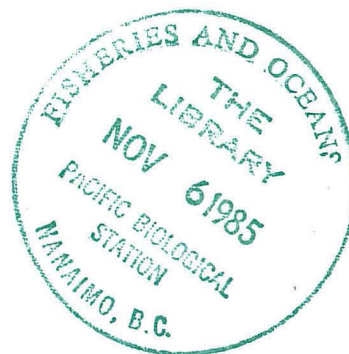


ARCOD WORKING PAPER 85-2

MANAGEMENT AND PROTECTION
OF BELUGA IN THE BEAUFORT SEA



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ARCOD WORKING PAPER 85-2

MANAGEMENT AND PROTECTION
OF BELUGA IN THE BEAUFORT SEA

ARCTIC OFFSHORE DEVELOPMENT COMMITTEE
DEPARTMENT OF FISHERIES AND OCEANS

April 1985



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 for Consideration by the Arctic Directors-General
 Committee.

INTRODUCTION

The habitat of beluga in the Canadian Beaufort Sea may be affected by hydrocarbon exploration, production and transportation in the area and by hydroelectric power development within the upper Mackenzie Basin. The beluga also are harvested by the Inuvialuit. In 1977, Mr. Justice Berger suggested that part of the Niakunak Bay - Shallow Bay area of West Mackenzie Bay should become a beluga sanctuary where hunting would be permitted but where industrial activity would be banned.

In 1982, the Minister's Committee on Whales and Whaling inquired regarding the status of Mr. Justice Berger's recommendation for a sanctuary. Subsequently, ARCOD was asked by the Arctic Directors-General Committee to provide advice on the need to protect the beluga habitat afforded by West Mackenzie Bay.

This ARCOD Working Paper on the management and protection of beluga in the Beaufort Sea was approved by the Arctic Directors-General Committee in April 1985. The paper is in two parts. The first part is in point form and identifies the background, considerations and some management options, and suggests a course of action. The second, a discussion paper, provides more details on the biology of the Beaufort Sea beluga population, on issues affecting management of the beluga, on DFO's current approach to beluga management and on some management options. The figures referred to in the first part are located at the back of the discussion paper.

PART 1

MANAGEMENT AND PROTECTION
OF BELUGA IN THE BEAUFORT SEA

An ARCOD Paper for Consideration by the
Arctic Directors-General Committee

April 1985

MANAGEMENT AND PROTECTION
OF BELUGA IN THE BEAUFORT SEA

An ARCOD Paper for Consideration by the
Arctic Directors-General Committee

April 1985

OBJECT

1. To set forth considerations, options and recommendations for DFO's management of the beluga population in the Beaufort Sea.

DECISION REQUIRED

2. Approval of a DFO strategy for the long-term management and protection of beluga in the Beaufort Sea.

BACKGROUND

3. The Beaufort Sea beluga population migrates through the Beaufort Sea and congregates in the West Mackenzie Bay - Niakunak Bay - Shallow Bay, the Garry Island - Kendall Island and the Kugmallit Bay areas of the Mackenzie estuary during the summer (Figs. 1 and 2).
4. A traditional domestic beluga hunt occurs in the Mackenzie estuary during the summer. The beluga is a major part of the traditional economy and lifestyle of the Inuvialuit from Aklavik, Inuvik and Tuktoyaktuk; the muktuk and meat are used locally for human consumption and dog food or are traded.
5. In the Mackenzie estuary and southern Beaufort Sea, hydrocarbon exploration is occurring, hydrocarbon production is proposed and ship traffic may increase. Also, the Mackenzie estuary could be affected by hydroelectric power development within the Mackenzie Basin, although this is uncertain.

6. In 1977, Mr. Justice Berger suggested that part of the Niakunak Bay - Shallow Bay area should become a beluga sanctuary where hunting would be permitted but where industrial activity would be banned (Fig. 2). Earlier in the course of the hearings, D. Sergeant (DFO, Ste-Anne-de-Bellevue) had proposed a beluga sanctuary in the area where both hunting and industrial activity would be banned.
7. In 1982 the Minister's Committee on Whales and Whaling inquired regarding the status of Mr. Justice Berger's recommendation for a sanctuary. Subsequently ARCOD was asked to provide advice on the need to protect the beluga habitat afforded by West Mackenzie Bay.

CONSIDERATIONS

8. The main considerations are outlined below. The attached Discussion Paper provides more details on the biology of the beluga population of the Beaufort Sea, on issues affecting management of the beluga, on DFO's current approach to beluga management, and on some management options.

Beluga of the Beaufort Sea

9. Current knowledge indicates that the Beaufort Sea beluga population moves through the area annually according to the following pattern (Fig. 1):
 - the beluga winter in the Bering and Chukchi seas;
 - from April to June they move along the Alaskan coast to about Point Barrow and then through an offshore system of leads in the ice to the vicinity of the large polynya near Banks Island;
 - then south to Amundsen Gulf where they occur in May and June;
 - then the population or a large portion of the population follows the shoreline or ice edge to the Mackenzie estuary usually arriving there in late June or early July; and
 - then they leave the Mackenzie estuary in early August in preparation for their westward migration back to the Bering and Chukchi seas.

10. The beluga congregate for a significant period in the Niakunak Bay - Shallow Bay area which therefore must be considered as an important area (Fig. 2). Other areas where beluga congregate (Fig. 2) and their migration routes also must be considered as important areas. Any management strategy must consider all of these areas.
11. At present it is unknown why beluga congregate in the Mackenzie estuary during the summer although several reasons have been suggested. Also it is unknown whether the population can survive in its present numbers if displaced from the Mackenzie estuary. However no similar estuary exists along the western arctic coast of North America.

Human Activities and Their Potential Impact on Beluga

12. The beluga are hunted by the Inuvialuit. The probable annual kill is less than 200 which is about 1.5% of the latest estimate of 11,500 individuals in the Beaufort Sea beluga population. Approximately 72% of the harvest is taken from Kugmallit Bay, 21% from Niakunak Bay and 7% from the Kendall Island area.
13. This beluga population also is hunted along the north Alaskan coast where as many as 58 beluga have been landed in one year. If for any reason there is a decrease in Alaskan bowhead hunting, the result could be an increase in the number of beluga taken.
14. Offshore hydrocarbon exploration in the Canadian Beaufort Sea began in the mid 1960s. Offshore exploratory drilling began in 1973 and is continuing. Several significant oil and gas discoveries have been made and the oil industry is preparing to develop one or more offshore oil fields, with production possibly starting in the early 1990s. The Beaufort Sea Environmental Assessment Panel concluded that small-scale phased oil production and transportation would be acceptable provided that certain conditions are met.

15. Most wells (Fig. 3) have been drilled away from areas where the beluga congregate. One well has been drilled in Kugmallit Bay, none in Niakunak - Shallow Bay, and seven in the eastern part of West Mackenzie Bay where a gas pool was discovered at Netserk and a small oil and gas pool at Adgo. ESSO is considering production of oil from the Adgo field.
16. Oil companies, primarily ESSO, have exploration agreements covering most of West Mackenzie Bay, Niakunak Bay and Kugmallit Bay and ESSO is committed to a seismic program and drilling at least five offshore wells by 1987 but their proposed drilling locations are distant from Niakunak Bay. Dome and Gulf are committed to drill at least 14 wells further offshore by 1988.
17. Much of the ship traffic supporting the offshore drilling operations traverses Kugmallit Bay. If a major support base or port is developed along the Yukon coast, it could be supplied by ships traversing either Niakunak Bay and West Mackenzie Bay or Kugmallit Bay, even though re-supply could take advantage of the Dempster Highway System.
18. Hydrocarbon development and associated shipping and other activities may result in increased human presence, increased underwater noise, seismic exploration, chronic contamination of the environment with oil and other toxic substances, and alteration of the sea floor through dredging and construction, and may result in altered ice breakup patterns, major oil spills and other perturbations. The impacts on beluga could include lethal or sublethal effects on individuals, changed behaviour, disturbed or disrupted movements or migrations, altered distribution, possibly decreased productivity or decreased population size, and could affect the harvest of beluga. However, the actual occurrence and significance of these postulated effects is uncertain.
19. Also, construction of dams in the Mackenzie Basin, such as those proposed for the Liard River, Slave River, Great Bear River and others, could alter the suitability of the Mackenzie estuary as summer habitat for beluga by delaying breakup, reducing water temperatures and altering primary productivity in the offshore zone. It is possible that any such effects would be less than the natural variability.

20. Any impacts caused by future hydrocarbon developments and any hydroelectric power (HEP) developments may compound the impacts on the beluga population from hunting and natural environmental variation. It is impossible with today's knowledge to predict accurately the cumulative effect of these stresses on the beluga population, but it is reasonable to assume that the beluga, being a long-lived terminal predator, is one of the species most vulnerable to such impacts.

