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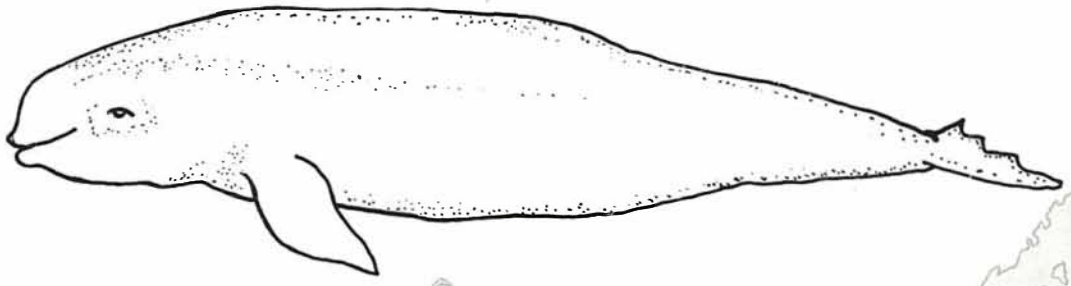
THE 1982
WHITE WHALE MONITORING PROGRAM
MACKENZIE ESTUARY



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THE 1982
WHITE WHALE MONITORING PROGRAM
MACKENZIE ESTUARY

Esso Resources Canada Limited
Dome Petroleum Limited
Gulf Canada Resources Inc.

March, 1983

FORWARD

This report on the 1982 White Whale Monitoring Program in the Mackenzie Estuary consists of two parts -- a scientific monitoring study of the arrival, abundance and distribution of white whales in the Mackenzie estuary; and a hunter/industry liaison program. The first part was conducted by Pamela Norton Fraker of LGL Limited. For Part II, Esso, Dome and Gulf requested Randy Pokiak of Tuktoyaktuk and Doug Irish of Aklavik to make regular liaison visits to the whaling camps from late June to early August. Being from Tuktoyaktuk, Mr. Pokiak was also able to maintain regular contact with the hunters from this community. Mr. Irish is Esso Resources' Northern Employment Counsellor, Inuvik Office.

THE 1982
WHITE WHALE MONITORING PROGRAM,
MACKENZIE ESTUARY

PART I

MIGRATION, DISTRIBUTION AND ABUNDANCE OF WHALES AND EFFECTS OF INDUSTRY ACTIVITIES ON WHALES

By

Pamela Norton Fraker

LGL Limited

environmental research associates

Sidney, B.C.

For

Esso Resources Canada Limited

Dome Petroleum Limited

Gulf Canada Resources Inc.

Calgary, Alberta

March 1983

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ACKNOWLEDGEMENTS

Many people made important contributions to the 1982 White Whale Monitoring Program. Mr. Tom Watmore, Mr. Mark Psutka and Mr. Arnie LaCroix of Esso, Dr. John Ward of Dome and Mr. Jim McComiskey of Gulf arranged accommodation and logistic support, supplied information on industry plans and activities and generally facilitated the study whenever necessary within their respective companies. Mr. Ron Quaife of Esso served very competently as an observer on several of the reconnaissance and systematic surveys and provided thought-provoking suggestions. Many people at Esso's Tuktoyaktuk base camp provided assistance and encouragement. In particular, I want to thank the individuals, such as Eliot Frosst of Dome, who took the time to record their observations of whales.

Randal Pokiak served very ably as second observer on the reconnaissance flights and as a liaison with the hunters in the whaling camps. Doug Irish of Esso also provided liaison during one round of camp visits. Many thanks to the families in all of the whaling camps for the hospitality they showed us.

Pilots Bob Conley and Chris Beilman of Aklavik Flying Service, Jeff Mahoney, Leonard Hagen and Al Martin of Aklak Air and Roch Gagnon of Inuvik Coastal Airways provided safe, accurate flying.

I would like to thank Tom Strong and Steve Tinker of Fisheries and Oceans Canada for permission to use the whale harvest data that they collected.

Within LGL, Dr. Rolph A. Davis provided constructive criticism of this report; Mrs. M. Hickey, Mrs. B. Nedzelski and Ms. S. Parsonage typed the report. B. Chamberlain drafted the figures.

SUMMARY

Because of the potential for activities in the Mackenzie estuary associated with oil and gas exploration to affect the distribution and abundance of white whales and to interfere with Inuit whaling, an annual monitoring program was initiated in 1972 and has been continued since. Part I of this report gives the results of the scientific part of the 1982 field program. The emphasis of the scientific program in 1982 was on documenting the arrival, and initial distribution and abundance of white whales in the estuary (the period when maximum numbers typically occur) and on detecting any interference by industry activities with the whale hunt by making camp visits. Fisheries and Oceans Canada monitored the white whale harvest in 1982.

The landfast ice barrier across the estuary first broke about 70 km directly east of Kay Point, opening up the west side of the estuary to whales, on or about 23 June. The ice blocking whale access to Kugmallit Bay did not break until 9-10 July. Whales were seen moving toward the breach in the ice on the west side during the first reconnaissance survey on 24 June. Although the peak number of whales seen during a reconnaissance survey was recorded on 28 June, the whale migration to the estuary continued through 13 July. Several observations of southeastward-moving animals were reported from Tarsiut aritificial island from 11 to 26 June.

Whales were first seen in Niakunak Bay on 28 June, although some animals probably entered this area on 24 June. Whales were first reported in Kugmallit Bay on 10 July. Although there was a great disparity in the opening dates of the two sides of the estuary, more whales used Kugmallit Bay in 1982 than in 1978, 1979, 1980 or 1981; whales were still migrating to the estuary after Kugmallit Bay became accessible in 1982.

Maximum numbers were estimated in both concentration areas on 14 July (5632 whales in Niakunak Bay and at least 1376 in Kugmallit Bay). The maximum estimate for the Mackenzie estuary in 1982, at least 7000 animals, is probably an underestimate because no correction was made for the fact that the Kugmallit Bay survey was done under fair observation conditions and no surveys were conducted in East and West Mackenzie bays around 14 July. The 1982 maximum estimate equalled the 1979 maximum estimate which was the highest recorded estimate since the survey areas were

standardized (1976). The span between the date when whales first entered the estuary and the date of the survey(s) giving the maximum estimate was greater in 1982 than in the years 1977 to 1981.

Small-scale differences in the areas within the estuary utilized by large numbers of whales have been observed from year-to-year.

Most of the survey effort was expended on Kugmallit Bay since this is the nearshore area with the highest intensity of both industry activities and hunting activities. No obvious relationship was found between the relative amount of industry activity and the maximum number of whales estimated using either all of the estuary or Kugmallit Bay during the periods of observation in 1980 to 1982. The number of whales landed daily from Kugmallit Bay was more closely correlated with the estimated number of whales present than with the number of passes by industry vessels along either the southern or the eastern or both shipping channels in Kugmallit Bay in 1982.

INTRODUCTION

Artificial island construction and support activities, such as vessel traffic, in the Mackenzie estuary and offshore regions occur largely during the open-water period; during the early part of this time period large numbers of white whales (*Delphinapterus leucas*) congregate in certain areas of the estuary and are hunted by local Inuit. Because of the potential for industry activities to interfere with the whales and the whale hunt, a monitoring program was initiated when artificial island construction began in 1972. This program has been in operation since and has evolved from year to year, as information accumulated and as industry activity changed. This part of the report presents the results from the reconnaissance and systematic surveys which started on 21 June and continued until 20 July.

Previous reports in this series have included summaries of the biology of white whales, analyses of the white whale hunt, and discussions of the local distribution and abundance of bowhead whales (*Balaena mysticetus*). Additional background information on white whales and information on the white whale hunt is given in: Slaney 1973, 1974, 1975, 1976; Fraker 1977a, b, 1978; Fraker and Fraker 1979, 1981; Fraker *et al.* 1979; Norton Fraker and Fraker 1982; and Strong and Walker in prep. Readers are referred to Renaud and Davis 1981, Davis *et al.* 1982, Harwood and Ford 1982 and Richardson (ed.) 1982 for information on bowhead whales.

Background Information on White Whales

The stock of white whales that uses the Mackenzie estuary winters in the Bering Sea. The northward migration begins in April and proceeds along the coast of Alaska northeast to Point Barrow; here the migrating whales turn east and proceed directly to Banks Island, following leads that develop in the east-west offshore shear zone (Fraker 1979; Ljungblad 1981; Marko and Fraker 1981). The earliest recent sighting of white whales in the Banks Island-Amundsen Gulf area was on 23 May 1977; numerous sightings have been made in that area in late May - early June (Marko and Fraker 1981). From mid-June to early July white whales are seen migrating southwestward to the Mackenzie estuary. Large numbers are observed in the shallow (<2m), warm, muddy waters of the estuary through much of July. In mid-July, the number of whales in the estuary begins to decline. In late July, large

groups (up to 200 whales) are frequently seen travelling southwestward along the Tuktoyaktuk Peninsula; these whales may be returning to the estuary after leaving to feed offshore or these movements may constitute a second, later migration to the estuary. In August and September much smaller numbers of whales are observed in the estuary area. Few sightings of white whales have been made anywhere along the Beaufort Sea coast in the fall, which suggests that the fall migration to the Chukchi Sea and eventually to the Bering Sea may occur offshore.

Previous studies of the Mackenzie estuary (Fraker and Fraker 1979, Norton Fraker and Fraker 1982) have estimated the size of the Mackenzie white whale stock to be about 7000 animals excluding calves. During an extensive bowhead whale study of the eastern Beaufort Sea and Amundsen Gulf in 1981, Davis and Evans (1982) observed large number of white whales in offshore areas during August. They estimated that the Mackenzie stock numbered at least 11,500 white whales.

Although the timing, location and intensity of whale use is well-documented for many parts of the Mackenzie estuary, the reason why whales use these areas is not well understood. Except around points of land, where fish might be expected to concentrate as they migrate along the coast, little feeding activity has been observed. The 1977 study for the Department of Fisheries and Oceans (DFO) that compared whale distribution with temperature, salinity and turbidity gradients concluded that temperature was the most important of the factors studied (Fraker *et al.* 1979); the thermal advantage afforded young of the year by the estuary water is thought to be important. That aerial (splashing) behaviours have only been observed in whale concentration areas and are seldom seen when small numbers of whales are present suggests that the Mackenzie estuary may also serve a social function (Fraker and Fraker 1981). Finley *et al.* (1982) have reported that white whales may use estuaries to moult old skin; in the eastern Arctic, white whales have been observed rolling on the bottom (Finley 1982). Mud trails have been seen in the Mackenzie estuary but it has not been possible to determine if the whales making the trails were rolling on the bottom or were disturbing the bottom while swimming or feeding.

While in the Mackenzie estuary the white whales are hunted by Inuit

from three communities -- Aklavik, Inuvik and Tuktoyaktuk. Also several hunters from other communities, such as Holman and Fort McPherson, have participated in the hunt in some years (Bourque 1967; Norton Fraker and Fraker 1982). Inuit from distant communities, such as Coppermine, come to Tuktoyaktuk to work and they may participate in the hunt as well (DFO 1981). The whale hunt has important cultural implications, that are difficult to measure, and serves as a source of reasonably-priced meat and muktuk for many families.

Activities Related to Oil and Gas Exploration

During the 1982 field season the three oil companies operating in the Mackenzie estuary region were, in order of most active to least active in the study area: Esso Resources Canada Limited, Dome Petroleum Limited, and Gulf Canada Resources Inc. In addition at least four other companies used the shipping channel through southern Kugmallit Bay (Fig. 1); some of this activity was related to oil and gas exploration. Although much of the 1982 industry activity was beyond the time frame and/or the area of study, only data on industry activities within both the time frame and the study area were gathered for this report.

Exploratory drilling is accomplished using either land rigs on artificial islands or drillships. Most of the industry activity in the study area involves transporting personnel, equipment and supplies to the drilling sites or dredging to build the artificial islands. In some years many vessel movements have been required to transport the fill material from the borrow location to the island site; in other years most of the dredging has been at the island site. Seismic and sounding surveys are used to delineate the subsurface materials and map the ocean floor contours.

Objectives

The overall purpose of the whale monitoring program is to minimize or prevent adverse effects of exploration activities by Esso, Dome and Gulf on white whales and Inuit whale hunting. To achieve this, information is required on white whale distribution, movements, abundance and reaction to human activities. The specific objectives of the 1982 study were:

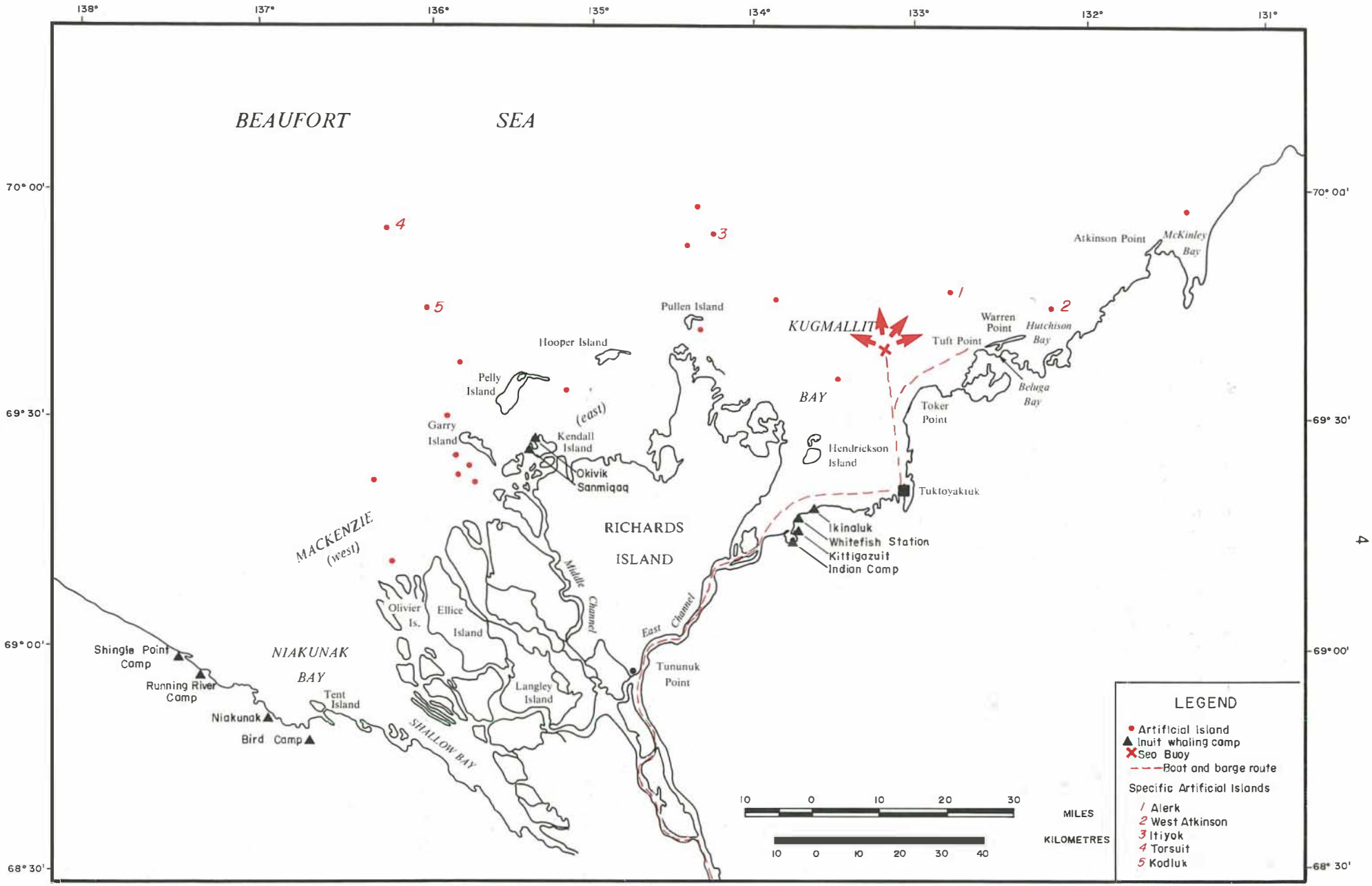


Figure 1. Location of human activities, Mackenzie estuary region, summer 1982.

(1) to determine when ice conditions allowed migrating whales access to Niakunak Bay and Kugmallit Bay, the two principal areas of the Mackenzie estuary used by white whales,

(2) to obtain an estimate of the maximum number of whales using these two areas,

(3) to document the number of whales, amount of vessel traffic and hunting success in Kugmallit Bay,

(4) to maintain good communication with Inuit hunters through camp visits so possible interferences with hunting could be detected early and appropriate responses made,

(5) to transfer the responsibility of communicating with the hunters to northern residents, and

(6) to record incidental sightings of the reactions of whales to any human activity.

