IMPORTANCE OF YUKON COASTAL WATERS TO BOWHEAD AND WHITE WHALES

by
P. Norton[1] and B.D. Smiley[2]

[1]PN Research Projects
P.O. Box 2296
Sidney, British Columbia
V8L 3S8

[2]Institute of Ocean Sciences

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Institute of Ocean Sciences
Department of Fisheries and Oceans
P.O. Box 6000
Sidney, British Columbia
V8L 4B2

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[1]PN Research Projects
P.O. Box 2296
Sidney, British Columbia V8L 3S8

[2]Institute of Ocean Sciences

Institute of Ocean Sciences
P.O. Box 6000
9860 West Saanich Road
Sidney, British Columbia
Canada V8L 4B2

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ABSTRACT

Norton, P. and B.D. Smiley. 1986. Importance of Yukon coastal waters to bowhead and white whales. Can. Contract. Rep. Hydrogr. Ocean Sci. 24. 20p.

Available published data from systematic aerial surveys of the Beaufort Sea (1974-1984) are used to evaluate the relative importance of Yukon coastal waters to bowhead and white whales. Each year large numbers of bowhead whales, representing 20 percent or more of the entire western Arctic population, inhabit the 16,000 square km of the Yukon coastal zone sometime during August and/or September. Feeding and socializing are the predominant activities of bowhead whales during that time. Similarly, each year large numbers of white whales, representing 20 percent or more of the Beaufort population, use the Yukon coastal waters during July. Socializing and moulting are the suggested reasons for white whales occupying the area. White whale calving may occur in the more offshore areas. Although the Yukon coastal zone is of little importance to either species as a spring migration route, these waters may be used as a fall migration route.

Key words: abundance, bowheads, distribution, white whales, Yukon coast

RESUME

Norton, P. and B.D. Smiley. 1986. Importance of Yukon coastal waters to bowhead and white whales. Can. Contract. Rep. Hydrogr. Ocean Sci. 24. 20p.

On se sert des données publiées disponibles provenant de levés aériens systématiques réalisés dans la mer de Beaufort (1974-1984) pour évaluer l'importance relative des eaux côtières du Yukon pour les baleines boréales et les bélugas. Chaque année, au cours du mois d'août ou de septembre, on trouve dans les 16 000 km carrés de la zone côtière du Yukon de grandes quantités de baleines boréales qui représentent 20 pour cent ou plus de toute la population de l'ouest de l'Arctique. L'alimentation et la socialisation sont à ce moment-là les principales activités des baleines boréales. De même, chaque année, un grand nombre de bélugas, représentant 20 pour cent ou plus de la population de la mer de Beaufort, fréquentent les eaux côtières du Yukon en juillet. La socialisation et la mue sont les raisons qu'en propose pour expliquer la présence des bélugas dans ce secteur. La mise bas chez les bélugas pourrait avoir lieu dans les secteurs situés plus au large. Bien que la zone côtière du Yukon ait peu d'importance pour les deux espèces comme route de migration au printemps, ces eaux pourraient servir de route de migration à l'automne.

Mots-clés: abondance, baleines boréales, distribution, bélugas, côte du Yukon

ACKNOWLEDGMENTS

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INTRODUCTION

Several management options for the protection of whales and other animals have been suggested for the Yukon coast and adjacent waters. The first impact assessment on proposed industrial development was completed in 1977 by Justice T.R. Berger, who recommended that the entire Yukon coast be made a national park, and West Mackenzie Bay be set aside as a whale sanctuary. In 1978, as a step toward fulfilling his former recommendation, an Order-in-Council removed the Yukon coast from development under the Territorial Lands Act; marine areas were not included in the order.

The Yukon coast and areas seaward to approximately 30 kilometres were designated as part of the lands traditionally used and occupied by Inuvialuit in the 1978 interim agreement between the Canadian government and the Committee of Original Peoples Entitlement (Anon. 1978). Land title excluding oil, gas or hydrocarbon rights to 21,900 square miles selected from the traditionally-used lands was to be granted as part of the final agreement. This agreement was concluded, approved, and signed in 1984. Although specific details are not yet known, the land claims agreement may establish a national park in the western part of the Canadian North Slope (Anon. 1984a).

Parks Canada designated the Yukon coast and adjacent waters, including Herschel Island, as a Natural Area of Canadian Significance (NACS), following an evaluation of the region (Woodward-Clyde Consultants 1981). Further review by Parks Canada in 1983 supported the establishment of a national marine park along the Yukon coast from the Alaska-Yukon border to King Point and seaward to approximately 50 kilometres (Craig et al. 1983).

Several industrial developments have been proposed or conducted in Yukon coastal waters. Offshore exploration for oil and gas commenced in 1977 by Dome Petroleum Limited operating a drillship at Natsek, 16 kilometres north of the Malcolm River delta. Drilling also occurred at that location for short periods in 1978 and 1979. Dome's drillships used Pauline Cove at Herschel Island as a winter harbour in 1976-1977. In 1982, Gulf Canada Resources Inc. applied to the Department of Indian Northern Affairs Canada (INAC) to build a temporary shorebase at Stokes Point; this application was rejected. Instead, Gulf has used Herschel Basin and Pauline Cove as a winter harbour since 1983/84. In 1983, Peter Kiewit Sons Co. Limited applied to INAC for permission to construct and operate a rock quarry and port facility at King Point. This application was withdrawn on July 27, 1984 (Anon. 1984b), but was later re-submitted (Anon. 1984a). No decision has been announced yet on the application.

Yukon coastal waters are considered important habitat for bowhead and white whales. Bowheads (Balaena mysticetus) are on the endangered species list, both in Canada and in the United States, and are the subject of extensive research studies. White whales (Delphinapterus leucas) are of interest because the population supports a subsistence harvest by the local Inuit. Future management strategies for Yukon coastal waters must consider the impact of all activities on both whale populations.