DFO Western Region's Current Approach to Beluga Management

21. DFO Western Region's present management approach for the beluga is based on its powers and responsibilities under the Fisheries Act to control the harvest and to protect the habitat. At present some hunting practices are detrimental to the long-term health of the population, no quota exists for the harvest, habitat protection measures usually are incorporated in and enforced through the legislation of other government departments which may or may not fulfil DFO's requirements, and industrial activities are regulated on a case-by-case basis after applications are made. Therefore the current management strategy does not necessarily ensure the long-term well-being of the beluga population, and it has been criticized by the Inuvialuit.
22. In its Position Statement on the Beaufort Sea Hydrocarbon Production Proposal, DFO concluded that "development is unacceptable in areas used by year-round or high seasonal concentrations of fish and marine mammals and which are considered habitats critical to the continued productivity and well-being of such populations" and that "Shallow Bay (West Mackenzie Bay) and Kugmallit Bay are areas of critical habitat". In 1982, in response to a request from COGLA, DFO concluded that hydrocarbon exploration should not occur in the West Mackenzie Bay - Niakunak Bay - Shallow Bay area nor the Kugmallit Bay area.

Other Considerations

23. The Task Force on Northern Conservation concluded in its 1984 report that some form of protective status must be extended to areas of particular

importance to marine mammals and that an integrated resource management plan should be prepared for the Beaufort Sea area. The Task Force further recommended that DFO should take the lead role in arctic marine conservation, that Northern Land Use Planning and land claims settlements can play an important role in the development of a northern conservation strategy, that comprehensive fishery resource management and marine conservation legislation are required, and that a marine mammal conservation agreement is required with Alaska and the U.S.A.

24. Future management of the beluga population will require increased cooperation and discussion with other interested groups rather than unilateral action by DFO. DFO's proposed Fish Habitat Management Policy commits the department to consultative resource planning and public consultation. Northern Land Use Planning, a forum for cooperation supported by DFO is being designed to help integrate the conservation of culturally or biologically important features, such as the beluga population, with orderly industrial and socio-economic development. In addition, the Western Arctic Claim Settlement requires the Inuvialuit to be full participants in the management of the beluga population. An understanding exists with COPE that no significant change should be made to beluga management practices pending the development of settlement legislation. The full implications of these and other initiatives, such as the political evolution of the Northwest Territories, to DFO's management of the beluga population are not yet completely clear.

MANAGEMENT OPTIONS

25. Rather than continue with its present reactive strategy, DFO should assert its lead role for the management of the beluga in the Beaufort Sea within an ecosystem context by obtaining effective and proactive participation in decision-making processes for all activities which may affect the beluga.
26. Given DFO's responsibility for the long-term well-being of the beluga population and for ensuring the best use of the beluga available for harvest, from a DFO perspective the West Mackenzie Bay - Niakunak Bay -

Shallow Bay area and the other areas of the Canadian Beaufort Sea should be managed for:

- a) total protection of the beluga population;
- b) protection and controlled hunting of beluga; or
- c) protection and controlled hunting of beluga with compatible industrial activities.

27. Several options for alternative management strategies have been reviewed and assessed. These are presented in the following sections. An assumption is that no event outside the Canadian Beaufort Sea will affect the beluga population.

28. Option 1: A Large Beluga Sanctuary

Protection of the beluga could be achieved by establishment of a large sanctuary, where neither hunting nor industrial activity would be permitted, encompassing most of the range of the beluga in the Canadian Beaufort Sea. Establishing such a sanctuary is considered impracticable since a traditional domestic beluga harvest exists and industrial activity is widespread.

Advantages:

- should ensure long-term survival of beluga;
- beluga and areas of summer concentrations and migration routes protected; and
- provisions could be made to permit compatible transitory activities (e.g. shipping) when beluga are absent.

Disadvantages:

- no hunting permitted; this is contrary to the Western Arctic Claim Settlement which gives the Inuvialuit the right to harvest a subsistence quota of beluga;
- difficult to implement because of existing hunting and industrial activities;
- not consistent with any further oil and gas development in the Beaufort Sea;
- difficult to manage any effects of HEP developments;
- management requirements for other fish and marine mammals may not be incorporated easily into this approach;

- legislative basis unclear; and
- boundaries unclear.

29. Option 2: Several Small Beluga Sanctuaries

Establishing smaller sanctuaries to encompass the areas of summer concentration is considered impracticable for the same reasons, and also would leave unprotected other areas, such as migration and travel routes, utilized by the beluga.

Advantages:

- would help ensure long-term survival of beluga;
- areas of summer concentrations and beluga in those areas protected;
- hunting permitted outside of the sanctuaries;
- oil and gas development could continue outside of the sanctuaries;
- provisions could be made to permit compatible and transitory activities (e.g. shipping) when belugas are absent.

Disadvantages:

- no hunting permitted in many traditional areas;
- difficult to implement because of existing hunting and industrial activities;
- leaves other areas unprotected except through existing reactive regulatory processes;
- difficult to manage any effects of HEP developments;
- management requirements for other fish and marine mammals may not be incorporated easily into this approach;
- legislative basis unclear; and
- boundaries unclear.

However, establishing one or more small sanctuaries could be part of a broader strategy. Such sanctuaries may not be a major imposition on the oil and gas industry, if the question of shipping corridors can be resolved, since the main hydrocarbon exploration interests are on the periphery of likely locations for sanctuaries.

30. Option 3: Beluga Hunting Areas

Establishment of beluga hunting areas, where beluga hunting would be managed effectively and no industrial activity permitted, is another management option. Since hunting occurs at present only in areas where beluga congregate during the summer, migration and travel routes would not be protected. The implications to industry would be the same as for a sanctuary in the same area. Like the sanctuary concept, hunting areas could be part of a broader management strategy.

Advantages:

- would help ensure long-term survival of beluga;
- hunting permitted;
- areas of summer concentrations protected from industrial activities;
- oil and gas development could continue outside of the hunting areas;
- provisions could be made to permit compatible and transitory activities (e.g. shipping) when belugas are absent.

Disadvantages:

- management of hunting may be inconsistent in different areas of the Beaufort Sea;
- no area where hunting not permitted;
- possible difficulties in implementation because of existing industrial activities;
- leaves other areas unprotected except through existing reactive regulatory processes;
- difficult to manage any effects of HEP developments;
- management requirements for other fish and marine mammals may not be incorporated easily into this approach;
- legislative basis unclear; and
- boundaries unclear.

31. Option 4: Beluga Management Area

A large beluga management area in the Canadian Beaufort Sea, encompassing most of the range of beluga, could be established. Within a beluga management area, the conservation of the beluga and its habitats would be

the prime consideration when options for other uses are evaluated, and sanctuaries, hunting areas, compatible industrial activity zones, shipping corridors and multiple-use zones could be established spatially and/or temporally, where appropriate. DFO would play a key role in making decisions on any activities which would occur within the beluga management area or which may have impacts within the area.

Advantages:

- should ensure long-term survival of beluga;
- hunting permitted;
- beluga and areas of summer concentrations and migration routes should be given appropriate protection;
- sanctuaries, hunting areas and other protection measures can be utilized in a Beluga Management Area;
- oil and gas development could continue outside of any restricted areas;
- provisions could be made to permit compatible and transitory activities (e.g. shipping) in restricted areas when beluga are absent;
- management requirements for other fish and marine mammals can be incorporated into the framework provided by a Beluga Management Area;
- good framework for cooperative decision-making with Inuvialuit, industry and other government agencies for conservation of beluga.

Disadvantages:

- depending on nature and location of any restricted areas, possible difficulties in implementation because of existing hunting and industrial activities;
- difficult to manage any effects of HEP developments;
- legislative basis unclear;
- boundaries unclear; and
- types of zones, their locations and their implementation undefined.

32. Preferred Option: Beluga Management Area

Establishment of a beluga management area (Option 4) is considered to be the best of these options. It should enable a proactive management regime for beluga to be established. The objectives of the Inuvialuit and many objectives of industry and other government agencies could be achieved within the framework of a beluga management area. At the same time, DFO's objectives for the long-term survival of the beluga, protection of important habitat, controlled harvesting and cooperative decision-making should be achieved, and DFO would be taking the lead in an arctic marine conservation issue.

33. The beluga management area should include all areas where beluga congregate during the summer, areas where hunting occurs, and the inshore and most offshore migration and travel routes. A suggestion is that the beluga management area (see Fig. 4) should be enclosed by the following lines:

- north from the Yukon-Alaska boundary (141°W) to 70°N;
- east along 70°N to 133°W;
- north along 133°W to 71°N;
- east along 71°N to 128°W;
- south along 128°W to the mainland; and
- west along the coast to 141°W.

This suggested boundary should be considered as preliminary, with the final boundary to be determined following consultations with other interested parties. Also, the inclusion of Amundsen Gulf within the beluga management area should be considered.

34. The following aspects of the beluga management area concept require clarification: i) management objectives for the beluga population, ii) requirements for the management of hunting and harvesting, iii) requirements for the management of industrial activities, including hydrocarbon related developments, shipping and hydroelectric power developments in the Mackenzie Basin, within and adjacent to the beluga management area, iv) boundaries of the beluga management area, v) proposed locations for any sanctuaries, hunting areas, industrial activity zones, shipping corridors and multiple-use zones, vi) the powers and responsibilities of DFO, DIAND and other government agencies, and appropriate operating procedures, vii) the best legislative option, such

as developing regulations under section 34 of the Fisheries Act, for establishing such an area, viii) integration of management requirements for other important fish and marine mammal species occurring in the area, and ix) a detailed implementation scheme and schedule.

35. Clarification of the beluga management area concept should be done by DFO and the Inuvialuit and should include discussions with industry and other government agencies.

