Old Ice: A Survey and Monitoring Programme of High-Alpine Cultural Heritage in the Central Alps, Switzerland

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Twenty years have passed since the Iceman’s discovery and the archaeological consequences of the rapid melting of the alpine glaciers have become well known. However, hardly any methodological procedures for glacial archaeology have been developed in Central Europe. In 2011, at the Dept. for Prehistory at the University of Zurich a project was founded with the aim to map ice patches with high archaeological potential throughout the Canton of Grisons/Switzerland. These valuable archaeological archives are to be studied before their eminent disappearance in order to answer questions regarding (pre)historic alpine land use, concentrating on communication routes, hunting, pastoral activities, trade and war. To be able to evaluate the ice patches a set of criteria influencing the probability of the presence of finds and the quality of their conservation was compiled. Analysis and visualizations based on aerial photography, landscapes models, glacial and cultural history, historical maps as well as calculations were made using ArcGIS. The resulting predictive model has been tested and continuously adapted during the late summer of 2011 and 2012 through systematic surveying. Such a model will become the basis of a monitoring programme from 2013 onwards.

In 1991 the most famous discovery of glacial archaeology in the European Alps was made: Ötzi, the Iceman. The perfect preservation of the 5300-year-old body and of his equipment and the extraordinary story of his murder, provided Alpine archaeological research with an extremely popular icon. However, although almost 25 years have passed since Ötzi was revealed by the glacier on the Tisenjoch and despite the fact that Scandinavian and North American permanent ice fields—so-called ice patches or...
snow patches—have continuously proven to be valuable depositories of archaeological finds (e.g. Farnell et al. 2004; Dixon et al. 2005; Vanderhoek et al. 2007a; Vanderhoek et al. 2007b; Andrews et al. 2012; Callanan 2014), the discovery and recovery of archaeological finds from ice, such as the finds made at the Schnidejoch and the Lötschen Pass in Canton Berne (Hafner 2015), are still largely left to chance in the alpine region and thus remain exceptional occurrences (Meyer 1992; Stadler 2005; Steiner 2013; Steiner 2015). Another early example are the frozen remains of a female body dating to the late seventeenth century—a time of advancing glaciers in the European Alps (Joerin et al. 2006; Grosjan et al. 2007; Joerin et al. 2008), which were found in the Swiss Canton Grisons between 1988-1992 (Rageth 1995; Reitmaier et al. 2015).

The ideal preservation conditions in ice lead to the conservation of objects made from organic materials, which have the potential to significantly enhance archaeological knowledge about Alpine Archaeology. This fact and the imminent threat to ice patches due to sustained global warming warrant swift action (Mitchell 2008). Nevertheless, the basis for a far-reaching protection concept with regard to these unique archaeological depositories has not been established in this region, or anywhere else in the Alps.

In this article, the authors propose a novel monitoring model based on North American and European examples (Dixon et al. 2005; Andrews et al. 2012; Rogers 2014; Rogers et al. 2014). The idea was originally developed during a master’s thesis at the University of Zurich, Switzerland (Naef 2013), covering the Swiss Canton of Grisons. The thesis expands the “Silvretta historica” project—which deals with various scenarios of alpine land use below 2600 masl in the border region between Switzerland and Austria (Reitmaier 2012)—to higher altitudes that are particularly interesting in terms of human mobility, animal husbandry/pastoralism and big game hunting. A proposal based on the thesis was then accepted by Grisons Institute for Cultural
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Studies and developed into the project “Altes Eis—Old Ice”, which started in October 2013 and will end in July 2016. Since global warming significantly threatens remaining ice patches, the project emphasizes a time-efficient approach. Due to a lack of Central European experience, this study is regarded as a test case, which will need to be further developed following survey experiences.

Study area

Situated in the centre of the Alpine arc, the Canton Grisons is an ideal research area for glacial archaeology. Measuring little more than 7,000 square kilometres in size, the Canton is home to around 150 valleys in addition to numerous, largely glaciated mountain ranges up to 4,000 masl. However, this demanding landscape has by no means been isolated or avoided in the past 10,000 years since its last full glaciation. On the contrary, the Grisons were, and still are an important transit region where some of the major transalpine pass routes are located. The large number of archaeological remains along these connecting axes between the Northern Alpine Foreland and the Italian Po Plane, are evidence of continuous human presence throughout the Holocene (Della Casa 1999; Della Casa 2000a; Schneckenburger 2002; Della Casa 2007; Walsh and Mocci 2011). While Mesolithic sites seem to be almost exclusively limited to the alpine stage above the timberline, a colonization of the inner alpine valley bottoms in the form of permanent settlements took place at the latest from Early Bronze Age on (Primas 1998; Della Casa 2000b; Krause 2009; Oeggl and Nicolussi 2009; Primas 2009; Reitmaier 2012; Della Casa et al. 2013). From that time on, an increasing frequency of year-round, high alpine mobility is to be expected in various contexts, such as high alpine hunting, animal husbandry/pastoralism, trade, conflicts, raw material exploitation and production. In order to reach the summer pastures situated on the other side of main ridges, shepherds even crossed glaciated passes with their livestock, which is well documented in the case of the Vermunt Glacier (2798 masl) in the Northeast of the Grisons (Gross 1975, 80).

