Immobilizing Polar Bears/Inuit: Productivity and Interspecies Wildlife Management in the Canadian Arctic

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Abstract: In this article, I describe polar bear research in the Northwest Territories in the 1970s and 1980s. This research operated through understandings of biological productivity that biologists used to civilize Arctic environments. Wildlife biologists saw inefficiency, instability and waste in polar bears' fluctuating fat stores. The Inuit hunt was similarly scrutinized for its conversion of polar bears into cash and its management of energetic resources. With the body as the locus of their concern, scientists monitored the circulation of energy in and between individuals and populations and, in doing so, demarcated the limits of normal biological function for both humans and bears.

Keywords: polar bears, Inuit, Northwest Territories, wildlife management

Résumé **:** Dans cet article, je décris la recherche sur les ours polaires dans les Territoires du Nord-Ouest dans les années 1970 et 80. Ces recherches s'exerçaient au travers de mesures de productivité qu'utilisaient les biologistes pour civiliser les environnements arctiques. Les biologistes voyaient de l'inefficacité, de l'instabilité et du gaspillage dans la fluctuation des réserves de graisse des ours polaires. On étudiait de la même manière les pratiques de chasse des Inuits, qu'on considérait comme une manière de convertir les ours en argent, et sous l'angle de la gestion des ressources énergétiques. En localisant leur intérêt dans le corps, les scientifiques mesuraient la circulation de l'énergie chez et entre les individus, et ce faisant, démarquaient les limites des fonctions biologiques normales, tant chez les humains que chez les ours.

Mots-clés : ours polaires, Inuits, Territoires-du-Nord-Ouest, gestion de la faune

Introduction

In the early summer of 1979, a team of wildlife biologists looped along the south coast of Devon Island (N74° W90°) in a helicopter, scanning the airwaves for the radio frequencies of collared polar bears. Only two adult females were recaptured during that field season, and both animals had rather skilfully disabled their radio transmitter and taken apart the harness holding the entire tracking package in place.

> Bear x4438 had been equipped with a collar and harness arrangement in 1978 but was wearing neither when recaptured near Cape Riley.... Bear x4351 had been equipped with both a collar and harness but was wearing only a wide black collar when recaptured near Swansea Point. ... The steel cable of the harness had broken off at its attachment to the base of the collar. The transmitter was not functioning when the animal was captured but began to transmit weakly for about an hour after being removed. Although the black tape covering the collar was intact in most places, it had been removed from around the bolts fastening the collar together and on either end of the transmitter itself. [Lee 1981:5-6]

Adding to the difficulties was the fact that the yearling cubs accompanying x4351 would not become immobile, despite having been shot with high doses of phencyclidine, a powerful narcotic also known by its street name, angel dust. Biologists meeting bears face-to-face sometimes had to contend with animals that did not want to be captured and researched. For wildlife biologists, abnormal reactions to being chased and handled were contained within the nature of an animal that, though it mostly managed to survive and reproduce, sometimes failed at managing its valuable energy resources and behaved without regard for its own material interest. Citing similar welfare concerns, northern administrators had relocated Inuit to the High Arctic—Devon Island in 1934 and Resolute in 1953—

places uninhabited by Inuit within living memory. At Resolute, the concern arose that, like dump bears, "these people [would] become fringe dwellers, combing refuse dumps and looking for handouts" (Tester and Kulchyski 1994:152). Relocations brought Inuit into closer contact with polar bears, which became particularly important as a source of cash where few other hunting opportunities existed. This raised alarms within the Canadian Wildlife Service that Inuit were being driven to overhunting by new technology and the allure of quick cash (Kulchyski and Tester 2007:117), and settlements from which Inuit hunted, such as Resolute, were used as logistic bases for helicopter surveys of polar bears (Taylor et al. 2008: 144). "The species must be managed," Charles Jonkel of the Canadian Wildlife Service declared, "for three things simultaneously: to control nuisance Bears in certain areas, to provide food, clothing, and income for the Eskimos and Indians, and to save the Bears from extinction" (1970b:117). That Inuit across the Arctic were not using their rifles "properly and economically" (Tester and Kulchyski 1994: 217) and were drawn into "recurring cycles of plenty and scarcity" (80) was an ongoing biological problem of managing wildlife for production and economic advantage. For the next decades the majority of biological surveys on polar bears in the Canadian Arctic focused on Foxe Basin, Lancaster Sound, Baffin Island, and the Keewatin—all areas where Inuit regularly hunted bears and lobbied for upward adjustments to their quota allocations (Stirling and Smith 1976; Stenhouse and Lunn 1987:1). It is on this region—the Inuit dominated eastern Northwest Territories (Nunavut Territory in 1999)—that I will focus my attention in this article.

Biology and Archives in the Northwest Territories

Biologists working with the Northwest Territories Wildlife Services Division, the agency that assumed responsibility for wildlife management in the territory after 1967, assumed that there was something faulty in the way some polar bear bodies processed and expended energy (food, calories and heat), responded to humans, or handled drugs (such as the narcotics used to immobilize them), and with the capacity of polar bears to cope with environmental fluctuation and change. Instances of "abnormal" behaviour highlight the assumptions that biologists made about bears as normatively rational and efficient resource optimizers, and reflect on biologists' own role in ensuring that animals functioned properly as individuals and populations.

Following Stoler (2002a), I recognize the colonial archive as a potent site of knowledge production and, therefore, as an important point of access to cultures of power. By bringing ethnographic sensibilities to the wildlife biological archive, I trace how scientific study, in its everyday and mundane form, was implicated in the dispossession of Inuit hunting rights. In the postwar period, as part of its growing administrative presence in the Arctic, the Canadian state sought to understand the dynamics of human and wildlife populations in order to regulate hunting practices, intervene in Inuit economies, and maximize the economic return from fluctuating animal populations. I use the manuscripts and reports of the Northwest Territories Wildlife Service to follow field research on the polar bear during the 1970s and 1980s—a period when biologists were still relatively unsure about how to capture and immobilize these powerful animals. And, although Inuit founded Inuit Tapirisat of Canada in 1971 to pursue land claims and began to demand a role in wildlife management, biologists continued to use science as the basis for understanding how animal populations functioned (Bocking 2005). In fact, Inuit knowledge entered into polar bear biology as part of an ecological system—a raw, untapped source of knowledge that resembled the state of nature and that could be refined and productively channelled into scientific research. In 1982, as part of the lead-up to signing the Nunavut Land Claim Agreement (1993), the Nunavut Wildlife Agreement created an "advisory" role for Inuit in allocation decisions, but Inuit hunters remained on the sidelines when it came to research design and the interpretation of results (Riewe and Gamble 1988:35).

I explore records of biologists' routine practices; those regular considerations of scientific technique by which official knowledge about polar bears was produced and by which the state intervened in what Stoler (2002b) calls the "intimate domains" of reproduction (in this case literally *re*-production) and the body. Scientists drugged, restrained, and worked on polar bear bodies that, when they resisted, contained within their very nature irrational economies of energy conversion, storage, and use. I suggest that field capture and handling techniques also had immobilizing consequences for Inuit who found their hunting activities severely curtailed by a scientific quota system and by assumptions about how relations between humans and non-humans were naturally organized. Non-corporal forms of wildlife management that included controlling access to animals and the transformation of Inuit knowledge into scientific facts, nevertheless operated through the body as a mutable engine of energy circulation and exchange, and required access to the body as a source of knowledge about the population being studied. Thus, violence was not just an earlier stage of colonial

development, as is sometimes assumed (Harris 2004), but remained in place, as a "preserved possibility," a latent force in the development of "more sophisticated modes of suasion" (Stoler and Cooper 1997:31, 39). In the Canadian Arctic, this possibility was retained through attention to the Inuit body as analogous, even continuous, in its economies of energy and fat to those of the polar bear.

