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History of Polar Bears as Summer Residents on the St. Matthew Islands, Bering Sea

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ABSTRACT. Polar bears were found as summer residents on the St. Matthew Islands in the northern Bering Sea from the time of their discovery in the mid-18th century until the late 19th century, when the last bears were presumably shot by crews from Canadian and American sealers and a U.S. revenue cutter. Historical documents suggest that the killing of the last summer-resident polar bears on the St. Matthew Islands was an indirect consequence of the controversy between the United States and Great Britain over management of the fur seal harvest and the associated pelagic hunting of these seals. Although polar bears have continued to be present near the St. Matthew Islands in winter, when sea ice is present, a metapopulation of summer-resident bears has not reestablished on these islands. In 1972, the State of Alaska considered a proposal to reestablish a summer-resident polar bear population on the St. Matthew Islands, and since 2008, when the United States listed the polar bear as a threatened species, such reestablishment has been suggested as a conservation strategy. However, given the observed changes in local Bering Sea ice conditions in recent decades, the lack of detailed information on the population ecology and habitat dependencies of the historical St. Matthew bears, and the unavailability of an analogous extant metapopulation of polar bears for comparison, it is highly unlikely that reestablishment of summer-resident polar bears on the St. Matthew Islands could be realized.

Key words: bears, sealers, revenue cutters, Bering Sea, extirpation, sea ice, climate change

RÉSUMÉ. Des ours polaires résidaient l'été sur les îles St. Matthew, dans le nord de la mer de Béring, du moment où ils ont été découverts vers le milieu du XVIII^{e} siècle jusque vers la fin du XIX^{e} siècle, lorsque les derniers ours auraient été tués par les équipages de phoquiers canadiens et américains ainsi que par des patraches de la douane américaine. Des documents historiques laissent entendre que la mise à mort des derniers ours polaires d'été sur les îles St. Matthew était une conséquence indirecte de la controverse entre les États-Unis et la Grande-Bretagne au sujet des récoltes d'otaries à fourrure et de la chasse pélagique connexe de ces otaries. Bien que la présence des ours polaires se soit poursuivie dans les environs des îles St. Matthew l'hiver, lorsqu'il y a de la glace de mer, une métapopulation d'ours d'été ne s'est pas réimplantée sur ces îles. En 1972, l'État de l'Alaska a considéré une proposition en vue du rétablissement de la population d'ours polaires résidant sur les îles St. Matthew l'été, et depuis 2008, lorsque les États-Unis ont ajouté les ours polaires à la liste des espèces menacées, ce rétablissement a été suggéré en guise de stratégie de conservation. Cependant, compte tenu des changements observés dans le régime des glaces de la mer de Béring ces dernières décennies, de l'absence de renseignements détaillés sur l'écologie de la population et sur les dépendances à l'habitat des ours historiques de St. Matthew, de même que de l'absence d'une métapopulation analogue historique à des fins de comparaison, il est peu vraisemblable que le rétablissement des ours polaires en résidence d'été sur les îles St. Matthew puisse se concrétiser.

Mots clés : ours, phoquiers, patraches de la douane, mer de Béring, disparition d'un endroit donné, glace de mer, changement climatique

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INTRODUCTION

The St. Matthew Islands (60˚15′ N, 172˚30′ W) were discovered during a Russian Navy voyage of exploration into the northern Bering Sea in 1764–68, under the command of Lieutenant Synd (Coxe, 1803). In 1778, Captain James Cook, unaware of Synd's earlier discovery, reached the St. Matthew Islands and provided the name still used today (Fig. 1). Later these islands gained notoriety because of the many polar bears (*Ursus maritimus*) residing there during summer after the pack ice of winter had left the Bering Sea. In ships' logs of whalers present in the Bering Sea in the 1800s, the St. Matthew Islands were often referred to as the Bear Islands. In 1909, although the summer-resident polar bears no longer existed there, an executive order of President Theodore Roosevelt gave these islands protection as a biological reserve because of their large concentrations of nesting seabirds. Today the islands are within the Alaska Maritime National Wildlife Refuge and have Wilderness status (ANILCA, 1980).