METHODS

The scientific part of the 1982 field program (aerial surveys) started on 21 June and continued until 20 July. For the first part of the 1982 program, most effort was expended surveying the area from Mackenzie Bay to Baillie Islands to determine the extent of the landfast ice and the location and number of the white whales on migration. When the whale migration appeared to be waning, the emphasis of the program switched to systematic surveys of Niakunak and Kugmallit bays. Niakunak Bay was surveyed until mid-July in order to obtain a count of the maximum numbers there. Systematic surveys of Kugmallit Bay were begun when that bay became accessible to whales and continued until 20 July because this is the area with most of the industry traffic. Nearshore waters of the Tuktoyaktuk Peninsula, an area with some industry traffic, were surveyed once the landfast ice receded. One survey was done in West Mackenzie Bay to obtain a complete count of whales in the estuary at that time (2 July). No surveys were conducted in East Mackenzie Bay.

Study Area

The study area is defined as that area covered by systematic surveys (Fig. 2); additional areas are covered during the spring migration reconnaissance surveys. To facilitate discussion of the 1982 data, five subareas have been specified. These are:

(1) Niakunak Bay - the portion of West Mackenzie Bay lying north of a line running between the mouth of West Channel and the northern tip of the southernmost Olivier Islands and south of a line running from Shingle Point to the outermost part of the Olivier Islands;

(2) Barrier Islands - Garry, Pelly, Hooper and Pullen islands;

(3) West Mackenzie Bay - the area from 69°15' to 69°35' N latitude and from 137°31' W longitude eastward to land;

(4) Kugmallit Bay - the seaward boundary extending between approximately Pullen Island and Warren Point; and

(5) Tuktoyaktuk Peninsula coastal area - the nearshore area along the Tuktoyaktuk Peninsula extending seaward for approximately 10 km.

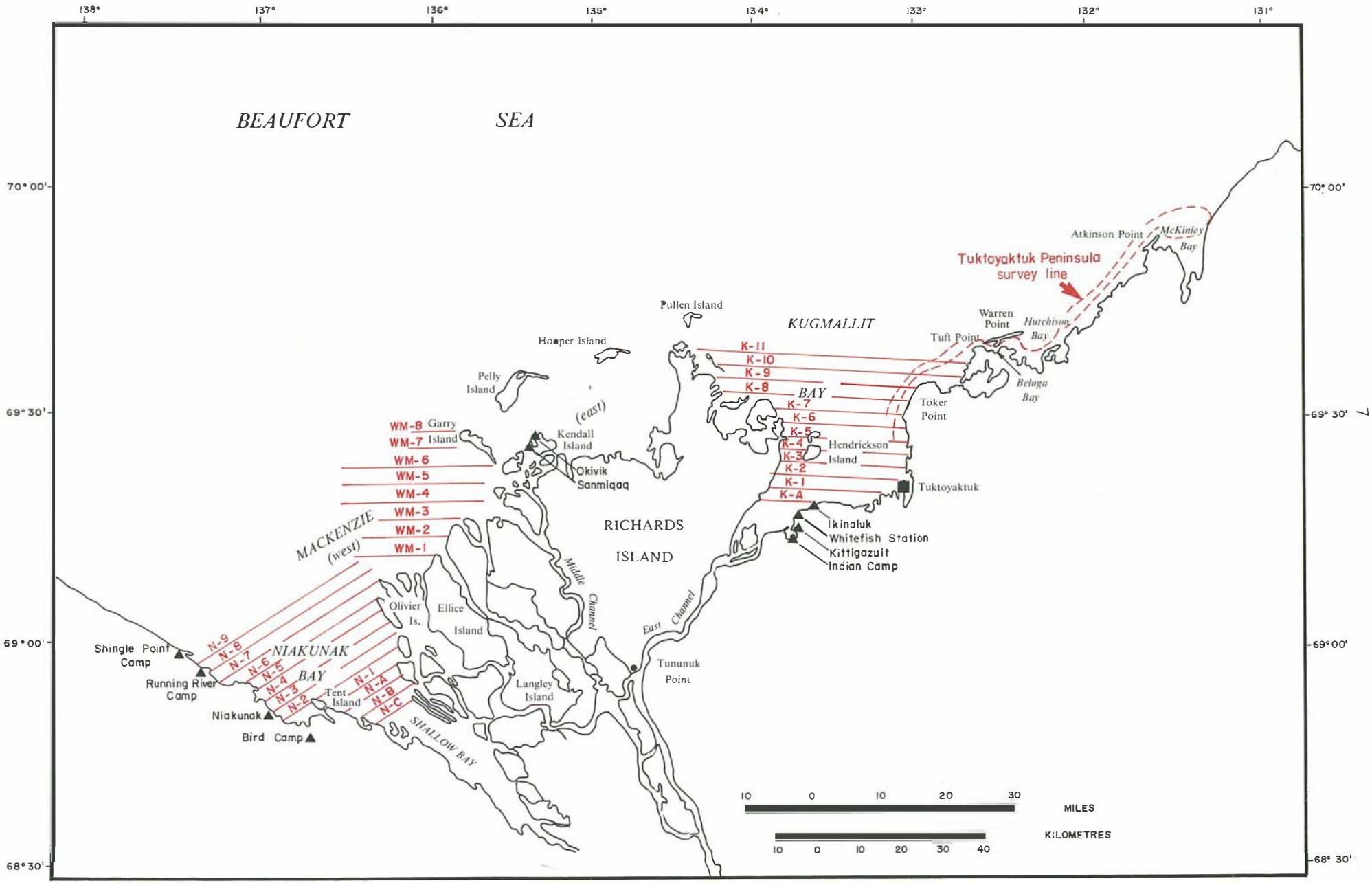


Figure 2. Standard survey lines, Mackenzie estuary and Tuktoyaktuk Peninsula, 1982.

Systematic Surveys

Systematic aerial surveys were conducted to obtain data on the distribution, relative abundance, behaviour, and movement patterns of whales. Transect lines were spaced at 3.2-km intervals across Niakunak Bay and Kugmallit Bay and at 4.8-km intervals across West Mackenzie Bay (Fig. 2). A standard flight track was flown along the Tuktoyaktuk Peninsula. The standard survey lines were first established in Kugmallit and Niakunak bays and off the Tuktoyaktuk Peninsula in 1976, and in West Mackenzie Bay in 1977.

A float-equipped Cessna 185 aircraft was used for all surveys. An altitude of 305 m and an airspeed of 193 km/h were maintained on all flights. The two observers, one in the right front seat and the other in the left rear, used digital watches that were synchronized before each survey. Times were recorded to the closest 15 s at the start and finish of each line and at landmarks along the way; total numbers of whales observed during each 15 s interval were recorded so that sightings could be plotted to within approximately 0.8 km. Surveys were conducted as often as weather allowed. Because of changes in weather, it was not always possible to complete each survey on each attempt, and therefore, the actual area surveyed was variable. The survey flights were timed so that the sun was either in front of or behind the aircraft in order to minimize glare on the water for observers looking out the sides. Observation conditions on each survey were rated according to the following scheme:

EXCELLENT: No glare or water disturbance to interfere with whale observations.

GOOD : Small amount of glare and/or a few whitecaps which cause a minor amount of visual interference.

FAIR : Glare and/or whitecaps which cause significant visual interference.

POOR : Severe winds which generate rough water; there may be glare, and air turbulence may interfere with both navigation and whale observation.

Visibility conditions were taken into account in interpreting the results of each survey. Estimates of whale numbers are from surveys conducted under good or excellent visibility conditions, unless otherwise noted. Surveys flown under any conditions may provide valuable data on distribution, movements and behaviour.

From an altitude of 305 m, it is possible to see whales up to 2 or 3 km away under favourable conditions. To keep the surveys consistent, only those whales seen within a 0.8 km-wide strip along each side of the aircraft were used to calculate estimates of numbers. In order for each observer to accurately determine the outer limit of the 0.8 km strip at the water surface, trigonometry was used to calculate the appropriate angle of view, taking into consideration the area obstructed by the float. Using an inclinometer the upper limit of this angle was marked with tape on the strut. Cassette tape recorders were used to record all data. Data were transcribed onto standard forms and plotted onto maps.

Reconnaissance Surveys

Reconnaissance aerial surveys were used to examine large areas during the spring migration period. These surveys were flown in several different twin-engine aircraft: deHavilland Twin Otter on 24 June; Cessna 337 on 26, 28 and 29 June and 13 July: Aero Commander on 1 July; and Navajo Chieftain on 9 July. All aircraft except the Navajo Chieftain afforded good side-view visibility. Generally the surveys were flown at an altitude of 457 m and an airspeed of 224 km/h. Procedures during reconnaissance flights were similar to those during systematic surveys except that the extent of the ice cover was mapped. This information was modified and expanded using NOAA satellite imagery.

Estimation Procedures

Because white whales are invisible beneath just a few centimetres of the highly turbid Mackenzie water, an accurate estimate of the number of whales present depends on knowing what proportion is at the surface at any one time. Unfortunately, this proportion is not precisely known and undoubtedly varies with the whales' activity. Sergeant (1973) watched white

whales from a cliff near Churchill, Manitoba, and observed that they spend about one third of the time at the surface; thus, he applied a visibility factor of three to his counts to arrive at an estimate of total numbers. Sergeant's visibility factor assumes an instantaneous count of whales for any given area. As the period of observation increases, a greater number of whales will be seen as they come to the surface. If we had restricted our observations to approximate an instantaneous count, whales would have been recorded as absent from areas where they occurred in low density. This procedure was unacceptable because information on distribution was an important objective of this study. By viewing objects while flying over land, Fraker (1976) determined that any given point is in view for about 15 s using the standard observation technique. To compensate for the fact that the assumption of an instantaneous count of whales was not met, Sergeant's visibility factor was reduced from three to two, and this factor has been applied consistently in whale studies in this area since 1975. It must be emphasized that the resulting figures should be treated as relative indices rather than unbiased estimates of abundance. Calves are not included in the estimates because the dark calves are not reliably detectable in the turbid water, even when they are at the surface.

Usually individual whales are continually surfacing and then submerging out of sight. In a few instances, however, most whales have been observed to remain at the surface and the numbers of whales observed have been strikingly larger than the numbers usually seen. In such cases, no visibility factor has been applied.

The transect lines in Kugmallit and Niakunak bays are 3.2 km apart and the transect width is 1.6 km or 50% of the total area. Thus, an extrapolation coefficient of two was applied to the total number of whales actually observed to allow for whales assumed to have been present in the unsurveyed area. In West Mackenzie Bay only 33% of the total area was under observation so an extrapolation coefficient of three was applied. For the surveys with only one observer present, the extrapolation coefficient was doubled to allow for the additional unsurveyed area.

Estimates of the number of white whales in the Mackenzie estuary may be affected by variables other than the proportion of whales at the surface.

Different observers and the use of different aircraft could also affect the number of whales counted. These sources of variation have been reduced as much as possible. The same seats of the same type of aircraft have been used for systematic surveys during the period when the highest numbers have been recorded. The same two observers conducted the surveys when the highest numbers were recorded in 1976 to 1980; different observers conducted the surveys in 1981 and 1982.

Information on Hunting Activities

Whaling camps were visited about every four days to maintain liaison with the hunters and to exchange information with local people who had been hired by Fisheries and Oceans Canada to collect data on the harvest. This procedure was continued by Randal Pokiak and Doug Irish after the termination of the reconnaissance and systematic surveys. (See Part II for their reports.) The harvest data used in this report were supplied by Fisheries and Oceans Canada (Appendix 1).

Observations by Industry and Other Personnel

Important observations were made by various persons on boats, in aircraft, or on the barge camps. These observations were recorded on standard forms and were submitted at the end of the field season. Data recorded included location and numbers of whales, date and time, direction of movement, distance from and reaction to vessels, and remarks on feeding or other behaviour (Appendix 2). These observations often covered geographical areas and/or time periods not included in the field program or when weather precluded surveying.

Information on Industry Activities

Data on the number of ship movements per day through southern Kugmallit Bay and from the Tuktoyaktuk harbour northward to the sea buoy and beyond were obtained either by examining the dispatcher's logbooks or the morning vessel location reports of companies with several vessels operating in the area or by interviewing the captains of individual vessels. Vessels

owned by or chartered to the following companies were included in enumeration of industry activities: Esso, Dome, Gulf, Northern Transportation Company Limited, Arctic Transportation Limited, Points North Transportation and Beluga Transport. Records of vessel movements by Len Cardinal Transport could not be obtained. 1982 was the first year that information on industry traffic through southern Kugmallit Bay was enumerated.

Information on seismic and sounding activity, barge camp location, island construction, drilling, etc., was supplied by the three oil companies.

RESULTS

Ice Break-up and Whale Migration to the Estuary

White whales can not enter the Mackenzie estuary until a break occurs in the landfast ice sheet across the estuary. According to satellite imagery, breaches in the landfast ice first occurred in West Mackenzie Bay, about 70 km directly east of Kay Point, on or about 23 June in 1982. Two avenues of open water between the major offshore lead and Niakunak Bay were observed during the first reconnaissance survey on 24 June (Fig. 3A). At this time the narrowest section in the band of ice across Kugmallit Bay was approximately 45 km wide. During subsequent reconnaissance surveys, the landfast ice was observed to be slowly receding (Figs. 3B, 3C, 3D, 3E, 3F and 3G). Kugmallit Bay was not accessible until 9-10 July in 1982; a strong east wind on 10 July probably first broke the band of ice across the bay. Thus, Niakunak Bay was accessible to whales two and one-half weeks earlier than Kugmallit Bay in 1982.

The edge of the pack ice in the eastern Beaufort Sea was far offshore on 24 June -- the width of the corridor of open water between the landfast ice and the pack ice varied from 50 to 185 km. Although cloud cover obscured part of the offshore area on 26, 28 and 29 June (Figs. 3B, 3C, and 3D), the major offshore lead did not appear to be decreasing in size during this time. Between 9 and 13 July strong northwest winds pushed large packs of ice from offshore in toward the northeastern shore of Baillie Islands and Cape Bathurst (Figs. 3F and 3G).

The whale migration had already begun by the time of the first reconnaissance survey in 1982. Eighty-nine whales were observed along the edge of the landfast ice on that date; several of the whales were travelling toward the west side of the estuary (Fig. 3A). Fewer whales were observed during the next survey, on 26 June (Table 1); most of the whales were heading toward the estuary (Fig. 3B). The largest number of whales seen during a reconnaissance survey was 255, on 28 June (Fig. 3C; Table 1). Most of the whales observed during the flight on 29 June were along the ice edge either north of Kugmallit Bay or northeast of Baillie Islands (Fig.3D). Only six whales were observed during the incomplete survey of the ice edge on 1 July (Fig. 3E). More whales (121) were observed during the survey on

