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Inuit Recollections of a 1950s Killer Whale (*Orcinus orca*) Ice Entrapment in Foxe Basin, Nunavut, Canada

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Abstract

In the early 1950s, probably 1955, a group of killer whales (*Orcinus orca*) became entrapped in developing landfast sea ice in northeast Foxe Basin in the eastern Canadian Arctic (Nunavut). Reports of killer whale ice entrapments are rare, and this is, to our knowledge, the only fatal entrapment reported for the Canadian Arctic. The entrapment was previously reported and briefly discussed by Blackadar (1964), but significant additional information became available from local Inuit elders, some of whom experienced the event first-hand. We summarize Inuit knowledge of this ice entrapment, using (1) semi-directed interviews with 12 hunters and elders conducted in 2008 and 2010 as part of a study on Inuit knowledge on Arctic killer whales, (2) a first-hand account of the event provided by a local elder in 2006 and 2011, and (3) transcripts from the Igloolik Oral History Database (extracted in 2008). Previous authors have noted that hunters harvested two killer whales, a female and a calf, but local knowledge summarized here indicates that more killer whales, at least five and probably 11 to 12, were entrapped and at least two harvested, while the rest likely died. Local knowledge also provided new information that the killer whales were entrapped in a different location than previously reported and that they survived in the breathing hole for several months before harvest. Inuit are reliable observers with excellent recall abilities, particularly for observations of rare events related to the natural environment that encompasses their way of life. The observations reported here are significant in understanding the physiology of killer whale starvation in cold waters, for managers monitoring frequency of episodic events, and in developing appropriate responses to rare entrapment events.

Key Words: ice entrapment, Inuit knowledge, Arctic, killer whales, *Orcinus orca*, oral history, semi-directed interviews, starvation

Introduction

Ice-covered waters represent about 15% of the world's oceans, and many marine mammals contend with the danger of suffocation due to ice preventing access to air. Killer whales (*Orcinus orca*) have a cosmopolitan global distribution but are generally most concentrated in colder regions and areas of high productivity (Forney & Wade, 2006). Killer whales come into contact with sea ice in many regions in the Northern Hemisphere; however, reports of ice entrapments or ice-induced stranding events are rare. Ice-related mortality of killer whales has been reported in the North Pacific (Lowry et al., 1987; Uni et al., 2005; Amano et al., 2011), West Greenland (Heide-Jørgensen, 1988), and Newfoundland (eastern Canada) (Mitchell, 1976; Lien et al., 1988; Mitchell & Reeves, 1988). These events represent an occasional source of natural mortality that could have significant effects on small killer whale populations (Baird, 2001). Killer whales demonstrate strong matrilineal societies (Baird & Whitehead, 2000), whereby specific cultural knowledge may be lost through the catastrophic loss of an extended family group (Colbeck et al., 2012). Thus, information on these events is of value to marine mammal scientists and resource managers and also of significant interest to the public as evidenced by the worldwide reporting of the recent (January 2013) killer whale entrapment in eastern Hudson Bay (Wittnich, 2012).

In the 1950s, a group of killer whales became entrapped in sea ice in northeast Foxe Basin in the eastern Canadian Arctic (Nunavut) (Figure 1). To our knowledge, this is the only known (or at least reported) fatal killer whale ice entrapment event in the Canadian Arctic, and the only event (fatal or not) at all prior to a recent entrapment in January 2013. The Foxe Basin entrapment was originally described by Blackadar (1964), and included by Reeves & Mitchell (1988), based on reports from local harvesters, although the information was

limited. Blackadar's (1964) account provides brief mention of the killer whale entrapment as part of a longer account about reports of a large whale frozen in the ice in Admiralty Sound (northern Baffin Island), a story first told to him in 1956 while he was travelling by dogteam in the Igloolik area. Blackadar was unable to find the animal himself, but various reports over the years (i.e., 1956 to 1964) indicated it was a bowhead whale (*Balaena mysticetus*) frozen in *aufeis* (ice formed by the overflow and freezing of lake or river water during autumn, which builds up and becomes thick enough to not completely melt during summer and, therefore, continues to grow each year). Early in his account, Blackadar wondered whether the frozen whale was of prehistoric origin, or simply a recent event involving a beluga (*Delphinapterus leucas*) or narwhal (*Monodon monoceros*) trapped at freeze-up. At first, he suggested a recent entrapment was most likely,