My approach extends multispecies ethnography into ethnohistory, by considering how colonial categories came to be sedimented within biological knowledge and how the resulting entanglements of human and non-human expanded the possibilities for violence against indigenous peoples. The ambiguities that existed in the Inuit hunting world between humans and polar bears, as flexible bodies that could transform one into another, existed also in the realm of wildlife management. Critical race and post-colonial studies are now merging with animal studies to explore how the boundaries among species are simultaneously drawn and destabilized, and what the material effects of differently assembled natures are (Livingston and Puar 2011). The turn in environmental anthropology towards multispecies ethnography is, in part, a search for bio-cultural hope in the midst of environmental destruction, focusing on rhizomatic associations, non-hierarchical alliances, and symbiotic attachments (Kirksey and Helmreich 2010:545). However, in addition to these cooperative outcomes, interspecies mingling has facilitated violent encounters between peoples, for example, in the form of militarized insects (Kosek 2010; Lockwood 2008), or as human vermin (Raffles 2010:141-161) and beasts (Jacoby 2008). I suggest that animals have been integrated also into ongoing colonial relationships, their bodies constituted as bodies through a politics of knowledge that actively suppressed other bodily possibilities and redeployed the bodies thus assembled to violent effect.

In foregrounding the knowledge of non-indigenous experts I describe how, in field settings, bears were "raced up" (Mavhunga 2011:152) to take on indigenous attributes, just as the Inuit hunt was seen as having animalistic characteristics of its own. I suggest that as far as researchers were concerned, bears that resisted capture and handling had transcended their animal nature and prowled the primitive borderlands of human nature. What they "did back" to researchers signalled that irrational physiological forces (such as overheating, overeating, or aggression) were at play—primitive economies that in human form threatened to derail the orderly conversion and circulation of work, energy, and cash in Inuit societies. Northern administrators and biologists tended to see Inuit hunting as driven by unproductive impulses—a kind of "primordial bloodlust" (Sandlos 2007:12) that merged with the excesses and improvidence of non-human nature. For example, the prominent polar bear biologist C.R. Harington, in a report to the Canadian Wildlife Service in 1961, explained that the sex ratio of female to male bears hunted in the Canadian Arctic was close to 1:1, because "Eskimos often have little choice with regard to sex or age composition of their kill once the sled dogs have caught bear scent" (Lee and Taylor 1994:242). Preserving the wild in its most natural form was a civilizing endeavour that, as northern wildlife management came to be dominated by agricultural metaphors of "surplus animals" and "annual yield," strove to regulate the economic relations between managed wildlife populations and sedentary hunters (Loo 2006:121-148).

My attention to violence is meant to problematize the particular conjunctures of animal and human that biologists used to immobilize polar bears and regulate Inuit hunting practices. Dart guns and immobilizing drugs, in the work they did to track individual animals and map the energetic possibilities of Arctic environments, entrained Inuit as individual pathways within an extended social body. Hunting transformed animals into cash, but understanding and regulating how this occurred, particularly following upon the postwar collapse of the northern fur trade, was a question of how to get Inuit and bear populations to work in relation to one another, according to what was given in nature itself. I draw on Foucault's (2009) notion of "security," a modality of power that emerged when humans joined other animal species as members of populations, and that turns on the problem of movement, of managing circulations. This management strategy is not a system of exhaustive surveillance, but rather, a way of ensuring that a population functions according to what are taken to be the laws and circulatory mechanisms of nature itself.

As marked animals, polar bears represented a distribution of cases that made demographic parameters and energetic fluxes accessible to researchers. Immobilizing and marking bears, "without which," biologists claimed, "certain wildlife facts are impossible to obtain" (Gunn et al. 1988:27) was also a way of locating truth within animal bodies. In contrast to Inuit hunters, who were believed to have regulated hunting through taboos or other accidental means (Riewe and Gamble 1988) and who sought knowledge in order to make "hunting or traveling decisions," wildlife biologists claimed direct access to nature based on the "broad objective" of "wise and sustained use" (Gunn et al. 1988:25-26). Understanding the factors that drove ecological productivities meant untangling the "cause-and-effect relationships" that regulated population size and distribution (25). And while immobilization

techniques made bears available to researchers, and therefore productive *for* research, the mobility of bears and Inuit on the land also held the potential to disrupt the research endeavour.

Making Bodies Productive for Research

Charles Jonkel, a pioneer of polar bear field biology working with the Canadian Wildlife Service, declared in 1970 that it was "impossible for such creatures [polar bears] to survive unprotected," and argued, as did other scientists who participated in the first international meeting of polar bear biologists, that the species was in decline and in danger of disappearing forever (Jonkel 1970a:1145; U.S. Department of Interior 1966). In his view, "long-term, management-oriented research" was needed to "safeguard the species indefinitely" (Jonkel 1970b:118).

By 1949, when all native people in the Northwest Territories were required to obtain a General Hunting License and to submit annual reports of game species taken, Inuit had for several decades been subject to closed seasons on fur-bearing animals, as well as a requirement to obtain export permits for furs. The patrol of outlying hunting camps by Royal Canadian Mounted Police and game officers was an additional source of data for wildlife managers (Sandlos 2007:236; Usher and Wenzel 1987:47). A quota system for regulating the polar bear hunt was added to the territorial wildlife regulations in 1967, thereby limiting annual harvest levels to numbers suggested by fur dealer records from the previous three years (Urquhart and Schweinsburg 1984:15; Stirling 1986:169). The Northwest Territories also began to increase the number of game officers sent to Inuit settlements, "which [according to the biologists] ... greatly improved communication to native hunters about polar bear management regulations" (Stirling and Macpherson 1972:58). Settlement quotas were set after discussion with the local Hunters' and Trappers' Association that tended to use a lottery system to allocate polar bear tags to individual hunters and to the guided sports hunt (Gunn et al. 1988:28). When the tag system was first introduced at Clyde River, the Hunters' and Trappers' Association "lost control" over the hunt by not requiring hunters early in the season to sign for their tags. This type of "tag mismanagement" led to a tightening up of restrictions and formal requirements for Hunters' and Trappers' Associations and camp bosses to "support the Game Officer in any future cases of bear being taken out of season and on any prosecution from a hunter breaking the law as a result of that hunter taking bear without possession of a tag or having not signed for a tag" (Land 1973).

During the 1970s and 1980s, the government of the Northwest Territories became an intermediary in the flow of polar bear body parts between Inuit hunters and wildlife biologists; ear tags and lower jaws were handed over to biologists by Inuit hunters for a monetary reward. Rising fur prices had convinced Canadian wildlife officials that "the native people [were] now aware of the value of their natural resources" (Smith and Jonkel 1975:2). The value of polar bear skins to external markets skyrocketed in the early 1970s: hides sold for $35-$70 per linear foot in 1970; by 1975, high quality hides sold for as much as $200 per linear foot (Wenzel 2008:13). As the cost of hunting away from settlements grew, polar bear hides became valuable as a source of much-needed cash, particularly in those places where wage labour was not readily available. In the early 1980s, when international anti-sealing campaigns destroyed the market for sealskin, Inuit became more interested in the extra cash the guided hunt for polar bear could provide (Freeman and Wenzel 2006:25). The meat continued to be valued as a source of food, and the hunt as a crucial way for less experienced hunters to learn about bears, but it was the intact skin that became important as a tradable commodity. No longer were bits of hide used for icing sled runners, as aids in hunting, or as clothing or bedding as George Kamookak relates, "we can't take anything from the hide anymore, because we don't want to cut them, and spoil the hide because of the price" (Keith 2005:72). Serially numbered tags that marked hides as legally taken, signified living animals and future kills, as well as a distribution of income to be managed by wildlife officials in support of Inuit economies.

The Northwest Territories Wildlife Service launched a polar bear tagging research program on a small scale in the western and high Arctic in 1970 and the eastern Arctic in 1972, and thereafter intensified this line of research with the goal of using recapture statistics to determine how many bears could be shot without "depleting" the population (Schweinsburg et al. 1981:1). Biological data was to replace historical kill data as a way of setting hunting quotas, and held out the promise of complete control over both the size of the polar bear population and the Inuit hunt. Polar bears became self-researching units—bodies—that merged with the biologists' technological toolkits. When bears behaved in unusual ways, biologists understood that that they were acting contrary to their nature, but also as members of vulnerable populations in need of managerial help.

Locating, chasing and immobilizing polar bears in the field was a violent affair. Helicopters served not only as transport machines, but also to cajole and scare bears into desired patterns of behaviour. Researchers preferred helicopters to fixed-wing aircraft because hovering over the bear allowed them to estimate weight and dosage, and

inject the immobilizing drug without having to expose someone to the bear on the ground.

