

Polar Bear and Mammoth on the Pribilof Islands

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ABSTRACT. Museum specimens of polar bear from the Pribilof Islands include the skull of an individual shot on St. Paul, and fragmentary remains of uncertain geologic age from a lava cave in Bogoslof Hill, St. Paul, once thought to represent a distinct species. Mammoth remains have been discovered from time to time beginning in 1836, and are here regarded as in part valid evidence that the mammoth actually lived in the area. The literature pertaining to these species on the Pribilof Islands is reviewed.

RÉSUMÉ. *L'ours polaire et le mammoth dans les Pribilof.* (Au musée Smithsonian) Les spécimens d'ours polaire des îles de Pribilof comprennent le crâne d'un individu abattu sur l'île Saint-Paul, et des restes fragmentaires, d'âge géologique incertain, provenant d'une caverne dans les laves du mont Bogoslof, sur Saint-Paul, et qu'on a déjà cru représenter une espèce distincte. On a découvert de temps à autre, depuis 1836, des restes de mammoth, et l'auteur les considère comme une preuve partielle valide que le mammoth a vraiment vécu dans la région. On passe en revue les références pertinentes à ces deux espèces pour les Pribilof.

РЕЗЮМЕ. *Белый медведь и мамонт на островах Прибылова.* Имеющиеся музейные образцы с островов Прибылова включают череп белого медведя, убитого на о. Св. Павла, и отдельные осколки неопределенного геологического возраста, найденные в пещере на том же острове и ранее считавшиеся остатками определенного вида медведя. Остатки мамонтов обнаруживались от времени до времени, начиная с 1836 г., и они рассматриваются нами как достаточно убедительное доказательство существования мамонта в данном районе. Дается обзор литературы по вышеописанным видам животных на о-вах Прибылова.

INTRODUCTION

In view of the intense interest during recent years in Beringia as a pathway of and barrier to biotic interchange (Haag 1962; Black 1966; Kurtén 1966; Colinvaux 1967; Hopkins 1967), any clarification of past distribution of species within the limits of the Bering-Chukchi platform itself seems worthy of addition to the meagre knowledge of the subject. Thus information assembled in the course of curating the collections of the U.S. National Museum of Natural History, relating to the occurrence of polar bear and woolly mammoth on the Pribilof Islands, is presented below.

POLAR BEAR

Lucas (1898, p. 718) reported that "Mr. R. E. Snodgrass and the party from Stanford University had, in 1897, obtained two teeth of the Mammoth and bones of a bear, apparently distinct from the existing Polar Bear, from a lava cave on Bogoslof Hill [St. Paul Island]. He [Lucas] was of the opinion that possibly the

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presence of these bones in such a situation might indicate the comparatively recent connection of the island with the mainland."

Maddren (1905, p. 21), apparently paraphrasing a conversation with Mr. Bristow Adams, one of the collectors of the material from Bogoslof Hill, stated as follows:

The cave is apparently formed by a contraction of the lava that forms the entire mass of Bogoslof Hill, which is about six hundred feet high and at least one-half mile from the nearest part of the seashore. The cave is up well towards its top. The cavity is not a large one, for its greatest dimension is not over forty feet and its height only about eight or nine feet. It has two openings. A large one in the roof about six feet in diameter by which nothing might enter the cavity without making a sheer drop of twelve feet and by which it is impossible to make an exit; and a small opening at one end barely large enough for an average sized man to squeeze through. It was by this smaller opening the party entered the cave. The floor of the cave was entirely composed of pulverulent organic humus and it was from this the mammoth teeth and bear bones were disinterred. The depth of the humus floor deposit was not determined and as only a limited time was spent in the cave no extensive excavations were made. The remains found were situated at the end of the cave farthest from the openings as if they had been dragged there. As it is not stated whether the mammoth teeth are those of the upper or lower jaws we are unable to say whether the evidence points towards the presence of the whole skull or only the lower jaw of the animal in the cave. It seems impossible that the skull of the mammoth could have been dragged into the cave and remains of it not be found with the teeth, but it would be an easy matter for a detached lower jaw to be transported to the cave by a bear.

