Annual Assessment of Subsistence Bowhead Whaling Near Cross Island, 2006: cANIMIDA Task 7 Annual Report

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Executive Summary

This Task Order, funded by the Minerals Management Service (MMS) has as its broad objective the description of subsistence whaling as currently conducted near Cross Island by residents of Nuiqsut. This effort is designed to measure basic descriptive parameters of Cross Island whaling so that observed changes (if any) can be analyzed in relation to such factors as oil and gas activities, weather and ice conditions, or other variables. Special attention is devoted to geospatial information through the sharing of GIS information by participating whaling crews. Annual project reports are only for the purposes of reporting information collected, with no analysis of the information either as a self-contained database or in conjunction with the many pertinent external databases. As a second broad objective, the project is designed as a collaborative effort of MMS and its contractor, Applied Sociocultural Research (ASR), the subsistence whalers from Nuiqsut, and the Alaska Eskimo Whaling Commission (AEWC). The project will develop a system for collecting information that local whalers themselves can adopt, adapt, and maintain. This report documents the results of the third year of this component of the cANIMIDA project and will be continued by at least one year of additional data collection.

Three methods of information collection are employed – systematic observations, collection of daily vessel locational information from handheld GPS units, and whalers' self-reports and perceptions. Emphasis has been placed on such measures as:

- Number of crews actively whaling (observation)
- Size and composition of crews, and fluctuation over the whaling season (observation)
- Number of whales harvested (observation, self-report)
- Days spent whaling, and days prevented from whaling (weather, equipment failure or repair, etc.) (observation, self-report)
- Days suitable for whaling when whaling did not occur (observation, self-report)
- Subsistence activities occurring other than whaling (self-report, observation)
- Location of whale sightings and whale harvest (GPS, self-report)
- Location of whale searching (GPS, self-report)
- Local weather and ice conditions (observation,
- self-report)
- Bowhead whale behavior in the Cross Island area, and indicated differences from past experience (self-report)
- Changes in access or other issues related to the whale hunt, such as increased effort for the same (or reduced) harvest, increased risk, increased cost (self-report)

In 2006, three crews were on Cross Island a total of twenty-one days each (counting day of arrival and day of departure). A fouth crew was on Cross Island for twenty days. At least three boats went scouting on ten different days. Whales were seen on eight of these days, although fewer whales were seen in the early part of the season, especially when the whalers were confined within the barrier islands by ice conditions. Single whales were struck and landed on each of the last four days that boats went out scouting. Each of the four crews that whaled landed a whale. Weather prevented whaling on four days, two days were devoted to travel, one day to preparing to whale once on Cross Island, and four days to butchering and packing to leave Cross Island at the end of the season.

The number of crew members in each vessel scouting for whales varied 2 to 7 per boat per day (most commonly 3 or 4), with an average of 4.3 crew members. Scouting trips varied in duration from two hours eight minutes to fifteen hours fifteen minutes, with an average of eight hours thirteen minutes and a median of nine hours twenty-three minutes. Total trip distance varied from 18.3 to 107 miles with a greatest distance from Cross Island of from 5.8 to 47.6 miles (average round trip 61.3 miles, median round trip 62.7 miles, average furthest distance from Cross Island of 22.4 miles, median of 19.7 miles). Whales were struck from 14.1 to 17.8 miles (average 16.75 miles) from Cross Island, at an average bearing of 58.75° true from Cross Island. Other daily trip characteristics -- GPS tracks, marked points, self-report of significant sightings, and other perceptions – were also collected and are discussed in the report.

In 2006, the first whaling crew went to Cross Island on 2 September, and the fourth and last crew arrived on Cross Island 3 September. Overall, reasonably good weather and seas marked the 2006 Nuiqsut whaling season, with only four scouting days lost to weather. Ice conditions limited the whalers' areas of activities early in the season. During the first four scouting days of the season, few whales were seen – no whales on one of these days, and a single whale on each of the other three. The whalers saw non-whaling vessels on all four days of scouting activity. These vessels were also within the barrier islands because of ice conditions. Once the ice conditions moderated, whalers saw more whales and did not report seeing non-whaling vessels. They went out scouting a total of ten days. They saw whales on eight of them, and took single whales on each of the last four days on which they went out scouting. The whalers called a cease fire on 18 September because they had completed their quota of four whales. They spent several days completing the tasks of butchering the whales, cleaning up the island, and packing, and left for Nuiqsut on 22 September. In summary, the 2006 Cross Island hunt was quite successful. The full quota of whales was taken. Total whaling effort expended was greater than in each of the last three years (2002-2005) but less than in either 2001 or 2002. Whalers reported that ice conditions apparently affected the distribution of whales, but other than requiring more effort and longer trips did not negatively affect the season. Sea conditions were not ideal, but again the weather cooperated at least enough to allow for a successful hunt. The whalers had a season-long concern with non-whaling vessel traffic, but did not report any specific conflict incidents. Some whales, especially on days when few whales were seen, were reported to be more "spooky" than others, but no general pattern of "spookiness" was reported by the whalers. No whale feeding behavior was reported, although one of the one whales landed had mud on its jaw.

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Acronyms and Abbreviations Used in Tables, Text, and Appendices

Acronym or Abbreviation	Expanded Term or Reference
UA[1]	Akiviana Whaling Crew
BO[1]	Oyagak Whaling Crew
IAN	Aqargiun Whaling Crew
NAP[1]	Napageak Whaling Crew
NUK[1]	Nukapigak Whaling Crew
#	Number
ACS	Alaska Clean Seas
AEWC	Alaska Eskimo Whaling Commission
ANCSA	Alaska Native Claims Settlement Act
ANIMIDA	Arctic Nearshore Impact Monitoring in Development Area
BP	Barometric Pressure
BPXA	British Petroleum Exploration Alaska
cANIMIDA	continuation of ANIMIDA
CI	Cross Island
esp.	especially
F	Fahrenheit (temperature measurement)
ft	Feet
GIS	Geographical Information System
GPS	Geographic Positioning System
HAD	Human Activities Database
HCC	High Cloud Cover
HP	Horse Power
IHLC	Inupiat History, Language, and Culture Commission
IWC	International Whaling Commission
MFCI	Miles From Cross Island
mmddyy	Date Format – month/day/year
MMS	Minerals management Service
MPH	Miles Per Hour
N,S,E,W and combinations	Compass directions (north, south, east, west, northeast, etc)
NA	Not Applicable
NQT	Nuiqsut
NSB	North Slope Borough
NSB DW	North Slope Borough Department of Wildlife Management
OCS	Outer Continental Shelf
OWA	Oil/Whalers Agreement
TOT	Total Time (of individual boat trips)
UNK	Unknown
w/number or /number	With the specified number (of people)
WCA	Whaling Captains Association
WCC	Whaling Communication Center
WD	West Dock (Prudhoe Bay)
WF	Weather File (time series of weather station measurements)

[1]When crews use multiple boats, each boat is differentiated by a number after the crew designation (1-4)

Acknowledgments

This work would not have been possible without the assistance of a great number of people. Foremost among them must be the whalers and other residents of Nuiqsut. While it is unfair to single out individuals when all provided essential information and support in what is after all a communal and cooperative undertaking, I would be remiss if I did not explicitly thank those whaling captains and their crews who extended me the hospitality of their cabins. This is the report on my sixth field season on Cross Island, for which the Ahkiviana crew served as my hosts. Paul Kittick, as my host for the first year when the project was still an unknown quantity to the whalers, also has my utmost appreciation. Archie Ahkiviana agreed to be my host the second year, when Paul did not whale, and Billy Oyagak served as my host the third season, and they both also have my profound thanks. The late Thomas Napageak was my host for the fourth season, and the Ahkiviana crew again for the fifth season. I of course also thank the other crews who were out on Cross Island for the 2001-2004 seasons (Nukapigak, and Aqargiun), and David Pausanna for all the help he has given me over the phone and while I have been in Nuiqsut. I cannot begin to list the other residents of Nuiqsut who shared much more of their time and knowledge than I had any reason to expect. Maggie Ahmaogak of the AEWC has also been generous with her advice, support, and cooperation.

Industry has also provided a good deal of help in various forms, from advice to more concrete logistical support. Ray Jucubczak, and Concie Rock at BPXA were especially notable in this regard, although several individuals at Alaska Clean Seas were also very helpful. BPXA also assisted with the transformation of the raw GPS track information into more usable GPS-based maps for the 2001-2003 data. Although these maps have since been replaced through more recent in-house software, their early assistance is much appreciated. More recently, other industry participants in the Conflict Avoidance Agreement have also provided logistical support, and BP has provided supplemental financial support for the Cross island research effort in conjunction with their annual application for permits for the Northstar production unit.

MMS, as the sponsor of the project, also deserves a formal "Thank you." Dick Prentki has been an ideal COTR, even though the course of the project has not always been smooth.

Lastly, the entities for which ASR performed this work as a subcontractor for the 2001-2003 field seasons, LGL Limited of Alaska and Batelle, must be thanked for their willingness to trust that the work would be accomplished with a minimum of oversight on their part. The budget for this limited task would not support a good deal of administrative overhead, and both worked with me to make it work. I am especially grateful to Dale Funk at LGL.

The above notwithstanding, all errors and shortcomings of this report are the responsibility of Michael Galginaitis and ASR. Please advise me of as many errors, misunderstandings, or confusing discussions as you find, so that whatever effort continues in this regard can bear as much fruit as possible. But again, none of this work would be possible without the cooperation and support of the Nuiqsut whalers, to whom I again give my most profound thanks.

Introduction and Objectives of the Task Order

This Task Order, funded by the Minerals Management Service (MMS) has as its broad objective the description of subsistence whaling as currently conducted near Cross Island by residents of Nuiqsut. It is the only socioeconomic component of the cANIMIDA program, which focuses more on physical science. While "traditional" subsistence whaling has been well documented in a number of locations, contemporary subsistence whaling is not as well documented, especially in terms of changes over time. This effort is designed to measure basic parameters of Cross Island whaling so that observed changes (if any) can in the future be analyzed in relation to such factors as oil and gas activities, weather and ice conditions, or other variables. Observations, and the narrative annual report summarizing them, will focus on descriptive measures of activities associated with whaling. Special attention is devoted to geospatial information through the sharing of GIS information by participating whaling crews. Project annual reports are only for the purposes of reporting information collected, with little analysis of the information either as a self-contained database or in conjunction with external databases. Among the many external databases of potential pertinence to the descriptive information collected under this task order are the Human Activities Database (HAD), although the database does not contain information later than 2000, and thus does not cover the time period of this project. Thus the HAD is primarily historical and is of most interest in terms of what information can be recovered about Nuiqsut whaling seasons prior to 2001. Of perhaps more potential utility for the more detailed information collected for this effort through the ANIMIDA and cANIMIDA projects are remote sensing information on ice cover or other geophysical parameters. Other linkages for potential future analysis (AEWC records of whale harvest, or untranscribed IHLC tapes, for example) also exist. Some of these may be discussed in the final synthetic report, following the last field season for this task under cANIMIDA (now budgeted for 2006, but MMS has an option for an additional year in 2007).

As a second broad objective, the project is designed as a collaborative effort among MMS (and its contractor, Applied Sociocultural Research), the subsistence whalers from Nuiqsut, and the Alaska Eskimo Whaling Commission (AEWC). Beyond the goal of six years of descriptive information on Cross Island subsistence whaling activities, the project was to develop a system for collecting such information that local whalers themselves could adopt, adapt, and maintain. The methodology has now been developed sufficiently, but the transition to local implementation of the program has been slow and is still in process.

This is the third field season for this task as part of the cANIMIDA project, but as discussed above the sixth field season for the overall program. Annual reports will be produced for the 2004, 2005, and 2006 field seasons. A more analytical report summarizing and analyzing the full six years of data (2001-2006) will also be produced, after the 2006 field season (or perhaps after a 2007 field season).

An Overview of Contemporary Subsistence Whaling in Alaska

The Inupiat of the North Slope maintain a vital native culture -- with kinship, dependence on hunting wildlife resources, and a respectful relationship to the land as fundamental values. Hunting provides most of the meat consumed by Inupiat. Whaling not only provides a significant

part of this food, but is also a key social organizational activity for North Slope Inupiat. Whaling is also a central ideological idiom for the expression of key cultural values, and an important vehicle for the transmission of those values (Worl 1978, Rexford 1997). Subsistence whaling has been (and continues to be) a key focus for Inupiat and Yupik culture and society (Bering Straits area, Northern coastal Alaska) for at least 1,000 to 1,500 years (Dumond 1984, Krupnik and Stoker 1993, McCartney 1994). However, nothing more than a brief orientation to contemporary subsistence whaling in Alaska is attempted in this report, and references are illustrative, not exhaustive. This discussion provides only a general description of some key aspects of the organization of subsistence whaling, within the context of its management regime, that are important for an understanding of this project's methods and results. This discussion proceeds from the general to the more specific.

In Alaska, ten coastal communities currently field whaling crews and are members of the Alaska Eskimo Whaling Commission (AEWC). The AEWC was formed in 1977 in direct response to the International Whaling Commission's (IWC) decision to ban the Alaskan subsistence bowhead whale hunt. The IWC had two main concerns – that the bowhead whale population was too small to sustain a regular harvest, and that subsistence hunting methods were too wasteful (too many animals were killed but then "lost"). As a result of a complicated series of negotiations, the United States and the AEWC convinced the IWC to allocate an initially small quota of bowheads that could be harvested in 1978. This quota was accompanied by an data collection program to measure and monitor the bowhead whale population and the efficiency of subsistence whaling harvest. This has resulted in an increased confidence in the robust size of the bowhead whale population and an incentive for the reduction of "struck and lost" whales (increase in the efficiency of the hunt) which has been quite successful. Because the bowhead population has been steadily increasing, along with the overall success rate of the hunt, the IWC has consistently increased the quota of animals available for harvest. Currently AEWC co-manages the Alaskan subsistence bowhead whale hunt with the National Oceanic and Atmospheric Administration, Department of Commerce.

The AEWC is essentially a self-regulating body that has implemented management practices that protect the reproductive capability of the resource, increase whaling success and/or reduce waste, increase the safety of the hunt, and enforce individual accountability for not complying with these practices. For example, whales with calves cannot be taken. This not only maximizes the population's growth, but is also a safety rule, since Inupiat whalers know that female bowheads with calves are the most aggressive and dangerous animals to approach. The first strike on a whale in the fall must be made with a darting gun (recent change in AEWC Management Plan), so that a bomb is shot into the whale at the same time that a float is attached to the whale with a harpoon. Since not all whales are killed with the first strike, the float serves to both slow the whale down and to assist the whalers in following it. A research program to increase the efficiency of whaling bombs has been ongoing, with periodic workshops to disseminate information and new technology to the whalers (2005 was the first year that the penthrite bomb, often termed the "superbomb," was available to Nuiqsut whalers). Guidelines for the size of whales to be taken are suggested, since experience has shown that larger whales pose the potential for more wastage than smaller whales (they potentially take more time to tow and butcher, and time often is directly related to wastage). AEWC sanctions have been most severe for violation of the quota set for a given community or for striking a mother with a calf – the

revocation of the right to go whaling for a specified number of years. Other sorts of violations may result in fines or public censure. In short, the AEWC has constructed a flexible system that rewards its members for compliance with rules and practices that foster both AEWC and IWC goals, and potentially penalizes them for noncompliance. Few cases of noncompliance have occurred, and this management regime is consistently cited as one of the most successful examples of such management (Huntington 1992). The original decision documents for the 1978 IWC action (U.S. Department of Commerce 1977,1978) also contain much of interest.

The IWC sets an overall quota for the hunt, and the AEWC in turn allocates that quota among the whaling communities. Each whaling community is represented by a local Whaling Captains' Association (WCA) at the AEWC, and each local WCA is responsible for managing the hunt in its respective community. Nuiqsut initially received an allocation of one whale landed or one strike, whichever occurred first, for 1978. That is, a harpoon that hits a whale counts as a strike, regardless of whether that animal is actually taken or not. Not all "struck and lost" whales necessarily die, but the conservative AEWC/NOAA management system assumes that they do. Nuiqsut's current allocation is four whales or four strikes. Unused strikes and quota can be transferred between communities, quota is now allocated in multi-year blocks, and there can be some "roll-over" of quota from one year to the next. Thus, the harvest in some years for any given community may be greater than the "normal" quota allocated, if a community's WCA requests and is granted one or more strikes over their "normal" quota allocation.