Helicopters were essential to two procedures that readied the animal for capture and tagging: "herding" and "buzzing."[1] A long, slow pass with the helicopter—"buzzing"—could sometimes be used to reposition the animal if it had collapsed with its nose down in the wet ground. This method also shortened the recovery time, or at least, the time required for completing the processing of a bear, by getting the individual to move along on its own four feet. If, after being injected with the drug antagonist, the bear still had not gotten up, it was encouraged to move away from the tagging location. Bears spotted close to water were "herded" away from water or other potential hazards by using the helicopter as an instrument of fear. This tactic did not always work: if the bear was "sufficiently disoriented to be unafraid of the helicopter, but still able to walk at a stagger," it might be impossible to direct the animal's movements from above. Researchers also found that it was best to avoid flying directly over still mobile polar bears, as "one trial was adequate for [the bear] to learn that it could pass under the helicopter unharmed" (Schweinsburg et al. 1982:278).

> The rate at which the bears became fully mobile varied. Although some animals got to their feet and moved away unsteadily, they gained full coordination after 50 to 100m. Some bears did not get up after 12-15 min and were "buzzed" with the helicopter, after which they got to their feet and moved away. [Haigh et al. 1983:143]

Buzzing also reassured the research team that the bear was unresponsive and could be approached on foot. However, when cubs were present as part of a family group, it was not advisable to "test" the female in this way, as the cubs would be scared away (Schweinsburg et al. 1982:281). Cub or yearling bears often acted to protect their mother, which could seriously interfere with the initial stages of a tagging operation. In a report of a polar bear fatality on Southampton Island in Foxe Basin, the researchers describe sighting an adult female with a single cub in an area containing small lakes and ponds. As Stenhouse and Lunn describe, when the mother was hit with the dart in the hind leg, both ran into the nearby pond:

> We immediately tried to drive her out of the water with the helicopter. When near the shore, her cub climbed on top of her hindquarters. At 10:41 the adult female's head submerged beneath the water. We landed immediately and attempted to pull her out of the water. However, her cub would not let us approach. [1987:Appendix A:1]

Dart guns, fired from the rear door of a helicopter, pierced the skin and fat layer and delivered a dose of immobilizing drug directly into the muscle tissue. If all went according to plan, the bear soon staggered, dropped its head, fell to the ground, and stayed put until the biologists had finished punching numbered tags into each ear, extracting a premolar tooth for aging purposes, examining, weighing, and measuring the body, and monitoring vital signs throughout the procedure. Researchers also regularly tattooed both sides of the polar bear's inner lip with a number matching the one on the ear tags, because this mark remained discernible on the finished hide, and could be "watched for in inspection of skin collections" (Flyger et al. 1982:113). Sometimes blood or other tissues were sampled, and researchers experimented in a limited way with the use of radio satellite collars (Lee 1981; Taylor 1986).

When phencyclidine became commercially unavailable in the late 1970s, the psychoactive drug ketamine replaced it as the drug of choice for polar bear immobilization. The addition of xylazine to this new narcotic reduced convulsions; the mixture also rendered bears tractable for long periods and had a "wide safety margin," reducing the overall rate of death by overdose (Lee et al. 1981: 335). Drugged polar bears displayed the first signs of the drug effect by staggering, showing a slow deliberate walk, or standing still for several minutes. They then lay with their heads up after which they proceeded to appear deeply asleep (Lee et al. 1981:334).

Some bears did not conform to this behavioural sequence. In May of 1980, during a tagging expedition near Clyde River, a bear received three doses of the ketamine/xylazine mix, "over twice the required dosage for immobilization," according to Richard Schweinsburg, the biologist in charge. He reported the incident as follows:

> During the tagging sequence the bear acted extremely aggressive to the helicopter, chasing it from excessive distances. Finally the bear slowed down and stopped where we could only see its head behind a pressure ridge. It looked like it took a step and fell, but when we landed where we had a better view, it raised its head and looked at the helicopter, then put its head down and for all appearances was anesthetized. I had the helicopter turned off, which is not normally done until the bear is checked, because we were low on fuel. We walked up to the bear, shouting as we went, until about 20 feet away, whereupon the bear lifted its head, jumped up and charged. There was no warning such as minute muscle movements that partially immobilized bears usually make when they hear one approaching. I ran, but tripped over a pressure ridge and clogged my

> gun barrel with snow. The bear hesitated at this point, some ten feet away, and then resumed its charge. At this point I told John Lee to shoot, which he did, hitting the bear through the front shoulders. [Lee and Schweinsburg 1982:20-21]

Schweinsburg's colleagues at the Canadian Wildlife Service reported similar problems with ketamine/xylazine, such as an incident in which "the bawling of the cubs seemed to rouse the female sufficiently that she overcame the anesthesia" (Schweinsburg et al. 1982:275). This bear was also shot. The ketamine/xylazine mix was soon reported to have serious disadvantages, including a lowering of the breathing rate of bears and consequently hyperthermia. Biologists discovered that by injecting the antagonist yohimbine under the tongue, "the heart beat and respiratory rate can be increased markedly, and an immobilized bear can be capable of walking again and thermoregulating within a few minutes" (Stirling 1986:170).

To avoid losing bears during handling, and to maximize the number of animals that could be released alive, biologists looked to immobilizing drugs that offered a practical balance between waking and sleeping, life and death. In the early 1980s, the Northwest Territories Wildlife Service began experimenting with the use of carfentanil on polar bears in the wild. Immobilization with this new drug was normally complete, and bears became tractable within minutes. Some of the bears treated with this drug, however, experienced what was termed "recycling:" these animals were discovered lying in snow banks in a drugged state, hours after waking up and walking away from the capture site. This effect appeared to have something to do with the use of naloxone, a substance meant to reverse the drug effect but that in practice only opened up new channels for resistance.

Polar bear x5287, immobilized near Clyde River in 1980, was injected with naloxone, a drug thought to act "directly on the arousal center of the brain" (Haigh 1982:51), forty minutes after becoming immobile. "The bear was moving within 90s[econds] but did not get up and move off like most bears," the researchers reported (Lee 1982:19). It continued a sequence of getting up and lying down again. The bear was checked again the next day, but it still had not moved very far, and "looked groggy" (19). Snow was dumped nearby the animal, and water was poured on it from the helicopter "in an attempt to rehydrate and cool it" (19). In the post-mortem pathology report, the veterinarian and biologists reported that the animal was in a "fat condition" (21) and also stated later that this particular death was not drug-related (Haigh et al. 1983:143). Animal behaviours such as these were anomalies and transgressed the productive possibilities of bodily circuits—the tissues, organs, and nerves that channelled drugs into desired research outcomes.

Polar bear biologists found that bears sometimes responded as though they had undergone a drug-induced immobilization, even when no drug was actually present. Unlike the "state of fear" that biologists recognized as a type of physiological irrationality masquerading as resistance, this behaviour was more difficult to assimilate into biological ideals of the body as a signalling and energy processing system. In the field trial of a new immobilizing drug, "bears in culvert traps often assumed a sitting position soon after injection, though this did not seem to be a response to the drug per se" (Stewart et al. 1980:59). A specialist in animal immobilization reported that, in the course of one immobilization conducted in an outside enclosure, a polar bear darted with phencyclidine "immediately walked to a corner and lay down and exhibited signs of immobilization" (Fowler 2008:58). Since the induction seemed far too rapid, the veterinarian deployed another syringe. When both darts were removed he determined that the first dart had not expelled any of the drug it contained (58). Charles Jonkel, who worked as a polar bear biologist for the Canadian Wildlife Service throughout the Northwest Territories in the 1970s and 1980s, recalled a similar incident that threw into question the assumption that bears were a bundle of physiological pathways in which immobilizing drugs were taken up, broken down, and excreted. He reports:

> This bear was quite tractable, and I'd shot a dart in him and he looked at where the dart went in. He looked at me like, what'd you do that for? And pretty soon he put his head down in his paws and I thought he was going under. Well, I took the dart and found out it hadn't been fired. He was totally undrugged when I walked up and gave him the shot with the hand syringe, and that was like a six, seven hundred pound bear" [Donahue 2010:18-19].