In an annotated list of Pleistocene mammals of Alaska, Gilmore (1908, p. 37) noted, under the heading of *Ursus*, sp. undet., that "bones¹ of *Ursus* have also been found associated with mammoth remains in a cave on St. Paul Island of the Pribilof group," and in the footnote (clearly referring only to the bear bones) that "these remains, collected by the party with Dr. D. S. Jordan in 1897, are now in the paleontological collection of the U.S. National Museum."

Preble (1923, p. 103) recorded that "W. L. Hahn found in the St. Paul Island log, under date of September 20, 1874, an entry stating that a party visited the cave on Bogoslof and brought back a bear skull known to have been there since the time of the first occupation of the island. . . . Frederic A. Lucas (1898, p. 718) has recorded the skull of a polar bear from the Pribilofs, but whether this is the Bogoslof specimen above noted is not known. I have been unable to find any Pribilof specimen in the U.S. National Museum collection". Lucas of course recorded "bones" rather than a skull, regarded them as "distinct from the existing Polar Bear", and the implication of both his and Adams' published statements is that the remains discussed by them were collected in 1897.

In his second bibliography and catalogue Hay (1930, p. 521) listed as the only fossil record under *Thalarctos maritimus*, "Pleistocene?; St. Paul's Island, Bering Sea," with Lucas (1898) as his source.

Barth (1956, p. 119) noted that "in 1897, two teeth of a mammoth and bones of a bear, apparently distinct from the polar bear were obtained from a lava cave at crater on Bogoslof Hill, St. Paul Island," citing Maddren (1915, in error for 1905), who quoted Lucas.

In his study of the evolution of the polar bear Kurtén (1964, p. 10) stated that "there is an alleged find from Alaska . . . , but its Pleistocene age seems to be in doubt," citing Hay's bibliography (quoted above).

Black (1966, p. 15), in discussing the Pribilof Islands, mentioned that "mammoth and bear (unlike the polar bear) have been found."

Clearly the accounts of all of these authors apply in whole or in part to the material first reported by Lucas (1898). Indications are that after Lucas no one has examined the specimens critically or, with the exception of Gilmore and possibly Hay, has even seen them. The obscurity and uncertainty surrounding this material, together with its being carried into recent literature (Barth 1956; Black 1966) as the basis for a possibly distinct taxon, make its rediscovery and reevaluation of some interest.

Uncatalogued remains of a polar-bear-like animal were found recently in the collections of the Division of Vertebrate Paleontology in the National Museum of Natural History. Some of the bones carry the number 96, apparently a field designation, but so far not traced to any catalogue. Accompanying the material is a decrepit label of the now defunct Department of Comparative Anatomy (in which Lucas held a curatorial position from 1887 to 1904) on the back of which is written "Bones. Bogoslof, St. Paul." These are undoubtedly the bones reported by Lucas. They have now been catalogued in the Division of Vertebrate Paleontology under the number U.S.N.M. 26108. They include the following principal elements: fragments of the braincase of at least two individuals, fragments of the rostrum of probably a single individual with the left M^1 and M^2 and the right M^2 , an isolated canine tooth, fragments of the posterior part of one left and two right mandibular rami, the styloid process of a right ulna, a right scapholunar, a left unciform, the distal epiphysis of a right femur, a left astragalus, a left calcaneum, a right second metatarsal, and the distal end of a metapodial. No less than two, and perhaps three, individuals are represented. The femoral epiphysis and the astragalus and calcaneum are indicative of a juvenile animal.

TABLE 1. Dimensions in millimeters of the crown of M^2 in some specimens of polar bear with reduced M^2 .