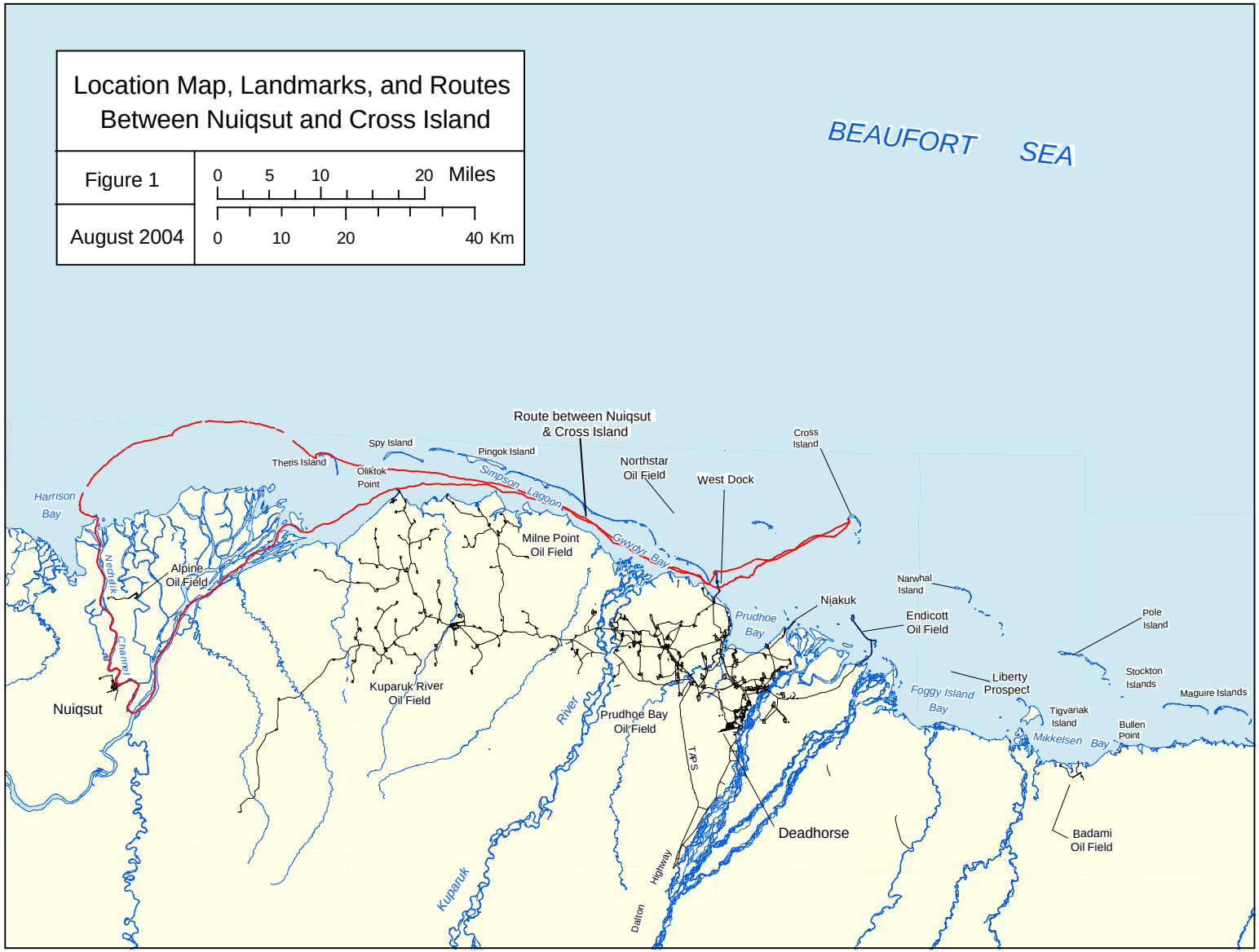
Subsistence whaling in Alaska occurs in the spring (generally April-May) and the fall (generally September-October), when the bowhead whale migration brings them reasonably close to the whaling communities. In the spring, bowhead whales migrate north through the Bering Strait and then, in Alaskan waters, east of Point Barrow into Canadian waters, where they spend the summer (some also go west into Russian waters). In the fall they reverse this course. Spring whaling differs from fall whaling. In the spring whales are migrating through relatively narrow open leads in the ice whereas in the fall the water is generally more open. Some years can be very different, however and there can be thick floating ice near Cross Island in the fall. The first years documented by this project, 2001-2004, were relatively ice-free, but in 2005 and 2006 floating pack ice has confined Nuiqsut whalers for most (2005) or part (2006) of the whaling season. Spring leads do not open up close enough to Nuiqsut or Kaktovik to allow these communities to whale in the spring. In the fall, because whales are not confined by leads and generally so far offshore at those points, it is difficult in most years for whaling communities south of Barrow to whale (although Wainwright and especially St. Lawrence Island whalers have increasingly taken a few whales in the fall). Thus most whaling communities, located on the Bering and Chukchi Seas, whale in the spring. Barrow, located where the Chukchi and Beaufort Seas meet, whales in both the spring and the fall. Nuiqsut and Kaktovik whale only in the fall. Spring whalers have traditionally and historically used only skin boats (until recently), whereas fall whalers use more durable wood, aluminum, and fiberglass boats. This is related to three general seasonal differences: the greater need to avoid unnecessary noise in the spring, the harsher environmental conditions of fall whaling (rougher seas, more floating ice), and the greater need for speed in the fall to find and pursue whales in more open water. Recent changes in spring whaling, especially in Barrow, have been described and discussed in Wohlforth (2004), and interested readers are referred to that source. This report discusses only Nuiqsut whaling, currently conducted from and near Cross Island in the fall.

The Historical Context of Cross Island Whaling

The present community of Nuiqsut has a relatively short history, having been resettled in 1973. However, Inupiat use and occupation of the Nuiqsut area has a very long history, which is the basis for Nuiqsut's status as a village recognized under the Alaska Native Claims Settlement Act (ANCSA). Nuiqsut is located about 12 miles inland on the Colville River (Figure 1), which is not a typical location for a whaling community. However, its residents trace their ancestry to people who whaled in the mid-Beaufort Sea (including near Cross Island) in the first half of the twentieth century, as well as prior to that time. Treatments of the complex and dynamic history of the North Slope region in general, and the Nuiqsut area in particular, can be found in Brown 1979, Galginaitis et al. 1984, Hoffman et al. 1988, Galginaitis 1990, and Long 1996. These sources are the basis for the information in this section. Figure 1 shows the location of Nuiqsut on the Colville River, and Cross Island in the Beaufort Sea, as well as typical routes between Nuiqsut and Cross Island and some significant landmarks in between. Cross Island is about 73 miles northeast of Nuiqsut "as the crow flies" and from 92 to 109 miles away by boat, depending on which channel of the Colville River can be used to reach the ocean. When the water level in the river is high, the more direct route can be used. When the water level is low, the more direct river channel is too shallow for most boats, so the longer route is used. Cross Island itself is about eleven miles offshore, but more importantly from a logistical point of view is ten miles from the Endicott causeway and fifteen miles from West Dock.

Prehistoric use of Cross Island has not been well documented or investigated archaeologically, but documentation for more recent use is quite extensive. Families who lived on and used Cross Island seasonally during the first half of the twentieth century included the Woods, Pausanna, Saavgaq, Ulaaq, Ahsoak, Ahgook, Ikpikuk, Ahvakana, Akpik, Sovalik, Kaigelak, Tigulak, Ahsogeak, Ahkivgak, Ekolook, and Ekowana (Smith 1980). Perhaps most important in terms of whaling was Taaqpak, who used Cross Island as a whaling base from the early twentieth century through the late 1940s. Documentation for his whaling harvests is quite incomplete, but include accounts of whales taken near Cross Island in 1922, 1927, 1928, and 1938. While relatively few of today's active whalers learned directly from Taaqpak, many have learned from those who were on his crews (or in turn learned from those who knew Taaqpak). Taaqpak himself maintained that Inupiat had hunted whales near Cross Island for centuries (Carnahan 1979:21-31). Thus whaling near Cross Island has a strong cultural continuity.

When Nuiqsut was resettled in 1973, many of the original settlers traveled from Barrow with the supplies necessary for their life in tents for a year or more. They used a variety of means – sleds towed by a small Cat (a tractor with tracks), snow machines, and weasels (another sort of tracked vehicle, of WW II vintage). One of these original founders took the first whale for Nuiqsut that fall, while on his way to Kaktovik to obtain some *muktuk* and meat to take back to the village. He and his crew had been looking for whales and had been out about six weeks. They had not seen any whales in that time, although they had seen a great number of seals, which was about their only source of food after the third week of their trip. By the sixth week the whaling captain had concluded that they were too late – that the whales had either passed them by or were too far from the shore for them to find and successfully land. On the chance that Kaktovik whalers had been more successful (since communications were much more rudimentary in 1973 than currently, he did not know if Kaktovik had taken any whales or not), he decided to go to



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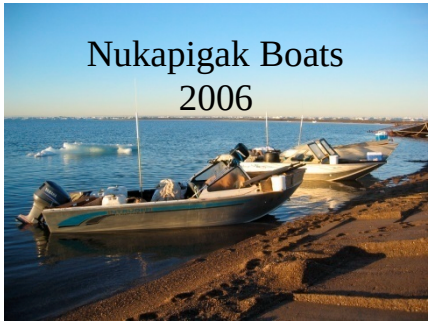

Nukapigak Boats
2006


Nuiqsut, July 2003

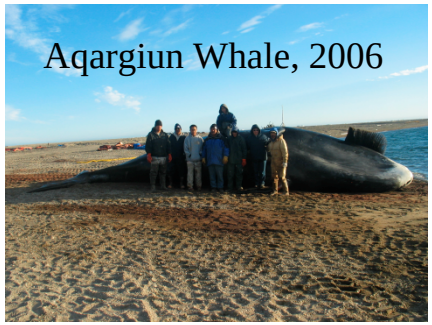

Nukapigak Whale
2006


Ahkiviana Boats
2006


Ahkiviana Whale
2006


Aqargiun Boat, 2006


Cross Island form the top of Oyagak Cabin
9/05/06


Aqargiun Whale, 2006


Oyagak Boats, 2006


Oyagak Whale, 2006

Kaktovik to obtain some *muktuk* and meat to take back to Nuiqsut. They then came upon a whale in the Brownlow Point/Flaxman Island area, in shallow water. They took this whale, butchered it, and returned to Nuiqsut with as much as possible. Several boats from Nuiqsut then made another trip to the harvest site to recover more of the *muktuk*.

Most of the six members of this 1973 crew are now active Nuiqsut whalers, and the captain, belying his age, was one of the most active Nuiqsut whalers until his recent death (2005). In the years immediately after 1973 relatively few crews whaled from Nuiqsut, with relatively infrequent success. Nuiqsut whalers regularly went to other communities in the spring to participate in spring whaling (a pattern that some continue up through the present), and sometimes in the fall, rather than whale in the mid-Beaufort Sea area. The next "Nuiqsut" whale was not taken until 1982, although crews whaled from various locations between 1973 and 1982 – Pingok Island, Narwhal Island, and Cross Island among them. A summary of whale harvest by Nuiqsut crews is presented in Table 1 below. Nuiqsut whalers attribute at least part of their relative lack of success in the 1970s and 1980s to interference from oil and gas exploration, as well as poor weather and ice conditions in some years, and a difficult logistical situation. These factors are also evident in the three years with the greatest incidence of "struck and lost" whales (1989-1991 or 1992). Once Cross Island was established as a logistical center for Nuiqsut whaling, and Nuiqsut whalers gained experience there, harvest success became much more regular. Another factor in this increased success may be more moderate ice conditions since 1992 (although this may be countered by greater sensitivity to higher winds when ice cover is lacking).

Cross Island is a low sandy barrier island with an artificial higher area built from gravel. This higher area was constructed for past oil and gas exploratory drilling. Cross Island is about 3 miles long and 150 yards wide, and is constantly changing due to erosion and redeposition. Especially in the earlier years logistical support for whaling on Cross Island was very difficult. Whalers had to haul or find their own gas and water, and hunted and fished to provide most or all of their food. There was at most one cabin for however many people were whaling. Since the mid-1980s, with the advent of the Oil-Whalers Agreement (OWA) in 1986 between the oil industry and fall whalers (represented by the AEWC), logistical considerations have become somewhat easier. The current agreement is referred to as the "Conflict Avoidance Agreement" (CAA). The oil and gas industry (and especially BPXA) has been providing logistical support of various sorts to Nuiqsut whalers as a mitigation measure for potentially disrupting subsistence whaling by exploration, development, and/or production activities. With the increased interest in offshore exploration in the Beaufort Sea in 2005 and for the foreseeable future, other energy companies are also significant participants in the CAA.

At the most basic level, the OWA/CAA provides for the constant communication between industry and the whalers about all of their respective ongoing activities, so that each can avoid interfering with the other. The mechanism for this mutual communication is the Whaling Communication Center (WCC – also referred to as the "Conflict Avoidance Communication Center", the "Oil/Whalers Communications Center", or "Com Center") in Deadhorse. The WCC operates during each fall whaling season and is staffed by bilingual radio operators. All industry and whaling vessels are required to report their activities to the WCC in real time (purpose, time left, time returned, significant events as they occur), and the WCC maintains a log of these reports which is archived by the AEWC. This provides a record of activities as they take place, and also

Table 1: Recent Harvest of Bowhead Whales Near Cross Island

Year	Whales			Notes
	Quota	Landed	Struck & Lost	
1973	NA	1	0	
1982	1	1	0	
1986		1	0	
1987		1	0	
1989		2	2	Oil industry vessel disturbance noted
1990		0	1	Oil industry disturbance, also rough seas
1991	3	1	2	Poor weather, bad ice conditions
1992	3	2	1	
1993	3	3	0	Very favorable conditions
1995	4	4	0	
1996	4	2	0	
1997	4	3	1	
1998	4	4	1	
1999	4	3	0	
2000	4	4	0	Very favorable conditions
2001	4	3	0	
2002	4	4	1	
2003	4	4	0	Poor weather
2004	4	3	0	Poor weather
2005	4	1	0	Very poor weather, bad ice conditions, disruption
2006	4	4	0	Ice restrictions first half of season

Notes: Years of no harvest and no "struck and lost" are not listed. This does not imply that no whaling effort was made that year. "Quota" was not applicable in 1973.
Source: Compiled from AWC records, personal communications from Nuiqsut whalers, and field notes from the 2001-2006 whaling seasons

documents to some extent the whaling activities. It also allows the WCC to advise industry of planned industry activities that may interfere with ongoing whaling, or to suggest windows of opportunity (when whaling is not taking place) when industry activity may have minimal potential effects. Unfortunately, vessel activity not associated with the oil and gas industry (for example, commercial barge traffic) need not coodinate with the WCC in the same way, so that this is not a totally effective mechanism for the mitigation of all such potential effects. Other sorts of logistical support have been supplied at least in part by industry. These have included low-cost connex units (converted into seasonal cabins on Cross Island); a winch to help haul whales up at Cross Island; assistance with a steadier supply of gasoline; a generator system to supply electricity to the cabins during the whaling season; diesel fuel (for the winch and generator); water and other supplies; help with transporting the butchered whale to Nuiqsut; at least limited phone service for one or two crews; help with mobilization and demobilization; and the assurance of available emergency assistance. Alaska Clean Seas (ACS) is the industry's contractor for much of this OWA support, as a small part of its overall responsibilities (which are mainly logistical and/or related to oil spill response). BPXA and ConocoPhillips provide most of the funding for ACS, but BPXA bears the

majority of OWA-related costs since ConocoPhillips has little or no offshore interests. The AEWC does pay for some of the services provided under the OWA, but the amount and exact services are not reported. Neither industry nor the AEWC discloses the financial terms of the OWA.

Preparations for whaling, in one form or another, take place during the entire year. This report focuses on the activities during the harvest season. The final preparation of boats and equipment happens in August, and a meeting of the NWCA is conducted to set a date for the start of the hunting effort and to review the rules and regulations. Labor Day is the normative date for whaling crews to go to Cross Island, but it is not unusual for individual crews to go out earlier, especially if Labor Day is "late." In 2004, one crew (with two boats) went out August 15. This was considered extremely early by the other crews, but this captain was thinking that the migration of whales had been earlier in the last several years than it had historically been and that weather in early September had been increasingly marginal for whaling in the last several years. The combination of bad weather and mechanical problems did not allow him to fully test his conjectures. The few times that his crew went scouting in August they did not see any whales. Crews prefer to go out together or with multiple boats, for safety, so that two boats is usually the minimum number.

Once the crews are on Cross Island the focus is on whaling. Boats usually go scouting for whales on all possible days unless a whale was taken the prior day, in which case butchering usually has priority (although this pattern may be changing – see the discussion of the 2006 season below). When a whale is taken, it is towed to Cross Island, hauled up on the gravel beach, and butchered. Select parts of the whale from the captain's share ("tuvsi") are sent to Nuiqsut via whaling boat the same or the next day "to feed the village". Occasionally it will be flown to Nuiqsut from West Dock, but will still be accompanied by a crew member to "run the flag" to the captain's house upon its arrival in Nuiqsut. The rest of the meat, *muktuk*, organs, and baleen is packed into plastic fish totes (or heavy, reinforced, corrugated cardboard boxes in 2004-2006) and transported to West Dock and then to Nuiqsut (most recently via ACS barge to West Dock and air freight to Nuiqsut). What is left of the whale is disposed of in the "bone yard." Once the quota is taken or conditions threaten to prevent returning to Nuiqsut (usually mid- to late-September), the whalers clean up the island, pack, and leave. Successful captains for that season will fly their flags.

Nuiqsut whalers first used wood boats and relatively small motors. Although they remember these vessels with fondness, and long for the economy of those motors, they also remember that they were limited in terms of speed and towing capability. Currently Nuiqsut whalers all use aluminum or fiberglass boats, 17 to 24 feet long, with motors of 70 to 225 horsepower. It is possible that a 16-foot boat may be used as a whale boat on occasion, but it would not be considered a primary boat. A few boats have cabins, but most are open. Boats typically scout for whales with a complement of three or four people, although some boat crews are as small as two and as big as eight. Although single boats do take whales on occasion, it is not encouraged and Nuiqsut boats almost always scout for whales in pairs, in case of mechanical break downs or other emergencies. Whaling crews with two or three boats are willing to whale on their own, but it is commonly agreed that five to seven boats is a preferable number to have available for whaling on a given day. More boats would be useful, and the availability of fewer boats decreases the efficiency, safety, and overall chance for success of the hunt.

Methodology

The data to be collected for this research will be discussed in terms of methods, with emphasis on the actual collection of descriptive information. In addition, it is important to address the issue of "hypothesis testing" in relation to the products of this research effort.

Hypothesis Testing

MMS explicitly required, as part of the proposal submission, the formulation of hypotheses related to potential changes in Cross Island subsistence whaling. These hypotheses can later be tested using the information collected by this research effort. Two major hypotheses were formulated:

- H1: Subsistence whaling activity and behaviors in the vicinity of Cross Island are significantly changed by offshore oil developments at Northstar and/or Liberty.
- H2: General subsistence activities on/near Cross Island are significantly changed by oil and gas activities associated with Northstar and/or Liberty.

These hypotheses are not stated in the "null hypothesis" format as such a formulation is counterintuitive to at least some of the local research participants and perhaps to the general public at-large. It will be necessary to express their implementation in that form for quantitative testing. It was explicitly recognized that the annual reports would not be able to test these hypotheses. Such tests will require more data (longer time series) and significant effort devoted to analysis, and will be part of the synthetic cANIMIDA final report (after the 2006 or 2007 field season).

In summary, the hypotheses have been formulated as examples of possible relationships that are testable after concrete empirical (and ideally quantitative) measures of Cross Island whaling that implement empirical facets of them have been compiled for a number of years. The hypotheses (and the measures to test them) thus guide the practical methods of collecting and archiving the information, to ensure that they will be useful for testing these hypotheses (as well as others as they are developed).