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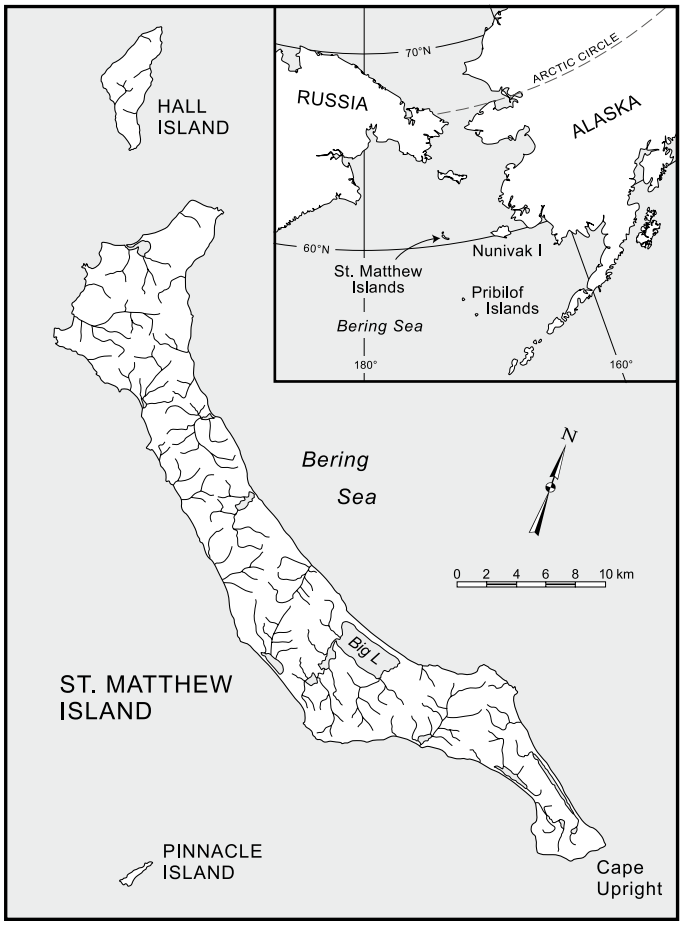

FIG. 1. Location of the St. Matthew Islands, which include St. Matthew, Hall, and Pinnacle islands, in relation to the Pribilof Islands. These islands, located on the coastal shelf, were part of Beringia during the Last Glacial Maximum.

The St. Matthew Islands were uninhabited when discovered in the 1760s and have remained so except for early (and largely unsuccessful) efforts by the Russians to establish a base from which to harvest furs and the overwintering of American trappers from Nome to harvest pelts of the white fox in the early 1900s (Rausch and Rausch, 1968). During World War II, Army Weather Service and Coast Guard personnel were stationed there to operate a weather station and LORAN navigational aid station, respectively. There is, however, evidence of earlier and brief human presence at the northern end of St. Matthew Island in the form of a single house pit, which upon partial excavation was found to be of the Inupiat (Inuit) whale hunting culture and dated at about 400 years BP (Frink et al., 2001). Subsequent archaeological reconnaissance of these islands has found no other evidence of human presence on the St. Matthew Islands prior to Synd's discovery (Dixon, 1999).

