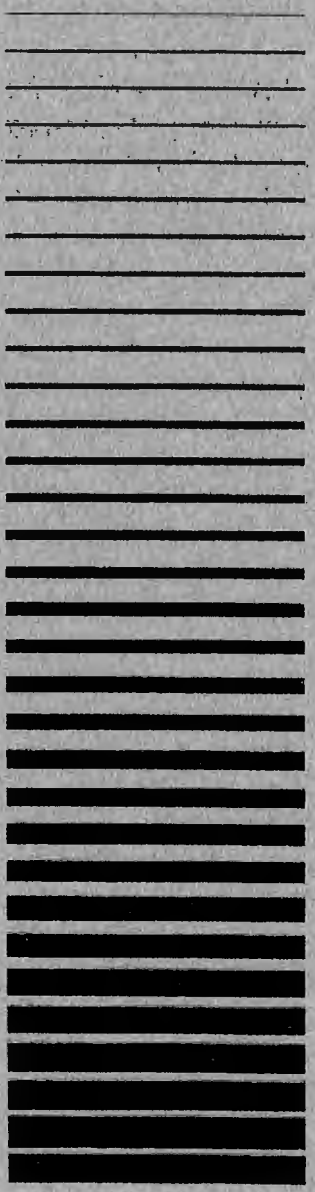
Inuit Knowledge of Belugas and Narwhals in the Canadian eastern Arctic

by

D.B. Stewart



Arctic Biological Consultants
for
Canada Department of Fisheries
and Oceans, Iqaluit, Nunavut

INUIT KNOWLEDGE OF BELUGAS AND NARWHALS

IN THE CANADIAN EASTERN ARCTIC

by

D.B. Stewart

Arctic Biological Consultants
Box 68, St. Norbert Postal Station
95 Turnbull Drive
Winnipeg, Manitoba
CANADA R3V 1L5
stewart4@mb.sympatico.ca

2001

PREFACE

This report was prepared under contract for the Canadian Department of Fisheries and Oceans. Scientific Authorities for this contract were Karen Ditz of the Department of Fisheries and Oceans, Iqaluit, NT, Canada, XOA OHO and Pierre Richard, Department of Fisheries and Oceans, 501 University Crescent, Winnipeg, Manitoba, R3T 2N6.

Correct citation for this report is:

Stewart, D.B. 2001. Inuit knowledge of belugas and narwhals in the Canadian eastern Arctic. Prepared by Arctic Biological Consultants, Winnipeg, MB for Canada Department of Fisheries and Oceans, Iqaluit, Nunavut. iv + 32 p.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

ABSTRACT

Stewart, D.B. 2001. Inuit knowledge of belugas and narwhals in the Canadian eastern Arctic. Prepared by Arctic Biological Consultants, Winnipeg, MB for Canada Department of Fisheries and Oceans, Iqaluit, Nunavut. iv + 32 p.

This report is a summary of three studies of Inuit knowledge of belugas *(Delphinapterus leucas)* and narwhals (*Monodon monoceros*) conducted in the Baffin region between 1992 and 1997. Information presented on the seasonal distribution and biology of these whales was collected from hunters and elders at Pangnirtung, Iqaluit and Kimmirut (Kilabuk 1998); Arctic Bay, Clyde River, Grise Fiord, Pond Inlet, Qikiqtarjuaq and Resolute (Remnant and Thomas 1992); and Grise Fiord, Arctic Bay, Igloolik and Hall Beach (Stewart *et al.* 1995). This report documents their observations for use in resource co-management, and to provide a basis for further discussions between the hunters and resource managers and researchers

Key words: Arctic Zone; Nunavut; subsistence harvesting; indigenous knowledge; Admiralty Inlet; Jones Sound; Foxe Basin; Baffin Bay; Hudson Strait; Frobisher Bay; Cumberland Sound; Lancaster Sound; marine mammals; life history; survey methodology; fishery management.

INTRODUCTION

Inuit knowledge of belugas *(Delphinapterus leucas*) and narwhals (*Monodon monoceros*) in the Baffin Region was collected between 1992 and 1997. Hunters and elders from Arctic Bay, Clyde River, Grise Fiord, Pond Inlet, Qikiqtarjuaq and Resolute (Remnant and Thomas 1992); Grise Fiord, Arctic Bay, Igloolik and Hall Beach (Stewart *et al.* 1995); and Pangnirtung, Iqaluit and Kimmirut (Kilabuk 1998) provided information on the seasonal distribution, biology, and harvesting of belugas and narwhals (Figure 1). This report summarizes their observations on the seasonal distribution and biology of these whales on a regional basis for use in resource co-management, and to provide a basis for further discussions between the hunters and resource managers and researchers.

METHODS

This section describes differences in the sampling methods used by Remnant and Thomas (1992), Stewart et. al. (1995) and Kilabuk (1998) and how these differences affect the interpretation of the information collected.

Sampling method:

Stewart *et al.* (1995) and Kilabuk (1998) used a "reputational" approach to sampling (Roberts 1993). The HTO in each community was asked to identify which hunters and elders it considered to be most knowledgeable of belugas and/or narwhals in their area. These people were then approached for interviews (Table 1). Thomsen (1993) used a similar approach in Greenland.

This method of selecting people to be interviewed introduces a variety of biases into these studies. In particular, no information was collected from women or non-hunters. These people are often astute observers of species biology and physiology. Because of their roles in the community, and interests, they may hold knowledge that is different from that of the hunters. Women also tend to live longer and may therefore have a greater span of traditional knowledge than the men. The effects of these biases were not measured. The reputational sampling method also results in a small sample size. This does not diminish the information obtained. In fact, it may reduce misinformation that can be introduced by less experienced observers.

In contrast, Remnant and Thomas (1992) selected an arbitrary number of hunters to be interviewed from each community and left the selection of hunters to be interviewed to the discretion of the interviewers. A sample selected in this way is not likely representative of the community, nor does it necessarily identify and interview only the most experienced hunters. Indeed information from the more experienced hunters may be obscured by that from those who are less experienced.

Questionnaire versus workshop approach:

Remnant and Thomas (1992) and Stewart *et al.* (1995) gathered information from the hunters using questionnaires. This approach is especially vulnerable to failure if the questions are inappropriate or the answers ambiguous. A number of questions in earlier study were unclear or were answered ambiguously and, despite rigorous editing, several were apparent in the later study. These problems are discussed below. The use of local interviewers to gather information also made follow-up questioning difficult and effectively prevented the clarification of inconsistencies in the data.

The esteem in which elders and senior hunters are held may also pose difficulties for this method of gathering information. Young interviewers may not understand some of the technical terms used by these experts, and may thereby miss important nuances of the information (Johnson 1992; G. Williams, pres. comm.). They may also be in awe of the elders and reluctant to ask questions for clarification. Likewise, a younger hunter may be reluctant to volunteer information that contradicts what an elder has said.

Kilabuk (1998) gathered local knowledge without the use of questionnaires. He used a workshop approach wherein eight hunters/elders from each community addressed specific topics identified in preliminary meetings with their HTO's. This approach is more responsive to the interests of the

local harvesters and provides useful information that might be missed by a questionnaire. However, like the questionnaire surveys it is vital to distinguish between knowledge versus opinion, to consider the problem of area coverage, and to relate seasonal information to environmental conditions.

Knowledge versus opinion:

Inuit knowledge studies must distinguish between knowledge and opinion. While Inuit observations are rarely wrong, their interpretations of what they have seen may be (Gunn *et al.* 1988). A major criticism of the questionnaire used by Remnant and Thomas (1992) is that it asked general questions, such as "How many calves does a beluga usually have in a year". While the intent of this question is to learn "what the hunter knows", the basis of that knowledge remains hidden. In fact, the response may be based on the hunter's interpretation of what he has seen, on hearsay from other hunters, or on the latest aerial survey information. Consequently, most of the information they collected on reproductive rates using these general questions is difficult to interpret. To distinguish between knowledge and opinion, Stewart *et al.* (1995) asked the hunters what they had seen, what they had been told by a parent or grandparent, and for their opinions on a number of topics. Kilabuk (1998) interact directly with the hunters in the workshops and also distinguished between direct observations and opinion.

Area coverage:

To properly interpret the hunter's observations we also need to know where they have travelled during each season. This information was not gathered by Remnant and Thomas (1992) or Kilabuk (1998). Without it, we do not know whether gaps in the hunters observations suggest that an area may not be used by whales, or simply that no one visits the area during that season. To obtain this information Stewart *et al.* (1995) asked hunters to indicate where they had travelled during each season. The hunters' observations were then matched to their seasonal travels. Seasonal observations from a particular area were not accepted if the hunter indicated that he had not visited that area or seen whales during that season. There are unexplained differences in the Arctic Bay hunters' reports of their seasonal travel between the beluga and narwhal sections.

Seasonal observations:

Inuit base their six seasons on the environmental conditions, not on the calendar. There is some variation in the months assigned to each season between communities due to different latitudes and oceanographic and climatic conditions, and within communities due to year-to-year variation in conditions. It is not unusual for the Inuit seasons to vary by a month or more on either end due to annual variations in climate. Inuit knowledge studies that relate observations to the calendar or to western seasons (spring/summer/fall/winter) and not to the Inuit seasons risk losing a valuable environmental component of the Inuit knowledge. This information is very important to scientists and resource managers, who need to understand how aspects of the whale's biology correspond to the environmental conditions and also to the calendar year.

The six Inuit seasons are characterized below with their approximate calendar months for comparison:

- **UKIU**--(winter: early January through mid-March) extensive sea ice which continues to thicken and coalesce, snow on the land and ice, short daylight with the sun returning, very cold;

- **UPINGOAKSAK**--(early spring: mid-March to late May) period of maximum ice cover and ice thickness; snow on the land and ice; daylight period long and increasing.

- **UPINGOA**--(late spring: late May to mid-July) progressive snow melt, widening of ice leads, and disappearance of ice; 24 hour daylight.

- **AUJA**--(summer: mid-July to early-September) open water with some drifting pack ice, daylight period long but decreasing.

- **UKIAKSAK**--(early fall: early September to late October) open water with ice beginning to form late in the season along the shoreline; snow on the land and ice on the lakes; daylight period short and decreasing.

- **UKIA**--(late-fall: late October to early January) new ice hardens and thickens to form extensive areas of landfast or drifting pack ice; snow on the land and ice; 24 hour darkness.

Remnant and Thomas (1992) only used western seasons and calendar observations; Stewart *et al.* (1995) asked hunters to relate their observations to the Inuit seasons and, if possible, also to the calendar; and Kilabuk (1998) provided the Inuit season on occasion . This difference between the studies makes it difficult to summarize information on the seasonal distribution and movements of belugas and to relate it to environmental conditions. Remnant and Thomas (1992) did not differentiate between early and late spring and between late fall and winter. Consequently, their spring observations are depicted on both the early and late spring maps, and their winter observations are depicted on both the late fall and winter maps with explanations in text.

INUIT KNOWLEDGE OF BELUGAS

Information presented below for the communities of Pangnirtung, Iqaluit, and Kimmirut is from Kilabuk (1998); information for Qikiqtarjuaq, Clyde River, Pond Inlet, and Resolute is from Remnant and Thomas (1992); and that from Arctic Bay, Igloolik/Hall Beach, and Grise Fiord is from Stewart *et al.* (1995). To improve readability these references have not been cited repeatedly below. The source of other material discussed, including that collected by Remnant and Thomas (1992) from Arctic Bay and Grise Fiord, is cited in text. Numbers have occasionally been included to provide a record of the responses, not for emphasis. An event seen by a single hunter is just as valid and important as one seen by several. Arrows on the maps show the whale's direction of movement. They are not related to the number of whales present (i.e. more arrows do not mean more whales). Likewise, shaded areas on the maps indicate the general area where whales are found and the size of these shaded areas is not related to the density or number of whales present (i.e. larger areas of shading do not mean more whales). Information on harvesting practices and recommendations from the hunters have not been discussed.

Seasonal distribution and movements:

The following observations reflect where Inuit hunters have observed belugas during a particular season. They are typically most detailed nearest the communities and become progressively less so with distance. The coverage varies widely with the season depending upon travel conditions. Because the extent of the hunter's seasonal travels was not reported by two of the studies and there are large gaps in hunter's coverage of the region, these observations represent an unknown fraction of the actual distribution and movements of belugas in the region

Ukiu (winter) (Figure 2)

Cold weather, low light conditions and extensive sea ice limit observations of belugas during the winter season. Hunters from Grise Fiord have seen belugas moving about the floe edge in eastern Jones Sound in January and February, feeding and trying to keep in open water as the ice changes--they also saw them in the pack ice south of Coburg Island during a survey of the North Water in 21-26 March 1993 (see also Richard et al. 1994). Hunters from Iqaluit have seen evidence that belugas surface through the ice at the Frobisher Bay floe edge in the winter. Belugas are seldom seen elsewhere in the Baffin region during this period except when they overwinter in a polynya or become entrapped in the ice (see below).

Upingoaksak (early spring) (Figure 3)

Hunters in the Baffin region travel more extensively during upingoaksak (early spring) than during ukiu and see more belugas at the floe edges. In the south, belugas that are hunted at the Cumberland Sound floe edge in April to June are typically smaller than those that summer at Clearwater Fiord, near the head of the Sound. These smaller whales feed at the floe edge but the hunters do not know where they come from or go to. Many belugas are present at the Frobisher Bay floe edge at this time. First to appear are the relatively large, yellowish animals that are believed to act as scouts and to guide the smaller whales during migration. A similar pattern has been observed when belugas move westward along the floe edge in northern Hudson Strait into the Kimmirut area, usually in April.

There, a small group of 3 or 4 badly scarred whales that seem to act as scouts, patrols the area a day or so before the main herd arrives. One of these whales has been observed almost annually since 1977. They feed and are hunted in waters near the community as they move westward towards Cape Dorset. Most of these whales travel around the southwest side of Big Island where the tidal current is steadier.

Belugas are seldom seen along the east coast of Baffin Island in early spring. They have been seen around Padloping Island (ca. 1943) and in Broughton Harbour (ca. 1963) moving northward. One hunter stated that belugas only passed through the Qikiqtarjuaq hunting area in spring for a short time, perhaps because shipping activity in Davis Strait caused them to alter their migration route. Some hunters in the Clyde River area think that the belugas migrate northward along the floe edge in the early spring, and remain in this open water until breakup. They indicated a number of fiords and offshore areas as spring (April-June) beluga habitat. The most frequently cited location being off the east Baffin coast from east of Clyde River south to Cape Raper.

Belugas are widely but sparsely distributed in the Pond Inlet area in spring (April-June). As the ice breaks up there may be some movement of animals into Pond and Navy Board inlets but most continue moving to the north and/or west. Some animals move westward along the ice edge at the mouth of Admiralty Inlet and then southward along the west coast of Brodeur Peninsula to at least Fitzgerald Bay; others gather at the Lancaster Sound ice edge east of Resolute to wait until the ice breaks up in Barrow Strait. Belugas were also reported in spring near the community of Resolute, off the northeast coast of Somerset Island, and in Creswell Bay [Author's note: These observations are not supported with information on ice conditions or a calendar date which would aid in their interpretation.]. Hunters from Igloolik and Hall Beach have seen belugas in western Fury and Hecla Strait and east of Igloolik in May and early June.