Descriptive Data Categories

The primary goal of data collection is the compilation of quantified measures of subsistence whaling behavior. Emphasis has been placed on such measures as:

- Number of crews actively whaling
- Size and composition of crews
- Fluctuations in active crew size and composition over the whaling season
- Number of whales harvested
- Days spent whaling
- Days prevented from whaling (weather, equipment failure or repair, etc.)
- Days suitable for whaling when whaling did not occur
- Subsistence activities occurring other than whaling
- Location of whale sightings and whale harvest
- Location of whale searching
- Local weather and ice conditions

These measures are a mixture of descriptive characteristics suggested by MMS and factors derived from or related to the perceptions of whalers on how and why whale behavior has changed, requiring that whalers change their behavior in hunting whales. For instance, size and composition of crews are fundamental descriptive characteristics that must have some relationship with the availability of whales. They also depend on the alternative (non-Cross Island) activities available to the crew members, such as alternative subsistence activities, wage labor opportunities, education, and so on. Because of the focus on Cross Island activities, information on the "full" range of factors that may be affecting the data collected was thus not compiled, but the range of possibilities was generally elicited from whalers during discussions of topics such as crew composition or crew recruitment. In this sense, these generally descriptive measures are thus also characteristics identified by Nuiqsut whalers as potentially significant and variable measures from year-to-year. The locations of whale sightings, harvests, and general whale searching behavior are all important in the examination of whether whales can be found in the same locations every season, or if this changes from year-to-year. If the latter, what causes such shifts in location is important. Nuiqsut whalers have experienced such variation and have suggested a number of factors to account for it. This project develops information to examine these questions about variation and changes in Cross Island whaling behavior. For instance, this information will allow for a preliminary (albeit rough) examination of "catch per unit effort" as well as factors associated with the distance whalers need to travel from Cross Island to whale.

Nuiqsut whalers generally agreed the suggested measures were significant and pertinent to the issues to be addressed. During the first field season (2001) Nuiqsut whalers also wanted to ensure that their more general perceptions and observations of whale behavior, and especially changes in whale behavior that had implications for hunting success or safety, were adequately noted. Such perceptions are also the most likely way for Nuiqsut whalers to contribute to future hypothesis formation and testing. Thus, information categories were added to ensure that whalers' perceptions and observations were noted on:

- Bowhead whale behavior in the Cross Island area, and differences from past experience; and
- Changes in access or other issues related to the whale hunt, such as increased effort for the same (or reduced) harvest, increased risk, increased cost, and so on.

These aspects of the research assumed more importance after the 2005 whaling season. Whalers reported that commercial (non-whaling) vessel traffic interfered with their whaling activities. BP requested that the researcher present a report on these aspects of the Cross Island subsistence whaling season at the stakeholder meetings conducted to collect information during the annual agency permitting process for planned offshore activities. MMS, the sponsor of this project, determined that this was not a conflict of interest with the purposes of the research – and indeed, was a direct example of how the information from the project could be used for ongoing management decisions. Thus, the project results of the 2005 Cross Island subsistence whaling season were presented at the 2006 "Open Water" meetings in Anchorage on April 18, to an audience of stakeholders including at a minimum Government agencies, industry, whalers, scientists, and environmentalists. A similar presentation for the 2006 season is planned for the Open Water meeting in April 2007.

Thus, the objective of the MMS Cross Island project is to describe Cross Island whaling using measures that document year-to-year variability in whaling and, when sufficient time series data are available, will allow tests of hypotheses on the causes of this variability. Concern about potential effects of oil and gas development on whaling is the prime motivation for the MMS project, but it is recognized that other factors can strongly affect Cross Island whaling and thus need to be considered as well. These other factors include weather and ice conditions, equipment problems, whalers' decisions, and non-industrial human activities. During the MMS-sponsored project, information is collected on level of hunting effort, including how many boats go out each day, crew size, how much time is spent on the water, lengths of trips in miles, and furthest point away from Cross Island during each trip. Information is also collected on the abundance and distribution of whales, including the number and location of whales observed and/or struck by the whalers. This information will be applied to internal MMS management leasing plans and decision, as well as stipulation requirements, and has also been recognized as important for the management decisions for other agencies.

Information on the level of hunting effort was collected by systematic observations by the researcher, who was on Cross Island for most of the whaling season in each of 2001–2006. This information was supplemented by conversations with all of the boat crews. Further information on the hunting effort, and on the abundance and distribution of whales, was obtained by issuing Garmin handheld GPS (Global Positioning System) units to all boats. The whalers were given instructions on how to record the GPS coordinates (track) of the boat's trip, and how to mark waypoints of significance, including whale sightings and strikes, sightings of vessels other than whaling vessels, and other pertinent observations. This information is then mapped, and is the basis for the Figures included in this report. It should be noted that whaling crews mark relatively few points when on the water, and the points they do mark represent the boat's position at the time a whale or group of whales was seen. These whales may be quite close or miles away (depending on the conditions of the day).

This information was supplemented by subsequent conversations with each boat crew, while reviewing the mapped GPS information on a laptop computer with them. When reviewing tracks after their return, crew members would often identify locations where they saw whales, and these points were added to the GPS information. Some of these points were boat positions, and some were estimated positions of whales (and thus not on a boat track). Other points were reference coordinates and may represent past whale sightings, so they also may not be on boat tracks. Galginaitis did not accompany the whalers in their boats while they were hunting, since it is not permissible for any non-Native to participate actively in hunting marine mammals.

Consultation

Consultation for the sixth field season built upon and was coordinated with that for the five previous seasons, as described in previous annual reports. These consultation efforts occurred in conjunction with efforts on behalf of several other MMS projects. In addition to periodic phone calls (primarily to the Native Village of Nuiqsut, the City of Nuiqsut, and various whaling captains in Nuiqsut; and the AEWC and IHLC in Barrow), consultation efforts consisted of the following:

- February 23-27, 2006 trip to Nuiqsut to report to present a short summary of the 2005 season's research effort and report at a NWCA meeting. Consultations with the whaling captains, both as a group and in individual meetings, refined and corrected accounts and explanations of the GPS tracks, and especially vessel encounter events. Early planning of the 2006 field season was also initiated.
- March 13, 2006 consultation with Edward Nukapigak in Anchorage. The discussion focussed on the GPS tracks for the Nukapigak crew in 2005 and the 2005 annual report, but also included future plans for the 2006 season.
- March 17, 2006 attendance at the AEWC meeting in Anchorage, for the session where GTX presented its plan for 2006 open-water seismic activities in the Chukchi and Beaufort Seas. Other petroleum industry companies also presented their plans. The AEWC had requested these presentations as a prelude to the negotiation of a global Conflict Avoidance Agreement between the subsistence whalers and the petroleum industry, instead of a number of individual such agreements between each company planning activities and the whalers.
- April 18, 2006 presentation of the Cross Island research at the annual Open Water meeting, sponsored by NOAA to facilitate communication about the permitting process for oil and gas exploration. The presentation was explicitly related to BP's permit renewal requests for Northstar, since the project is designed as part of the monitoring effort for Northstar, but was of more general interest because of all the other planned activities for the 2006 open water season (seismic especially). This was also another opportunity to talk with the AEWC representatives about the progress of the project.
- August 21-23, 2006 trip to Nuiqsut, to attend the NWCA meeting scheduled for the evening of 8/21. This was a special meeting with AEWC and Shell representatives (on behalf of industry in general) in attendance, to go over the newly negotiated Conflict Avoidance Agreements. AEWC also introduced some recent changes in the AEWC management plan (mainly the requirement for fall whaling for the first strike to be made with a harpoon with a bomb attached). The NWCA also used this to review their rules for the conduct of the hunt and to finalize their plans. Consultations with each of the whaling captains led to the conclusion that no crews were likely to leave for Cross Island for at least a week, so after firming up plans to go with a specific crew, the researcher returned to Anchorage. This was a practical decision to conserve project resources and to facilitate work on other projects as much as anything else. A short review of the 2005 whaling season and the draft annual report for the MMS project was also reviewed with most of the Nuiqsut whaling captains during this trip.
- August 30-September 30, 2006 field trip to Nuiqsut, Cross Island, and Barrow. The Cross Island field research occupied September 2-22. The time prior to that was spent in Nuiqsut helping the crews to get ready. September 23 was spent helping fix a boat in Deadhorse and returning to Nuiqsut, and September 24-27 was spent consulting with whalers about field notes and GPS tracks and other field matters. September 28-30 was spent in Barrow in consultation with the NSB Wildlife Department, AEWC, and IHLC. In addition, short visits were made where Barrow whalers were butchering some recently landed whales.
- January 12-18, 2007 trip to Nuiqsut to consult with the whalers about the draft 2006 annual report and to attend a NSB/Pioneer workshop on the coordination and improvement of subsistence-related research in the Nuiqsut area.
- January 30 (and some time during the week before) consultation with Edward Nukapigak in Anchorage about the draft annual 2006 report and some specifics of the 2006 whaling season.

As in most prior years, the field arrangements were not totally firm until shortly before the season started. Unlike prior years, all crews left for Cross Island on the same day (although one crew experienced boat problems and had to delay their trip until the next day). Thus the researcher was present for the entire 2006 subsistence Cross Island whaling season.

Data Collection

The logistics of the 2006 field season were easier than in the previous years, as all crews left for Cross Island on the same day (although one was then delayed until the next day) and the researcher was in Nuiqsut well before that day. The only complication was a NWCA meeting the week before that required that the researcher either make two trips between Anchorage and Nuiqsut for the field season tasks or devote much more time to the project in Nuiqsut than was budgeted. The researcher made two trips, based on the budget constraints and the need to work on other projects. Although the researcher was present on Cross Island for the entire season, two GPS tracks were not collected and the two other GPS tracks were incomplete. The missing tracks were due to crews using GPSs with the tracking feature turned off as a result of not using the project-supplied GPS for that trip. Crews were reminded that they could use any GPS that they wished (and many prefer to use their personal GPS units with the tracking turned off), but that they should always take the project-supplied unit and turn it on. The partial tracks were due either to memory limits of the units on long trips, or the crews turning the units on after they had been on the water for a while. In addition, few GPS tracks for "travel" days between Cross Island and Nuiqsut were obtained, but they were not given much priority in 2006.

The 2006 whaling seasons can be characterized as having two distinct parts, and will be discussed in more detail in the "Results" section below. During the first period, when ice confined the whalers within the barrier islands as it had in 2005, the whalers only saw three whales in four days of scouting (one on each of three days). During the second period, when whalers were able to reach open water outside of the barrier islands, they identified thirty-six points where they saw one or more whales, or identified whale chase events such as first strikes or kill locations. Although some points duplicate sightings of the same whale, they are almost certainly counter-balanced by other points representing up to ten blows seen from the same boat position, so that "thirty-six" is most likely an underestimate of the actual number of whales observed. These points are the result of six days of scouting, on the first of which no whales were seen On the sixth day of scouting, many whales were seen (thirteen points marked or located) but no whales were struck. On the seventh day of scouting only one whale was seen, but it was struck very early in the day (8:20 AM) and landed. On the eighth day of scouting, relatively few whales were seen (four whale points marked or located), but again a whale was struck relatively early in the day (2:05 PM) and landed. On the ninth day of scouting many whales were seen (nine whale points) and a whale was struck later in the day (5:06 PM) and landed. On the tenth and final day of scouting, many whales were seen, even though the whale was struck relatively early in the day (11:29 AM) and landed. Thus it would appear that as soon as the whalers could reach open water, they had the possibility of finding and striking whales. However, it also appears that they saw more whales towards the end of the period when they could reach open water (the last three or four scouting days) as compared to the start of this period (scouting days five and six). The whalers did encounter some problems in the open water, away from the ice cover, due to "surf waves," but less than in 2005.

Table 2: Summary Characteristics[1] of Whales Struck Near Cross Island, 2006

Date	Time Struck	Length	Sex	Whale ID	Miles from Cross Island	Bearing from Cross Island	Notes
9/13/06	8:20 AM	42'6"	M	06N1	17.8	46° true	Nukapigak
9/14/06	2:05 PM	28'10"	M	06N2	17.4	74° true	Ahkiviana
9/15/06	5:06 PM	35'1"		06N3	14.1	49° true	Aqargiun
9/18/06	11:29 AM	34'0"		06N4	17.7	66° true	Oyagak

[1]All characteristics are from direct observations or GPS records made on the day of the activity, other than the WhaleID number. WhaleID numbers are assigned by the North Slope Borough Department of Wildlife Management (NSB DW). Times are approximate and are derived from the recorded GPS tracks and/or radio logs, combined with whalers' accounts, as are the distances from Cross Island.

Table 2 summarizes the whales struck by the Cross Island whalers in 2006 (a more detailed day-by-day presentation of daily whaling activity for the entire Cross Island whaling season is presented in Table 5 later in this report). As related above, each of the four crews whaling in 2006 landed a whale – Nukapigak on September 13, Ahkiviana on September 14, Aqargiun on September 15, and Oyagak on September 18. The whaling captains made the unusual decision to land and finish the initial butchering of the first three whales (and then all four whales) before dividing them into crew shares in order to take advantage of favorable weather for scouting. This decision, of course, was based on their experience in recent years as documented in previous project annual reports.

Three types of data were collected during the 2006 field season, as discussed above. These are GPS information; systematic observations of quantifiable measurements of various components of subsistence whaling activity; and whalers' observations on whale behavior (and especially changes in such behavior). This last sort of information is often accompanied by perceptions of possible causes for such changes and the implications such changes may have for subsistence whaling activities. Each is discussed in an appropriated section below.

GPS Data

All whalers participating in the research in 2006 had participated in the research in previous years. Thus, all crews whaling in 2006 were reasonably familiar with the goals and methods of the project, and in using a GPS unit. All crews had been issued GPS units previous years, but several required an additional unit either because of using an additional boat or the desire of the researcher, based on the 2005 field season, to increase the number of GPS 60Map units gathering data. The tracks from these units had been of significantly greater quality than from prior units, and many whalers liked using that unit more than the others. Some whalers preferred the GPS V unit, which was comparable to the GPS 60MAP on most characteristics but had the advantage of a lower price (although slower data transfer speeds). Somewhat over half of the new GPS units were Garmin GPS 60MAPs, and the rest were Garmin GPS Vs. Whalers were again instructed to record the locations of whale strikes, whale kills, or other subsistence activities or observations. Most boats had at least one crew member familiar with GPS units, and most boats used them as a matter

of course. GPS tracks were recovered for most scouting trips (96 percent, for 47 of 49 scouting trips and 1 of 1 tow-only trip).

All crews were instructed to keep the "tracking" feature on, which recorded the path the boat traveled each time it went out. The cause of the two missing tracks was that the tracking feature was turned off on the units those crews took into the field that day (they took their personal units, while leaving the project-supplied unit on shore). As in previous years, tracks were sometimes incomplete or composed of several separate tracks, due to the unit's memory limitations, whalers turning the unit off and on, loss of battery power, or the unit losing its positional fix. These problems did not occur with the frequency of previous years, however – due in part to the past experience of the crews with the project and in part to the use of more 60MAP and GPS V units than in the past. As for recent years, all boats were provided with a power cord so that the GPS units could be operated from the boat's electrical system, so that depleted batteries were not the problem they had been in the first two years of the project. However, not all boats were wired to use such cords. Also, all boats were provided with a boat-mounted holder for the GPS unit, so that the units would be readily available, secure, and not be mistakenly shielded from satellite signals due to being put in a pocket. Still, at times satellite coverage was spotty and reception was lost. Whalers were instructed how to mark points, and told to mark the points where whales were seen. Whalers were also asked to mark other events such as "blows," other animals (polar bears, seals, and so on) and key points in their trip (the ice edge between "open-water and the ice pack, places where weather conditions change, and so on). Positions where whales were seen, struck, or killed were marked by a number of crews, but were seldom if ever labeled and so required additional discussion with the crew and additional processing of the "track" file. Relatively few points were marked in 2006, but whalers were able to approximately locate many points while reviewing their tracks on the computer screen, and the researcher was able to make some fairly reliable conclusions about other whale event points from the GPS track characteristics. In any event, the process of increasing the incidence of marking significant points will require steady attention and constant encouragement.

The researcher visited each crew that had gone out scouting after they came back, in order to download the information from their GPS unit into his laptop computer. This ensured that the GPS units were always available to the crews should they decide to go out at short notice. This procedure also enabled the crews to immediately see where they had been that day with the mapping software, and allowed the crew an opportunity to discuss their trip with the researcher while it was very fresh in their minds. The utility of this information, as concretely represented on the mapped tracks displayed by the computer, has been obvious to the whalers since the inception of the project and is one reason for the high degree of participation. An example of the combined tracks for one day of scouting can be seen in Figure 2. This is the track for 09/14/06, when the Ahkiviana crew landed the second whale of the season. Two other boats scouted that day and assisted in the hunt and tow. Tracks for all days that boats went out scouting appear in electronic Appendix A on the CD-ROM attached to this report. The MMS Alaska OCS Region holds the processed GPS data files for individual boats on each day, as well as the combined tracks for each day and a file containing all the tracks for the 2006 season.

Hunters were also asked to report other subsistence efforts and results, in terms of time spent, species, number, and location in terms of GPS coordinates. Little such activity was reported, but

more than in previous years. Crews expended some effort hunting seals (which were very abundant on some days), and harvested two or three. Polar bears were numerous, although not as troublesome as in some previous years. One polar bear was shot and processed, which has been typical during the course of the project. The whalers encountered walrus out in the open water and ice, although no attempts were made to take any. No birds were harvested.