	<i>Left</i>	<i>Right</i>
U.S.N.M. 26108, Bogoslof specimen		
<i>length</i>	20.4	18.3
<i>width</i>	14.8	13.6
Specimen with smallest M^2 among 113 measured by Kurtén (1964, p. 17, plate 4A)		
<i>length</i>	18.7	—
<i>width</i>	13.3	—
U.S.N.M. 3430, specimen with smallest M^2 among 102 examined in Division of Mammals		
<i>length</i>	17.9	17.7
<i>width</i>	13.8	13.6

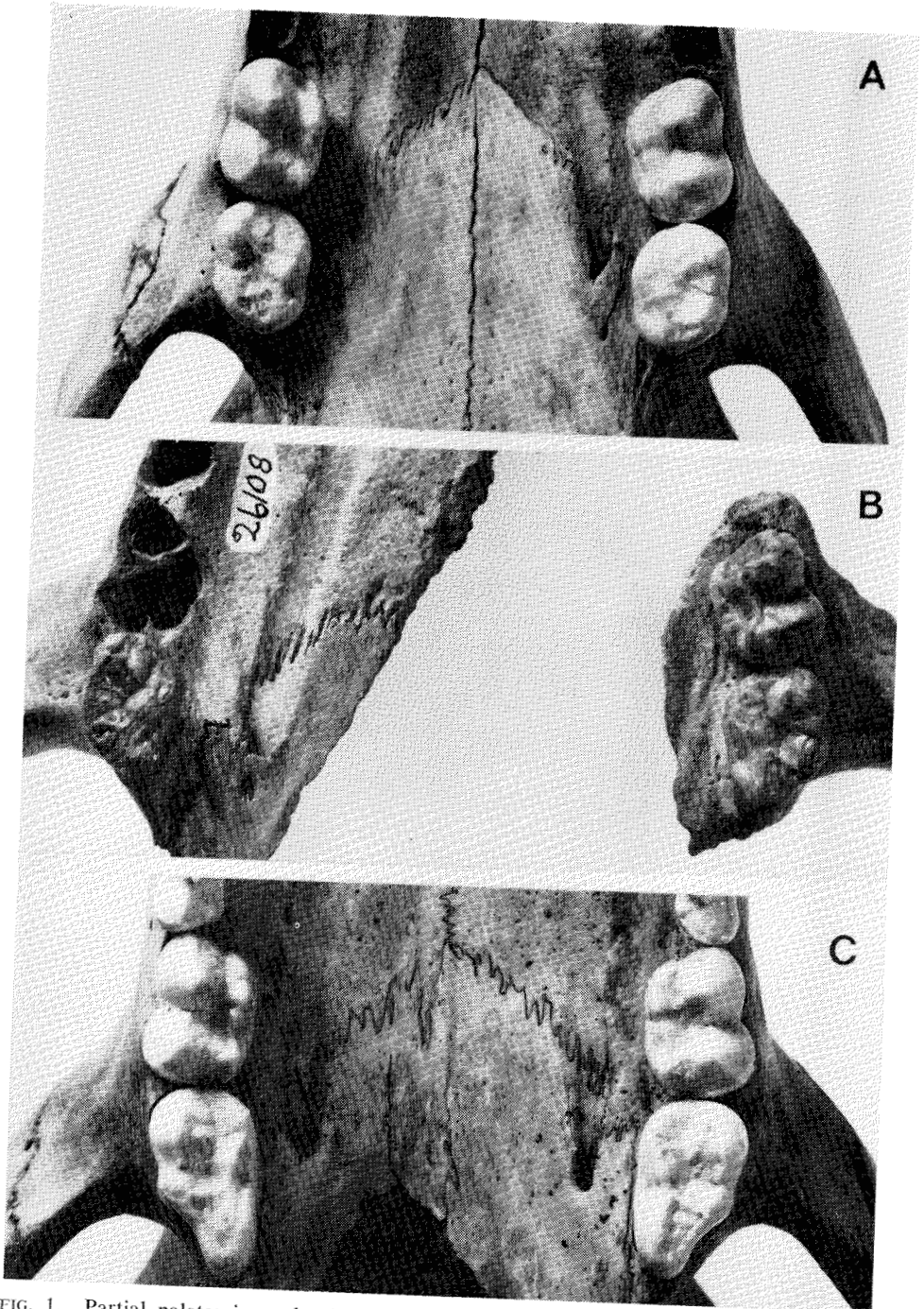


FIG. 1. Partial palates in occlusal aspect of 3 polar bears showing variation in M^2 . A: U.S.N.M. 3430 (Division of Mammals), the specimen with the smallest observed M^2 ; B: U.S.N.M. 26108 (Division of Vertebrate Paleontology), the specimen from Bogoslof Hill, St. Paul; C: U.S.N.M. 258620 (Division of Mammals), a specimen with more typical M^2 . Approximately natural size.

The only distinctive characteristic noted among the fragments preserved that might conceivably have been regarded by Lucas as setting the material apart from the modern polar bear is the extreme reduction of the talon in the M^2 of each maxilla (Fig. 1B). Reduction of the talon of M^2 is a well-marked trend in the polar bear (Erdbrink 1953, pp. 13-14; Kurtén 1964, pp. 16-18, plate 4A; in the present paper Fig. 1A). Dimensions of the crown of M^2 in the Bogoslof material, and in two modern individuals with greatly reduced M^2 are given in Table 1. Less than 10 per cent of the combined total of 215 skulls have the M^2 on one or both sides reduced to a degree at all comparable to that in U.S.N.M. 26108. Thus the Bogoslof specimen is very near but not below the minimum observed range for length of M^2 among modern polar bears. In Fig. 1 are shown the Bogoslof specimen (B), the specimen, U.S.N.M. 3430, with the smallest observed M^2 (A), and a specimen, U.S.N.M. 258620, with a more typical M^2 (C). One may suppose that Lucas wisely refrained from describing the Bogoslof animal as new after he had examined series of specimens demonstrating the extreme variability