To the north, in eastern Jones Sound, belugas continue to move about the floe edge during upingoksak, feeding and trying to keep in open water as the ice changes. One hunter, who had travelled up the east coast of Ellesmere Island, indicated that the belugas' use of the area is related to ice, and that they wait in open water until the ice dissipates before moving northward. He did not know the northward extent of their movements but indicated that they were coming from the south and moving northward to at least Talbot Inlet, feeding beneath the landfast ice as they travelled.

Upingoa (late spring) (Figure 4)

As spring breakup progresses, belugas are hunted as they follow leads in the ice on their way to their summering grounds. In the Pangnirtung area, large groups of belugas migrate into Cumberland Sound in late June and early July. Most of these whales follow ice leads along the west side of the Sound on their way to the summer calving grounds in Clearwater Fiord, but some remain in bays along the west side of the Sound. Iqaluit elders suspect that, after winter, belugas travel from the Frobisher Bay floe-edge towards Pangnirtung. While there are many belugas at the Frobisher Bay ice edge in early spring, relatively few enter the Bay and travel towards Iqaluit. Those that do, travel mostly along the western side of the Bay.

During upingoa, belugas continue to migrate northward along the east coast of Baffin Island and westward along the north coasts of Bylot and Baffin islands, feeding as they go. Some of them move into fiords along the east coast and into the entrances of Pond, Navy Board, and Admiralty inlets as ice conditions permit. The southward movement of belugas along the west coast of Brodeur Peninsula continues and animals gathered at the Lancaster Sound ice edge east of Resolute move to summering areas in Barrow Strait and Creswell Bay as ice conditions permit. Hunters from Igloolik and Hall Beach have seen belugas following the floe edges looking for food, in mid-June through mid-July, west of Rowley Island and near the southeastern coast of Melville Peninsula.

From mid-May through early July, the belugas continue to move and feed along the floe edge in eastern Jones Sound and to move northward east of Ellesmere Island. The latter movements which occur in leads and open water extend northward to at least Cadogan Inlet. The whales also follow leads into the fiords of southern Ellesmere Island if there is open water. During heavy ice years some belugas remain at the Hell's Gate polynya year-round.

Auja (summer) (Figure 5)

During July and August belugas in the Pangnirtung area gather in Clearwater Fiord to calve. Until the 1960's these animals often remained in the Fiord until late October, but some now leave via the west side of Cumberland Sound in late August. Reasons suggested by the hunters for this change include: that these whales may now be more sensitive to boat noise; that a killer whale population may no longer be in the area; and that the ice may now be forming earlier in Clearwater Fiord. Other belugas are distributed in the bays along the west side of Cumberland Sound. Few belugas are seen in Frobisher Bay or in the waters around Kimmirut in the summer.

Belugas were present in the Qikiqtarjuaq hunting area in summer in the past but are seldom seen today. They do summer and calve to the north in Clyde Inlet, Isabella Bay, and waters along the south coast of Henry Kater Peninsula. Clyde River hunters have observed a general northward movement by these animals in summer.

Few belugas summer in the Pond Inlet area. Most animals that pass through the coastal waters of Bylot Island and the mouths of Pond and Navy Board inlets continue to move north and/or west, but some summer in Eclipse Sound, Milne Inlet and Koluktoo Bay, and calve in southern Milne Inlet and Koluktoo Bay and the southern half of Navy Board Inlet.

Hunters interviewed in 1994, indicated that belugas do move up and down Admiralty Inlet in summer, entering the fiords and feeding as they go. They did not, however, indicate whether these animals are common or abundant. In contrast, the 1992 study reported a limited presence of belugas at the mouth of the Inlet in summer and no presence of belugas in the Inlet in the fall or winter (Remnant and Thomas 1992). This difference may be due to the hunter's reluctance to impart information on belugas to the 1992 study (A. Taqtu, pers. comm.).

Further west, belugas summer in Barrow Strait along the north shore of Somerset Island and at Creswell Bay, and move south through Peel Sound to summer in the Browne Bay area along the east side of Prince of Wales Island and at Wrottesley Inlet on the west side of Boothia Peninsula. In Foxe Basin, they are seen mainly in the area between Igloolik, Hall Beach, and Rowley Island, searching for food or sometimes moving northward.

During auja the Grise Fiord hunters' marine travels had been limited to Jones Sound. They had observed belugas moving westward into the sound following leads in the ice, and feeding. The animals bypass some of the fiords along the southern coast of Ellesmere Island (e.g. South Cape Fiord and Starnes Fiord) but do enter Grise, Harbour, and Muskox fiords. Belugas had also been observed moving westward in leads along the north coast of Devon Island, and southeastward from Jones Sound through Lady Ann Strait.

Ukiaksak (early fall) (Figure 6)

There is a general movement of belugas out of the coastal waters in early fall as the landfast ice begins to form. The whales feed and rest as they go. In the north, belugas from the fiords of southern Ellesmere Island migrate eastward back towards the winter floe edge, although one hunter indicated that the whales are usually entering the fiords during ukiaksak. Some stop to feed at the mouth of Grise Fiord in late September.

During Ukiaksak, belugas feed in the Igloolik Island/Jens Munk Island area of Foxe Basin and move southward and northward in the vicinity of Igloolik Island. They occupy Barrow Strait, between Cornwallis and Somerset islands, in September and October and there is a general northward movement of belugas out of Peel Sound and Prince Regent Inlet and eastward through Barrow Strait to Lancaster Sound.

The movement of belugas northward out of Admiralty Inlet continues into November, and some of the whales enter Adams and Strathcona sounds on their way. Belugas pass through the open coastal waters off the coast of Bylot Island on their southward migration. They were not reported to enter Pond Inlet but do enter Navy Board Inlet–possibly to avoid killer whales.

Only one of the Clyde River hunters reported the presence of belugas in the fall. He indicated that they were present in the same general areas as in summer but were moving southward. A hunter from Qikiqtarjuaq also indicated a number of areas used by belugas on their southward migration in September

and October.

Belugas pass through the Kimmirut area as they return eastward in the fall. They follow the same general route as in the spring but travel on both sides of Big Island, and are observed in larger herds. The majority of the fall migrants are females with young and juveniles. There are fewer adult males, similar to the mid-1900's. Belugas migrate out of Frobisher Bay and Cumberland Sound during ukiaksak, mostly along the west side of the Bay and Sound.

Ukia (late fall) (Figure 7)

Few of the hunters had seen belugas in the Baffin region in late fall. One, from Grise Fiord, had seen belugas trapped in the ice near the mouth of Starnes Fiord, an event reported by Freeman (1968). Fewer whales were seen in the Grise Fiord area in the three years following the ice entrapment event. In the Igloolik/Hall Beach area, belugas had been seen moving southward in October from past Hall Beach in search of open water. They are rare or absent in the Resolute area in late fall and winter, although one hunter had seen them in Barrow Strait. It is not known whether or not these whales were trapped in the ice. During ukia, some belugas are still moving northward out of Admiralty Inlet and then eastward in Lancaster Sound. They are found in Eclipse Sound, near Pond Inlet, before the ice forms. This area was identified as late fall and winter habitat but it is not known whether the whales were trapped in the ice. Hunters from the eastern and southern Baffin communities had not seen belugas in the late fall.

Changes in seasonal distribution and behaviour:

Some hunters in each community described changes in the numbers of whales visiting their hunting area over time and in the behaviour of those whales, changes in the whales' seasonal distributions were sometimes described. The greatest changes were reported by hunters in the southern Baffin Island area.

Hunters in the Pangnirtung area see fewer belugas now than they did prior to the late 1970's. They attribute the decrease to large commercial hunts that took place in the region until the late 1970's, and observed that the numbers continued to decrease after these hunts were stopped. They believe that belugas numbers have stabilized and may be rising, as females with young are now more numerous, and that recent decreases in beluga numbers are not due to over-hunting but to some belugas' avoidance of Clearwater Fiord or Cumberland Sound. Belugas now leave the calving area in Clearwater Fiord as early as late August whereas until the late 1960's they would not leave until late October. In the past, belugas also left Clearwater Fiord temporarily, more often and in larger numbers and calved in the Iqalugadyuk area (Shark Fiord) immediately east of Clearwater Fiord.

Iqaluit hunters and elders have noticed that belugas are now travelling in smaller groups than before and believe that there are fewer whales in Frobisher Bay now than in the past.

Belugas now appear in the Kimmirut area later in the spring and in smaller numbers than in the past. Hunters believe that this change is not due to over-hunting but to a change in the migration route taken by some whales. They did not describe how the route has changed. This decrease in numbers has been evident since the early 1980's. The spring migration is composed of a scattering of small groups or individuals, whereas the fall migration consists of larger herds – if disturbed, the scattered whales will regroup into larger herds. Belugas now reach Kimmirut much later in the fall closer to freeze-up, when the ice is forming and hunting by boat is difficult. Hunters have observed an increase in the number of individual whales and have noticed that noise from motorboats is causing them to avoid some camps they used to visit. Belugas also used to enter Kimmirut Inlet more frequently and in larger numbers–today such visits are rare.

Along the eastern Baffin coast, belugas were historically present in the Qikiqtarjuaq area in spring, summer, and fall but their frequency of occurrence and abundance there in the past are unknown. Today they are seldom seen in the Qikiqtarjuaq hunting area. Some Clyde River hunters suggested that there has been an increase in the number of belugas over time in their area, but that this number varies depending on human activity.

Further north, a hunter from Pond Inlet stated that fewer belugas are seen at the floe edge travelling

north in the spring now as compared to the 1950's, and suggested that the migration pattern of belugas had been altered somewhat. Some hunters from Arctic Bay and Resolute reported that belugas were less common once ships began visiting the area on a regular basis, particularly during auja, others had not noticed any change. One hunter from Arctic Bay indicated that the belugas now get stuck in the ice when it returns because they are late moving northward.

Belugas in the Igloolik/Hall Beach area were said to prefer deeper water during auja and ukiasak, now than in the past, and to be less common in the well-travelled area between Igloolik Island and Melville Peninsula. One hunter said that the number of belugas has been decreasing at every season; others noted seasonal and interannual variations in the numbers of belugas, but had not recognized an overall change.

Grise Fiord is a relatively new community so local knowledge of whales only extends back about 40 years. One hunter observed that there seem to be more whales when the ice breaks up completely and fewer when it does not, but noted that comparison is difficult. Others noted a general decrease in the number of belugas since 1975; over the past 10 years; or in the last 3 years (1991-1993)--the latter being attributed to the persistent presence of old ice.

Hunters throughout the Baffin region have observed changes in beluga behaviour since the introduction of motorboats and snowmobiles improved hunter access to offshore waters and the floe edge. Belugas will undertake large detours or flee an area when they hear engine noise. Repeated disturbances are making them avoid areas where they were formerly found, particularly around outpost camps, and some now travel within ice packs to avoid hunters. Many whales have learned to avoid hunters at the floe edge. They no longer come close in to the floe edge before diving to feed or float still at the floe edge after feeding. Instead, they begin their dives further out and often feed at the floe edge at night when all is quiet. When they rest after feeding they do so at some distance from the floe edge. Pangnirtung Elders have seen a slight decrease in the thickness of the whale's fat and suspect this is because they need to travel further and faster to avoid the motorboats.

Reproduction:

Within each community, opinions on whether belugas give birth at the same time each year, on how frequently they give birth, and on where and when mating occurs were mixed. It was seldom clear which responses to the 1992 questionnaire were based on personal observation, traditional knowledge, or conjecture. Direct observations reported by the 1994 study provide clearer information on these topics as does information from the 1997 workshops.

In summer, many belugas gather in Clearwater Fiord, at the head of Cumberland Sound, to give birth. Clearwater Fiord was the only large-scale calving area identified by hunters and elders in the Baffin region (Figure 5). Most of the pregnant females enter the Fiord once Cumberland Sound is ice free and give birth in July or early August (auja), after spending some time in the area. Pangnirtung hunters believe that these whales may give birth annually, as many are accompanied by a new born, yearling, and juvenile. In the past, belugas also calved in Shark Fiord immediately east of Clearwater Fiord. Belugas will, on occasion, calve at other areas along the Baffin coast, either prematurely or by design. The hunters also identified areas where belugas give birth near Clyde River, in southern Navy Board Inlet, southern Milne Inlet and Koluktoo Bay, and in Jones Sound.

Belugas had been observed mating during upingoaksak (May) and upingoa (July) at the Admiralty Inlet floe edge. None of the Arctic Bay hunters had seen a beluga give birth but newborn calves had been seen at the floe edge during upingoa (July). Arctic Bay hunters had found foetuses inside female belugas during upingoaksak, upingoa, and auja (May, July, August). None of the females contained more than one foetus, but foetuses of different sizes were seen at the same time of year. Several hunters had killed pregnant belugas that also had a calf. The calves were about 2 m (6') in length while the foetuses were about 1 m (3-4') in length. Most hunters did not indicate the season of these harvests, but one said it was during upingoaksak (May). Another hunter observed that about one in four of the white female belugas killed is pregnant.

Igloolik and Hall Beach hunters had not seen belugas mating or giving birth. They had seen newborn calves during upingoa or auja (June, August,

and September) in the Igloolik and Jens Munk Island areas. One of the Hall Beach hunters had found twin foetuses in a beluga during ukiaksak (September).

Most (4) of the Grise Fiord hunters interviewed had seen belugas giving birth. Births were observed at the floe edge in July, in Grise Fiord in August, or off the mouth of Grise Fiord in September. Newborn calves or births were seen in each month starting in February and continuing through October. The Grise Fiord hunters had found foetuses in female belugas killed during ukiaksak (September and October). During this season, some of the pregnant females also had a calf, but none had more than one foetus. The calves were about 2 m (6-8') in length, and the foetuses about 0.6 m (2 ft). One hunter found different-sized foetuses at the same time of year.

None of the hunters had observed a grey giving birth. But, while most did not believe greys give birth, a few hunters in Igloolik and Grise Fiord said that they do so on occasion. One hunter said that he had seen larger greys with a calf; another had seen foetuses in grey females but did not believe that grey females give birth; and a third observed that the larger greys are the size of the older whales that have calves, but was unsure whether they give birth.

Food and feeding:

Arctic cod (*Boreogadus saida*) are a common and important dietary item for belugas throughout the Baffin region almost year-round (March through December). Belugas prey on them at the floe edge and inshore. Turbot or Greenland halibut (*Reinhardtius hippoglossoides*) are eaten at the floe edges in Cumberland Sound, Frobisher Bay, Baffin Bay (offshore Clyde River and Pond Inlet), and Admiralty Inlet. In the fall, anadromous Arctic charr (*Salvelinus alpinus*) are also eaten as they congregate near river mouths before migrating into freshwater. Greenland cod (*Gadus ogac*), sculpin, eelpout and capelin are also eaten seasonally at some locations. Invertebrates, particularly shrimp, are also important dietary items for belugas. On arriving in the Clearwater Fiord area, and when they depart, the belugas feed more on shrimp and invertebrates than on fish. Whales are generally fatter when they arrive in the spring than when they leave in the fall after birthing and/or moulting. There are locations where belugas usually have food in their stomachs and others where they do not. Pangnirtung Elders described having seen belugas that died while feeding on "tupiyyutik" or grenadier.