> for that same winter a female killer whale and one young had stayed behind too long in Steensby Inlet. At Christmas time they were found by some hunters in a patch of open water. Apparently the female had by constant effort managed to keep a patch ice-free, but had they not been killed, the intense cold of January and February would soon have rendered this activity impossible. (p. 42)

Higdon (2007) briefly discussed this event and included information from a Hall Beach elder (S. Qanatsiaq), who described the event to staff with Fisheries and Oceans Canada (DFO) (pers. comm., 12 January 2006) and suggested a total of 12 killer whales had been trapped. Elders who live (or lived) in the Foxe Basin area have direct knowledge of this event, either from active participation or via local oral history. Herein, we summarize local recollections of the entrapment collected during (1) semi-directed interviews (Huntington, 1998, 2000) with elders in three Nunavut communities in 2008 and 2010, (2) several interviews from the Igloolik Oral History Database (MacDonald, 2001) that recounted the event and discussed Inuit relationships with killer whales, and (3) continued discussion in 2011 with S. Qanatsiaq, who was present for the event.

Methods

We used semi-directed (or semi-structured) interviews to document spatial and textual information

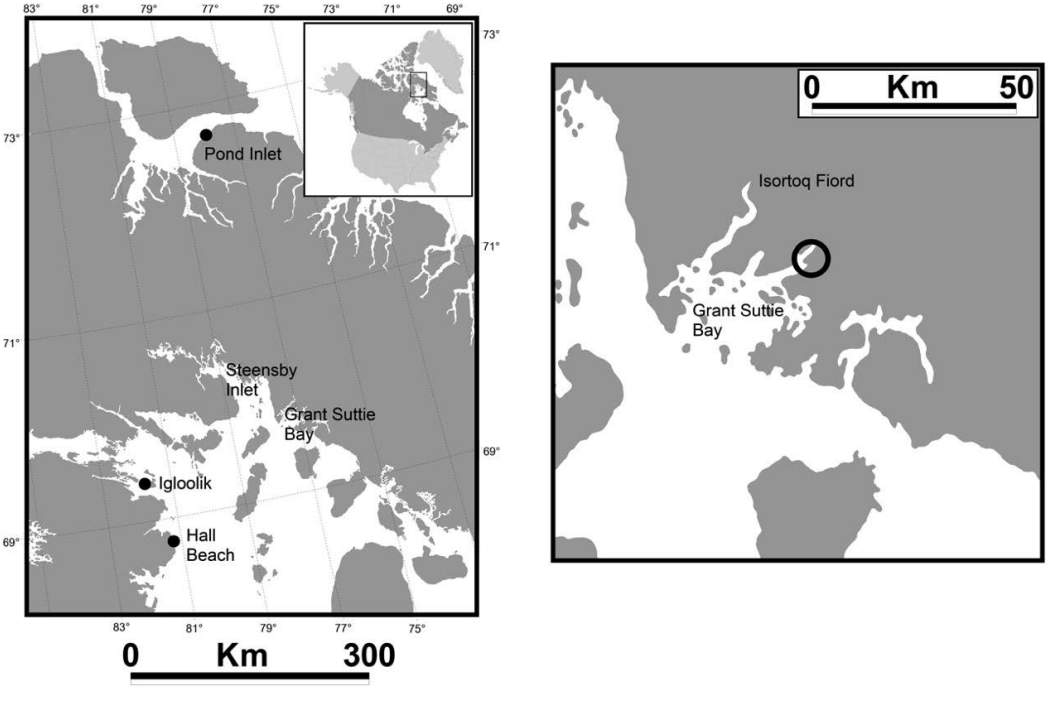

Figure 1. Map showing location of Foxe Basin, Nunavut, Canada, with three communities that provided information and local place names mentioned in the text identified (left panel); the black circle (right panel) indicates the approximate location of the ice entrapment in Grant Suttie Bay (*Isurtuq*). "Isortoq" (Fiord, River) is the official spelling used on government maps.