of the M^2 in the polar bear. In my opinion, the bones are inseparable from those of the modern polar bear. Although the condition of the material gives no indication of great antiquity, its geologic age remains unknown. The near certainty that the mammoth teeth from Bogoslof Hill were the product of a hoax (detailed below) casts at least a suspicion of doubt upon the natural occurrence of the polar bear remains found at the same time. However, the earlier (1874) discovery of a polar bear skull in the cave, and the inclusion of a variety of elements, some quite small, among the material of 1897, lend credibility to the record.

Regarding definitely modern occurrence of polar bear on the Pribilof Islands, Elliott (1882, p. 115) reported that "the natives have seen them here on St. Paul. . . . The last . . . killed on St. Paul island was shot at Boga Slov [Bogoslof], in 1848; none have ever come down since, and very few were there before, but those few evidently originated at and made St. Matthew island their point of departure." Preble (1923, p. 103) cited several records, none supported by a museum specimen. Hall and Kelson (1959, p. 877 and map 453) included the Pribilof Islands as marginal localities for the polar bear, on the authority of Preble (1923). Manville and Young (1965, p. 44) mapped both St. Paul and St. George as literature records, undoubtedly also on Preble's authority.

The collections of the Division of Mammals, National Museum of Natural History, include a skull of a polar bear, apparently that of an old male, catalogued on 4 May 1897, under the number 83594, from St. Paul Island, obtained by C. H. Townsend, naturalist on the Fish Commission steamer Albatross, during his visit of the summer of 1895 in connection with the fur seal investigations. A note attached to the skull, and written by Townsend, reads "Polar Bear. Killed at N. E. Pt., St. Paul I., Pribilofs 'by Karp Buterius' father' about 20 years ago."