STUDY AREA

The study area extends from shore to 80 kilometres seaward, and from the Alaska-Yukon border (141°W) east to the Yukon-NWT border (136°28'W). Specific areas and place names mentioned in this report are shown on Figure 1.

Yukon coastal waters are ice-covered for almost 10 months of the year, from September to June. During March or April, a network of offshore leads develops from Point Barrow to Banks Island, but this system normally develops north of the study area (Marko and Fraker 1981). Another network of leads extends along the Tuktoyaktuk Peninsula and often continues into Yukon coastal waters. These leads usually develop later than the Barrow-Banks Island lead system, although they can occur in early April. The landfast ice initially recedes along the coast but leaves an ice barrier between the nearshore and offshore bodies of open water. In "normal" years, this barrier is broken by late June (Robertson and Millar 1984) allowing whales access to the study area.

The bathymetry of the study area is not typical of much of the Beaufort Sea. The region's coastal areas generally have a gentle slope to the 100m isobath, which results in a wide shelf of shallow water. However, around Herschel Island, the seabottom slope is steep, and deep water (>10m) is found within two kilometres of shore. In part due to this bathymetric pattern, both nearshore and offshore oceanographic regimes are found within the study area.

APPROACH

The Beaufort Sea Whale Data Inventory (Norton and Smiley 1984), produced as part of the Arctic Data Cataloguing and Appraisal Program at the Institute of Ocean Sciences, was used to identify and select sources of information on whales in Yukon coastal waters. The general parameters (measurement types, area, time, and sampling methods) of each data set were examined and those sets with data from recent systematic or reconnaissance surveys or from shore-based observation posts were used. Data sets containing only incidental observations or historical commercial whaling information were not scrutinized in great detail.

Several limitations restrict the usefulness of this data base. Some of the published reports do not present the results by geographical area; it was difficult to determine if whale activities in Yukon coastal waters differ from those in other Beaufort Sea areas.

Some estuarine areas with traditionally high whale densities, such as Niakunak Bay and Kugmallit Bay, have been surveyed with more intense coverage (up to 50 percent) than other marine areas. Extensive surveys of the region range from 0.3 to 17.5 percent coverage.

More restrictive, however, are the temporal gaps and sampling irregularities of the existing data base. Except for four 1974 bird

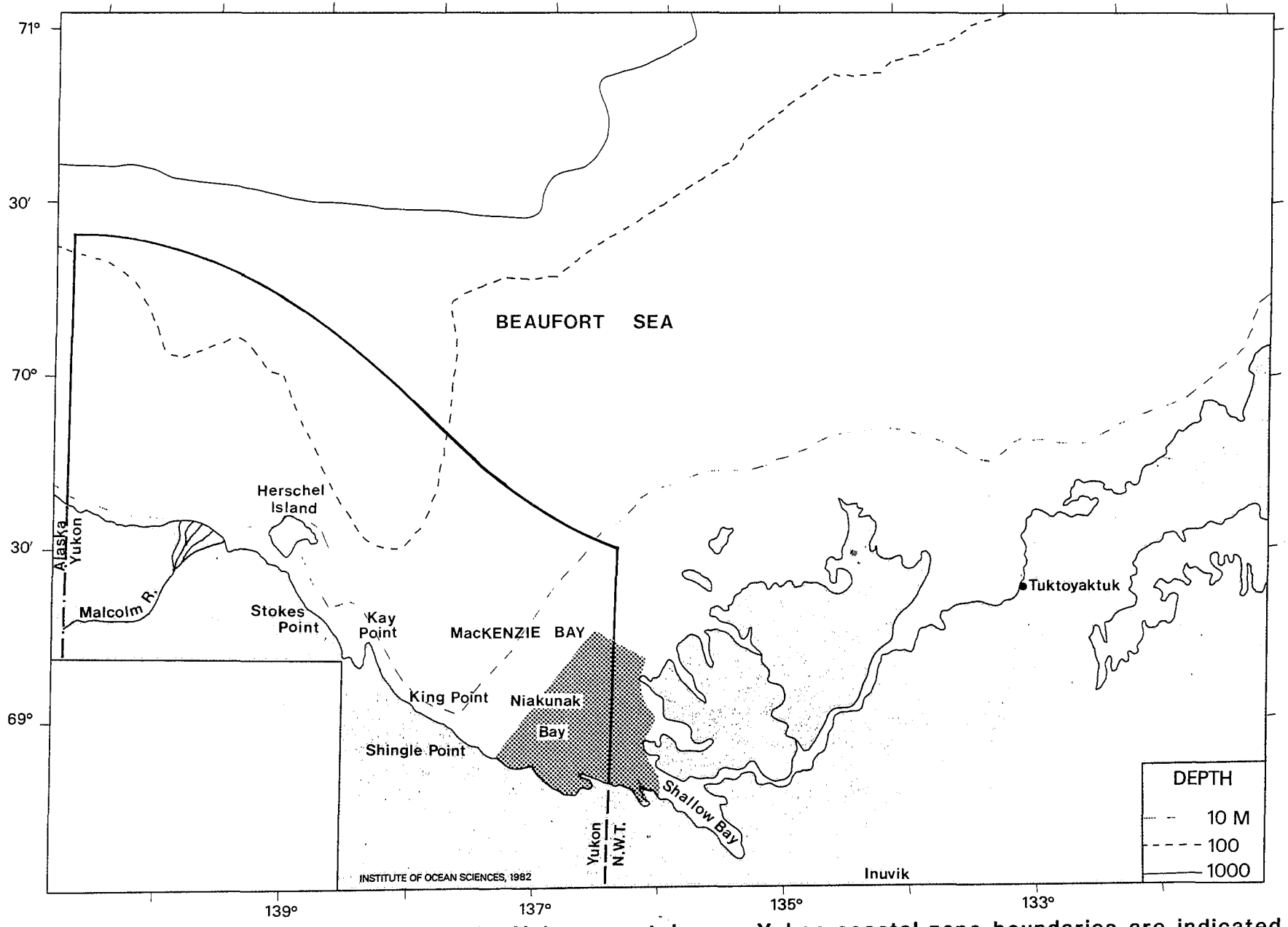

Figure 1. Geographical locations in the Yukon coastal area. Yukon coastal zone boundaries are indicated. Location of Niakunak Bay survey area is shown relative to Yukon coastal zone boundaries.

surveys (with incidental whale observations) in early June, late September, and October, all extensive systematic surveys have been conducted from mid-June through mid-September. Even within this short period, the survey effort was not consistent. For example, the study area was surveyed seven times during late June, but only once in early August. Because the whales' habits and behaviour vary from year-to-year and month-to-month, the existing data are insufficient to provide a complete, detailed description of whale use patterns of Yukon coastal waters.