IMPLEMENTATION OUTLINE

36. DFO should establish a steering committee comprising R. Campbell, R. Josephson, R. Paterson and G. Robins to oversee the development and implementation of the beluga management area concept with the Inuvialuit, industry and other government agencies.
37. A technical committee, comprising mainly Western Region staff, could be formed to support the steering committee. The Institute of Ocean Sciences should be asked to participate in the planning so that relevant oceanographic advice and information is utilized.
38. The Fish Habitat Management Branch (P&FF HQ), with advice from the legal branch, should identify the most appropriate legislative option for establishing a beluga management area and different use zones within the area.
39. As soon as possible DFO should initiate preliminary discussions with the Inuvialuit, DIAND, other government departments, industry and other interested groups on the feasibility and operation of a beluga management area in the Canadian Beaufort Sea.
40. DFO should negotiate for an effective and proactive role in decision-making processes for all activities which may affect the beluga. Extending this role to cover all fish and marine mammals should be considered.

41. Northern land use planning probably will provide the most appropriate cooperative forum for finalizing the boundaries of a beluga management area and the locations of any sanctuaries, hunting reserves, industrial activity zones and shipping corridors within it.
42. DFO should consult with the U.S.A. on international aspects of the management of the Beaufort Sea beluga population.
43. Until a beluga management area is established, DFO should continue to:
 - a) ensure that exploration agreements and licences etc. for new industrial activities in the Beaufort Sea include, whenever appropriate, measures for the protection of beluga, a program to detect any effects on beluga, and the right to modify or stop the activities if unacceptable impacts occur;
 - b) strongly discourage and refuse to endorse any new large-scale industrial activity, e.g. no new hydrocarbon developments and no new major shipping corridors, in the West Mackenzie Bay - Niakunak Bay - Shallow Bay area and in Kugmallit Bay; and should
 - c) support any proposal to establish a conservation area in West Mackenzie Bay - Niakunak Bay - Shallow Bay or Kugmallit Bay areas if the proposal is acceptable to DFO and the Inuvialuit.
44. DFO should enhance its program to gather, analyze and interpret data relevant to the management of the Beaufort Sea beluga population. The following specific topics should be addressed:
 - a) development of a population model for Beaufort Sea beluga and obtaining the information needed to use the model;
 - b) determination of the reasons for the congregation of beluga in estuaries during the summer;
 - c) determination of the effects, if any, of industrial activities on the beluga; and

d) determination of the population's status as revealed through harvest and other information.

45. A possible timetable for the implementation of a beluga management area is:

- Steering Committee begins work in May 1985;
- consultations held with the Inuvialuit, industry, other government agencies and the U.S.A. in the summer of 1985;
- a draft management plan prepared and distributed for review in the fall of 1985; and
- the final management plan presented in March 1986.

46. The final management plan should include an assessment of the resources needed for its implementation.

CONCLUSIONS

47. The beluga habitat afforded by West Mackenzie Bay (including Niakunak Bay and Shallow Bay) does require protection. Also, the beluga habitat of the Garry Island - Kendall Island, Kugmallit Bay and Amundsen Gulf, the beluga migration routes and the beluga themselves require protection to ensure the long-term survival of the beluga population.

48. A beluga management area, which encompasses most of the range of the beluga in the Canadian Beaufort Sea, is considered the best management option since it should ensure the long-term survival of the beluga population, permit controlled hunting of beluga and permit compatible industrial activities.

49. DFO and the Inuvialuit should develop the objectives and processes for a beluga management area in consultation with industry and other government agencies, and then should implement the concept.

50. A small steering committee should be established to oversee DFO's role in the development and implementation of a beluga management area.

RECOMMENDATIONS

51. It is recommended that the Arctic Directors-General consider, modify as appropriate and endorse:
 - a) the concept of a beluga management area for the Canadian Beaufort Sea; and
 - b) the general implementation process outlined above.
52. It is recommended that the Arctic Directors-General should establish a steering committee to oversee DFO's role in the development and implementation of a beluga management area. The Steering Committee should attempt to produce a finalized management plan by March 1986.

PART 2

MANAGEMENT AND PROTECTION
OF BELUGA IN THE BEAUFORT SEA

A Discussion Paper
Prepared by ARCOD in Support of a
Paper for Consideration by the
Arctic Directors-General Committee

April 1985

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INTRODUCTION

The habitat of beluga in the Canadian Beaufort Sea may be affected by hydrocarbon exploration, production and transportation in the area and by hydroelectric power development within the upper Mackenzie Basin. The beluga also are harvested by the Inuvialuit. In 1977, Mr. Justice Berger suggested that part of the Niakunak Bay - Shallow Bay area of West Mackenzie Bay should become a beluga sanctuary where hunting would be permitted but where industrial activity would be banned.

In 1982, the Minister's Committee on Whales and Whaling inquired regarding the status of Mr. Justice Berger's recommendation for a sanctuary. Subsequently, ARCOD was asked to provide advice on the need to protect the beluga habitat afforded by West Mackenzie Bay.

This discussion paper provides additional background material in support of the ARCOD paper prepared for consideration by the Arctic Directors- General Committee. This paper provides biological information on the beluga population of the Beaufort Sea. Hunting, hydrocarbon exploration and development and hydroelectric power development are discussed as they relate to the beluga. DFO's current approach to beluga management is outlined., Other considerations, such as the report of the Task Force on Northern Conservation, Northern Land Use Planning and the Western Arctic Claim Settlement, are outlined. Finally some options for the management of the beluga are discussed. Implementation is not discussed in this paper.

BELUGA OF THE BEAUFORT SEA

DISTRIBUTION AND ABUNDANCE

The beluga or white whale (Delphinapterus leucas) occupies a discontinuous circumpolar range in arctic and subarctic marine and estuarine waters. About 24,000 to 28,000 beluga occur in Canadian waters where its range includes the St. Lawrence estuary, Hudson Bay, Ungava Bay, Davis Strait, Baffin Bay, Lancaster Sound and adjacent channels, and the Beaufort Sea area. It is rare or non-existent in the central Arctic.

Past estimates for the number of beluga occurring in the Beaufort Sea area have varied from 2,000 to 7,000; an estimate in 1981, which covered a large segment of the offshore area, indicated a population of about 11,500 individuals. Population estimates for 1982 and 1983, covering the onshore zone were less than the 1981 estimate.

The population estimates may vary due to the dates of the survey and the area surveyed. The recent estimate of 11,500, which added 4,500 animals to the previous highest estimate, found large numbers of beluga offshore in August. This survey was designed to census bowhead whales and therefore did not cover water less than 5 m in depth so it is not known if large numbers of beluga were inshore at that time.

Only the general distribution and movements of beluga of the western Arctic stock are known (Fig. 1). Current knowledge indicates this population likely winters in the Bering and Chukchi seas. From April to June the beluga leave their wintering grounds, moving first along the Alaskan coast to about Point Barrow, then north-east through an offshore system of leads in the ice to the vicinity of the large polynya near Banks Island, and then south to Amundsen Gulf where they occur in May to June. From there, the population or a large portion of the population follows the shoreline or the ice edge to the Mackenzie estuary where they remain for some time. Arrival in the Mackenzie estuary is dependent on ice conditions, but usually occurs in late June or early July. Late migrants may go directly to the Mackenzie estuary from the wintering grounds. The migration from the Mackenzie estuary begins in late

July or early August; some beluga may return to Amundsen Gulf before beginning their westward movement back to the Bering and Chukchi seas. Most beluga have left the Mackenzie estuary by mid-August.

In the Mackenzie estuary, large numbers of beluga congregate for a significant period only in Niakunak and Shallow bays, the Garry Island-Kendall Island area, and Kugmallit Bay (Fig. 2). For instance, during the first week of July in 1983 approximately 5,800 beluga occurred in Niakunak Bay with the highest concentrations in Shallow Bay and approximately 1,100 beluga occurred in Kugmallit Bay. Use of these areas has been relatively consistent since 1972, with maximum numbers occurring in late June and early July. During most years Niakunak Bay and Kugmallit Bay become accessible to beluga at about the same time. However, during years when ice remains longer, Niakunak Bay becomes accessible first; it may be more important under that circumstance than Kugmallit Bay.

The reason for the congregation of beluga in the Mackenzie estuary is unknown. At present the most widely accepted suggestion is that the warm estuarine water provides a thermal advantage particularly to neonates. The estuary may provide shelter from wind, or may be a feeding ground although it is unknown whether beluga do feed there. It was thought that the estuary was a calving ground for beluga but it has been shown that at least some beluga calve before they reach the estuary.

Groups of beluga seen travelling southward along the Tuktoyaktuk Peninsula may be returning to the estuary after feeding offshore but no documentation exists to support this hypothesis.

REPRODUCTION

Based on information from Cumberland Sound, Baffin Island, female beluga are mature when 9 or 10 dentinal layers are present. Male beluga in Cumberland Sound are mature with 14 dentinal layers, but male beluga in western Hudson Bay are not mature until 16-18 dentinal layers are present. One or two dentinal layers may be deposited annually. This suggests that the age of maturity for beluga in various parts of the arctic may differ

slightly. Age specific reproductive parameters for the Beaufort Sea beluga are currently being studied.

Calving in Cumberland Sound is reported to occur in late July and early August, with conception having occurred during May of the previous year. Preliminary indications suggest that male Beaufort Sea beluga may still be fertile in late July so the possibility exists of an extended breeding and calving season but more information is required. Young-of-the-year, and neonates have been reported from the north coast of Alaska as early as April, and small young-of-the-year as late as September 28.

