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The Barrow Symposium on Sea Ice, 2000: Evaluation of One Means of Exchanging Information between Subsistence Whalers and Scientists

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INTRODUCTION

A Barrow Symposium on Sea Ice (BSSI) was held in early winter 2000. The National Science Foundation (U.S.) funded this symposium as the keystone event in a project designed to ally traditional ecological knowledge (TEK) with formal ice research and remote sensing. The goal of the project was to stimulate substantive interactions between scientists and technicians who study sea ice on one hand, and Iñupiat Eskimos (primarily whaling captains and their crews) who use the ice routinely for travel, camping, and hunting, on the other. From different perspectives, at different scales, and for different purposes, the two groups have accumulated extensive knowledge of ice characteristics and dynamics. We evaluate strengths and weaknesses of the workshop format as a means of exchanging information between scientific and traditional knowledge.

The idea for the BSSI arose within a group of Arctic-resident researchers whose experience included a unique blend of traveling and working on sea ice themselves while collaborating with Iñupiat whalers and elders in Barrow. These investigators knew firsthand of the Iñupiat whalers' superior skills in distinguishing types of ice and associated ice dynamics, and particularly of the application of their observational skills to adopting safety precautions. The investigators also obtained access to several forms of remote-sensing technologies to provide images of sea ice. These images, which display information on both local and regional scales, are helpful in assessing the structure of the ice. Combining these two complementary scales of understanding offered the promise of achieving greater insight into the large- and small-scale forces acting on sea ice and into the relationships between them. A better understanding might benefit all analysts, especially those who take risks associated with living and traveling on sea ice for extended periods each year.

PREPARATION

To illustrate the power of combining the two types and scales of knowledge, investigators had to choose methods and forums. The workshop approach was chosen as the most effective means to encourage discussions, review photographs and other graphical material, and promote a sense of shared purpose among the participants. Other methods considered included conducting a series of interviews, preparing written and illustrated materials, and working together in the field. While interviews and written materials often provide greater detail and depth, they cannot by themselves encourage broad discussion and exchange of information. Many of the researchers and elders who participated in the BSSI have engaged in collaborative fieldwork. As a means of exchanging information, however, undertaking new fieldwork was considered premature because selecting research topics and methods in advance would narrow the range of subjects under consideration. The BSSI became the project's central instrument or focusing experiment in synthesis and integration. Interviewing, preparing written and illustrated materials, and conducting joint field studies were all used as preparatory and supplemental methods.

Having chosen the symposium as the means, the co-investigators next had to decide the topics that promised best to stimulate discussions. General topics—freeze-up, breakup, the formation of leads and pressure ridges—can be useful starting points for interviews. In a workshop setting, however, there is relatively little time for each participant to speak. Case studies of a finite number of memorable events offered a promising compromise between too tightly focused and too vaguely defined starting points.

Nine candidate cases were identified, typically involving a memorable event for which there were likely to be both remote sensing or weather records and detailed, vivid recollection by members of the community. Five case studies (Table 1) were ultimately selected. The criteria for case study selection were that (a) cases should address events that were locally noteworthy; (b) there should be adequate meteorological correlates, remote sensing records of the event, or both; (c) detailed traditional knowledge of the event or the phenomenon should exist; and (d) collectively, the cases should cover a wide range of anomalous conditions. In the end, the case studies spanned four decades. They included two local retrospectives and two

TABLE 1. Synopsis of five case studies adopted by the project, as addressed by the Symposium in November 2000, arranged by year of primary occurrence.