Daily boat report forms were used to capture the GPS and associated information. The form for the 2006 field season was the same as used for the 2004 and 2005 field seasons. A form is completed for each boat that goes out scouting or engages in some other significant whaling activity. Table 3 below presents as example of the form completed for the boat that landed the whale on 09/14/06. Forms for the other two boats out scouting that day are not included in the body of this report, but appear, along with all the other boat report forms, in electronic appendix B on the CD-ROM attached to this report. Those boats not out scouting on any given day do not have a separate form completed for each of them, but rather have their activities and status summarized on a single form. On days when no boats go out scouting, all will be on one form. Table 4, as an example, contains the information for all the boats that did not go out scouting on

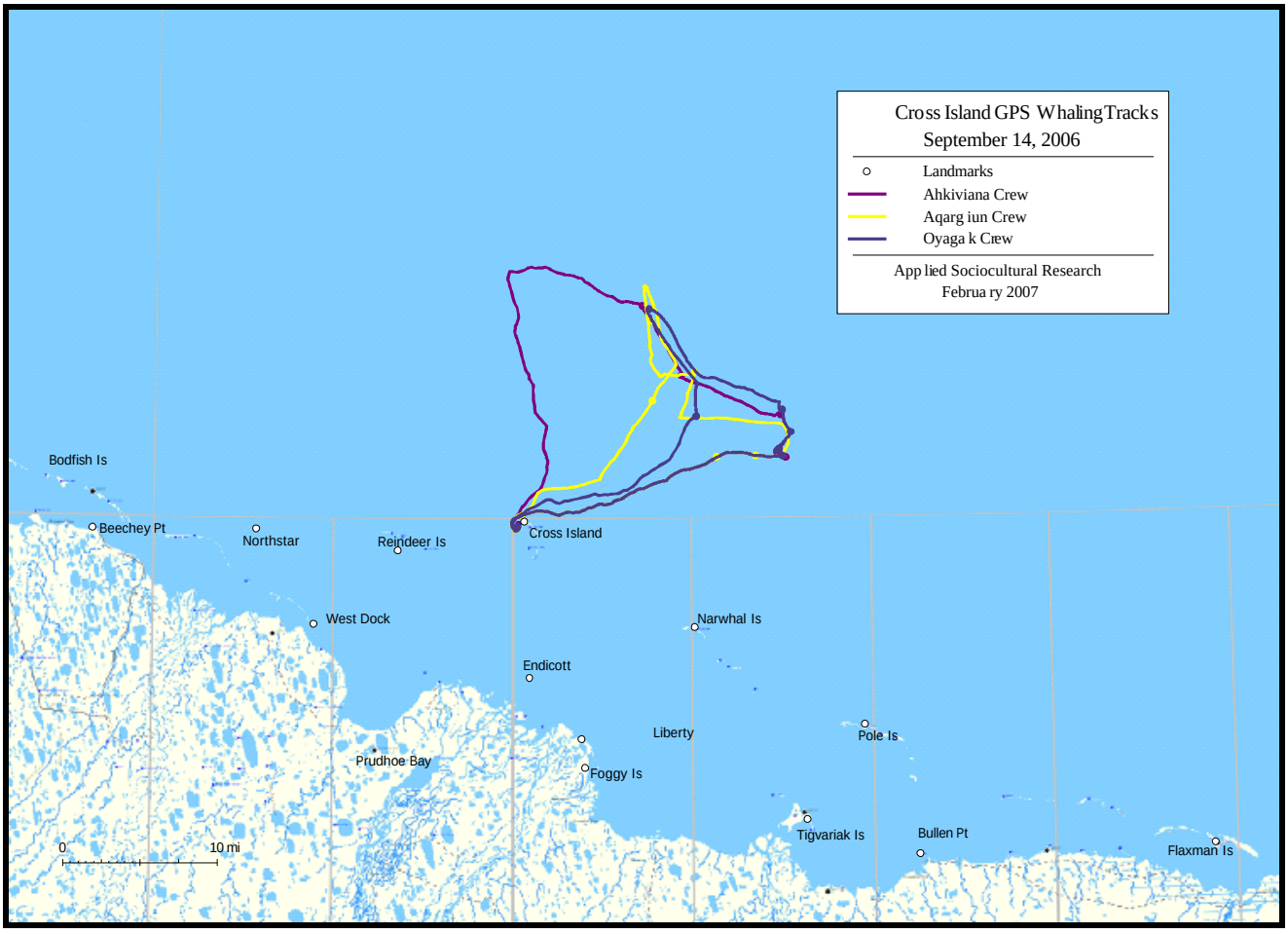


Figure 2: Composite Scouting Tracks for a Single Day – 9/14/06

Table 3: Example Daily Boat Report Form

cANIMIDA Task 7 Data Collection Form, 2006 **Use one form for each vessel/day**

Date: 09/14/06 **Crew:** Ahkiviana **GPS Type:** Garmin 60MAP

Vessel	Type	Length	HP Motor	# crew aboard/notes
UA1	Fiberglass	20’	Yamaha 150	4

Whaling today? Yes **If not, why not?**

Time departed: **9:39** **Time returned:** **19:34**

Waypoints or Coordinates noted

Way Point #	Lat/Long	Time	Notes (if whale - # of animals, direction of travel, behavior)
UA1_091406a	N70 41.696 W147 37.864	11:29	where UA1 boat met up with BO1 and IAN boats
ua1_091406b	N70 37.808 W147 31.292	12:24	reached open water (ice edge)
UA1_091406c	N70 35.552 W147 14.515	13:40	UA1 BLOW SIGHTING (same as BO1_091406c?)
UA1_091406d	N70 33.519 W147 15.072	14:05	UA1 FIRST STRIKE location
ua1_091406e	N70 33.391 W147 14.591	14:11	area of at least one additional bomb in whale
ua1_091406f	N70 33.224 W147 13.838	14:49	approx location of start of tow

Describe the day's activity (traveling, hours searching for whales)

Direction of initial search (and explanation):	North of Cross Island, to look in a different area from others
Time spent actively scouting/# people looking:	4:01 with 4 people, but see account (start to point “c”)
Time spent in travel/tow/assistance to other boats/on “break”:	5:21 (14:13 – 19:34), tow (and preparation)
Notes:	UA1 left with BO1, but went almost due North in order to search a different area. UA1 did not report when they hit open water but other crews indicated that it was about 6 miles from Cross Island. UA1 traveled at high speed until about 10:34, when they slowed to a more normal speed for scouting. They soon speeded up again - either in response to the IAN crew reporting a whale sighting or to continue traveling before that report came in (time of IAN sighting uncertain). UA1 sighted the other boats at point “a” and from this point stayed with BO1. At point “b” both boats were on the ice edge and were in the open water until point “c.” At point “c” UA1 saw a blow and both boats went for it. They saw it again when it came up (unmarked) and UA1 struck it at point “d.” Point “e” marks where at least one additional bomb was placed into the whale. UA1 did not mark the kill site but BO1 did (BO1_091406g). Point “f” marks the approximate start of the tow, after a period of preparation. The tow followed the ice edge, or perhaps was just within it as the whalers reported most of it was through the (floating) ice.

Observations of Whaling Crew - weather, sea state, ice-conditions

Fog or clouds?	N	**Weather notes:**	Seas calm near floating ice, significant waves in open water		
Wind Direction:	SSE to E	**Wind speed and other notes:**	0-10 mph, mostly 5-8		
% Ice Coverage:	variable	**Ice Type:**	Floating floes	**Other Notes:**	Ice not jammed together - scattered
Wave Height:	variable	**Other notes on sea conditions:**	Ice thicker near Cross Island, “open” farther away		
Other pertinent notes:		Whalers said that the further from the ice, the bigger the waves BUT it got calm right before UA1 saw the whale			

Note: Cross Island weather observations are compiled in a separate file (weather station + observer)

Engaged in any other subsistence activities? **If yes, describe below**

No

GPS track? Yes **GPS File Name:** UA1_091406.gbd

If not, why not?

Table 4: Daily Boat Report Form for Boats Not Out Scouting

cANIMIDA Task 7 Data Collection Form, 2006 **Use one form for all non-scouting vessels/day**

Date: 09/14/06 **Crew:** Various **GPS Type:** None

Vessel	Type	Length	HP Motor	# crew aboard/notes
NUK1	AL	18'	Yamaha 115	Stayed in to butcher whale taken 9/13
NUK2	FG	20'	Yamaha 200	Under repair
NUK3	AL	18'	Mercury 125	Butcher, then to NQT with *tavsi*
BO2	AL	18'	Yamaha 70	Weather limited (waves too high)
UA2	AL	18'	Yamaha 75	Logistic support boat only
UA3	FG	24'	Evenrude 75	Arrived on CI with 4 on board

Whaling today? No **If not, why not?** As summarized above, the Nukapigak crew had landed a whale the day before and stayed in to butcher it – but gave permission for the other crews to go out scouting since good progress had been made on the butchering. NUK3 was able to leave for NQT later in the day with the *tavsi* to "feed the village." NUK2 was under repair and could not go out scouting in any event. BO2 and UA2 were primarily support boats and the wind/waves were too high for them to go scouting. UA3 was only a support boat and just arrived on CI on 9/14 with 4 on board.

Time departed: NA **Time returned:** NA

Waypoints or Coordinates noted

Way Point #	Lat/Long	Time	Notes (if whale - # of animals, direction of travel, behavior)
NA			

Describe the day's activity (traveling, hours searching for whales)

Direction of initial search (and explanation):	NA
Time spent actively scouting/# people looking:	NA
Time spent in travel/tow/assistance to other boats/on "break":	NA
Notes:	NA

Observations of Whaling Crew - weather, sea state, ice-conditions

Fog or clouds?	N	**Weather notes:**	Seas calm near floating ice, significant waves in open water		
Wind Direction:	SSE to E	**Wind speed and other notes:**	0-10 mph, mostly 5-8		
% Ice Coverage:	variable	**Ice Type:**	Floating floes	**Other Notes:**	Ice not jammed together - scattered
Wave Height:	variable	**Other notes on sea conditions:**	Ice thicker near Cross Island, "open" farther away		
Other pertinent notes:	Whalers said that the further from the ice, the bigger the waves BUT it got calm right before UA1 saw the whale				

Note: Cross Island weather observations are compiled in a separate file (weather station + observer)

Engaged in any other subsistence activities? **If yes, describe below**

No – other than in support of whaling (see above)

GPS track? Yes **GPS File Name:**

If not, why not?

09/14/06. For most days of the 2006 Cross Island subsistence whaling season, some boats will have separate forms and a group of other boats will be treated on a single form. The forms are organized in Appendix B in terms of date rather than by crew as in most past reports. Figures of individual boat tracks for each day have not been produced, a departure from past reports, since this information is conveyed more economically in figures for each scouting day containing the tracks of all boats out scouting that day. Indices to Appendix B are provided by both date and crew to assist the reader in finding specific boat report forms (although the diligent reader could use Table 5 to guide him or her in this task). A list of acronyms and abbreviations used is provided on page ix.

The information used in the Table 3 example was not chosen at random, but rather because it demonstrates some of the difficulties presented in the waypoint information reported in this (and previous) documents. Although instructed to mark waypoints whenever whales are spotted or where significant events take place, no crew in fact can mark all such points, for a variety of reasons.

Whaling events happen so quickly that crew members are fully occupied with their duties and sometimes cannot divert their attention to mark a point (or perhaps even remember to do so). When points are marked, crews seldom take the time to assign them names, so that they are designated with "default" numbers. When waypoints are marked for whales, they still do not necessarily represent the same thing. Waypoints indicating where a whale was struck or killed for the most part represent the immediate area where that event took place. Those indicating a whale sighting are less precise, showing the position of a boat when a whale was sighted. It may indicate a whale seen a short distance away, or the "blow" of a whale seen in the distance (up to 2 or 3 miles away). Also, a waypoint may represent one whale or multiple whales. For some tracks, there are no waypoints that the crew marked while they were on the water, but quite a few that they could approximate when they later reviewed the track with the researcher. Many of these points represent whale sightings, and are not necessarily any less precise than points marked on the water – but in most cases can be assumed to represent whales or blows seen at a greater distance than for a waypoint actually marked when on the water. In Table 3, for example, the Ahkiviana crew marked where they first saw the whale they eventually struck and landed (point "c"), as well as the location of where they first struck it (point "d"). They also marked the point when they met up with (were in visual range of) the other two boats in the area where these other boats had seen whales (point "a"). Points that they later identified while reviewing their track on the computer screen were the location of the ice edge on the way out from Cross Island (point "b"), the location where at least one additional bomb was put into the whale (point "e"), and the start of the tow (point "f"). They did not mark or indicate the kill location, as that point had been marked by one of the other crews that was in close proximity (BO1_091406g).

Since most crews discussed most of their trips with the researcher, it has been possible to collect more waypoint information that is present in the raw GPS data files, but with a potential loss of precision. Crews remember how many whales they have seen on a trip (except in cases where blows were both distant and numerous), and generally where they were. When looking at the mapped tracks of their trip they are able to identify where they saw whales, so that an approximate waypoint can be generated. In most cases, sighting locations are associated with

changes in a boat's direction. Such "generated" waypoints are differentiated from those actually marked by crews by using lowercase letters in their labels.

Some marked waypoints are also somewhat ambiguous in meaning, however, since the crew may assign one meaning or memory to a point when in fact it may have another. That is, especially when whales are harvested, whalers may misidentify the waypoints that they do mark. Given that crew members have little attention to spare in this situation, and that the waypoints themselves are usually only numbered, and that the crew may not remember exactly how many waypoints were marked (or if all attempts to mark points actually succeeded), such confusion can be expected. However, since whalers communicate with each other, the Com Center, and sometimes their Cross Island base station, by radio it is often possible to note when significant events take place by what is said on the radio and noting the time. When compared to the date stamps on waypoints these notes can then aid in the interpretation of what the waypoints actually represent. It should also be noted that the researcher is also a potential source of confusion, in that his understanding of a crew's description of their trip activities and events may in fact be in error – the researcher may misinterpret what the crew tells him. The data as presented is the result of comparative cross-checks using the information obtained from all sources (GPS, crew accounts, radio notes).

Ambiguities of meaning influence the way in which the points can be used but not to the extent that they do not have meaning. Whale sighting waypoints can not be interpreted as point locations. Whale strike and kill locations can generally be interpreted as point locations, but not necessarily precise point locations. Boats are always moving and waypoints are seldom if ever marked at the precise time that a strike is made or a whale is killed.

Table 4 is an example of how the Daily Report Form was used to reduce the number of forms to complete for those days when not all boats went out scouting, as discussed above. Separate forms were still used to record information for those boats that did go out scouting on 09/14/06 (one of which is included above as Table 3). A single form was used for the six boats, from three crews, that did not go out scouting that day. Note that three of this boats were from crews that had single boats out scouting that day, and three boats were from a crew that did not go out scouting at all that day. A rough indication of what else the crews did on those days (and if the boats were used for other purposes than scouting) is noted, but not in detail. Attempts were made to determine if weather, mechanical problems, or other obligations such as butchering was the major factor in a boat not going out scouting on any given day. For some days where multiple factors applied determining which was most important may not be possible.

Systematic Observations

Systematic observations were also transferred to the standardized recording forms (daily boat report forms). These observations are the basis for the summary tables that appear in the "Results" section, as well as the completed daily vessel activity forms. From these records it is possible to make a basic "census" of the crews on the island, and to track changes as people came to Cross Island and left. In addition, notes were made on which crews went out on each day. In most cases it was possible to note who went out in each boat. From these basic

observations can be derived some of the most basic measures of subsistence whaling activity – number of active crews (and boats), size and composition of crews, fluctuations in crew size and composition, and days spent whaling. The GPS data provide systematic locational information for whaling activities. This information also was recorded on the daily boat report forms. Examples of the daily boat report forms appeared above as Tables 3 and 4. The complete series of forms is included electronically as Appendix A. A list of the acronyms and abbreviations used in these tables (and elsewhere in the report) is provided on page ix.

In addition, very basic weather observations were made (temperature, wind direction and strength, degree of fogginess or clarity, barometric pressure). A weather station was installed on Cross Island, with a remote data logger to record the information. The data logger functioned for the period 9/03/06 (11:31 AM) through 9/22/06 (9:12 AM), with readings every five minutes for temperature (outdoor and indoor), wind speed, wind direction, barometric pressure, and relative humidity (file CI2004WF.xls, also included electronically as Appendix C). There were short periods of data gaps for one reason or another – signal interference, instruments freezing up, or other factors. A second weather station, positioned in a second location, was not reliable enough to provide useful comparative information.

Since January 1, 2001 MMS has maintained a weather station at Endicott, which is close enough to Cross Island to be pertinent. The datalog is available at **www.resdat.com/mms**. This is another potential data set of interest for the analysis of the whaling data (MMS also maintains weather stations at Northstar, Badami, Milne Point, and Cottle Island). Other potential sources of weather information and whaling activities are the communications logs of the Whaling Communications Center. Since the researcher could not go out in the boat while they scouted for whales, he had little ability to judge the degree of ice cover, although the Nuiqsut whalers did report their observations in a general way. There was considerable no ice cover in 2006. Ice observations are noted on the daily boat report forms. Information on ice cover may be obtainable from remote sensing sources or the MMS aerial bowhead survey.

Whalers' Observations

Whalers would sometimes make observations on whale behavior or give their thoughts on how and why whale behavior in the Cross Island area was different in 2006 than it had been in the past. Much of this was recorded in the daily fieldnotes. Much is of limited immediate relevance to the central aims of this project. A summary of the most pertinent information is included in the "Results" section.

Butchering Photographs from the 2004 Season

Results

Results are discussed in this section in terms of the quantitative observations designed as measures of subsistence whaling activity and the less quantifiable observations and perceptions of Nuiqsut whalers about whale behavior in 2006 as compared to previous years.

Quantitative Measures

The most basic summary of information, extracted from Table 5 and Figure 3, describes the primary characteristics of Cross Island subsistence whaling of most concern for MMS. In 2006, four crews from Nuiqsut whaled from Cross Island. Three crews used primarily one boat each for whaling, although two of these crews had at least one other boat for logistical help, and these boats could go whaling if conditions were favorable. The fourth crew had three whaling boats, but due to mechanical problems seldom used more than two on any given day. Thus, although formally there were seven boats that went out scouting for whales at least once in 2006, functionally there were five whaling boats at Cross island for most of the 2006 whaling season.

The size and composition of the crews varies from year to year. In 2006 all crews displayed direct kinship relationships among most members (most people in Nuiqsut can trace indirect kinship relationships with most others). There were few female crew members on Cross Island in 2006, but more than in past years – three divided between two crews. Twelve of the twenty-seven to thirty-four crew members on Cross Island during the 2006 season were not adults – a much higher percentage than in the past. However, more of these were in that intermediate stage of high school/college age – seven or eight of the twelve. Only three or four of the "sub-adult" crew members were younger than high school age, which is comparable to previous years. No single crew had more than two crew members of this age, although one crew had four high school/college age members. Once all four crews were on Cross Island, the total number of crew members varied from 27 to 38 (with visitors on one day) or about 7 to 9 per crew, on average.