The observation that polar bears might grant or deny permission to be captured, tagged and otherwise manipulated accords well with Inuit understandings that bears understand the thoughts and intentions of humans. Although Inuit regard humans and other animals as members of common social and moral communities, the polar bear holds a special status as the most intelligent animal (Wenzel 1983; Schmidt and Dowsley 2010). In the Inuit world, bears are powerful beings whose relationship with humans, because they are so closely related, is one of tension and ambiguity (Keith 2005:72-82; D'Anglure 1990:180). At the beginning of time, when

bears metamorphosed into humans, they were recognizable by the size of their canines and their liking for fat (D'Anglure 1990: 179). Polar bears also taught humans how to hunt for seals and to construct winter shelters (183). Improper thoughts and intentions toward polar bears, which include joking about or laughing at bears, or feeling that one has power over them such as by fighting over tags (Dowsley and Wenzel 2008:185-186), counting bears to decide how many can be hunted (Dowsley 2010:47), or killing fewer bears than choose to make themselves available to hunters (Wenzel 2008:80) can cause bears to move out of an area, or lead to attacks and failure in hunting (Schmidt and Dowsley 2010:381-382). Bears are regarded as being in control of the hunt and are encountered as individuals; communication between bears and hunters includes an acknowledgement of what is being done and gives the hunter information about how the animal wants to be approached (Gombay 2010:44; Wenzel 2004:245-246). Bears also differentiate among humans, regularly attacking certain individuals and families, and leaving others alone (Keith 2005:77-78; Tyrrell 2006:193). The productivity of the Inuit hunt is therefore controlled not by technology or human will, but by the quality of the human-polar bear relationship; this relationship involves obligations of reciprocity and respect, and is maintained by a community of persons that includes bears as equal participants (Schmidt and Dowsley 2010:381-382).

In contrast, polar bear researchers, when confronted with bears that proved to be or were potentially "aggressive," injected them with additional doses of immobilizing narcotics, or with neuroleptic drugs such as promazine. The latter substance is not merely a "tranquilizer," which is how it is described in field reports, but a drug used to counter "excitement" and to force bears to comply with the research agenda (Schweinsburg et al. 1982:269). Neuroleptics acted as synergists to narcotic immobilizing agents, by sedating the animal in a way that re-routed the narcotics being injected into pathways productive for research. Speeding up induction and recovery times and minimizing undesirable side effects was a matter of maintaining the bodily efficiencies that circulated the blood and kept oxygen supplied to the organs and muscles (Haigh 1982:49-55). Even with these aids, animal bodies that were in a state of "fear or terror" set off the exhaustion of competing physiological mechanisms: "tissue hypoxia and stagnation of capillaries result," leading to "decreased tissue perfusion, vascular collapse, and shock resulting in tissue hypoxia and cellular necrosis" (Spraker 1982:102). In addition, potassium could easily leak out of cells and cause heart failure in a body already sensitized by epinephrine; prolonged running, especially when overheating, was a factor that could "quickly lead to anaerobic metabolism and a build-up of lactate in the muscle, resulting in cellular death, acidosis, and death due to shock" (102). With tranquilization, dilated vessels were filled with blood, "thereby lowering overall blood pressure and venous return to the heart. This adds to the progression of shock, decreased tissue perfusion, hypoxia and cellular necrosis" (102). These were irrational possibilities within bodily economies, but ones that nevertheless could be explained as patterns of circulation and could be managed by working through bodily pathways to track down inefficiencies and reinstate the drug effect. Improving on the circulation of materials, preventing blockages, dangerous build-ups, and leakages defined the work of wildlife biologists at all levels. Attending to the economies of fat was part of this work.

Energy and Fat as Common Denominators

One biologist interested in the effects of handling on polar bears was Mitchell Taylor of the Northwest Territories Wildlife Service. His 1978 observations of a summer concentration of bears at Radstock Bay, Devon Island, found that bears fitted with satellite transmitters were twice as active as non-harnessed bears, and spent less of their "total time budget" sleeping and grooming (Taylor 1986:219). As a result, "harnessed bears killed 0.83 seals/day vs. 0.49 seals/day for non-harnessed bears." Taylor concluded that the harnesses, which probably irritated the bear in the lying position, resulted in an increase in activity, and that "telemetry data from harnessed bears may be biased" (219).

A polar bear's productivity in hunting fed into weight gain, as long as the animal kept its energy expenditures in check and spent wisely in ways that translated into predictable reproductive outcomes. In the body, stored caloric energy took the form of fat. Ramsay and Stirling, who assessed the effects of large-scale mark-recapture, attributed the undetectable effect of capture on adult males to the fact that "males in autumn have fewer energetic constraints to moving when disturbed than do pregnant females" (Ramsay and Stirling 1986:624). Female bears, the biologists pointed out, had precarious patterns of fat storage and usage. Not only must pregnant females "fast all winter and live off their body stores" (623), placing them in a critical situation when extra energy expenditures are unexpectedly incurred, but "females may also put more stored resources into reproductive effort with increasing age" (625). In their view, these budgetary constraints, rather than attached markers and tracking devices accounted for smaller litters and lighter cubs among some female bears.[2]

Biologists saw fluctuating fat reserves and environmental conditions that varied seasonally and annually as threats to the stability of polar bear populations. They regarded the high Arctic as the ideal Arctic environment for polar bears—a place where "the ice can remain, either in floes or solid sheets, permitting a continuous [seal] hunting season" (Stirling and McEwan 1975:1021). Biologists assumed that polar bears in the far north were adapted to uniformly icy and snowy conditions, and that those living away from this core habitat were vulnerable to melting ice. Constrained by this model to hunt on the ice as a specialist predator of the ringed seal, polar bears, therefore, had to accumulate large fat stores to survive the ice-free period, especially pregnant females who fasted for up to seven months in maternity dens. Pregnant females observed in the summer were commonly described in articles and field reports as obese, overweight, or "extremely fat when they first come ashore, so that they may overheat easily in warm weather" (Stirling and Ramsay 1986:349). Although the narcotic drugs used to immobilize polar bears were known to interfere with thermoregulation, researchers looked for clues to the cause of death in the fat content of polar bear bodies. During the 1985 field research season in Foxe Basin, biologists captured eleven bears, of which five died during handling. An autopsy of three of the bears concluded that while one yearling female had a pre-existing injury to the lung, the two others—an adult female and a yearling female—were "fat and the weather warm" and "overheating was probably the cause" (Lunn and Stenhouse 1987:23, 24).

Polar bears were known to be, by nature, "inefficient walkers," and also sometimes gorged on blubber (Lunn and Stenhouse 1987:14). This made them unpredictable and vulnerable to dying from overheating, overeating, or a combination of the two. A large adult male bear, injected with phencyclidine, succumbed to "acute digestive failure" after ingesting what the researchers deemed to be an abnormally large amount of fatty food (Furnell 1981:31). Two days earlier, the research team had found the carcass of a small beluga whale on the shore of an island in the Keewatin region, cut it up, and cached it under rocks intending to use the meat later for baiting snares. Furnell relates that

> at 1030 hours on 4 September the snare was checked and found to hold a 270kg (600lb.) adult male polar bear. The bear had apparently broken into the cached beluga and eaten much of it. The bear was lethargic rolling over on its back and paying us little attention. Its abdomen was extremely enlarged as a result of its recent meal [31].

In the minutes and hours following immobilization, the bear appeared to be responding to handling with "no abnormal reaction or stress," and looked to be making progress toward recovery but the next day, it was found dead. Furnell describes how

> The body was grossly bloated, the anus distended 7 cm from the body, and oil and blood were dripping from the nose, mouth and anus. It appeared to have been unable to properly digest the great amounts of blubber it had eaten and died possibly from the resulting bloating or the heat.... When my knife broke the skin, oil bubbled from the knife hole and I was engulfed in a fetid cloud of steam. [33]

Like those bears that were considered too fat, emaciated bears were also cause for biological concern. A tagging and recapture operation in Foxe Basin in 1984 found a large number of "thin or emaciated" female bears with cubs-of-the-year (COY) (Stenhouse and Lunn 1987:14). Where the field team surveyed that year, along the coast of Southampton Island, "some of the COYs ... caught had either gained little weight in 6 months, or else had lost a lot of weight recently" (14). The poor quality of these individuals, the field report concluded, had to do with their "individual hunting efficiency" since "the number of bears handled that were over 400 kg suggests that the marine productivity of the surrounding waters is good in some areas" (14-15).