THE SUMMER-RESIDENT POLAR BEAR POPULATION AND ITS EXTIRPATION

The presence of summer-resident polar bears on St. Matthew Island was first brought to the attention of the American public in 1875, less than 10 years after the purchase of Alaska from Russia, in a front-page article in *Harper's Weekly* (Elliott, 1875) describing a visit to the island in 1874. Elliott reported, "We landed on St. Matthew Island early on a cold gray August morning, and judge our astonishment at finding hundreds of large polar bears….lazily sleeping in grassy hollows, or digging up grass and other roots, browsing like hogs" (Fig. 2). Elliott, who was trained as a biologist, had been assigned by the United States government to oversee the harvest and management of the fur seals (*Callorhinus ursinus*) that hauled out annually on the Pribilof Islands during the breeding season and birth of their young. Through his training and his experience on the Pribilof Islands, Elliott had gained broad understanding of the biology and ecology of marine mammals of the Bering Sea. During his 1874 visit to the St. Matthew Islands, accompanied by Lieutenant W. Maynard, Elliott estimated that 250 to 300 polar bears were present there. In a separate report to the Navy, Maynard (1876:19) noted, "The females were accompanied by their cubs, from one to three in number, which were (in August) about one third grown." The landing party shot six bears. The bears were butchered in the field, their weights estimated, and the amount of body fat noted. Elliott judged the bears to be in good body condition. The bears, however, were molting their winter hair, so their skins were considered of no economic value.

Before the United States purchased Alaska from Russia in 1867, a small group of Russians accompanied by Aleuts from the Pribilofs had attempted to overwinter on the St. Matthew Islands to harvest the skins of polar bears and the white arctic foxes (*Vulpes lagopus*) (Hanna, 1920). The attempt apparently resulted in failure because of severe winter weather and scurvy, which caused the death of several Russians. Few skins were actually harvested. The hunting party had also failed to anticipate that since the major prey of polar bears in winter is the ice-inhabiting seals, few polar bears were likely to be present on these islands in winter, except possibly some denning females.

During the 1890s, an international controversy was developing over methods of harvesting northern fur seals. Vessels from the U.S. Revenue Cutter Service, precursor of the U.S. Coast Guard, were assigned to the Bering Sea in summer in an effort to prevent poaching of fur seals on the Pribilof Islands and curtail pelagic hunting of fur seals in the Bering Sea. On some occasions when the revenue cutters were near the St. Matthew Islands, crewmembers were provided the opportunity to go ashore to hunt both polar bears and walrus (*Odobenus rosmarus*) (Healy, 1887, 1889). Such a hunt on Hall Island on 8 September 1885 was noted in the 1885 cruise report of the Revenue Cutter *Corwin* (Healy, 1887:97–98), as follows: "A hunting party went ashore for the purpose of killing a polar bear on Hall. Mr. C.H. Townsend, who was one of the party, succeeded in killing a large polar bear [one of four seen from the ship], which was skinned and brought on board and will be exhibited at the Smithsonian Institution in Washington. Another party attempted to hunt walrus on the west end of Hall but the water was too rough and the area

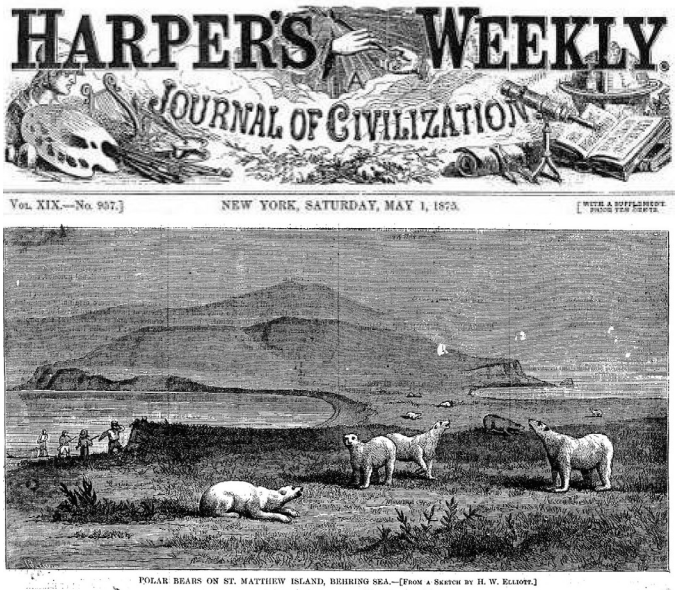
HARPER'S WEEKLY
A JOURNAL OF CIVILIZATION
Vol. XIX.—No. 967.] NEW YORK, SATURDAY, MAY 1, 1875. [WITH A SUPPLEMENT.
POLAR BEARS ON ST. MATTHEW ISLAND, BEHRING SEA.—[From a Sketch by H. W. Elliott.]