The format is similar within the separate sections describing bowhead and white whale use of Yukon coastal waters. Whale abundance was examined by half-month intervals using only data collected during extensive, systematic aerial surveys. Such data selection allows some quantitative comparison among sub regions. The trends evident from the systematic survey data were then re-assessed using whale distribution and abundance data from intensive systematic surveys, reconnaissance surveys, and shore-based watches. For time periods when Yukon coastal waters are important to each whale species, whale uses of the area are speculated. Specific information on whale behaviour within the study area was noted as supportive evidence.

Estimates of whale numbers within the Yukon coastal zone were calculated using only those data sets where more than 2.5 percent of the study area was surveyed. This arbitrary cut-off was selected to avoid sampling effort biases. Other factors which introduce bias into the calculations of whale numbers are inappropriate correction factors. Two studies report that effective transect width was narrower than planned transect width for white whales in offshore areas (Davis and Evans 1982; Norton and Harwood 1985a). In these cases, planned transect width was used in the calculations because there are insufficient data to calculate an appropriate transect width.

A sightability index is intended to correct for on-transect whales missed by observers because they were beneath the surface or at the surface and not seen. One study (Davis et al. 1982) calculated a sightability index of 5.592 for bowhead whales (3.83 for animals beneath the surface x 1.46 for animals missed at the surface). Too few data have been collected to calculate a sightability index for white whales in offshore areas. In estuarine areas, where waters are turbid, an index of two is usually applied to account for unseen animals (Fraker and Fraker 1979; Fraker and Fraker 1981; Norton Fraker 1983). In the absence of sightability estimates for white whales in offshore waters, this index of two was used for all calculations in this report.

Estimates of population size vary for both whale species using Yukon coastal waters. Bowhead population estimates have steadily increased (571-796 animals, Braham and Krogman 1977; 2,264, Braham et al. 1979; 2,983-3,842, Davis et al. 1982) as survey techniques have been improved and the extent of area surveyed has increased. The estimate of 3,871 - 254 bowhead whales accepted by the Scientific Committee of the International Whaling Commission (IWC 1984) is used in this report.

White whale population estimates, based on intensive surveys of the Mackenzie River estuarine areas where the whales traditionally concentrate,

have ranged between 3,500 and 7,500 animals (Norton Fraker 1983; Robertson and Millar 1984). However, a more reliable estimate of approximately 11,500 white whales was derived from an extensive regional survey of the Beaufort Sea and Amundsen Gulf in 1981 (Davis and Evans 1982). More recent regional surveys support the higher estimate (Norton and Harwood 1985a), and it is used in this report.

For each extensive systematic survey, the number of survey kilometres flown within the Yukon coastal zone was measured from maps of actual survey transects. The surveyed area was calculated by multiplying the line transect lengths by the stated transect width. The surveyed area was then compared to the total area of the Yukon coastal zone --16,000 km^2-- and expressed as a percent.

BOWHEAD WHALE USE OF YUKON COASTAL WATERS

ABUNDANCE

Bowhead whale abundance and distribution are highly variable in the Beaufort Sea. Different local areas are used by large numbers of whales, depending on the month and year (Richardson et al. 1984). Bowhead whale use within Yukon coastal waters is no exception to this regional pattern of variability. More than 20 percent of the western Arctic population has been recorded in the study area during August and/or September of some years (Table 1). For example, during the four years (1981-1984) when 2.5 percent or more of the Yukon coastal zone was surveyed during early September from 1.5 (1983) to 44.6 (1984) percent of the bowhead population was present (Table 1).

Data from non-systematic surveys and shore watches also support the general pattern of high relative abundance of bowheads in Yukon coastal waters during August and/or early September of some years. Several incidental sightings reported bowheads in the nearshore waters between Shingle Point and Kay Point. On 13 September 1976, at least 33 animals were observed here (Fraker and Bockstoce 1980). In 1983, biologists estimated that at least 215 (and possibly 430-823) bowheads were concentrated along a 37 km long coastal stretch, within 10 km from shore, and centered at King Point; this concentration occurred throughout the last two weeks of August (McLaren and Davis 1985). In contrast, a shore watch maintained at King Point from mid August to mid September 1980 detected only one bowhead whale. Similarly in 1981, a shore watch in the same area from mid August to early September reported one bowhead sighting and possibly bowhead "blows" (Wursig et al. 1982).

DISTRIBUTION

Specific areas used by large numbers of bowheads vary within the Yukon coastal zone. For example, in early September 1982, most bowhead sightings were of one or two animals at least 20 km from shore (Fig. 2). In contrast, during the same time period in 1984, large groups of four to nine animals were seen, and several were within 3 km of shore (Fig. 3). One

Table 1. Seasonal variation of bowhead whale abundance in the Yukon coastal waters.