Crew Characteristics

All crews had a majority of adult members, but differed in the age of the youngest member and the ratio of older to younger members. One crew five adult members, four high school/college age members, and one younger member. Another crew had five adult members, one high school/college age member, and two younger members. A third crew had five adult members and three high school/college age members. The fourth crew had ten adult members and one younger member. This fourth crew is the only crew that consistently used more than one whaling boat, and that came with three boats. Kinship and kin relations were clearly important for the composition of all four crews, but differed in the way they were expressed in each crew.

Crews also differed in the number of people who actually manned the boat while whaling. There may have been a tendency for female crew members to go out scouting in the boat less often than male crew members. A whaling boat normally requires a minimum of three crew members – a driver, a harpooner, and a person in charge of the float – although boats will sometimes go out with only two crew members. A fourth crew member is sometimes assigned to the shoulder gun.

Table 5: Summary of Boat Activity, Cross Island Whaling, 2006

Date	Ahkiviana[1]		Aqargiun		Nukapigak						Oyagak				Notes
	AA1		IAN		NUK1		NUK2		NUK3		BO1		BO2[2]		
	Boat Crew[3]	Trip Time	Boat Crew[3]	Trip Time	Boat Crew[3]	Trip Time	Boat Crew[3]	Trip Time	Boat Crew[3]	Trip Time	Boat Crew[3]	Trip Time	Boat Crew[3]	Trip Time	
09/02/06	To CI w/4		repair in NQT		To CI w/3		To CI w/3		To CI w/2		To CI w/3		To CI w/3		21 people on CI
09/03/06	prep		To CI w/7		prep		prep		prep		prep		support		28 people on CI
09/04/06	6	10:28	7	10:31	3	10:21	3	8:54	2	10:24	4	9:58	support		28 people on CI
09/05/06	6	10:20	5	6:27	3	9:23	3	6:57	repair		6	10:07	support		28 people on CI
09/06/06	6	10:55	6	12:00	3	10:56	repair		3	10:59	5	11:25	support		29 people on CI
09/07/06	6	8:09	7	8:14	3	7:30	repair		3	7:13	4/3	7:16	2/3	3:02	29 people on CI
09/08/06	weather		weather		weather		repair		weather		weather		weather		29 people on CI
09/09/06	weather		weather		weather		repair		sealing w/		weather		weather		28 people on CI
09/10/06	6/4	2:52/ 3:40	7/4	3:56/ 3:57	3	2:38	repair		SC w/3	3:17	3/4	2:48/ 3:21	weather		28 people on CI
09/11/06	6	11:19	5/6	4:47/ 6:13	4	11:15	repair		SC w/3	11:25	3	4:12	2	2:08	28 people on CI
09/12/06	weather		weather		weather		repair		weather		weather		weather		28 people on CI
09/13/06	6	9:39	5	8:37	4	9:31	repair		3 HAR	9:40	5	8:47	weather		34 people on CI, whale landed
09/14/06	4 HAR	9:55	5	9:45	butcher		repair		To NQT with tuvsi		5	10:11	weather		38 people on CI, whale landed
09/15/06	butcher		5 HAR	15:15	4	11:03	repair		Back from NQT		3	14:04	weather		34 people on CI, whale landed
09/16/06	butcher		butcher		butcher		butcher		butcher		butcher		butcher/weather		29 people on CI
09/17/06	weather		weather/ to WD with tuvsi		weather		weather		weather		weather		weather		27 people on CI
09/18/06	4	8:29	6[5]	4:49[5]	in reserve		in reserve		4	8:21	4 HAR	9:40	weather		27 people on CI, whale landed
09/19/06	butcher		butcher		butcher		butcher		butcher		butcher		butcher		30 people on CI
09/20/06	butcher		butcher		butcher		butcher		butcher		To WD w/3 with tuvsi		butcher		30 people on CI
09/21/06	butcher/pack		butcher/pack		butcher/pack		butcher/pack		butcher/pack		butcher/pack		butcher/pack		30 people on CI
9/22/06[4]	to NQT w/4		to WD w/4 crew flew NQT		to NQT w/3		to NQT w/2		to NQT w/2		to NQT w/4		to WD on barge, then NQT w/3		30 people on CI

Notes

[1]Ahkiviana crew also used two other boats. UA2 came on 09/02/06 w/3, and UA3 on 09/14/06 w/4. Both were used only for logistical support.

[2]BO2 was not a true ocean-going boat and so was more restricted by weather in terms of scouting activity. It was modified 9/07 to make it more seaworthy.

[3]Numbers indicate crew size. Two different numbers indicate either two trips in one day or a crew transfer between boats at sea.

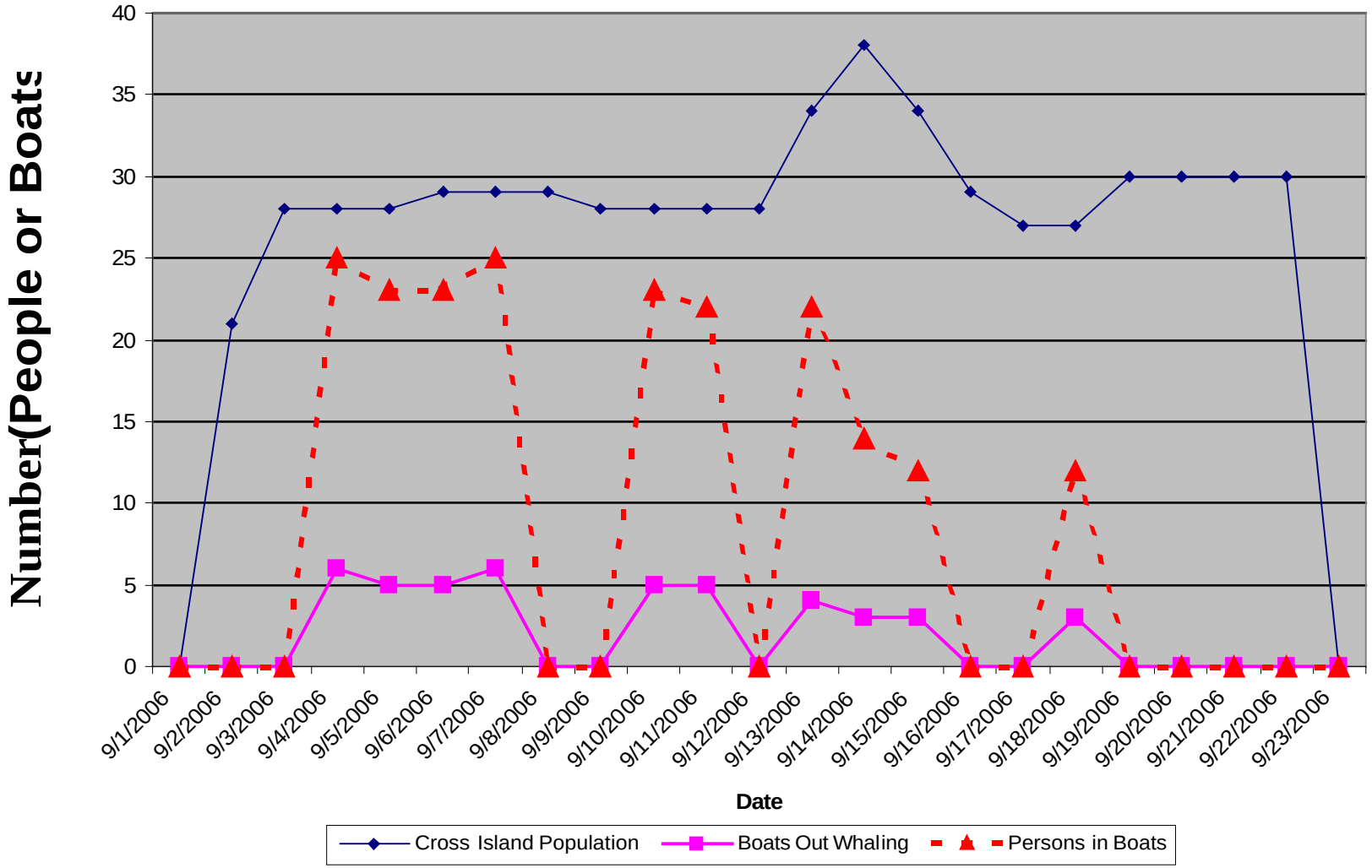
[4]Because of weather and sea conditions some boats were put on the large barge to go to WD, a number of crew members rode to WD on ACS day boats, and other crew was redistributed among the remaining whaling boats to go to WD (numbers are estimates).

[5]IAN crew on 9/18 only went out to assist in the tow after the whale was dead

"To" indicates a logistical boat trip, CI = Cross Island, prep = preparation for whaling, weather = poor conditions for scouting, repair = boat or motor needed to be fixed, HAR = Whale Struck and Landed, WD = West Dock, NQT = Nuiqsut, butcher = crew had butchering obligations

Days when boats went scouting are shaded. GPS tracks collected are those with LIGHTER shading, while those not collected have DARKER shading. Travel days, indicated by "to," destination and number of crew generally did not have tracks collected. Some tracks collected are partial.

Figure 3: Cross Island Population and Scouting Activity, 2006



Depending on conditions and intuition, a whaling captain may desire to take as few crew members as possible (to have a light, fast boat) or as many extra as possible (to have as many eyes watching for whales as possible).

One single-boat crew made ten scouting trips, on nine different days, in 2006. On seven of them they had six crew members in the boat, and four on the other three (average 5.4). The other single-boat crew made eleven scouting trips on nine days, with from four (one trip) to seven crew members (three trips) in the boat – with an average of 5.6 (they also made one trip to help tow a whale with six crew members). A third crew used a second boat for only two scouting trips on two different days, each with only two crew members in the boat. Their primary boat made eleven scouting trips on ten different days, with a boat crew ranging from three (three trips) to six (one trip), and an average of 4.2. The fourth crew used three boats for whaling at times. One boat made three scouting trips on two different days, always with a boat crew of three. The boat that struck the whale this crew landed made seven scouting trips on seven different, days with three boat crew members on five trips, and a single trip each with two and four (average of three). Their designated primary boat made eight scouting trips on eight different days with three boat crew members on five trips and a boat crew of four on the other three trips (average 3.4).

In 2006, single-boat crews tended to have larger boat crews than did multi-boat crews. Important factors appear to be engine size, the overall number of crew members, and the threshold value each captain places on the optimal six boat crew for his boat. Another consideration for the three-boat crew was the necessity to leave two or three capable crew members on shore when one or two of the boats needed some mechanical repair.

Whaling Days

During the 2006 whaling season there were 10 days when Nuiqsut whalers went scouting for whales. On one of these days, three boats made two scouting trips, stopping back at Cross Island between such trips to refuel and to rest. Thus, there were a total of 47 "boat days" and 50 total scouting trips in 2006 (Table 5). GPS tracks were collected for 48 of these (including one "whale tow only" trip), or 96 percent. In addition, there were two tracks that were only partial, as discussed above. The missing tracks are shaded more darkly in Table 5.

The whaling seasons for the four crews ranged in length from 20 to 22 days, counting travel days. The seasons for the individual crews were 20, 21, 21, and 22 days. The whalers encountered a great deal of ice in 2006, but not as much as in 2005. The ice conditions probably increased the distance and effort required to harvest whales, but did not prevent the harvest of whales. The weather was also more moderate than in 2005. Winds were not as strong or constant as in 2005 and only four scouting days were lost due to weather.

At least one boat went out scouting for whales on ten different days (and several small boats also went out without whaling equipment on short trips to hunt seals). The researcher was on Cross Island for the entire whaling season and was able to collect GPS tracks and whaler accounts for all scouting days, although not from all boats. The number of boats scouting on any given day ranged from three to five. One crew scouted on all ten days (with a total of twelve boat days).

Two crews each scouted on nine separate days (and as each used only one boat, each had only nine total boat days, although one of these crews also assisted on towing the whale taken on the day they did not go out scouting). The fourth crew scouted on eight different days (and used three boats for a total of seventeen total boat days). Each crew devoted 2 days or (in one case) 3 days to travel to and from Cross Island. Various boats were disabled at times due to mechanical problems of various sorts, and weather prevented scouting on four days. Ice and sea conditions (especially "surf waves") limited scouting activities to some days when boats did go out scouting.

Figure 4 displays all the boat tracks for the 2006 whaling season, color-coded to aid in the following discussion. Crews spotted whales on eight of ten scouting days, but only saw about three whales during the first four scouting days (and no whales at all on one of those days). These four days (3 September through 7 September, coded blue in Figure 4) were also those for which ice conditions confined the whalers within the barrier islands, and were the only days on which whalers reported seeing non-whaling vessel traffic. During the next two scouting days (10 and 11 September, coded yellow in Figure 4) whalers were able to reach open water beyond the barrier islands and saw more, although not an excessive number, of whales. On each of the last four scouting days (13 September through 15 September, 18 September, coded green in Figure 4) a different crew each took a whale, and multiple whales were observed on all but one of these days. Whalers remarked that the ice cover probably pushed the whale migration farther from Cross Island than if there had not been much ice, and limited where the whalers could go for the first part of the season.

The whalers reported observing barges on at least four days when they were scouting for whales (as above). None of these barges were directly engaged in petroleum industry-related activities, and whalers did not indicate that these vessels had interfered with whaling activities (although they were very concerned that they might). More detailed information on these barge sightings / interactions and whaler concerns is provided below (see discussion of observed vessel activity). Whaler observations and reports of whale feeding behavior and "skittish" behavior are also briefly discussed below, in separate sections.

The quantitative measures for the 2006 season are displayed for comparative purposes with those from all prior documented seasons in Table 6 (above), but will not be discussed in any detail in this report. Perhaps the most important characteristic of the 2006 season was that ice conditions confined the whalers within the barrier islands for the first part of the season, during which time they saw few whales. Once they could reach open water (which required somewhat greater effort than in some past years, but was probably about the median in terms of the six seasons documented for this project), they found whales and were successful in the harvest. Some aspects of the difference between the early part of the 2006 season and the later part are briefly discussed in the sections below, but most such analysis will be deferred until the final synthetic report for the project. The number of days when boats went out scouting for whales, and days on which they saw whales, were in the median of the range documented for all six seasons. Length of trip (both time and distance) and average distance of whales strikes from Cross island also were in the median of the documented ranges. The furthest point reached from Cross island during scouting trips was towards the long end of the documented range for the project, but total effort expended on the water was again in the median of the range documented for the six seasons.

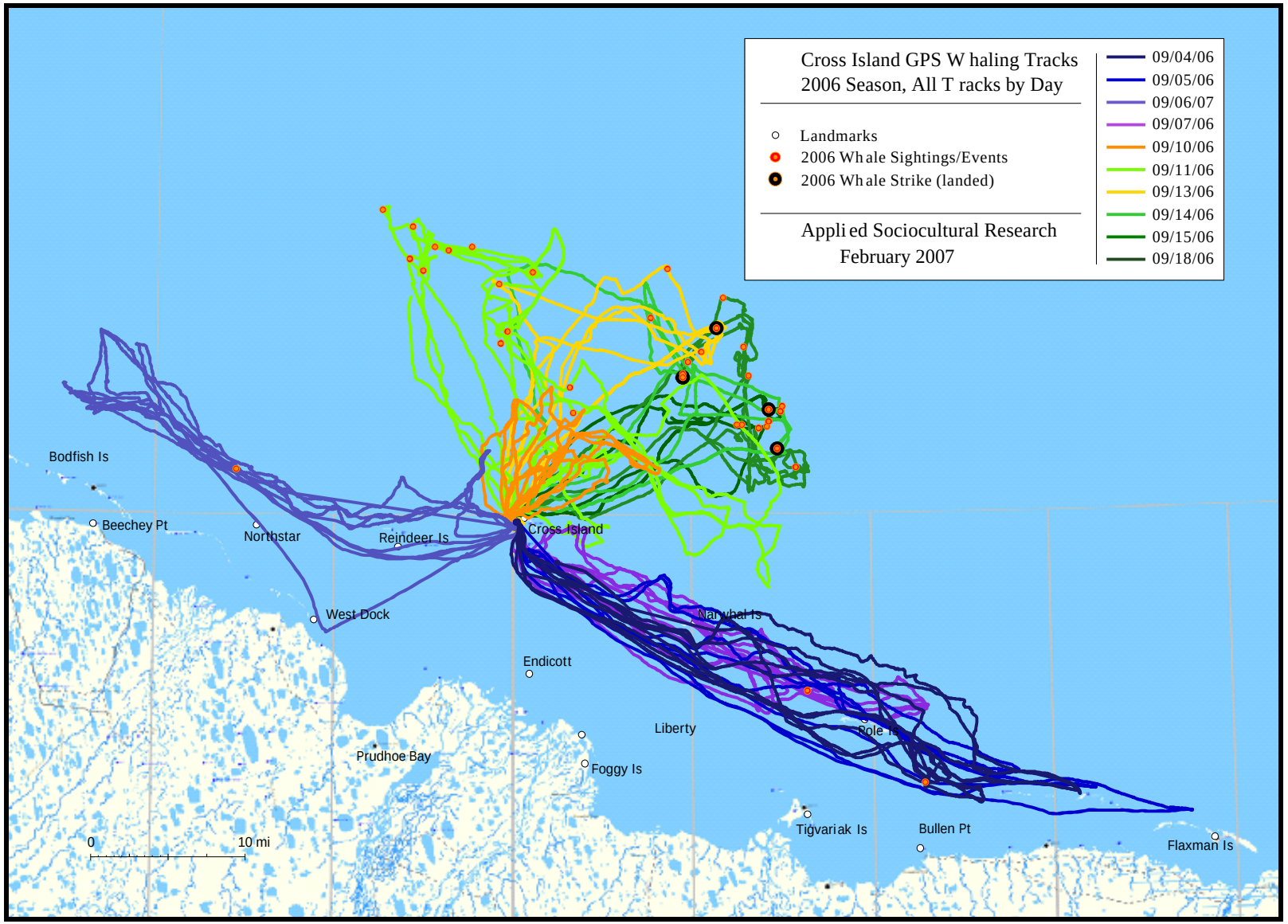


Figure 4: Cross Island GPS Tracks, 2006 Season, by Day

Table 6: Selected Measures of Cross Island Whaling, 2001-2006

Metric		Season					
Measure	Type	2001	2002	2003	2004[7]	2005	2006
Whales Taken/Whales Struck and Lost	count	3/0	4/1	4/0	3/0	1/0	4/0
Active Crews on Cross Island (maximum)	count	4	3	4	4	5	4
Scouting Boats on Cross Island (maximum)	count	7	9	10	8	8	7
Cross Island Population	average	27.7	26.6	20.4	18.9	29.8	29.2
Length of Season[1]	count	24	23	19	30	27	21
Weather Days	count	8-9	4	8	10	11-15	4
# days scouting[2]	count	12[8]	15[8]	7	12[9]	8[9]	10
# days whales seen[3]	count	9	9	7	6	7	8
# boat days[4]	count	57	65	33	41	33	45
Boats scouting/day	average	4.8	4.3	4.7	3.4	4.1	4.5
Length of trip (miles)	average	85.6	65.1	36.4	47.8	83.0	61.0
Duration of trip (hours:minutes)	average	9:55	8:04	4:28	7:24	9:44	8:12
Furthest point from Cross Island (miles)	average	23.9	19.8	11.5	12.5	19.3	22.4
Strike distance from Cross Island (miles)	average	19.5	13.4	9.3	9.7	25.9	17.0
Strike Direction from Cross Island –degrees[5]	average	64°	67°	56°	36°	82°	59°
Total Effort (Boat-Hours)[6]	sum	575.3	532.5	156.4	299.4	331.0	418.2

[1]Number of days with at least one crew on Cross Island, includes day of arrival at and departure from Cross Island.
[2]Number of days when at least one boat went out scouting for whales
[3]Number of days when at least one crew saw whales while scouting from a boat. Blows were seen from Cross Island on a few non-scouting days, but are not included in these totals.
[4]Each boat scouting for whales on any given day counts as one "boat day" – regardless of the duration of the trip or if whales are seen or not. Thus if 2 boats scout on one day and 4 boats scout on the next, the total for the two days would be 6 boat days.
[5]Due north is 0 degrees, due east is 90 degrees
[6]Yearly total equals aggregate sum of duration of all scouting trips by all boats
[7]One crew went to Cross Island well before other crews, so total season measures may be somewhat misleading. See 2004 Annual Report.
[8]On one of these days, only one crew with one boat went scouting.
[9]On two of these days, only one crew with one boat went scouting. On another day in 2005, this same boat went out sealing (no whale gear).

