
| | | 1 B | 2 B | | |
| | | 3 beluga | | | |
| | | 1 H | 2 H | | |

MARINE MAMMAL SURVEY

| Date and time | Beyond 1/2 mile | Within 1/2 mile | Within 1/2 mile | Beyond 1/2 mile | Remarks |
|---|---|---|---|---|---|
| 13 Apr. 72--Cont. | | | | | |
| 1538 | 2 W | 2 W | | | |
| 1539 | | 1 B | | | |
| 1540 | | 6 W | 6 W | 5 W | |
| | | 2 W | | | |
| 1541 | | | | | 124, new heading |
| 1543 | | | 3 W | | |
| 1544 | 2 W | | | 50 W | |
| 1549 | | | 1 B | | |
| 1550 | | | 1 W | | |
| | | | 1 B | | |
| 1552 | | | 1 seal? | | |
| 1553 | | 1 B | | | |
| 1555 | | | 1 B + pup | | |
| 1557 | | | | | Ship tracks, close pack ice, 0.9 cover |
| 1601 | | 1 S | | | |
| 1610 | | 1 S + pup | 1 S | | |
| 1611 | | 1 S | | | |
| 1615 | | 1 S | | | Close pack with lead |
| 1616 | | 1 S | 3 S + 1 pup | | 0.9 |
| 1617 | | | 1 S | | |
| 1620 | | | 2 S | | |
| | | | 1 S | | |
| 1625 | | 1 S | | | |
| 1629 | | | 1 S | | |
| 1632 | | 3 W | | | |
| | | 25 W | | | |
| 1634 | | | 1 S | | Ice edge, brash ice 0.4 cover |
| 1635 | | | | | New heading |
| 1639 | | | 1 W | | In water |
| 1640 | | | 1 B | | |
| 1645 | | | 1 S | | Open water |
| 1647 | | | | | 1 Kittiwake, 20 Mur |
| | | | | | Brash ice, loose pa 0.9 cover |
| Total | 4 W | 38 W | 11 W | 55 W | |
| | | 2 B | 5 B | | |
| | | 7 S | 12 S | | |
| | | | 1 seal? | | |

MARINE MAMMAL SURVEY

| Date and time | Beyond 1/2 mile | Within 1/2 mile | Within 1/2 mile | Beyond 1/2 mile | Remarks |
|---|---|---|---|---|---|
| 13 Apr. 72--Cont. | | | | | |
| 1654 | | | | | Open water |
| 1657 | | | | | 5 Glaucous-winged Gulls, 10 Pacific Kittiwakes |
| 1659 | | | | | Young brash ice, 0.[illegible] cover |
| 1712 | | 1 S + pup | | | |
| 1722 | | 1 B | | | 10,000 murres |
| 1730 | | | | | Fog and snow squall visibility 500 |
| 1735 | | 1 S | | | |
| 1738 | | | 140 W | | Less fog |
| 1739 | | | 2 W | | |
| | | | 1 W | | |
| 1740 | | 4 W | 4 W | | No fog |
| 1741 | 4 W | 2 W | 10 W | | Close to pack with open holes |
| 1742 | 500 W | | 125 W | | |
| | | | 10 W | | |
| | | | 5 W | | |
| | | | 10 W | | |
| | | | 50 W | | |
| 1743 | 100 W | 100 W | 50 W | | 1 W in water |
| | 200 W | | 10 W | | |
| | | | 1 W | | |
| 1744 | 100 W | 1 W | 15 W | 200 W | |
| | 200 W | 2 W | | | |
| | | 6 W | | | |
| 1745 | 6 W | 2 W | 25 W | | |
| | 2 W | 2 W | | | |
| 1746 | | 15 W | | | |
| 1747 | | | 5 W | | |
| | | | 1 W | | |
| 1748 | | 100 W | 25 W | | |
| 1749 | 10 W | 10 W | 2 W | | |
| | | 100 W | | | |
| 1750 | | 12 W | 5 W | 20 W | |
| Total | 1,122 W | 356 W | 496 W | 220 W | |
| | | 3 S | | | |
| | | 1 B | | | (of these 1 W in water) |