Season	Year	# of bowheads seen on-transect	# of survey kilometres	Transect width (km)	% of Yukon coastal waters surveyed	Estimated # of bowheads present	Percent of population present*	Reference
June: early	1974	0	414	0.4	1.0	-	NC+	Fraker et al. 1978
late	1974	0	828	0.4	2.1	-	NC	Fraker et al. 1978
	1974	0	985	1.6	9.8	-	0	Fraker 1979
	1975	1	985	1.6	9.8	57	1.5	Fraker 1979
	1976	0	985	1.6	9.8	-	0	Fraker 1979
	1977	0	1,065	1.6	10.6	-	0	Fraker 1979
	1978	0	985	1.6	9.8	-	0	Unpublished data
	1979	0	985	1.6	9.8	-	0	Unpublished data
July: early	1974	0	414	0.4	1.0	-	NC	Fraker et al. 1978
	1984	0	445	2.0	5.6	-	0	Harwood & Borstad 1985
late	1974	0	828	0.4	2.1	-	NC	Fraker et al. 1978
	1981	3	1,090	2.0	13.6	123	3.2	Davis et al. 1982
	1984	2	405	2.0	5.1	219	5.7	Harwood & Borstad 1985
	1984	8	515	2.0	6.4	699	18.1	Harwood & Borstad 1985
	1984	2	520	2.0	6.5	172	4.4	Harwood & Borstad 1985
Aug.: early	1981	7	205	2.0	2.6	1,506	38.9	Davis et al. 1982
late	1974	0	828	0.4	2.1	-	NC	Fraker et al. 1978
	1981	15	1,400	2.0	17.5	479	12.4	Davis et al. 1982
	1982	25	825	1.6	8.2	1,695	43.8	Harwood & Ford 1983
	1983	27	770	2.0	9.6	1,573	40.6	McLaren & Davis 1985
	1984	6	1,035	2.0	12.9	260	6.7	Harwood & Borstad 1985
Sep.: early	1974	0	117	0.4	0.3	-	NC	Fraker et al. 1978
	1981	3	475	2.0	5.9	284	7.3	Davis et al. 1982
	1982	18	930	1.6	9.3	1,082	28.0	Harwood & Ford 1983
	1983	1	770	2.0	9.6	58	1.5	McLaren & Davis 1985
	1984	29	755	2.0	9.4	1,725	44.6	Harwood & Borstad 1985
late	1974	0	332	0.4	0.8	-	NC	Fraker et al. 1978
Oct.: early	1974	0	199	0.4	0.8	-	NC	Fraker et al. 1978
late	1974	0	329	0.4	0.8	-	NC	Fraker et al. 1978

* Percent of population present calculated if >2.5% of Yukon coastal waters surveyed
+ NC = not calculated

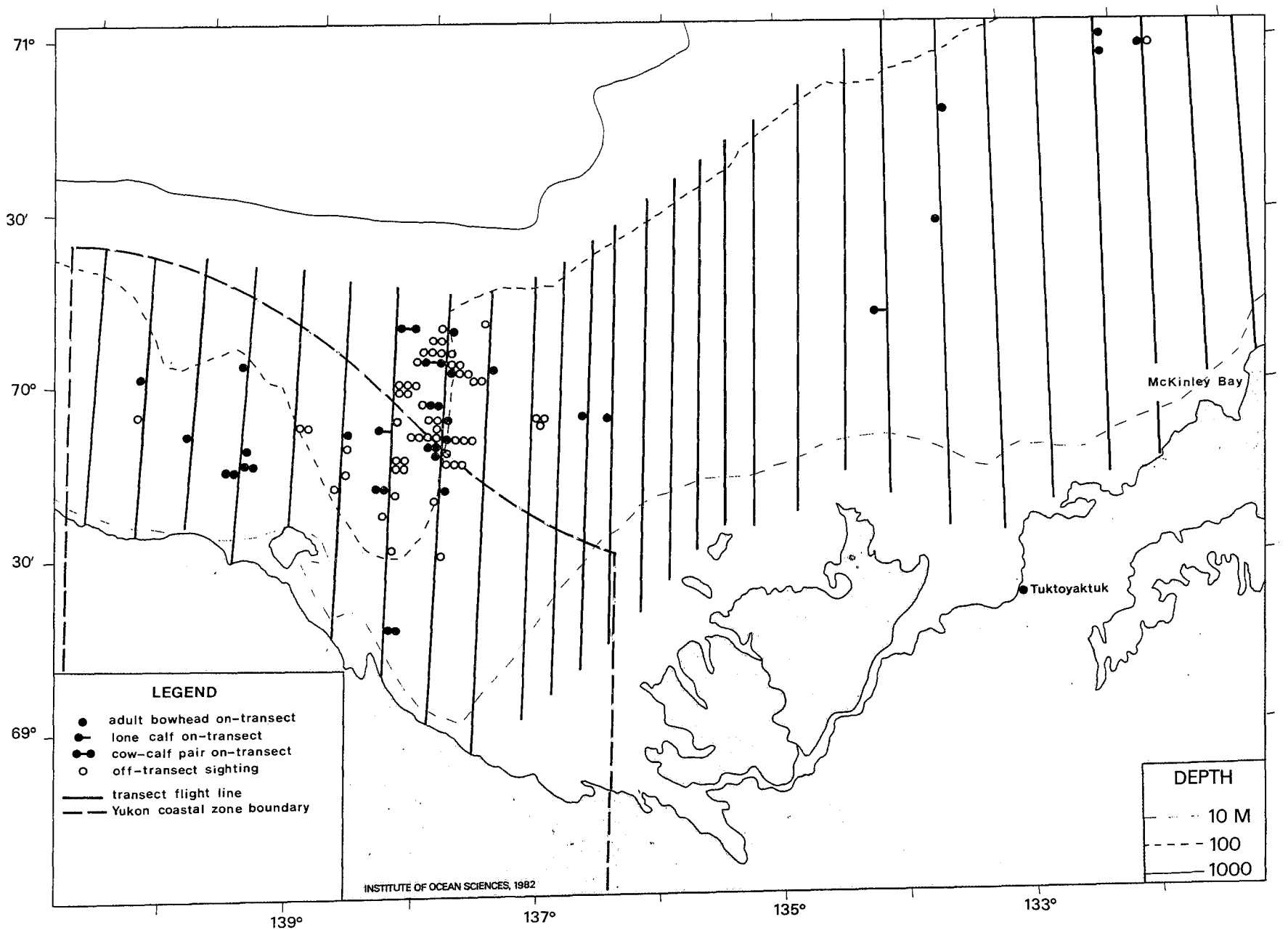

Figure 2. Distribution and abundance of bowhead whales, early September 1982 (adapted from Harwood and Ford 1983).