FIG. 2. H.W. Elliott's sketch of the shore party as they encountered numerous polar bears on St. Matthew Island, produced on the front page of an 1875 issue of *Harpers Weekly.*

too rocky. None were captured…. Two or three walrus were killed by officers of the *Corwin* at Hall Island on September 8 but no specimens were saved." Presumably, these walrus were shot from the ship.

Four years later, a party from the Navy vessel U.S.S. *Thetis* landed on St. Matthew Island during a cruise in the Bering Sea in late June 1899. Stockton (1890:5) reported on their landing:

> The object in visiting this island was twofold, the first being to ascertain if there were any shipwrecked persons upon the island, the other being to verify the statement made upon the chart we possessed that the island was infested with polar bears. We found plenty of old tracks but no recent evidence of the existence of polar bears. This was ascertained after honest and fatiguing endeavor to find them by parties of officers and men from the ship. We scoured the eastern part of the island, both upon the hills and upon the low tundra but without success."

In August of 1891, while doing a reconnaissance of the coastal geology of the St. Matthew Islands from the H.M.S. *Pheasant*, G.M. Dawson (1894) reported seeing several polar bears climbing on the steep rocky slopes of Pinnacle Island, where myriads of seabirds were nesting. He made no mention, however, of seeing bears on St. Matthew Island or Hall Island, although he reported in detail on the geological character of the entire coastal areas of these islands. The last record of summer-resident polar bears on the St. Matthew Islands appears in a brief paper on the mammals of St. Matthew Island by G.D. Hanna (1920), who noted that crew from the Revenue Cutter *Corwin* killed 16 polar bears there sometime in the 1890s.

FIG. 3. Old polar bear skull found by A. Sowls on St. Matthew Island in 1982, now in the Museum of the North collections at the University of Alaska. It likely was among the last of the summer-resident polar bears, which were shot in the 1890s. Note the bullet hole in the left temple (Photo: D.R. Klein).

In 1899 the Harriman Expedition, which included the eminent mammalogist C. Hart Merriam and the pioneering conservationist John Muir, visited St. Matthew, Hall, and Pinnacle islands. Muir and Merriam were particularly chagrined to find no live polar bears (Merriam, 1901 – 10). They did report finding skeletal remains of bears with bullet holes in the skulls, similar to the ones found many years later by D. Klein and F.H. Fay in 1963 and by A. Sowls in 1982 (Fig. 3).

Trails that the bears used when moving about the island remain evident more than 100 years after the bears' demise (Fig. 4). The crews of the revenue cutters hunted polar bears in the latter half of the 19th century when their cruises in the Bering Sea and Arctic Ocean took them close to the St. Matthew Islands, and these hunts undoubtedly played a role in the decimation of the bears (Healy, 1889). In the absence of other documented killing of the bears, however, Brooks (1972) had suggested that whalers were primarily responsible for the total demise of the bears. Following overexploitation of whales in the North Atlantic by the middle of the 19th century, much of the whaling effort shifted to the Pacific (Bockstoce, 1986). The northern Bering Sea and adjacent Arctic Ocean were the focus of exploitation of bowheads (*Balaena mysticetus*) and right whales (*Eubalaena glacialis*). The numerous whaling ships present near the St. Matthew Islands at that time provided the basis for speculation that the whalers were responsible for the excessive killing of the polar bears that presumably terminated the summer-resident presence of the bears on these islands. The first author examined 23 logbooks of whaling ships that had been in the vicinity of the St. Matthew Islands in the late 1880s and 1890s (Hegarty, 1959). A review of these ship's logs, which were archived in the library of the New Bedford Whaling Museum and the New Bedford Public Library, tended to exonerate the whalers from primary responsibility for the demise of the summer-resident population of polar bears of the St. Matthew Islands.