In most popular and scientific accounts, however, polar bears were gluttonous and opportunistic feeders, particularly in situations where food was easy to come by. Based on his years living in Pelly Bay as an Oblate missionary, Father Frans Van de Velde summarized the polar bear's life cycle and commented on the variety of its behaviours by making analogies between "Nanuk, king of the Arctic beasts," and people: "[the polar bear] constructs a house of snow" and, if the temperature is not too cold, "he will readily leave his hole to hunt ... or to pillage the food stores of the Eskimos" (Van de Velde 1957:4, 14). The polar bear, he claimed, also "roves" about in a nomadic fashion, sometimes managing to steal a "free meal" from camps, all the while "accumulating enough fat under his skin to protect him against the low temperatures of the winter months" (12). Once successful in killing a seal, "the feast begins" and, "if game were plentiful, Nanuk would not touch the seal meat and eat only the fat" (12).

Making Inuit Hunting Productive

When biological study of Arctic mammals began in earnest, biologists also weighed in on how they believed Inuit

hunting practices functioned in the wild, where cached meat was "more often than not enjoyed by 'the beasts of the field' (bears, wolves, foxes, weasels, wolverines, lemmings, etc.) who 'help themselves to the free feast'" (Campbell 2004:163). Administrators responsible for the Keewatin district had been of the opinion that Inuit did not know how to save food properly but this was a difficult problem to address while people were still moving between hunting camps: "we cannot at present [1954] insist on a nomadic people carrying out careful storage" (Usher 2004:182). Beginning in the late 1940s, when fur trading posts were closing in quick succession, and the Arctic fox-based fur economy was nearly eliminated, Inuit hunting practices came under intense surveillance by wildlife officials (Welland 1976:83; Usher 2004; Tester and Kulchyski 1994:61-71). The caribou, which biologists believed to be in precipitous decline, was singled out as a species of special concern. Measures to wean Inuit (in particular those who relied on the fall caribou hunt for their winter food supply) off hunted meat included relocations to the coast, supervised hunts, and the provision of wage labour and imported food (Tester and Kulchyski 1994). As the "view from above" (Bocking 2005:219) gained authority as the official perspective on wildlife populations during the 1950s and 1960s, and biologists counted fewer and fewer caribou, biologists became certain that they had a crisis on their hands. This sense of ecological crisis was soon extended to other large mammals, and a federal order-in-council in 1960 declared caribou, muskox and polar bear in danger of extinction (Usher 2004:192). Inuit were accused of waste on a massive scale. When caribou failed to make an appearance along their expected migration routes, scientists postulated that overkill had decimated the population. Spearing large numbers of caribou at river crossings (Sandlos 2007:144, 150), feeding caribou to dogs.(Usher 2004:186; Sandlos 2007), allowing wounded animals to retreat into the bush and become food for other predators (Campbell 2004:164), using caches of caribou, seal or whale as bait for trapping (Welland 1976), and using caribou for meat at certain times of year, and for skins at others (Sandlos 2007:152), were just some of the ways in which subsistence hunting practices, as interpreted by wildlife managers, reinforced Euro-Canadian assumptions that Native hunters lacked self-control and were driven by primitive "desire" to kill more than they could eat (Campbell 2004:167).

That Inuit ate more calories than they could burn became an ancillary concern; Inuit people were scrutinized by nutritionists, social scientists and wildlife biologists for their accumulation of body fat and their consumption of monetary and energetic resources. Across the central and eastern Canadian Arctic, medical researchers set up "field testing" programs, whereby thousands of Inuit were measured and weighed in their socks and underwear as part of routine medical surveys (Schaefer 1977). While these investigators suggested that Inuit were racially inclined to store fat around internal organs rather than under the skin, and that this was related to the need to store energy and resist the cold on hunting trips, they also came to the conclusion that Inuit were "at risk" for obesity problems, based on measurements of skinfold thickness (Shephard et al. 1973:12; Schaefer 1977:1623). Investigators measured the "loss of fitness" of the indigenous population by placing volunteers on treadmills to measure their aerobic capacity, which had diminished "due to the use of snowmobiles, and a general decline of hunting activity" (Rode and Shephard 1984:1477). The body became a particular locus of concern as social scientists, following in the research tradition of cultural ecology, measured caloric intake and performed nutritional studies in order to answer questions ranging from the metabolic efficiency of eating meat to how the fish and game resources of the Arctic matched the needs of Inuit populations (Berkes and Freeman 1986:450; Schaefer 1981; Myers 1982).[3]

Analyses of how Inuit were adapting to life in centralized, permanent settlements tended to see acculturation at work, driven by the easy availability of energy in the form of rifles, gas-powered motors, and store-bought carbohydrates such as sugar and flour. "Intricate symbols and beliefs," which were to outside researchers the markers of tradition, stood in contrast to "modern ways" and were being "lost in the report of the high-powered rifle and the rumble of the outboard motor" (Kemp 1971:114).[4] Hunting, to the extent that it remained along the margins of civilization, was seen as precarious and dependent on natural laws governing the availability of animals—a situation that could be stabilized only by monetary and technological inputs derived from elsewhere (Myers 1982). Left to affect change on their own, these external inputs were sources of instability; Inuit and their hunting way of life passed through "difficult times" as they weathered exposure to forces they could neither "absorb" nor control (Rowley 1972:202). The sense of crisis that hung over the Arctic as an administrative region was one that harkened back to a primordial past, when "starvation controlled the size of the population and kept it in balance with productivity" (203). Problems of fluctuating animal populations were also problems of unmanageable growth in Inuit populations. Social scientists reported a "population explosion" for the Canadian North—a demographic shift they explained as the invariable response of birth

rate to the settlement of "nomadic populations" (Berkes and Freeman 1986:432).[5]

The new ecology that came to pervade Arctic wildlife biology in the 1950s, and that remained in place well into the 1980s, took settlement and farming as a point of departure and as a comparative tool with which to judge ecological relationships. It held an "agronomic attitude" towards nature and saw the land as a bio-economic system regulated by energy budgets and exchanges of capital, measurable as caloric intake and output (Worster 1994:305-312). Under this wildlife regime, productivity could be maximized according to the carrying capacity of a particular area, and animal populations could be confidently managed to produce surplus individuals for an annual harvest. The goal was to maintain animals, as R.Y. Edwards and C. David Fowle remarked in 1955, "in such numbers that they only eat the annual interest from food plants and none of the principal" (Loo 2006:145). This approach turned animals and cash into functional equivalents, so that the first federal instructions to manage polar bear, which came into effect in 1967 (by which time the movement of Inuit to permanent settlements was nearly complete in the eastern Arctic) stipulated that "when assigning quotas to Game Management Zones and individual settlements, employment opportunities as well as the availability of other species (white fox, seal, etc.) will be given due consideration in order to be fair and just to all parties concerned." (Kwaterowsky 1967:2).

Canadian reports detailing the conservation and management status of the polar bear in the years following the 1973 Agreement on the Conservation of the Polar Bear pointed to the mid-1960s as a turning point "when hunting from snowmobiles became popular" and when there occurred a "sudden increase" in the number of polar bear kills (Urquhart and Schweinsburg 1984:11). It was even possible, biologists argued, to assume that polar bear populations maintained stable age distributions, because "human predation had been held at traditional levels by a quota based on historical fur dealer records set before the advent of snowmobiles and a viable polar bear fur market" (Furnell and Schweinsburg 1984:727). This limitation, wildlife biologists believed, had maintained the central Arctic island population of polar bears in a "stable and nearly pristine state" (727). When snowmobiles first came into use in Inuit areas, wildlife managers and other officials became concerned about how this new capacity for killing might impinge on wildlife populations. At Grise Fjord, one police constable reported that, "the apparent ease with which polar bear can be taken by this means, together with the present high price paid for the raw hide, will no doubt cause some of the people to consider the purchase of a ski-doo, with these thoughts in mind" (Kulchyski and Tester 2007:115). Dogs, as polar bear biologist Anne Gunn reports, "extend the hunter's awareness through their acute vision and sense of smell" (Gunn et al. 1988:28). But sedentarization restricted the caribou hunt, thereby decreasing the supply of winter clothing, the feasibility of winter travel, and the need for large dog teams (Usher 2004:195). By the 1970s, polar bears became, for the purposes of wildlife management, organic machines, their exploitation, along with the flow of cash into and out of communities, and their use in combination with snowmobiles, governed as a new and self-contained social body.