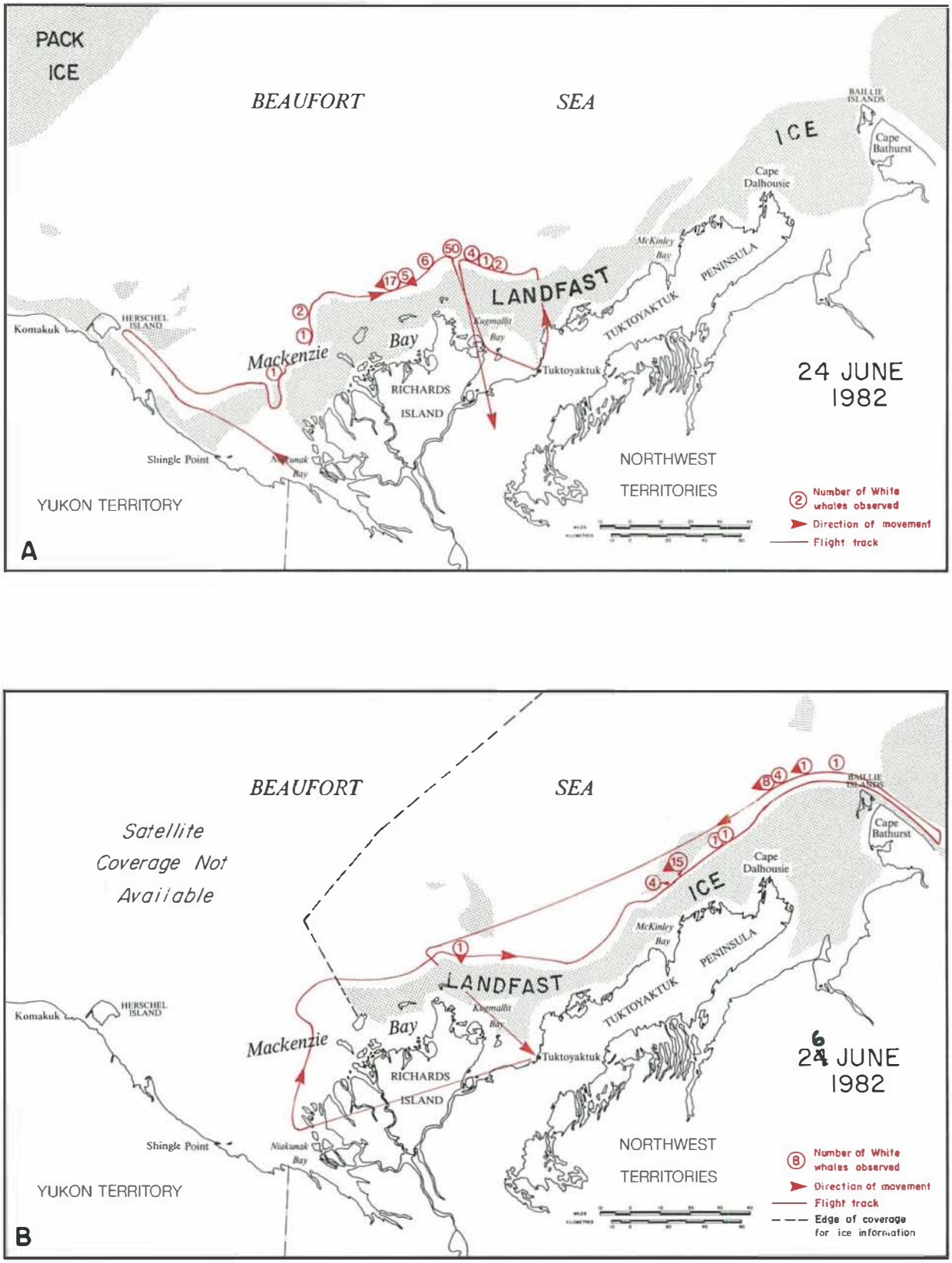
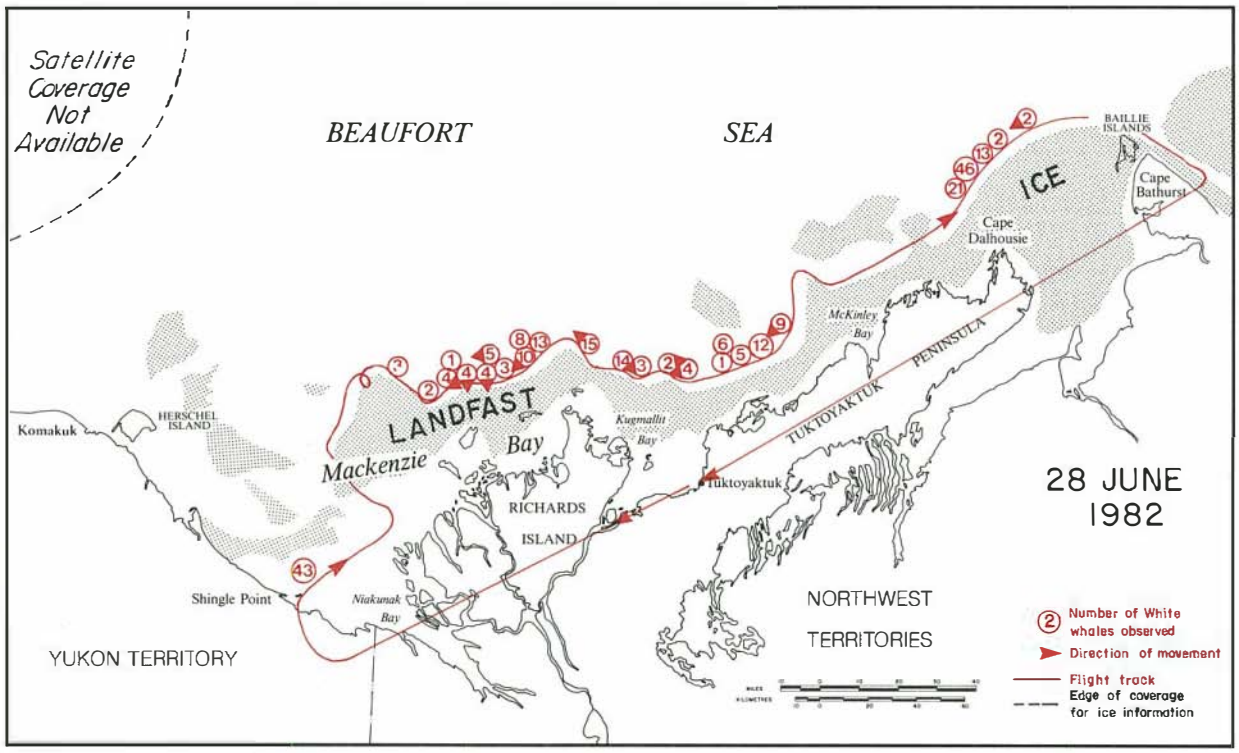
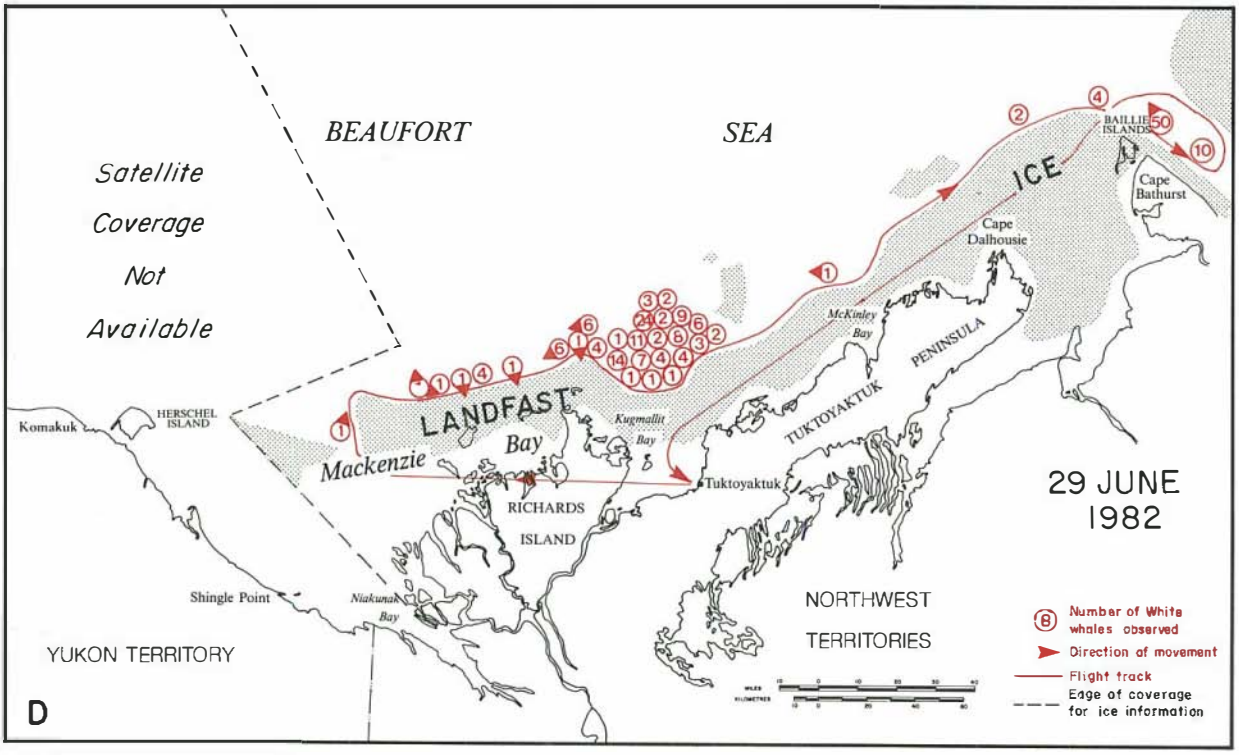


Figure 3. Results of spring migration surveys, 1982. The extent of ice cover for each date was mapped using satellite imagery and observations made during the reconnaissance flight.





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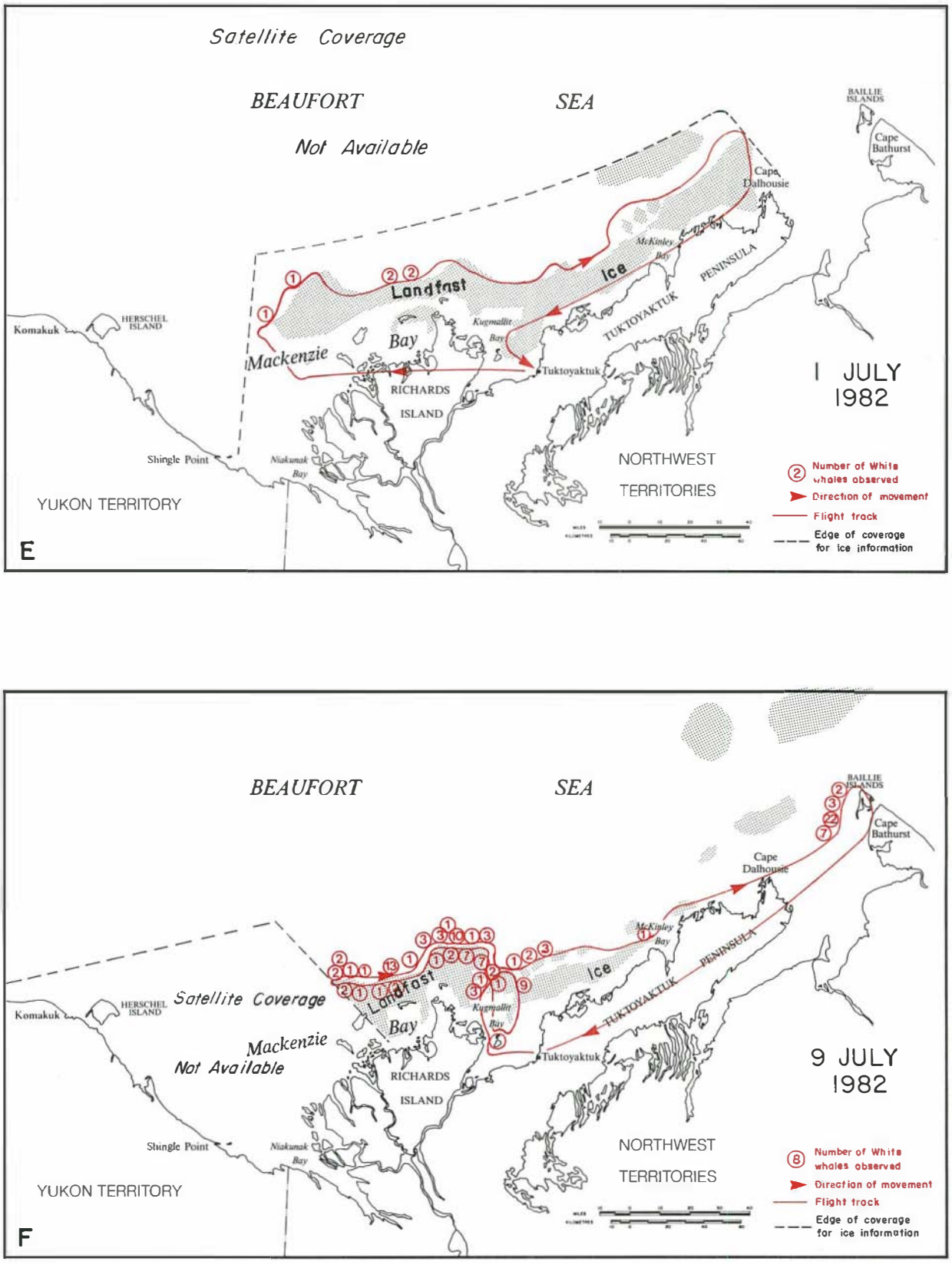

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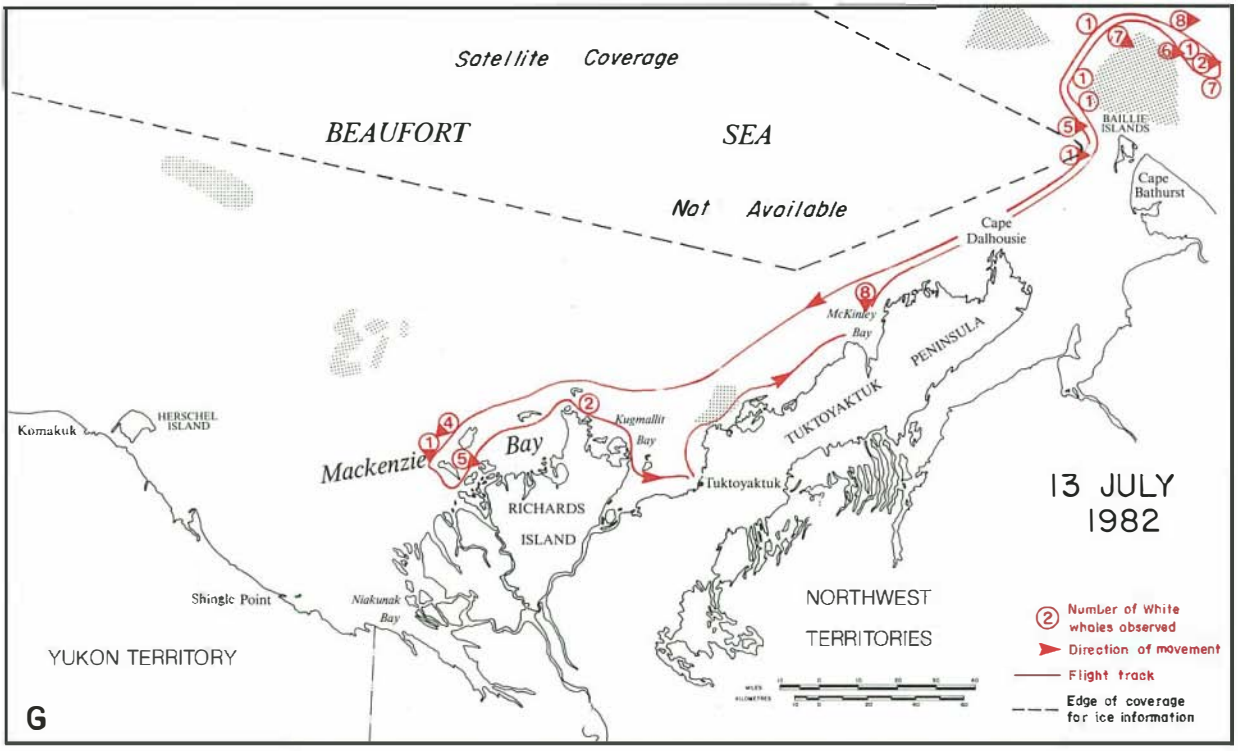

Figure 3. Continued

Table 1. Number of white whales observed along the landfast ice edge during aerial reconnaissance surveys, June - July 1982.

Date	Number of whales sighted
24 June	89
26 June	36
28 June	255
29 June	198
1 July	6
9 July	121
13 July	60

9 July (Fig. 3F). Of the 60 whales observed on 13 July, most were north-northeast of Cape Bathurst and were heading east (Fig. 3G).

Several observations of white whales were reported from Tarsiut artificial island from 11 to 26 June, which is part of the period when Tarsiut was on the outer edge of the landfast ice (see Observations by Industry and Other Personnel). More whales were reported on 25 June than on any other day observations were made at Tarsiut.

Of the whales observed along the landfast ice edge during the 24 June reconnaissance survey, one whale was approximately 28 km northeast of Niakunak Bay. Assuming even a moderate rate of travel (4 km/h), this whale could have entered Niakunak Bay later on the same day. The first whales were observed in Kugmallit Bay at 10:45 on 10 July.

Distribution and Abundance of Whales Within the Estuary

Niakunak Bay

In 1982, reconnaissance surveys of Niakunak Bay were flown on 24 and 28 June and four systematic surveys were conducted during the first half of July. Weather prevented surveys on 26 June and from 4 to 10 July.

No whales were observed in Niakunak Bay on 24 June; however, one whale was seen approximately 28 km northeast of Niakunak Bay at 1400. Assuming a moderate rate of travel (4 km/h; Kleinenberg *et al.* 1964), this whale could have been in the Niakunak Bay area at 2100 h on 24 June. On 28 June, 43 whales were seen along a line through the middle of Shallow Bay and Niakunak Bay. Many more whales (521) were observed in Niakunak Bay during the first systematic survey on 2 July (Table 2; Appendix 3). An estimated 2084 whales were in the survey area at that time. Fewer whales were seen the next day but observation conditions were only fair. On the third systematic survey, on 11 July, 596 whales were counted by the single observer under fair-good conditions. The peak estimate of whales in Niakunak Bay, 5632 animals, was obtained on 14 July. Only one observer was present on the 14 July survey. The estimated increase in whale abundance in Niakunak Bay appeared to be more gradual in 1982 than in 1978, 1979 or 1980 (Fig. 4); the pattern of abundance in 1982 was similar to the initial pattern of whale abundance in 1977. (The period between the first and second surveys was too large in 1981 to be able to accurately assess a pattern of abundance in that year.)

The area in Niakunak Bay used by large numbers of whales in 1982 was within the boundaries of the combined areas used in 1976, 1977, 1978, 1979, 1980 and 1981 (Fig. 5). Year-to-year variations in the area used are common.