on killer whale ecology provided by Inuit hunters and elders in 11 Nunavut communities. Semi-directed interviews are an effective way to collect traditional ecological knowledge (TEK) in an open and flexible manner that promotes dialogue (Huntington, 1998, 2000). A list of questions was developed in advance (see Ferguson et al., 2012, supplementary material), but interviews remained open-ended, with each interviewee able to elaborate on matters that were important to them and direct the conversation to subjects they wished to discuss. Interviewees do not always address every topic included in the question list, but the approach allows the interviewee to provide important information that is sometimes not anticipated by the researcher. Interviewees were selected using a mix of reputational and snowball sampling, starting with lists of knowledgeable persons provided by community Hunters and Trappers Organizations (HTO). Our research methodology (e.g., question list, sampling protocol, recognition of informant rights and consent to being interviewed, interview medium and methods of data recording, conditions for use of recorded information, etc.) was approved by the University of Manitoba (ethics approval), the Nunavut Research Institute (NRI), and the HTO in each community. This study includes only the interviews that provided information on the killer whale ice entrapment (n = 12; from three communities, out of 105 total interviews). This included a mix of first-hand and second-hand information. All available information is summarized here, but we identify whether the knowledge source was actually present at the entrapment event. More information on the interview process, the interviewees, and the information collected is available in Ferguson et al. (2012), Westdal et al. (2013), and Higdon et al. (in press).

We also consulted the Igloolik Oral History Database (MacDonald, 2001), maintained by the Igloolik Research Centre (Nunavut Research Institute) and Inullariit Elders Society of Igloolik, for information on killer whales. Interviews were conducted in Inuktitut and transcribed to English from cassettes for inclusion in the database as searchable text files. Five (of > 500) interview transcripts contained 50 hits for the keywords "killer whale" or "killer whales," and two of these contained information on the ice entrapment. One additional transcript included relevant information on Inuit relationships with killer whales and traditional rules for hunting the species. We also include relevant information from the Nunavut Coastal Resources Inventory for Igloolik (Government of Nunavut, 2008), where 11 elders (10 male) were interviewed in 2007-2008 (with some overlap with our interviewees; n = 4). Finally, we include first-hand information provided by S. Qanatsiaq, a Hall Beach elder, on 12 January 2006 (Higdon, 2007) and 15 July 2011 (pers. comm.).

Results

Inuit Knowledge of the Ice Entrapment

The 1950s ice entrapment of killer whales is well known among Inuit elders in the Foxe Basin region, with eight of 16 Igloolik and three of seven Hall Beach interviewees discussing the event. One of eight Pond Inlet interviewees was also present as a child (Table 1). All interviews were conducted in Inuktitut (the Inuit language) with the aid of a local interpreter, and any quotes reproduced here represent the English translation, not the original Inuktitut. All interviewees requested that direct statements not be attributed to them, and all quotations included in this paper therefore remain anonymous (identified by interview number and date only) (Table 1). All interviewees are listed by name in the Acknowledgments, with their consent. In this summary, we use only the subset of interviews that discuss the Foxe Basin ice entrapment.

The youngest interviewee to note the ice entrapment was 47 y old, and had been told the story by his father (Igloolik). The remaining 11 interviewees were all elders ranging from 62 to 79 y of age. Most (10 of 12) interviewees were male. Eight interviewees provided first-hand accounts of the entrapment event, which occurred when they were children or young adults, and the rest provided information told to them by others (Table 1). The amount of information provided by each interviewee varied from a brief mention to details on entrapment timing, number of animals killed, hunting methods, and utilization of the landed killer whales. Two of the transcripts from the Oral History Database discussed the entrapment: one provided brief mention (Kappianaq, 2000), while the other provided a detailed (almost 1,400 word) first-hand account of the ice entrapment and subsequent hunt (Irngaut, 1990). In addition, Aqatsiaq (1996) discussed cultural rules regarding Inuit hunting of killer whales. Five of the 11 interviews for the Nunavut Coastal Resources Inventory (Government of Nunavut, 2008) provided information on killer whales. We also spoke to a Hall Beach elder (S. Qanatsiaq) who experienced the event first-hand but was away from the community at the time of the 2008 interviews. This individual had previously discussed the event with DFO employees on 12 January 2006 (Higdon, 2007), and he provided additional details to one of the co-authors (JWH) on 15 July 2011.