Predators and ice entrapment:

The depth of information gathered on two sources of natural mortality, non-human predators and ice entrapment, varied between the reports reviewed. Stewart *et al.* (1995) related descriptive and seasonal observations by the hunters on both predation and ice entrapment. Remnant and Thomas (1992) and Kilabuk (1998) only collected information on ice entrapment.

The entrapment of belugas by ice is a widespread phenomenon in the Baffin region that typically occurs in late fall and may recur periodically at some locations (Figure 8).

In 1956, over 100 belugas were trapped during ice formation on the west side of Cumberland Sound (no location given). Belugas are repeatedly entrapped by ice in the fall at other areas along the west side of Cumberland Sound and, occasionally, in Nettilling Fiord. Thirty-five whales were found dead above the high tide mark in Irvine Inlet. Currents in this area are fast and the water shallow, and an elder has suggested that these belugas may have been stranded rather than entrapped by ice.

Hunters from Iqaluit could not recall any ice entrapment of whales. They suspect that it occurs but not on a large scale. There was no mention of such entrapments by hunters from Kimmirut, but entrapments do occur occasionally in the Qikiqtarjuaq and Clyde River areas.

In the Arctic Bay area, belugas and narwhals have been observed entrapped together by ice in Adams Sound during ukiaksak (October). The hunter estimated that such events might occur about every ten years, and did not believe that there had been a change in the frequency of ice entrapment events.

The ice entrapment of belugas occurs during ukia and ukiu (October through February) in the Igloolik area. Hunters had observed belugas entrapped by the ice at the entrance and exit to Fury and Hecla Strait, and in Murray Maxwell Bay. Entrapped whales were also seen by the hunters'

parents or grandparents in Agu Bay, northern Committee Bay, eastern Fury and Hecla Strait and Guilliam Bay. One hunter indicated that entrapment occurs less often than every ten years, and that this frequency has not changed. Only one hunter had harvested ice-entrapped belugas.

Grise Fiord hunters had harvested belugas which were entrapped in the Starnes Fiord area between September 1966 and April 1967. During the 1994 survey, the hunters referred the interviewer to Freeman (1968) for the details!

Hunters at Arctic Bay, Igloolik/Hall Beach, and Grise Fiord had seen wounds or scars on belugas caused by the unsuccessful attacks of killer whales (*Orcinus orca*) and polar bear (*Ursus maritimus*), but none of them had seen evidence of attacks by Greenland shark (*Somniosus microcephalus*). Observations of successful predation on belugas were limited. One hunter had seen the site where a polar bear had killed a beluga at the Jones Sound floe edge; another had seen a killer whale kill a beluga near Arctic Bay.

Stock identification:

Hunters from Pangnirtung recognize three distinct groups of belugas based on differences in size, appearance, health and behaviour. Belugas that are hunted at the Cumberland Sound floe edge in the spring (April, May or June) are noticeably smaller and skinnier than those that summer in Clearwater Fiord. They are white and do not show signs of shedding. These whales travel in smaller groups and their origin and destination are unknown. They are easier to hunt than the Clearwater Fiord whales, as they come in closer to the ice and do not stay under water as long. Belugas that summer in Clearwater Fiord are larger than those that are hunted at the floe edge or that spend the summer in western Cumberland Sound. The Clearwater Fiord animals usually reach Cumberland Sound in late June or early July and travel in large herds. When they arrive, the outer layer of their skin is yellow and in its early stage of shedding. These whales are fat and most float when killed. Belugas that summer on the west side of Cumberland Sound are also smaller and skinnier than the Clearwater Fiord whales. They frequent coastal waters and faster currents and tend to sink when killed. Their skin (Maayak) is thick, their muktuk more flexible, and their meat and muktuk have a stronger taste that of the other whales.

To the west, hunters and elders from Iqaluit and Kimmirut believe that belugas from more than one population may enter their hunting areas. They have observed differences in the flippers and flukes, body size, behaviour, and colours at different times of the year but are unable to distinguish between populations. They suggested that a photo library might be compiled to assist them to distinguish between the different whales. In the 1950's larger, whiter whales with longer teeth were present in the Kimmirut area. These belugas appeared in large herds and are no longer seen.

Hunters from communities to the north did not recognize different types or kinds of belugas, apart from males, females and calves. Some, in the Arctic Bay, Igloolik/Hall Beach and Grise Fiord areas, indicated that male belugas generally frequent one area and females, greys and calves another. One hunter who had lived in both Iqaluit and Grise Fiord said that the whales seemed smaller in Cumberland Sound than Jones Sound; another that belugas in Greenland waters were larger than those around Pond Inlet. A hunter from Igloolik who had examined belugas with bullet wounds believed that they had come from a distance, perhaps Greenland, as the bullets were of an unfamiliar type.

INUIT KNOWLEDGE OF NARWHALS

Information presented below for the communities of Qikiqtarjuaq, Clyde River, Pond Inlet, and Resolute is from Remnant and Thomas (1992); and that from Arctic Bay, Igloolik/Hall Beach, and Grise Fiord is from Stewart *et al.* (1995). Kilabuk (1998) did not collect Inuit knowledge of narwhals from the southern Baffin communities. To improve readability these references have not been cited repeatedly below. Where other material is discussed its source is cited in text. Numbers have occasionally been included to provide a record of the responses, not for emphasis. An event seen by a single hunter is just as valid and important as one seen by several. Information on harvesting practices and recommendations from the hunters have not been discussed.

Seasonal distribution and movements

Ukiu (winter) (Figure 9)

Few narwhals are seen in the Baffin region in winter. Large breathing areas have been found in new ice at the Baffin Bay floe edge in the Qikiqtarjuaq area, suggesting that the whales remain there throughout the winter to feed. Narwhals are also found in open water near the Pond Inlet floe edge in the winter (no location given) and in Tremblay Sound and southern Milne Inlet–the latter may indicate ice entrapment or confusion with the seasons. A narwhal was found frozen into the ice of a fiord near Clyde River, and one of the Arctic Bay hunters had seen whales entrapped by ice during ukiu, as had his father before him. Despite extensive travels on Jones Sound, Baumann Fiord and Norwegian Bay and Makinson Inlet and Smith Bay, none of the Grise Fiord hunters had seen narwhals in winter.

Upingoaksak (early spring) (Figure 10)

Narwhals are widely distributed offshore the east coast of Baffin Island in the spring. Hunters from Qikiqtarjuaq and Clyde River have observed a general northward trend to their movement and indicated that they remain offshore until ice break up allows them to enter the fiords. Further north, narwhals patrol the floe edges near the mouths of Pond and Navy Board inlets, feeding and waiting for ice breakup to allow them to enter the inlets.

During upingoaksak narwhals feed on cod as they move westward into Lancaster Sound. They follow the floe edge near the mouth of Admiralty Inlet, and some proceed southward along the west coast of Brodeur Peninsula to at least Fitzgerald Bay. These whales are seldom seen in the Resolute area in spring. They are present at the floe edge in Lancaster Sound where they feed and wait for the ice to break up in Barrow Strait before moving further west. Narwhals were also reported to be present near Creswell Bay in the spring. Despite extensive travels on Jones Sound, Baumann Fiord and Norwegian Bay and Makinson Inlet and Smith Bay, none of the Grise Fiord hunters had seen narwhals during upingoaksak.

Upingoa (late spring) (Figure 11)

In late spring, narwhals continue to migrate northward along the east coast of Baffin Island and westward along the north coasts of Bylot and Baffin islands. They feed on cod as they go. Some narwhals move into fiords along the east coast and into the entrances of Pond and Navy Board inlets as ice conditions permit. As spring progresses they begin to move into Clyde Inlet. They also move into Eclipse Sound, Milne Inlet, Tremblay Sound, and Koluktoo Bay –possibly to avoid killer whales.

During upingoa the narwhals continue to move along the ice edge near the mouth of Admiralty Inlet, feeding on cod, and along the west coast of Brodeur Peninsula southward to at least Fitzgerald Bay. As the season progresses they follow leads, and possibly seal holes, southward from the ice edge into northern Admiralty Inlet. Narwhals gather at the Lancaster Sound ice edge east of Resolute and move to summering areas in Barrow Strait and at Creswell Bay as ice conditions permit. In late spring, hunters from Igloolik and Hall Beach have observed them trying to move southeastward from the Gulf of Boothia into Fury and Hecla Strait. And, further north, they are found feeding, tusking, and resting at the ice edge in eastern Jones Sound. When disturbed these animals move eastward and return in 6 to 12 hours.

Auja (summer) (Figure 12)

Many hunters from both Qikiqtarjuaq and Clyde River identified the fiords of Home Bay as summer habitat for narwhals. These whales also visit fiords to the south, possibly en route to Home Bay, and are found in most fiords and inlets along the eastern Baffin coast in the Clyde River area. To the north, narwhals summer in Eclipse Sound and the adjacent bays and sounds. They enter the Sound via Pond and Navy Board inlets and spend the summer moving about the area feeding, calving, moulting, and mating. One hunter indicated that the younger whales tend to remain within the inlets.

Narwhals travel throughout most of Admiralty Inlet during auja, moving north and south and penetrating into the heads of the bays, feeding and mating. To the west, they are present in Barrow Strait, Creswell Bay, and along the east coast of Prince of Wales Island. They also move southward along both coasts of Somerset Island and westward from Barrow Strait towards Austin Channel.

All of the Igloolik and Hall Beach hunters had

observed narwhals during auja in the Igloolik and Fury and Hecla Strait areas. The whales move through the Strait in one direction or another, searching for food. Some enter Guilliam Bay from the north, while others pass east of Igloolik Island on their way north to Fury and Hecla Strait.

During auja, the Grise Fiord hunters' marine travel was limited to Jones Sound. They had observed narwhals moving westward into the sound and trying to follow leads into the fiords of southern Ellesmere Island. When not being hunted, the narwhals are often feeding. Some whales usually enter Grise Fiord, where they pass by the community as they enter or exit. While they are found at the floe edge every summer, narwhals do not enter Grise Fiord every year. Sometimes they are not seen in the fiord for 3 or 4 years, other times they are seen every year for a number of years.

Ukiaksak (early fall) (Figure 13)

During early fall, the Grise Fiord hunters had travelled the coastal waters of southern Ellesmere Island and observed narwhals in Harbour, Grise, and Starnes fiords. By late September the whales are moving out of the fiords and eastward back to open water, feeding as they go. Some pass by the community and are scared by hunters.

Narwhals are occasionally seen during ukiasak in the Igloolik area searching for food. Further north, others migrate out of the Resolute hunting area as inshore ice begins to form, moving northward along the east and west coasts of Somerset Island and eastward out of Barrow Strait into Lancaster Sound. Narwhals in the Arctic Bay hunting area also move northward, entering the fiords as they travel out of Admiralty Inlet to Lancaster Sound and then eastward towards Baffin Bay. One hunter indicated that there are fewer whales present than in summer (auja).

Further east, narwhals are found in Eclipse Sound, Navy Board Inlet, Pond Inlet, and along the north shore of Bylot Island in the fall. They feed actively before leaving the inlets and migrate southward before the ice forms. One hunter indicated that the narwhals return to the inlets if killer whales are present and remain there until it is safe to resume their migration.

In early fall, narwhals are present in virtually all of the fiords and inlets along the east coast of Baffin Island from Scott Inlet south to the Padloping Island area. Hunters from both Qikiqtarjuaq and Clyde Inlet reported a general southward movement of narwhals out of their hunting areas as the ice forms in September and October. One hunter suggested that the whales travel inshore rather than offshore so they can stop to feed and give birth in the fiords.

Ukia (late fall) Figure 14)

In late fall, the narwhals continue to move northward out of Admiralty Inlet and Prince Regent Inlet, and they are occasionally seen searching for food in the Igloolik area. Few whales are seen during after October in the Pond Inlet, Clyde River, and Qikiqtarjuaq areas. One hunter from Pond Inlet indicated that narwhals are present in Tremblay Sound and southern Milne Inlet during the late fall and winter (i.e. November to March). During this time, hunters in the area had observed large breathing areas in new ice at the Baffin Bay floe edge, and suggested that the whales remain in this area throughout the winter to feed.

Changes in seasonal distribution:

In the late 1970's narwhals stopped frequenting the areas centred around Kivitoo and Padloping Island, but began to appear in the area around Qikiqtarjuaq and Canso Channel and the fiords in between. Most hunters from Qikiqtarjuaq agreed that the narwhal population had increased since the 1960's or 1970's. Year to year variation was noted but the population was believed to be increasing.

Until the 1970's, narwhals in the Clyde River area were mainly fall migrants moving through on their way south. Since then, they have remained in the area from spring to fall. The population varies in size from year to year, but the hunters believe there are more narwhals in this area now than there were 20 to 30 years ago. They attributed this change variously to increased shipping activity further north, altered ocean currents, earlier ice breakup, and more efficient hunting practices. Narwhals were reported to be very sensitive to noise and it took 6 to 10 years for the population to returned to its original size following seismic activity (type unspecified) in Baffin Bay and Davis Strait.

Since the 1960's, hunters from Pond Inlet have observed that narwhals are less common near their community and tend to travel down the centre of the Inlet. They attributed this change to an increase in the number of people hunting and travelling with motorboats and snowmobiles near the community. Since the 1970's, narwhals have also been seen more frequently in the sounds and bays south of Eclipse Sound and, since the 1980's, in the Coutts Inlet area and further south towards Clyde River. The narwhal population in the Pond Inlet hunting area had shown year to year variation but most hunters (21/35) believed that it was stable–some (9/35) that it had decreased and others (5/35) that it had increased.

Hunters from Arctic Bay reported a number of changes in how narwhals use their area. During upingoaksak the whales now arrive later in the year, when the ice is becoming unsafe for travel; and during upingoaksak and ukiaksak they no longer enter the bays. Some said that the increased ship traffic is scaring the whales away, others that there are more now. Seasonal ship traffic does cause the ice to disappear earlier than normal. Narwhals no longer visit "the bay on the other side of Arctic Bay".

Hunters from Resolute Bay had observed little change in the distribution of narwhals, but some indicated that there are now fewer near the community than in the past. Hunters from Igloolik and Hall Beach had not observed changes in the seasonal distribution of narwhals but one said that, during summer, there are more narwhals and they seem to increase in size. Belugas were said to outnumber narwhals in this area.

Because of the short history of Grise Fiord, only one hunter had local knowledge from his parents or grandparents. He had seen narwhals in the same areas as his father, but recalled being told that narwhals did not frequent the Grise Fiord area in the early 1950's. One hunter reported that the number of narwhals had increase during the past 15 years. The others had not observed any change in abundance. As with belugas, the heavy ice conditions over the past three years was the only factor identified by the hunters as hampering the presence and hunting of narwhals in their area.

Reproduction (Figure 15):

Within each community, opinions on whether narwhals give birth at the same time each year, on how frequently they give birth, and on where and when mating occurs were mixed. It was not always clear which responses to the 1992 questionnaire were based on personal observation, traditional knowledge, or conjecture. Direct observations reported by the 1994 study provide clearer information on these topics.

Hunters from Qikiqtarjuaq had observed narwhals mating at the outskirts of Home Bay, at the floe edge and within Canso Channel. Calving occurs in the spring and summer in the fiords of Home Bay and at several other fiords in the area. Most hunters said that the females give birth to one calf per pregnancy and can reproduce annually, but occasionally miss a year. They observed that females are often accompanied by a small calf and a large calf.

