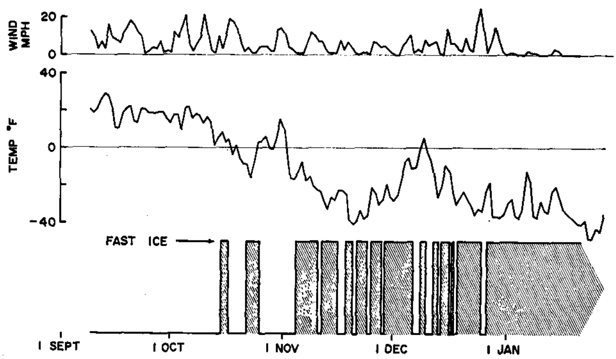

FIG. 3. Wind speed and air temperatures at Mould Bay and periods of fast ice.

a smooth envelope. In fact, this fragmented envelope is a characteristic of the noise records throughout the early fall, whereas the relatively smooth, uniformly varying envelope is a characteristic of the noise records from mid-winter through to the spring of 1968 where the ice is known to be shore-fast[2].

Time intervals of the type shown in Fig. 2 were assembled in Fig. 3 on the same time scale as air temperatures and wind speeds obtained from the nearest weather station records at Mould Bay on Prince Patrick Island. The shaded blocks indicate time intervals where the ice is not in motion; the temperatures are daily mean air temperatures and the wind speeds are the amplitudes of the resultant wind vectors for each day.

An interpretation of Fig. 3 raises the question of the geographical precision with which noise can be used as a means to detect motion. The RIP was equipped with a hydrophone having a uniform sensitivity in all directions. For the 150-300 Hz frequency band under consideration, and for a hydrophone situated on the bottom in a water depth of 300 m. in a region covered with pack ice, calculations show that if the ice cover is assumed to generate noise uniformly, the hydrophone will sense 50 per cent of its noise power from within a surface area 5.5 km. in diameter, and 75 per cent from within a surface area 11.0 km. in diameter. When the ice is in motion, the noise it makes is not uniformly distributed in area and depends on the location of ridging, rafting and other forms of relative motion. It can then be assumed that the sporadic nature of ice-motion noise will be detectable over a much greater area than is indicated by simple calculations.

The interesting feature of Fig. 3 is that during December 1967, the ice cover was frequently in motion, contrary to expectations. The change of air temperature with time reflects, to some degree, the looseness or fastness of the ice. From this figure little correlation exists between the wind speed and the existence of motion, except perhaps for the hours between 0800, 23 December, and 1400, 24 December (LST) where a buildup of wind preceded a temperature rise.

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Some Properties and Age of Volcanic Ash in Glacier Bay National Monument*

INTRODUCTION

Volcanic ash occurs in one section of marine sediments in the eastern part of Glacier Bay National Monument, southeastern Alaska. Radiocarbon dates on wood from marine deposits at nearby localities indicate that the ash was deposited about 11,000 years B. P. No other ash layers of this age have been reported from this part of Alaska (Fig. 1); Mount Edgecumbe, near Sitka, may have been the source.

The volcanic ash occurs in Granite Canyon and is exposed for a distance of 15 m. on both sides of the river. Along the bluff on the east side of the river, where better exposed, the stratigraphic section (58° 54′ 57″N. 135° 50′ 14″W.) of unconsolidated deposits consists of:

*Contribution No. 166 of the Institute of Polar Studies The Ohio State University