The "total effort" measure still requires some additional refinement and analysis, since it confounds a number of, in principle, "effort components" that can be differentiated from each other. Such components would include:

- transit time (at high speed en route to a search area or on the way back to Cross Island)
- scouting time (when actually looking for whales)
- following and chasing time (after finding a whale)
- towing time (after killing a whale)
- other miscellaneous activities (assistance to other boats, mechanical breakdown, rest breaks, and so on).

A detailed breakout of such separate activities is not easily done at present, although it is possible through close analysis of the GPS track information. Rough breakouts could perhaps be compiled with a reasonable level of effort, but more exact accounting (leading to perhaps person-hour levels of effort estimates) would require more effort. This topic will be addressed in the final synthetic report.

Some generalizations, based on all six documented seasons, about the factors influencing decisions to go whaling are possible, although no systematic model can yet be developed. If the weather is suitable for successful scouting of whales (slight or no wind, slight or no chop, good visibility), all boats physically able to whale will go out. Some captains will go out in more marginal weather than others, and such decisions are quite situational in nature. A crew that has not been out recently seems more likely to go out in marginal weather than those crews that have been out more recently. Crews that have not harvested whales seem more likely to go out whaling than those crews that have landed whales. A captain may call a "rest day" for a crew that has been working hard, especially if conditions are marginal. Trips on days with marginal weather conditions tend to be shorter than on days with better weather. After the harvest of a whale the butchering must reach a well-defined point before whaling can resume. For Nuiqsut whalers this is generally the next day for crews other than that which took the whale, and is often the next day for that crew as well. Crews go whaling in suitable weather and any deviation from that pattern has a specific explanation.

The weather factors that seem to be most directly related to when Nuiqsut whalers scout for whales are barometric pressure and wind speed (and to some extent direction). Barometric pressure changes relatively slowly, and whalers often scout when it is in transition, but good scouting conditions tend to correspond with high barometric pressure or times of transition. Figure 5 displays the barometric pressure at Cross Island for the 2006 whaling season, and the discussion below will relate barometric pressure to scouting activity. Nuiqsut whalers do not observe barometric pressure directly – or, at least did not do so until the start of this research and the appearance of a weather station on Cross Island. If the barometric pressure trend is available, whalers will take it into account when deciding whether to scout for whales or not. Since it is at best a rough predictive tool, however, and whalers know from experience that a (relatively brief – up to several hours) period of good scouting conditions can occur when the wind shifts

directions, whalers will sometimes go out scouting even when the barometric pressure is falling. Nuiqsut whalers thus rely much more on their direct observations of the wind and their experience as to what the future wind conditions will likely be. Whalers prefer days with no wind, and winds up to 5 mph, or even 10 mph, are acceptable. Scouting can occur even with higher winds, given other circumstances. Wind speed for the 2006 Cross Island whaling season is displayed in Figure 6, with wind direction displayed in Figure 7. The following discussion will show that scouting activities correspond with periods of lower wind speeds. It should be noted that conditions on Cross Island are not necessarily the same as experienced when scouting for whales, but the general trends are often the same (complete weather file in electronic appendix). It should be noted for 2006, ice conditions influenced scouting activity much more than weather, which was generally favorable.

During the period of time for which weather measurements are available, scouting occurred on 9/04-07, 9/10-11, 9/13-15, and 9/18. There were no periods of extremely low barometric pressure, although non-scouting days were associated with the lowest barometric pressures recorded (Figure 5). Similarly, the highest wind speeds were recorded on days with no scouting activity (Figure 6), although scouting occurred on some days with relatively brisk winds. Whalers remarked that the ice cover on those days was an advantage in that it dampened wave height near the ice pack. Open water conditions could still be dangerous because of large waves or swells and moving ice, but could be negotiated for limited periods of time. Non-scouting days did not seem to be associated with wind directionality in 2006 (Figure 7).

Figure 5: Barometric Pressure at Cross Island, 9/03/06 – 9/22/06

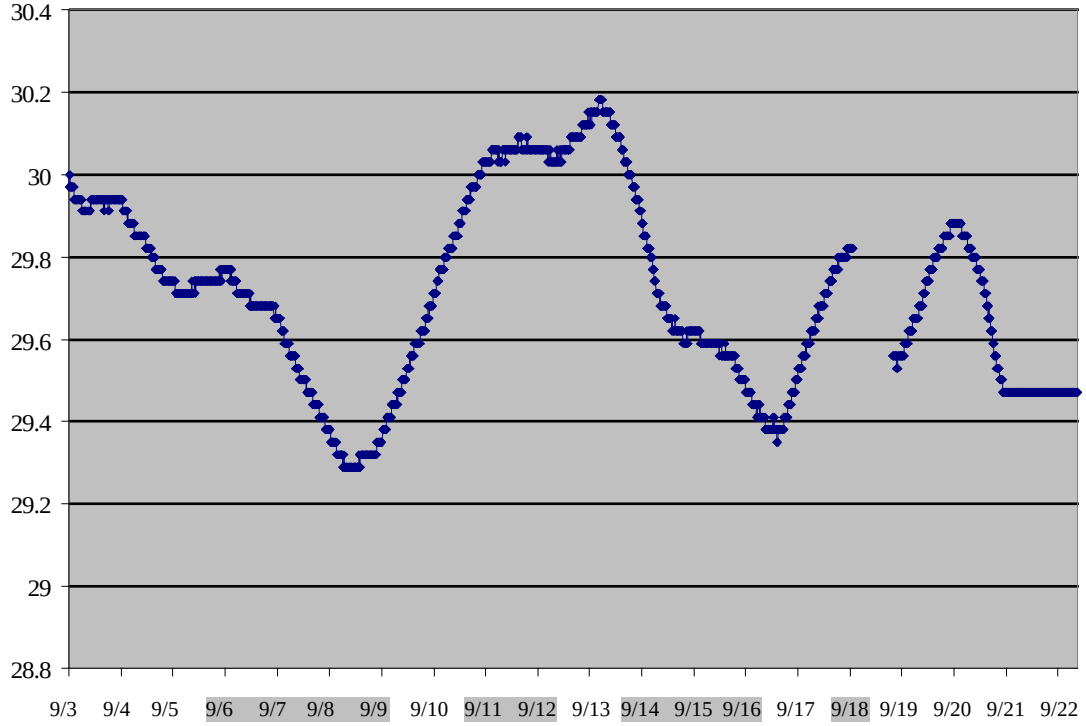
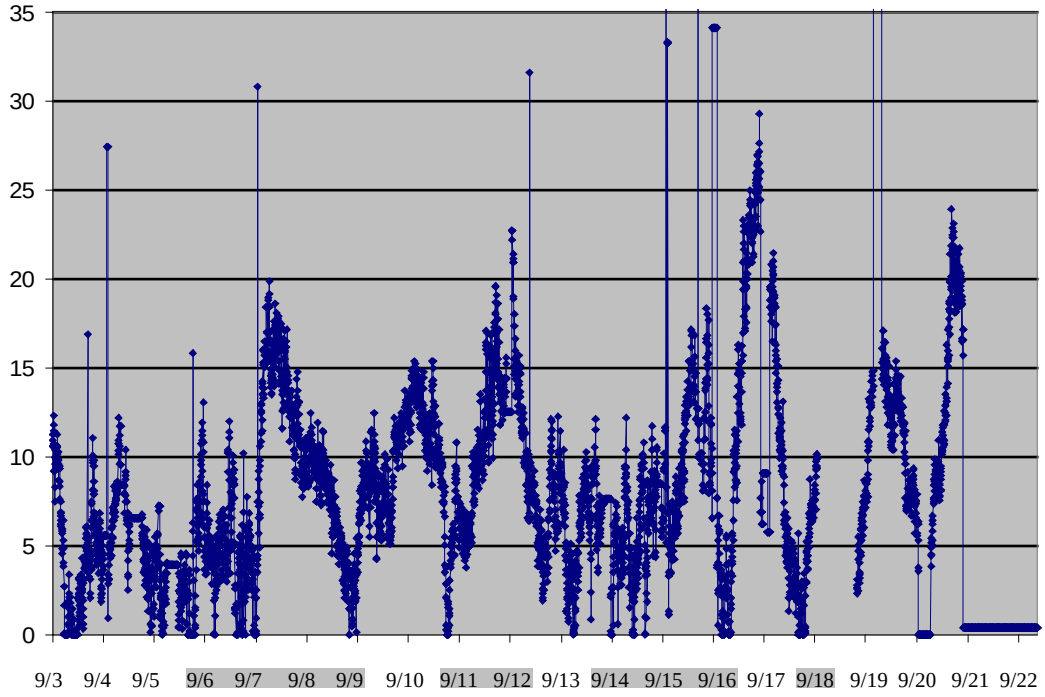
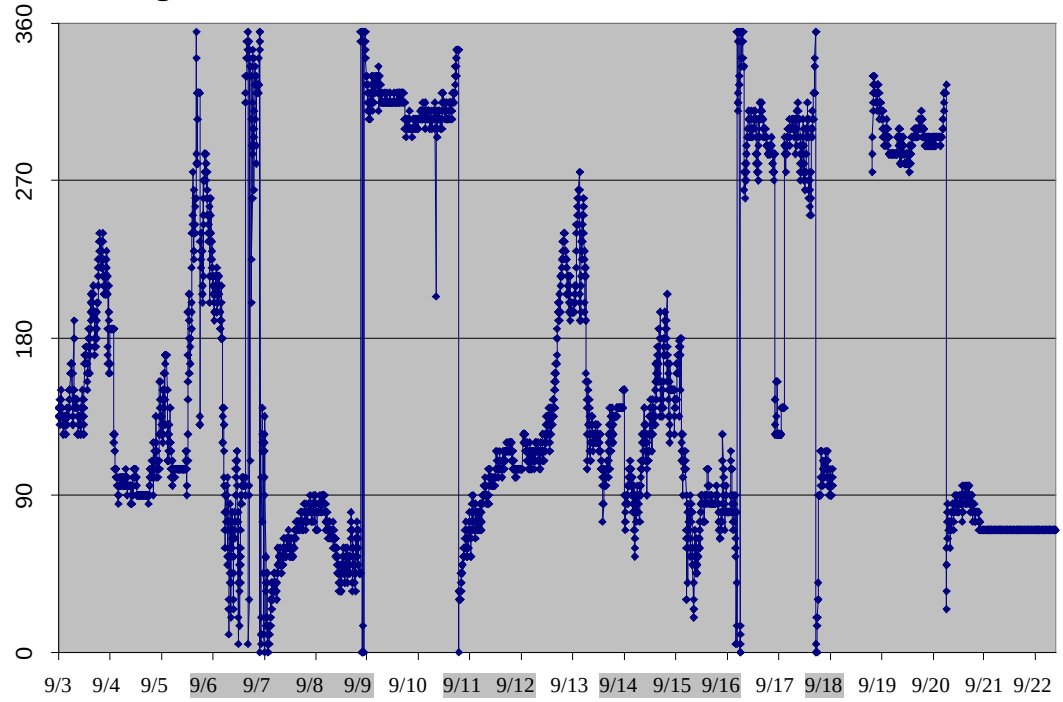


Figure 6: Wind Speed at Cross Island, 9/03/06 – 9/22/06



Date (scouting days are shaded)

Figure 7: Wind Direction at Cross Island, 9/03/06 – 9/22/06



Date (scouting days are shaded)

"Non-Whaling" Boat Activity

In addition to searching for whales, several Nuiqsut whaling vessels made trips between Cross Island and West Dock. Most commonly, trips are made for logistical reasons – to pick up supplies, needed parts, or to drop off and pick up crew members. Generally, after the harvest of a whale a certain portion of it is sent to Nuiqsut to "feed the village." In most cases the successful captain will designate one or more of his crew members to take one of his boats to Nuiqsut for this purpose. If conditions for boat travel are poor, the "fresh kill" may be taken to West Dock and flown to Nuiqsut – but will still be accompanied by the captain's flag and a crew member to run the flag to the captain's house.

This information collection effort focuses explicitly on Cross Island whaling activity. No attempt was made to systematically collect information on preparation, support, or other crew member activities that occurred elsewhere (primarily in Nuiqsut). Whaling support activities from non-Nuiqsut sources (mainly oil and gas industry support through Alaska Clean Seas barges) were quite evident, but mainly in terms of island infrastructure rather than the frequency of ACS barge activity. Only a limited number of ACS barges landed on Cross Island while the whalers were there, mainly to service the infrastructure supporting the whalers. ACS did of course use their barges to mobilize the Cross Island infrastructure before the first crew arrived, and demobilized this equipment on the day that the whalers left. Thus, compared to most previous years, there were comparatively fewer trips by ACS barges to Cross Island. Whalers made fairly frequent trips from Cross Island to West Dock, but these have not been counted or compared to previous years. Documentation of contacts and interactions through telephone, FAX, or non-whaling non-Nuiqsut vessel were not fully documented, and such information was only collected as contextual background.

GPS Information

All whaling crews agreed to carry and use GPS units. All track information is presented in the electronic appendices, with two examples from the 2006 season in the body of the report – Figures 2 (single day) and Figure 4 (composite of all tracks, by day). Figure 8 presents all GPS tracks for each project season, by year, for comparative purposes. A list of waypoints noted by the whalers is presented in Table 7. The level of information obtained varied from boat to boat, but for most boats and for all crews at least partial tracking information was obtained, along with the unlabeled points where whales were observed (or struck). In Table 5, as discussed above, the days that boats went out whaling are shaded. Dark shading indicates that a GPS track was not obtained for that day from that boat. Light shading indicates that a GPS track was obtained form that boat for that day. There were 47 different "boat days" (49 scouting trips plus one "whale tow only" trip) for which GPS tracks were possible. GPS tracks were collected for 47 boat days (48