The polar bear seems not to have been a regular member of the fauna of the Pribilof Islands during the period of European observation. It occurred, apparently seasonally and sporadically (during years of especially extensive pack ice; cf. Perry, 1966, pp. 96 and 118), as long as suitably situated population reservoirs remained, such as that on St. Matthew Island, some 225 miles to the north, where

bears were abundant through the late 1800's but were essentially exterminated by the turn of the century (Rausch and Rausch 1968, p. 73). Drs. Francis H. Fay and Robert L. Rausch have pointed out (personal communication) that the bears are most likely to arrive from the northeast in view of the more southerly extent of the ice, and of concentrations of seals, in that direction. The discovery of remains (some juvenile) in the cave on Bogoslof Hill, St. Paul, suggests that the species might have denned on the island at some time in the past.

MAMMOTH

The first report of mammoth remains on the Pribilof Islands seems to be that of Veniaminov (1840, pp. 106-107), who recorded the discovery in 1836 of a tusk on St. Paul. This record was cited by Grewingk (1850, pp. 263-264) as "mammoth teeth" found either on St. Paul or on St. George, and by Dall and Harris (1892, p. 266) as a "mammoth tooth on the island of St. George." All subsequent authors have carried forward the erroneous version of Dall and Harris. Interestingly, Veniaminov suggested, in explaining the occurrence on St. Paul, that part or all of the Bering Sea might once have been dry.

Stanley-Brown (1892, p. 499) stated as follows: "There are two fragments of paleontologic evidence connected with the islands which, as they have been used by writers, demand a cautionary word. The tusk of a mammoth was found in the sands of Northeast point on Saint Paul island [cf. Preble 1923, quoted below], and the tooth of one is reported as coming from the shores of Saint George [undoubtedly the Veniaminov record]. As there is not a foot of earth upon either island, save that which has resulted from the decomposition of the native rock and the decay of vegetation, the value of such testimony is questionable."

Dawson cited Dall and Harris (1892), quoted in whole (1894a, p. 132) and in part (1894b, p. 4) the above statements of Stanley-Brown, and commented (1894b, p. 4; and similarly, 1894a, pp. 132-133) as follows: "The precise intention of the cautionary remark just quoted is not clear to the writer. The finding of the bones upon St. George and St. Paul Islands does not appear to be doubtful. Both islands were uninhabited previous to their discovery by the Russians; they show neither traces of glacial action nor erratics; and in what way the Mammoth can be supposed to have reached these islands, except by means of a former connexion with the mainland, it is difficult to understand . . . the whole eastern part of Bering Sea is rather notably shallow, nearly everywhere less than 50 fathoms in depth. An elevation of the land by about 300 feet would thus suffice to unite the islands mentioned, with a number of others, to the American Continent, and it appears scarcely to admit of doubt that it was across such a practicable plain that the Mammoth found its way to these places." Of course it is now known that St. George was in part glaciated (Hopkins and Einarsson 1966).

Dall (1896, p. 858) repeated his reference to the Veniaminov report, but here suggested that the remains might have reached the islands as debris frozen into floe ice originating on the mainland.

Lucas (1898, p. 718; quoted above, under Polar Bear) recorded two mammoth teeth from a cave on St. Paul, and felt that they indicated a former connection to the mainland.

Maddren (1905, pp. 20-22) cited and quoted in part most of the above reports, together with the description (quoted above, under Polar Bear) by Mr. Bristow Adams of the collection of the material recorded by Lucas, and concluded, "with these facts we leave each one to draw such conclusions as may suit his fancy. But we suggest that it will require more evidence than is afforded by this occurrence of mammoth remains to justify the assertion that the Pribilof Islands, as they stand today, have ever been part of a continental area during the time the mammoth lived . . . we are far from sure that the outflows of eruptives that entirely form the Pribilof group . . . existed at an early enough date as a land surface for mammoths to roam over them. These islands have probably risen quite recently from the shallow sea floor."

Hanna (1919, p. 222) dismissed the mammoth remains as follows: "It should be stated here that the reports of the finding of bones of fossil elephants on the Pribilof Islands are probably attributable to practical jokes which have been played on credulous naturalists in the past. No such bones have thus far been found that were not planted by man, according to reports of eye-witnesses to some of the pranks."