Hunters from Clyde River did not identify specific mating areas. Most of them believed that narwhals mate anywhere, either year-round or in the spring or summer. Calving was reported to take place primarily in the fiords where the water was warm and silty. Most hunters said that the females give birth to one calf per pregnancy. They observed that females are often accompanied by a yearling and a newborn calf. Two hunters stated that a pregnancy begins with 3 or 4 foetuses but only one will develop fully.

Hunters from Pond Inlet indicated that narwhals mate at the floe edge, in Eclipse and Tremblay sounds, Milne Inlet and Koluktoo Bay, and that mating takes place either year-round or in the spring, summer, or fall. Most hunters indicated that calving takes place in the summer, but the floe edge was also identified as a calving site. Calving was said to occur within the inlets, fiords and sound; wherever narwhals feed; in warm water at river mouths; in open water and at the floe edge. The birthing process can take several weeks and the calf's tail is often visible for several days before the calf emerges. Most narwhals have one calf per pregnancy and give birth every year or two.

Narwhals have been seen mating during upingoa (June) at the Admiralty Inlet floe edge, and during auja (August) in western Admiralty Inlet. Birthing areas are widely distributed in the Inlet and most of the hunters from Arctic Bay had seen narwhals give birth. Some (3) said that they all give

birth during auja (July through September), others (2) that they give birth at any time of the year, and the rest did not know. Newborns had been seen in auja. During the birth, a calf sometimes helps its mother as it emerges; some newborns cannot dive and others cannot swim. Three hunters indicated that narwhals give birth annually and one that they give birth every two years. One hunter had seen a narwhal accompanied by four calves of different sizes, one of which was noticeably smaller, in summer. [Author's note: this may be evidence of "aunting", whereby a female looks after other female's calves while they are diving deep to feed.] Foetuses had been found in female narwhals during upingoa and auja (July and August). None of the hunters had seen a female with more than one foetus but all had seen foetuses of different sizes at the same time of year. Pregnant females with calves had been killed during upingoa and ajua (July and August). The calves ranged in length from 2 to 2.5 m (6-8') and the foetuses from 1.3 to 1.5 m (4-5'). The hunters did not know what proportion of the females killed are usually pregnant.

Responses by hunters from Resolute to questions on narwhal reproduction varied widely. One hunter did indicate that narwhals calve along the east coast of Prince of Wales Island. Hunters from Igloolik and Hall Beach had seen narwhals mating in auja (August) but did not identify any mating areas. Births had been seen at the west end of Fury and Hecla Strait during auja (July or August), and newborns during auja (August) in the Igloolik area.

Hunters from Grise Fiord had not observed narwhals mating or giving birth, but had seen newborn calves in mid-June and late July at the floe edge, and in August and September in Grise and Starnes fiords. Pregnant narwhals had been harvested in upingoa, auja, and ukiaksak (June through September). None of these animals was accompanied by a calf or had more than one foetus, although foetuses of different sizes were found at the same time of year. The hunters did not know what proportion of the female narwhals killed were pregnant.

Food and feeding:

Narwhals feed on a variety of fishes and invertebrates, including Arctic and Greenland cods, Arctic charr, turbot, herring and sculpins, shrimp, squid, and planktonic crustaceans. The Hunter's observations suggest that there may be some seasonality to the whale's diets. Most hunters indicated that narwhals feed year-round; some indicated that they increased their food intake prior to migration and fasted during fall migration. Relatively few discrete feeding areas were identified by hunters interviewed in the three Inuit knowledge surveys. The floe edge and fiords in Home Bay and around Canso Channel; Milne Inlet, Eclipse Sound, and Koluktoo Bay; and an area in Barrow Strait west of Resolute and another along the southwest coast of Devon Island were identified as feeding areas. Narwhals do not feed in Eclipse Sound when killer whales are present.

Predators and ice entrapment:

The depth of information gathered on two sources of natural mortality, non-human predators and ice entrapment, varied between the reports reviewed. Stewart *et al.* (1995) related descriptive and seasonal observations by the hunters on both predation and ice entrapment; Remnant and Thomas (1992) only collected information on ice entrapment.

Narwhals have been entrapped by ice in the Arctic Bay area during auja, ukiaksak, and ukia (August, October, November) (Figure 16). This occurs every ten years or less, a frequency said to be unchanged. Entrapped narwhals are harvested when possible. Hunters from Igloolik and Hall Beach had found narwhals entrapped by ice during auja (August) in Guilliam Bay and eastern Fury and Hecla Strait, and during ukia and ukiu (October through January) in Murray Maxwell Bay, Agu Bay, Guilliam Bay, and eastern Fury and Hecla Strait. No explanation was given for the auja entrapment. These events were thought to occur less often than every ten years. Two of the hunters had harvested entrapped narwhals. They located the whales in January but did not hunt them until April, or catch many. Hunters from Grise Fiord were not aware of any ice entrapment of narwhals in their area.

Hunters in the Baffin region had observed killer whales preying successfully on narwhals. They had also seen evidence of unsuccessful attacks on narwhals by polar bears and sharks. A hunter from Arctic Bay had seen six killer whales attacking a narwhal in August. Another had seen a narwhal killed by a killer whale. The killer whales ate the meat and

fat but left the skin. They also "smashed" a smaller narwhal. Still another hunter had seen a whole narwhal on the ice, but did not indicate how it came to be there. Narwhals had also been observed following killer whales. Scars from unsuccessful attacks by killer whales had been seen on the tail flukes, on the flanks in front of the tail, on the back behind the melon and above the front fins, and on the sides behind the front fins of narwhals. Parallel scratches from unsuccessful attacks by polar bears had been seen on the backs, sides and tails of narwhals. They were differentiated from scars made by ice which generally chips the skin on the back between the melon and the mid-back.

Two hunters from Arctic Bay and another from Grise Fiord had seen evidence of sharks attacking narwhals. One hunter had seen circular pieces chewed off a refloated narwhal carcass, but did not known whether the shark was scavenging from the carcass or had killed the whale. Another hunter had seen a narwhal with its skin "broken to pieces" in a manner that he recognized was from a shark attack. He did not indicate whether the whale was alive or dead when it was bitten. Still another hunter had seen a shark bite, with an "opening", on the side of a narwhal midway between the hump and the tail.

Stock identification:

The majority of hunters from Qikiqtarjuaq stated that there were no observable differences in the local narwhal population but some of the hunters, and most of those from Clyde River, identified two varieties of narwhals. There is a larger, darker type with longer tusks and a smaller, lighter type with shorter tusks, both of which are found in the same pods. Some hunters from Resolute had also seen these two forms of narwhals. One of them indicated that the smaller form had a more tightly spiralled tusk.

Hunters from the other communities did not identify different types or groups of narwhals in their area apart from males and females. The males are generally larger, breathe more strongly, and have tusks. Most females lack tusks, and they are often accompanied by a calf. One hunter from Arctic Bay said that whales of both sexes are found in the same areas, while several hunters from Igloolik indicated that the males generally stay together in one area, females in another, and females with calves in another. Two hunters from Grise Fiord believed narwhals in Jones Sound to be a separate stock from that in the Pond Inlet/Arctic Bay area, because of their behavioural differences. Narwhals in the Grise Fiord area are more readily herded into shallow water, than those in Lancaster Sound and off Greenland. Visitors from Greenland and Pond Inlet have remarked on how, compared to those in other areas, narwhals at the floe edge in Jones Sound are not alarmed at the sight of hunters. Most narwhals that frequent the Grise Fiord area are young, and old animals are rare. Tusked female narwhals have been killed in Grise Fiord. One hunter said that some pods of narwhals have much older tusks without a hollow inside; others have smaller tusks with a hollow; and some come with hardly any tusk.

ACKNOWLEDGMENTS

Thank-you to the hunters who contributed generously of their knowledge and to Karen Ditz of DFO Iqaluit, Pierre Richard of DFO Winnipeg, and Cécile Stewart of Arctic Biological Consultants in Winnipeg who provided constructive comments on the manuscript.

REFERENCES

FREEMAN, M.M.R. 1968. Winter observations on beluga (*Delphinapterus leucas*) in Jones Sound, N.W.T. Can. Field-Nat. 82: 276-286

FREEMAN, M.M.R (ed.). 1976. Inuit land use and occupancy project. Milton Freeman Research Limited for the Department of Indian and Northern Affairs, Ottawa. 3 vols.

GUNN, A., G. ARLOOKTOO, and D. KAOMAYOK. 1988. The contribution of the ecological knowledge of Inuit to wildlife management in the Northwest Territories, p. 22-30. In M.M.R. Freeman and L.N. Carbyn (ed.) Traditional knowledge and renewable resource management in northern regions. University of Alberta, Boreal Institute of Northern Studies, Occasional Publication 23.

JOHNSON, M. 1992. Dene traditional knowledge. North. Perspect. 20(1): 3-5.

KILABUK, P. 1998. A study of Inuit knowledge of the southeast Baffin Beluga. Nunavut Wildlife Management Board, Iqaluit. Iv + 74 p. [Prepared for the Southeast Baffin Beluga Management Committee].

REMNANT, R.A., and M.L. THOMAS. 1992. Inuit traditional knowledge of the distribution and biology of High Arctic narwhal and beluga. North/South Consultants Inc., Winnipeg for the Canada/Greenland Joint Commission for the Conservation and Management of Beluga and Narwhal. vii + 96 p.

RICHARD, R., J. ORR, R. DIETZ, and L. DUECK. 1994. Report on an aerial survey of belugas in the North Water, 21-26 March 1993. Working document prepared for the 1993/1994 Arctic Fisheries Science Advisory Committee meeting, 8 January 1994, in Winnipeg, MB. 22 p.

ROBERTS, L.W. 1993. A review of traditional knowledge survey methodology. Unpublished report prepared by Sociometrix Inc., Winnipeg for Department of Fisheries and Oceans, Winnipeg. 11 p

STEWART, D.B, A. AKEEAGOK, R. AMARUALIK, S. PANIPAKUTSUK, and A. TAQTU. 1995. Local knowledge of beluga and narwhal from four communities in Arctic Canada. Can. Tech. Rep. Fish. Aquat. Sci. 2065: viii + 48 p. + appendices on disk.

THOMSEN, M.L. 1993. Local knowledge of the distribution, biology, and hunting of beluga and narwhal. Inuit Circumpolar Conference for Greenland Hunters' and Fishermen's Association, Greenland Home Rule Authorities, and the Inuit Circumpolar Conference. 98 p. + appendices.

PERSONAL COMMUNICATIONS

TAQTU, A. Arctic Bay, Nunavut, XOA OAO.

WILLIAMS, G. Wildlife Advisor, Nunavut Tunngavik Incorporated, P.O. Box 638, Iqaluit, Nunavut, XOA OHO.

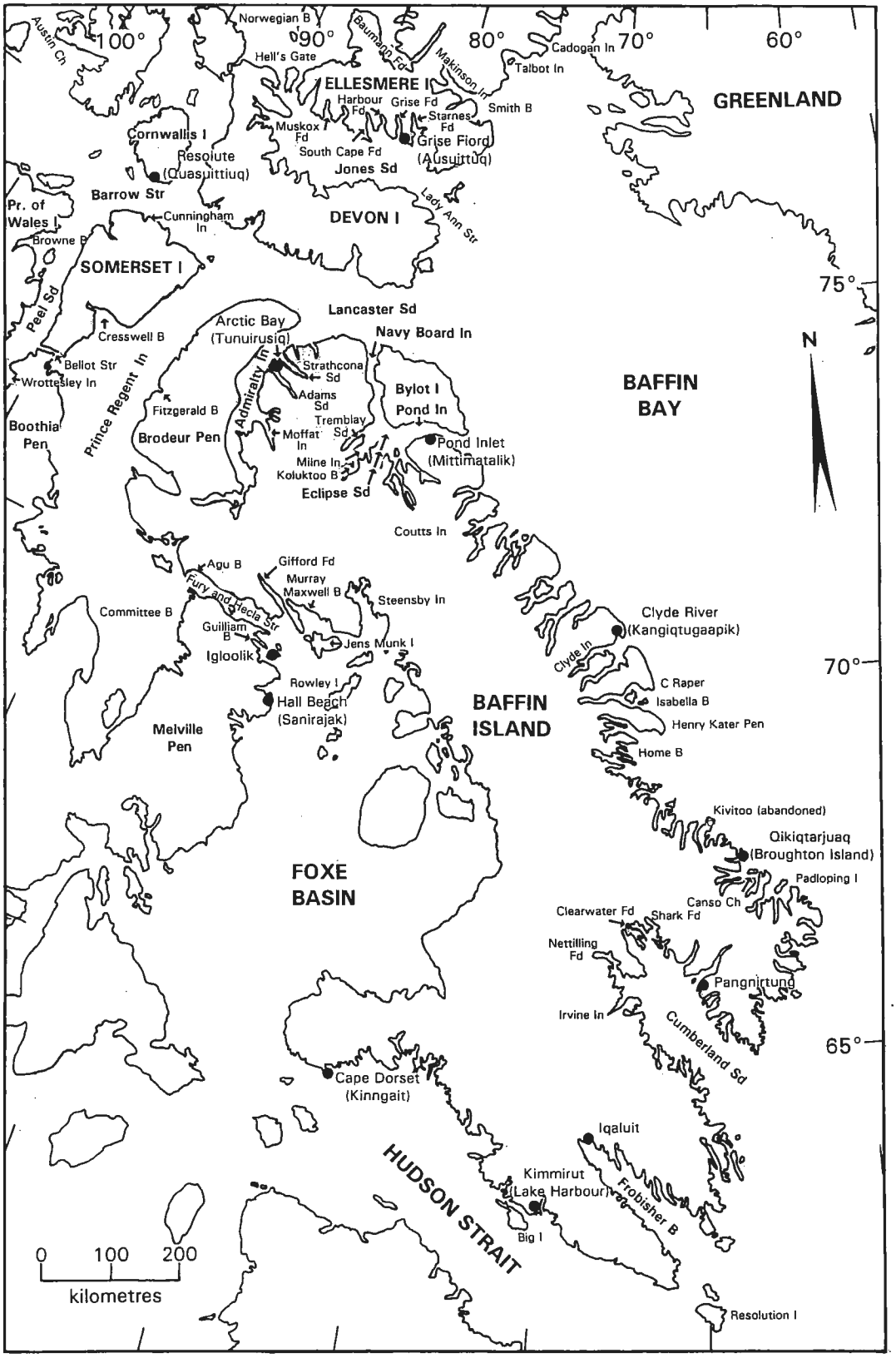


Figure 1. Place names in the Baffin Region.