The conversion of individual animals—transferred as polar bear license "tags" from the Northwest Territories to regional offices, Hunters' and Trappers' associations, individual hunters, and finally into cash was carefully monitored by the government of the Northwest Territories (Freeman and Wenzel 2006; Kwaterowsky 1970; Kwaterowsky 1974). Tags were coded and tracked, and were to be attached to hides immediately, even before stretching and cleaning (Kwaterowsky 1974:2). In the case of a kill made in self-defense, it was important that the value of the bear not be lost, and that the hide be turned over to a hunter eligible to take a bear as determined by the Hunters' and Trappers' Association (Kwaterowsky 1974:2).This enforcement regime confronted a pre-existing Inuit reality, where bears and humans existed under a shared skin, making valuations of bears, and their merging in and out of human bodies, difficult for outsiders to control.[6] Those who hunt polar bears and share their meat are *Inummarik*—"real Inuk" (Keith 2005:84; Wenzel 1983:93). Sharing tags, limiting the number of tags allocated to the sports hunt, and using tags allocated in community lotteries as opportunities for teaching hunting skills to youth are adaptations to the quota system, while at the same time reproducing hunters and sustaining the kinship between bears and humans (Dowsley 2010). Continuing a relationship with the land requires eating polar bear and other country foods. To the surprise of southern officials running hospitals, residential schools, or relocated communities, Inuit were "hungry" for meat from their homeland, even when other foods were available; as one official stationed in the Keewatin community of Whale Cove remarked, "they get enough flour and grain products to eat but are hungry" (Tester and Kulchyski 1994:359; see also Usher 2004:179-181).

Infractions against the polar bear hunting regulations, such as not complying with the process for registering kills, arose under the simplified valuation scheme of wildlife managers and were attributed to the fact that Inuit did not "clearly understand the necessity of polar

bear conservation and that the present restriction will be beneficial to them in the long run" (Kwaterowsky 1970). Regional game management officers were reminded by government officials to explain and re-explain the regulations in detail to hunters (Kwaterowsky 1970). Biologists hoped that Inuit would maximize the value of a given kill and abstain from killing female bears, which they considered more biologically productive, and so more valuable, per unit individual, than male bears. Also, "the more protection cubs receive," wildlife officials believed, "[the] more of them will reach maturity and ensure the continuance of the species" (Kwaterowsky 1967). The season opening dates for the Northwest Territories reflected the view that pregnant females embodied unborn numbers of individuals and that killing these animals, and their twins in utero, represented a triple loss to the total population count. Inuit hunters were encouraged to select larger adult male bears "to maximize the economic value of the hunt and to increase the sustainable yield" (Derocher et al. 1997:1080). Seen in these terms, females were "the most valuable section of the population" (Stirling 1986:169). Before tags were used to regulate the hunt, kills were distributed more evenly across the population. "Before we had tags," one elder hunter from Gjoa Haven said as part of a traditional knowledge study in 2002, "we hunted any polar bear, even if it was a small one. We just got it for food. After the tags we were told to try and get the biggest bear and try to save the females. Maybe that is why there are fewer big male bears" (Keith 2005:145).[7]

The prohibition against hunting females in winter was a way to "protect pregnant females in the fall" and "encourage hunters to take polar bears when their hides are more valuable" (Smith 1978:4). Wildlife biologists were puzzled that all but four settlements in the Northwest Territories filled their allotted quotas in the 1974-75 hunting season, despite the lower prices paid for hides that year. They predicted that if prices stabilized or continued to decline, Native hunters would become more selective about the number, size and condition of bears killed, "so as to ensure the maximum financial return for hunting effort" (Smith and Stirling 1976:3). Wildlife biologists also hoped that Inuit would allocate more of their polar bear tags to the sports hunt, since a tag used in an unsuccessful sports hunt could not be re-used. Male bears were preferred by hunters from the south as trophies, but biologists also encouraged Inuit hunters to fill their quota with as many male bears as possible.[8]

Curbing Inuit hunting was a matter of protecting the reproductive efficiencies of female bears. Biologists working in the Northwest Territories claimed that, "hunters from Gjoa Haven, Pelly Bay, and Spence Bay have killed many bears in autumn before pregnant females entered dens" (Schweinsburg et al. 1981:38). The settlements of Broughton Island, Frobisher Bay, and Pond Inlet, "in return for quota increases, agreed to delay the opening of the hunting season to 1 January from 1 October in order to protect pregnant females" (Stirling and Smith 1980:36). As an additional incentive for Inuit to make their hunting behaviour more productive, biologists devised a "red tag" quota. The red tag quotas came with strict conditions that emphasized this segment of the hunting quota as a "special" and therefore retractable privilege, and that it also needed to contribute to the productivity of research (Stirling and Smith 1980:37). Hunters were required to hand over jaws from all harvested bears, "to monitor the kill and detect if bears were being overharvested" (Stirling and Calvert 1981:106). Inuit settlements were warned that, if they failed to turn in every jaw, they would be penalized by a reduction or complete retraction of the privilege. In a report on the success of the red tag quota system, the biologists in charge attributed the jaw return rate, which was almost ninety percent, and which they described as an unprecedented level of cooperation, to the fact that hunters liked the system (107).

However, the wildlife biological construct of the female bear as an investment in a future, subtractable surplus, and the assumption that hunting mortality could be planned in such a way as to "replace natural mortality by hunting mortality without increasing the total" (that is, that certain classes of individuals were expendable based on their productive capacity), was incompatible with what Inuit hunters knew about polar bear behaviour, and Inuit tended not to agree with biologists that "surplus" animals existed within wildlife populations (Stirling and Smith 1980:37; Freeman 1985). Inuit communities on the Hudson Bay coast hunted polar bears in the fall, when they migrated up the coast before the sea ice formed (Welland 1976). During the 1979-80 season, the hunting and trapping associations of nine Keewatin communities protested against the January 1st opening date, because pregnant bears stayed in the denning area near Churchill, and did not migrate up the coast with subadults and adult males (Stirling and Calvert 1981:108).

Wildlife biologists retracted the red tag quota for that season but restored it in 1980-81 after they determined that mature females did not, in fact, comprise a significant fraction of the fall kill (Urquhart and Schweinsburg 1984:24). Without a firm grasp on actual numbers of polar bears, or what those numbers meant for population-level trends, biologists decided on how many tags were "adequate" for each community, based on how efficiently the "non-productive" elements of the polar

bear population could be converted into cash (Stirling and Calvert 1981:106, 109). This efficiency was achieved either through the sale of a small number of large, male hides, or through guided sports hunts (Stirling and Calvert 1981:106-110). Inuit embodied other efficiencies too, that could be drawn out of their traditional behaviours in the service of rational wildlife management. By the late 1980s, many biologists had been awakened to the existence of indigenous knowledge, and the idea that it contained valuable facts with the potential to corroborate or fill in gaps in scientific data sets. In former times, when scientific explorers travelled exclusively on rivers or over land, Inuit hunters were indispensable as guides. And, while they continued in their role as guides, they now also interpreted bear behaviour and distribution, based on the expectation that indigenous knowledge could help sort out the tangled complexities of natural systems.

Producing Inuit Knowledge

As a comprehensive program of wildlife survey research got underway, the Northwest Territories Department of Renewable Resources began to hire experienced hunters as Assistant Renewable Resource Officers, whose "knowledge and longtime experience of their area and its wildlife ... [was] valued as much as their abilities as guides" (Gunn et al. 1988:27). Mark-recapture research for polar bears was only successful if individual animals could be reliably located, year after year, and this required knowledge of how polar bears used the land and sea ice to hunt, travel, and den. In order to identify land areas actually used for over-wintering maternity dens, biologists carried out denning surveys throughout the Arctic in early spring, when females emerged with their cubs. Biologists hoped to cover the area as completely as possible but the territories involved were vast, and deep snow, rough ice, exposed rock, raised beaches and other kinds of difficult terrain meant that only small portions of potential denning habitat could be thoroughly searched. Researchers therefore concentrated their efforts on places likely to contain the highest density of dens and where Inuit knew the lay of the land from previous hunting experience (see for example, Lee and Schweinsburg 1982).