Kugmallit Bay

Surveys of Kugmallit Bay were conducted frequently in 1982. During all of the reconnaissance surveys (on 24, 26, 28 and 29 June and 1, 9 and

Table 2. Results of systematic surveys of white whales in Niakunak Bay, 1982.

Date	Lines flown	Observation conditions	Whales observed	Number of observers	Extrapolation coefficient *	Visibility factor	Estimated number
2 July	N-A to N-10	Good	521	2	2	2	2084
3 July	N-A to N-10	Fair: N-A to N-7 Good: N-8 to N-10	432	2	**	**	**
11 July	N-B to N-9	Good: N-B to N-3 Fair: N-4 to N-9	596	1	**	**	**
14 July	N-B to N-9	Good	704	1	4	2	5632

* An extrapolation coefficient of two was used to allow for the unsurveyed areas when two observers were present on a survey. When there was only one observer, the appropriate extrapolation coefficient was four.

** No population estimate was calculated for surveys done under fair conditions.

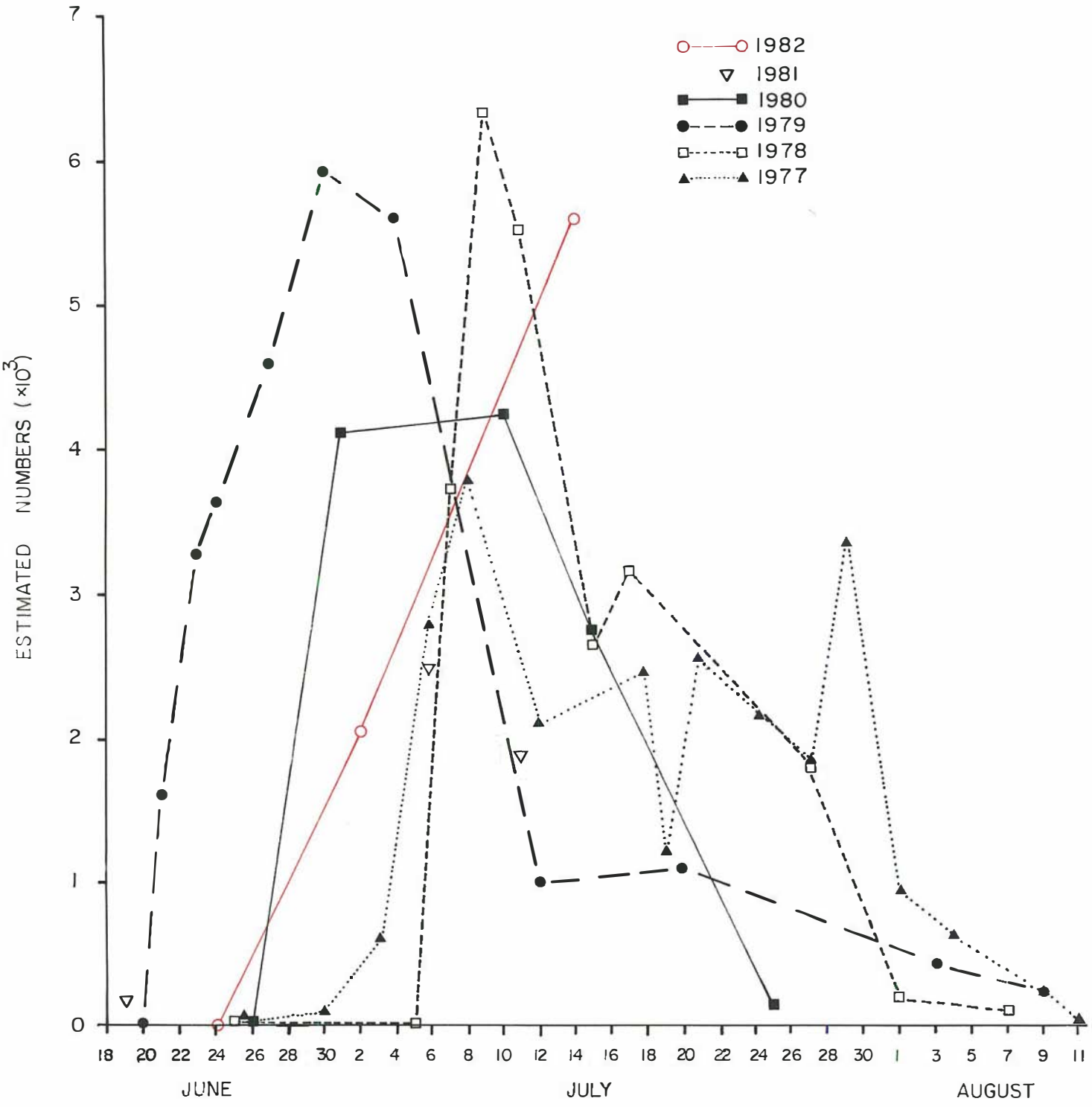

Figure 4. Estimated numbers of white whales in Niakunak Bay, 1977–1982.

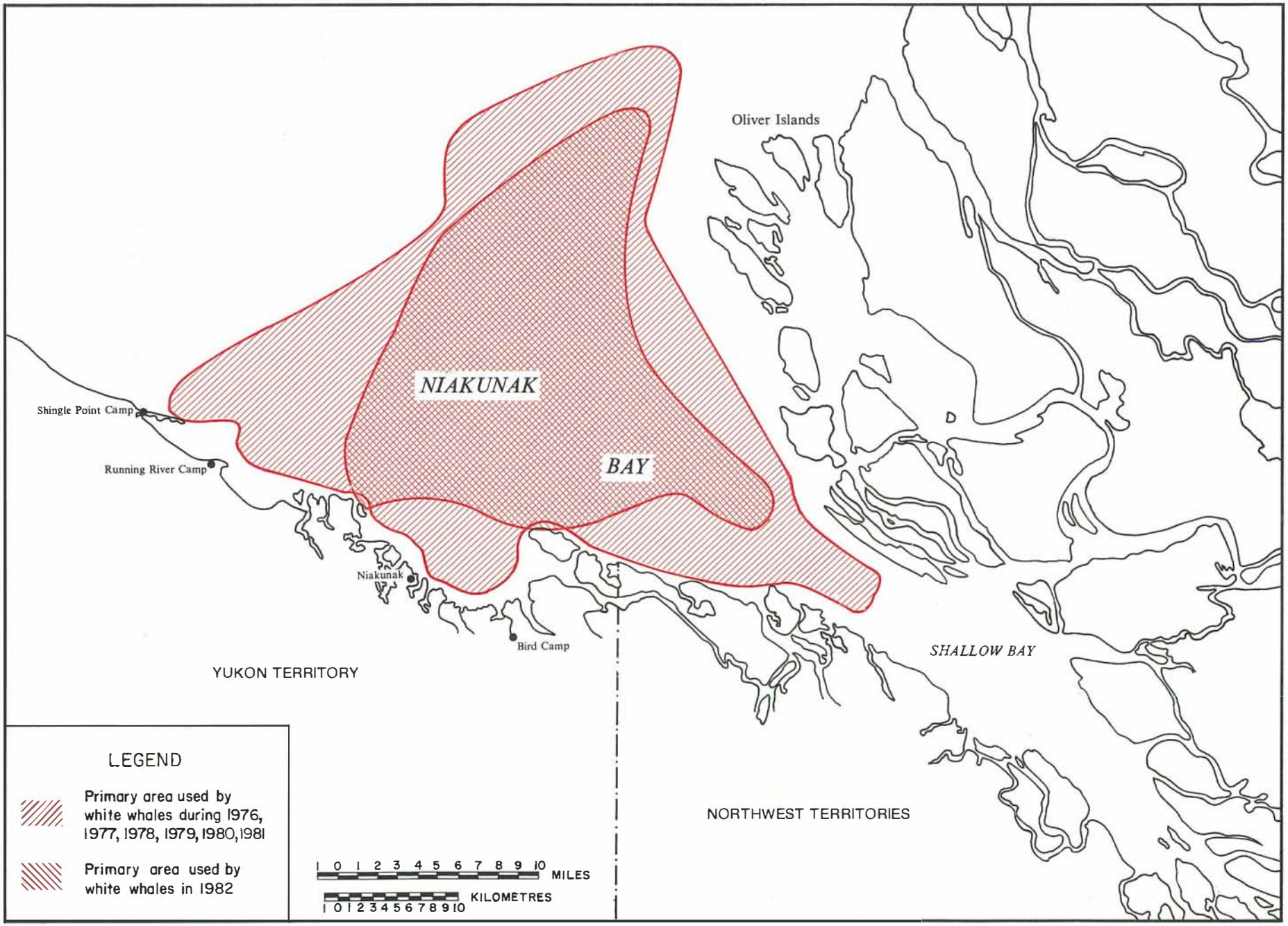

Figure 5. The extent of the Niakunak Bay white whale concentration area, 1976–1982.

13 July) and during a short flight on 5 July, the water landward of the band of landfast ice was examined for whales. Systematic surveys were done on 12, 14, 16, 18 and 19 July. Much effort was expended on Kugmallit Bay because this is the nearshore area with the greatest potential for industry activities to interfere with whales or whaling. This is the area with the greatest intensity of industry traffic and many of the whales harvested in the Mackenzie estuary are taken from Kugmallit Bay.

Whales were first observed in Kugmallit Bay mid-day on 10 July; about one hundred animals were seen (see Observations by Industry and Other Personnel). A similar number of whales was observed under fair conditions during the first systematic survey on 12 July (Table 3; Appendix 3). The greatest number of whales observed in Kugmallit Bay was during the 14 July survey; observation conditions in the areas where the whales were seen during the survey were fair. A minimum of 1376 whales were estimated to have been in the concentration area at that time. (Under fair conditions fewer whales are seen; an appropriate visibility factor is not available.) About 1000 whales were estimated to be in Kugmallit Bay through to 20 July. Once Kugmallit Bay became accessible to whales, the pattern of whale abundance seen there in 1982 was similar to that seen in some of the previous years (Fig. 6). The pattern of whale abundance in Kugmallit Bay has varied from year to year.

Some of the areas within Kugmallit Bay used by large numbers of whales in 1982 were the same as those used in previous years (Fig. 7). However, in 1982 large numbers of whales were seen in areas that were not previously defined as part of the Kugmallit Bay concentration area. Whales were seen in most of these "new" areas during only one survey: whales were seen in the southern extension (area 1 on Fig. 7) only during the first survey on 12 July, in the small western extension (area 2) only during the survey on 14 July, and in the northern extension (area 3) only during the survey on 16 July. (About 100 whales were seen in the southern extension on 10 July; see Observations by Industry and Other Personnel.) However, many whales were observed in the northwestern extension (area 4) during three surveys, on 14, 16 and 19 July.

Table 3. Results of systematic surveys of white whales in Kugmallit Bay, 1982.

Date	Lines flown	Observation conditions	Whales observed	Number of observers	Extrapolation coefficient *	Visibility factor	Estimated number
12 July	K-A to K-9	Fair	99	1	**	**	**
14 July	K-A to K-9	Good: K-A to K-2 Fair: K-3 to K-9	172	1	**	**	**
16 July	K-A to K-11	Excellent	118	1	4	2	944
18 July	K-A to K-9	Fair	16	1	**	**	**
19 July	K-A to K-10	Excellent: K-A to K-2 Good: K-3 to K-10	129	1	4	2	1032

* An extrapolation coefficient of four was used to allow for the unsurveyed areas when one observer was present on a survey.

** No population estimate was calculated for surveys done under fair conditions.

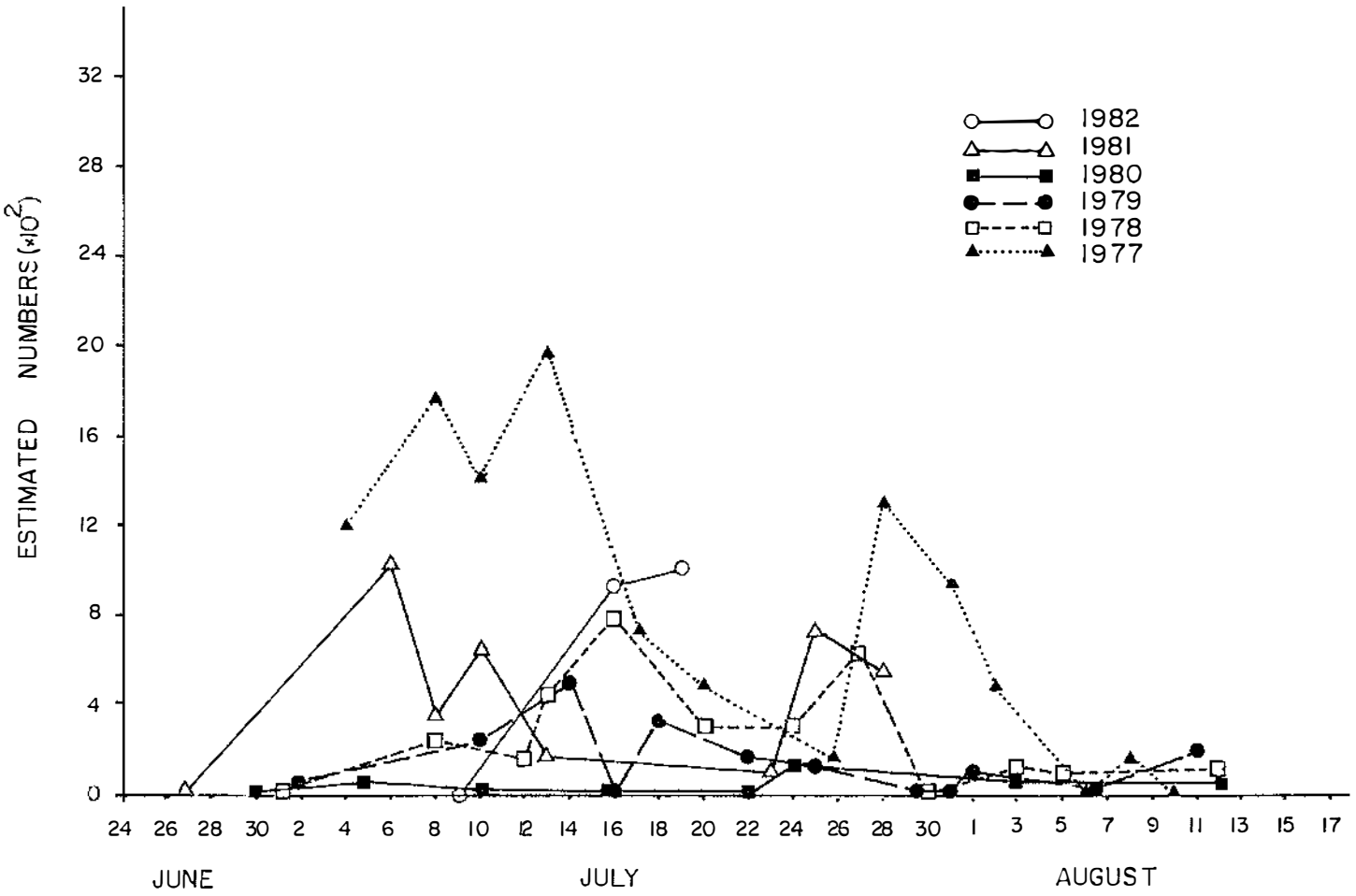

Figure 6. Estimated numbers of white whales in Kugmallit Bay, 1977–1982.