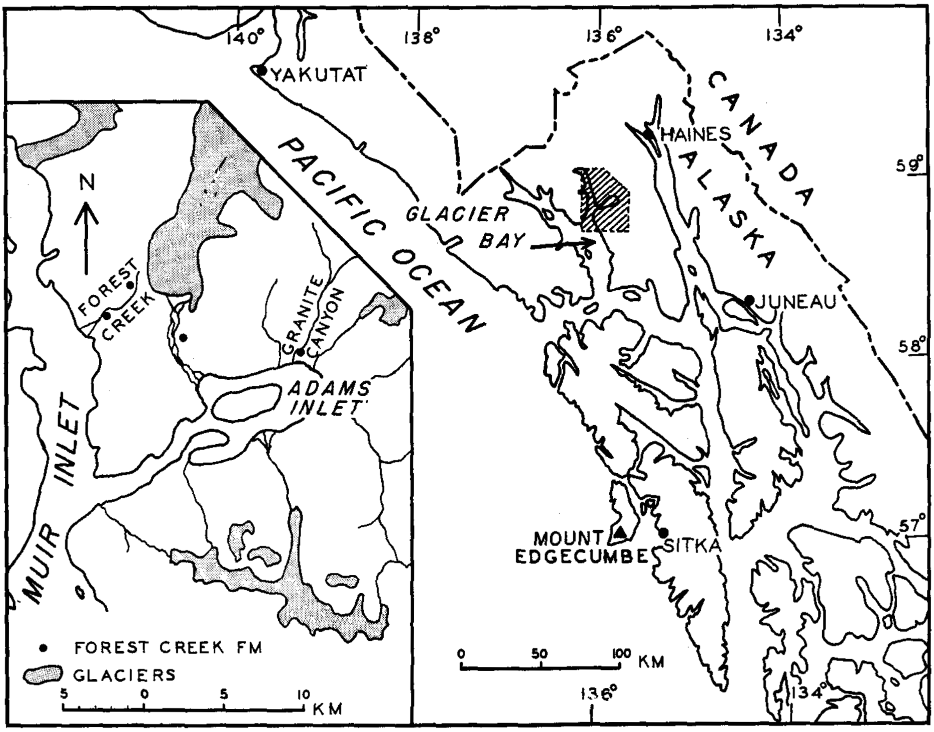

FIG. 1. Location map of Glacier Bay area and Mount Edgecumbe. Large dots on inset map are outcrop localities of Forest Creek Formation; the volcanic ash is exposed in the Granite Canyon section.

Gravel, gray coarse bouldery	4.0 m.
Gravel, reddish-brown medium-coarse, with weathered pebbles	1.2 m.
Silt and sand, white to reddish-brown, with some pebbles	2.0 m.
Silt, gray (oxidizes to green), with marine shells, shell fragments and black organic material	1.3 m.
Ash, gray (oxidizes to grayish-white) laminated, organic mottles	0.5 m.
Silt, as above the ash layer	0.5 m.
Slump to creek level	2.5 m.
Total	12.0 m.

The laminated ash occurs within a marine deposit known as the Forest Creek Formation[1]. Worm burrows 3 mm. in diameter contain a green material that is finer grained than the enclosing ash. The upper 0.2 m. of ash is darker than the remainder and may be mixed with other silt-sized material. A black layer, 5 mm. thick, at the base of the ash contains more organic material than other parts of the ash; however, a 150-g. sample submitted for radiocarbon dating yielded only 1/100 of the required organic material.

The ash was deposited in a near-shore marine environment, either directly or by inwash from surrounding slopes covered by the ash. The fossil assemblage in the enclosing Forest Creek Formation (Fig. 1) indicates shallow water (2 to 18 m.) according to A. La Rocque of The Ohio State University, who identified the fossils. Microfossils also occur within the ash. Two foraminifera specimens were found, one of which, according to R. Todd (personal communication, 1968) of the U. S. Geological Survey, is probably *Elphidium clavatum* Cushman. This species is rare to common today in fiords of southeastern Alaska with bottoms of sand, silty clay, and pebbly clay[2].

PROPERTIES OF ASH

Several samples of the ash were collected from each exposure. Granulometric, petrographic, and partial chemical analyses of one sample gave the following properties:

The specific gravity of the ash is 2.44 g. per cc.; the grain-size distribution is given in Table 1.

TABLE 1. Grain-size distribution in the volcanic ash, determined by pipette and by hydrometer methods

Method	Weight per cent in each fraction		
	sand (2.0-0.05 mm.)	silt (0.05-0.002 mm.)	clay (< 0.002 mm.)
Pipette	5	86	9
Hydrometer	3	90	7

Glass shards are generally clear with no visible signs of alteration. Vesicular shards and fine threads of glass are common. The index of refraction of the glass is approximately 1.51, which indicates an acid rock with about 68 per cent silica and a specific gravity of 2.39 g. per cc.[3]. Partial elemental analysis by x-ray fluorescence of the glass portion of the ash was made using a Norelco unit. Duplicate pellets were prepared with 30 per cent boric acid at a pressure of 3,515 kg. per $cm.^2$. The standards used were prepared according to the method of Handy and Rosauer[4]. The weight per cent of the elements determined are: calcium, 2.0; iron, 2.85; manganese, 0.077; potassium, 1.64; titanium, 0.176; and zirconium, 0.142.

Phenocrysts in the volcanic ash make up about 10 per cent of the +250 mesh (0.061 mm.) fraction. In the heavy mineral (sp. gr. > 2.96) fraction, pyroxenes and amphiboles are equally abundant and together constitute about half of the sample. Almost all of the orthopyroxenes and many of the other grains are coated with glass. Biotite and glass shards with inclusions each comprise about 10 per cent of the heavy minerals; 20 per cent of the grains are opaque. About 10 per cent of the grains were not identified, and some of the small cloudy amorphous grains in this category may be intergrowths of feldspar and cristobalite. The light fraction of the ash, other than the glass, consists mainly of albite with a minor amount of potassium feldspar. X-ray diffractograms of a ground total-ash sample were made using oriented specimens on ceramic plates and a random sample in a rotating sample holder. Feldspar and quartz peaks were identified but no clay minerals were found.

AGE AND POSSIBLE SOURCE

No date is available for the sections of Forest Creek Formation that contain volcanic ash; however, peat on top of the Forest Creek Formation, approximately 200 m. upstream from the sections containing the ash (Fig. 1), has a radiocarbon date of 10,940 ± 155 years B. P. (I-2395). The dated section contains 2.6 m. of glaciomarine clay beneath the peat, but no ash. This minimum age for the ash in the Forest Creek Formation is supported by dates from other areas in Glacier Bay. A spruce cone from the Forest Creek Formation on lower Forest Creek (Fig. 1), 12 km. northwest of Granite Canyon, is 11,170 ± 225 years B. P. (I-2396), and autochthonous wood on top of Forest Creek Formation in upper Forest Creek is 10,400 ± 260 (I-1616) years old.