In a research environment in which productivity was measured by the number of polar bears immobilized and tagged per hour of helicopter flight, and where immobilization drugs were evaluated based on the speed of induction and recovery, Inuit understandings of polar bear distributions and movement patterns helped to maximize the efficiency of research, while making the knowledge that led to these improvements all the more marginal. "Inuit hunters," the Northwest Territories Wildlife Service reported, "tend to be well acquainted with where polar bears den. In the past, bears were taken while in dens and denning areas were regarded as 'food reserves' being an almost certain source of meat if caribou or seal hunting was poor" (Gunn et al. 1991:1). Thus, wildlife biologists saw Inuit guiding as an extension of the traditional hunt, which they deemed a precarious source of food, and which itself depended on the "traditional behaviour" of denning female polar bears (2).

Besides mapping the "productivity" of an area of land as a substrate for female dens, denning surveys were the foundation for subsequent mark-recaptures, which counted on finding polar bears in the same location year after year. And while Inuit knowledge was not tapped as a source of reliable data, it could be called upon to help sort out anomalies, and it could also be used to find out whether biological survey data was the product of a "typical" year. Locating dens in areas of drifted snow, or explaining why dens were empty or why they could not be found in places that looked like suitable denning habitat was a task that fell to Inuit helpers, who made the research more productive by concentrating the search effort in areas likely to yield the most animals (Williams and Jingfors 1983; Gunn et al. 1991; Kraft 1980).

Inuit knowledge was also included in reports where it could improve on the value of wildlife data. The appendix to the 1978 report of the Wager Bay denning survey contains "additional information on polar bears," provided by three hunters: Joseph Nattar, who spent several years in the Wager Bay area twenty years previously, and was "very surprised to see such a concentration of bears around the area now;" Mikkituk Bruce of Coal Harbour, who travelled to Wager Bay in 1948 and "only saw one bear in that area;" and Donat Milortuk from Repulse Bay, who travelled by canoe from Repulse Bay to Rankin Inlet in 1977, and who reported the locations of many bears he had seen on the coast and nearby islands (Davidge 1980:20-21). These observations were included as fragments, reinforcing their classification as bits of preliminary and pre-scientific knowledge.

In addition to providing logistical support, members of local Inuit communities were called on to deal with bears that had died as a result of being drugged and handled. Polar bear biologists asked hunters for information that could be used to pinpoint the cause of death—"Inuk skinning the animal stated that the fat was greasier than usual," as one pathology report stated (Lee 1982:21). One "experienced hunter," after examining the carcass of a bear that had died after being shot with carfentanil, commented that "young female bears chased hard in the early fall had been known to succumb to chasing by hunters

without a shot being fired" (Haigh et al. 1983:143). In fact, Inuit hunting polar bear by dog team and/or snow machines "ran" bears to the point of overheating and then killed them at close range (Keith 2005:58; Wenzel 1983:91-93).

Inuit were also asked to weigh in on sequences of events that did not correspond with the caloric model of productivity assumed by biologists to guide bear behaviour. Based on "observations ... made incidental to a study examining techniques for live-capturing bears at Wager Bay," biologist Donald Furnell and his Inuk assistant, David Oolooyuk, described an adult male bear successfully hunting seals in open water (rather than on the sea ice), and another "large lone bear" carrying a dead seal in its mouth in an ice-free area. But the biologist in charge attributed this finding to an unusually high density of ringed seal, sidelining it as a behaviour that "may not be common to Polar Bears through their range" (Furnell and Oolooyuk 1980:89).

Polar bear biologists interpreted unexpected behaviours in terms of bodily constraints and capacities, rather than as evidence of adaption to environmental variability and change. Variations in the time at which cubs are weaned, or in the use of dens, as well as unusual feeding behaviours, were explained scientifically with reference to the variables of energy and productivity, and their organic equivalent—fat. Although Inuit hunters sometimes told of polar bears raiding colonies of waterfowl (Russell 1975:123), biologists considered that the consumption of prey other than ringed seals was immaterial and inefficient. Based on equations relating walking speed and oxygen consumption, "it was estimated that a 320-kg bear running at 20 km/hr would have to catch a goose in approximately 12s[econds] to be energy efficient ... chasing geese would also increase the chance of hyperthermia by increasing the amount of metabolic heat to dissipate" (Lunn and Stirling 1985:2295).

Scientific discussions about kills of so-called "problem bears," or bears that fed on human refuse, associated these animals strongly with Inuit camps and settlements rather than with non-indigenous industrial facilities, as Stenhouse et al. report, "81% of problem kills took place in relation to native land use activities" (1988:277). The dump habit was seen to be particularly dangerous to the population as a whole, as biologists believed polar bear mothers transmitted this behaviour "culturally" to their young (277). Although some bears got fat at the town dump, biologists positioned polar bear "scavenging" in the wild at the boundary between the instinctual and cultural, and as something polar bears did when they were falling behind in their energy budgets (Lunn and Stirling 1985:2291). Female bears with cubs and lone sub-adult bears formed "strong habits" related to dumps and other human sources of food, and were individuals that needed to be investigated and understood "if we are to begin managing bears properly" (Jonkel 1970a:1147). Dump bears were also easily identifiable as fat as they had a "typical dump profile of a bear getting adequate food with no exercise" (Jonkel 1970b:117). The hides of problem bears did not usually count toward the community quota and were confiscated and sold separately by conservation officers, thereby further excluding these animals from the population as a managed whole (Smith and Stirling 1976:1).

Just as biologists were developing some of the first population dynamic models of polar bears (towards the end of the time period I cover in this article), ecological science underwent a theoretical shift towards understanding nature as sets of interacting "complex systems." This development opened up new possibilities for using Inuit knowledge in biological research. "Trying to understand complex systems as wholes," rather than "taking them apart and then laboriously reassembling all the once integrated bits and pieces" meant comprehending complexity through traditional ecological knowledge, an "old-style intuitive approach" that nevertheless functioned as a sort of living "supercomputer" (Freeman 1992:9). With nature presiding as a mysterious and chaotic force, micro-processes of control—the fine-tuning of an ecological machine—were neither possible nor desirable. Instead, setting acceptable limits to the behaviour of a system, a mode of security described by Foucault (2009:65) as obedience to natural processes (and commonly glossed today as the "resilience" of nature) allowed wildlife biologists to govern across wide geographic areas and to manage polar bear populations whose biology they did not completely understand. The shift in ecological thinking towards the "systems ecology" paradigm did not mean that ecologists had given up on the possibility of a deterministic universe; on the contrary, finding out how energy circulated and changed state in a non-linear fashion made nature legible as a series of multidimensional fluxes, morphing from order to change and back again (Worster 1994:410-413). Inuit hunting behaviour and beliefs about bears became accessible to researchers as part of that natural system, in which sudden disorder might disrupt even the best laid predictions and plans. Conflicts, such as those over the effects of handling on bears, could "hamper the subsequent exchange of knowledge between hunters and biologists" (Gunn et al. 1988:27).[9] However, when research was moving along in a productive manner, Inuit and bears—their "really natural" nature—were collaborators that made the system function better as a whole.

Conclusion

In this article, I have suggested that, in the first decades of sustained biological research on the polar bear, immobilization practices worked through the body as an interstitial space, where ambiguities between wild and civilized, non-human and human gave force to the interspecies nature of the management endeavour. Biologists worked on the irrational possibilities that presented themselves at energetic nodes—bodies—where calories, fat, or cash were tied up, squandered, or disappeared into unmanageable pathways, endangering the welfare of entire populations. Before wildlife conservation measures were imposed, Inuit transformed polar bears into energy in seemingly irrational and untraceable ways. Where bears resisted researchers as humans might, drawing on the circulatory and productive possibilities of their bodies to do so, they too became known as populations in need of managerial help. Tropes of animality mapped Inuit behaviour onto that of the polar bear, while at the same time linking the entire managerial exercise of wildlife biology to the governance of abnormal bodies. Traditional polar bear hunting involved killing female bears in dens using dogs, a practice that was understood as linked to the privations and excesses of primitive foodways, and that also signalled to wildlife managers that polar bear populations were in danger of being overhunted. Improving on the efficiency of Inuit hunting meant ensuring that the cash value of individual hides was fully realized and the long-term sustainability of the hunt ensured. Bears that did not become immobile or that died from handling simply did not process drugs correctly or had eating habits that made them vulnerable to overheating, digestive failure and circulatory collapse. This vulnerability was part of what concerned biologists about polar bears (particularly female polar bears) as members of populations; their survival and reproduction relied on fat stores that could be drawn up or down rather quickly, and their life cycle included dangerously long periods of fasting punctuated by large intakes of food.