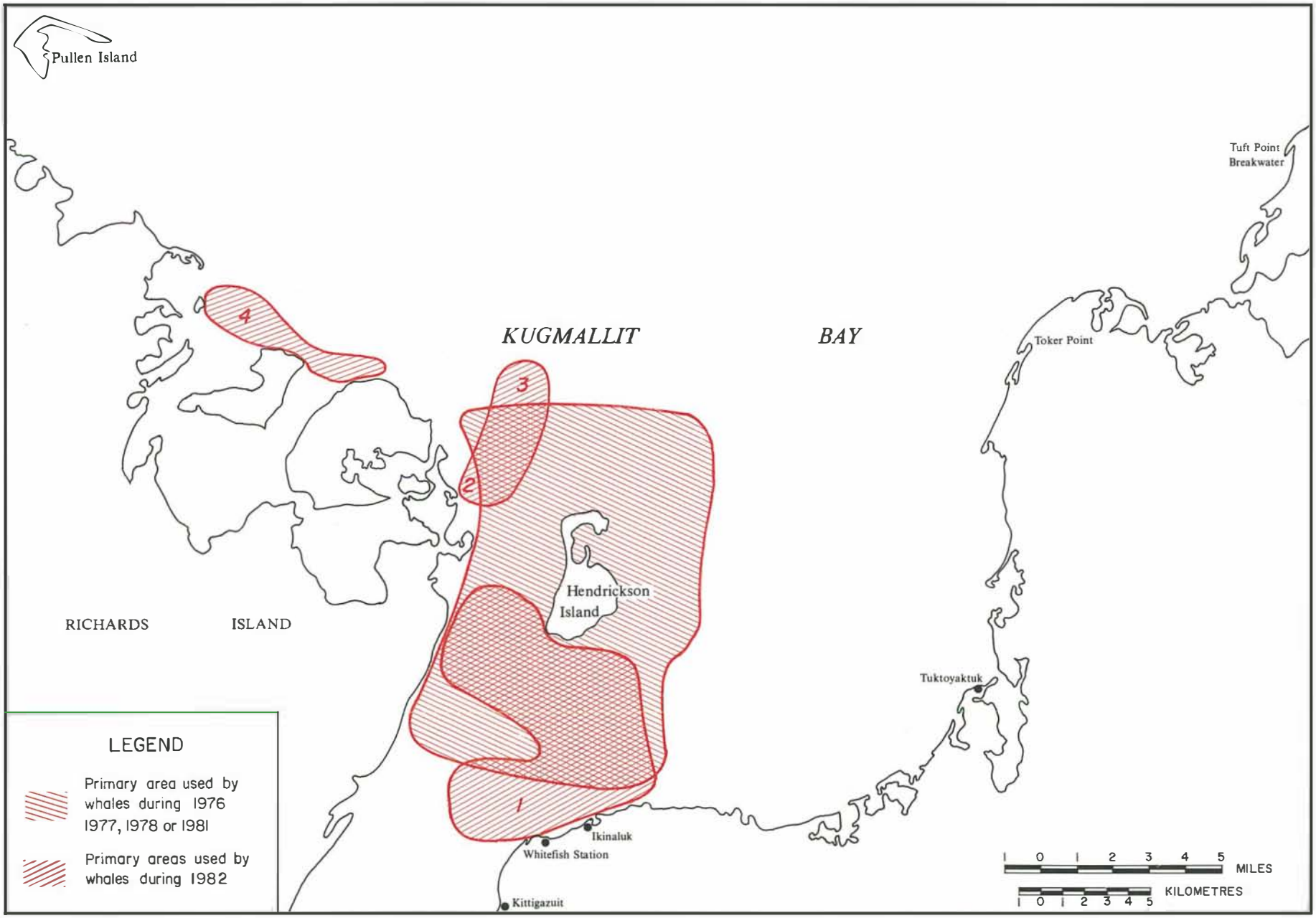

Figure 7. The general extent of the Kugmallit Bay white whale concentration area in 1976, 1977, 1978 and 1981 compared with 1982. (Too few whales used Kugmallit Bay in 1979 and 1980 to define a concentration area. Area numbers are referred to in the text.)

Tuktoyaktuk Peninsula

Three systematic surveys along the Tuktoyaktuk Peninsula were conducted in 1982 on 16, 18 and 19 July. This area is monitored because it is a major travel corridor for white whales coming to the Mackenzie estuary from the east, and there are occasions when this area is used by much industry traffic as well. In total, eighty-six whales were observed during the surveys (Table 4). With the exception of two sightings on 19 July, an individual whale that was not travelling and two whales in McKinley Bay, all the whales observed along the Tuktoyaktuk Peninsula were headed in toward the estuary.

West Mackenzie Bay

In an effort to obtain a more complete maximum estimate, one survey of West Mackenzie Bay was conducted on 2 July. Previous commitments as well as poor weather made it impossible to survey this area on 14 or 15 July.

During the 2 July survey the shortened survey lines (Fig. 2) were flown for safety reasons. Approximately nine hundred whales were estimated to be in the area at that time (150 whales sighted x an extrapolation coefficient of three x a visibility factor of two). At least two groups sighted were presumed to be feeding since gulls were circling above the whales.

Observations by Industry and Other Personnel

Industry personnel and personnel in support services are often present in areas not covered by systematic surveys and are in the field with the opportunity to make whale sightings for much of the open-water period. In 1982, there were 18 sightings of a total of at least 337 white whales (Table 5); bowhead whale sightings will be included in a report by LGL for the U.S. Bureau of Land Management that is still in preparation. Only one sighting, on 10 July, was of white whales in the study area. Nine sightings were made from Tarsiut artificial island, from 11 to 26 June (Table 5); Tarsiut was on the outer edge of the landfast ice when these observations were made.

Table 4. Results of systematic surveys along the Tuktoyaktuk Peninsula from Toker Point to McKinley Bay, 1982.

Date	Total number of whales seen during survey	Specific sightings of whale groups		
		Number	Direction of travel	Location
16 July	27	5	W	NW of Warren Pt.
		3	S	N of Warren Pt.
		2	S	SW of Atkinson Pt.
		1	SW	NW of Atkinson Pt.
		16	S	N of McKinley Bay
18 July	42	42	SW	SW of Atkinson Pt.
19 July	17	1		W of Toker Pt.
		7	W	N of Hutchison Bay
		7	SW	SW of Atkinson Pt.
		2	NW	in McKinley Bay

Industry Activities

During the study period many of Esso's activities were in support of the drilling operation at West Atkinson (see Fig. 1). The drilling rig was disassembled and barged into Tuktoyaktuk during mid-July. The dredge, Beaver Mackenzie, and the barge camp, Arctic Breaker, were moved from Tuktoyaktuk harbour to Tuft Point on 16 July. Dredging operations at Tuft Point were begun on 17 July and finished on 20 July. The Beaver Mackenzie then proceeded to Itiyok. Esso's seismic and sounding activities occurred outside either the time frame and/or the study area of this project.

Canmar's drillships, Explorer I (Gulf-operated), II, III and IV, left their overwintering site, McKinley Bay, on 11, 4, 1 and 14 July respectively. All proceeded to drilling locations offshore beyond the study area. Supply vessels used the shipping lane in eastern Kugmallit Bay on their way between Tuktoyaktuk and the offshore locations. Dome's dredging, seismic and sounding activities occurred outside either the time frame and/or the study area of this project.

Table 5. Observations of white whales by industry and other personnel, 1982.

Date Time	Location	Number of Whales	Direction of Movement	Observations	Observer Company
11 June AM	N69°54' W136°12'	10-15	ESE	whales came as close as 100 m to Tarsiut artificial island; group included some young.	E. Frosst Dome
16 June 1030	N69°54' W136°12'	4	SE	whales remained as close as 100 m to Tarsiut artificial island for 20 minutes.	E. Frosst Dome
16 June 1130	N69°54' W136°12'	6	SE	whales remained as close as 100 m to Tarsiut artificial island for 20 minutes.	E. Frosst Dome
16 June PM	N69°54' W136°12'		SE	a series of pods, each containing 6 to 12 individuals, rounded the north side of Tarsiut artificial island then headed SE.	E. Frosst Dome
22 June	N69°54' W136°12'	3 pods of 6 each	SE	the pods passed north of Tarsiut artificial island, came in as close as 100 m, then headed SE along the landfast ice edge; some were calves	E. Frosst Dome
24 June 1500	N69°54' W136°12'	12		one adult remained for 5 minutes within touching distance of observer on ice edge near Tarsiut artificial island.	E. Frosst Dome
25 June 1015	N69°54' W136°12	6	SE	whales came as close as 200 m to Tarsiut artificial island.	E. Frosst Dome
25 June throughout day	N69°54' W136°12'	8-10 pods of 4-6 whales each	SE	whales came as close as 200 m to Tarsiut artificial island.	E. Frosst Dome

Table 5. Cont.

Date Time	Location	Number of Whales	Direction of Movement	Observations	Observer Company
26 June	N69°54' W136°12'	20+	SE	whales remained as close as 20 m to Tarsiut artificial island for 60 minutes.	E. Frosst Dome
10 July 1045	N69°21' W133°46'	100	E	no reported reaction to vessel Kap IV 45 m away.	R. Stanley ATL
7 August 2210	N69°58' W133°30'	10	NW	no reported reaction to vessel Imperial Sarpik 400 m away.	M. Gardlund Esso
14 August 1315	N70°34' W134°10'	1	SE	whale blew 3200 m away from Explorer II as vessel was drilling.	T. Holden MPC
16 August 1600	N70°03' W136°45'	±19	NW	no reported reaction to Sikorsky 76 helicopter at altitude of 300 m, 1600 m away.	S. Young MPC
17 August 1530	N70°19' W128°52'	~60	SW	no reported reaction to Bell 206B helicopter at altitude of 300 m, 400 m away; group included 6 young.	J. Henke QAL
23 August 1123	N69°55' W135°53'	4	N	gulls were flying near and dipping into water near whales.	S. McDermott MPC
26 August 1745	N70°34' W134°10'	1	E	whale was present 3200 to 4800 m away for 2 minutes while Explorer II was testing.	P. Sinclair Dome
15 Sept. 1300	N69°52' W135°55'	1	N	whale came as close as 1600 m to Explorer I.	J.C. Sanderson Dome
21 Sept.	N69°55' W135°53'	20-30	E	whales were swimming and playing for 15 minutes 1600 m from Explorer I as vessel was drilling.	S. Whitbread Dome

* Abbreviations used for company names are: ATL = Arctic Transportation Limited; MPC = MacLaren Plansearch Corporation; QAL = Quasar Aviation Limited.

Except for a trial run of the dredge, Geopotes IX, about 20 July in Kugmallit Bay, all of Gulf's activities occurred outside either the time frame and/or the study area of this project.

In 1982 the first recorded tugboat pass through the shipping channel in southern Kugmallit Bay was on 28 June (Table 6). During the period 21 June - 20 July there was a total of 41 vessel passages through this shipping channel. The date the first vessel passed through the shipping channel in eastern Kugmallit Bay in 1982 was 8 July. A total of 95 passes between the Tuktoyaktuk harbour and more northern locations (including the sea buoy) was recorded from 8 to 20 July 1982 (Table 7). Although some vessels heading to and from Tuft Point, West Atkinson and Alerk go via the sea buoy, some follow along the coast. For this summary it was assumed that all vessels heading to and from Tuft Point and West Atkinson followed the coast and all vessels travelling between Tuktoyaktuk and Alerk proceeded via the sea buoy.

Whale-Vessel Interactions

During the 1982 surveys, detailed observations of whale-vessel interactions were made on only one date, 19 July. During a systematic survey of Kugmallit Bay, a tugboat was seen travelling along the coastline, about 3 km out from shore. This vessel came within one to five kilometres of several groups of whales as it proceeded north (Fig. 8A; only one observer was present during this flight so whales were observed on only one side of each survey line.). Several of the whale groups were seen travelling away from the tugboat, but at least two groups were travelling in a similar direction to the tug, 3 km and 4 km distant. None of the whales observed was moving at a rapid rate and dive times appeared to be "typical" for travelling white whales (on the order of 10-15 seconds). Line K-8 was surveyed again about 70 minutes after the first flight and approximately the same number of whales were seen on transect (Fig. 8B); the animals seen during the second pass were more spread out and generally were farther west than the whales which had been seen on the first pass, however, the animals had not vacated the area.

Table 6. A summary of vessel movements through southern Kugmallit Bay, by company, 21 June - 20 July, 1982.

Date	Esso	Dome	NTCL	Others	Total
June 21					
22					
23					
24					
25					
26					
27					
28			1		1
29			1	1	2
30	1		1	1	3
July 1	1				1
2					
3			2		2
4	1				1
5			1		1
6			1		1
7					
8	1		1		2
9				1	1
10	1		3	1	5
11	1				1
12		1		1	2
13	1		1	1	3
14			1		1
15					
16			2	1	3
17			1	1	2
18			4		4
19	1	1			2
20	1		2		3
Total Movements	9	2	22	8	41

Table 7. Number of one-way passes of vessels between Tuktoyaktuk harbour and more northern locations, by company, 21 June - 20 July, 1982.

	Tuktoyaktuk ⟷ sea buoy			Tuktoyaktuk ⟷ Tuft Point or West Atkinson
Date	Esso	Dome	NTCL	Esso
June 21				
22				
23				
24				
25				
26				
27				
28				
29				
30				
July 1				
2				
3				
4				
5				
6				
7				
8		1		
9		1		
10				
11		4		3
12		1	1	3
13	1	3		7
14	2	1		5
15		4	1	7
16		3	1	13
17	1	1	1	6
18	2	1		6
19	3	1		4
20		1	1	5
Total Movements	9	22	5	59

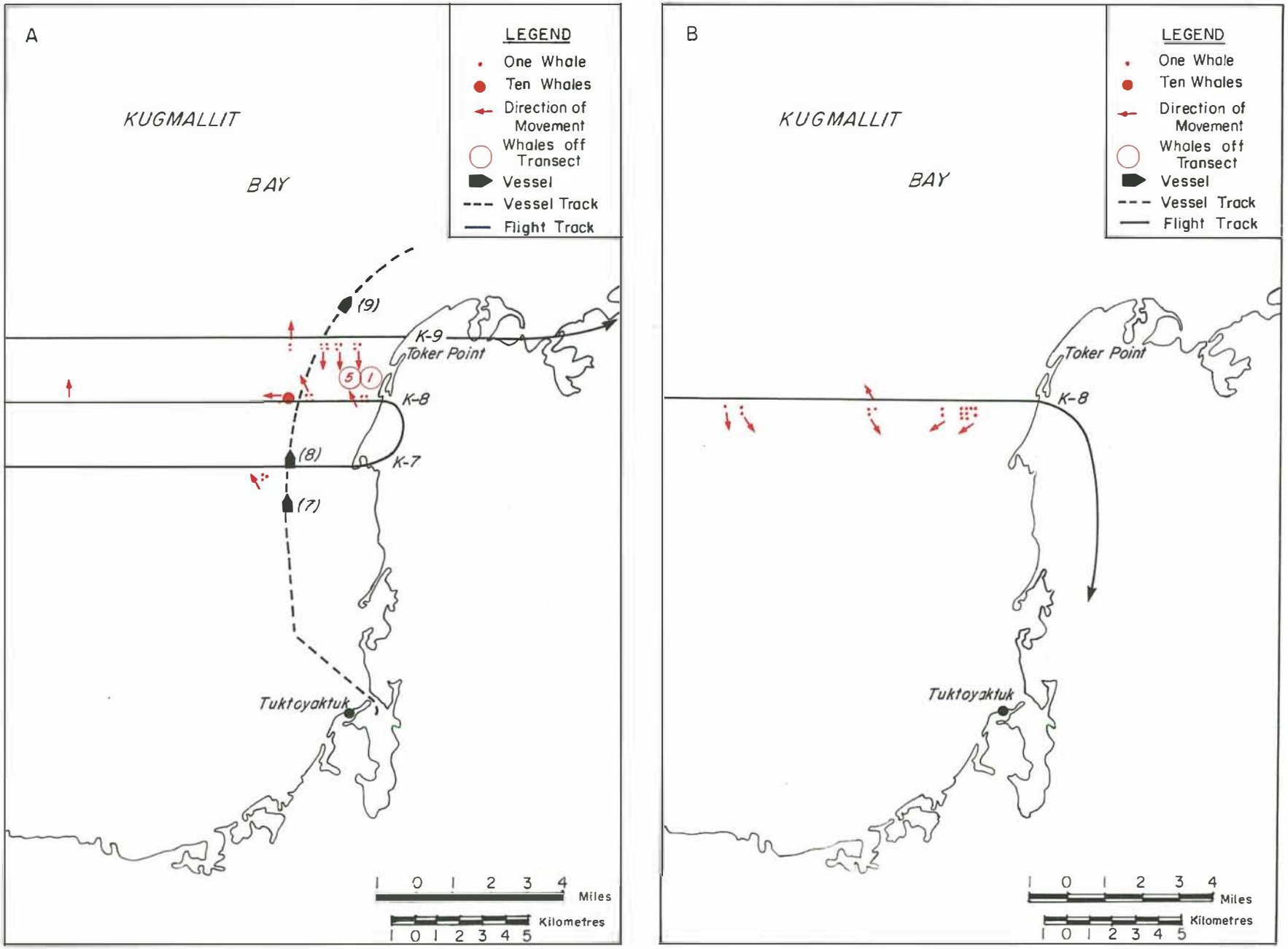

Figure 8. Movements of a tugboat and white whales in eastern Kugmallit Bay, 19 July 1982. (The number in parentheses next to a vessel indicates that the tugboat was at that location when the line with that number was surveyed: 7=K-7, 8=K-8 and 9=K-9.)

DISCUSSION

Whale Migration to the Estuary

Previous studies have indicated that the timing and pattern of the white whale migration to the Mackenzie estuary relative to the timing and location of break-up of the landfast ice sheet affects the initial whale distribution and abundance in Niakunak and Kugmallit bays. For this reason, frequent surveys along the landfast ice edge from the Yukon coast to Baillie Islands have been carried out for the past three years; previous to 1980 only occasional surveys were made. In all years most of the whales observed during the ice reconnaissance surveys have been seen in areas to the northeast of the Mackenzie estuary or seaward of the landfast ice blocking access to the estuary. Most of the whales seen have been travelling parallel to the ice edge, moving toward the estuary (Table 8; because the ice edge frequently changes orientation, whales following the edge such that their movement would take them to the estuary have been recorded as moving west. Whales moving away from the estuary have been recorded as moving east). This migration pattern was evident in 1982, although, in 1982 proportionately more whales were observed moving in toward or away from the ice edge or moving along the ice edge in a direction that would take them away from the estuary than in 1980 or 1981 (Table 8). Several observations of southeastward-moving whales were made from Tarsiut artificial island during the time that Tarsiut was on the edge of the landfast ice (see Table 5). These whales were moving away from the west side of the estuary, the area that was accessible first, toward the east side where access would be blocked for another two to four weeks. The reason that these whales were moving southeastward is not known. Movements such as these may have occurred but not been observed in previous years; 1982 is the first year observers have been on an island situated right on the ice edge during break-up.