Table 1. Summary of Inuit knowledge sources used to describe the Foxe Basin killer whale ice entrapment, including information collected during semi-directed interviews (n = 12), informal conversation with a Hall Beach elder, and transcribed interviews from the Igloolik Oral History Database (n = 2). Data include the age and gender of the knowledge holder; whether the account was first-hand (i.e., interviewee was present at the entrapment) or not; a general assessment of the level of detail provided by the informant; information on the location of the event; and comments regarding the number of killer whales involved, landed, killed, and lost.

Community	Source	Interview date	Gender	Age	Account type	Account type	Location	Number of killer whales present, harvested, etc.
Igloolik	IG 01	3 March 2008	Male	72	Second-hand	Brief mention only	GSB[1]	Two were caught.
	IG 04	3 March 2008	Male	60s	First-hand	Description of event	GSB	Hunters killed three or four of the killer whales.
	IG 05	4 March 2008	Male	69 (born 1939)	Second-hand	Brief mention only; no details	GSB	> 1 (“killer whales”)
	IG 09	4 March 2008	Male	70 (born 1938)	First-hand	Brief mention only	GSB	Family caught a killer whale.
	IG 10	5 March 2008	Male	79 (born 1929)	First-hand	Brief mention only	GSB	> 1 (“killer whales”)
	IG 11	5 March 2008	Male	64 (born 1944)	First-hand	Some details on event	GSB	Hunters killed three but two sank.
	IG 12	5 March 2008	Male	62 (born 1946)	Second-hand	Brief mention only; no details	GSB	> 1 (“killer whales”)
	IG 15	9 March 2008	Male	47 (born 1961)	Second-hand	Some details on event	Southwest of GSB	One was caught, and others were killed but sank.
	Irngaut (1990)	23 Feb 1990	Male	n/d	First-hand	Description of event	GSB (*Isurtuq*)	“When we pulled it up on to the ice, we found that it was only a young [one] . . . . [W]e secured a mature killer whale” (two landed total; see text); three lost when harpoon lines broke or killed to put out of their misery.
	Kappianaq (2000)	16 June 2000	Male	n/d	Second-hand	Brief mention only	GSB (*Isurtuq*)	“[A] killer was caught in the freeze up; well, there were two of them.”
Hall Beach	HB 02	11 March 2008	Male	70s (born 1930s)	Second-hand	Some details on event	Southwest of GSB	Five killer whales were once killed when they were stuck in the ice in very late fall.
	HB 03	12 March 2008	Female	70s (born 1930s)	First-hand[2]	Description of event	GSB	One killer whale was caught by her grandfather when she was a young woman.
	HB 04	12 March 2008	Male	65 (born 1943)	First-hand	Brief mention only; some details on event	Near Igloolik	Three killer whales were caught.
	S. Qanatsiaq (2006, 2011)	Jan. 2006, July 2011	Male	60s	First-hand	Description of event	GSB	At least two landed; others killed but harpoon lines kept breaking; 11 to 12 present in total, suspect all died.
Pond Inlet	PI 01	1 March 2010	Female	66	First-hand	Description of event	Near Igloolik	There were six killer whales when they first spotted them; two were harvested after the ice thickened.

[1] Grant Suttie Bay (*Isurtuq* in Inuktitut)

[2] This interviewee may not have been present for the actual harvesting of the killer whales (i.e., at the entrapment site) but used products such as oil and blubber that were secured from the killer whales.

Year of the Ice Entrapment

Interviewees provided variable information on the year the entrapment occurred (n = 8; 4 with no details on the year). Two individuals (Interviews IG 01 & IG 10; see Table 1 for codes) stated that the entrapment occurred in the 1950s, while three interviewees said it happened when they were children (one of whom was born in 1938 and would have been 17 in 1955; Interview IG 09). Another interviewee said he was 13 when the entrapment happened; and since he was born in 1939, his memory puts the entrapment in 1952 (Interview HB 04). The youngest interviewee, who heard the story from his father, responded that the entrapment occurred before he was born in 1961 but was not able to be more specific (Interview IG 15). Finally, an elder in her 70s said she was a young woman with two children when the entrapment occurred (Interview HB 03). One of the interviewees for the Nunavut Coastal Resources Inventory reported seeing a killer whale in a *polynya* (i.e., area of open water) as a child, but gave the year as 1949 (Government of Nunavut, 2008). In 2006, S. Qanatsiaq reported that the killer whales were trapped around 1959; in 2011, he was unable to recall the year and simply indicated that it occurred when he was a child. Blackadar (1964) was travelling through Foxe Basin via dogsled in 1956 and noted that the entrapment happened "that same winter" (p. 42), although Blackadar does not state that he was present at the entrapment and so presumably heard the story from local hunters. We assume that 1956 means early in the year (i.e., winter 1955-1956) as Blackadar did not report which month it was when he heard the story. Given that the reported harvesting event had occurred at "Christmas time" of "that same winter" (p. 42), it is most likely that the entrapment occurred during autumn 1955. Sources generally agree that the entrapment occurred sometime in the 1950s.