# MARINE MAMMAL SURVEY

| Date and time | Beyond 1/2 mile | Within 1/2 mile | Within 1/2 mile | Beyond 1/2 mile | Remarks |
|---|---|---|---|---|---|
| 13 Apr. 72--Cont. | | | | | |
| 1752 | | | | 2 W | |
| 1756 | | | 5 W | | |
| 1757 | | | | 10 W | |
| 1759 | | 2 W | | | |
| | | 4 W | 3 W | | |
| 1800 | | | 6 W | | |
| | | | 6 W | | |
| 1801 | | | | | 48T, new heading |
| 1802 | 4 W | 7 W | 10 W | | |
| | | 1 W | | | |
| | | 2 W | | | |
| 1803 | 2 W | | | | |
| 1804 | 2 W | | | | |
| 1805 | | 2 W | 3 W | | |
| | | 2 W | | | In water |
| 1806 | | | 4 W | | |
| 1808 | | 1 W | | | In water |
| 1813 | | 1 W | | | In water |
| 1814 | 2 W | | | | |
| 1816 | | | 1 B | | |
| 1819 | | | | | New heading |
| 1823 | | 1 S | | | |
| 1828 | | | | | Terminated, fog and darkness |
| 1904 | | | | | King Salmon |
| Total | 10 W | 22 W<br>1 S | 37 W<br>1 B | 12 W | |

Grand total = 30 B
2,763 W (of these 5 W in water)
4 H
51 S
3 belugas
1 seal?

# MARINE MAMMAL SURVEY

| Date and time | Beyond 1/2 mile | Within 1/2 mile | Within 1/2 mile | Beyond 1/2 mile | Remarks |
|---|---|---|---|---|---|
| 14 Apr. 72, leave King Salmon 1150 | | | | | |
| 1209 | | | 1 B | | Close pack ice, sma leads, 0.8 cover |
| 1214 | | 1 S | 1 S | | |
| 1217 | | 1 S | | | |
| 1218 | | | 1 B | | |
| 1225 | | 1 B | | | |
| 1234 | | 1 B | | | |
| 1235 | | 1 S | 2 B | | |
| 1236 | | 1 B | | | |
| 1238 | | | | | New heading |
| 1240 | | | 3 beluga | | Yound ice, 0.8 cove |
| 1247 | | | | | New heading |
| 1252 Ar. Walrus Is. | | | | | New heading |
| 1255 | | | | | Ice shelf all the way around Round Isle |
| 1300 | | | | | Very young ice, 0.4 cover, Crooked Isle |
| 1305 leave Walrus Is. | | | | | High Isle, no sign of walrus in area |
| 1312 | | 2 B | 1 B | | |
| 1315 | | | | | Loose pack ice, 0.5 cover |
| 1316 | | 4 beluga | | | Fog |
| 1317 | | 1 B | 1 B | | |
| | | | 1 B | | |
| 1320 | | 1 B | 1 S | | |
| | | 3 S | 2 S | | |
| | | 7 B | 7 B | | |
| | | 4 beluga | 3 beluga | | |
| 1321 | | | 1 B | | |
| 1322 | | 1 B | | | |
| | | 1 S | | | |
| 1324 | | | Several hundred W holes | | Very young ice, 0.9 cover |
| Total | | 7 S | 4 S | | |
| | | 15 B | 15 B | | |
| | | 8 beluga | 6 beluga | | |
| | | | Several hundred walrus holes | | |

MARINE MAMMAL SURVEY

| Date and time | Beyond 1/2 mile | Within 1/2 mile | Within 1/2 mile | Beyond 1/2 mile | Remarks |
|---|---|---|---|---|---|
| 14 Apr. 72--Cont. | | | | | |
| 1325 | | | 1 S | | |
| 1329 | | | | | Close pack ice 0.8 cover |
| 1330 | | | 2 B | | |
| | | | 1 B | | |
| 1331 | | | 1 B | | |
| 1335 | | | 2 W | 2 W | |
| 1336 | | 1 B | 3 W | | |
| 1338 | | 3 W | 1 W | | |
| | | | 3 W | | |
| 1339 | 6 W | 5 W | | | |
| | | 2 W | | | |
| 1343 | | 6 W | | | |
| | | 1 W | | | 1 W in water |
| 1344 | 50 W | 2 W | | | |
| | | 5 W | | | |
| 1345 | | | 1 S | 1 W | |
| | | | 1 S | | |
| 1347 | | 1 S | | | |
| 1403 | | | | | 100 Eiders |
| 1407 | | 1 sea otter | | | Heavy pack, 1.0 cover |
| 1408 | | | | | Alaska Peninsula |
| 1417 | | | | | New heading |
| 1425 | | 5 sea otter | | | 20 mi. from shore, circle & return to head. |
| 1430 | | 2 sea otter | | | |
| 1441 | 3 W | 1 W | 4 W | | |
| | | 3 W | | | |
| 1443 | | 2 W | | | |
| | | 1 W | | | |
| | | 3 W | | | |
| 1447 | | | 1 W | | |
| Total | 59 W | 34 W | 14 W | 3 W | |
| | | 1 B | 4 B | | |
| | | 1 S | 2 S | | |
| | | 8 sea otter | | | (of these 1 W in water) |