During most years, whales are seldom seen moving along the Yukon coast during ice break-up; no whales were seen in this area in 1982 (see Fig. 3A).

Fewer whales were sighted on average during 1982 (109 whales/survey) than during 1981 (369 whales/survey) or 1980 (200 whales/survey). Also, in 1982 there were two small peaks in the number of whales seen during a survey (see Table 1) while in 1980 and in 1981 one distinct peak in the number of

Table 8. Number and direction of movement of whales observed during reconnaissance surveys, 1980-1982.

Year	Number of whales sighted	Number of whales moving in a known direction (per cent of number seen)	Number of whales moving (%)		
			West	East	Toward or away from ice edge
1982	765	431 (56)	259 (60)	82 (19)	90 (20)
1981	2582	1906 (74)	1674 (88)	166 (9)	66 (3)
1980	798	571 (72)	501 (88)	40 (7)	30 (5)

whales seen per survey was observed. However, in 1982, much of the migration to the estuary may have occurred during the period from 2 to 8 July when no ice reconnaissance surveys were done.

In the Canadian Beaufort Sea region, the white whale migration to the Mackenzie estuary started before 11 June (according to the observations made at Tarsiut) and continued through 13 July (according to the observations made during the reconnaissance flights). This time span, of four weeks, is longer than has been observed in previous years -- in 1981 the migration appeared to take slightly less than three weeks. However, prior to 1982, there were no observers on an artificial island located right on the edge of the landfast ice while the whale migration to the estuary was occurring. If only the data from the reconnaissance surveys are used, then the 1982 whale migration would have been estimated to have begun on or about 22 June and continued through at least 13 July, a time span of approximately three weeks. This figure is similar to the time span estimated from reconnaissance survey data in previous years.

Initial Distribution of Whales Within the Estuary

Ice conditions determine when specific areas within the estuary are accessible to whales. In 1982, Niakunak Bay was accessible approximately 17 days before Kugmallit Bay. Since 1972, the west side of the estuary has been accessible before the east side in every year for which there is accurate information on the break-up of the ice barrier (Table 9). However, the disparity between the opening dates on the two sides of the estuary was greater in 1982 than in previous years.

Table 9. Approximate dates when the ice barrier broke in Mackenzie Bay and Kugmallit Bay and the maximum estimated number of whales in Kugmallit Bay, 1972-1982.

	Approximate date when ice barrier broke		Maximum estimated number of whales in Kugmallit Bay
	Mackenzie Bay	Kugmallit Bay	
1972	NA*	NA	NA
1973	22-23 June	27 June	NA
1974	10-11 July	10-11 July	NA
1975	late June	late June	NA
1976	NA	NA	2000
1977	17 June	NA	1750
1978	5 July	5-6 July	780
1979	19 June	1 July	500
1980	27 June	30 June	120
1981	15 June	27 June	1040
1982	22 June	10 July	1376**

* NA means that insufficient data were collected to determine even an approximate date or maximum estimate.

** This maximum is probably an underestimate because the survey that produced the maximum count was done under fair conditions.

In spite of the great difference in the timing of the opening of the two bays in 1982, more whales used Kugmallit Bay in 1982 than in 1978, 1979, 1980 or 1981 (Table 9), even though the 1982 figure for Kugmallit Bay is an underestimate. Observations made during the 9 July reconnaissance survey (see Fig. 3F) suggest a possible reason -- even though the whale migration westward to the estuary was already in progress by 24 June, there were still many whales travelling along the ice edge on 9 July. Eighty-six whales were seen on that date along the edge of the landfast ice between Tarsiut and Warren Point. Several of these whales (23) were in the area where the break in the landfast ice sheet blocking Kugmallit Bay seemed most likely and other whales (28) were heading toward this area. The whales that were moving along the ice edge presumably entered Kugmallit Bay once the ice that was blocking access broke (on 10 July). The maximum number of whales observed during a survey of Kugmallit Bay in 1982 was seen on 14 July, soon after the bay became accessible.

In 1981, as in 1982, there was a large disparity in the timing of the opening of the two main concentration areas, however, Kugmallit Bay became accessible while the white whale migration to the estuary was still underway. Over a thousand whales used Kugmallit Bay in 1981. In 1980, although Kugmallit Bay became accessible only three days after the west side of the estuary, ice reconnaissance surveys indicated that the whale migration was over before Kugmallit Bay opened and very few (less than 200) whales gathered on the east side that year. Data from all three years when frequent ice reconnaissance surveys were made (1980 to 1982) indicate that large numbers of white whales (over a thousand) come into Kugmallit Bay soon after it opens if that bay is open before the whale migration to the estuary ends.

Number of White Whales Using the Estuary

An estimate of the maximum number of whales using the estuary was attempted in 1982, using the same techniques and surveying the same areas as in 1976 to 1981. In 1982 the maximum count was obtained from surveys on 14 July. Seven hundred and four whales were seen by the single observer during a survey of Niakunak Bay, giving a total estimate of 5,632 whales in that area. Later the same day 172 animals were counted by the same observer during a survey of Kugmallit Bay. Although survey conditions were fair in

the areas in Kugmallit Bay where the whales were seen, the extrapolation coefficient and visibility factor were not changed. The estimated number of whales on the east side was 1376 and the maximum estimate for the entire estuary in 1982 was 7000 white whales.

The 1982 maximum estimate may well be an underestimate of the total number of whales using the estuary in 1982. Firstly, it was not possible to survey East and West Mackenzie bays on or near 14 July. Thus whales in those areas were excluded from the maximum count. The error introduced by this omission is probably small -- surveys in previous years have indicated that during mid-July if there are large numbers of whales in Niakunak Bay, then few whales occur in East and West Mackenzie bays. However, some whales were in the unsurveyed area north of Kendall Island during the camp visit on 15 July and whaling was occurring near Kendall Island around the time of the maximum estimate. Secondly, the maximum count for Kugmallit Bay is undoubtedly an underestimate since no correction was made for the increased difficulty in sighting whales under fair observation conditions. Another factor to consider is that only one observer was present on the surveys when the maximum count was obtained. If there is an even distribution of animals over the areas used by the whales, the error introduced into the maximum estimate by having only one observer may be small. However, there are differences in observers' abilities and so having just one observer could produce some bias in the estimate, resulting in either an under- or an over-estimate. Although observer bias may have resulted in either an under- or an overestimate, the lack of surveys in East and West Mackenzie bays and the lack of a suitable visibility factor because of the fair observation conditions in Kugmallit Bay undoubtedly resulted in the 1982 maximum estimate being lower than the actual maximum.

In 1982, 20 days elapsed between the time when whales probably first entered the estuary and the time of the surveys that produced the maximum count (Fig. 9). This is the longest time span between the first entry and the maximum count for any year for which accurate dates are available (Fig. 9), and is probably related to the prolonged time span of the whale migration to the estuary in 1982. During 1981, the other year with a large time span between the date of the first entry and the date of the maximum

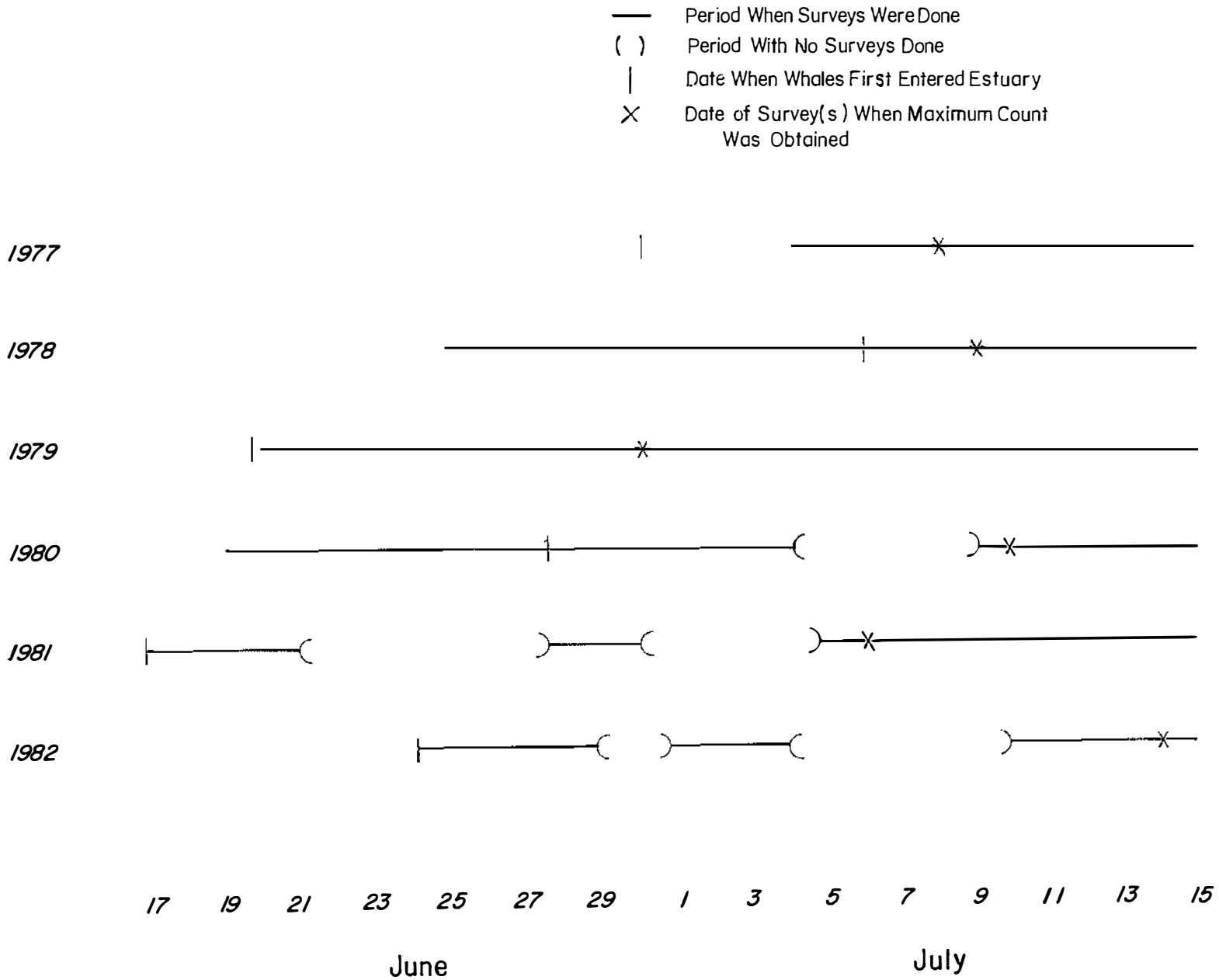

Figure 9. A comparison of the date when whales first entered the estuary and the date of the surveys when the maximum count was done with unsurveyed intervals of more than two days duration shown, 1977–1982.

count, there were two long periods when no surveying was possible. One period with no surveying was shortly after the whale migration to the estuary probably ended (according to reconnaissance surveys). So the actual maximum may have been missed in 1981.

The 1982 maximum estimate equals the highest previous estimate (in 1979) recorded since the survey areas have been standardized. The high 1982 estimate ends the trend observed from 1979 to 1981 of a lower maximum estimate each year (Table 10).

Effects of Industry Activities on Whales and Whaling in Kugmallit Bay

Kugmallit Bay is the nearshore area most exposed to human activities -- both support activities for oil and gas exploration and Inuit white whale hunting (Fig. 10). Thus this area has the greatest potential for negative effects of human activities on whales and of industry activities on whaling. For this reason Kugmallit Bay is closely monitored once it becomes accessible to white whales and detailed information is gathered on vessel movements along the two main shipping channels.

The intensity of vessel movements along the eastern and southern shipping channels in Kugmallit Bay was compared with (i) the abundance of whales, (ii) the southernmost survey line on which whales were seen (= extent of whale penetration into the bay), (iii) the survey line on which the most whales were seen, and (iv) the number of whales landed or lost by hunters from the Kugmallit Bay camps or Tuktoyaktuk (Table 11). Because the timing of most of the events within a calendar day (i.e. vessel movements and landing or losing of whales) was not known, vessel movements for the day before, as well as the day of the survey were examined. The small number of observations did not permit meaningful statistical tests. However, there was no obvious relationship between the intensity of vessel movements and the distribution or abundance of whales or whaling success. Since whales in the concentration area are at least 10 km from the eastern shipping channel and Ford (1977) found that sounds from vessel traffic in the Tuft Point area were unlikely to be perceived by whales more than 3.3 km away, it is not surprising that there was no obvious relationship between intensity of vessel movements along the eastern shipping channel and whale distribution or abundance or whaling success.

Table 10. Maximum estimate of white whales, Mackenzie estuary, 1976-1982.

Year	Maximum estimate
1976	5500-6000
1977	5500
1978	6600
1979	7000
1980	4500
1981	3500
1982	7000

Large numbers of whales were seen in areas outside of the concentration area for short periods of time in 1982. One of these "new" areas (Area 1 on Fig. 10) is in a location with a high probability of disturbance from human activities. Two whaling camps are less than 1 km away and the southern shipping channel goes through much of the area. Whales were reported in this area on 10 July (see Table 5) and they were still there on 12 July (according to the first systematic survey) even though there were several passes by vessels ($\bar{x}$=2.7/day) through this area at that time. The presence of whales in this new area for several days suggests that vessel movements did not greatly affect whale distribution in Kugmallit Bay in 1982.

The relative amount of industry activity in the estuary early in the open-water season (as measured by the mean number of passes by industry vessels through eastern Kugmallit Bay) was compared to the maximum estimate of whales in Kugmallit Bay and in all of the estuary for 1980, 1981 and 1982. Quantitative data on industry traffic were first gathered in 1980 and only data on movements through the eastern shipping channel were gathered previous

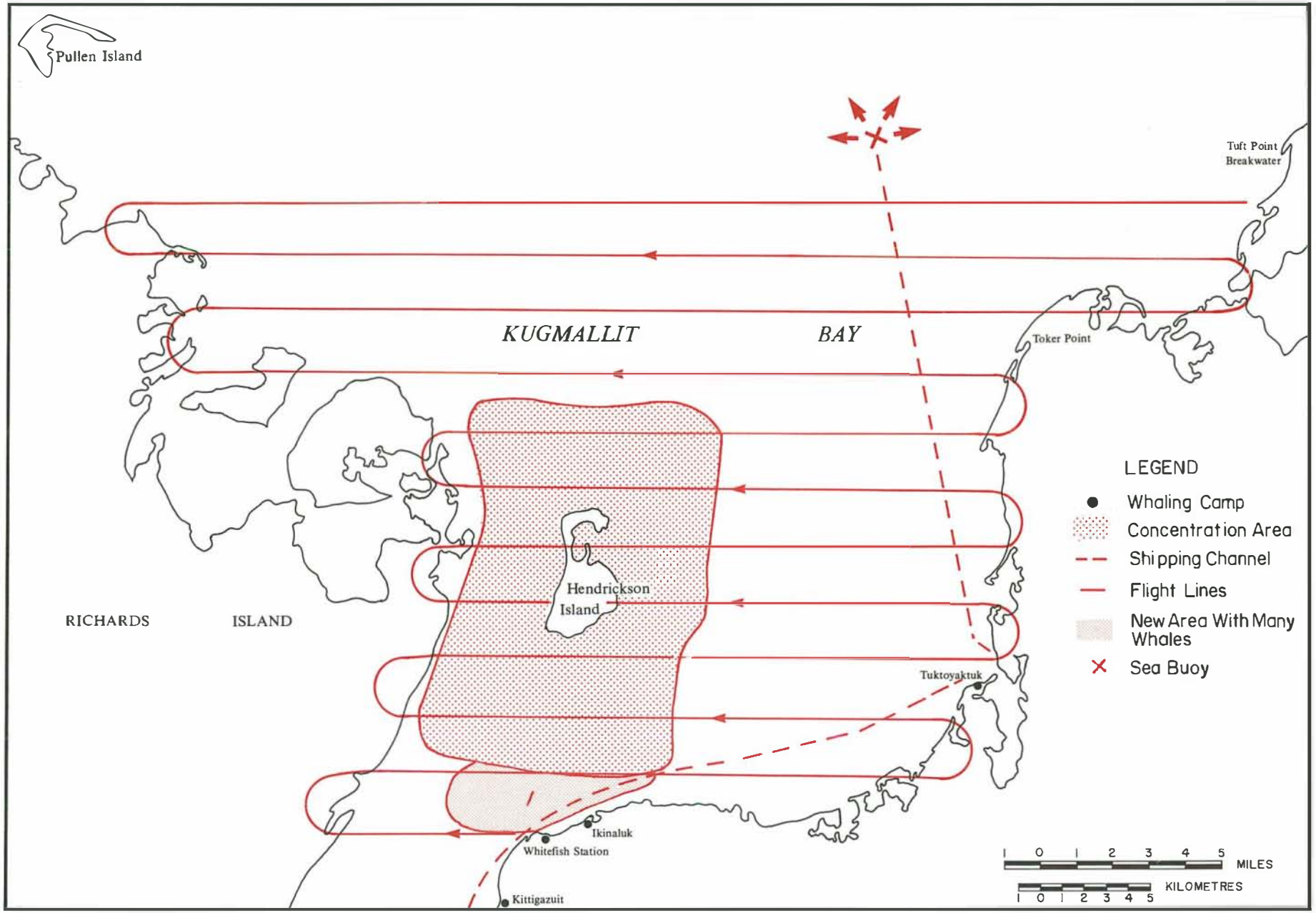

Figure 10. Location of human activities and whale-use areas, Kugmallit Bay, 1982.