Year(s) Designation 1st Author(s)	Nature of the Event	Description	Notes
1957 KB57 Karen Brewster	High-energy and high-speed ice override (*ivu*) out on landfast ice; Barrow spring whaling season.	Whalers lost a major proportion of gear and dog teams to a surge of sea level and ice; had to "run for their lives."	On 6–7 May 1957, depression tracked N over the Siberian mainland, SW winds in south Chukchi Sea.
1975 (1998) KK75-98 Karim-Aly Kassam	Heavy ice year (compared with light ice year); Shipping view vs. mammal hunters' views.	Sealift blocked at Wainwright en route to Prudhoe Bay by persistent pack ice from August to October.	Case study extends from Wainwright, AK to Holman, NWT, highlights local contrasts.
1980 (1994) JB80-94 John Burns	Late winter pack ice blockage of Bering Strait prevented marine mammals from migrating north until until mid-May (compared with an early year).	First whales arrived at Barrow on 23 May, a month later than normal; possible migration of whales in Siberian waters, far west of normal route.	Ice "arches" formed across Bering Strait, blocking southward extrusion of ice, and choking normal lead formation in the Chukchi Sea.
1993, 1997 CG93-97 Craig George	Break-off of shorefast ice along Chukchi Sea during spring subsistence season; Safety? Prediction?	Instances since 1980 of whalers being set adrift by calving events, having to evacuate or be rescued.	Hindcast suggests several triggering events, e.g., SW winds, rapid sea level changes.
2000 RP2000 Russ Page & Dave Norton	Any events such as those in first four case studies that might affect safety or success of subsistence and other activities connected with sea ice.	Alongshore lead closed; break-off event avoided by suspension of whaling on 30 May; 2 or 3 *ivu* events; August storm, effects of which varied locally.	Predictive capabilities partially evaluated and vindicated; Lead closure meant that RP2000 needed to be repeated in 2001.

regional retrospectives. The final case study was in effect a case study of case studies. By examining the upcoming 2000 spring whaling season at Barrow, participants undertook to assess efforts by the National Weather Service, the Alaska Eskimo Whaling Commission, the North Slope Borough's Department of Wildlife Management, and the Barrow Whaling Captains' Association to use and share information synchronously or in near-real time.

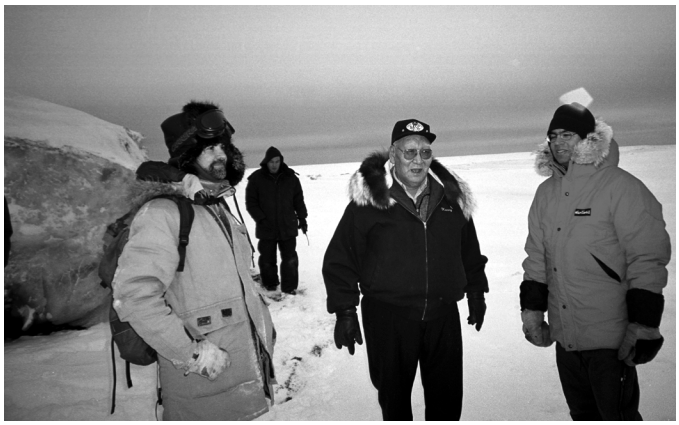
For each case study, a presenter was selected and given lead responsibility for gathering information about the event and making a presentation at the BSSI to begin the discussions of that particular event or phenomenon. The case studies varied in the types of information upon which they drew. The case of the destructive breakup of shorefast ice in May 1957, for example, pre-dated satellites and relied heavily on interviews with whalers (now retired) who had been there. The case of large calving events in 1993 and 1997, by contrast, relied both on recollections of people who had experienced them and on satellite images of the ice during the time in question. For all cases, the presenter was to describe the event, review the available information from various sources, identify the main factors that caused the event, and discuss the implications for safety, hunting success, or other outcomes. The staff of the North Slope Borough's GIS Division and the National Weather Service gathered additional information concerning each event, including satellite photographs and weather maps.

A major task for co-investigators was to select participants in the BSSI. The BSSI was open to all members of the Barrow community, and several elders and whalers were invited personally. Ice scientists who were working or had worked in the Barrow area were also personally invited. Several other interested persons were asked to act as "external reviewers," meaning that they were not part of the planning team and could independently critique the symposium. We have used these reviewers' comments in the preparation of this analysis.