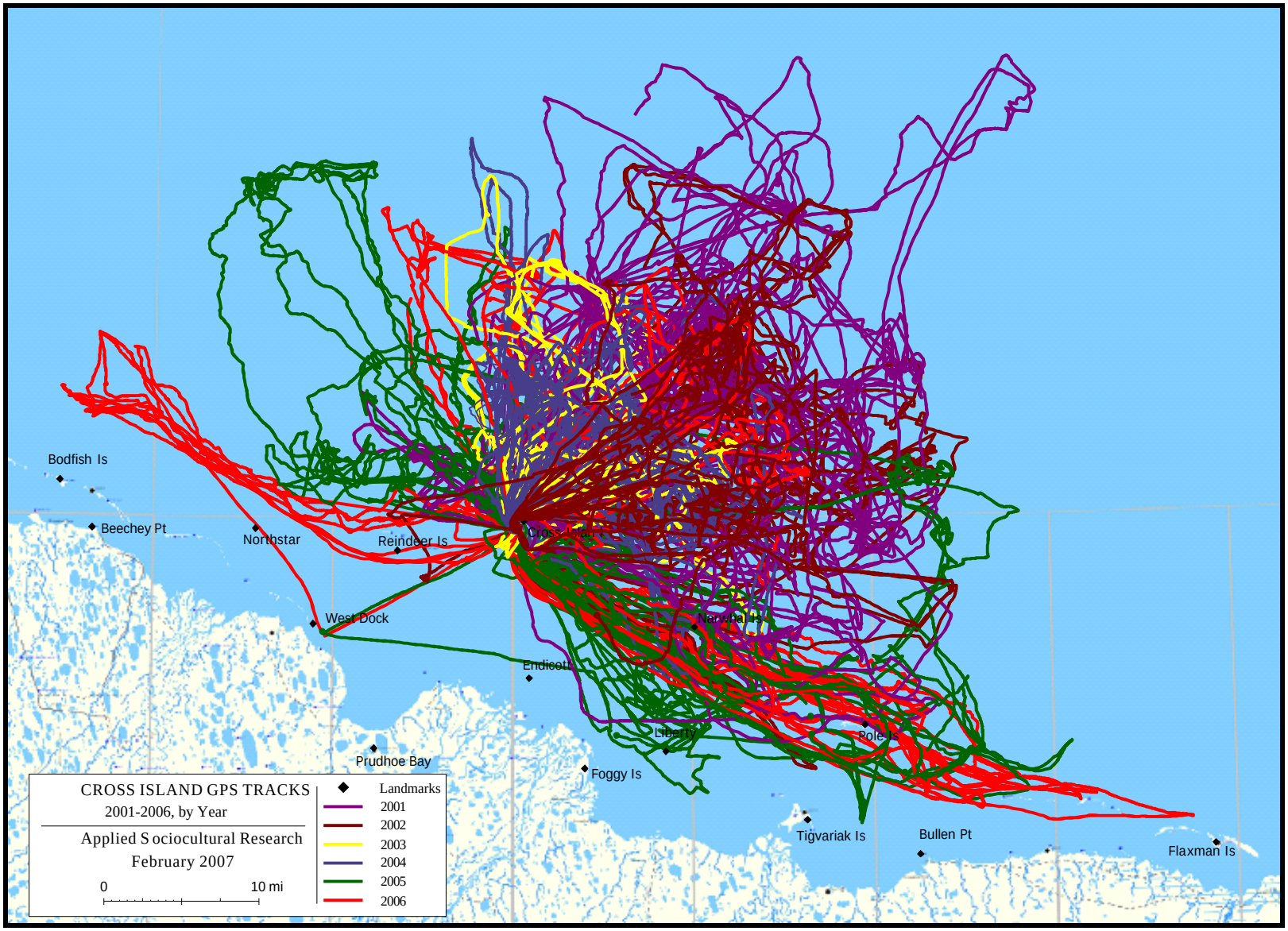


Figure 8: All Cross Island Whaling Tracks, 2001-2006, by Year

Table 7: All Waypoints Marked or Located, 2006 – Whale Sightings Shaded

Date	Crew	Waypoint #	Lat/Long	Time	Notes
09/04/06	BO	bo1_090406a	N70 16.964 W146 42.950	11:02-11:30	stopped for lunch on an ice berg
09/04/06	BO	bo1_090406b	N70 13.913 W146 25.612	12:55 (?)	position when IAN called in with whale sighting
09/04/06	IAN	ian_090406a	N70 14.758 W146 51.309	13:26	WHALE SIGHTING (in the ice)
09/04/06	IAN	ian_090406b	N70 20.450 W147 25.849	16:06	estimated boat position when they saw a barge
09/04/06	UA	ua1_090406a	N70 18.876 W146 44.383	9"58	bearded seal in the ice
09/04/06	UA	ua1_090406b	N70 22.232 W147 37.024	17:00	estimated boat position when they saw a barge
09/04/06	UA	ua1_090406c	N70 21.467 W147 36.716	17:00	estimated position of barge seen
09/05/06	IAN	ian_090506a	N70 20.707 W147 27.270	8:30	estimated position where they entered the ice pack
09/05/06	NUK	nuk2_090506a	N70 19.590 W147 25.613	13:38	estimated position where a plane flew over them
09/05/06	NUK	nuk2_090506b	N70 20.983 W147 30.919	14:12	estimated position where motor problems started
09/06/06	BO	bo1_090606a	N70 33.353 W148 49.822	13:21	seals and oogruks
09/06/06	BO	bo1_090606b	N70 32.303 W148 50.213	17:20	seals and oogruks
09/06/06	IAN	ian_090606a	N70 32.301 W148 46.128	13:18	Estimated position of WHALE SIGHTING
09/07/06	IAN	IAN_090706a	N70 18.903 W147 16.781	15:25	unspecified point - may be open water, not a whale
09/07/06	NUK	nuk1_090706a	N70 19.909 W147 10.566	13:48	Estimated position of WHALE SIGHTING (25-footer)
09/07/06	NUK	nuk1_090706b	N70 18.837 W147 18.839	15:14	estimated position of turning off motor and listening
09/10/06	BO	BO1_091006a	N70 36.236 W147 58.860	10:20	coordinates given by UA1 as their position
09/10/06	BO	bo1_091006b	N70 34.638 W148 00.967	11:39	estimated position of seal harvest
09/10/06	BO	bo1_091006c	N70 34.788 W147 50.929	16:11	estimated position of ice edge
09/10/06	BO	bo1_091006d	N70 34.975 W147 52.197	16:53	large piece of ice they tied up to for a while
09/10/06	BO	BO1_091006e	N70 34.923 W147 51.973	18:24	where UA1 tried to take a seal (missed)
09/10/06	IAN	ian_091006a	N70 31.990 W147 58.117	9:47	estimated position of large polar bear
09/10/06	IAN	ian_091006b	N70 32.303 W147 57.122	9:56	estimated position of where fog started
09/10/06	IAN	ian_091006c	N70 33.395 W147 51.658	15:05	estimated position of reaching open water
09/10/06	IAN	ian_091006d	N70 32.320 W147 48.533	17:49	estimated position of where ice started on return trip
09/10/06	IAN	ian_091006e	N70 30.828 W147 54.992	18:28	estimated position of bearded seal
09/10/06	UA	ua1_091006a	N70 33.116 W148 04.834	9:37	estimated start of open water (ice edge)
09/10/06	UA	ua1_091006b	N70 34.638 W148 00.967	9:59	estimated position of trying for a seal
09/10/06	UA	UA1_091006c	N70 36.236 W147 58.860	10:19	relatively open water (but maybe not a distinct ice edge)

Table 7 (Continued): All Waypoints Marked or Located, 2006 – Whale Sightings Shaded

09/11/06	BO	bo1_091106a	N70 34.198 W147 56.156	9:56	open water (ice edge)
09/11/06	BO	bo1_091106b	N70 33.218 W147 40.655	10:53-11:06	rest spot on ice berg, easternmost point of track
09/11/06	BO	BO1_091106c	N70 32.711 W147 46.428	11:56	steering broke down
09/11/06	BO	bo2_091106a	N70 33.609 W147 54.118	17:05	reached open water (ice edge)
09/11/06	BO	bo2_091106b	N70 35.214 W147 58.817	17:14	encountered ice again, turned north
09/11/06	BO	bo2_091106c	N70 45.710 W148 00.123	17:38-18:22	open water 18 or 19 miles N of CI, rough and wet
09/11/06	BO	bo2_091106d	N70 44.798 W148 06.512	17:38-18:22	SAW BLOWS (others already chasing whales)
09/11/06	BO	bo2_091106e	N70 42.891 W148 15.134	18:15 or so	harpoon line pulled overboard, returned to CI
09/11/06	BO	bo2_091106f	N70 37.459 W148 16.054	18:35	reentered ice pack (ice edge)
09/11/06	IAN	IAN_091106a	N70 33.038 W147 55.749	8:52	unknown
09/11/06	IAN	ian_091106b	N70 33.753 W147 55.106	8:56	entered ice about this point (ice edge)
09/11/06	IAN	IAN_091106c	N70 33.423 W147 44.585	11:30	position of IAN boat when BO1 requested assistance
09/11/06	IAN	IAN_091106d	N70 33.631 W147 46.585	15:20	unknown
09/11/06	IAN	IAN_091106e	N70 30.170 W147 57.021	15:23	unknown
09/11/06	IAN	IAN_091106f	N70 31.419 W147 51.411	16:03	Estimated position of ice edge (reached open water)
09/11/06	IAN	IAN_091106i	N70 42.735 W148 02.031	17:16	First WHALE SIGHTING of the day for (lost it)
09/11/06	IAN	ian_091106j	N70 44.579 W148 10.559	18:04	Second WHALE IAN chased this day (30-footer, lost it)
09/11/06	IAN	ian_091106k	N70 44.882 W148 13.566	18:07	this same 2nd whale, near the start of the chase
09/11/06	IAN	ian_091106l	N70 46.834 W148 21.802	18:36	approx. area IAN lost 2nd whale, many BLOWS to N
09/11/06	IAN	ian_091106m	N70 35.284 W148 03.461	20:04	approx. ice edge on return trip to CI
09/11/06	IAN	ian_091106n	N70 41.803 W148 04.376	17:10	several large ice bergs encountered
09/11/06	IAN	ian_091106o	N70 37.813 W148 04.283	19:54	ice edge
09/11/06	IAN	ian_091106p	N70 44.232 W148 14.089	ref. pt.	ice edge
09/11/06	IAN	ian_091106q	N70 33.432 W147 52.385	ref. pt.	ice edge
09/11/06	NUK	nuk1_091106a	N70 29.202 W147 20.991	12:44	where NUK1 met NUK3 - stayed together after this
09/11/06	NUK	nuk3_091106a	N70 32.313 W147 48.049	8:47	open water (ice edge), about 5 miles from CI
09/11/06	NUK	nuk3_091106b	N70 29.104 W147 19.551	12:37	returned to the ice because of high swells in open water
09/11/06	NUK	nuk3_091106c	N70 35.551 W147 49.625	14:44	small WHALE SIGHTING (25-footer), about 7.8 miles
09/11/06	NUK	nuk3_091106d	N70 39.383 W148 01.645	16:04	two different WHALES (1st seen by UA1)
09/11/06	NUK	nuk3_091106e	N70 43.373 W147 56.220	17:25-17:47	three dif. WHALES (1st seen by BO1) + BLOWS to N
09/11/06	NUK	nuk3_091106f	N70 43.503 W148 15.052	18:50	MOTHER WHALE W/CALF
09/11/06	UA	ua1_091106a	N70 32.975 W147 37.347	13:40	left the ice for the open water (ice edge)
09/11/06	UA	UA1_091106b	N70 36.993 W147 50.169	14:49	WHALE SIGHTING (also seen by others)
09/11/06	UA	UA1_091106c	N70 40.112 W148 00.700	15:57	two different WHALES (1st seen by UA1), 2 hour chase
09/11/06	UA	ua1_091106d	N70 43.634 W147 58.766	17:31	lost track of whale being chased - most N point of track
09/11/06	UA	UA1_091106e	N70 44.846 W148 12.818	17:58	single WHALE seen - at least 9 BLOWS to N, NE, NW
09/11/06	UA	UA1_091106f	N70 45.965 W148 16.679	18:27	single WHALE seen - at least 9 BLOWS to N, NE, NW
09/11/06	UA	ua1_091106g	N70 44.128 W148 17.218	18:49	single WHALE seen - at least 9 BLOWS to N, NE, NW
09/11/06	UA	ua1_091106h	N70 38.408 W148 12.034	19:40	entered ice about this point (ice edge) on return trip

Table 7 (Continued): All Waypoints Marked or Located, 2006 – Whale Sightings Shaded

09/13/06	BO	bo1_091306a	N70 39.260 W147 52.778	7:52	BO1 boat position when they received whale coordinates
09/13/06	BO	bo1_091306b	N70 40.405 W147 24.852	8:33	probable start of tow
09/13/06	NUK	nuk1_091306a	N70 38.950 W147 27.868	7:53	coordinates given for NUK1 WHALE SIGHTING
09/13/06	NUK	nuk1_091306b	N70 38.655 W147 27.177	7:56	2nd set of coordinates for this same whale
09/13/06	NUK	nuk1_091306c	N70 38.203 W147 25.971	8:05	where this whale poped up 1st time, next to ice floe
09/13/06	NUK	nuk1_091306d	N70 39.478 W147 26.754	8:08	2nd time this whale came up (very short dive)
09/13/06	NUK	nuk1_091306e	N70 40.529 W147 24.616	8:43	position of prayer once whale was dead
09/13/06	NUK	NUK3_091306a	N70 43.562 W147 33.265	7:52	Probable 1st WHALE SIGHTING or BLOWS by NUK3
09/13/06	NUK	NUK3_091306b	N70 43.551 W147 33.248	7:52	duplicate marked point for whale(s)
09/13/06	NUK	NUK3_091306c	N70 43.377 W147 33.146	7:54	dulpicate marked point for whales(s)
09/13/06	NUK	NUK3_091306d	N70 40.218 W147 25.166	8:20	position of FIRST STRIKE
09/13/06	NUK	NUK3_091306e	N70 40.499 W147 24.544	8:46	position of whale death
09/14/06	BO	bo1_091406a	N70 35.504 W147 28.612	10:19	ice edge (reach "open water")
09/14/06	BO	bo1_091406b	N70 41.442 W147 36.707	11:25-11:31	area where IAN had seen a whale (only IAN ever saw it)
09/14/06	BO	BO1_091406c	N70 35.835 W147 14.367	13:42	WHALE SIGHTING (seen by UA1 first)
09/14/06	BO	bo1_091406d	N70 34.555 W147 12.816	13:59	whale came up and seen a 2nd time
09/14/06	BO	bo1_091406e	N70 33.669 W147 14.997	14:02	boats still chasing and close to whale
09/14/06	BO	BO1_091406f	N70 33.530 W147 15.082	14:05	BO1 boat position when UA1 1st struck whale
09/14/06	BO	BO1_091406g	N70 33.322 W147 14.352	14:13	BO1 boat position when whale died
09/14/06	IAN	IAN_091406a	N70 36.414 W147 36.081	10:30	ice edge (?)
09/14/06	IAN	ian_091406b	N70 40.844 W147 36.324	12:18	WHALE SIGHTING
09/14/06	IAN	IAN_091406c	N70 33.293 W147 18.855	15:21	unknown
09/14/06	IAN	ian_091406d	N70 33.196 W147 25.447	15:54	unknown
09/14/06	UA	UA1_091406a	N70 41.696 W147 37.864	11:29	where UA1 boat met up with BO1 and IAN boats
09/14/06	UA	ua1_091406b	N70 37.808 W147 31.292	12:24	reached open water (ice edge)
09/14/06	UA	UA1_091406c	N70 35.552 W147 14.515	13:40	UA1 BLOW SIGHTING (same as BO1_091406c?)
09/14/06	UA	UA1_091406d	N70 33.519 W147 15.072	14:05	UA1 FIRST STRIKE location
09/14/06	UA	ua1_091406e	N70 33.391 W147 14.591	14:11	area of at least one additional bomb in whale
09/14/06	UA	ua1_091406f	N70 33.224 W147 13.838	14:49	approx location of start of tow

Table 7 (Continued): All Waypoints Marked or Located, 2006 – Whale Sightings Shaded

09/15/06	BO	bo1_091506a	N70 33.737 W147 36.085	9:16	reached open water (ice edge)
09/15/06	BO	bo1_091506b	N70 33.250 W147 10.850	12:22	open water, high "surf waves"
09/15/06	BO	bo1_091506c	N70 32.161 W147 16.398	13:28-13:38	back to the ice, to find a "perch" to look from
09/15/06	BO	bo1_091506d	N70 33.338 W147 18.838	14:04	back to the open water to have lunch and look around
09/15/06	BO	bo1_091506e	N70 39.181 W147 20.634	15:12	WHALE SEEN to the north (boat position)
09/15/06	BO	bo1_091506f	N70 40.086 W147 19.727	15:22	this area and circles to the west - looking for whale
09/15/06	BO	bo1_091506g	N70 38.323 W147 29.971	17:02	two different WHALES SEEN (boat position)
09/15/06	BO	bo1_091506h	N70 37.692 W147 30.919	17:02	two different WHALES SEEN (est. whales position)
09/15/06	BO	BO1_091506i	N70 37.581 W147 30.987	17:16	BO1 boat position when IAN 1st struck whale
09/15/06	IAN	IAN_091506a	N70 32.449 W147 12.200	10:45	WHALE SEEN in ice (but soon lost)
09/15/06	IAN	ian_091506b	N70 34.866 W147 21.861	13:44-14:44	"VILLAGE OF WHALES" while going N - many BLOWS
09/15/06	IAN	ian_091506c	N70 38.880 W147 30.422	16:21	IAN boat position when BO1 saw a whale
09/15/06	IAN	ian_091506d	N70 37.542 W147 30.960	17:06	estimated FIRST STRIKE location
09/15/06	NUK	nuk1_091506a	N70 34.804 W147 21.175	14:11	WHALE SEEN (or several) or could be nuk1_091506a')
09/15/06	NUK	nuk1_091506a'	N70 37.520 W147 19.904	14:44	WHALE SEEN (or several) or could be nuk1_091506a)
09/15/06	NUK	nuk1_091506b	N70 38.395 W147 19.140	15:07	maybe saw whale again, also 4 walrus on ice
09/15/06	NUK	nuk1_091506c	N70 41.946 W147 24.058	16:21	SAW BLOWS to the S (on way back to CI)
09/18/06	BO	bo1_091806a	N70 34.584 W147 18.293	10:58	WHALE SEEN
09/18/06	BO	BO1_091806b	N70 34.579 W147 18.486	10:58	may be coordinates for a whale
09/18/06	BO	bo1_091806c	N70 34.695 W147 16.838	11:11	MANY BLOWS, all directions
09/18/06	BO	bo1_091806d	N70 34.977 W147 16.539	11:14	three WHALES SEEN (and chased)
09/18/06	BO	bo1_091806e	N70 35.406 W147 14.781	11:24	following whale
09/18/06	BO	bo1_091806f	N70 35.638 W147 16.421	11:29	FIRST STRIKE on WHALE (and MANY BLOWS)
09/18/06	BO	bo1_091806g	N70 36.265 W147 17.422	12:10	more bombs into whale?
09/18/06	BO	bo1_091806h	N70 36.335 W147 17.417	12:24	estimated position of whale death
09/18/06	BO	BO1_091806i	N70 36.340 W147 17.401	12:26	location of prayer of thanks
09/18/06	BO	BO1_091806j	N70 36.382 W147 18.190	12:52	beginning of the tow
09/18/06	UA	ua1_091806a	N70 32.800 W147 32.743	10:04	ice edge (about 10.8 miles from Cross Island)
09/18/06	UA	ua1_091806b	N70 31.127 W147 22.394	11:07	UA1 position when BO1 saw whale and called for help
09/18/06	UA	UA1_091806c	N70 35.415 W147 14.916	11:23	position when UA1 caught up to BO1 and NUK3
09/18/06	UA	UA1_091806d	N70 35.702 W147 16.625	11:48	float put on the whale (by UA1) to help kill whale

trips), or 96 percent. The two tracks (four percent) that were not collected are accounted for by one crew which had the "tracking" function on their GPS units turned off, as discussed above. All GPS tracks collected have been transmitted to MMS in Garmin MapSource (*.gdb) and shape file (*.shp and associated files) formats, and are available to appropriate users.