Table 11. Estimated number of whales present, number of whales landed or lost, southernmost extent and concentration of whale distribution and number of vessel movements per day along the eastern and southern shipping channels for periods when a systematic survey was done, Kugmallit Bay, July 1982.

Date of survey	Estimated number of whales present	Number of whales landed or lost	Southernmost survey line on which whales were seen	Survey line on which the most whales were seen	Number of vessel movements/day			
					Day of survey		Day before survey	
					Eastern channel	Southern channel	Eastern channel	Southern channel
12 July	792*	3	A	1	5	2	7	1
14 July	1376*	14	2	3	8	1	11	3
16 July	944	5	5	8	17	3	12	0
18 July	128*	3	1	1	9	4	9	2
19 July	1032	4	1	2	8	2	9	4

* This estimate is based on data from a systematic survey done under fair observation conditions for which no appropriate visibility factor is available.

to this year. (Data on movements by NTCL vessels were included in the 1980 and 1982 figures but not the 1981 figure. This is not a large omission as NTCL traffic is a small proportion of the total along this shipping channel.) An increase in the mean daily number of vessel passes through eastern Kugmallit Bay for the period between the opening of that bay and the date of the the survey producing the maximum estimate did not result in a decrease in the maximum estimate of the number of whales using Kugmallit Bay (Table 12). No relationship was found between the level of industry activity and the maximum estimate of whales using all of the estuary for the same period (Table 12).

Hunters from the Kugmallit Bay camps and from Tuktoyaktuk started landing whales on 11 July; the number landed peaked on 14 July (Fig. 11). Small numbers (four or fewer) were landed on subsequent days during the study period. Hunting success in Kugmallit Bay was more closely correlated with the number of whales estimated in the bay (Fig. 11; $r = 0.736$, $df = 4$, $p>0.05$) than with the amount of industry traffic along the southern shipping channel in Kugmallit Bay ($r = 0.205$, $df = 9$, $p>0.05$), along the eastern shipping channel ($r = -0.003$, $df = 9$, $p>0.05$) or along both channels ($r = -0.069$, $df = 9$, $p>0.05$). None of the correlations were statistically significant.

That current levels of industry activity are not adversely affecting white whale distribution and abundance in Kugmallit Bay is shown by:

(1) the comparisons of the intensity of vessel movements with whale distribution and abundance,
(2) the utilization by whales of an area with frequent vessel traffic,
(3) the lack of a consistent yearly relationship between the number of whales present and the level of industry activity, and
(4) the lack of a significant correlation between industry activity and whaling success.

Table 12. The mean daily number of vessel passes through eastern Kugmallit Bay and the maximum estimate of whales in Kugmallit Bay and in all of the estuary for the period between the opening of Kugmallit Bay and the date of the survey producing the maximum estimate, 1980-1982.

Time span between opening of Kugmallit Bay and date of maximum estimate	Mean daily number of vessel passes through the eastern shipping channel	Maximum number of whales estimated in Kugmallit Bay	Maximum number of whales estimated in Mackenzie estuary
30 June - 10 July 1980	2.5	120	4500
27 June - 6 July 1981	2.8	1040	3500
10 July - 14 July 1982	6.2	1376	7000

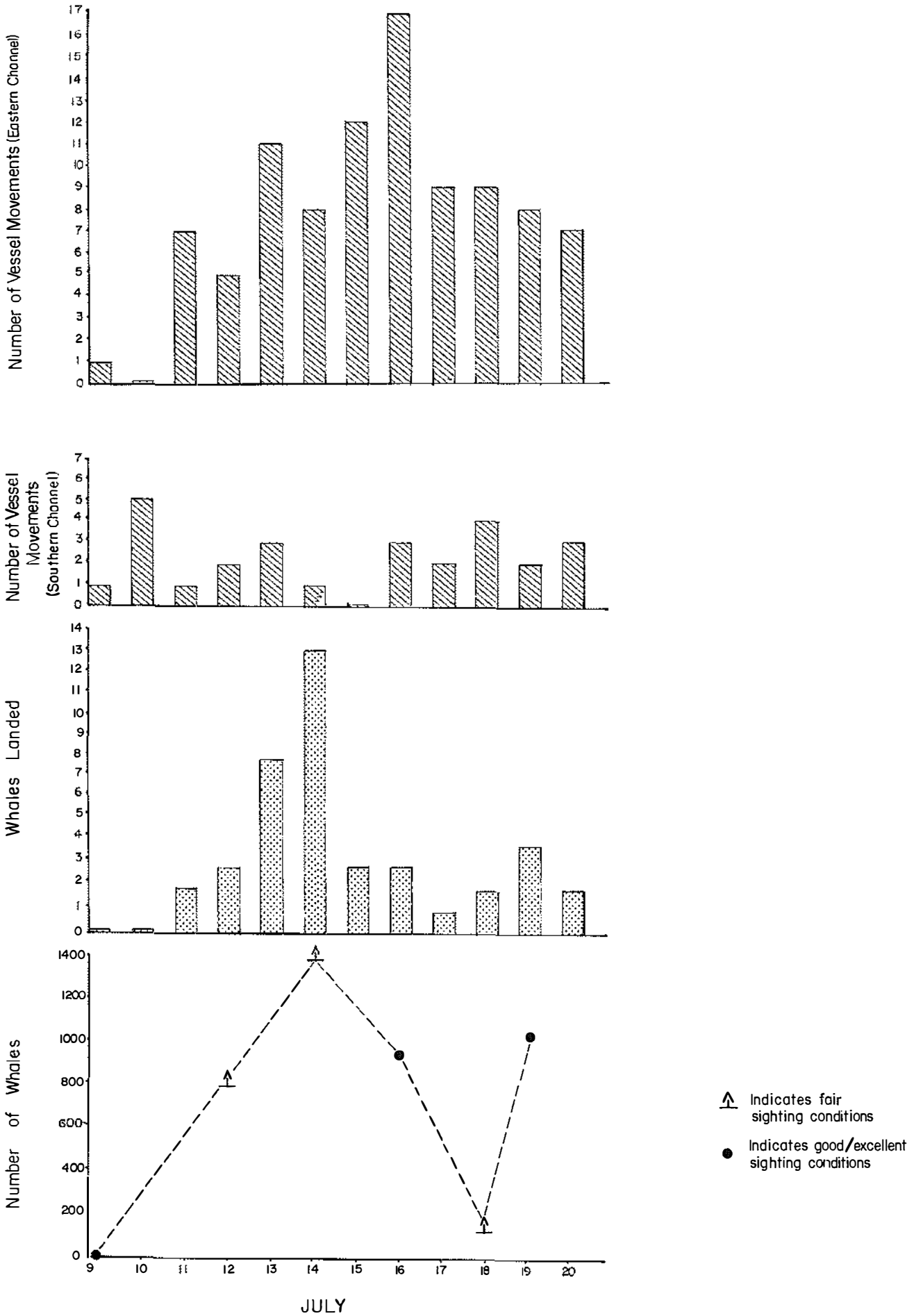

Figure 11. Number of whales landed, estimated number of whales present, and number of passes by industry vessels along the southern and eastern shipping channels, Kugmallit Bay, 9-20 July 1982.

LITERATURE CITED

Bourque, J.W. 1967. Report of Fort McPherson whaling project. Unpubl. rep. by Game Management Service, Government of the Northwest Territories. 4 p.

Davis, R.A., and C.R. Evans. 1982. Offshore distribution and numbers of white whales in the eastern Beaufort Sea and Amundsen Gulf, summer 1981. Unpubl. LGL Limited rep. for Sohio Alaska Petroleum Company, Anchorage, and Dome Petroleum Limited, Calgary. 78p.

Davis, R.A., W.R. Koski, W.J. Richardson, C.R. Evans and W.G. Alliston. 1982. Distribution, numbers and productivity of the Western Arctic stock of bowhead whales in the eastern Beaufort Sea and Amundsen Gulf, summer 1981. Unpubl. LGL Limited rep. for Dome Petroleum Limited, Calgary, Alberta, and for Sohio Alaska Petroleum Company, Anchorage, Alaska. 135 p.

D.F.O. (Department of Fisheries and Oceans). 1981. Beluga whale observers program, Canadian Western Arctic, summer 1981. Inuvik station, Inuvik, N.W.T. 54 p.

Finley, K.J. 1982. The estuarine habit of the beluga or white whale *Delphinapterus leucas*. Cetus 4(2):4-5.

Finley, K.J., G.W. Miller, M. Allard, R.A. Davis, and C.R. Evans. 1982. The beluga (*Delphinapterus leucas*) of northern Quebec: distribution, abundance, stock identity, catch history and management. Can. Tech. Rep. Fish, Aquat. Sci. No.1123. 57 p.

Ford, J. 1977. White whale - offshore exploration acoustic study. Unpubl. F.F. Slaney and Company Limited rep. for Imperial Oil Limited, Calgary. 21 p.

Fraker, M.A. 1977a. The 1976 white whale monitoring program, Mackenzie Estuary, N.W.T. Unpubl. F.F. Slaney and Company Limited rep. for Imperial Oil Limited, Calgary. 73 p.

Fraker, M.A. 1977b. The 1977 whale monitoring program, Mackenzie Estuary, N.W.T. Unpubl. F.F. Slaney and Company Limited rep. for Imperial Oil Limited, Calgary. 53 p.

Fraker, M.A. 1978. The 1978 whale monitoring program, Mackenzie Estuary, N.W.T. Unpubl. F.F. Slaney and Company Limited rep. for Esso Resources Canada Limited, Calgary. 28 p.

Fraker, M.A. 1979. Spring migration of bowhead (*Balaena mysticetus*) and white whales (*Delphinapterus leucas*) in the Beaufort Sea. Can. Fish. Mar. Serv. Tech. Rep. No. 859. 36 p.

Fraker, M.A. and P.N. Fraker. 1979. The 1979 whale monitoring program, Mackenzie Estuary. Unpubl. LGL Limited rep. for Esso Resources Canada Limited, Calgary. 51 p.

Fraker, M.A., C.D. Gordon, J. McDonald, J.K.B. Ford and G. Cambers. 1979. The distribution of white whales (*Delphinapterus leucas*) in the Mackenzie estuary and the relationship to physical and chemical factors. Can. Fish. Mar. Serv. Tech. Rep. No. 863. 56 p.

Fraker, P.N., and M.A. Fraker. 1981. The 1980 whale monitoring program, Mackenzie Estuary. Unpubl. LGL Limited rep. for Esso Resources Canada Limited, Calgary. 98 p.

Harwood, L.A., and J.K.B. Ford. 1983. Systematic aerial surveys of bowhead whales and other marine mammals in the southeastern Beaufort Sea, August - September 1982. Unpubl. ESL Environmental Sciences Ltd. rep. for Dome Petroleum Limited and Gulf Canada Resources Inc., Calgary.

Kleinenberg, S.E., A.V. Yablokov, B.M. Bel'kovich and M.N. Tarasevich. 1964. Beluga (*Delphinapterus leucas*), investigation of the species. Akad. Nauk SSSR, Institut Morfologii Zhivotnykh Im. A.N. Severtsova, Moscow. 450 p. (Translated into English, 1969, Israel Program for Scientific Trans., Jerusalem, 376 p.)

Ljungblad, D.K. 1981. Aerial surveys of endangered whales in the Beaufort Sea, Chukchi Sea, and northern Bering Sea. Naval Ocean Systems Center Tech. Doc. 449. 49 p.

Marko, J.R. and M.A. Fraker. 1981. Spring ice conditions in the Beaufort Sea in relation to bowhead whale migration. Unpubl. LGL Limited rep. for Alaska Oil and Gas Association, Anchorage. 99 p.

Norton Fraker, P., and M.A. Fraker. 1982. The 1981 white whale monitoring program, Mackenzie Estuary. Unpubl. LGL Limited rep. for Esso Resources Canada Limited, Dome Petroleum Limited and Gulf Canada Resources Inc., Calgary. 74 p.

Renaud, W.E. and R.A. Davis. 1981. Aerial surveys of bowhead whales and other marine mammals off the Tuktoyaktuk Peninsula, N.W.T., August - September 1980. Unpubl. LGL Limited rep. for Dome Petroleum Limited, Calgary. 55 p.

Richardson, W.J. (ed.). 1982. Behavior, disturbance responses and feeding of bowhead whales (*Balaena mysticetus*) in the Beaufort Sea, 1980-81. Unpubl. LGL Ecological Research Associates, Inc. rep. for U.S. Bureau of Land Management, Washington. 455 p.

Sergeant, D.E. 1973. Biology of white whales (*Delphinapterus leucas*) in western Hudson Bay. J. Fish. Res. Bd. Canada 30:1065-1090.

Slaney, F.F. & Company Limited. 1973. Environmental impact assessment. Immerk Artificial Island Construction, Mackenzie Bay, Northwest Territories. Volume 2, Environmental studies. Unpubl. rep. for Imperial Oil Limited, Calgary. 59 p.

Slaney, F.F. & Company Limited. 1974. White whale study, Herschel Island - Cape Dalhousie, coastal region of the Beaufort Sea. Unpubl. rep. for Imperial Oil Limited, Calgary. 29 p.

Slaney, F.F. & Company Limited. 1975. Summer environmental program, Mackenzie River Estuary. Volume 3, White whale studies. Unpubl. rep. for Imperial Oil Limited, Calgary. 53 p.

Slaney, F.F. & Company Limited. 1976. Summer environmental program, Mackenzie River Estuary. Volume 2, White whale studies. Unpubl. rep. for Imperial Oil Limited, Calgary. 61 p.

Strong, J.T. and R. Walker. (in prep.). Data report.

Appendix 1. Number of white whales harvested in the Mackenzie estuary, 1972-1982. 1982 data provided courtesy of Fisheries and Oceans Canada. The per cent of the total harvest attributed to each area is indicated in parentheses.

	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	Mean Harvest 1972-1981
Tuktoyaktuk Hamlet	45(40)	87(49)	40(33)	50(35)	51(33)	54(39)	53(44)	49(41)	23(26)	62(42)	38(36)	51.4 (39)
Kugmallit Bay Camps	31(27)	63(36)	50(41)	60(42)	59(38)	32(23)	28(23)	31(26)	14(16)	30(20)	22(21)	39.8 (30)
Kendall Island Camps	4 (4)	7 (4)	2 (2)	3 (2)	12 (8)	30(21)	10 (8)	12(10)	24(27)	22(15)	27(25)	12.6 (9)
Niakunak Bay Camps	33(29)	20(11)	30(25)	29(20)	32(21)	24(17)	30(25)	28(23)	29(32)	35(23)	20(19)	29.0 (22)
	113	177	122	142	154	140	121	120	90	149	107	132.8

BEAUFORT SEA WHALE SIGHTING CARD

☐ WHITE (Beluga) WHALE ☐ BOWHEAD WHALE ☐ KILLER WHALE

Number of whales _____ Direction of movement _____
(indicate true or magnetic heading)

Location _____ water depth _____
(latitude and longitude, if possible)

Date seen _____, 198___ Time seen _____ a.m. ☐ p.m. ☐

Seen from vessel ☐ vessel name _____ type _____

or aircraft ☐ type of aircraft _____

Activity of vessel/aircraft _____

Estimated closest distance of whales to vessel
or altitude and horizontal distance to aircraft _____

How long did whales remain at closest distance (if known) _____

Other observations _____

_____

Your name _____ Organization _____

Address _____

_____ Check here if you require another sighting book ☐

Thank you for taking the time to record your observations.

Appendix 2. The form used by industry and other personnel to record whale observations.

Appendix 3. Number of whales counted during systematic aerial surveys in the Mackenzie estuary, by survey line and area, 1982. NS means that line was not surveyed on that date.