THE SYMPOSIUM

The BSSI spanned three days. Each of the five case studies was allotted half a day, and the morning of the second day was set aside for a field trip to Point Barrow. Following introductory remarks and an invocation the first morning, the participants introduced themselves and explained their interest in the symposium and in sea ice. Thirty-five persons participated in part or all of the BSSI. About 25 were present throughout all the sessions, including four elders from Barrow and one elder from Wainwright. Tables and chairs were arranged in a large square, one side of which was taken up by a projection screen. Although the square was too large for intimate discussions between participants, this arrangement facilitated interaction and exchange better than classroom-style seating would have done.

Reflecting the differences among the case studies themselves, the presentations and discussions varied in style. Some presentations were brief, focusing on a description of the event and then turning to discussion. During some of



Symposium participants during a field trip on 1 November 2000, inspecting the foot of a remnant of override sea ice that persisted over the summer of 2000, near Point Barrow, Alaska. Left to right: Jim Maslanik, Harry Brower, Jr. (background), Kenneth Toovak, Sr., and Karim-Aly Kassam.

the discussions, supplemental information was presented, such as references to weather conditions at the time of the event. Discussions also introduced novel ways of studying and looking at ice. Two films were shown during the presentations. One was home-movie footage of a pressure ridge as it formed and engulfed a whale that had been hauled onto the ice for butchering. The second was Lew Shapiro's time-lapse film of radar imagery of ice off the coast near Barrow. This 1970s film showed a number of processes, such as formation of ice, pressure ridges, patterns of ice movements, current reversals, and spring breakup of ice. Discussions followed each film, adding to the material covered by the five case studies.

The discussions following each presentation were the heart of the intent of the BSSI to stimulate interaction between scientists and whalers. They generally succeeded. Although there were fewer hunters than scientists, the hunters who were present took an active part in the discussions, raising new points and responding to the ideas of others. The scientists, too, questioned each other and the whalers, eager to share information as well as to learn. The extended period given to each case study, together with the free-form nature of the discussions, allowed a variety of points to be raised concerning not only the specific event of the case study, but related aspects of sea ice as well.

Two examples illustrate the value of the discussions. Presentation of the 1957 destruction of landfast ice gave considerable attention to local and regional weather conditions, the frequency with which those patterns occur in weather records, and the ways in which they could have contributed to, or caused, the destruction of the entire zone of fast ice. Toward the end, one of the elders who had been on the ice that spring remembered that the proportion of multiyear ice frozen into the landfast ice during the winter of 1956–57 was unusual, and that whalers had worried that brittle multiyear ice might shatter instead of forming pressure ridges when hit by waves or moving pack ice. In a more restrictive discussion period, this insightful recollection might not have been raised.

The case study of the heavy ice summer in 1975 focused on the village of Wainwright, southwest of Barrow. During discussions, one researcher who had been in Wainwright in 1975 pointed out that, although walrus hunting was greatly hampered because boat travel was curtailed, seal hunting was excellent, so that residents of Wainwright were able to switch prey and secure a large harvest. This observation opened the door to a number of points regarding the use of sea ice by marine mammal hunters and the ways in which the hunters could adapt to various conditions. Attempts to classify years simply as "good" or "bad" for hunting obscure more subtle variations as well as social changes. In previous decades, a poor walrus year might have caused hardship, because walrus were used for feeding the dogs upon which hunters relied. By 1975, however, snow machines had largely replaced dogs as the mode of travel in Wainwright, so the lack of walrus meat was not nearly as significant. Detailed subtleties such as these are difficult to appreciate without an extended open discussion period.

On the second morning, the participants traveled by snow machine and tracked vehicle to Point Barrow, looking at the remains of pressure ridges along the beach and at the newly forming ice both in the protected waters of Elson Lagoon and in the open sea. Near the Point, we examined blocks of override (*ivu*) ice deposited by an event 11 months earlier in sufficient mass that they had not melted during the summer months (Fig. 1). Whalers and scientists compared their understanding of override processes and features of this remnant ice. Although its scientific value was limited, the field trip provided a break from confinement to the meeting room and reminded participants what the BSSI was all about.