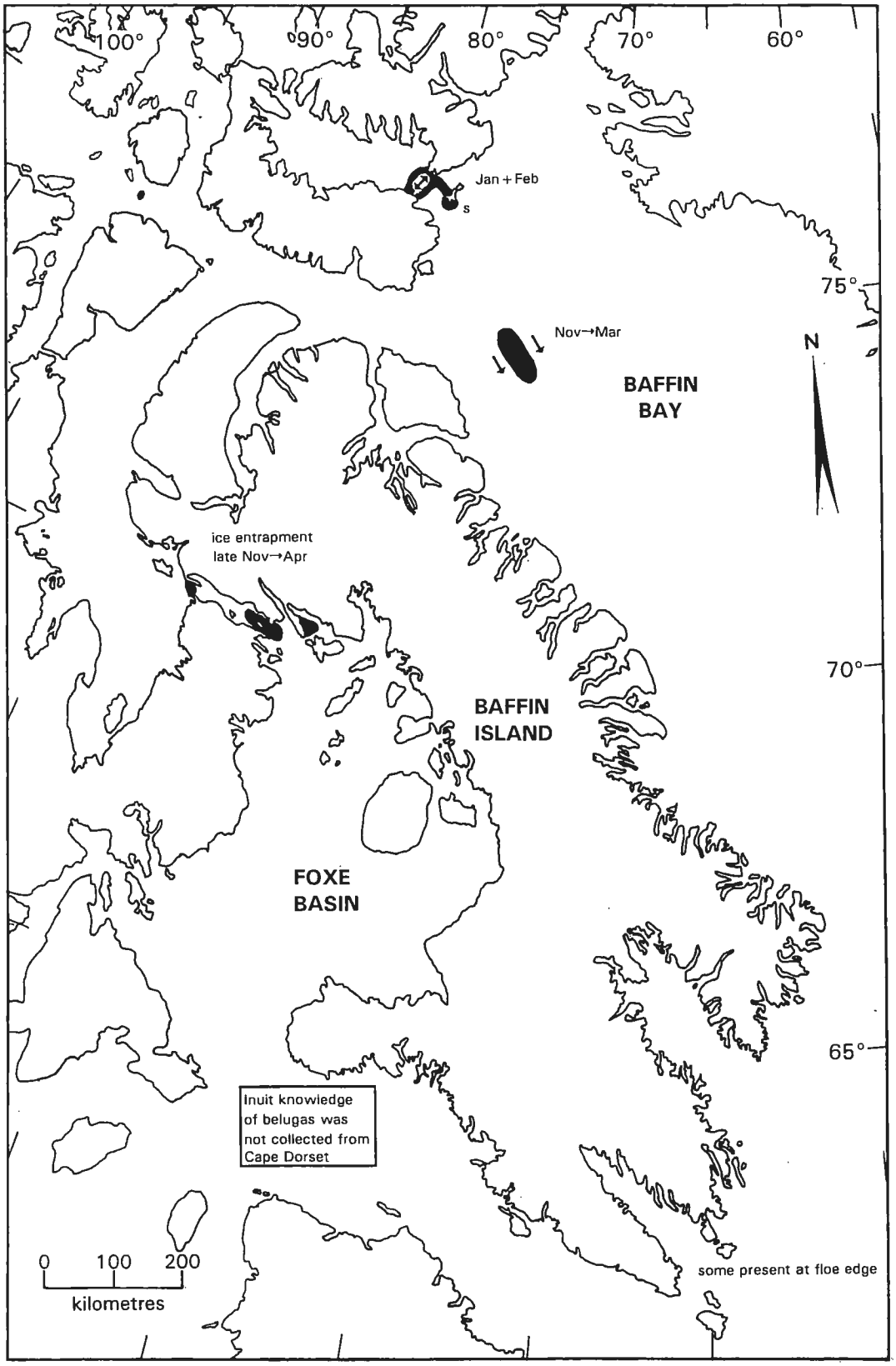


Figure 2. Areas where hunters have observed belugas during ukiu (winter). Arrows show the whale's general direction of movement and shading the general areas where they are found. Neither the number of arrows nor the size of the shaded area are related to the number of whales. Observations from aerial surveys are denoted with the letter "s".

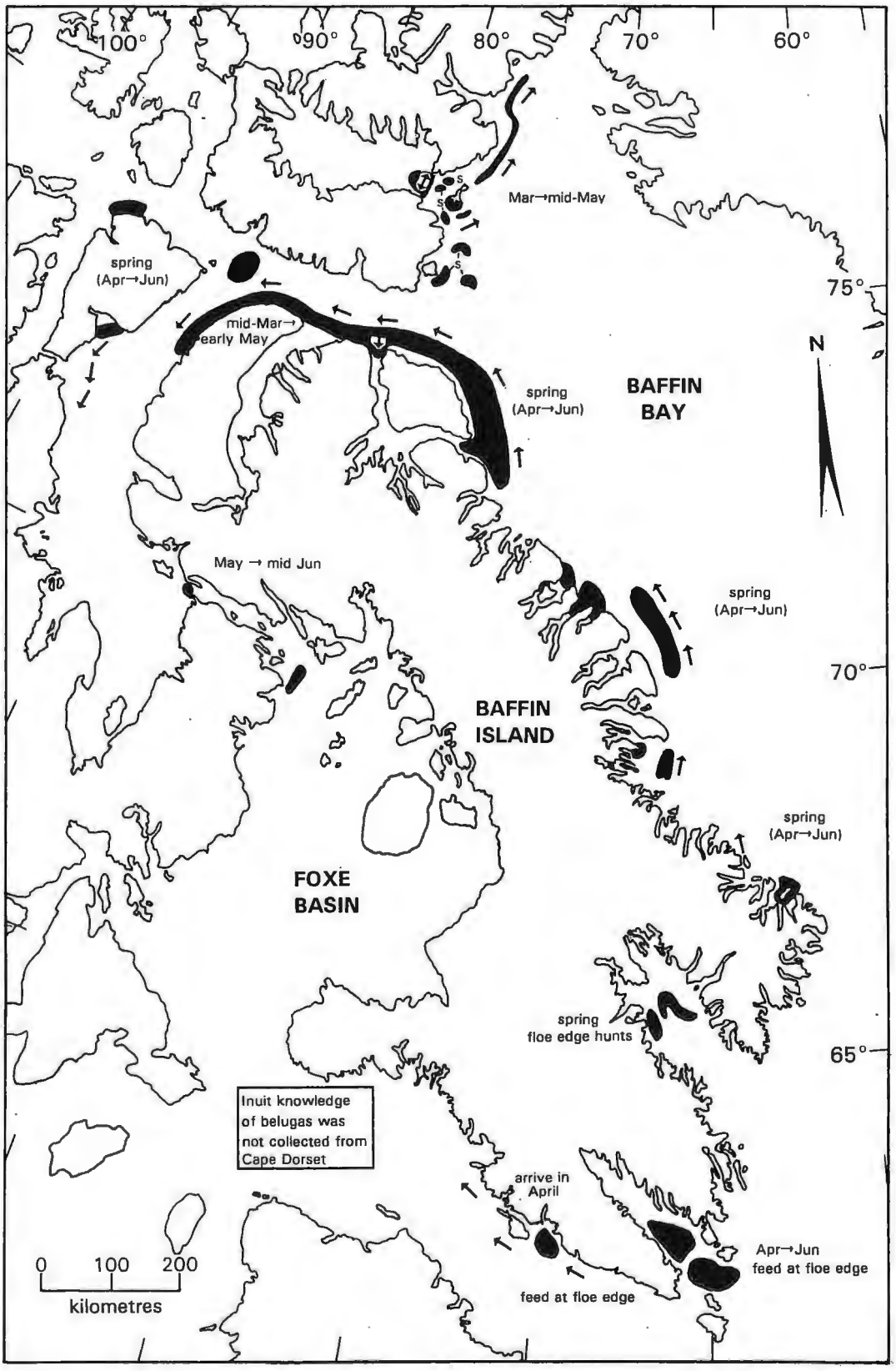


Figure 3. Areas where hunters have observed belugas during upingoaksak (early spring). Arrows show the whale's general direction of movement and shading the general areas where they are found. Neither the number of arrows nor the size of the shaded area are related to the number of whales. Observations from aerial surveys are denoted with the letter "s".

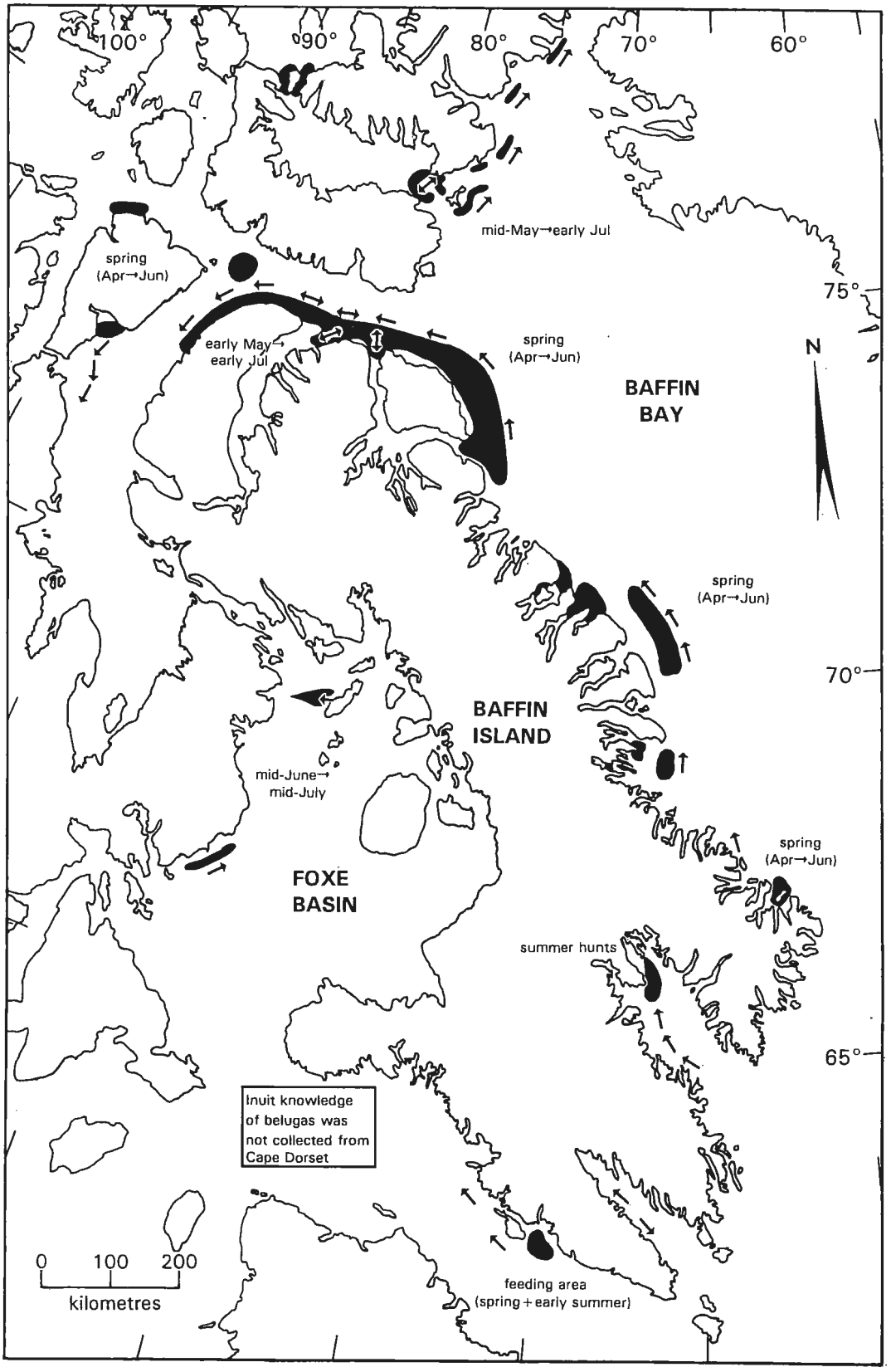


Figure 4. Areas where hunters have observed belugas during upingoa (late spring). Arrows show the whale's general direction of movement and shading the general areas where they are found. Neither the number of arrows nor the size of the shaded area are related to the number of whales.

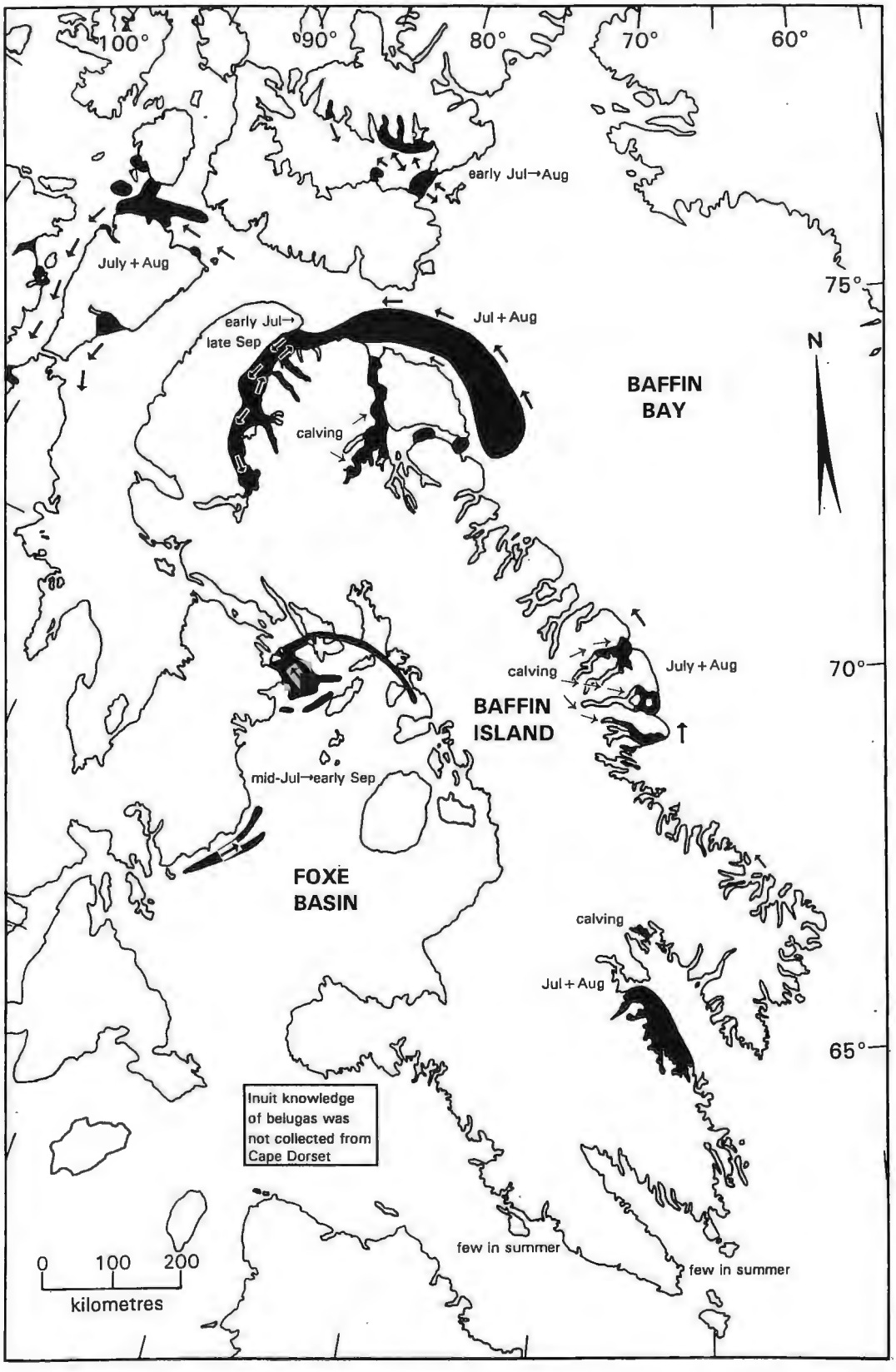


Figure 5. Areas where hunters have observed belugas during auja (summer). Arrows show the whale's general direction of movement and shading the general areas where they are found. Neither the number of arrows nor the size of the shaded area are related to the number of whales.