Lactation is reported to continue for two years, and females are capable of producing a calf every three years. Information collected from the Mackenzie Delta to date is sparse but does support a three year cycle.

CONCLUSION

The distribution and abundance of the Beaufort Sea beluga population is well documented only in a general sense. It is unknown why beluga use the Mackenzie estuary, but West Mackenzie Bay, Niakunak Bay, Shallow Bay and Kugmallit Bay are areas considered essential for the survival of the Beaufort Sea beluga population. If displaced from these areas, it is unknown whether the population can survive in its present numbers as no similar habitat exists within the range of this population. Additional census work is required to confirm the recent population estimate of 11,500 and the possibility that a large offshore component of the population may be present.

Past studies do not provide all the information required for sound management of the beluga population. Many biological parameters for the Beaufort Sea beluga are unknown at present. Available information that might be used to estimate these biological parameters is from beluga in other areas which are likely from different stocks. Studies are required to investigate the biology of the Beaufort Sea beluga for time specific activity patterns, the occurrence and importance of sexual or age specific segregation, population turnover within the waters of the estuary, feeding habits, the effects of parasites and other natural phenomena on mortality, and reproductive parameters.

HUMAN ACTIVITIES AND THEIR POTENTIAL IMPACT ON BELUGA

HUNTING

Beluga have been hunted in the Mackenzie estuary for many hundreds of years. No accurate report exists on the annual harvest of beluga prior to 1954 when 208 beluga were reported taken, but an anecdotal report stated that more than 300 beluga could be taken in a single day in the early 1900's.

Inuit from Aklavik, Inuvik and Tuktoyaktuk hunt beluga in the Mackenzie Estuary. The muktuk and meat are used locally, or are traded, for human consumption or dog food. Reasonably accurate data exist for the beluga harvest since 1954. The reported harvest has ranged from 208 in 1954 to 68 in 1965. The average annual reported harvest for the past 23 years has been 121 beluga landed; the probable annual kill is less than 200. This is about 1.7% of the Beaufort Sea beluga population, assuming a total of 11,500 individuals. In any year approximately 21% of the harvest is taken from Niakunak Bay, 7% from the Kendall Island area and 72% from Kugmallit Bay. These figures may reflect an increased hunting effort rather than a greater density of beluga in Kugmallit Bay.

This Beaufort Sea beluga population is also harvested along the north-west Alaska coast. As many as 58 whales have been landed during the spring migration. If for any reason there is a decrease in Alaskan bowhead hunting, the result could be an increase in the number of beluga taken.

HYDROCARBON EXPLORATION AND DEVELOPMENT

General

Offshore hydrocarbon exploration began in the Canadian Beaufort Sea began in the mid 1960s and exploratory drilling began in 1973. Exploratory drilling has occurred from more than 20 artificial islands in shallower water (<30 m) and from drillships over deeper water (Fig. 3). Several significant oil and gas discoveries have been made offshore and in the Mackenzie Delta; their commercial viability is being evaluated.

In 1980, a group of companies led by Dome Petroleum Ltd., ESSO Resources Ltd. and Gulf Canada Resources Ltd. proposed to produce and transport oil and gas from the Beaufort Sea - Mackenzie Delta region with production possibly starting in 1988-1992. The proposal involved development of one or more offshore oil fields. Oil would be produced, processed and stored at a series of artificial islands, monocones or production atolls, and would be transported to markets either by ice-breaking tankers through the Northwest Passage or by pipeline probably along the Mackenzie Valley. By 2000, at least four offshore oil fields could be developed. Depending on the rate of development, 6 to 40 exploration islands and 12 to 29 production islands could be constructed by 2000; this would involve dredging 2 to 60 million m³/year. Also, 110 to 220 vessels could be operating in the Beaufort Sea area.

Industry's proposal was reviewed by the Beaufort Sea Environmental Assessment Panel which released its report in July 1984. The Panel concluded that small-scale phased oil production and transportation would be acceptable on environmental and social grounds provided that certain conditions are met and that transportation begins through a small-diameter pipeline. The Federal Government is preparing its response to the Panel's report. Production of oil could begin from on-land and near-shore reservoirs in the early 1990's.

West Mackenzie Bay

Oil companies, primarily ESSO Resources, have exploration agreements for most of West Mackenzie Bay and Niakunak Bay. Little exploration activity has occurred in the western part of this area. In the eastern part seven wells were drilled from artificial islands (Fig. 3). A small oil and gas pool was discovered at Adgo and a gas pool at Netserk.

ESSO is committed to spend a minimum of \$600 million for additional exploration by 1987. The program will include seismic exploration and drilling at least five offshore wells. The proposed locations of the offshore wells are distant from Niakunak Bay. When the exploration agreement expires in 1987, ESSO must surrender half of the area back to the Crown; the surrendered lands then could be made available to industry for exploration for another five year period or retained by the Crown.

ESSO is considering the development of the Adgo oil pool. Oil would be produced from artificial islands and brought to shore through a pipeline for processing. The oil then may be transported to market through a pipeline along the Mackenzie Valley.

A major support base and deepwater port for hydrocarbon exploration and development could be established at King Point or Stokes Point on the Yukon coast. Access by sea would be from the West Coast and by barge either down the West Channel of the Mackenzie River and through West Mackenzie Bay or down the East Channel, through Kugmallit Bay and westward around the Delta. This could involve considerable vessel traffic operating in West Mackenzie Bay.

Potential Effects

The exploration for and development of hydrocarbons and associated marine transportation and other activities in the area may result in increased underwater noise, seismic exploration, the chronic contamination of the environment with oil and other toxic substances, the alteration of the sea floor through dredging and construction of offshore structures, the alteration of ice breakup patterns, major oil spills, increased human presence and other perturbations. The impacts on beluga could include lethal or sublethal effects on individuals, changed behaviour, disturbed or disrupted movements or migrations, altered distribution, possibly in decreased productivity or decreased population size, and could affect the harvest of beluga. However, the actual occurrence and significance of these postulated effects is uncertain.

HYDROELECTRIC POWER DEVELOPMENT

The hydroelectric potential of the upper Mackenzie Basin may be developed. Two major schemes have already been proposed; Alberta Power is investigating the construction of a dam on the Slave River near the Alberta-NWT border, and B.C. Hydro is considering the construction of one or more dams on the Liard River but this development has been deferred until at least 2000.

Construction of the dams, especially the ones on the Liard River, could result in breakup being delayed, water temperatures being reduced and primary production being altered in the Mackenzie estuary and in the offshore zone. Such effects could alter the suitability of the Mackenzie estuary as summer habitat for beluga, but they may be less than the natural variability. These effects may make the mitigation of other stresses even more important.

The effects of such hydroelectric power (HEP) developments must be considered in a proposal for the management of the beluga.

CONCLUSION

It is certain that hunting is affecting beluga and that industrial activity will affect beluga in the Mackenzie estuary, but these latter effects have not been predicted and their significance is unknown. Any impacts caused by future hydrocarbon exploration and development and by hydroelectric power developments may compound existing impacts on beluga stocks from hunting and natural environmental variation. It is impossible with today's knowledge to predict accurately the cumulative effect of these stresses on the beluga population, but it is reasonable to assume that the beluga, being a long-lived terminal predator, is one of the species most vulnerable to the effects of human activities.

DFO WESTERN REGION'S CURRENT APPROACH TO BELUGA MANAGEMENT

LEGISLATIVE RESPONSIBILITIES

The Department of Fisheries and Oceans has the responsibility, derived from the Constitution Act, 1982 and the Department of Fisheries and Oceans Act, 1979, to manage and protect beluga, its habitats and the ecosystems upon which it depends for the present and future social and economic benefit of all Canadians. The legislative basis for this is the Fisheries Act, and the Beluga Protection Regulations, the Northwest Territories Fishery Regulations and the Yukon Territory Fishery Regulations promulgated under the Act.

Specific activities are controlled through legislation. For example:

- The harvesting of beluga is controlled under the Beluga Protection Regulations. Under these Regulations conditions of hunting are specified, and quotas can be established. DFO has not set a quota on the number of beluga that can be harvested in the Canadian Beaufort Sea. Hunters have been advised, however, that the present average yearly harvest (121 beluga) may be approaching the maximum sustainable yield for the population, that any increase in the average number of beluga taken per year should come from the segment which is struck and lost, and that some aspects of current hunting practices are detrimental to the long-term health of the population.
- The destruction of beluga, except by hunting, is prohibited under section 30 of the Fisheries Act. Also, the wilful disturbance of beluga is prohibited under the Beluga Protection Regulations.
- The use of explosives in water requires authorization under the Northwest Territories and Yukon Territory Fisheries Regulations; the department has prepared guidelines to assist in the preparation of applications for such authorizations.

- The alteration, disruption and destruction of beluga habitat are prohibited under section 31 of the Act. The deposit of deleterious substances in water frequented by beluga is prohibited under section 33; this section is administered in part by the Department of the Environment (DOE) but the Minister of Fisheries and Oceans remains accountable to Parliament.
- Under the Act the Minister may request plans and other information on projects likely to affect beluga habitat, and may require such plans to be modified if it is deemed the Act may be contravened.