FIG. 4. Polar bear trails paralleling the coasts remain evident on St. Matthew Island, though unused for more than a century. This trail on an old beach ridge is overgrown with crowberry (*Empetrum nigrum*) (Photo: D.R. Klein, July 2005).

None of these logbooks indicated any attempt to put crew members ashore to hunt polar bears or reported any interest in doing so, although knowledge that bears were present on these islands was often noted when the islands were sighted. When in the vicinity of the St. Matthew Islands at the beginning of the whaling season, whalers were preoccupied with hunting whales at the edge of the receding ice. They could not risk losing time for hunting and processing whales by putting crew members ashore for recreational hunting of polar bears, nor could they risk their ships' becoming stuck in the ice that tended to aggregate close to the islands at that time of year. During the return to their home ports with their valuable cargos, time was also of the essence for those awaiting a return on their investments in the whaling voyages, which included the captains and crews of the whaling ships (Bockstoce, 1986).

If the whalers, preoccupied with hunting the declining populations of whales present in the Bering, Chukchi, and Beaufort seas in the late 1800s, were not responsible for the extirpation of the summer-resident bears on the St. Matthew Islands, who, in addition to crews of the revenue cutters, was accountable? Strong evidence suggests that crews of the many smaller sealing schooners present in the Bering Sea in the 1890s may have had primary responsibility for shooting most of the last polar bears resident on the islands during the controversy between the United States and Great Britain (for Canada) over pelagic hunting of northern fur seals. Sworn statements of the sealing schooner captains were obtained in conjunction with the Tribunal of Arbitration (TA, 1895). The United States expressed concern over the pelagic hunting of fur seals because it concentrated on females, was done from small boats in often rough waters and was thought to result in the wounding of many animals that were not recovered. In their sworn statements, captains of both American and Canadian sealing schooners consistently countered the charge made by American authorities of excessive loss of wounded seals during pelagic hunting, emphasizing the skilled marksmanship of their hunters. However, the captains readily acknowledged that they encouraged their hunters to improve marksmanship by shooting any wildlife wherever it might be encountered. Marine mammals and seabirds were the primary targets available. Hunting crews were provided with more ammunition than they needed to shoot fur seals, and when close to land, they were given opportunities to go ashore to hone their marksmanship on any wildlife that they might see. Also, in the proceedings of the Tribunal of Arbitration related to poaching of fur seals on the Pribilofs in the 1890s (TA, 1895), it was reported that sealers often anchored close to the northern coast of the Pribilofs while surreptitiously waiting for foggy weather or dark nights to make seal hunting raids. Crews from some of these anchored sealers were known to have made close friendships with the crews of the revenue cutters that often anchored in the same area, who likely encouraged the sealers to visit the St. Matthew Islands and hunt the bears by recounting their own polar bear hunting exploits on these islands (Healy, 1887). It is noteworthy that the revenue cutters' primary assignment in the Bering Sea was to protect the fur seals from illegal harvest. But except for the fur seal and the sea otter (*Enhydra lutris*), which had earlier been hunted to near extinction (primarily by the Russians) for their valuable skins, no restrictions on hunting of marine wildlife in the Bering Sea existed at that time. Technically, landing by foreigners on any of the lands of the Territory of Alaska for the purpose of harvesting natural resources was prohibited without a permit from the United States Government; however, there is no indication that this law was enforced in the Bering Sea except with regard to the Pribilof Islands (Healy, 1887).