Location of the Ice Entrapment

The detailed account by Irngaut (1990) indicated that the killer whales were observed in the vicinity of their camp "around the coast of *Isurtuq*." Blackadar (1964) reported that the ice entrapment occurred in Steensby Inlet; however, *Isurtuq* is the Inuktitut name for Grant Suttie Bay, south of Steensby Inlet (S. Perry, Government of Nunavut, Department of Culture and Heritage, Igloolik, NU, pers. comm., 17 September 2010), sometimes spelled as *Isuqtuq* (Inuit Heritage Trust Inc., 2009) (Figure 1). Eight interviewees also identified Grant Suttie Bay as the location (another did not give a location, two identified it as "near Igloolik," and two noted a general area southwest of Grant Suttie Bay) (Table 1). Importantly, no interviewee identified Steensby Inlet, and the five who gave the most detailed accounts all indicated Grant Suttie Bay. The Nunavut Coastal Resources Inventory's (Government of Nunavut, 2008) report of a killer whale at a polynya identified a location slightly south of Grant Suttie Bay (but also identified the year as 1949; see above). Another interviewee in that study mapped a record in Grant Suttie Bay but provided no additional details (year, numbers of killer whales, whether it was an entrapment, etc.). Kappianaq (2000) also reported that the entrapment occurred in the "waters of *Isurtuq*." S. Qanatsiaq (pers. comm., 12 January 2006, 15 July 2011) placed the entrapment in Grant Suttie Bay and identified the general location as "a shallow inlet" on a 1:250,000 scale topographic map (Figure 1). Blackadar (1964) had the general area correct (i.e., northeastern Foxe Basin) but presumably misunderstood his Inuit informants with respect to the specific location.

Timing of the Ice Entrapment

Blackadar's (1964) report suggested that the killer whales were chanced upon by hunters around Christmas time, but local observations specified that the killer whales were first observed in late summer and were present until winter. Irngaut (1990) stated that the killer whales were first seen by family members during autumn, at a time of year when seals were hunted using row boats and the evenings had plenty of daylight. The summer (*auja*) season is characterized by open water with some drifting ice and a long but decreasing daylight period, typically occurring from mid-July to early September (Nunavut Wildlife Management Board [NWMB], 2000). The Pond Inlet interviewee reported that they were watching the killer whales from shore in September (Interview PI 01). This interviewee also noted that the killer whales moved out of the inlet where they were first seen, but ultimately became trapped elsewhere. S. Qanatsiaq (pers. comm., 15 July 2011) stated that they were first seen in August and were observed moving through the various inlets of Grant Suttie Bay and did not get out before the ice started to form.

Irngaut (1990) stated that when the ice formed, they started hunting seals on frozen leads (*nigajutait*); and the killer whales were first seen to be trapped in the ice at that time. In previous decades, hunting at *nigajutait* usually started around mid-October (Laidler et al., 2009), though in recent decades the freeze-up has been occurring later (Canadian Ice Service [CIS], 2002; Stirling & Parkinson, 2006; Laidler et al., 2009). Foxe Basin is relatively shallow, generally less than 100 m deep, with the shallowest areas found on the east side of the basin (Jones & Anderson, 1994). Sea ice formation typically begins in this shallow

northeastern section—that is, the Grant Suttie Bay area (Markham, 1986). Grainger (1959) observed sea ice formation at Igloolik (Turton Bay) during the winter of 1955-1956, in a region of strong current due to outflow from Fury and Hecla Strait. Thin films of ice formed several times during early October but were constantly broken up by winds. A permanent solid ice layer first appeared on 21 October and was about 10 cm thick on 27 October 1955. This occurred in the sheltered bay, and areas of more exposed water remained open for a longer time. The Pond Inlet interviewee reported similar information (via a translator): "After the ice was formed, people saw breathing holes; the killer whales were trapped in the inlet. . . . When they travelled by dog team, they saw the trapped killer whales" (Interview PI 01).