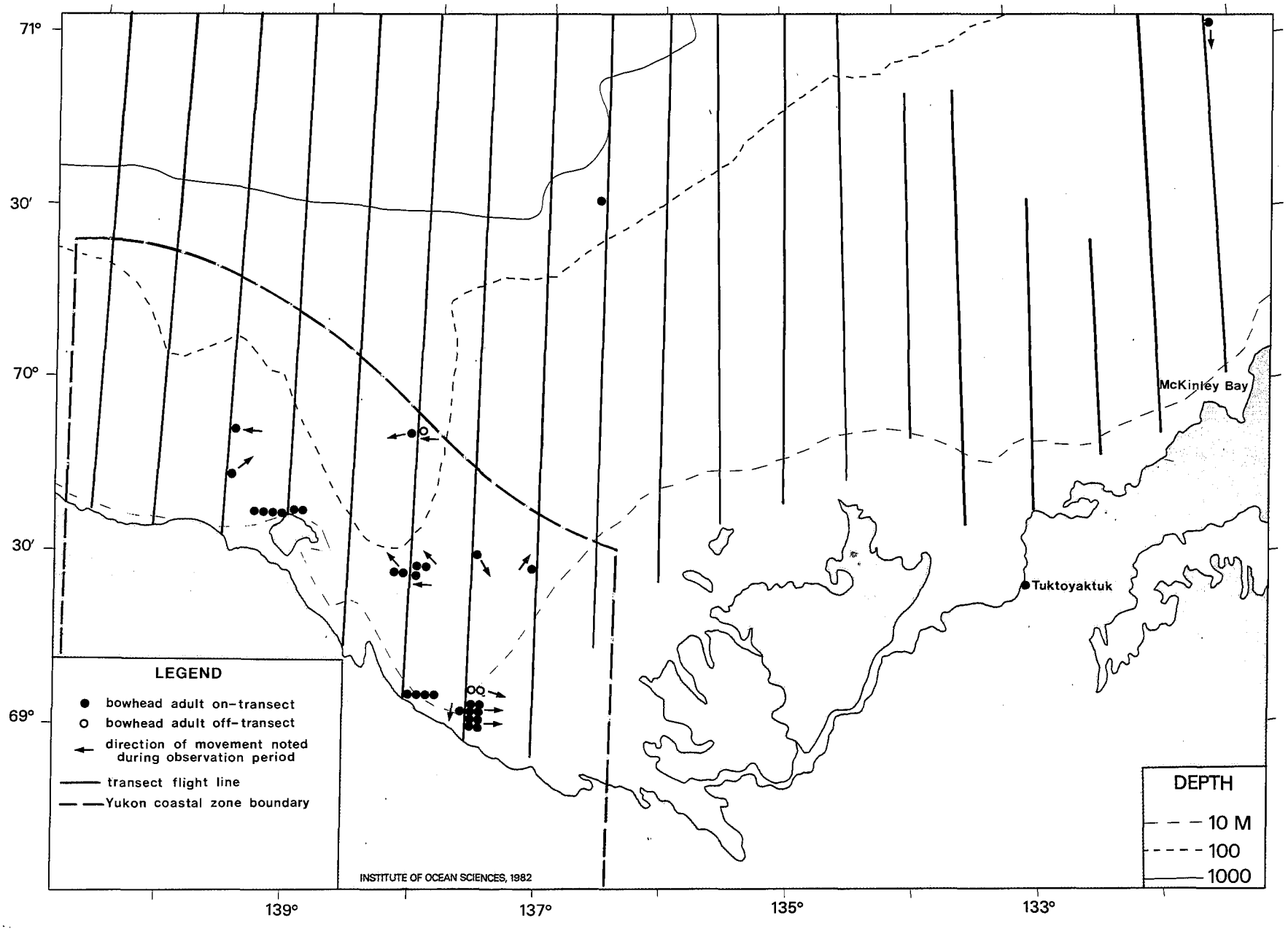

Figure 3. Distribution and abundance of bowhead whales, early September 1984 (adapted from Harwood and Borstad 1984).

purposed hypothesis for the variability in bowhead distribution is that the animals are avoiding areas with intense industrial activities (Indian and Northern Affairs Canada and Environment Canada 1985). An alternate hypothesis is that bowheads concentrate where there are concentrations of zooplankton (their food) and that these areas change as the physical oceanography of the area changes.

Geographic segregation of bowheads by age has been found by Wursig et al. (1984) and Cubbage et al. (1984). The 1983 bowhead concentration off the Yukon coast included many sub-adults (Wursig et al. 1984).

MOVEMENTS AND MIGRATION

The Yukon coastal waters are probably not an important route for the bowhead spring (April-May) migration, but may be for the fall (September-October) migration. Only data from non-systematic surveys exist for the spring, April to May. From 1974 to 1979, no sightings of bowhead whales were reported prior to June in Yukon coastal waters (Marko and Fraker 1981). Ljungblad et al. (1984) made one flight pass in the study area in May 1983 and did not see any bowheads. A six-year review of reconnaissance surveys, occurring primarily in Alaskan waters, found that the area just west of the western boundary of the Yukon coastal zone had the highest (relative) bowhead density in October (Ljungblad et al. 1985). Although no relative density was calculated for the Yukon coastal zone, at least eight bowhead sightings were made there in October.