DISCUSSION

The BSSI was a generally successful experiment. The case studies proved interesting, the discussions were stimulating and productive, and whalers and scientists enjoyed opportunities to talk and to learn. Among the strengths of the symposium were the high level of interest brought by each participant, everyone's willingness to consider diverse approaches to studying and using sea ice, and the utility of the case study approach for stimulating exchanges without arbitrarily restricting the scope of discussions. Had less care been invested in selecting invitees, the symposium might have spurred far less interaction. Had the participants not been willing to look at sea ice in new ways, the case studies could have remained dry lectures, rather than springboards for lengthy exchanges. Had the case studies not been carefully chosen and prepared, the discussions could have meandered aimlessly. In reality, a lively group took advantage of a strong forum. Specific points raised during the BSSI were effectively translated

into prescriptions for further analyses to be conducted subsequently by individual participants and smaller groups.

The BSSI did suffer from a few weaknesses. The five case studies varied in scope, and differed in purposes and audiences. To expect one setting—the symposium in a large room holding an average of 25 people—to accommodate all cases equally well proved unrealistic. Although the BSSI proved to be a splendid way to impress newcomers with the benefits of stimulating collaboration between scientists and hunters, the volume of material covered and the number of discussants wishing to speak limited the depth to which many points could be covered during the symposium itself.

Technical jargon occasionally obscured some of the points being stressed by presenters or discussants during the BSSI. Despite pre-symposium guidelines and pep talks about using plain, nontechnical English, investigators sometimes lapsed, so that both hunters and specialists in other disciplines were denied full understanding. There is no simple remedy to this challenge, not even the suggestion that organizers should have appointed a "language cop" for the symposium. Besides jargon, a few of the graphical representations used by presenters of the case studies failed to be clear to all participants. Although satellite imagery, maps, and cross-sectional diagrams of sea ice were well received, graphic representation of wind velocities that combined wind speed and direction failed to make intuitive sense to many participants. Establishing effective communication takes more time, practice, and effort than can be managed during a single three-day symposium.

The BSSI was intended as a first step in genuine collaborative sea ice research and understanding between whalers and scientists. As such, it addressed multiple goals and provided for several outcomes. For an introductory meeting, this was perhaps advantageous, because each participant could bring unique expectations and seek distinct outcomes. One result of the symposium has been our growing conviction that progress toward genuine integration and synthesis benefited more from the Iñupiat hunters' integrative approach to sea ice observations at the BSSI than it did from scientists' input. In those case studies to which hunters contributed local firsthand knowledge, the pattern in their analysis was invariably integrative. That is, members of subsistence communities regard sea ice as part of a three-dimensional system, in which bathymetry, water column, and under-surface of sea ice are important parameters, with atmospheric conditions above ice completing the vertical dimension. Moreover, subsistence hunters and Arctic-resident observers traditionally track the evolution of landfast sea ice beginning in autumn of each annual cycle. This tracking provides another dimension of integration, investing the landfast ice at the end of winter with properties evolved and accumulated over an entire ice season—a form of "system memory"—that plays an important role in how spring whaling crews assess risks.

By contrast, a largely glaciological approach, which describes the surface, or two-dimensional, zonation of shorefast ice at a single moment, lacks these third and fourth dimensions of integration. Although the glaciological approach is capable of acknowledging linkages to physical oceanographic, meteorological, and developmental histories of nearshore sea ice, Iñupiat TEK articulated at the BSSI was essential in persuading ice scientists to ask new questions, to deploy specific instruments at defined locations in future fieldwork, and to think integratively.

To continue to develop the interactions and shared purposes that characterized the BSSI, a core group of participants needs to meet periodically to review progress on sea ice research in the region, and to seek ways to promote further collaboration between ice observers from the subsistence community and scientists. Research on sea ice appears likely to continue to flourish near Barrow. Both whalers and scientists are eager to share information and insights. Facilitating that exchange is not a trivial task. To be successful in the long run, the promising start made by the BSSI needs to be followed up with refinements in collaborative field research, as well as by regular opportunities for scientists and whalers to learn from one another.

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