Irngaut (1990) described going to see the killer whales "trapped on the ice with a large *aglu* [breathing hole] that they had kept from freezing" (p. 1). They never went close to the whales because they were considered dangerous, but "knew though that they would not move away from their ice trap" (p. 1). Irngaut's father waited until "the ice got thicker with snow drifts formed on it" (p. 1) before going to check on the killer whales. The Pond Inlet interviewee also noted that they only tried to harvest them after the ice thickened. Snow had typically accumulated and drifted on the sea ice by the end of autumn (late November; Laidler et al., 2009). In 1955, the ice in Turton Bay was 23 cm thick on 10 November, 45 cm thick on 25 November, and 59 cm thick on 7 December (Grainger, 1959). Blackadar (1964) reported that the killer whales were harvested in late December (at Christmas time), and, therefore, they possibly had remained entrapped for about 2 to 2.5 mo (from mid-October to late December) prior to being harvested.

Number of Killer Whales Involved

Blackadar (1964) and Reeves & Mitchell (1988) reported that two killer whales were trapped, but there is good evidence from local residents that more killer whales were involved (Table 1). Irngaut (1990) stated that there were "numerous" individuals when first seen, and described two killer whales being landed and a minimum of three killed and lost. In 2006, S. Qanatsiaq suggested that up to 12 killer whales had been present (Higdon, 2007), and reported "11 or so" whales to JWH on 15 July 2011. One interviewee stated that "there were many at first" (Interview IG 04, first-hand account); another said that there were at least three (Interview IG 11, first-hand account); and a third respondent (Interview HB 02), while not providing information on the number of killer whales entrapped, reported (second-hand) that five were killed, which is in agreement with the minimum reported by Irngaut (1990). The Pond Inlet interviewee reported that six killer whales were first spotted, with two landed (Interview PI 01).

Inuit informants gave varying estimates of the number of killer whales killed or secured (Table 1), but at least two were successfully landed. One Hall Beach elder (Interview HB 04) noted that three were caught, and other interviewees noted that a single killer whale was caught by members of their family. Multiple families likely participated in the harvest, and it is possible that one group landed a single killer whale in addition to the two detailed by Irngaut (1990) and others. Multiple sources noted that some killer whales were lost (Table 1), chiefly because the harpoon lines (made from bearded seal [*Erignathus barbatus*] skin) kept breaking. The killer whales were so strong that the harpoon lines would break even when two lines were attached to a whale (Irngaut, 1990; Interview IG 04; S. Qanatsiaq, pers. comm., 12 January 2006, 15 July 2011). The total number of killer whales involved cannot be conclusively determined, but the available accounts suggest a minimum of five killer whales (i.e., Irngaut, 1990), and likely 11 or 12 total involved (S. Qanatsiaq, pers. comm., 12 January 2006, 15 July 2011).

The entrapment involved both large and small killer whales as Irngaut (1990) stated that "some were smaller than the rest, about the size of a young beluga whale" (p. 2). One of the landed killer whales was young, "slightly larger than a full grown beluga whale" (p. 2), and the other one was "a mature killer whale . . . a good size one, much bigger than a beluga whale, at least much longer" (p. 2). One killer whale, which was "the largest of the lot" (p. 2) and too heavy to pull up on the ice, was shot to humanely dispatch it because it was wounded and emitting blood. Irngaut also noted that the two landed killer whales appeared to be thin and suggested that this was related to a lack of food. S. Qanatsiaq (pers. comm., 12 January 2006, 15 July 2011) considered it likely that all the killer whales ultimately died. Information on the age and gender of the killer whales is limited. Blackadar (1964) reported that the two killer whales involved in the entrapment were a female and a young killer whale, in agreement with Irngaut's (1990) account that a young killer whale (about the size of a young beluga, so likely a calf) and an adult (although gender was not stated) were landed. Irngaut (1990) also stated that "some were smaller than the rest" (p. 2), suggesting that more than one calf (or juvenile) was present. The largest killer whale, described by Irngaut as being too large to pull it up onto the ice using the dogteams, may have been an adult male.