These dates suggest an age of approximately 11,000 years B. P. for deposition of the ash. Mount Edgecumbe, 210 km. south of Granite Canyon on Kruzof Island, is the most probable source for the ash. The absence of evidence for eruptions from other volcanoes at this time in the area, and the occurrence of what is believed to be Mount Edgecumbe ash at Montana Creek, 30 km. northwest of Juneau (Fig. 1) suggest this origin. The eruption of Mount Edgecumbe has been estimated at about 9,000 years ago based on a radiocarbon date of 10,300 ± 400 years B. P. (L-207D) on peat beneath the ash at Montana Creek[5]. Because the date is on material underlying the ash, the date of the eruption could have been closer to about 10,300 years B. P. It is conceivable that Mount Edgecumbe may have erupted as early as 11,000 years ago, and continued to be active for a thousand years or longer.

In support of the hypothesis that Mount Edgecumbe is the source for the ash at Granite Canyon is the refractive index of glass from lapilli fragments covering the upper slopes of the mountain. A sample of this glass (collected by D. Brew, U. S. Geological Survey) has a refractive index between 1.50 and 1.51, which is close to that of the Granite Canyon ash (1.51). Portions of this glass are, unlike the Granite Canyon material, coated with a red stain.

Before a firm conclusion can be drawn on the source of the ash, detailed analyses of the mineralogy, refractive index, and major and trace element composition of Mount Edgecumbe ash from several locations are needed. Trace element abundances by neutron activation analysis[6] might be the most promising method for determining the origin of the Granite Canyon ash.

ACKNOWLEDGMENTS

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L. Wilding and R. Drees. I am grateful for the fossil identifications, and the samples and advice supplied by D. Brew and R. Lemke. G. Moore advised on the mineralogical investigation. The manuscript was reviewed by R. Behling, J. Splettstoesser, and I. Whillans.

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Field Notes on Mammals of the Chesterfield Inlet District of Keewatin

These notes are based on observations, and some collecting, during a stay at the village of Chesterfield Inlet (C) from 27 May to 21 July 1967; they include some information obtained from local white and native residents. Small mammal traps were set in the warehouse of the Hudson's Bay Company (hereafter referred to as the "Bay") at Chesterfield, at several points on the outskirts of the village, and on Promise Island. A few specimens were also secured during 4 days, 21 to 25 July, spent at Rankin Inlet (R), 4 days, 25 to 29 July, spent at Baker Lake (B). In the annotated list below trinomials are used only for those species of which specimens were collected; in the case of arctic foxes the subspecies could be determined from several skulls that were found. The subspecific determinations were made by P. M. Youngman, curator of mammals at the National Museum of Canada, where the specimens were deposited. The localities referred to are shown on the sketch map, Fig. 1. The vernacular names of the species and the order of the list follows Burt and Grossenheider[1] whose guide was used in the field.

The Eskimo names given are those in use about Chesterfield Inlet. My orthography is essentially that of Thibert's dictionary[2] i.e., the words are sounded as if they were Latin (or for that matter German) with the following exceptions: the guttural sound which often follows *ak*, for which Thibert finds no true equivalent in French, is rendered *ch*, pronounced as in the Scots' word loch (or German *dach*); the sound which he renders as *s* is written *sh* to be pronounced as in English (equivalent to German *sch*); *s* is to be pronounced as in any of the West European languages. This simple system is the same as I have previously used for Amerind and Eskimo bird names[3,4]. As far as I can judge it is in agreement with Greenlandic orthography.

My journey to Keewatin was supported by grants from the National Research Council of Canada and the Arctic Institute of North America.

ANNOTATED LIST

*Identifiable remains such as skulls or bones found and examined; **Specimen or specimens collected.

*POLAR BEAR: *Thalarctos maritimus*, Esk. nannuk.

The hunters of 3 native families who camped at Cape Silumiut from mid June to 18 July shot two polar bears. I saw the pelts of one of these as well as an old skull. Identifiable portions of recent skulls were also found on the outskirts of C.

SHORTTAIL WEASEL: *Mustela erminea*, Esk. tereak.

An adult seen on the outskirts of C on 24 June was in full summer pelage. On 14 July some boys at C reported having found one with young in the cemetery and having seen an adult near the "Bay" store.

RED FOX: *Vulpes fulva*, Esk. teriganiakdshuk (large terigania).

Two locally obtained skins were brought to the C "Bay" in the 1966-1967 season.

*ARCTIC FOX: *Alopex lagopus innuitus*, Esk. terigania or aopaluktok.

Sixty skins were brought to the C "Bay" in the 1966-1967 season. On 3 June a fresh track was seen at Baker Foreland following those of a hare. An old burrow, presumably of this