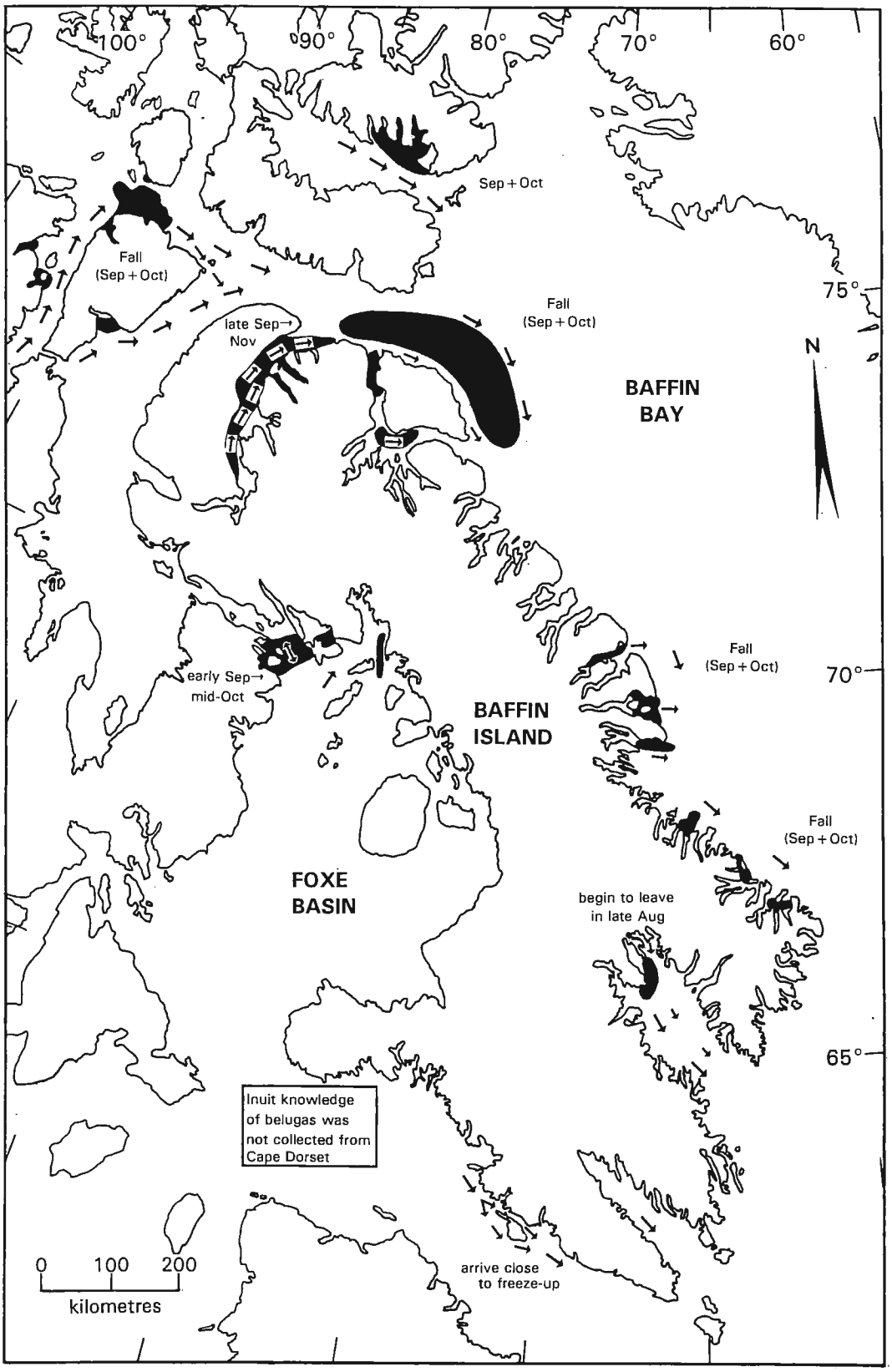


Figure 6. Areas where hunters have observed belugas during ukiaksak (early fall). Arrows show the whale's general direction of movement and shading the general areas where they are found. Neither the number of arrows nor the size of the shaded area are related to the number of whales.

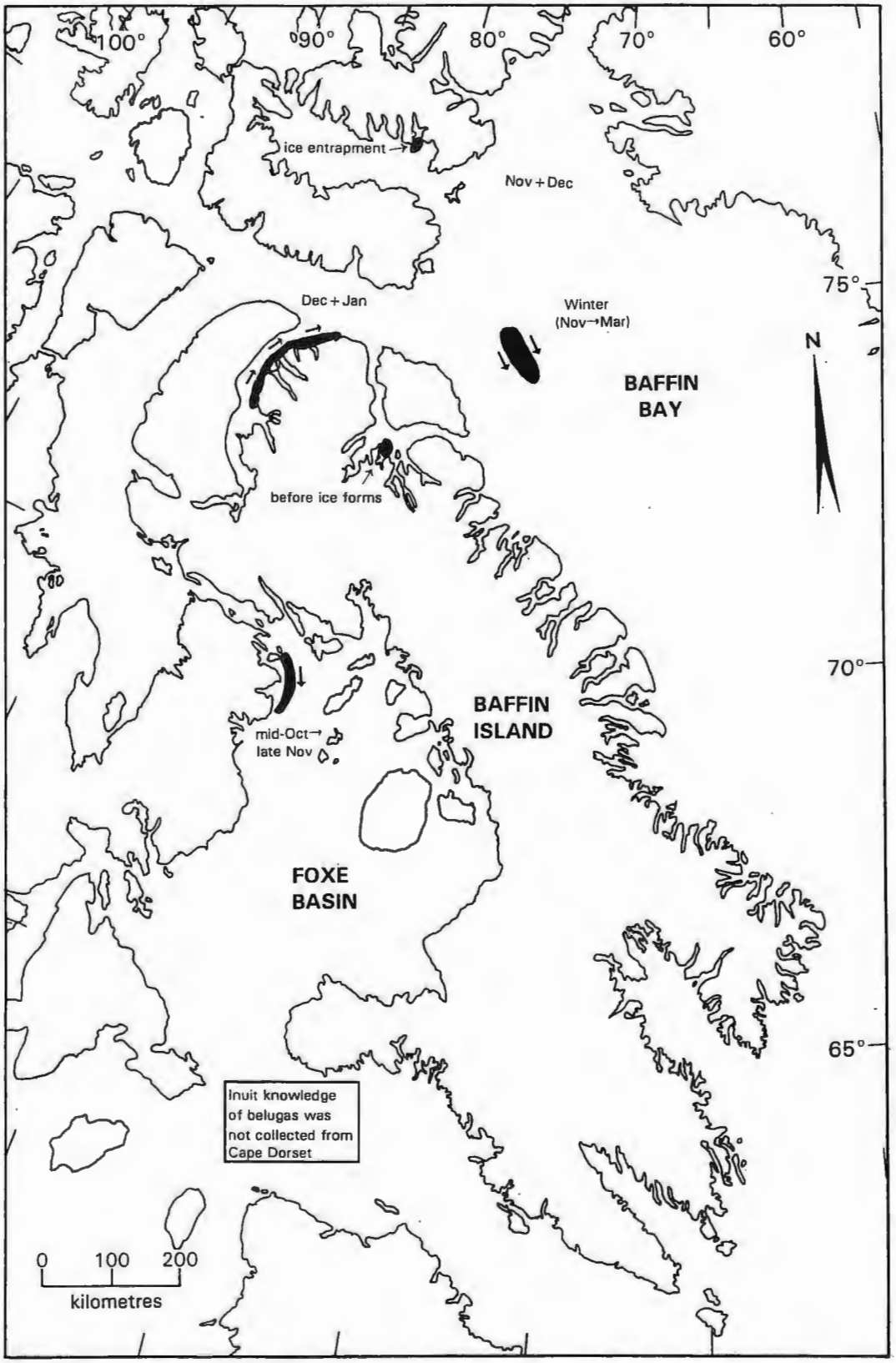


Figure 7. Areas where hunters have observed belugas during ukia (late fall). Arrows show the whale's general direction of movement and shading the general areas where they are found. Neither the number of arrows nor the size of the shaded area are related to the number of whales.

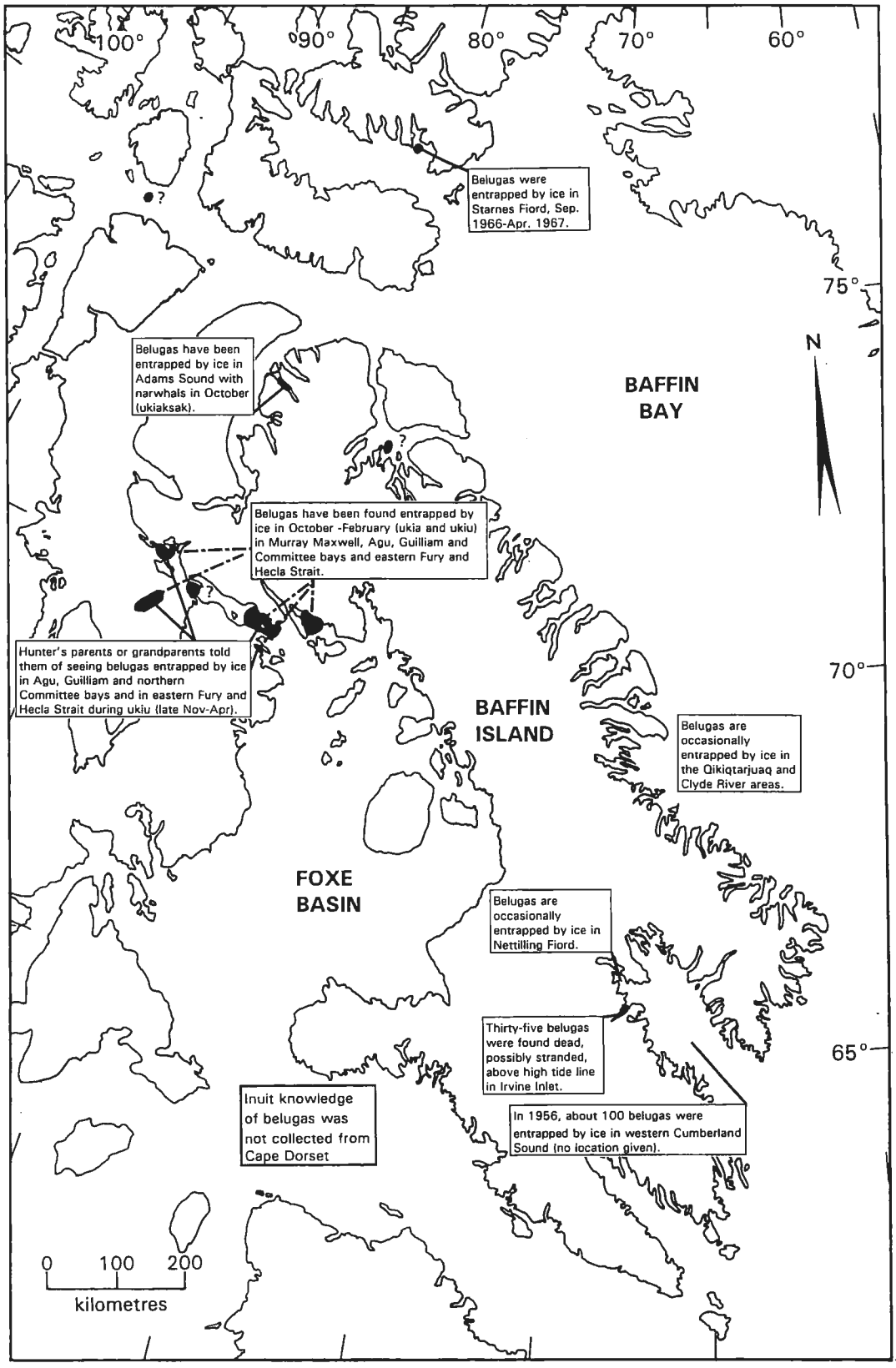


Figure 8. Areas where belugas have been found entrapped by ice. Shaded areas indicate the general location of the entrapment. The size of the shaded area is not related to the number of trapped whales .

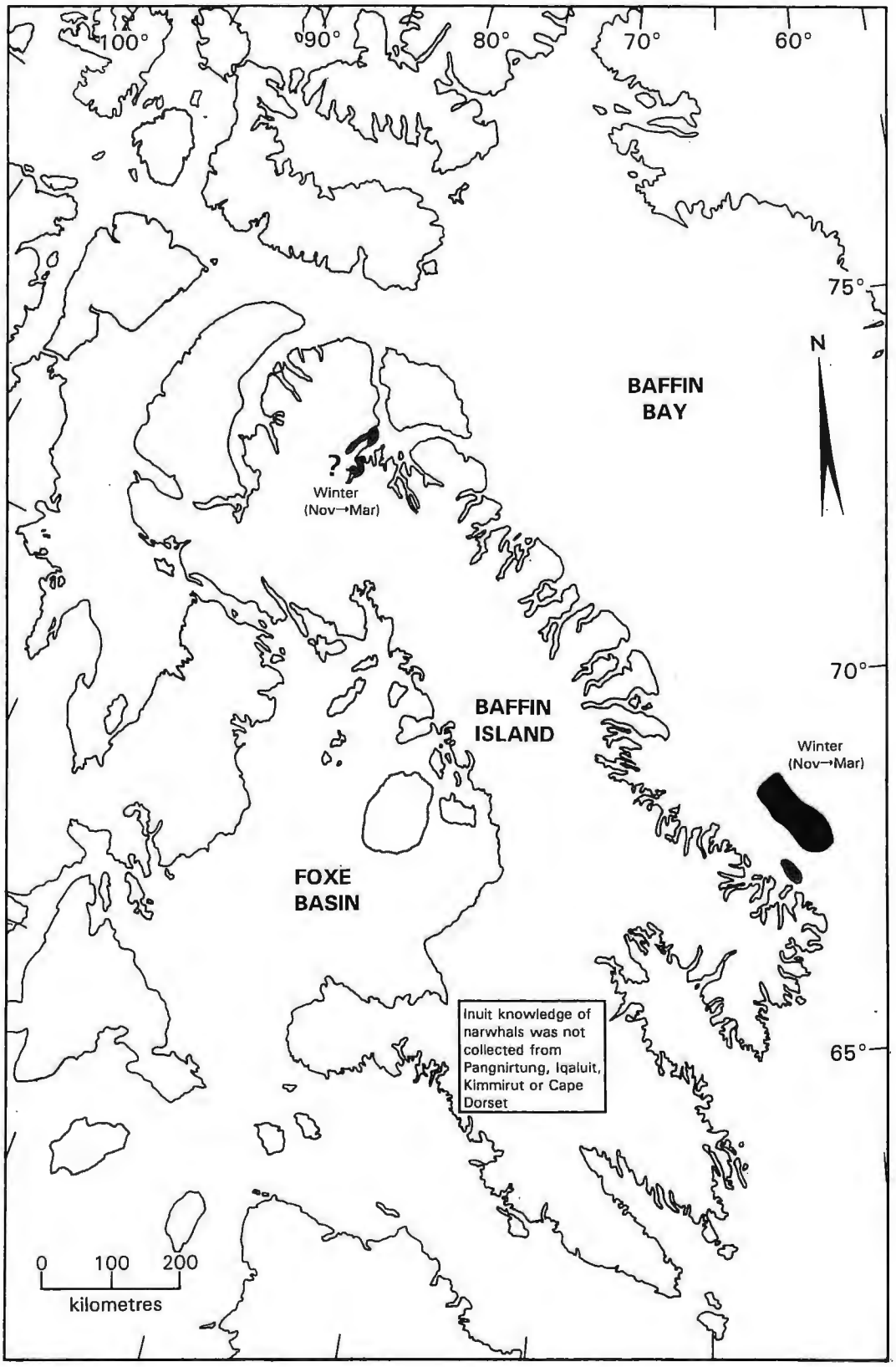


Figure 9. Areas where hunters have observed narwhals during ukiu (winter). Shading shows the general areas where they are found. The size of the shaded area is not related to the number of whales.