FEEDING

A four-year study of bowhead whale behaviour in the Canadian Beaufort concluded that feeding is a predominant activity in the region (Wursig et al. 1984). Yukon coastal waters are an important feeding area in some years. Indications of bottom feeding, ie., whales surfacing with muddy water coming from inside their mouths, were observed east and east-northeast of King Point on two occasions in 1983 (Wursig et al. 1984). Skim feeding, ie., bowheads moving forward with their mouths open at or just below the surface, was also observed in the same area that year during the same study. Only one possible indication of feeding, one bowhead opening its mouth once, was recorded in Yukon coastal waters during the 1980-1982 period.

NON-FEEDING BEHAVIOURS

Social behaviours, such as nudging, pushing, chasing, and aerial displays, are exhibited by whales anywhere in the Canadian Beaufort Sea. The relative recorded frequency of such behaviours, including the frequency of such behaviours in Yukon coastal waters, varies from year-to-year (Wursig et al. 1983, 1984). It is not known if this variation is real or is a sampling artifact. Behaviours indicative of calf nursing were observed on four occasions in 1982 within the Yukon coastal zone, in an area north- northeast of Herschel Island (Wursig et al. 1983). The two observed instances of apparent mating during the four-year behavioural study were not in Yukon coastal waters.

WHITE WHALE USE OF YUKON COASTAL WATERS

Studies of white whales in the Canadian Beaufort began in 1972. Most research has been expended during the summer period when the whales concentrate in the Mackenzie River Estuary and in locations where local Inuit hunt the whales. In addition, white whales are usually recorded during aerial surveys for bowheads.

ABUNDANCE

Data from extensive systematic surveys indicate that more than 20 percent of the white whale population may use Yukon coastal waters in July and early August (Table 2). However, white whale use of Yukon coastal waters during early August is based on one survey of 2.6 percent coverage in 1981 (Davis and Evans 1982). Few whales have been recorded in the area during June or from mid August through October.

Much of Niakunak Bay falls within the southeastern portion of the Yukon coastal zone (Fig. 1). As a traditional white whale concentration area, this Bay has been intensively and systematically surveyed during the open-water period from 1976 through 1983. In most years, surveys commenced soon after the landfast ice barrier was broken and whales had access to the area. Large numbers of whales, ranging from 2,464 animals in 1981 (Norton Fraker and Fraker 1982) to 6,368 in 1978 (Fraker 1978) were recorded in Niakunak Bay (Table 3); most were within that portion of the Bay in the Yukon coastal zone.

The most complete study of Niakunak Bay occurred in 1977. Large numbers of white whales (2,752 to 3,348 animals) were estimated to occupy the Bay throughout July (Fraker et al. 1979). The numbers dropped dramatically to less than 650 in early August.

DISTRIBUTION

The 1984 aerial surveys provide the best data on white whale occupancy of Yukon coastal waters. In early July, most white whales were concentrated in nearshore waters just north of Shallow Bay (Fig. 4), although several sightings, of one to four animals, in deeper waters were also reported. By mid to late July, the pattern reversed -- most whales were observed in deeper waters and few animals were present nearshore (Fig. 5). The last survey in July recorded substantially fewer whales throughout the study area (Table 2).

MIGRATION AND MOVEMENTS

It is possible that white whales migrate through Yukon coastal waters in April and May, en route from Point Barrow to the Banks Island-Amundsen Gulf area. Most likely, however, white whales follow the same migration route as bowhead whales, which head due east from Point Barrow, passing far north of Yukon coastal waters (Marko and Fraker 1981). Data from reconnaissance flights in late June along the ice edge suggest that some

Table 2. Seasonal variation of white whale abundance in the Yukon coastal waters.

Season	Year	# of white whales seen on-transect	# of survey kilometres	Transect width (km)	% of Yukon coastal waters surveyed	Estimated # of white whales present	Percent of population present*	Reference
June: early	1974	0	414	0.4	1.0	-	NC+	Fraker et al. 1978
late	1974	7	828	0.4	2.1	667	NC	Fraker et al. 1978
	1974	3	985	1.6	9.8	61	0.5	Fraker 1979
	1975	0	985	1.6	9.8	-	0	Fraker 1979
	1976	20	985	1.6	9.8	408	3.5	Fraker 1979
	1977	0	1,065	1.6	10.6	-	0	Fraker 1979
	1978	12	985	1.6	9.8	245	2.1	Unpublished data
	1979	2	985	1.6	9.8	41	0.4	Unpublished data
July: early	1974	0	414	0.4	1.0	-	NC	Fraker et al. 1978
	1984	86	445	1.6	4.4	3,909	34.0	Norton & Harwood 1985a
late	1974	5	828	0.4	2.1	476	NC	Fraker et al. 1978
	1981	61**	1,090	1.6	10.9	1,119**	9.7	Davis & Evans 1982
	1984	69	405	1.6	4.0	3,450	30.0	Norton & Harwood 1985a
	1984	144	515	1.6	5.2	5,539	48.2	Norton & Harwood 1985a
	1984	28	520	1.6	5.2	1,077	9.4	Norton & Harwood 1985a
Aug.: early	1981	24**	205	1.6	2.6	2,400**	20.9	Davis & Evans 1982
late	1974	1	828	0.4	2.1	95	NC	Fraker et al. 1978
	1981	2**	1,400	1.6	14.0	29**	0.3	Davis & Evans 1982
	1982	10	825	1.6	8.2	244	2.1	Harwood & Ford 1983
	1983	25	770	2.0	9.6	521	4.5	McLaren & Davis 1985
	1984	6	1,035	2.0	12.9	93	0.8	Norton & Harwood 1985a
Sep.: early	1974	0	117	0.4	0.3	-	NC	Fraker et al. 1978
	1981	0	475	1.6	4.8	-	0	Davis & Evans 1982
	1982	0	930	1.6	9.3	-	0	Harwood & Ford 1983
	1983	0	770	2.0	9.6	-	0	McLaren & Davis 1985
	1984	8	755	2.0	9.4	170	1.5	Norton & Harwood 1985a
late	1974	0	332	0.4	0.8	-	NC	Fraker et al. 1978
Oct.: early	1974	0	199	0.4	0.5	-	NC	Fraker et al. 1978
late	1974	0	329	0.4	0.8	-	NC	Fraker et al. 1978

* Percent of population present calculated if >2.5% of Yukon coastal waters surveyed

\+ NC = not calculated

** Numbers are approximations; on-transect and off-transect animals not differentiated on map

Table 3. Numbers of white whales in Niakunak Bay, 1976 to 1983.