In addition, DFO Western Region does not rely solely on its powers under the Fisheries Act to protect beluga and its habitat. It cooperates with other departments and industry in the environmental review of project proposals under the Environmental Assessment and Review Process. Also, DFO cooperates with other departments in stipulating conditions required to protect beluga and its habitat. The Ocean Dumping Control Act administered by DOE is used to control dumping and disposal of spoil at sea. The Arctic Waters Pollution Prevention Act administered by the DIAND and the Department of Transport is used to control waste disposal. The Oil and Gas Production and Conservation Act administered by COGLA is used to control adverse effects from hydrocarbon exploration and production.

The administrative processes for interdepartmental cooperation on environmental review and stipulation under these statutes enable DFO to make its position known and for its protection requirements to be considered on a case-by-case basis. The processes do not ensure that appropriate protection measures will be incorporated into the project or its licences since DFO does not have an equal voice in the decision-making. However, if necessary, DFO can resort to using its powers under the Fisheries Act.

GOALS AND POSITIONS

Recently, the Department has developed objectives and goals which are relevant to the management and protection of beluga. One of the Western

Region's six main goals is "To maintain current levels of fish and marine mammals, where productivity is known, through proper management, habitat protection and the enforcement of parliamentary acts and regulations which protect these resources both from over-exploitation and from habitat reduction which may often result from mining, hydrocarbon exploration and production, and hydroelectric generation projects in the Arctic". Another goal is "To ensure the best use of the fish and marine mammal resources available for harvest in the Canadian Arctic".

One proposed goal of the draft National Fish Habitat Management Policy is "Prevent damage to fish habitats supporting Canada's fisheries resources". This draft Policy also proposes relevant strategies including:

- protect fish habitats by administering the Fisheries Act and incorporating fish habitat protection requirements into land and water use activities and projects (habitat protection);
- participate in and encourage resource planning and management to incorporate fish habitat priorities into air, land and water use plans (consultative resource planning); and
- consult the public on major or controversial fish habitat issues and on the development of new policies and legislation for fish habitat management (public consultation).

In its response on the Beaufort Sea Hydrocarbon Production Proposal, DFO stated the following positions which are relevant to the management and protection of beluga in the Mackenzie estuary:

- development is unacceptable in areas used by year-round or high seasonal concentrations of fish and marine mammals and which are considered habitats critical to the continued productivity and well-being of such populations;
- development of new shorebases or ports is unacceptable in critical habitat areas;
- the sensitivity and importance of fish, marine mammals and their habitats must be reflected in the location, design, construction and operation of new shorebase or port facilities;
- DFO is unable to determine the acceptability of the construction and operation of offshore production facilities or of subsea pipelines,

but would be prepared to accept demonstration projects under conditions including that their location would not be in areas critical for fish and marine mammals; and

- Shallow Bay (West Mackenzie Bay) and Kugmallit Bay are areas of critical habitat.

CONCLUSION

The present DFO Western Region management approach for beluga does not provide a quota for the harvest of beluga and only regulates industrial activities on a case-by-case basis after applications are made. Consequently, it does not ensure effective long-term conservation of the Beaufort Sea population of beluga and its habitats. The Department is committed to both cooperative resource planning and public consultation in its management of the beluga population.

OTHER CONSIDERATIONS

Other factors, in addition to harvesting, industrial activities and DFO responsibilities and policies, impinge upon the conservation and management by DFO of beluga and its habitats in the Beaufort Sea area.

CONSERVATION

There are several other relevant conservation interests and responsibilities.

World Conservation Strategy

Canada has officially endorsed the World Conservation Strategy and consequently now has obligations to implement it in Canada. Its three objectives are i) to maintain essential ecological processes and life-support systems, ii) to preserve genetic diversity, and iii) to ensure the sustainable utilization of species and ecosystems. All three objectives are relevant to the management and protection of beluga in the Mackenzie estuary.

Northern Conservation Policy and Strategy

In 1982, DIAND released a draft discussion paper on a comprehensive conservation policy and strategy for the NWT and Yukon. The subject was discussed at a workshop in March 1983. As a result of the workshop, a Task Force on Northern Conservation was established to report to the Minister of IAND and the Governments of NWT and Yukon on a framework for a comprehensive conservation policy for northern Canada, a strategy and ongoing mechanism for implementing the policy, and conservation targets which can be met over the next two years.

The report of the Task Force was completed in December 1984. The Task Force proposed four principles, two goals and a strategy for northern conservation and made several recommendations. The conclusions of the Task Force most relevant to the conservation of beluga in the Beaufort Sea include:

- a) some form of protective status must be extended to areas of particular importance to marine mammals;
- b) an integrated resource management plan should be prepared for the Beaufort Sea area;
- c) DFO should accept and implement its responsibility as the lead agency for arctic marine conservation;
- d) Northern Land Use Planning and land claims settlements can play an important role in the development of a northern conservation strategy, and components of the Inuvialuit settlement may be more effective in achieving the goals of conservation than much of the current resource management legislation;
- e) legislation should be enacted for comprehensive fishery resource management and for marine conservation; and
- f) an agreement on marine mammal conservation is required with Alaska and the U.S.A.

Sanctuary Proposal

Mr. Justice Thomas Berger, in the 1977 report of the Mackenzie Valley Pipeline Inquiry, proposed a beluga sanctuary in a portion of Shallow Bay, most of Niakunak Bay and a portion of West Mackenzie Bay (Fig. 2). The exact size and boundaries of the sanctuary were not specified. The proposal was based on the assumptions that i) beluga converge on the Mackenzie Delta to calve, ii) the beluga "herd" consists of some 5,000 beluga, iii) Mackenzie Bay is critical habitat because "here they have their young", and iv) there is a long term threat to beluga due to the whole complex of petroleum activities in the coastal waters bordering the Mackenzie Delta, Richards Island and adjacent areas. Mr. Justice Berger recognized the proposed area as a compromise since other areas of the Mackenzie Delta with beluga concentrations already had been given over to industrial use. Industrial activity would not be permitted within the sanctuary but the native beluga harvest would be allowed to continue.

Earlier, during the inquiry hearings, D. Sergeant (D.F.O. Ste. Anne de Bellevue) proposed a larger sanctuary in the area in which both hunting and industrial activity would be prohibited.

Parks Canada

Parks Canada has completed a study of the Western Arctic Marine Region as part of its programme to identify and protect Natural Areas of Canadian Significance (NACS) and Natural Sites of Canadian Significance (NSCS). West Mackenzie Bay area was not identified as a NACS nor NSCS; the area does not have sufficient natural diversity to meet the criterion for NACS designation that "the area must portray the diverse geological, physiographical, oceanographical and biological themes of a natural region", nor did it meet the criterion of NSCS designation that "the site must contain a natural feature or phenomenon which is unique or rare in Canada or the world, or the best example of a particular natural theme component in Canada".

Other Conservation Interests

Part of the West Mackenzie Bay area is included in the Reindeer Grazing Reserve. Kendall Island is a Migratory Bird Sanctuary.

DOE has identified conservation interests in i) the Richards-Garry Island area, ii) the Kidluit Bay to Hendrickson Island area, iii) McKinley Bay-Atkinson Point area, and iv) The Caribou Hills/Napoiak Channel-Mackenzie River area. Part of the rationale for the former two areas is the occurrence of beluga. The Canadian Committee for the International Biological Programme, Conservation Terrestrial - Panel 9, identified i) Garry and Pelly islands, ii) Toker Point, and iii) Caribou Hills and Mackenzie River Delta as proposed ecological sites.

NORTHERN LAND USE PLANNING

A Northern Land Use Planning policy was approved by Cabinet and announced by the Minister of IAND in 1981. Northern Land Use Planning is an organized process for determining the uses of lands, waters and related resources based on cooperative decision making by governments, groups and individuals. It is intended to complement rather than replace existing planning mechanisms. Northern Land Use Plans will be designed to ensure conservation of elements with cultural, biological or esthetic importance

while providing for orderly development which ensures fulfillment of northern socio-economic goals and national objectives. Details have not yet been finalized. DFO is fully supportive of DIAND'S implementation of land use planning in the north, but has significant reservations about the specifics of the 1982 draft land use planning proposal.

One proposed land use planning area is the Beaufort Sea, Mackenzie Delta and adjacent coasts. A planning appraisal for the Beaufort Sea/Mackenzie Delta was completed for DIAND in July 1982. The area still may be one of the first for which land use planning occurs.

LAND CLAIMS

In 1973, the federal government announced two new approaches in respect to comprehensive aboriginal land claims. First, the federal government was prepared to accept land claims based on traditional use and occupancy, and second it was willing to negotiate settlements of such claims. Settlement of claims could include a variety of terms, such as protection of hunting, fishing and trapping, land title and money, in exchange for release of the general and undefined Native title.

In addition to protecting their rights to hunt and fish, such settlements could require fuller participation by native peoples in wildlife management such as making recommendations to the government on the establishment and maintenance of wildlife quotas or providing advice on the formulation of management policies and other related matters. DFO would be required to participate on management boards, in stock and habitat management and research programmes, and in communication and consultative processes with local committees.

One comprehensive claim is that of the Committee for Original Peoples' Entitlement (COPE) representing the Inuvialuit of the Western Arctic Region. The area of this claim includes the Mackenzie estuary and surrounding sea and land. Inuit aboriginal rights in the offshore areas of the arctic are a legal reality. An agreement-in-principle was negotiated and signed in 1978. The final Western Arctic Claim Settlement received Cabinet approval in June 1984.