Early Arctic explorers had established the image of the polar bear as an aggressive and dangerous carnivore; this image, plus a Daniel Boone huntsman mentality described by John Muir (2000), apparently prevailed among those subsequently entering the Arctic for exploration, whaling, sealing, rescue, and other activities. Muir, who understood food chain relationships of marine mammals and did not approve of trophy hunting, was aboard the Revenue Cutter *Corwin* as a guest scientist when it was in the pack ice near Wrangell Island. He lamented their encounter with three polar bears spotted on the broken sea ice, which became frightened by the approaching ship and were then shot by the captain and crew.

Sealers, who were often present near the St. Matthew Islands in the 1890s, undoubtedly played an important role in the extirpation of the summer-resident population of polar bears on the St. Matthew Islands. It is ironic however, that the Revenue Cutter Service, precursor to the U.S. Coast Guard, whose ships had been assigned to the Bering Sea to protect the northern fur seal from illegal exploitation, also may have contributed in a major way, both directly and indirectly, to the extirpation of those polar bears. In fact, the 16 polar bears reported by Hanna (1920) to have been shot by the crew of a revenue cutter in the 1890s may well have been the last of the summer-resident population of bears on

the St. Matthew Islands. The role of the United States in providing protection for the fur seals of the Pribilof Islands in the late 1800s pioneered as a model for the conservation of a large carnivore species. Its motivation, however, was not recognition of the value of the seals as a component of the maritime fauna of the northeastern Pacific and Bering seas, but rather maintaining the population to support the annual harvest of fur seal skins, of great monetary value to the United States.

Concurrently, polar bears were viewed largely in a negative context, or as a curiosity, by those residing outside of the Arctic. There was little recognition at that time of their value to the subsistence-dominated economy of indigenous peoples of the Arctic or of the potential commercial value of polar bears for their skins or trophies for wealthy hunters. Although the summer-resident polar bear population of the St. Matthew Islands was extirpated in the 1890s, polar bears, presumably from the Chukchi population, have continued to reach the vicinity of the St. Matthew Islands during winter when sea ice is present there. In 1982, A. Sowls found the remains of a polar bear that had been recently killed in an avalanche on the northwest shore of Hall Island. There have been undocumented reports in recent years of an occasional polar bear being present in summer on the St. Matthew Islands; however, a summer-resident population of polar bears has not reestablished there in the more than 100 years since their extirpation.

WERE POLAR BEARS SUMMER RESIDENTS ON OTHER BERING SEA ISLANDS?

Polar bears were not resident on the Pribilof Islands, 400 km southeast of the St. Matthew Islands (Fig. 1), at the time of their discovery by the Russians in 1786. Aleuts (Unangans) were subsequently translocated from the Aleutian Islands and settled on the Pribilofs by the Russians to assist in the harvest of fur seals and the processing of their skins (Torrey and Krukoff, 1983). Historically, Aleut residents of St. Paul Island reported winter visits of single polar bears in the occasional years when compact sea ice reached the island (Veltre et al., 2008). Fossil polar bear bones have been found on both St. George and St. Paul islands of the Pribilofs. Bones from several individuals found in lava tube, pitfall caves on St. Paul Island have been dated to 4587–3653 cal yr BP, and the high prevalence of bones from juvenile bears among those found suggested to Veltre et al. (2008) that polar bears may have been summer residents on the island at that time. These dates correlate with the marked cooling of the early Neoglacial Period (Mann et al., 1998), a time when winter sea ice apparently occurred over the entire eastern portion of the Bering Sea shelf south to the eastern Aleutian Islands (Crockford and Frederick, 2007). Both the Pribilofs and the St. Matthew Islands lie on the continental shelf and were part of Beringia during the Last Glacial Maximum.

COULD SUMMER-RESIDENT POLAR BEARS BE REESTABLISHED ON THE ST. MATTHEW ISLANDS?