# MARINE MAMMAL SURVEY

| Date and time | Beyond 1/2 mile | Within 1/2 mile | Within 1/2 mile | Beyond 1/2 mile | Remarks |
|---|---|---|---|---|---|
| 14 Apr. 72--Cont. | | | | | |
| 1451 | | 1 B | 2 W | | |
| 1454 | | | | | Close pack ice, 0.8 cover, new heading |
| 1456 | 10 W | 15 W | | 2 W | |
| 1457 | | 60 W | 3 W | | |
| | | | 8 W | | |
| 1458 | | 4 W | 25 W | | |
| | | 70 W | | | |
| 1459 | | 100 W | 25 W | | |
| | | 10 W | 3 W | | |
| | | 30 W | | | |
| | | 5 W | | | |
| 1500 | | 2 W | 2 W | | |
| | | 3 W | 100 W | | |
| 1501 | | 15 W | 5 W | | |
| | | 3 W | 2 W | | Light fog, visibility 0.5 mi. |
| | | 10 W | 4 W | | |
| | | 250 W | 2 W | | |
| | | 2 W | 150 W | | |
| | | 3 W | 2 W | | |
| | | 3 W | 30 W | | |
| | | 50 W | 50 W | 50 W | |
| | | | 500 W | | |
| | | | 150 W | | |
| 1502 | | | 2 W | | |
| | | | 4 W | | |
| 1504 | | | 1 B | | |
| 1505 | | 1 W | 5 W | | |
| | | 1 W | 1 W | | |
| | | 2 W | 2 W | | |
| | | | 15 W | | |
| 1506 | | 1 W | 4 W | | |
| | | 4 W | 20 W | | |
| | | | 20 W | | |
| | | | 10 W | | |
| | | | 20 W | | |
| | | | 3 W | | |
| | | | 5 W | | |
| | | | 35 W | | |
| Total | 10 W | 644 W<br>1 B | 1,207 W<br>1 B | 52 W | |

MARINE MAMMAL SURVEY

| Date and time | Beyond 1/2 mile | Within 1/2 mile | Within 1/2 mile | Beyond 1/2 mile | Remarks |
|---|---|---|---|---|---|
| 14 Apr. 72--Cont. | | | | | |
| 1507 | 30 W | | | 1 W | |
| 1509 | | | 1 W | | Fog, visibility 0.5 |
| 1512 | | 2 W | | | |
| 1513 | | | 1 B | | |
| | | | 3 S + 1 pup | | Blood on ice |
| 1515 | | | 3 W | | |
| | | | 5 W | | |
| | | | 30 W | | |
| 1517 | | | 1 S + pup | | Not near a lead |
| 1519 | | | 1 W | | Pink, large ♂, hairless like those that haul out during summer |
| 1520 | | 1 B | | | |
| 1521 | | | | | Clear, new heading |
| 1528 | | | | | New heading. |
| 1530 | | | | 2 W | |
| 1531 | | 2 W | | | |
| 1540 | | | | | Cape Newenham |
| 1545 | | | | | New heading, close pack, old ice, 0.9 cover |
| 1605 | | | | | New heading |
| 1645 | | 1 W | | | In water |
| 1647 | | | | | Young ice with old ice 0.8 cover |
| 1649 | | 2 W holes | | | |
| 1716 | | | | | Broken floe ice, la patches, 0.8 cover new heading |
| 1730 | | | | | Nunivak |
| 1752 | | | | | Unbroken ice, new heading |
| 1815 | | | | | Solid ice, no break terminate survey, 1855--Bethel |
| Total | 30 W | 5 W | 40 W | 3 W | (of these 1 W in water) |
| | | 2 W holes | | | |
| | | 1 B | 1 B | | |
| | | | 6 S | | |