Year	Maximum Estimated Number	Reference
1976	3,460	Fraker 1977
1977	3,820	Fraker et al. 1979
1978	6,368	Fraker 1978
1979	5,948	Fraker and Fraker 1979
1980	4,234	Fraker and Fraker 1981
1981	2,464	Norton Fraker and Fraker 1982
1982	5,632	Norton Fraker 1983
1983	5,880	Robertson and Millar 1984

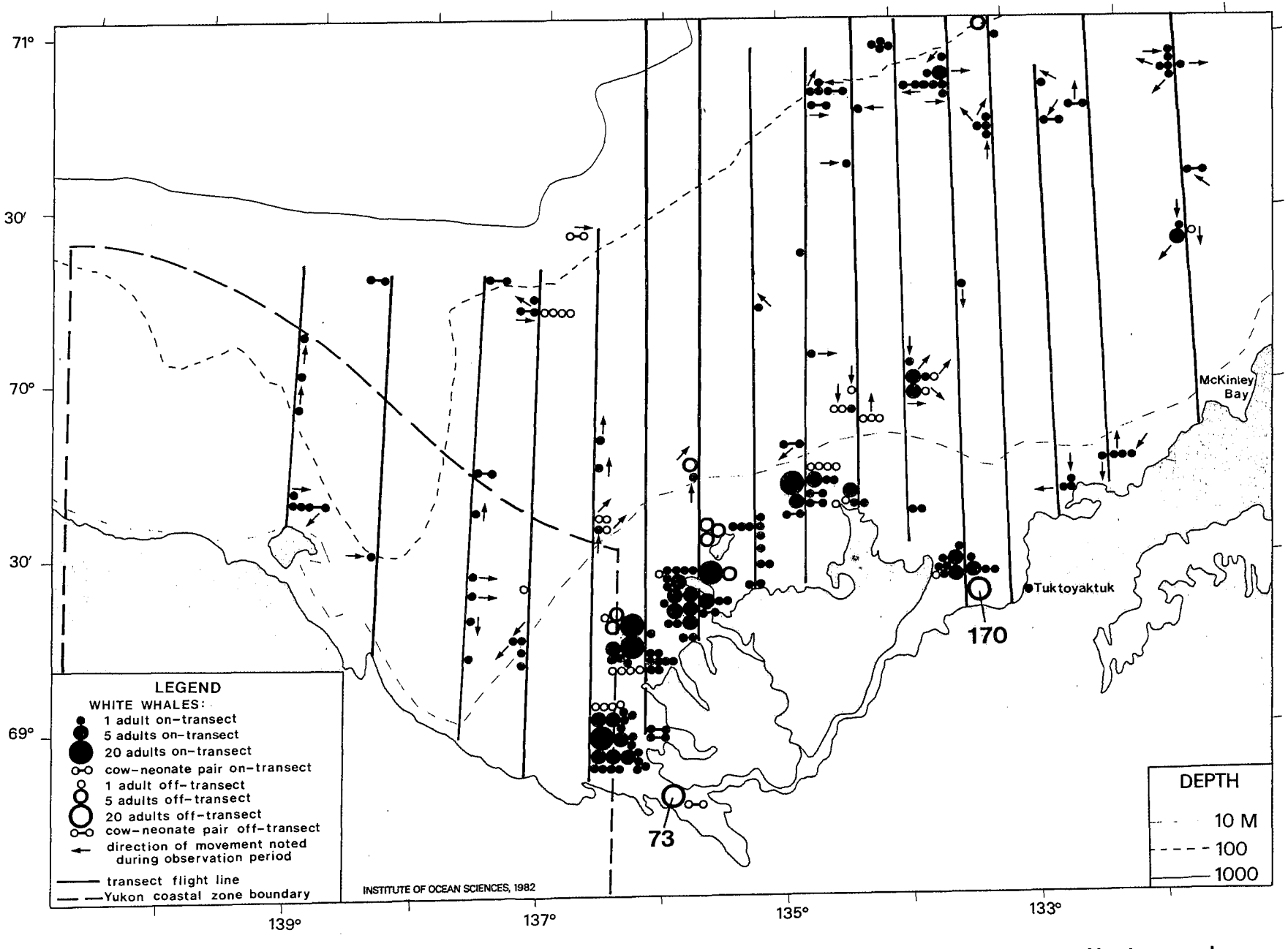

Figure 4. Distribution and abundance of white whales, (early July 1984 (adapted from Norton and Harwood 1985a).