Utilization of the Landed Killer Whales

The landed killer whales were butchered and mostly used for dog food, although some whale meat and *maqtaq* (skin and outer blubber layer) were also eaten by people (Irngaut, 1990; Interviews IG 11, HB 03 & HB 04; S. Qanatsiaq, pers. comm., 12 January 2006, 15 July 2011). The *maqtaq* was described as being thinner than a beluga, and the blubber was harder (Irngaut, 1990). It was edible, but not as palatable as the *maqtaq* from other whales (S. Qanatsiaq, pers. comm., 15 July 2011). One Hall Beach interviewee noted that the oil was good in a *qulliq* (oil lamp) because it produced a bright flame with little smoke (Interview HB 03). Irngaut (1990) described the rendered oil as being similar to that made from walrus (*Odobenus rosmarus*) fat.

Discussion

Inuit Relationships with Killer Whales

Inuit Qaujimajatuqangit (IQ) encompasses all aspects of traditional Inuit culture, including values, language, social organization, and knowledge (Simpson, 2004; Wenzel, 2004; Tester & Irniq, 2008). It can be broadly outlined as a set of teachings about society, human nature and experience, and ecological knowledge, passed on orally from one generation to the next, that is holistic, dynamic, and cumulative in its approach to knowledge, teaching, and learning, essentially, that one learns best by observing, doing, and experiencing (Arnakak, 2000, 2002). There has been a tendency to equate IQ with traditional ecological knowledge (TEK), but TEK is not the whole of IQ and is only a component (Wenzel, 2004). IQ includes multiple facets in addition to knowledge on wildlife species biology and ecology, including the ways Inuit conceptualize human-animal relations and how this influences wildlife use (Arnakak, 2000, 2002; Wenzel, 2004). Semi-directed interviews throughout Nunavut have indicated that the body of knowledge and unique cultural insights of Inuit into the human-killer whale relationship is complex (Westdal et al., 2013). Inuit interviewees had variable, and sometimes conflicted, attitudes toward killer whales, ranging from positive (killer whales drive other marine mammals to shore and make them easier to hunt; leave uneaten remains that can be collected by Inuit) to negative (compete for same food sources, waste food by killing and not consuming marine mammals, and dangerous to hunters).

Many interviewees noted that Inuit fear and respect killer whales, and oral history indicates that killer whales have the capacity to remember past events and will carry a grudge and take revenge against any person who harms or kills one of their own (Westdal et al., 2013). Inuit know that killer whales are dangerous and elders advised that they should not be hunted (Westdal et al., 2013). Irngaut (1990) noted on several occasions that they were afraid of the killer whales and thought they might be dangerous (also Qipanniq, 1991; Aqatsiaq, 1996). An interviewee who was also present at the entrapment indicated that people were afraid of the killer whales while they were watching them from shore in the fall (Interview PI 01).

Inuit oral history indicates that killer whales are dangerous to kayaks and other small boats; hunters would head to shore when killer whales were sighted (Brody, 1976; Brice-Bennett, 1977; Aqatsiaq, 1996; Kappianaq, 2000; Westdal et al., 2013), although several recent interviewees noted that they no longer feared killer whales and did not mind seeing them up close, which may be related to the use of larger and faster boats in comparison to the past. Killer whales are the only Arctic marine mammal that was not hunted on the open sea but that could be hunted when frozen in or trapped, and even then only when the ice was thick enough for safe travel and hunting (Irngaut, 1990; Aqatsiaq, 1996; Interview PI 01; Westdal et al., 2013).

Two Igloolik elders (Interviews IG 10 & IG 12) provided a story of a killer whale killing a person during the Foxe Basin ice entrapment. A young man was warned not to go see the killer whales, because the ice was still too thin to be safe. Both elders stated that the young man thought he could outrun them and ignored the advice given. A killer whale chased him, broke through the thin ice, and ate him. Both accounts are remarkably similar, although we acknowledge that they are also paraphrased statements from the same interpreter. The report included here is unverified, and both interviewees gave few details of the actual entrapment event (Table 1). One (Interview IG 10) was present for the entrapment (i.e., harvesting) but that does not imply that he was present during the described incident, which would have occurred prior to Inuit hunting the killer whales. The other interviewee was not present at the entrapment at all and noted that the story was told to him by elders. Aggressive interactions with humans are rare, and there has never been a documented fatal attack by a wild killer whale. There is a single documented instance of a wild killer whale biting a surfer in California in 1972 (Anonymous, 1972, 1996); and in 2005, a killer whale charged and bumped into, but did not bite, a 12-y-old boy who was swimming in shallow water in southeastern Alaska (The Associated Press, 2005). This latter incident involved transient (marine mammal-eating) killer whales, and interviewed biologists

(J. Ford, C. Matkin) suggested it may have been an aborted attack from a whale that initially mistook the boy for a seal.

