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Managing frozen heritage: Some challenges and responses

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ABSTRACT

Archaeological and historical remains of great value are emerging from melting snow and ice across the globe as rising temperatures and changing weather patterns lead to the degradation and decline of snow patches, ice sheets and glaciers. Rescuing the heritage remains that exist within some of these sites is a serious challenge for cultural heritage management (CHM) systems and regimes in a number of ways. This paper is a review of some of these challenges. It begins with an overview of the geographical and chronological distribution of glacial archaeological sites and finds from around the world. The institutional CHM context within which this sub-discipline has emerged is described, as are some of the difficulties associated with managing frozen heritage sites and finds. An overview is also given of some of the field and methodological responses that have been applied in different regions until now. Finally, a number of management related issues in need of special attention in the future are highlighted.

1. Introduction

A new sub-discipline of archaeology has literally emerged from melting ice and snow in recent years, as global temperatures continue to rise and regional and local weather patterns are disrupted. The term *Glacial Archaeology* refers to a wide range of scientific and management activities aimed at locating, preserving and understanding a broad spectrum of cultural remains currently appearing on glaciers, ice patches and other frozen settings on sites around the world. This article focuses on some of the challenges facing this emerging field, from the perspective of cultural heritage management (CHM).

Frozen cultural heritage is not alone in facing the threat of damage and destruction from the effects of climate change. A whole range of sites and environments around the globe are currently under threat from factors such as rising sea levels, flooding, changes in soil chemistry and humidity levels (e.g. Blankholm, 2009). But as alpine glaciers and ice patches are already melting, glacial archaeology represents the frontlines of this struggle and therefore in many respects is test-case, where we can see how heritage management structures and practices are equipped to adapt to the challenges of systemic climate change.

We begin with a short description of glacial archaeology, looking at the distribution, age and behavioral background for these finds. In the second section, we examine some of the basic ideas and principles that many CHM regimes build on. In the third section, we look at some of the challenges specific to managing frozen heritage. Following this is a presentation of ways these challenges have been met in different regions. In the final section, some of the more pressing issues and challenges facing this sub-discipline are discussed.

1.1. Glacial archaeology: a global phenomenon

A significant portion of the Earth's surface is either permanently or seasonally frozen. Researchers use the term 'the cryosphere' to describe those areas where water is found in a frozen state. This broad definition includes large-scale structures and phenomena such as sea ice, permafrost, frozen ground, continental ice sheets as well as small structures such as glaciers and perennial snow patches. The global cryosphere plays an important, integrated role in the biosphere, not least as part of the planet's climate system. Public and scientific attention is today increasingly focused on developments in the cryosphere, as the effects of anthropogenic climate change become all the more evident (Barry and Gan, 2011:1–8).

Glacial archaeology focuses on cultural remnants of human interactions with the cryosphere (See Callanan, 2010, Andrews and Mackay, 2012; Reckin, 2013; Dixon et al., 2014). But only specific parts of this enormous area are relevant for archaeological activity. Glacial archaeological remains have been discovered on valley

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glaciers, small ice sheets, permanent alpine snow patches and in other frozen alpine contexts (See Dixon et al., 2014:1–2). Features of this kind are distributed across the globe, either at high latitudes or at high altitudes. Glacial sites are not the only cryospheric features to have seen human activity in the past. A wide variety of cultural deposits are also found in permafrost contexts around the world. In fact, most of the frozen remains of the past have come from permafrost sites and contexts. Permafrost archaeology has a long history in certain regions, with its own specific interpretative and methodological issues and discussions. While there are clear depositional and methodological differences between these two broad find complexes, there are also a number of important commonalities. No least with respect to the common threat facing all remnants of the human frozen past from the effects of warming climates, and the ensuing degradation and erosion of sites (e.g. Andersen, 2014). However, the following discussion focuses on true glacial contexts in alpine and sub-alpine areas.

Glacial archaeological sites have been discovered in a number of different regions. In Scandinavia, a large number of productive sites are situated in the mountains of southern and central Norway (Nesje et al., 2012; Callanan, 2014). A small number of finds have been found in northern Norway too (Sommerseth, 2015). The few finds reported from Sweden come from Northern mountain areas, close to the border with Norway. It is surprising that so few finds have been discovered in the northern interior of the Scandinavian Peninsula, especially considering the important role mountain landscapes have played in the region through prehistory until today.

Elsewhere in Europe, glacial finds and sites are until now limited to the Alps. Ötzi, the Neolithic Iceman discovered on the border between Italy and Austria in 1991 is the best well-known glacial find in the world. There are other notable finds sites spread across the Alpine region in Switzerland, Austria and elsewhere in Italy (Dickson, 2012; Hafner, 2012). As of yet, no glacial finds have been reported from other European mountain regions such as the Pyrenees and Carpathians.