Some specific points relating to the Western Arctic Claim Settlement are:

- a) a basic goal is to protect and preserve fish and wildlife, environment and biological productivity through the application of conservation principles and practices;
- b) critical fish and wildlife habitat is to be protected;
- c) the Inuvialuit would be integrated into management through their participation on the following joint Inuvialuit - Government committees: Wildlife Advisory Committee, Joint Fisheries Management Committee, Environmental Impact Screening Committee, Environmental Impact Review Board, and Research Advisory Council;
- d) the Wildlife Advisory Councils of the Yukon and Northwest Territories will provide advice to the appropriate ministers on all matters relating to the management, regulation, policy and administration of wildlife (including fish and marine mammals), habitat and harvesting, including the preparation of a wildlife conservation plan;
- e) the Joint Fisheries Management Committee will assist the Inuvialuit and DFO in managing the fisheries by advising the Minister on all matters relating to regional fisheries;
- f) the Environmental Impact Screening Committee will examine every development likely to cause negative environmental impact and may refer the review to the Review Board if no suitable review mechanism exists; and
- g) the Research Advisory Council will make recommendations on research requirements and may commission studies.

All areas would continue to be subject to existing general laws as they apply to hunting and fishing, and they would be subject to present and future sound conservation policies.

An understanding existed that no significant change in the management regime for fish and wildlife would be implemented pending the development of the final agreement and settlement legislation.

HUNTERS' ORGANIZATIONS

Under the Western Arctic Claim Settlement the Inuvialuit Game Council will provide Inuvialuit members to all wildlife committees established by the settlement. Also under the proposed settlement, local Hunters and Trappers Committees will advise the Inuvialuit Game Council.

At a 1981 meeting among representatives of the Inuvialuit Game Council, COPE and DFO, the Game Council expressed an interest in the cooperative management of beluga.

Not all individual hunters agree with COPE, the Game Council and the Associations on all matters. Individuals often express the opinion that DFO and industry should leave them alone to look after the whales since in the past they did not have the problems that affect harvesting now.

GOVERNMENT OF THE NORTHWEST TERRITORIES

DFO at present exercises exclusive management control over marine mammals in the NWT. The Drury Commission reported in 1980 that the GNWT and native groups believed that their needs were not being met adequately by DFO. Although the Drury Commission recommended that certain responsibilities should be devolved to the GNWT, it concluded that responsibility for offshore and marine fisheries and habitat should remain for the time being with DFO, but effective consultative mechanisms should be established to ensure that territorial interests are addressed and reflected in federal decisions and policies.

Some relevant policies of the GNWT are i) the protection of the environment and renewable resource activities, ii) protection of northern lifestyles and cultural heritage, iii) participation of local communities and interest groups in consultation programmes, and iv) recognition of the interests of native groups. It also states that disruption of fish and wildlife populations and their habitat should be avoided or minimized.

DIVISION OF THE NORTHWEST TERRITORIES

The Minister of IAND announced in November 1982 that the federal government is prepared to accept in principle the subdivision of the NWT. Preconditions to division include support for division by a majority of NWT residents, the resolution of native land claims, and the achievement of consensus among northern residents on the location of boundaries and the distribution of powers between territorial, regional and community levels of government. A majority of residents did support the subdivision of the NWT in a subsequent referendum.

The Nunavut Constitutional Forum has prepared a discussion paper containing proposals for a constitution containing proposed constitutional principles some of which are relevant to the issue of the management and protection of beluga in the Beaufort Sea. These are i) the peoples' interests must be recognized in any regimes established for the management of use of lands and waters and the people must have the right to participate in relevant decisions and benefits, ii) a Nunavut government should have particular powers in relation to the fast ice zone, its management, exploitation within it and benefits from its development, and iii) a functional division of powers respecting the offshore should be worked out between the federal and Nunavut governments.

CONCLUSION

Several initiatives (land use planning, Task Force on Northern Conservation, land claims settlements, political evolution of the Northwest Territories) affect or may affect DFO's management of the Beaufort Sea population of beluga. However, the ramifications of these initiatives are not yet completely clear.

MANAGEMENT OPTIONS

The three major existing and potential uses of the Canadian Beaufort Sea and the Mackenzie estuary are i) preservation of the beluga population, ii) harvesting of beluga, and iii) industrial activity, especially hydrocarbon development, and associated shipping.

The area could be managed for one of these uses or for a combination of these uses. However, DFO has the responsibility for the long-term preservation of the beluga population and the goal of ensuring the best use of the beluga available for harvest. Therefore, from a DFO perspective, the area must be managed for one of three sets of uses:

- total protection of the beluga population;
- protection of the beluga population with controlled hunting; or
- protection and controlled hunting of beluga, plus industrial activities which are compatible with the long-term well-being of the beluga population and with domestic hunting and harvesting.

Four management options exist related to these three sets of uses (Table 1). The first option, total protection, could be achieved by establishing a sanctuary where neither hunting nor industrial activities would be permitted. In theory, a sanctuary provides an area where total protection is achieved, where animals thrive, populations expand and excess animals "spill over" into other areas. However, a sanctuary that includes most, if not all, of the Canadian Beaufort Sea is considered impracticable since industrial activity is already widespread, and a traditional domestic harvest exists.

The second option is the creation of a series of small sanctuaries which include the three concentration areas. This also is considered impracticable. The domestic hunt takes place in all three areas and could not be moved offshore given the present hunting technology. A small sanctuary or sanctuaries covering part of the summer concentrations may not provide the mix of habitat, such as feeding areas and movement/migration routes, that the beluga appear to utilize. It is also possible that the establishment of a small sanctuary or sanctuaries might preclude the full protection of other critical habitats and consequently might not ensure that the beluga will survive. Such

sanctuaries may not be a major imposition on the oil and gas industry, if the question of shipping corridors can be resolved, since apparently they have limited exploration interest in the areas where beluga congregate.

The third option, protecting the beluga from industry but allowing hunting follows the recommendation of Mr. Justice Berger when he suggested the Shallow Bay sanctuary. It does not necessarily ensure the protection of the beluga, since the harvest is not yet regulated by a quota.

If this option were selected, problems may arise regarding the location of a hunting area(s). Industrial development already exists on the periphery of the three beluga concentration areas, and Kugmallit Bay is a major ship/barge/boat travel area. Retaining Shallow Bay as a hunting zone may still be possible, but likely it would not accomplish the protection or preservation of the beluga. It would be difficult to establish a quota for one concentration area and not the other two. The hunters use traditional hunting sites; they do not move freely along the coast. A quota for one area therefore would be an imposition on the hunters who use that area. The problem would increase if for some reason the numbers of beluga in the other concentration areas declined and more hunters began to hunt in the hunting reserve.

This option is not viable because it retains all the major problems of the first option and has additional unique problems that may make it less feasible.

The fourth option, protection of the beluga population with controlled hunting and with industrial activities which are compatible with the other uses, seems to be the only reasonable choice. This option would allow the creation of a large "Beluga Management Area" in which small sanctuaries, hunting areas, shipping corridors and compatible industrial activities could be located. Within the management area, the preservation of the beluga population would be the paramount objective but all compatible activities would be allowed. Sanctuaries, hunting areas, industrial zones, shipping corridors and multi-use zones would be created preferably by negotiation with all concerned parties, but the option to create them unilaterally if the beluga population is threatened should be retained by DFO.

The advantages and disadvantages of each of these management options are summarized in Table 2.

It must be recognized that protection of beluga in isolation will not ensure their survival. Beluga are part of a marine ecosystem, and all components of that ecosystem are important if it is to function. Management strategies must consider food chains and habitat if they are to be successful.

The beluga management area option should be the choice of DFO since it allows flexibility and considers all user groups. However, DFO needs to define clearly its powers and responsibilities and those of other government departments in any sanctuary, management zone and management area. Also, DFO should identify the most appropriate legislative approach for establishing those management regimes. One option is to develop regulations under Section 34 of the Fisheries Act.

Some broader fisheries management considerations exist:

- the management regime for the Beaufort Sea beluga population should be consistent with the requirements for managing the other fish and marine mammal resources of the area, e.g. bowhead, seals, anadromous coregonids, arctic charr; and
- a generalization of the management regime for the Beaufort Sea beluga population should be applicable to other beluga populations in Canada.

CONCLUSION

The establishment of a large beluga management area in the Canadian Beaufort Sea is proposed as the best management strategy for DFO. Within the beluga management area the conservation of the beluga and its habitats would be the prime consideration when options for other uses are evaluated, and sanctuaries, hunting reserves, compatible industrial activity zones, shipping corridors and multiple-use zones could be established spatially and/or temporally, where appropriate. DFO would play a key role in making decisions on any activities which would occur within the beluga management area or have impacts within the area.