Preble (1923, pp. 119-120) discussed most of the above accounts, and added that "a native chief, Gromoff, informed Dr. W. L. Hahn that he had found two mammoth tusks on St. Paul, one on the north shore and the other at Northeast Point. The latter is probably the one referred to by Stanley-Brown . . ." Preble discounted Hanna's explanation of the occurrences as the work of pranksters, but felt that "these remains were most probably accidentally transported to the islands, most likely on floating ice, and that, therefore, their occurrence there has no special geological significance."

Barth (1956, p. 119) and Black (1966, p. 15) noted, but did not evaluate, the presence of mammoth remains on the Pribilof Islands.

At this writing I have neither been able to locate the two teeth reported by Lucas (1898) from the lava cave in Bogoslof Hill, St. Paul, nor to find any record that they were received or catalogued in the Division of Vertebrate Paleontology or Division of Mammals, U.S. National Museum. Furthermore, Gilmore's statements (1908, p. 37; quoted above, under Polar Bear) seem to imply that these teeth were not to be found in the vertebrate paleontological collections of the museum in 1908.

There is in the Division of Vertebrate Paleontology an isolated, incomplete, abraded cheek tooth of a mammoth, U.S.N.M. 23455, from St. Paul. The specimen was forwarded to the U.S. National Museum in 1965 by Dr. Robert L. Rausch who provided the following data: ". . . excavated by Robert E. Carroll in July, 1964, at Northeast Point, St. Paul Island. It was found about 2½ feet below the surface."

At my request the late Dr. G. Dallas Hanna recently elaborated upon the situation relating to the mammoth remains from Bogoslof Hill, as follows (personal communication):

It is a long time since I inquired into the circumstances of the finding of bones of several mammals in a cave on Bogoslof Mountain, St. Paul Island, Alaska. At the time of the Jordan Investigation of the Fur Seals of the

Pribilof Islands, these islands were under lease to the North American Commercial Company. The local manager was Mr. ——— Redpath. After the termination of the lease, he settled at Dutch Harbor, Alaska. I met him there once, but I do not recall having discussed the various practical jokes which were attributed to him by his own company associates, A. H. Proctor and ——— Allis. Mr. Redpath was a very pleasant conversationalist. One of these pranks was the sowing of Lukanin black sand beach with brass spelter just after the last ship had sailed south one fall. The news of having discovered gold in the black sands of Alaska the previous summer led to casual observation at the mess table that some of the sands on St. Paul were black. Might they also carry gold? Lukanin Beach, being very handy, was investigated and much to the surprise of every one, the first test revealed specks of yellow metal. The resulting "gold" rush was on and lasted until cold weather closed the operation. Before spring, someone figured out how to test for gold and the fun was over.

The mammoth teeth found in the cave in Bogoslof Hill were apparently planted under Mr. Redpath's direction. They had probably been obtained from people returning from Seward Peninsula, where they were obtained in numbers during gold-rush days. South-bound vessels from Nome often put in to Village Cove on St. Paul, so the opportunity was there. Apparently Mr. Redpath was entertaining members of the Jordan Expedition and turned the conversation to fossil mammoths and suggested that the cave in Bogoslof Hill would be an excellent place to search. Members of the expedition then went to the cave and rather quickly found what they were looking for.

I believe one of the natives who first told me the story of Bogoslof Cave was Neon Tetof, in whom I grew to place much confidence. It was repeated by others, including the two (then boys) who did the actual planting. I recall they chose a dark, rainy day for the three or four mile trip, so as not to be seen by any of the investigators of the expedition.

Dr. Hanna, and others, including Dr. David M. Hopkins, have visited the cave, and found no trace of vertebrate remains. It seems clear that the record of mammoth from the cave in Bogoslof Hill must be discounted.