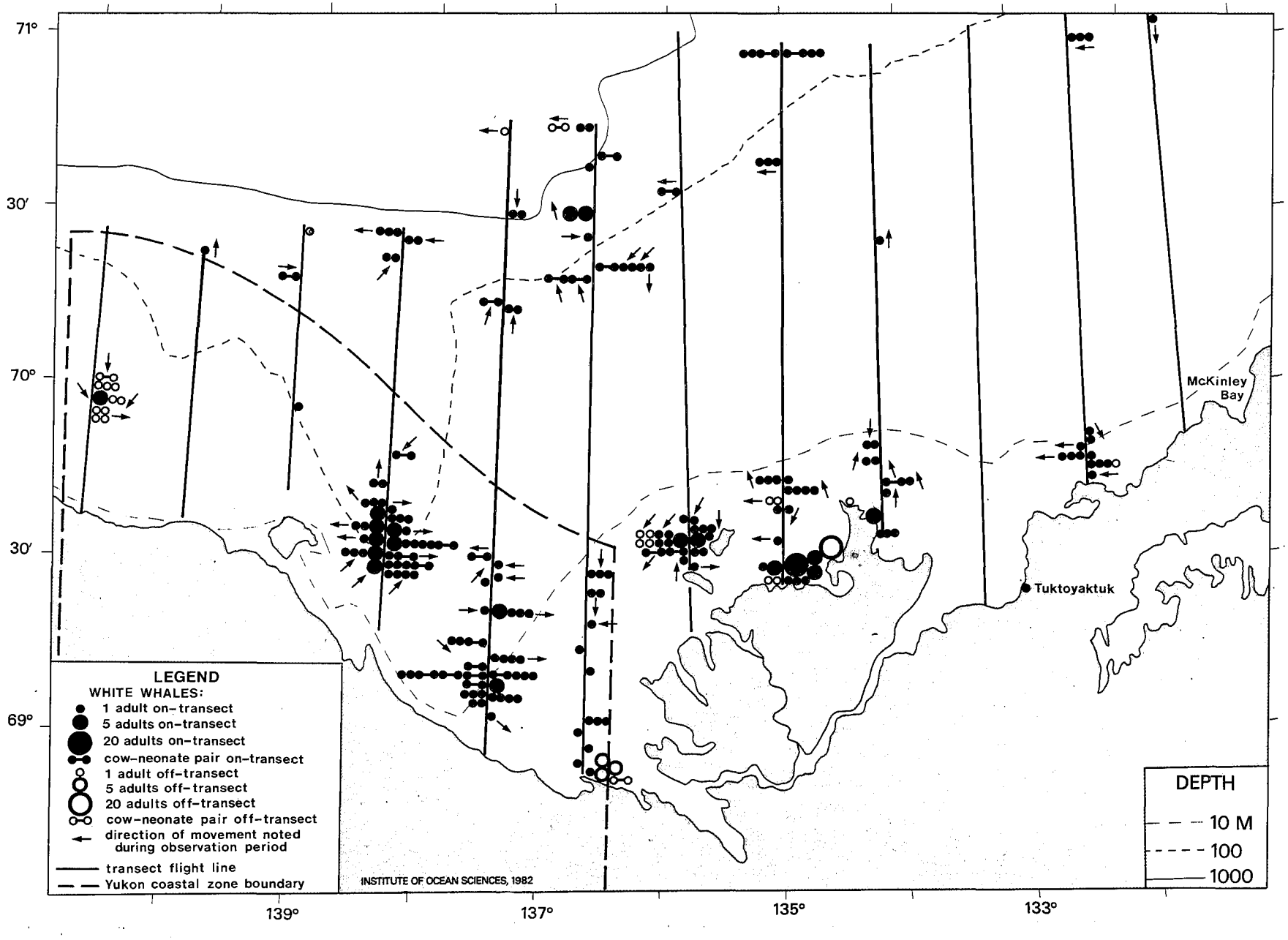

Figure 5. Distribution and abundance of white whales, late July 1984 (adapted from Norton and Harwood 1985a).

white whales come into Yukon coastal waters if they do not have access to the estuarine concentration areas (Fraker and Fraker 1979, 1981). Most of the whales seen in the Yukon coastal zone at that time were moving east, toward the area where the ice barrier was the narrowest.

White whales may travel through Yukon coastal waters during the fall (late August and September) migration. Occasionally, large groups of white whales have been reported, heading west, near Herschel Island in September (Fraker et al. 1978).

FEEDING

During July and early August, when Yukon coastal waters are important to white whales, not much is known of the whales' habitat uses. Within the estuary, behaviours indicative of feeding are seen only occasionally and most animals harvested from the estuary have empty stomachs (Fraker et al. 1978). However, feeding white whales have been reported near Shingle Point and the mouth of Blow River (Robertson and Millar 1984). The importance of offshore areas as feeding locations is not known (Norton and Harwood 1985a). A summary of white whale behaviours observed during monitoring programs from 1976 to 1985 reported relatively frequent sightings of feeding in Yukon coastal waters (Norton and Harwood 1985b) as compared with other areas in the region.

NON-FEEDING BEHAVIOURS

Social behaviours, such as breaching, tail slapping, and spy-hopping, have been frequently reported in Niakunak Bay, especially when large numbers of white whales are present (Fraker and Fraker 1981). Moulting of old skin is purported as one reason that white whales concentrate in river estuaries such as the Mackenzie River Estuary (Finley 1982). Unfortunately, the turbidity of the Mackenzie River estuarine water makes detection of whales rubbing their bodies against the bottom almost impossible.

Until recently, calving was assumed to occur in the warm estuarine waters, based on limited information. However, cow-neonate pairs have been observed along the ice edge in June, before whales have had access to the Estuary. It is now thought that some calving occurs in offshore waters (Norton and Harwood 1985a); several cow-neonate pairs were observed in the study area in July (Fig. 5).

CONCLUSIONS

1. Both species of whales utilize Yukon coastal waters during part of the open-water season; more than 20 percent of the bowhead population is in the area some time during August or early September each year, and more than 20 percent of the white whale population, during July and early August.

2. During the spring migration, Yukon coastal waters are not utilized by bowheads, and probably not by white whales. Both species do use this area during the fall migration, but the relative importance of the Yukon coastal zone as a migration route is not yet known.

3. White whales are more common in the nearshore areas during early July and in the offshore areas after mid to late July. Bowhead whales have been common in the Yukon coastal zone during August or September, but bowhead distribution is variable, and no distinct trend is evident.

4. Yukon coastal waters are probably an important feeding area for bowheads and, to a lesser extent, white whales.

5. Both bowheads and white whales exhibit social behaviours in the Yukon coastal zone. The importance of these behaviours to the species is not known.

6. Some white whales may calf in the offshore areas of the Yukon coastal zone. Bowhead calving areas have not been determined, but are probably not in the study area.

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