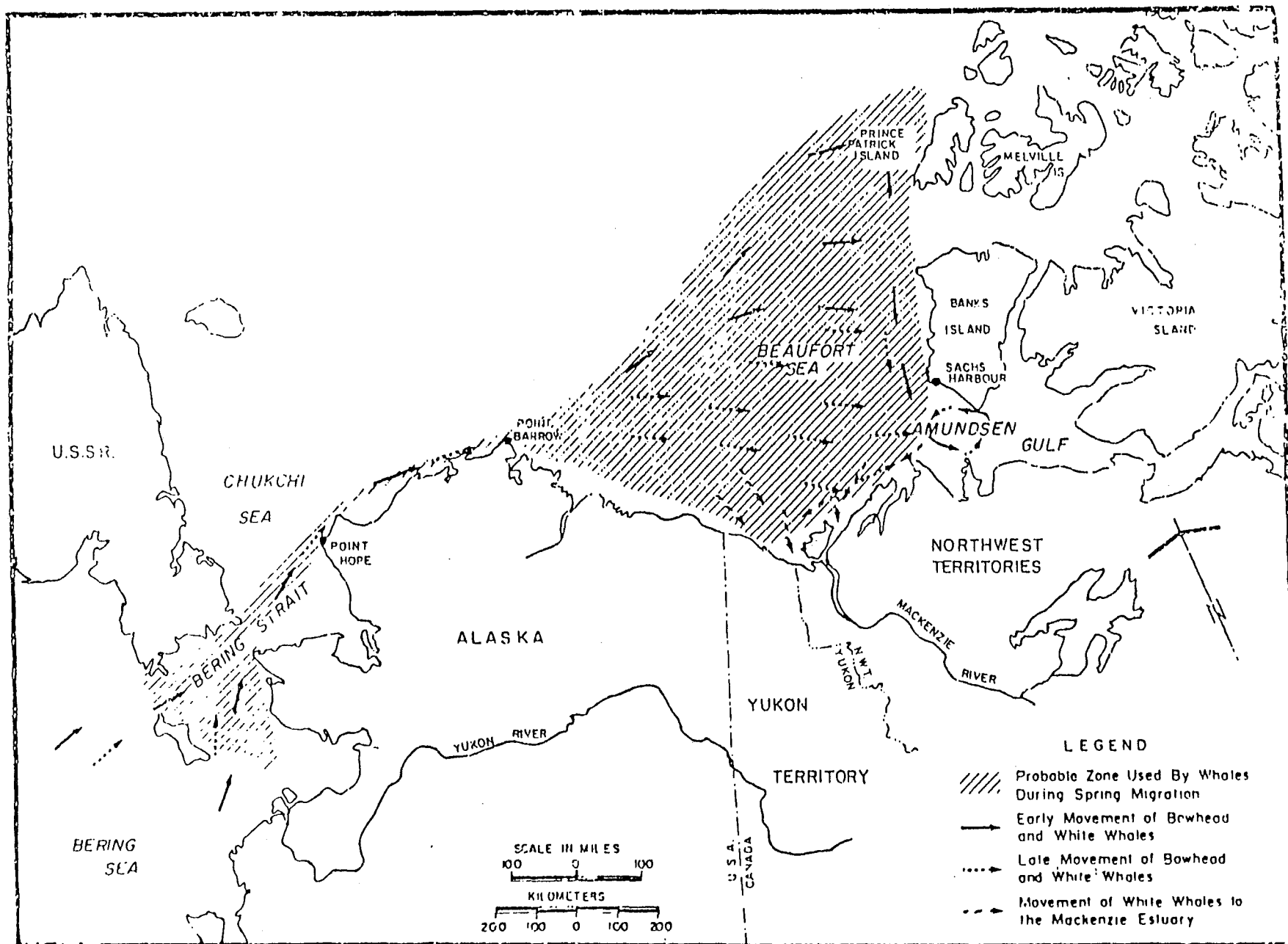


Fig. 1 . Generalized pattern of spring migration of bowhead and white whales from the Bering Sea to the Beaufort Sea. (From Fraker 1979)

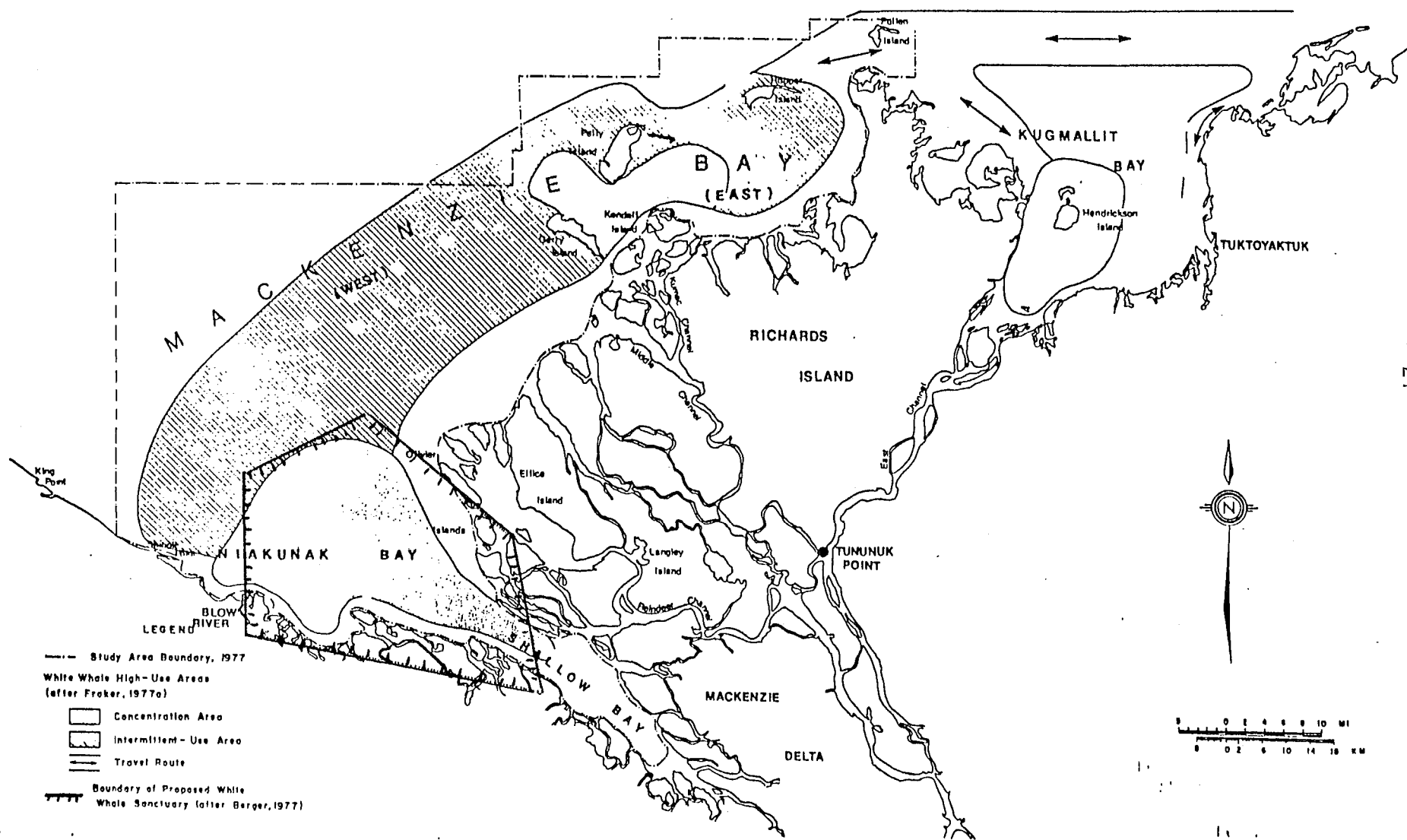


Fig. 2. The 1977 study area, white whale high-use areas, and proposed white whale sanctuary boundaries, Mackenzie estuary, N.W.T.

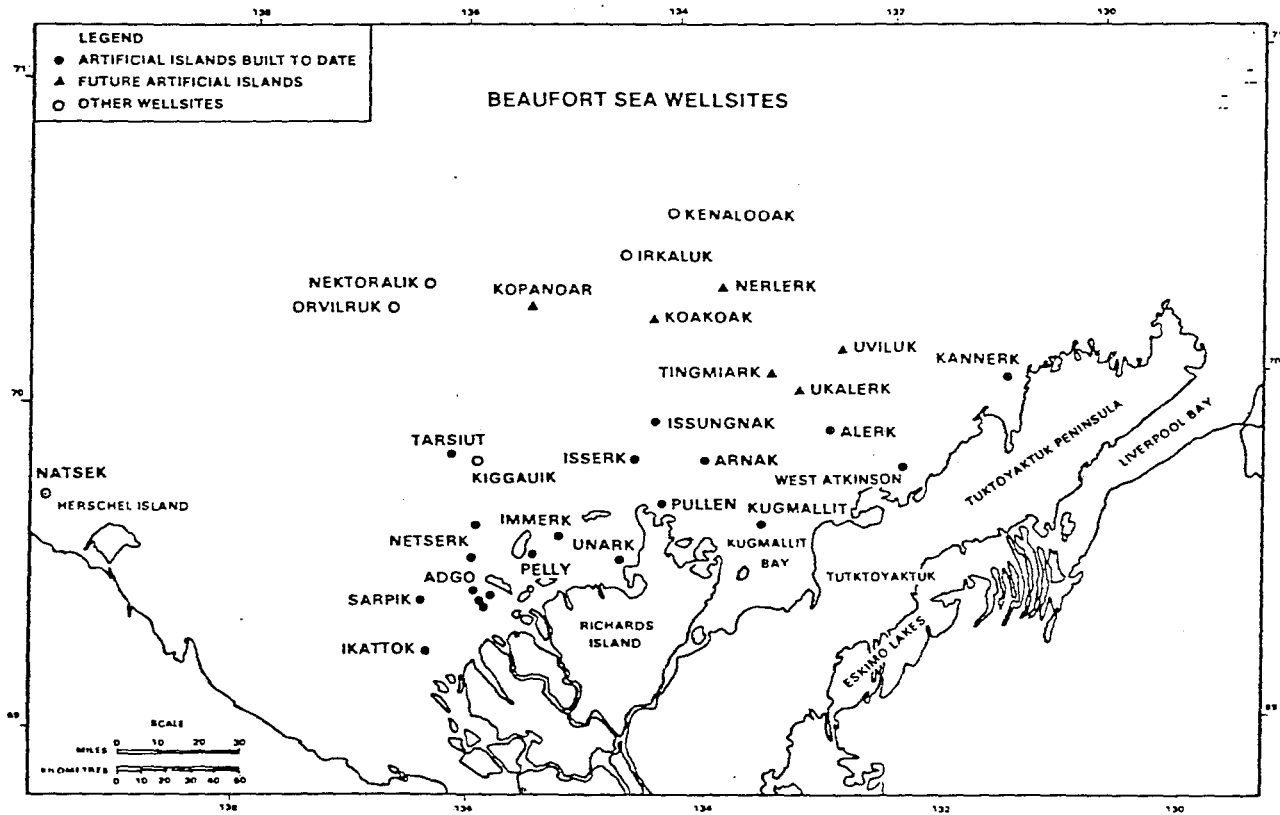


FIGURE 3 - Wellsites in the offshore Beaufort Sea.