Thus the mammoth is represented on St. Paul by no less than four reported specimens collected at as many distinct times and places, excluding the teeth from the cave in Bogoslof Hill. Surely not all of these finds, spanning the years 1836 to 1964, are attributable to pranksters. In view of the now general acceptance that the Bering-Chukchi platform was broadly emergent during much of Quaternary time, of the sufficient geologic age of St. Paul (Cox *et al.* 1966), and of the existence of suitable, principally aeolian, source deposits, notably on the north shore and on Northeast Point, St. Paul (Hopkins, personal communication), there is no longer a need to account for all mammoth remains on the Pribilof Islands through ice rafting or planting. The most economical hypothesis is that the remains in general occur naturally, and are valid indication that the woolly mammoth actually lived in the vicinity. Additional specimens, with full field data, are much to be desired.

The apparently natural occurrence of the woolly mammoth on St. Paul, on Unalaska Island (tusks and molars found in 1801 according to Stein 1830, pp. 382, 383; 1842, p. 207) and on St. Lawrence Island (Murie 1936, p. 345) demonstrates that the species ranged over much of the Bering Land Bridge. Several specimens collected by Otto Geist on St. Lawrence Island are preserved in the Museum of Paleontology, University of California, Berkeley, and in the Department of Vertebrate Paleontology, American Museum of Natural History. The presence of mammoth in this region is essential to the most compelling theories (for example, Haynes 1966, p. 111, and Laughlin 1967, p. 421) concerning the first invasion of the New World by Man, which call for mammoth-hunters, of possible Clovis type, occupying the Bering land mass and the unglaciated areas to the east and west during late Wisconsinan time.

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REFERENCES

- BARTH, T. F. W. 1956. Geology and petrology of the Pribilof Islands, Alaska. *U.S. Geological Survey, Bulletin* 1028-F: 101-160.
- BLACK, R. F. 1966. Late Pleistocene to Recent history of Bering Sea-Alaska coast and man. *Arctic Anthropology* III-2, 7-22.
- COLINVAUX, P. A. 1967. Bering land bridge: evidence of spruce in late-Wisconsin times. *Science*, 156: 380-83.
- COX, A., D. M. HOPKINS and G. B. DALRYMPLE. 1966. Geomagnetic polarity epochs: Pribilof Islands, Alaska. *Geological Society of America Bulletin*, 77: 883-910.
- DALL, W. H. 1896. Report on coal and lignite of Alaska. *U.S. Geological Survey, 17th Annual Report*, part I: 763-875.
- DALL, W. H. and G. D. HARRIS. 1892. The Neocene of North America. *U.S. Geological Survey, Bulletin* 84, 349 pp.
- DAWSON, G. M. 1894a. Geological notes on some of the coasts and islands of Bering Sea and vicinity. *Bulletin of the Geological Society of America*, 5: 117-46.
- . 1894b. Notes on the occurrence of Mammoth-remains in the Yukon District of Canada and in Alaska. *Quarterly Journal of the Geological Society of London*, 50: 1-9.
- ELLIOTT, H. W. 1882. A monograph of the seal-islands of Alaska. *U.S. Commission of Fish and Fisheries, Special Bulletin* 176, 176 pp.
- ERDBRINK, D. P. 1953. *A review of fossil and Recent bears of the Old World*. Deventer: Drukkerij Jan de Lange. Volume I, XII + 320 pp.
- GILMORE, C. W. 1908. Smithsonian exploration in Alaska in 1907 in search of Pleistocene fossil vertebrates. *Smithsonian Miscellaneous Collections*, 51 (3), 38 pp.