Fat was a suspect substance—it de-coupled productivities both from time and from particular locations, and held open the possibility that animals (humans and non-humans) themselves, rather than ecological principles such as optimal foraging behaviour or carrying capacity, were in charge of energetic fluxes. Unfortunately for polar bear biologists, fat interfered in powerful ways with the research process. Not only did fat deposits facilitate the overheating of narcotized bears, but also the narcotics used in immobilization were markedly lipophilic. Haigh reports that, "it is possible that fat animals immobilized with these drugs might absorb narcotics into fatty tissues and release them at a later time when antagonists have been metabolized" (1982:50). Natural systems had irrational ways about them, which it was the job of wildlife managers to rein in—but only to the degree that those systems functioned according to principles already given in nature. Cycles of plenty and scarcity, like those of many Arctic mammal populations, could neither be predicted nor controlled, but they could be read from human and animal bodies, and from the energetic fluxes transmitted back and forth to the rest of the eco-"system" through those bodies. Perhaps it is for this reason that scientific concern with Inuit health centred on nutritional problems (in particular "nutrient excesses"), and why rehabilitation from disease included job training that encouraged more "secure" ways of making a living (Freeman 1988:162; Tester and Kulchyski 1994:308-317).

Immobilization as a research practice targeted individual bears as a basis for understanding the composition and behaviour of entire populations. It was the troublesome individuals—in particular females, and bears that did not cooperate with the research agenda—that took the study of wildlife to the outer limit of wildness and into the cultural realm, where dump habits, store habits and irrational patterns of fat storage and energy use intermingled as the objects of managerial research and concern. However, this form of managerial power was not of a disciplinary sort, where individuals were fashioned in view of a particular norm, but it instead evaluated how things should circulate or not circulate, and what sorts of movements, exchanges, and distributions would guard against potentially dangerous outcomes. Movements across porous species boundaries solidified biologists' authority to demarcate the limits of normal biological function; the slippage between human and animal models of productivity meant that individual polar bears could be located within a matrix of intersecting bodily, cultural, natural, Inuit and scientific productivities.

At the same time that wildlife biologists were studying and regulating populations on the basis of mark-recapture research, the eastern Inuit, through their newly formed organization, Inuit Tapirisat, were undertaking land use and occupancy research in support of land claims negotiations and, together with social scientists, produced a three volume report of their findings (Freeman 1976). The maps and narratives included within the report describe in a detailed way the land and sea ice areas used for hunting and fishing, point out significant sites for travel and ceremonial use, and provide information on historical change and how animals themselves used the land. This research, while it did not directly influence the methods or analyses of wildlife biology, showed that the hunting

way of life was still strong and led to the negotiation of the Nunavut Land Claim Agreement (1993). The Government of Nunavut, which represents a population that is 85 percent Inuit, retained many of the institutional features of the Government of the Northwest Territories; however, following upon an Elders' conference in 1998, *Inuit Qaujimajatuqangit* was adopted as the guiding principle in government policy-making. The new term for Inuit traditional ecological knowledge and its official definition recognized that this knowledge is not limited to particular details of animal behaviour or environmental trends, but encompasses "all aspects of traditional Inuit culture including values, world-view, language, life skills, perceptions and expectations" (Wenzel 2004:241). In 2005, Nunavut increased the quota for polar bears in western Hudson Bay based on a combination of Inuit knowledge and research findings, and did so again in 2011 (Tyrrell 2006:200; also George 2011). The polar bear biologists who now work for the Government of Nunavut's Department of Environment count bears by aerial means, because Inuit have voiced opposition to the immobilization and handling of bears (Aerial Survey). Federal polar bear biologists, as well as polar bear biologists internationally, continue to assess the status of polar bear populations in large part by examining the body condition of immobilized animals, and argue for lower quotas on that basis. Recent wildlife biological analyses suggesting that the polar bear's possibilities for long-term survival are shrinking alongside the extent of summer ice coverage, focus on the relationship between energy expenditures and reproductive rates (Derocher et al. 2004; Molnar et al. 2010; Rode et al. 2010; Stirling and Parkinson 2006). No resolution appears to be in sight for what the prominent polar bear biologist Ian Stirling has described as the conflict between "sound science-based management" and "traditional knowledge" (Struzik 2012). Yet, like *Inuit Qaujimajatuqangit*, wildlife biological knowledge cannot be narrowed down to data on the distribution and abundance of animals. As I have argued here, immobilization techniques were also ways of intervening in the collectivity (composed of bear *and* Inuit) and in how its components functioned in relation to one another; this mode of intervention was as much a matter of scientific study as a process of dispossession. As the polar bear body was assembled and handled by researchers, it continually shifted between human and non-human form, and provided a template for wildlife biological assumptions about what was traditional about Inuit knowledge and the Inuit hunt. In assembling that body differently, one might therefore set aside, for the moment, attempts at "integrating" scientific study with Inuit knowledge, and focus instead on understanding the relations of force that are embedded in the research endeavour itself.

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Notes

1 The practice of drugging and then tagging large animals originated in Africa in a separate colonial context, where survey aircraft were also used to swoop down and "buzz" meat-carrying "poachers" (Turner and Watson 1965:13).

2 The biological concern with fat storage and energy use in the polar bear originated in the classification of this animal as a "specialist," and as a "K-selected species" (Derocher 2004:163) that invests heavily in a small number of young. In the language of conservation, K-selected species were particularly "pre-disposed to survival problems" –"unfortunates," who, by virtue of their biological attributes required stable environments, were averse to change, and were ill equipped to co-exist with humans (Myers 1983:101). In this equilibrium model of "r" and "K" selection used by conservation biologists, certain species, such as polar bears, were evolutionary "losers" that required careful oversight. As Myers explains (1983), "special steps need to be taken to safeguard K-selected species while their numbers are still well above what would be acceptable levels in other species" (102-103).

3 These studies followed upon some of the earliest administrative interventions in the Arctic, which were directed at Inuit as bodies. A lingering state of "primitive" malnutrition (Tester and Kulchyski 1994:74), as well as "lethargy" and "indolence," which appeared to limit hunting in ways not understood by health and welfare officials (226,244), became part of the problem of food scarcity. Powdered milk and infant cereal were issued under the family allowance program to combat the high infant mortality rate in the 1940s. These were distributed to parents as foodstuffs, in order to ensure that credits entered directly into growing bodies and were not used to purchase "luxury goods" (72).

And when a series of devastating famines hit relocated communities in the Keewatin district, Inuit themselves were blamed for the starvation; at Garry Lake a constable who examined the bodies of victims found "no evidence of starvation" (233).

4 While researchers such as Kemp (1971) realized that external sources of energy were being channelled into hunting activities, and that modern hunting was therefore part of a traditional way of life, they also increasingly viewed money as an ecological force that circulated through Inuit villages.

5 Beginning in the 1950s, overpopulation and game scarcity were thought to be at the root of the Inuit welfare "problem" (Tester and Kulchyski 1994:113).

6 When skinned, polar bears resemble humans anatomically.

7 Although Inuit hunters today may prefer to kill large, male polar bears, this preference cannot be separated from the regulatory regime that supports it, and from the mixed cash-subsistence economy in which hunters are embedded. Arctic and sub-Arctic hunters tend to disagree with wildlife biologists about killing only large, male animals, saying that these individuals are important for the social coherence and survival of the group. (see Freeman 1985; Nadasdy 2005).

8 Beginning in 1992-1993, wildlife managers introduced a target harvest ratio of two male bears for every female bear. Meeting this kill ratio was crucial if communities were to avoid a downward adjustment to their quota allocation (Wenzel 2008:23).

9 In the field reports and publications of biologists, little mention is made of Inuit concern over the effects of immobilization on bears. Faced with opposition from Inuit over their handling of polar bears, biologists with the Northwest Territories Wildlife Service suggested that a system of marking polar bears with coloured dyes could be devised. "If the system worked," the biologists speculated, "time and money would be saved and public relations problems should be reduced" (Stirling et al. 1985:85); but this method was soon judged ineffective and abandoned. According to Usher (1988:196), Inuit and Dene saw research on caribou, which also involved chasing and tagging animals, as detrimental to the animals and as part of the cause for their scarcity.

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