Not all waypoints listed in Table 7 were actually marked by crews while they were out on the water. Some were described by crews during their reviews of GPS tracks. Waypoints that were marked by crews during their trips have labels with capital letters. Thus, not all whale sightings were marked, and not all unmarked whale sightings were later described to the researcher. The daily boat report forms may include some additional likely whale sightings that are not included in Table 7, but these additional points are based on whalers' general accounts, and no specific locational information. It is likely that not all whale sightings are included on the daily report forms, although most individual whales sighted are probably represented. Multiple sightings of the same whale were usually reported as such by most crews, but most crews only marked a single position for a whale unless they followed it for a significant period of time and/or struck it. Different crews may mark the position of the same whale, so the number of different whales observed may require an analysis of all points and tracks in relation to each other.

Waypoints are of three types – whale sightings/strikes, reference points (generally whales seen on previous days or by other boats), and "unknown significance". Whale sightings may have actually been marked by a crew, or may have been located on their track when reviewing it with the researcher at some point. Strike locations are relatively fixed, but sightings may be for a whale or blow located anywhere from 10 feet to several miles from the boat, and thus are less fixed in terms of position. Each waypoint number consists of three parts: BoatID (upper case for points marked while out on the water, lower case for points located while discussing the GPS track with the researcher), Date(mmddyy), and Sequence Number.

Other Subsistence Activities

Little non-whaling subsistence activity was documented on or near Cross Island during the whaling season, but more than in previous seasons. Of course, a great deal of "non-whaling" subsistence activity took place throughout the year in order to support the whaling effort. Whalers did note that they had seen seals and birds, but did not mark these points and generally described such sightings as taking place where ice was encountered (which was not often). Polar bear tracks were found on Cross Island when the crews arrived, and it can be presumed were present from that point on. Polar bears were a concern, but not as troublesome as in some past years. One nuisance bear was shot. Bears were very close to the cabins several times, and tried to break into at least one. Hazing occurred repeatedly and fairly frequently.

Walrus were observed while boats were out scouting for whales, but none were taken. Many bearded seals and "regular" seals were seen while out scouting. No bearded seals were taken, but one or two small ("pot size" seals were shot and cooked for a "general invitation" Cross Island dinner. No harvest of birds was noted, and no fishing took place while the whalers were on Cross Island.

Nuiqsut Whalers' Observations and Perceptions of Whale Behavior in 2006

Ice conditions in 2006 during the early part of the season were very similar to those in 2005, with similar consequences. The whalers were confined to within the barrier islands and saw few whales. They remarked that the whales were probably where they usually were, but that they could not reach them with their boats. When ice conditions moderated, this proved to be the case.

Observed Whale Feeding Behavior in 2006

There were no reports of whale feeding behavior during the 2006 Cross Island whaling season. This does not necessarily mean that feeding did not occur, or that Nuiqsut whalers did not observe it. However, it is an indicator that whale feeding activity was not very obvious in 2006. Stomach contents from only two of the four whales taken were examined, and no samples were taken. One of these stomachs was quite full, while the other was nearly empty. Possible explanations for the relative lack of observed whale feeding behavior, not mutually exclusive, are as follows:

- Whale feeding is not commonly observed (or at least not reported) by Nuiqsut whalers near Cross Island (only one incident during the previous five years);
- Few whales were observed on some days by whalers during the 2006 season;
- On some days when scouting was possible, ice conditions made it difficult to observe whales for more than the shortest periods of time;
- On some days when scouting was possible, swells and waves (due to wind) still made spotting and observing whales difficult;
- On some days when a relatively large number of whales were observed, most were seen only at a relatively large distance;
- Barge and other vessel activity may have "spooked" whales early in the season;
- A major part of the migration may have bypassed the area accessible to the whalers.

For the five years previous to 2006, only one observation of whale feeding was reported and recorded. This was a spectacular sighting of a whale feeding on the surface with its mouth open, about 7.8 miles (12.6 km) from Cross Island, bearing 34E true. The captain, a very experienced whaler, remarked that this was the first time he had seen this. This does not necessarily indicate that Nuiqsut whalers did not observe whale feeding behavior on other occasions in 2001–2006 when they were out scouting. However, it probably means that such observations were not common. If other sorts of feeding behavior had been observed during 2001–2006, they would probably have been reported.

Most feeding by bowhead whales is below the surface and difficult to recognize via surface observations; however, there have been some previous observations of bowheads feeding actively at the surface in the Canadian and Alaskan Beaufort Sea, with mouths open (Würsig et al. 1984, 1989; Richardson and Thomson [eds.] 2002). The first whale taken by a Nuiqsut crew, in 1973, was reported to have been feeding on the bottom near Flaxman Island. Some other whales landed at Cross Island have been found to have recently-consumed food in their stomachs (Lowry and

Sheffield 2002; Lowry et al. 2004). One of the whales taken in 2006 was also reported to have had mud on its jaw.

"Skittish" Whale Behavior During 2006

For the most part, Nuiqsut whalers reported that when they found whales and could reach them in 2006, they were able to follow them. However, a few whales were described as appearing to be "spooked" from the time the whalers first saw them. On the first five scouting days, which were in the 4 to 10 September period, relatively few whale observations were reported and some of those were described as "spooked". On the last five scouting days (11 to 18 Sept. period), when the most whales were seen, there were also reports of "spooky" behavior. Whether there was a difference in the frequency of "spooked" whales between the first and second parts of the season would be difficult to assess, since so few whales were seen in the first part of the season. Overall, the whalers did not elaborate on possible explanations for the "spooked" behavior and did not make a distinction between the first and second parts of the season in this regard. However, some obvious possibilities (not mutually exclusive or all inclusive) and suggested at various times by whalers as possible general explanations for "spooky" behavior suggest that whales could have been expected to be somewhat more "spooky" early in the season

- ice cover persisted throughout the season, but was much more extensive early in the season and confined the whalers, other vessel traffic, and perhaps whales within a relatively confined area;
- non-whaling vessel traffic was much more evident to the whalers in the early part of the season; and
- a higher proportion of the whales seen in the first part of the season were solitary whales – solitary whales may exhibit more "spooky" behavior than do bowheads accompanied by other whales.

In 2001, when whalers reported that whales seemed to be more skittish than normal, they suggested several possible explanations. Although Nuiqsut whalers cited industry activities as one possible explanation or factor for this pattern, they said that other explanations were also possible. These other factors were ice conditions to the east of Cross Island, presence of natural predators such as killer whales, barge traffic related to the Kaktovik water and sewer project, or other air or vessel traffic to the east of Cross Island. Note that two of these, while not related to oil industry activities, are related to other human economic activities.

The two years (2001 and 2006) were very different in terms of environmental conditions. In 2001, there was almost no ice and the whales found by whalers were quite distant from Cross Island. Whalers went far to the NW and NE of Cross Island when scouting for whales in 2001. Acoustic monitoring in 2001 also found that the whales were farther offshore in that year than in some subsequent years—specifically 2003 and 2004 (Richardson [ed.] 2006; Blackwell et al. MS). In 2006, Nuiqsut whalers took their whales in that same offshore area, even though ice made this area more difficult to reach in 2006 than in 2001. The whalers suggested that the whales were there in 2006 because the ice conditions prevented their being much closer. In 2001, "spooky" behavior was the more prevalent explanation. Whalers gave the impression that whale sightings were more abundant in this area during 2006 than in 2001.

General Offshore Distribution of Whales, 2006

Although conditions for whaling were much better in 2006 than in 2005, there were still relatively few days on which whalers were able to travel to open water and find whales (5 of 10 scouting days). Of these five days, they saw a good number of whales on only four days (11, 14, 15, and 18 Sept.). Single whales were taken on four days: one whale was taken per day on the three days when good numbers of whales were seen, and one whale was taken on a day (13 Sept.) when it was the only whale seen that day. On some days "surf waves" (large rolling waves) made it difficult if not dangerous to travel in the open water. Also, waves (and fog) can make spotting blows and whales difficult. The whalers did not suggest that there were actually fewer whales in the general Cross Island area at those times. Rather, they theorized that the wedge of pack ice that prevented the whalers from going much north of Cross Island for much of the time also encouraged most of the migrating whales to stay well north of Cross Island, in more open water. This ice allowed the whalers to travel most easily to the SE of Cross Island, and this is the direction that most of their scouting trips took in the early part of the season (Fig. 4, tracks coded in blue/purple tones). It was only in the latter part of the 2006 season, when whalers were able to make their way through the ice and reach waters well north of Cross Island, that they were able to find a good number of whales and land their quota of four (Fig. 4, tracks coded in greens and yellows).

The limitation of scouting trips to nearshore waters early in the 2006 season was a pattern very different from that in most other recent years, aside from 2005 when nearly all effort was restricted to the nearshore area and harvest success was low (Galginaitis 2006). For years prior to 2005, most trips were either NW or NE of Cross Island, with a few more easterly and only a very few with a southerly component (Fig. 5). In 2006, it was only when whalers were able to make their way through the ice and reach the more offshore area that they were able to find and land a good number of whales to fill their quota (Fig.4).

In general, Nuiqsut whalers report that significant ice cover allows whales to "hide" and thus makes them more difficult to spot. Significant ice cover also allows whales that are seen to escape more easily; it makes them more difficult to follow. Whales can dive under ice, whereas boats must travel around it. Thick ice cover, such as that encountered near Cross Island in 2005, may also direct most of the migration farther north into more open water, while at the same time effectively preventing Nuiqsut whalers from reaching or accessing those areas. When Nuiqsut whalers were able to reach the more open water to the north of the ice pack, they did find whales and were able to follow and chase them. Nuiqsut whalers believe that the migration of whales in 2006 was similar to that of previous years, but that ice and weather conditions prevented the whalers from reaching and seeing most of the whales. They also believe that many of the whales that they did see, at least in the area SE and E of Cross Island, were affected by non-whaling vessel activity in the area, and that this had a detrimental effect on the success of their subsistence whaling (see following section).

Non-Whaling Vessel Activity in 2006 and Expressed Whalers' Concerns

This Section summarizes specific observations made by Nuiqsut whalers of activities by vessels other than whaling vessels during the 2006 Cross Island whaling season. The inclusion of this information reflects the general concern that Nuiqsut whalers' have about the possibility of non-whaling vessel traffic disrupting or otherwise affecting their whaling activities, and is more specifically related to their experience in 2005. In 2005, ice conditions and weather confined the whalers to the shore side of the ice (and the barrier islands) except for one day. This was the one day in 2005 when they saw a large number of whales. They had seen non-whaling vessels on previous days, but on this one day were actually chasing whales when they encountered a non-whaling vessel that came into close proximity with at least one of the whaling vessels and disturbed the hunt. Although the whalers were successful in landing a different whale later in the day, after the non-whaling vessel had proceeded to the west, the whalers reported this encounter may have delayed the landing of a whale, and certainly contributed to their decision not to try to land two whales on this day. Nuiqsut whalers thus were quite sensitive to the possibility of non-whaling vessels disturbing their hunt in 2006. Compounding this concern, ice conditions early in the 2006 season appeared to be a repeat of those in 2005 and the whalers observed non-whaling vessels (but few whales) on each of the first four days when they went out scouting inside of the barrier islands. Their concerns were alleviated somewhat once ice conditions moderated and they were able to reach open water beyond the barrier islands. They found numerous whales and landed their full quota of four, while not observing any more non-whaling vessels. Their concern with this potential problem was not dissipated, however. This was evident from their continued discussions among themselves and with the AEWC, and their sensitivity to any such vessel (or aircraft) activity taking place in the Cross Island area when whaling may be taking place. Documentation of these observations and concerns in 2006 is summarized in this section below.

This information was recorded by a researcher (MSG) staying with the whalers on Cross Island and is abstracted from the more general accounts of Cross Island whaling activities. Summaries are included only for those days on which vessel activity was reported, or when concerns for vessel activity effects were discussed. The GPS tracks of concern are those from the early part of the 2006 season, 4 September through 7 September (Figure 4, blue and purple coded tracks).

9/05. Some barge activity noted "near Cross Island" - evidently an effort to deploy BP's seafloor acoustic recorders near Northstar. This fostered some discussion of the CAA arrangements.

9/06. Com Center calls whalers about ACS vessel to deploy acoustic instruments (not for BP) north of Northstar. Discussion with the whalers, who plan to be in that area today and thought the acoustic gear had been deployed yesterday. [The effort on 9/05 was for BP, and was unsuccessful due to ice; today's effort was for another company.] After discussion, whalers initially agree to it. After further discussion, they ask if the deployment can be delayed, but later seem to come around to allowing it. However, the ACS vessel with the acoustic gear returned to shore, in compliance with the Nuiqsut whalers' initial request. The whalers do hear a barge while out scouting and say it was loud. It may have been on its way to Cape Simpson.

9/07. At 06:40 AM, the Com Center radios Nuiqsut whalers and asks if the ACS vessel, operating for BP, can deploy recording gear offshore of Northstar today. Since the whalers

intend to scout SE today they give their okay. Com Center says there will also be a barge from Point Thomson to Kaktovik and one or two others (details not recorded). This sparks a whaler–Com Center discussion on the level of vessel activity. There are the deployments of acoustic gear in the west for BP and another operator, and quite a bit of barge activity in the east—at least three that Com Center enumerates. The whalers specifically request that the Point Thomson gravel haul operation be suspended until after their whaling season is over. The whalers agree that the fuel barges can operate—fuel is essential for the villages—but request that activities with more operational flexibility such as gravel haul be deferred until after their whaling season. Their spokesman said that they had not seen any whales so far (they had actually seen only a few up to that point). While out scouting, the whalers did see one barge south of them heading towards West Dock or Endicott (10:30–11:00 AM). This could have been a of the fuel barge.

9/08. No barge activity noted but two private sailboats overnight at Cross Island. They came for the east and leave to the west on 9/09.

9/09. No vessel traffic noted, but there was a phone conversation between the NWCA and AEWC concerning the barges and the sail boats.

9/12. No barge traffic noted but NWCA and AEWC had another phone conversation, at least part of which was about barge traffic.

When some Nuiqsut whalers were reviewing a draft of this report, concern was raised about some of the proposed industrial activities being proposed for the 2007 open water season (part of which, of course, is the fall whaling season). Of special concern was the possibility of drilling at the Kuvlum and Hammerhead units. Exploration wells were drilled at Hammerhead in 1985/86 and at Kuvlum in 1992/93. Whalers relate that both disrupted whaling for those years (Long 1996 in particular, but much more information available – see, for instance, the more general remarks from North Slope Inupiat in USDOI MMS 1996 and USDOI MMS 1999, or Ahmaogak 2002). Information on the disruption to whaling for those years is not documented in much detail in the literature, due to a variety of reasons, but could be of significant value if it could be developed at this late date. In any event, Nuiqsut whalers have expressed a significant concern that industrial activity at the Hammerhead or Kuvlum unit sites could adversely affect their whaling activities.

Planned Future Activities

As this is written, the draft report for the 2005 field season is also in final preparation and undergoing review by the Nuiqsut whalers. Plans for the 2007 field season are tentative, as MMS has not yet committed funds for that purpose. Plans for the production of the final synthetic report are underway, although they would be affected (at least in terms of timing) if there is an additional field season in 2007. Consultation with the Core Contractor on the delivery data to MMS in a standard database format is also underway, as is the necessary processing to make the data collected in the first years of the project consistent with that for the later years. In summary:

- Completion of draft reports for 2005 and 2006 is anticipated by the end of February, pending the comments of Nuiqsut whalers and formal presentation of the 2006 results to the Nuiqsut

whaling captains at a Nuiqsut Whaling Captains' Association meeting (expected to be in February). The 2005 material has undergone such review, while the review of the 2006 report is in process. Both will be made available to MMS in a pre-approval format for internal use, when they are in appropriate form, but should not be distributed or made available on the MMS website until transmitted to MMS in "final" form. This will be after the 2006 results are formally presented to the NWCA and their comments are received and incorporated. This presentation will also allow for consultation on the use of pictures in the report;

- Consultation with Nuiqsut whaling captains about the possible 2007 field season is underway. These plans are tentative, pending MMS commitment of funds;
- Re-processing of data for analysis in the final synthetic report is underway, along with overall planning for the structure of this report;
- In conjunction with the re-processing of data for the final report, the delivery of data to the Core Contractor for transmission to MS in a standard database format is in development;
- Follow-up trips to Nuiqsut will be required for the final report in any event, and for purposes of the 2007 field season and reporting of results, should the 2007 field season be funded.

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Electronic Appendices (files that appear on accompanying CD-ROM)

Annual Assessment of Subsistence Bowhead Whaling Near Cross Island, 2006 Annual Report (cANIMIDA Task 7) – PDF file "AnRpt2006.pdf"

PDF format files containing displays of combined whale boat GPS tracks for all days in 2006 on which at least one boat went scouting for whales:
"AppendixA.pdf"

PDF format file containing all boat report forms for 2006:
"AppendixB.pdf"

Data Logger file from Cross Island weather station for 2006 in Excel format:
"AppendixC.xls"

The Department of the Interior Mission

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering sound use of our land and water resources; protecting our fish, wildlife, and biological diversity; preserving the environmental and cultural values of our national parks and historical places; and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to ensure that their development is in the best interests of all our people by encouraging stewardship and citizen participation in their care. The Department also has a major responsibility for American Indian reservation communities and for people who live in island territories under U.S. administration.

The Minerals Management Service Mission

As a bureau of the Department of the Interior, the Minerals Management Service's (MMS) primary responsibilities are to manage the mineral resources located on the Nation's Outer Continental Shelf (OCS), collect revenue from the Federal OCS and onshore Federal and Indian lands, and distribute those revenues.

Moreover, in working to meet its responsibilities, the **Offshore Minerals Management Program** administers the OCS competitive leasing program and oversees the safe and environmentally sound exploration and production of our Nation's offshore natural gas, oil and other mineral resources. The MMS **Royalty Management Program** meets its responsibilities by ensuring the efficient, timely and accurate collection and disbursement of revenue from mineral leasing and production due to Indian tribes and allottees, States and the U.S. Treasury.

The MMS strives to fulfill its responsibilities through the general guiding principles of: (1) being responsive to the public's concerns and interests by maintaining a dialogue with all potentially affected parties and (2) carrying out its programs with an emphasis on working to enhance the quality of life for all Americans by lending MMS assistance and expertise to economic development and environmental protection.