- GREWINGK, C. 1850. Beitrag zur Kenntniss der Orographischen und Geognostischen Beschaffenheit der Nord-West-Küste Amerikas, mit den anliegenden Inseln. *Verhandlungen der Russisch-Kaiserlichen Mineralogischen Gesellschaft zu St. Petersburg*, Jahrgang 1848 und 1849, pp. 76-424.
- HAAG, W. G. 1962. The Bering Strait land bridge. *Scientific American*, 206: 112-20, 123.
- HALL, E. R., and K. R. KELSON. 1959. *The mammals of North America*. New York: Ronald Press. Volume II, viii, 547-1083, and 79 pp.
- HANNA, G. D. 1919. Geological notes on the Pribilof Islands, Alaska, with an account of the fossil diatoms. *American Journal of Science* (4th Ser.), 48: 216-24.
- HAY, O. P. 1930. Second bibliography and catalogue of the fossil vertebrata of North America. *Carnegie Institution of Washington Publication* No. 390, Volume II, XIV + 1074 pp.
- HAYNES, C. V., JR., 1966. Elephant-hunting in North America. *Scientific American*, 214: 104-12.
- HOPKINS, D. M. (Ed.). 1967. *The Bering land bridge*. Stanford, California: Stanford University Press, 495 pp.
- HOPKINS, D. M., and T. EINARSSON. 1966. Pleistocene glaciation on St. George, Pribilof Islands. *Science*, 152 (3720): 343-45.
- KURTÉN, B. 1964. The evolution of the polar bear, *Ursus maritimus* Phipps. *Acta Zoologica Fennica*, 108, 30 pp.
- . 1966. Pleistocene mammals and the Bering bridge. *Commentationes Biologicae, Societas Scientiarum Fennica*, 29 (8), 7 pp.
- LAUGHLIN, W. S. 1967. Human migration and permanent occupation in the Bering Sea area. In: D. M. Hopkins, editor. *The Bering land bridge*. Stanford, California: Stanford University Press, pp. 409-450.
- LUCAS, F. A. 1898. The occurrence of mammoth remains on the Pribilof Islands. *Science* (n.s.), 8: 718.
- MADDREN, A. G. 1905. Smithsonian exploration in Alaska in 1904, in search of mammoth and other fossil remains. *Smithsonian Miscellaneous Collections*, 49 (1), 117 pp.
- MANVILLE, R. H. and S. P. YOUNG. 1965. Distribution of Alaskan mammals. *U.S. Department of the Interior, Fish and Wildlife Service, Bureau of Sport Fisheries and Wildlife, Circular* 211, 74 pp.
- MURIE, O. J. 1936. Notes on the mammals of St. Lawrence Island, Alaska. In: O. W. Geist and F. G. Rainey. *Archaeological excavations at Kukulik, St. Lawrence Island, Alaska*. Miscellaneous publications of the University of Alaska, volume II, Appendix III, pp. 337-46.
- PERRY, R. 1966. *The world of the polar bear*. London: Cassell. 195 pp.
- PREBLE, E. A. 1923. Mammals of the Pribilof Islands. Pp. 102-120. In: E. A. Preble and W. L. McAtee. A biological survey of the Pribilof Islands, Alaska. I. Birds and Mammals. *North American Fauna*, 46: 1-128.
- RAUSCH, R. L. and V. R. RAUSCH. 1968. On the biology and systematic position of *Microtus abbreviatus* Miller, a vole endemic to the St. Matthew Islands, Bering Sea. *Zeitschrift für Säugetierkunde*, 33: 65-99.
- STANLEY-BROWN, J. 1892. Geology of the Pribilof Islands. *Bulletin of the Geological Society of America*, 3: 496-500.
- STEIN, F. W. 1842. Sind die Aleutischen Inseln ein Product des unterirdischen Feuers, der Flötzeit, oder der Urzeit? *Schriften der in St. Petersburg gestifteten Russisch-Kaiserlichen Gesellschaft für die gesammte Mineralogie*, Band I, Abtheilung II, pp. 199-213. (Originally published, 1830, in Russian, in the predecessor to this journal, Vsesoiuznoe Mineralogicheskoe obshchestvo Trudy, pp. 374-389.)
- VENIAMINOV, I. 1840. [Notes regarding the islands of the district of Unalaska.] St. Petersburg: Russian-American Company. Part I, iv, X, 364, and 4 pp. (Russian).