Grand total = 39 B
2,101 W (of these 2 W in water)
21 S
8 sea otter
14 beluga

# MARINE MAMMAL SURVEY

| Date and time | Beyond 1/2 mile | Within 1/2 mile | Within 1/2 mile | Beyond 1/2 mile | Remarks |
|---|---|---|---|---|---|
| 15 Apr. 72, leave Bethel 1025, 150 kts. at 4000 ft | | | | | |
| 1105 | | | | | 0° Over ice, fog |
| 1115 | | | | | 1000 ft, 160 kts. |
| 1117 | | | | | 500 ft, 140 kts. |
| 1119 | | | | | 1000 ft, 140 kts. |
| 1122 | | | | | Heavy pack, 0.8 cov |
| 1125 | | | | | 3500 ft |
| 1128 | | | | | 4000 ft |
| 1135 | | | | | Start down, improve visibility |
| 1136 | | | | | Brown ice |
| 1142 | | | | | 500 ft, heavy pack, 0.9 cover |
| 1145 | | | | | Snow in Bethel now, new heading |
| 1156 | | 1 S | | | |
| 1205 | | 1 W | | | Animal dove in wate not seen |
| 1214 | | | | | Old W holes, frozen in |
| 1221 | | 2 W holes | 6 W holes | | |
| 1224 | | 6 W " | 4 W " | | |
| 1225 | | | 3 W | | |
| 1226 | | 2 W | | 1 W | 2 W in water |
| 1227 | | | 20 W holes | | |
| 1228 | | | 1 B | 2 W | |
| 1237 | | | 1 S | | |
| | | | 1 S | | |
| 1245 | | | 10 W holes | | |
| 1246 | | | 1 S | | |
| 1250 | | Hundreds of W holes | | | |
| 1252 | | 1 S | | | |
| 1253 | | 1 W | 1 W | | |
| 1255 | | Hundreds of W holes | | | |
| 1257 | | " | " " " | | |
| 1258 | | 1 W | 1 W | 50 W | |
| | | | | 10 W | |
| | | | | 10 W | |
| Total | | 5 W | 5 W | 73 W | |
| | | 2 S | 3 S | | |
| | | | 1 B | | (of these 2 W in water) |

# MARINE MAMMAL SURVEY

| Date and time | Beyond 1/2 mile | Within 1/2 mile | Within 1/2 mile | Beyond 1/2 mile | Remarks |
|---|---|---|---|---|---|
| 15 Apr. 72--Cont. | | | | | |
| 1259 | 20 W | 10 W in wat. | 12 W | | Extensive ice sheets with meandering leads, 0.8 cover |
| | | 50 W " " | 15 W in water | | |
| | | | 60 W | | |
| 1300 | 75 W | | 15 W in water | | |
| | 15 W | | 1 W | | |
| | 25 W | 1 W | | | |
| 1301 | | 20 W | 30 W in water | | New heading |
| | | 25 W | 150 W | | |
| | | 20 W | | | |
| 1302 | | 30 W | 1 W | | Newborn calf, looks dead, lots of blood on ice--10 ft. in diameter blood Circle for pictures |
| | | 10 W | 100 W | | |
| 1307 | 5 W | 200 W | | | On course |
| 1309 | | 100 W | 20 W | | |
| | | 1 W | 1 W | | |
| | | | 20 W in water | | |
| 1310 | | 25 W | 1 W | | |
| | | 150 W | 1 W | | |
| | | | 10 W | | |
| | | | 1 W | | |
| 1311 | | | 30 W | | |
| | | | 4 W | | |
| | | | 2 W | | |
| 1312 | | | | | New heading |
| 1317 | | | 30 W | | |
| 1318 | | | 10 W | 200 W | |
| | | | | 50 W | |
| | | | | 30 W | |
| | | | | 100 W | |
| | | | | 25 W | |
| | | | | 150 W | |
| 1320 | | 25 W | | | |
| 1322 | | Hundreds of W holes | | | |
| Total | 140 W | 667 W | 514 W | 555 W | (of these 140 W in wate |