The potential threat to polar bear populations of the declining extent of seasonal sea ice in the Arctic has been acknowledged in the Arctic Climate Impact Assessment report (ACIA, 2005) and has received wide attention in the public media. In 2008, the U.S. Fish and Wildlife Service (USFWS, 2008) listed the polar bear as threatened under the Endangered Species Act. For a large portion of the annual cycle, polar bears are dependent upon sea ice, which provides the platform from which they hunt ice-inhabiting seals. Thus, declining sea ice eliminates critical habitat for both seals and bears (Durner et al., 2009). The genetic purity of polar bears as a species may be considered threatened when they become stranded on land in areas where breeding with resident brown bears is possible (Doupé et al., 2007).

In 1972, James Brooks, newly appointed commissioner of the Alaska Department of Fish and Game, raised the question of how feasible it would be to reestablish a summer-resident population of polar bears on St. Matthew Island as a wildlife conservation strategy (Brooks, 1972). Brooks had previously investigated polar bear ecology in the Chukchi Sea region as an employee of the U.S. Fish and Wildlife Service. Also, the Marine Mammal Protection Act passed in 1972 transferred management responsibility for polar bears from the State of Alaska to the federal government. The original population of summer-resident bears on St. Matthew Island had been extirpated by humans before any restrictions on hunting or commercial harvest of polar bears existed. Brooks assumed that the St. Matthew Islands, with the seasonally longer presence of winter sea ice at that time, provided a suitable habitat for reestablishment of a summer-resident population of polar bears. At that time, the State of Alaska was responsible for managing polar bear populations in the adjacent Beaufort, Chukchi, and Bering seas, where hunting by indigenous peoples and guided trophy hunting were permitted. The extreme potential logistic and biological complexity of any effort to reestablish polar bears on the remote St. Matthew Islands, as well as the high cost, apparently forestalled further consideration of the proposal.

Is reestablishment of a summer-resident population of polar bears on the St. Matthew Islands feasible under present conditions, and would it be a desirable conservation strategy in the context of the species' present listing under the Endangered Species Act? During the 1800s, when a summer-resident population of polar bears was present, the pack ice reached and usually surrounded the St. Matthew Islands for as much as seven months each winter. The St. Matthew bears presumably ventured onto the sea ice in winter to hunt seals, and pregnant females quite likely returned to these islands to establish maternity dens, where they gave birth to young. The presence of polar bears during summer was also observed on Wrangell Island in the Chukchi Sea although sea ice was often present adjacent to

portions of Wrangell Island in summer months (Obsyanikov, 1998). Other bears may have sought the deep snowdrifts common along the rugged and hilly coastal areas of the St. Matthew Islands to shelter in dens during extreme winter storms, which are characteristic of the central Bering Sea (Klein and Shulski, 2009; Klein et al., 2009). In the Bering Sea, the absence of rough-surfaced multiyear ice would have provided less suitable denning conditions away from the islands than has been the case in the past on the multiyear ice north of Alaska (Fischbach et al., 2007). In recent decades, a warming climatic trend in the Bering Sea, which is largely reflected in longer and warmer summers, has been recorded at St. Paul in the Pribilofs (Klein and Shulski, 2009). Sea ice, however, continues to reach and surround the St. Matthew Islands in winter, though its seasonal duration has shortened, and in the eastern Bering Sea the more stable and concentrated pan ice of the past is being replaced by brash and thinner ice (Grebmeier et al., 2006; Francis and Hunter, 2007). The extent of winter sea ice in the western Bering Sea has been kept more stable by a southward flow of cooler waters from the Bering Strait and the strong influence of the interaction of the Siberian High and Aleutian Low pressure systems (Luchin et al., 2002). Modeling of projected trends in Bering Sea ice based on IPCC (2007) greenhouse gas forcing scenarios by Douglas (2010), project median March ice extent to be about 25% less than the 1979–88 average by mid-century and 60% by the end of the century.