In North America, productive archaeological snow patches are currently found in several different territories. The largest group of sites is in the Southern Yukon, Canada where surveying and monitoring has been going on since 1997 (Hare et al., 2012). Several sites have also been identified in the neighbouring Northwest Territories, Canada (Andrews et al., 2012). In the US, glacial finds come from two distinct regions. In Alaska, productive sites have been located in at least three different parts of the state (Dixon et al., 2007; VanderHoek et al., 2012). The other group of glacial sites lies in the Rocky Mountains in the contiguous United States. Here, a number of sites producing both archaeological and paleobiological material have been registered in Colorado, Montana and Wyoming (Lee, 2012).

In South America, a number of frozen mummies have been discovered on several mountaintops in Chile, Argentina and Peru. These sites are often located at extreme altitudes (i.e. >6000 masl). While the finds themselves are not directly associated with ice patches or glaciers, this high alpine environment is crysopheric in every regard (Ceruti, 2004, 2014; Reinhard, 2005).

The oldest artefact recovered from a glacial site until now is a dart foreshaft found high in the Rocky Mountains in Colorado USA in 2007. This object was radiocarbon dated to c. 10,000 cal BP (Lee, 2010, 2012). Snow patch sites in Southern Yukon, Canada have produced a series of artefacts that date from c. 7500 cal BP and onwards (Hare et al., 2012). However, the vast majority of finds recovered on glacial sites until now are somewhat younger than those from these two areas. For example, artefacts recovered from snow patches in Alaska date from between 3400 cal BP and modern times (VanderHoek et al., 2012: 157). In Norway, finds from snow patches range from the Neolithic period (c. 5500 cal BP) through to historical times, with a large portion of the recovered material dating to the Iron Age and Medieval Period (Farbregd, 2009; Nesje et al., 2012; Sommerseth, 2015; Callanan, 2014). In Northern Sweden, finds indicate that snow patches were in use from at least the Iron Age and onwards (Callanan, 2014). In the European Alps, the find complex at Schnidejoch, Switzerland contains elements dated to between 6800 and 4220 cal BP (Hafner, 2012). This is somewhat older than the famous Neolithic Iceman from the Ötztal Alps that dates to c. 5330 cal BP (Bortenschlager and Oeggl, 2000). Elsewhere in the Alps, most of the finds recovered in the different regions are from the Medieval and Historical periods (Hafner, 2012). In South America, the Frozen Mummies recovered from mountaintops in Argentina and Peru are associated with the Inca cultures and date to between 5 and 600 cal BP (Ceruti, 2004, 2014). From this overview we see that glacial contexts have the potential to preserve organic materials in relatively good condition for many thousands of years. But what kinds of heritage remains are glacial archaeologists recovering and how were people using these peripheral regions in the past?

Many of the finds, such as arrowheads, arrow shafts, throwing darts, quivers, knives, snares and gopher sticks are the remnants of hunting and trapping activities on patches of ice and snow in the mountains. The hunting/trapping group of finds is the largest single group of finds until now, which tells us something about the role these zones played in peoples' lives in the past. Also recovered are items such as shoes, clothing, jewellery, and other personal items that give us important data regarding the timing and nature of activities on these sites. Artefacts usually appear as diffuse groupings of finds that are recovered either individually or in small groups from sites over time. Temporary dwellings and organic components of complex hunting leads have been recovered in a couple of instances (e.g. Nesje et al., 2012). However, large-scale structures or permanent settlements are not a usual feature of these areas. In some cases, the chronological and functional character of recovered finds in specific topographical settings suggest these landscape features were used as alpine passes by people attempting to cross mountain ranges (e.g. Hafner, 2012).

Glacial sites have also produced a number of human remains in different contexts (Dickson, 2012). Bodies are found in different states of preservation depending on the type of context and depositional background. Some frozen bodies are only partially preserved, especially when found in connection with dynamic glaciers. These bodies have a tendency to be relatively young in age. In other cases, complete human bodies have been preserved, either in static ice contexts or in sub-areal contexts at extreme altitudes. These corpses can be preserved for several thousand years under special circumstances, as illustrated by the example of Ötzi, the Neolithic man from Hauslabjoch. The deposition background for some of these frozen bodies is attributed to accidental or violent deaths in the mountains, while others were the result of ceremonial rituals and funerary rites on mountaintops. In summary, the different finds associated with glacial contexts give the impression that human activity and presence in glacial environments in the past were generally very targeted, temporary or transitional.

Moving on from this general overview of the distribution, age and character of glacial finds, we can turn our attention to some of the challenges associated with managing this portion of our global cultural heritage. We begin by listing some generalised characteristics of modern heritage management regimes, under ideal circumstances.