MARINE MAMMAL SURVEY

| Date and time | Beyond 1/2 mile | Within 1/2 mile | Within 1/2 mile | Beyond 1/2 mile | Remarks |
|---|---|---|---|---|---|
| 15 Apr. 72--Cont. | | | | | |
| 1324 | | 4 W in wat. | 130 W | | |
| | | | 5 W | | |
| | | | 1 W | | |
| | | | 6 W | | |
| | | | 20 W | | |
| 1325 | | 3 W | 25 W | | |
| | | | 1 W | | |
| | | | 5 W | | |
| 1327 | | 1 S | | | |
| 1328 | | 1 S | | | |
| 1329 | | | | | New headings |
| 1330 | | Hundreds of W holes | | | |
| 1331 | | 1 W | | | |
| | | 4 W | | | |
| 1332 | | 1 W | | | |
| | | 1 W | 75 W | | Some W in water |
| 1333 | 10 W | | | | |
| 1334 | | 1 W | 15 W | | Fog |
| | | 20 W | | | |
| 1343 | | | | | New heading |
| 1345 | | Hundreds of W holes | | | |
| 1346 | | | | | Manure on ice |
| 1347 | | | 1 S | | |
| 1349 | | | 1 W | | Large area of manu on ice, many W ho |
| 1350 | | | | | Manure on ice |
| 1353 | | Hundreds of walrus holes | | | |
| 1354 | | 20 W | | | Young ice |
| | | 1 W | | | |
| 1358 | | Hundreds of W holes | | | |
| 1400 | | | 10 W | | On 1/2 mile line |
| 1401 | 50 W | 1 W in wat. | | | Began climbing, ne heading, fog. |
| 1407 | 50 W | | | | 5000 ft, 140 kts. |
| 1413 | | | | 500 W | 5500 ft. |
| 1417 | 100 W | | | | 5500 ft, W on edge large lead west of St. Lawrence Is. |
| Total | 210 W | 57 W | 294 W | 500 W | |
| | | 2 S | 1 S | | (of these 5 + W in water |

# MARINE MAMMAL SURVEY

| Date and time | Beyond 1/2 mile | Within 1/2 mile | Within 1/2 mile | Beyond 1/2 mile | Remarks |
|---|---|---|---|---|---|
| 15 Apr. 72--Cont. | | | | | |
| 1421 | 25 W | | | | 5500 ft. |
| 1423 | | | | 10 W | 5500 ft. |
| 1424 | | | | | Start down |
| 1426 | | | | 1 B | 2500 ft, new heading |
| | | | | 1 B | |
| 1429 | | 20 W | 40 W | 75 W | |
| | | | 1 B | 40 W | 500 ft. |
| 1430 | 30 W | | 2 W | | Old floe ice surroun |
| | 10 W | | 10 W | | ed by young ice |
| 1431 | | | 15 W | | |
| | | | 12 W | | |
| 1432 | 10 W | 30 W | 2 W | | |
| | | | 30 W | | |
| 1433 | | 75 W | | | |
| 1435 | | 35 W | 12 W | | |
| 1440 | | 1 W | | | Young ice, 0.6 cove |
| 1443 | | 1 W | 2 W | | In water |
| 1445 | | 1 W | 3 W | | In water |
| 1446 | | 1 bowhead | | | Circle and resume heading |
| 1447 | | 2 W | | | |
| 1452 | 3 W | | | | |
| 1454 | | 2 W | 2 W | | |
| | | | 3 W | | |
| 1456 | | 5 W | | | |
| 1458 | | 2 W | 5 W | | |
| | | | 2 W | | |
| 1459 | | 3 W | 75 W | | |
| 1501 | | 1 W | 1 W | | |
| 1504 | 10 W | | 4 W | | |
| 1505 | | 2 W + 1 calf | 1 W | | |
| | | | 30 W | | |
| 1506 | | | 8 W | 1 W | |
| | | | | 15 W | |
| 1507 | | 1 W + 1 calf | 1 W + 1 calf | | |
| | | | 1 W | | |
| 1510 | | 125 W | | | |
| Total | 88 W | 308 W | 262 W | 141 W | |
| | | 1 bowhead | 1 B | 2 B | (of these 5W in water) |