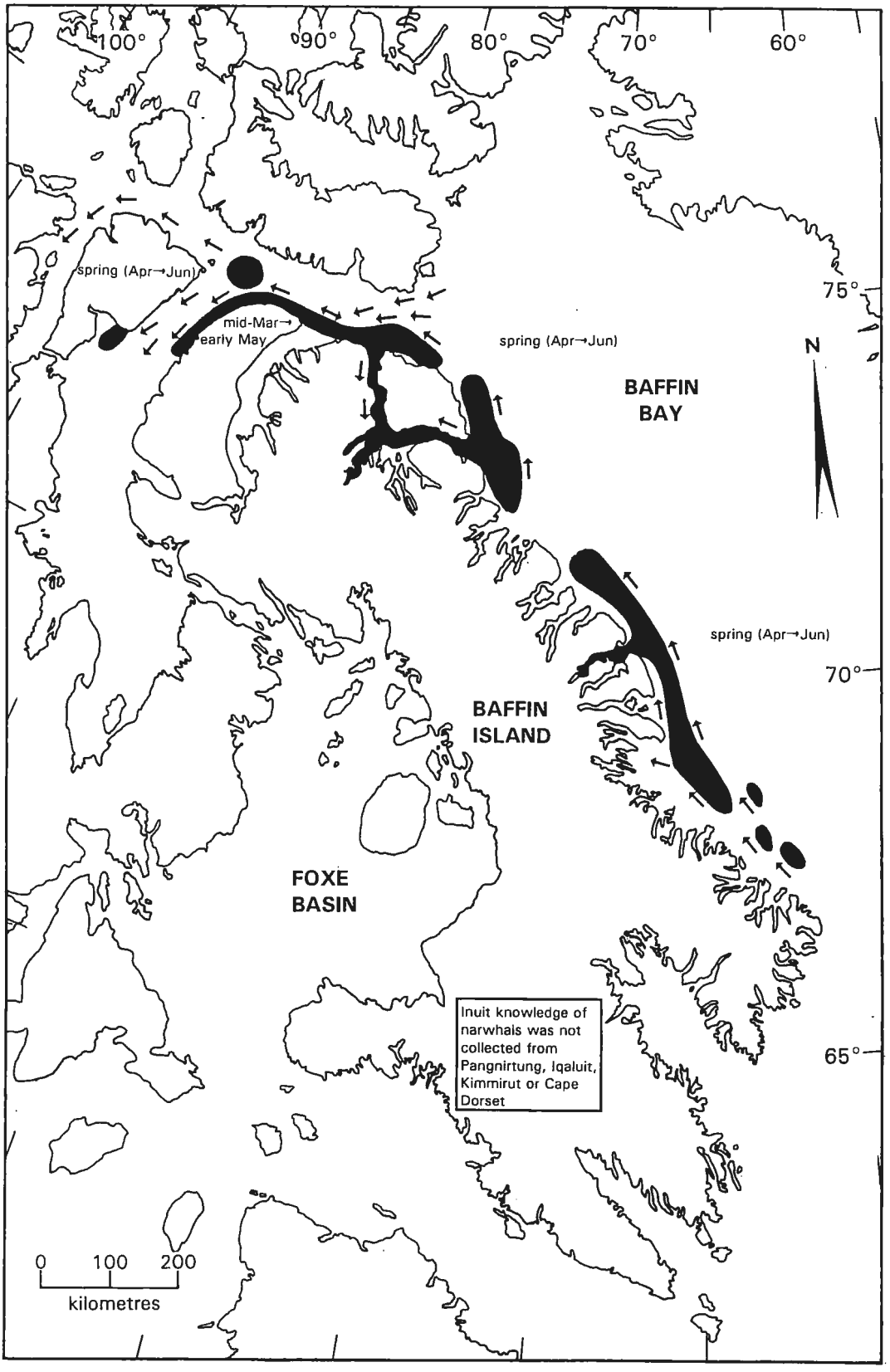


Figure 10. Areas where hunters have observed narwhals during upingoaksak (early spring). Arrows show the whale's general direction of movement and shading the general areas where they are found. Neither the number of arrows nor the size of the shaded area are related to the number of whales.

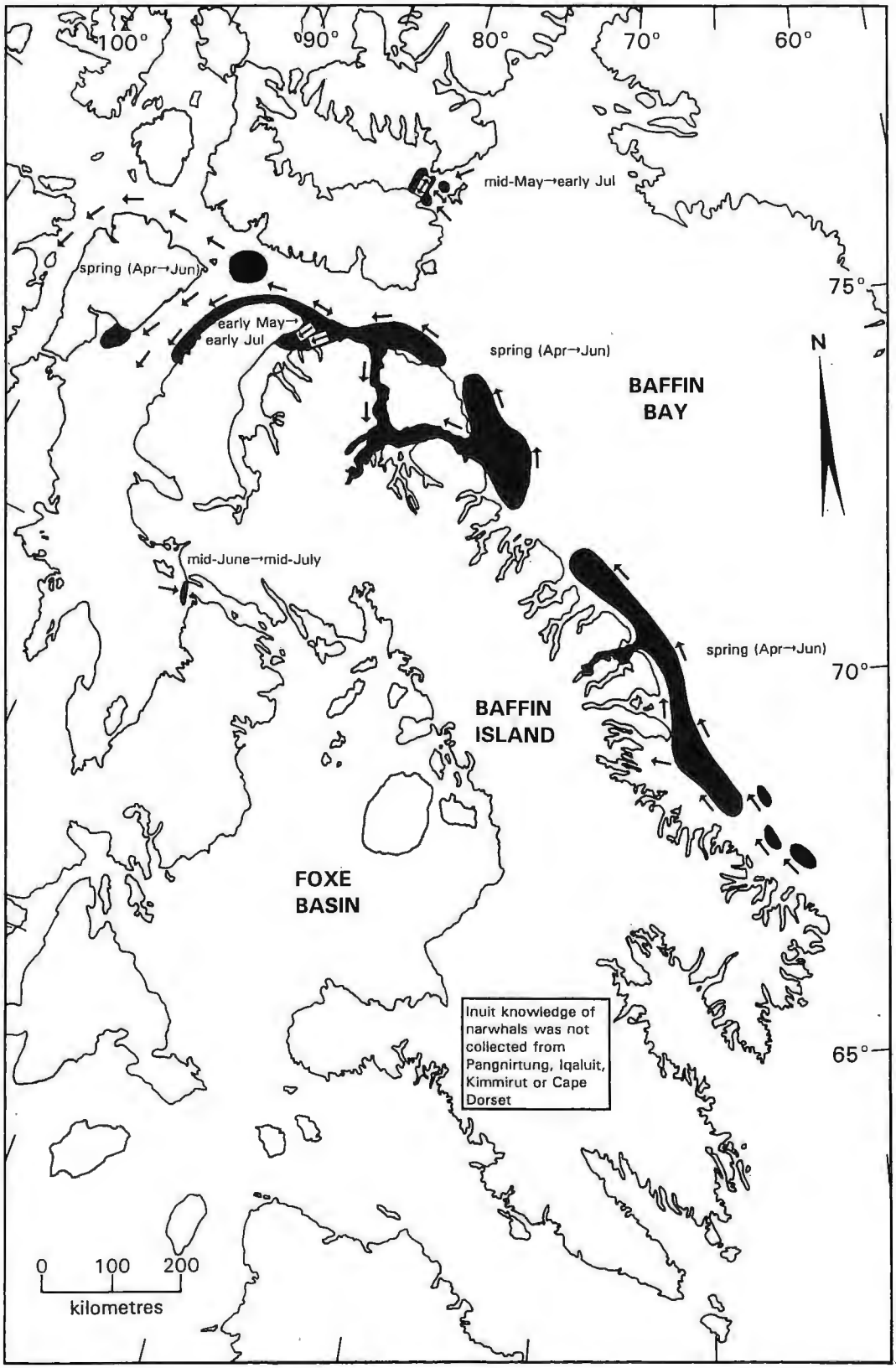


Figure 11. Areas where hunters have observed narwhals during upingoa (late spring). Arrows show the whale's general direction of movement and shading the general areas where they are found. Neither the number of arrows nor the size of the shaded area are related to the number of whales.

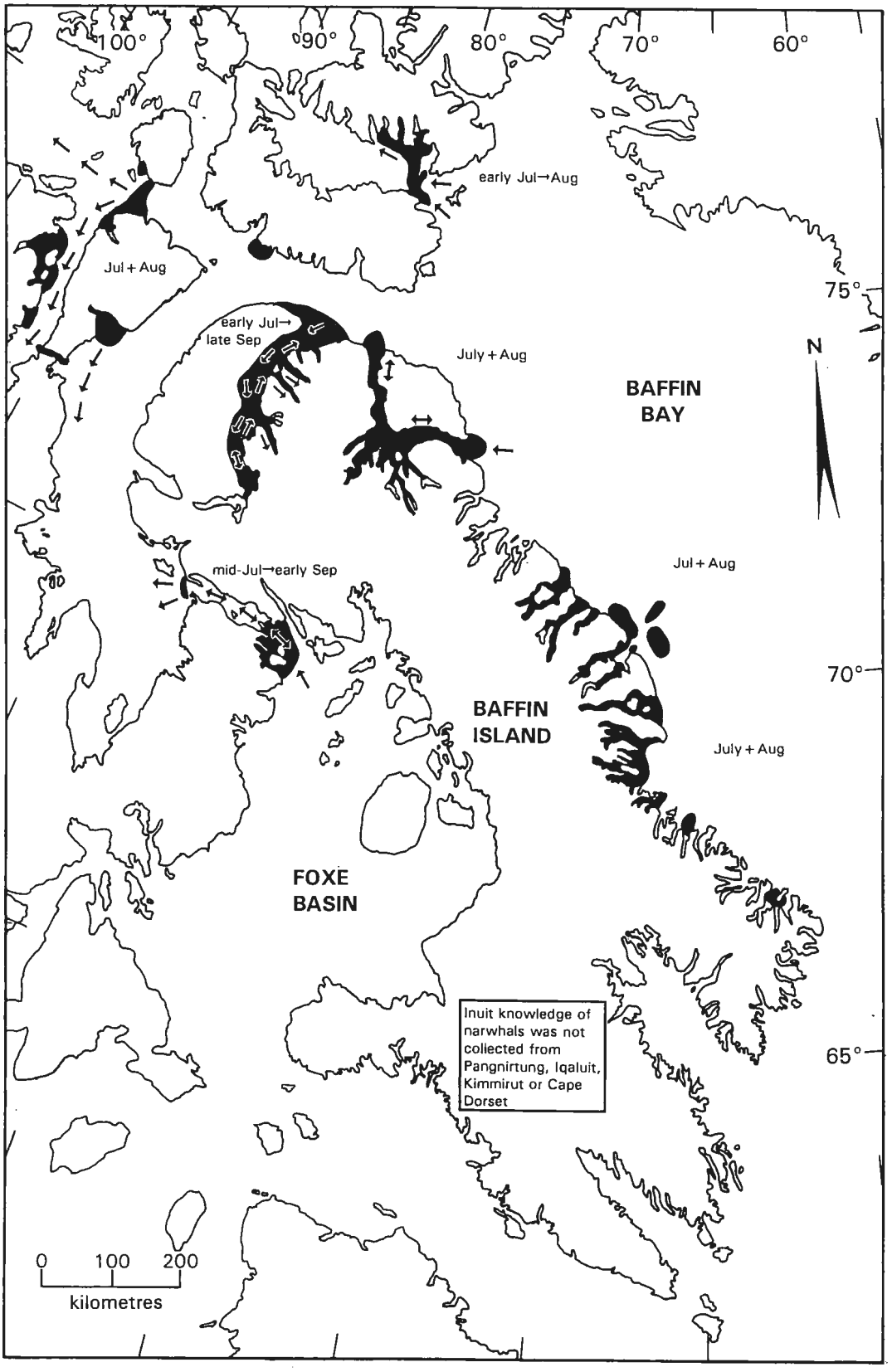


Figure 12. Areas where hunters have observed narwhals during auja (summer). Arrows show the whale's general direction of movement and shading the general areas where they are found. Neither the number of arrows nor the size of the shaded area are related to the number of whales.