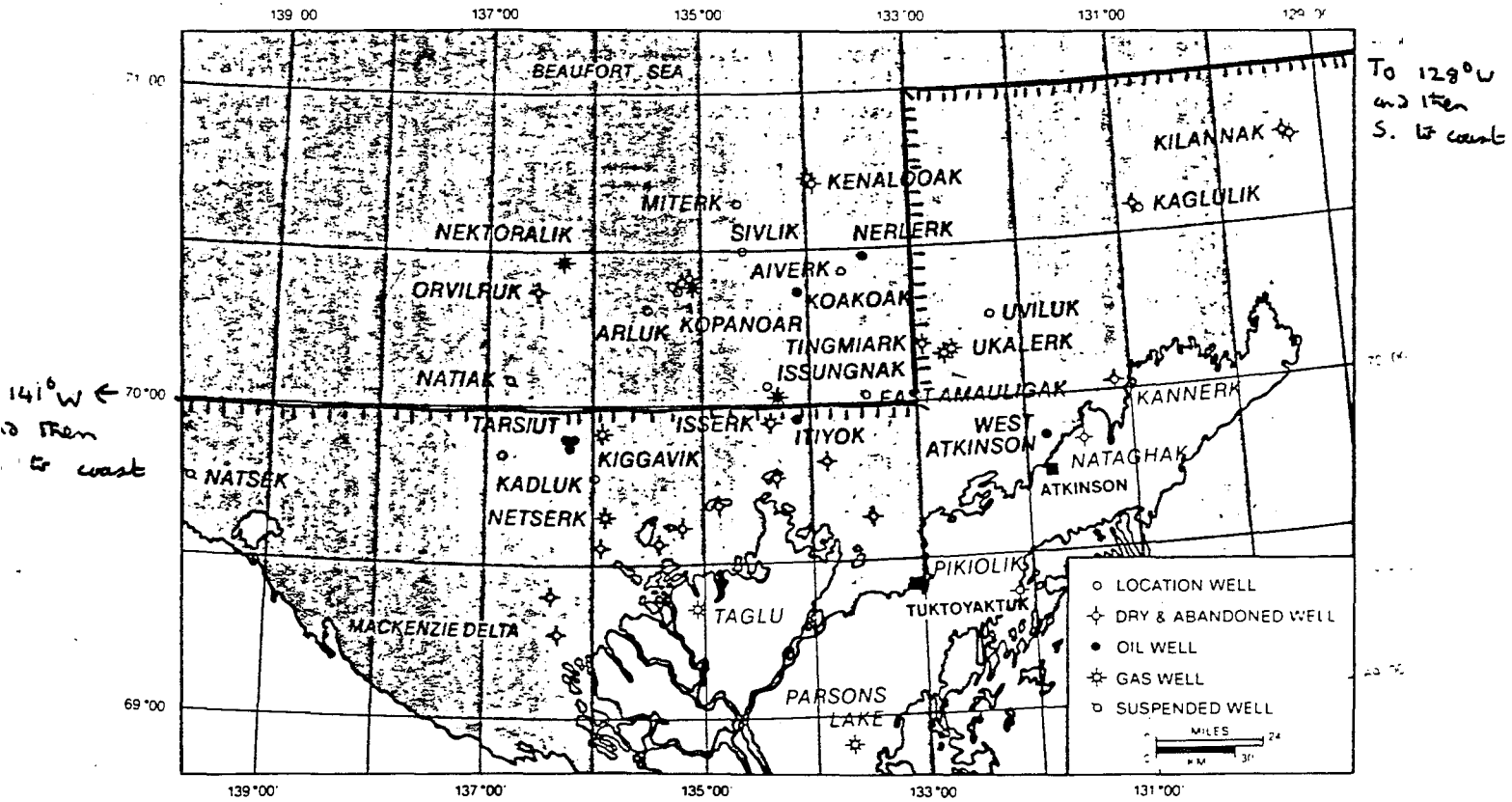


Fig. 4. Location of suggested boundaries of the proposed beluga management area in the Canadian Beaufort Sea.

Table 1. Options for the Management of Beluga.

Management Option	Potential Uses of the Area			Effect on DFO Responsibilities
	Industrial Activities	Beluga Hunting	Beluga Preservation ¹	
Beluga Sanctuary	Not allowed.	Not allowed.	Guaranteed.	Preservation would be achieved but no harvesting allowed. ²
Beluga Hunting Area	Not allowed.	Allowed; hunting and harvest controlled.	Guaranteed.	Achieved.
Beluga Management Area	Allowed if demonstrated to be compatible with long-term survival of beluga and with hunting.	Allowed; hunting and harvest controlled.	Should be guaranteed.	Should be achieved, but it is unknown whether industrial activities are compatible with the long-term survival of the beluga.

¹ The assumption is that no events elsewhere in the range of the beluga population would affect adversely its long-term survival.

² Increased harvesting could occur in other parts of the Mackenzie estuary, but the number of beluga elsewhere may decrease because of their death or their movement to the sanctuary to escape hunters.

Table 2. Advantages and Disadvantages of Management Options for Beluga in the Canadian Beaufort Sea.

	Beluga Sanctuaries		Beluga Hunting Areas	Beluga Management Area
	One Large Sanctuary	Several Small Sanctuaries		
Proposals	Establish one large sanctuary encompassing most of the range of beluga in the Canadian Beaufort Sea where no hunting nor industrial activity would be permitted.	Establish several small sanctuaries encompassing areas of summer concentrations of beluga where no hunting nor industrial activity would be permitted.	Establish one or more hunting areas in areas of traditional hunting where no industrial activity would be permitted.	Establish a beluga management area encompassing most of the range of beluga in the Canadian Beaufort Sea where hunting and industrial activities could be subject to spatial and temporal restrictions.
Advantages	Should ensure long-term survival of beluga	Would help ensure long-term survival of beluga.	Would help ensure long-term survival of beluga.	Should ensure long-term survival of beluga.
	Beluga and areas of summer concentrations and migration routes protected.	Areas of summer concentrations and beluga in those areas protected.	Areas of summer concentrations protected from industrial activities.	Beluga and areas of summer concentrations and migration routes would be given appropriate protection.
		Hunting permitted outside of the sanctuaries.	Hunting permitted.	Hunting permitted.
		Oil and gas development could continue outside of the sanctuaries.	Oil and gas development could continue outside of the hunting reserves.	Oil and gas development could continue outside of any restricted area.
Provisions could be made to permit compatible and transitory activities (e.g. shipping) in restricted areas when beluga are absent.				
Disadvantages				Management requirements for other fish and marine mammals can be incorporated into the framework provided by a Beluga Management Area.
				Good framework for cooperative decision-making with Inuvialuit, industry and other government agencies for conservation of beluga.
	No hunting permitted; this is contrary to the Western Arctic Claim Settlement which gives the Inuvialuit the right to harvest a subsistence quota of beluga.	No hunting permitted in many traditional areas.	Management of hunting may be inconsistent in different areas of the Beaufort Sea. No area where hunting <u>not</u> permitted.	Depending on nature and location of any restricted areas, possible difficulties in implementation because of existing hunting and industrial activities.
	Not possible to implement because of existing hunting and industrial activities and the provisions of the Western Arctic Claim Settlement.	Difficult to implement because of existing hunting and industrial activities and provisions of Western Arctic Claim Settlement. Leaves other areas unprotected except through existing reactive regulatory processes.	Possible difficulties in implementation because of existing industrial activities. Leaves other areas unprotected except through existing reactive regulatory processes.	
Not consistent with any further oil and gas development in the Beaufort Sea.				
Difficult to manage any effects of hydroelectric power developments.				
Management requirements for other fish and marine mammals may not be incorporated easily with these three approaches.				
Legislative basis unclear.	Legislative basis unclear.	Legislative basis unclear.	Legislative basis unclear.	Legislative basis unclear.
Boundaries unclear.	Boundaries unclear.	Boundaries unclear.	Boundaries unclear.	Boundaries unclear.
				Types of zones, their locations and their implementation undefined.