We have no direct evidence to confirm that a predatory attack, or even a human death, occurred. If a young man did die, it could have been a drowning event after he broke through thin ice or fell into the breathing hole from the edge of the ice. Killer whales are behaviourally conservative in their food preferences (Barrett-Lennard & Heise, 2006) and often kill or harass members of other species without eating them (e.g., Jefferson et al., 1991), although in the case of the Foxe Basin killer whales, they may have been starving. Ultimately, we cannot confirm that this event occurred as described. Both accounts clearly identify the same themes and provide the same lessons—that is, the dangers of underestimating wild animals and thin ice and the need to listen to the expert advice of elders.

Summary and Conclusions

Killer whales come into contact with sea ice in many regions; however, reports of ice entrapments or ice-induced stranding events are rare. These events represent an occasional source of natural mortality that could have significant effects on small killer whale populations (Baird, 2001). In the early or mid-1950s, probably 1955, a group of killer whales became entrapped in developing autumn sea ice in northeast Foxe Basin in the eastern Canadian Arctic (Nunavut), the only known fatal killer whale ice entrapment reported in Arctic Canada. It was originally reported by Blackadar (1964) and included by Reeves & Mitchell (1988) as two killer whales, a female and calf, discovered and harvested at Christmas time in 1956 in a patch of open water in Steensby Inlet. However, information from local Inuit clarified a number of points of information with respect to this event—namely, that it occurred in Grant Suttie Bay and not Steensby Inlet, that more whales were involved (at least five, and probably 11 to 12), and that the killer whales remained trapped for several months prior to being harvested. Local interviewees also provided a rich body of IQ on human relationships with killer whales, and this information is needed for the successful management and conservation of large predators in Arctic Canada (Kotierk, 2010; Westdal et al., 2013).

Inuit are dedicated and reliable observers with excellent recall abilities (Arima, 1976; Freeman, 1976; Smith, 1991), particularly for observations of rare events and species (Mallory et al., 2003, 2008). Inuit observations have proven valuable in informing wildlife management and conservation (NWMB, 2000; Mallory et al., 2006), and can provide resource managers with information over a long temporal and wide spatial record (Ferguson et al., 1998). The Foxe Basin killer whale entrapment event would remain unknown to cetacean scientists and managers were it not for the sharing of Inuit observations, extending from the brief mention provided by Blackadar (1964) to the detailed accounts reported herein. These observations as a collective are valuable for managers who may need to plan responses to entrapment events such as the recent but temporary ice entrapment in eastern Hudson Bay (Wittnich, 2012). Inuit observations provided information on potential starvation and survival times for trapped killer whales. Once landfast ice started to form, it would have become difficult for the killer whales to find sufficient marine mammal food and stay within a safe range of the breathing hole. Evidence suggests these animals were trapped for 2 to 2.5 mo, or approximately 60 to 70 d, before being hunted, and they were considered by Irngaut (1990) to be thin because of a lack of food. The estimated length of the entrapment event is similar to a case involving three transient killer whales that were live captured in British Columbia in March 1970 and held in a net pen (Hoyt, 1992; Ford & Ellis, 1999). The killer whales refused all offered food (fish) for several months, and a female died of malnutrition on the 75th d of captivity. The two remaining killer whales began to accept fish on the 79th d of captivity and continued to eat until they escaped and resumed their typical diet of marine mammals. This knowledge can assist in determining how quickly managers need to respond while giving time for possible shifts in ice that might allow the killer whales a natural escape from entrapment. Such information may become of increased importance with changing sea ice dynamics and potentially increasing entrapment risks (Laidre & Heide-Jørgensen, 2005; Laidre et al., 2012), coupled with an increasing killer whale presence in the eastern Canadian Arctic (Higdon et al., 2012, in press).

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