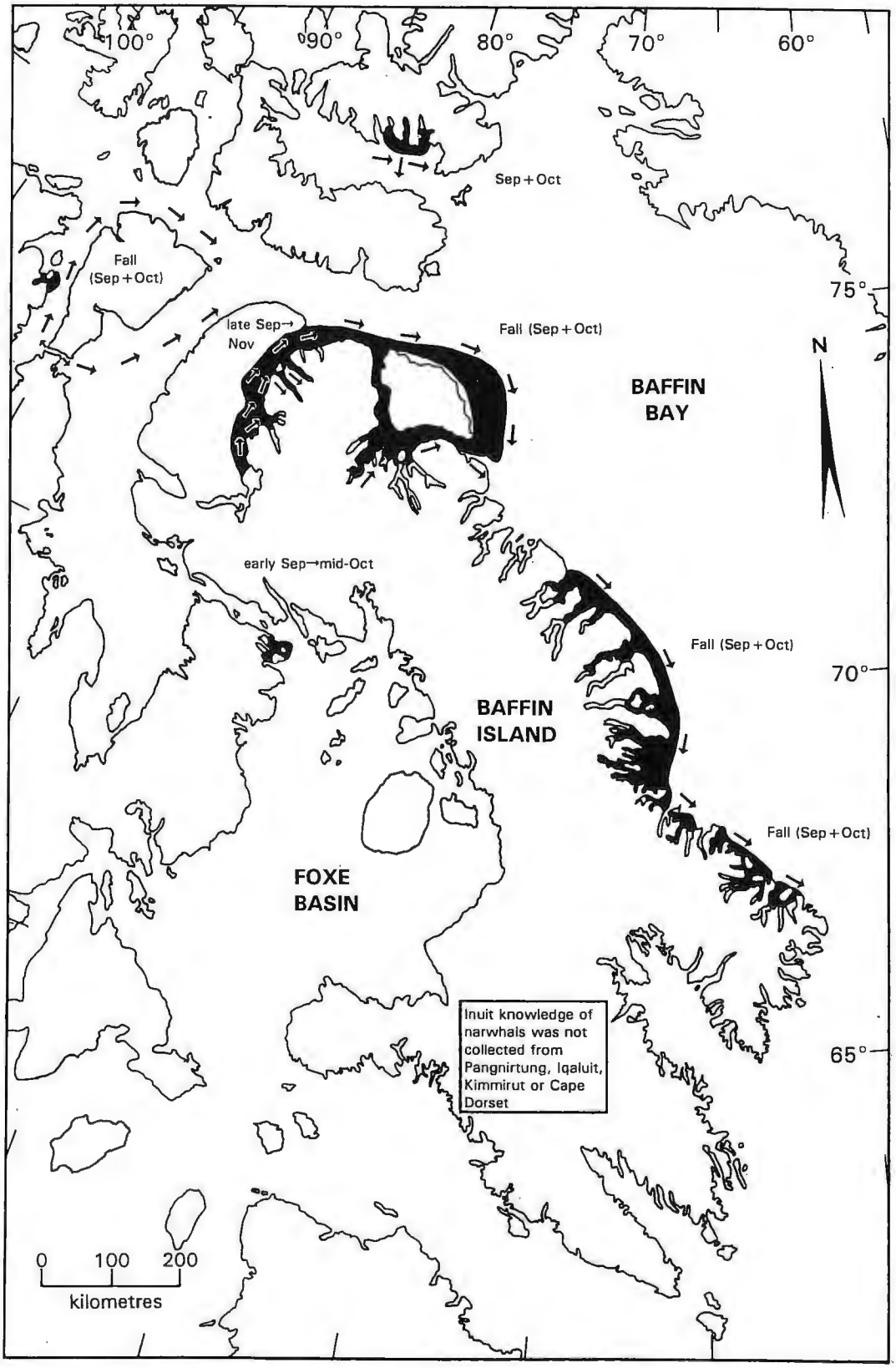


Figure 13. Areas where hunters have observed narwhals during ukiaksak (early fall). Arrows show the whale's general direction of movement and shading the general areas where they are found. Neither the number of arrows nor the size of the shaded area are related to the number of whales.

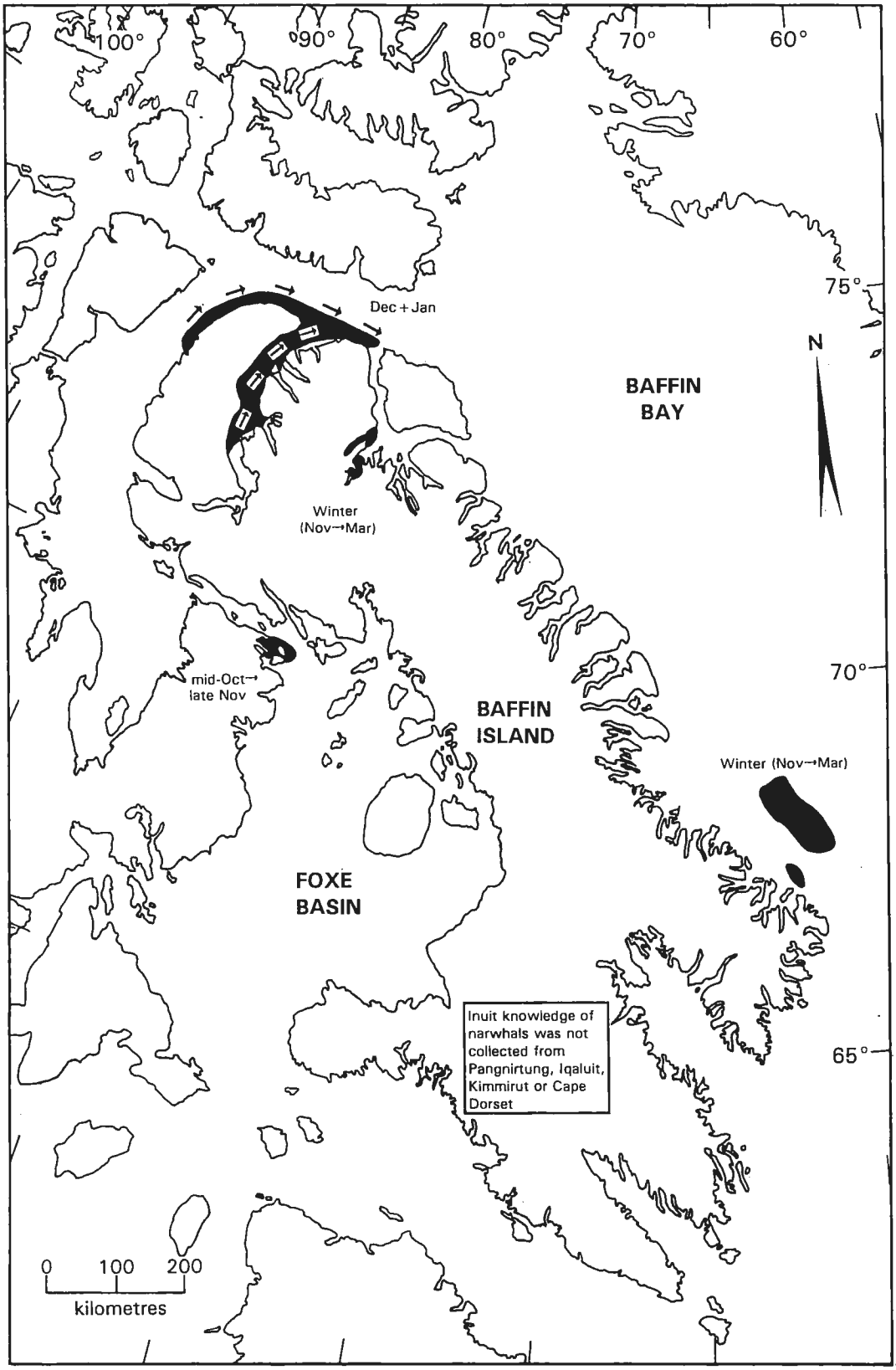


Figure 14. Areas where hunters have observed narwhals during ukia (late fall). Arrows show the whale's general direction of movement and shading the general areas where they are found. Neither the number of arrows nor the size of the shaded area are related to the number of whales.

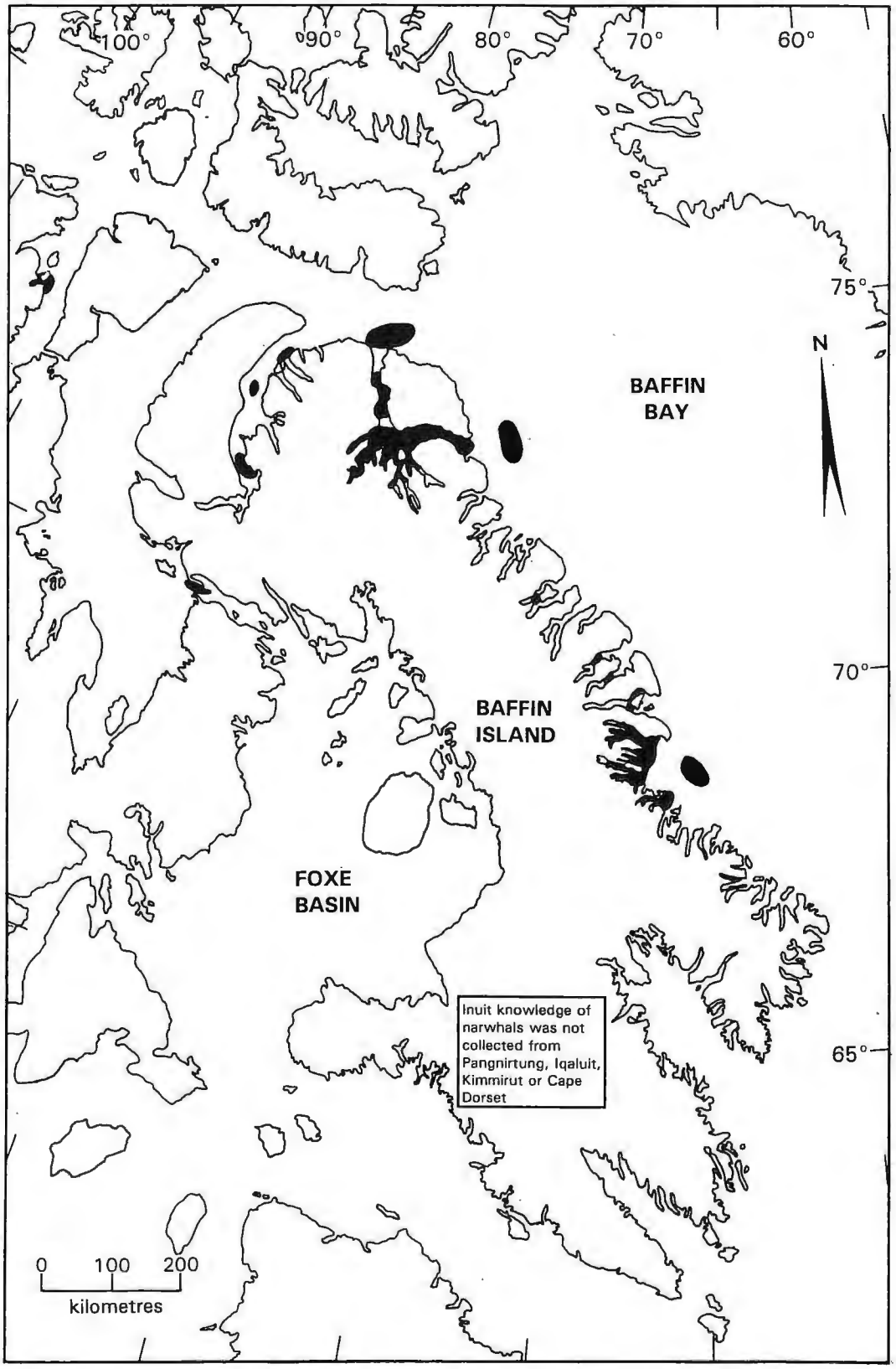


Figure 15. Areas where narwhals calve (shaded). The size of the shaded area is not related to the number of whales.

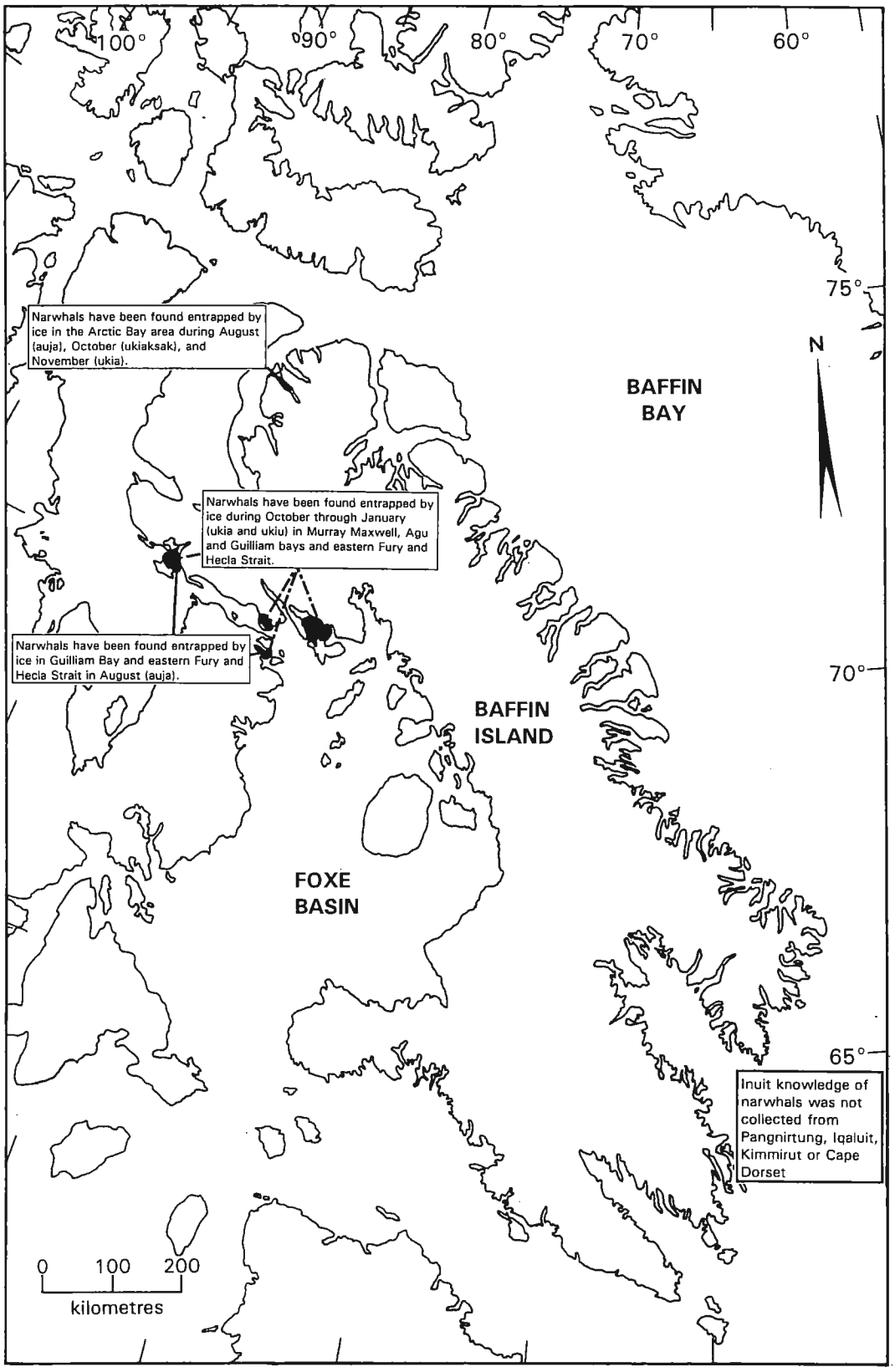


Figure 16. Areas where narwhals have been found entrapped by ice. Shaded areas indicate the general location of the entrapment. The size of the shaded area is not related to the number of trapped whales .

Table 1. Hunter/Elder interviews conducted at each community.

Community	Hunters/Elders interviewed	Average age of Hunters/Elders in years	Average hunting experience in years	Comments*
Pangnirtung	8 (0)**	–***	–	1997—5 elders, belugas only
Iqaluit	8 (0)	–	–	1997–3 elders, none had lived in the Tudgat (Resolution Island) area, belugas only
Kimmirut	8 (0)	–	–	1997—5 elders, belugas only
Qikiqtarjuaq	23	51	29	1992
Clyde River	19	54	38	1992
Pond Inlet	35	56	34	1992– few actively hunted belugas.
Arctic Bay	10	56	37	1992
	7	–	–	1994
Resolute	10	50	33	1992
Igloolik/Hall Beach	7	–	–	1994–only six hunted beluga
Grise Fiord	4	48	34	1992
	5 (3)	–	33	1994–all had lived in Grise Fiord since late 1950's or early 1960's, only 3 were interviewed for narwhal.

* 1992 = Remnant and Thomas (1992); 1994 = Stewart *et al.* (1995); 1997 = Kilabuk (1998).
** where the number of hunters providing information on belugas and narwhals differed the number interviewed for narwhals are in brackets.
***not available.