# MARINE MAMMAL SURVEY

| Date and time | Beyond 1/2 mile | Within 1/2 mile | Within 1/2 mile | Beyond 1/2 mile | Remarks |
|---|---|---|---|---|---|
| 15 Apr. 72--Cont. | | | | | |
| 1511 | | 50 W | 15 W | | |
| 1512 | | 500 W | | 50 W | |
| | | 1000 W | | 75 W | Circle and return to heading |
| | | | | 100 W | |
| | | | | 150 W | |
| 1514 | | 150 W | 10 W | | |
| 1515 | 500 W | 1 W | | | |
| 1517 | 400 W | 15 W | 5 W | | |
| | | 45 W | 100 W | | |
| | | 50 W | 25 W | | |
| | | 75 W | 25 W | | |
| | | | 25 W | | |
| | | | 50 W | | |
| 1518 | 25 W | | 4 W | | |
| | 20 W | | 2 W | 20 W | |
| | 50 W | | 2 W | | |
| 1519 | 3 W | | 1 B + pup | | |
| 1520 | | 1 B | 1 R | | |
| | | 1 B | 2 B | | |
| 1521 | | | 1 B | | |
| 1523 | | | 2 B | | Consolidated pack, 0.9 cover, new heading |
| 1527 | | | 1 B | | |
| 1530 | | 3 W | 1 W in water | | |
| 1534 | | | 20 W | | |
| 1535 | | 2 B | 8 W | | |
| | | | 7 W | | |
| 1536 | | 4 W | | | Pass King Island |
| 1540 | | 1 B | 1 B | | |
| 1552 | | | 1 W in water | | |
| 1600 | | | | | Terminate survey, pass Sledge Island |
| 1614 | | | | | Land at Nome |
| Total | 998 W | 1,893 W | 300 W | 395 W | |
| | | 5 B | 9 B | | (of these 2 W in water) |
| | | | 1 R | | |

Grand total = 18 B
1 R
7,405 W (of these 154 W in water)
8 S
1 bowhead

# MARINE MAMMAL SURVEY

| Date and time | Beyond 1/2 mile | Within 1/2 mile | Within 1/2 mile | Beyond 1/2 mile | Remarks |
|---|---|---|---|---|---|
| 16 Apr. 72, depart Nome 1205 | | | | | 500 ft, 145 kts. 0° C |
| 1207 | - | | | | Heavy pack, 0.8 cov |
| 1213 | | 1 B | 1 R | | |
| | | 1 B | | | |
| 1217 | | | 1 B | | |
| 1225 | | | 1 B | | |
| 1242 | | | | | Heavy pack ice, 1.0 cover |
| 1245 | | 4 B | | | |
| 1246 | | | | | New heading |
| 1258 | | | | | Open water |
| 1301 | | | | | Pack ice, 1.0 cover |
| 1315 | | | | | 0.7 cover, scattere old pack-young ice |
| 1317 | | 1 seal? | | | |
| 1325 | | | | | New heading |
| 1326 | | | | | Placenta on ice |
| 1327 | | 1 B | | | Fog |
| 1330 | | | | | Heavy pack ice, 0.8 cover |
| 1335 | | | | | Terminate survey, fog |
| | | | | | Over solid ice |
| Total | | 7 B<br>1 seal? | 2 B<br>1 R | | |

Grand total = 9 B
1 R
1 seal?

Appendix 2

## Areas of High and Low Abundance in N. Bering Sea

St. Lawrence-Gulf of Anadyr-Northern Bering Sea; ca. 240 miles long and average ca. 25 miles wide.

High abundance area = 240 x 25 = 6,000 sq. miles

Low abundance area = Gulf of Anadyr and area south of St. Lawrence Island, average ca. 360 miles long by ca. 150 miles wide

360 x 150 = 54,000 sq. miles

Area north of St. Lawrence Island to Bering Strait, average ca. 140 miles long by ca. 70 miles wide

140 x 70 = 9,800 sq. miles

Total = 54,000 + 9,800 = 63,800 sq. mi.
Minus high abund. area 6,000

Total low abund. area 57,800 $mi^2$ (probably should be rounded to 60,000 sq. miles)

Total area: High abund. area = 6,000 $mi^2$
Low abund. area 60,000 "

Total 66,000 "

## Areas of High and Low Abundance in Bristol Bay and S. Bering Sea

High abundance area--central Bristol Bay
Av. ca. 30 x 50 mi = 1,500 $mi^2$

Low abundance area--Bristol Bay to beyond Pribilof Islands
Av. ca. 375 mi x 120 mi = 37,500 $mi^2$
Minus area of high abund. 1,500 $mi^2$

Total low abund. area 36,000 $mi^2$