	Niakunak Bay Survey Lines													
Dates	N-A	N-B	N-C	N-1	N-2	N-3	N-4	N-5	N-6	N-7	N-8	N-9	N-10	Totals
2 July	0	52	155	62	58	59	9	11	18	18	44	33	2	521
3 July	0	0	0	0	0	116	40	34	29	39	71	98	5	432
11 July	NS	0	0	0	0	0	20	180	115	131	128	22	NS	596
14 July	NS	0	0	6	46	167	120	128	98	74	35	30	NS	704
Totals	0	52	155	68	104	342	189	353	260	262	278	183	7	2253

Appendix 3. (Cont.)

Dates	Kugmallit Bay Survey Lines*												Totals
	K-A	K-1	K-2	K-3	K-4	K-5	K-6	K-7	K-8	K-9	K-10	K-11	
12 July	11	52	7	14	8	0	7	0	0	0	NS	NS	99
14 July	0	0	4	65	39	0	21	10	8	25	NS	NS	172
16 July	0	0	0	0	0	5	0	13	44	43	4	9	118
18 July	0	16	0	0	0	0	0	0	0	0	NS	NS	16
19 July	0	6	52	0	0	2	0	3	20	45	1	NS	129
Totals	11	74	63	79	47	7	28	26	72	113	5	9	534

*Lines K-12, K-13 and K-14 were not surveyed in 1982.

THE 1982
WHITE WHALE MONITORING PROGRAM,
MACKENZIE ESTUARY

PART II

REPORT ON ICE, WHALES AND
WHALING CAMP VISITS, JUNE - AUGUST 1982

By

Randal Pokiak
Tuk Tuk Tours and Services
Tuktoyaktuk, N.W.T.

and

Doug Irish
Northern Employment Counsellor,
Esso Resources, Inuvik

For
Esso Resources Canada Limited
Dome Petroleum Limited
Gulf Canada Resources Inc.
Calgary, Alberta

October, 1982

SUMMARY REPORT RE: ICE, WHALE
AND CAMP VISITS RECONNAISSANCE

START OF PROGRAM: June 26, 1982 - August 7, 1982. If the program is to continue, it will start on June 15 of each year.

PROGRAM: Program was jointly funded by Esso, Dome and Gulf. The purpose of the program is to:

1) keep track of the landfast ice condition and the artificial islands;
2) keep track of the time and condition of the break-up;
3) watch the migrating of whales along the flow edge (i.e. number in the group, the direction of travel - try to determine what they are doing);
4) watch for impact on whale harvesters by industry (if there is any impact we determine actions to be taken to minimize the impact).

A) LANDFAST ICE AND ARTIFICIAL ISLANDS:

By the time the program started, the ice had already broken up at Shallow Bay. Landfast ice started directly north-west of Garry Island to the parallel of Tarsiut; from Tarsiut to Issungnak which was surrounded by ice; to Alerk, which also was surrounded by ice, and on, some 5 - 8 miles of ice along the Tuk Peninsula to Baillie Island.

B) BREAK-UP:

By July 9 Kugmallit Bay was just about broken up. Once the ice was broken up, the wind and waves easily broke up the rest. By July 13, the landfast ice along the peninsula was drifting out.

C) WHALES:

On our first flight out, we saw whales along the flow edge; numbers in each group varied. Just before the ice broke up in Kugmallit Bay, a healthy number of whales were milling around the broken up ice and cracks as well as some miles out from the flow edge.

D) IMPACT:

When the whales came in, we started camp visits. Fisheries were going to keep track of the number of landed, struck, stinkers, length, sex and some other information so that we didn't concentrate on keeping track other than the numbers landed and how the hunts were coming along. Wind was the main obstacle the hunters had to contend with. Running River hunters were bothered during one hunt by a boat and chopper putting up markers at escape reef. The boat did not belong to the industry located at Tuk. According to some hunters working directly with industry and hunting in their time off, it was pretty frustrating. The weather wasn't in their favour or their time off wasn't timed right, as they had to wait for their time off to hunt. Some of these hunters never succeeded in getting any whales although they made many attempts.

WHALES LANDED:

Bird Camp plus other locations in that area	10 plus
Running River / Shingle Point	10
Kendall (some week-end hunters got none)	24
Whitefish (some week-end hunters got none)	22
Tuk (people still going out to check for whales)	41 plus

Some people were still trying to get some whales when the program ended, and the whales stopped coming into Kugmallit Bay. (The whales had started coming into the Bay irregularly. One day they would come in for a few hours, then would not return for several days.)

WHALE MONITORING PROGRAM - DAILY REPORTS

Saturday, June 26, 1982

Flight - We left about 9:00 a.m. and arrived back about 1:30 p.m. We stopped at Dome's airport. We then went to Tuk Base to meet with John Ward and have supper. We flew directly to Shallow Bay, but it was too foggy to see much. We flew to where we figured Tarsiut was but we couldn't see the island.

Ice - After we passed Tarsiut, north of Hooper we could see the shorefast ice. We then followed the ice edge to Baillie Island. (Clear the rest of the flight.)

Islands - We never saw Tarsiut. Issungnak was surrounded by ice, same with Alerk and W. Atkinson.

Whales - One just east of Issungnak; a bunch west of McKinley; one at Baillie Island.

People - Chris the pilot, Pamela, Randal.

Monday, June 28, 1982

Got to the airport at 8:30 a.m. Weather was clear all day.

Flight - Met with John Ward before taking off for the reconnaissance aerial survey. We left Tuk at about 9:00 a.m. and arrived back at 1:30 p.m.

Ice - We flew directly to Shallow Bay. We spotted the first whales outside of Shingle Point. We then flew NE until we arrived at the shorefast ice. Followed the ice edge all the way to Baillie Island.

Islands - Ice was on the west side of Tarsiut and Issungnak was surrounded by ice, same with Alerk and W. Atkinson. (Saw two islands outside of Garry.)

Whales - Whales were spotted outside of Shingle Point, between Tarsiut and Issungnak. Some were spotted between Issungnak and west of W. Atkinson. Another bunch was spotted west of Cape Dalhousie - two between Dalhousie and Baillie. A total of about 145 whales spotted.

Boats - One boat was tied up beside Tarsiut.

People - Chris the pilot, Pamela, Randal.

Tuesday, June 29, 1982

Weather - Wind from the west. Hazy along the delta because of fires around Inuvik. Clear for sighting whales.

Flight - We left Tuk about 2:00 p.m. and got back about 6:30 p.m.

Ice - We flew directly to Garry Island to pick up the landfast ice. Followed the ice edge all the way to Baillie and then south.

Islands - We never saw the islands outside of Garry Island. There was still a point of ice on the west side of Tarsiut. Issungnak was still surrounded by ice, so was Alerk and W. Atkinson.

Whales - One whale spotted as we were rounding the point of ice outside of Garry Island. Then, a few minutes east of Tarsiut some more were spotted. Some spotted north of Issungnak. Quite a few spotted north of Kugmallit Bay. Next bunch spotted directly north of Baillie Island point, another small bunch just west of Smoking Hills. (Some of the whales spotted at Baillie had calves alongside them.)

Boats - One at Tarsiut. Drillship going out at McKinley Bay, three Suppliers around it (busting ice along the channel).

People - Chris the pilot, Pamela, Randal, Ron Quaife

Thursday, July 1, 1982

Weather - Clear, east wind - got foggy on the ice edge north of Cape Dalhousie.

Flight - We used Coastal Air Lines. We left Esso Tuk Base camp about 2:00 p.m. and got back to Tuk about 4:00 p.m. Our flight was cut short because of the fog at Dalhousie.

Ice - We started following the ice edge north of Garry Island. We followed the ice right up to Dalhousie. Ice is still thick and miles offshore.

Islands - There was still a point of ice west of Tarsiut (ice was right close to Tarsiut). Issungnak was still surrounded by ice, as was Alerk, W. Atkinson.

Whales - Only saw six whales on the pilot side of the plane, none on the co-pilot side.

Boats - One boat was beside Tarsiut. One Supplier was north of Alerk going through the ice towards the island.

People - Pilot - Rick, Co-pilot - Doug, Pamela, Randal and Ron Quaife.

Monday, July 5, 1982

Weather - Weather was questionable. It looked promising for the flight.

Flight - We used Aklak Air Ltd., Cessna 185 on floats. On our way to Shallow Bay we flew over the landfast ice of Kugmallit to the ice edge. From there we flew to Shallow Bay.

Ice - There was a crack all the way to the ice edge from Kugmallit.

Islands - We never say any islands because of us flying directly to Shallow Bay.

Whales - We never saw any. Fog was too low over the water at Shallow Bay.

Boats - We never say any.

Camps - There was a camp at East Whitefish but we never stopped.

People - Pilot - Willard Hagan, Pamela and Randal.

Friday, July 9, 1982

Weather - Clear, ENE winds (pretty strong).

Flight - We used Aklak Air Ltd. We left about 2:00 p.m. and came back at about 5:30 p.m. We flew around Hendrickson Island. Looked at the ice conditions north of Hendrickson, then flew west to Tarsiut, following the ice edge. Coming back we flew a little farther past the ice edge, then we hit the ice edge west of Hendrickson and followed it until we turned back from between Cape Dalhousie and Baillie Island.

Ice - Ice west of Hendrickson was about to open. There were cracks all over and needed a little more wind to clear it of ice. The landfast ice was surrounding Issungnak and Alerk. From the two islands it formed into a bay, just west of Hendrickson, where it was about to break up. Shorefast ice was still between Tarsiut and Pelly, Hooper Islands. Ice was breaking away along the Tuk Peninsula.

Whales - There were whales waiting to come in just north of Hendrickson - between ice pans and cracks leading to Kugmallit. Some between Issungnak and Tarsiut and another bunch farther out from the ice edge. One whale outside at McKinley Bay. We saw another bunch just before we headed back between Cape Dalhousie and Baillie Island.

Friday, July 9, 1982 (cont'd)

Boats - One beside Tarsiut. Supplier outside of Issungnak, another west of Alerk. Barge west of Alerk. One drillship due north of Hendrickson. Another boat west of McKinley.

Camps - Some tents at East Whitefish. Fisheries camp at Hendrickson. One boat from Tuk at Hendrickson (Willy, Raddi and Ernest Cockney).

People - Pilot, Pamela, Randal, Emmanuel Adam, Jorgan Elias.

Comments - Talking to the two HTA members after the flight. They concluded that the islands are holding the ice. They had all the signs of it. We were all glad to see whales waiting to come into Kugmallit Bay.

Saturday, July 10, 1982

- We were to fly in the afternoon to Shallow Bay to visit camps and count whales while we were there.

- Pam was at Inuvik and I was to meet her at Tuk Base (Esso).

- I arrived across at Tuk Base (Esso) at 1:15 p.m. and waited for the arrival of the Cessna 185. Pam and Bruce arrived about 1:45.

- We waited out the weather until 7:00 p.m. We didn't fly that day because of the weather.

- Arrived back at Tuk at 9:30 p.m.

Sunday July 11, 1982

- Weather was windy still but we decided to take the flight that we missed on Saturday. Pam and Jeff, pilot for Aklak Air Ltd., picked me up in front of the Hudson's Bay Co. at 3:15 p.m.

- We flew directly to Shallow Bay, flying over East Whitefish. We saw two whales that were landed.

- We flew the survey lines. We saw a bunch of whales in a fairly large area.

- We stopped at two camps. First at Shingle Point, where George and Barbara Allan were camped. Next we stopped at Bird camp where Jacob Archie and Frank Elanik were camped. Bird camp got three whales.

- There were two more camps in other channels but we didn't stop at them.

- Pam wanted to start another survey and camp visits to Kugmallit next morning so we flew to Inuvik to overnight. We landed at 11:30 p.m., hoping to be in the air by 7:30 a.m.

Monday, July 12, 1982

- We were delayed by winds again.

- We finally flew about 2:00 p.m.

- We flew directly to Indian camp where we visited Buster and Mary Kialleek. Buster expressed concern about boat traffic in Kugmallit Bay, especially the boats leaving Tuk Harbour to go to the Beaufort. He would like to see boats travelling only after the whaling is over. He said they have enough trouble with the weather without having another problem. Weather we have no control over, but boats we can control.

- We visited East Whitefish where M. Kayntak and J. Drey were camped. The men were out whaling at Skiff Point.

- Billy Day was camped just in the creek a ways, and he too was out hunting at Skiff Point.

- We arrived back in town about 5:30 p.m.

Tuesday, July 13, 1982

Weather - Clear and East winds.

Flight - We flew out of Tuk M.O.T. and landed again at M.O.T.

Ice - Ice was broken up and scattered, being blown out by the east wind.

Islands - All the islands were clear of ice (Tarsiut, Issungnak, Alerk, W. Atkinson).

Whales - We saw whales outside of McKinley Bay, outside of Russell Inlet, between Cape Dalhousie and Baillie and north of Baillie Island. On our way back to Tuk we flew to Pelly Island and Kugmallit Bay. We saw whales around Kendall area and around Hendrickson Island and Ungvik. We saw one bowhead whale.

Boats - On the Beaufort Sea we saw a Supplier, dredge and a ship and ATL tug and barge.

People - Jeff the pilot, Pam, Randall, Jorgan Elias and Emanuel Adam were on the flight.

Thursday, July 15, 1982 - Camp Visits

Weather - Clear, windy at Tuk and east half of Shallow Bay. Tuk on side and Bird camp were calm.

Whales - Big herd outside of Niakunak Bay.

Camps - Shingle Point (one whale), Running River (three whales), Bird camp (7 whales), West Whitefish (two whales), Indian Camp (just arrived), Bill Day's camp (eleven whales, total in area) and Kendall (nine whales).

People - Jeff the pilot, Pam, Doug Irish and Randal.

Friday, July 23, 1982

Weather - Clear and windy

Whales - We never say any.

Camps - Shingle Point (we landed at George and Wilma Allan's camp). No-one in the delta (Bird camp and Whitefish).

- Running River had a whole bunch of camps (we couldn't land because of the waves).

- Pete's Creek (Danny and Ruby Sydney we visited - they got one whale, planning to go out again).

- Kendall (we couldn't land because of waves).

- Indian Camp (we visited, got enough whales unless someone approaches and asks for a whale.

- West Whitefish (Ned and family, finished whaling unless someone asks for a whale).

Flight - We left Tuk at 11:45 a.m., arrived at Tuk Base (Esso) at 6:00 p.m.

People - Bruce Richards (pilot), Doug Irish and Randal.

Monday, July 26, 1982

Whales - Some along the shore, south side of Hendrickson, some at Niakunak, some more south of Garry Island.

Camps - Kendall (24 whales) and some people from Inuvik still trying to get whales (week-end hunters).

- Shingle Point, Running River (8 whales landed) still want a few more whales (hunting delayed because of wind).

- Pete's Creek (1 whale, couple of hunters at Whitefish waiting to hunt whale).

- Billy Day's camp at W. Whitefish (22 whales landed; that includes the one at Pete's Creek). People still hunting, Buster still at Indian camp and Ned at Whitefish.

People - Aklak Air Ltd. 185 - Pilot, Jeff
Nick VanderKooy, Randal Pokiak

Comments - We picked up a boy (Lee Kaytak) from Running River, he had a toothache. He was brought to Inuvik.

Friday, July 30, 1982

Whales - We never saw any whales.

Camps - Billy Day's camp (22 whales yet and still hunting)

- Kendall Island - camp gone, moved upriver.

- Shingle Point (nine whales at Running River, one at Shingle Point).

- Aklavik to drop Doug Irish off, Inuvik to gas up and back to Tuk to drop me off.

People - Pilot, Jeff, Doug Irish, Randal Pokiak

Wednesday, August 4, 1982

Whales - Saw four at Niakunak, about ten passed by the shore of Shingle Point while we were landed there.

Camps - Shingle Point (two whales), Joe Arey arrived and got one since the last visit. Running River was too windy, couldn't land.

- Elijah Attaw's camp - as far as he knows 24 whales landed at Kendall.

- Indian camp - still hunting and fishing

- Bill Day's camp - out hunting at the Island (22 whales so far landed).

- Ned left W. Whitefish

People - Pilot, Jeff, Peter Devenis (Dome), Randal

Comments - We brought Lee Kayotak back to Shingle Point (boy with a toothache).

Saturday, August 7, 1982

Whales - Saw four at Niakunak - offshore at Shingle Point

Camps - Running River (eight whales yet) wind stopping hunt on July 28, two days after the 26th visit, the wind died down enough to hunt. While they were hunting a boat and chopper came on shore to put markers and disturbed the hunting.

- The hunters never got any whales; they went back to Aklavik without getting a whale.

- Shingle Point (two whales yet); Elijah's camp (24 whales yet); Indian camp (still would like a whale). Wind has stopped the hunt for quite some time. Weather was good enough a few times, but no whales in shallow water.

People - Pilot, Jeff and Randal

Comments - From Elijah's camp a girl got hurt accidentally, she couldn't seem to get better so we brought her to Inuvik to get medical attention. (That made our visit cut short in that camp.) We visited extra long at camps since it was our last flight, and we talked a bit longer.

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