The food resources that Elliot (1882) and Maynard (1876) considered important to the summer-resident polar bears on the St. Matthew Islands at the time of their visit in 1874 included plant material in the sedge meadows, where bears were seen to be grazing; the endemic singing voles (*Microtus abbreviatus*); both sea birds and ground-nesting birds and their eggs; walrus and the occasional hair seal (probably *Phoca larga*) that hauled out on the beaches of the islands; beached carcasses of whales and other marine mammals; and other marine detritus. Note that the polar bears Elliot observed to be "grazing and rooting like hogs" on St. Matthew Island in 1874 may well have also been "rooting" for the endemic "singing" voles, which we have observed to become very abundant at the peak of their population cycles in the sedge-dominated communities of St. Matthew Island. Carbon isotope analysis of collagen extracted from the old polar bear skull picked up by Sowls in 1982 (Fig. 3) and from a polar bear leg bone that had become exposed by the lowered level of Big Lake in 2005 was done at the Alaska Stable Isotopes Facility at the University of Alaska Fairbanks. Carbon values of $\delta^{13}C$ -14.06‰ and -13.26‰, respectively, fell within the range for bones of carnivores feeding exclusively on marine resources and failed to reflect significant use of vegetation or other terrestrial foods (Heaton and Grady, 2007). Bones from two polar bears thought to be summer-resident bears, which were found in Qagnax Cave on St. Paul Island and dated from the Neoglacial Period, had similar stable isotope values of $\delta^{13}C$ -12.6‰ and -12.1‰ (Veltre et al., 2008). Hobson and Stirling (1997), working with stranded polar bears known to be eating vegetation in the Hudson Bay area, pointed out that in carnivores, carbon derived from vegetation (in contrast to carbon from marine-derived foods) would likely be directly mobilized for energetic needs. Subsequently Hobson et al. (2009) assessed isotope homogeneity of breath CO_2 from fasting and berry-eating polar bears and found no evidence of reliance on terrestrial foods by polar bears. The stranding of polar bears in the Hudson Bay area during summer in recent decades appears to be analogous to the summer residency of bears on the St. Matthew Islands. However, Elliott's (1875, 1882) observations indicate pronounced differences, in that the St. Matthew bears did not appear to be stranded; many were seen to be actively feeding; those shot were in good body condition; and the metapopulation had been known to be present in large numbers during summer for more than 120 years, from the time of the discovery of the islands until the last bears were shot in the 1890s.

Successful reestablishment of a summer-resident population of polar bears on the St. Matthew Islands would most likely require the continued presence of sea ice during several winter months, providing habitat for the bears to hunt seals. This requirement may be problematical in view of current global climate warming and associated projections of declining duration of seasonal ice in the Bering Sea (Grebmeier et al., 2006; Douglas, 2010). Assuming current and projected trends in sea ice conditions in the Bering Sea associated with global climate warming (IPCC, 2007), ecological constraints related to declining seasonal duration and condition of sea ice would limit availability of the ice-inhabiting seals, presumably an essential prey of polar bears throughout most of their Arctic distribution (Hunter et al., 2010). Establishing fidelity of introduced bears to the St. Matthew Islands would be a prerequisite to allowing them to range on the sea ice, where they would be free to mix with bears of the Chukchi Sea population (Garner et al., 1990). The latter have regularly moved north annually with the seasonal decline of sea ice.

Additional constraints to reestablishment and sustainability of a summer-resident population of bears on St. Matthew Island include the limited availability of historical information on seasonal food dependency and related physiology of the previous bear population, as well as insufficient understanding of how a regime change in the eastern Bering Sea marine system (Mueter and Litzow, 2008) would affect food chain relationships of introduced polar bears. Aside from these seemingly insurmountable constraints, any effort at establishing a summer-resident population of polar bears on the St. Matthew Islands would be confronted with major costs and logistical obstacles.

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