Methods

The predictive model presented here is based on the systematics of a similar model from Alaska (Dixon et al. 2005) and adapted to the specific conditions of the Alps. The starting point of the semi-automated GIS-model consists of a map containing all high alpine passes within the Grisons (See Figure 2 Step 1), rather than mapping ice covered areas. In the Alps—compared to other regions—almost every site where objects melted out of the ice have been found is located within reach of a pass route (Steiner 2013; Hafner 2012; Meyer 1992). This may be related to the fact that natural gaps within the rugged terrain naturally channel the different forms of high alpine mobility. A pass is often the highest point of a journey, so that people are forced to pass through areas of interest for glacial archaeology (>2500 masl) to carry out activities at lower elevations. Therefore, areas around transit routes and passes are more likely to provide archaeological objects compared to the rest of the alpine terrain. In a first step the 500 passes initially identified, were reduced by almost 50% by eliminating all passes with no visible ice-cover on and around the pass summit or the access area.
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Figure 2  Explanatory illustration of the model: 1) mapping of all passes above 2500 masl; 2) elimination of ice-free passes based on different maps and areal images; 3) evaluation of glacial archaeological potential considering: historical maps (Dufour, 1845-1865; Siegfried, 1870-1926), strategic position (traffic), the inventory of Swiss Historic Traffic Routes (IVS), game habitats (defined via maximum altitude), glaciation/permafrost (based on the PERMOS-model of the Federal Office for the Environment FOEN); 4) weighted intermediate evaluation (reference sites: Schnidejoch and Lötschenpass (BE, CH)); 5) addition of historical and archaeological data and 6) detailed evaluation of the topographic situation (only selected/promising passes); 7) final summary of all steps in the form of two results: a selective (most promising 40 passes) and a general mapping of the glacial archaeological potential (all 264 passes); illustration: Leandra Reitmaier-Naef. A detailed description of the model was published in Naef 2015.
This was done by consulting different areal images and maps from the twentieth and twenty-first centuries (See Figure 2 Step 2). The remaining 264 passes were subsequently ranked by a clearly defined, multistage evaluation procedure in order to find the most promising locations from a glacial archaeological point of view. This evaluation procedure involved topographic characteristics (slope, exposition [See Figure 2 Step 6]), then permafrost and glaciation (See Figure 2 Step 3) were evaluated to detect areas with high potential for the preservation of old ice. Such areas are usually less exposed to the sun and wind (exposed to the north and northwest) and the subsoil is as flat as possible or trough-shaped (Haeberli et al. 2004; Maisch 1992). The altitude (lower limit 2500 masl) and the mass of the ice are also crucial aspects for the permanence of an ice-cover. Ice patches or small glaciers which are exposed to seasonal cycles of accumulation and ablation or show evidence of flowing are generally less suitable for the preservation of archaeological artifacts, due to the fact that objects can be displaced, fragmented and often even destroyed by the movements of a glacier. Additionally, the frequency of use of each single pass was quantified by rating the importance of every route. Due to a lack of distinct archaeological evidence pertaining to tracks and trails, and based on the assumption that existing paths (partly)
still follow the prehistoric and historic tracks, maps from the past 150 years were used to trace various routes through the study area (See Figure 2 Step 3). The strategic position of every pass was then estimated considering the surrounding landscape: the more passes found lying in close proximity, the lower the potential of each passage and vice versa (See Figure 2 Step 3). Eventually, the ranking steps were summarized to a weighted intermediate evaluation (See Figure 2 Step 4) in order to test and verify the chosen strategy using the well-known sites Schnidejoch and Lötschenpass in the Bernese Alps (Hafner 2015) as references - resulting in convincing rankings within the top third of all evaluated passes. No further adjustment of the weighting was made in order to avoid excessive dependence on the two reference sites.

In a second step, the model—so far as objective and automated as possible—was transferred into a subjectively selected model by adding only selectively available cultural data such as the mention of individual passes in historical sources or the proximity to archaeological sites and finds (See Figure 2 Step 5). There were specific problems associated with this working step, however. For example, several graphical sources mention small, high alpine passes with no or unclear naming, so that they could not be identified unequivocally.

Also, due to the scarcity of archaeological evidence from high alpine regions, the association of archaeological remains or sites found at lower elevations with specific passes was only possible in a few cases. Nevertheless, the inclusion of cultural data added significance to some previously underrated passes.

Figure 4  General mapping of glacial archaeological potential in the Grisons, Switzerland; Map: Leandra Reitmaier-Naef.
Management programme

The model resulted both in a general mapping of glacial archaeological potential in the Canton of Grisons and in a selection of the 40 most promising passes out of the initial sample of 264.

From the model, a guide for directed archaeological fieldwork during August and September—when the glacier and snow extent is at its lowest—was developed. About half of the areas with potential have already been surveyed in the field with varying degrees of success between 2012 and 2015. The exact date for the inspection seems to be a key factor, as even thin layers of remaining or new snow cover makes archaeological artifacts invisible. Repeated visits to promising spots seem to be the best way to ensure that finds are not missed. As a result, the present strategy consists of a progressive reduction of the monitored pass areas to a feasible minimum by choosing the highest rated 40 spots. As a trade-off, lower rated territories were specifically considered with regard to outreach work. The area south of the Pass dil Segnas (2627 masl) between the villages of Flims (Canton of Grisons) and Elm (Canton Glarus) is presented here as an illustrative example. A first survey of the Muletg da Sterls-area below the pass took place in early September 2012.

Because winter snow had remained around the numerous snow and ice patches during this time, only a first overview and rough inventory of the area was possible. Also a second inspection in the following season proved unsuccessful, despite intensive field walking and less snow cover. One year later, in August 2014, a third and successful attempt was made during a field school with Prof. Albert Hafner, University of Bern. Surveying with a metal detector yielded two Roman finds in the scree: a silver
denarius, minted around 100 BC in Rome and a bronze fibula dating to the second/third century AD. These two artifacts show that the Pass dil Segnas must have been frequented long before it’s first mention in the fourteenth century as a trade route between Flims and Elm. Furthermore, the crossing of this pass appears probable even before Roman times.

The project also serves as a basis for a broad outreach campaign which aims to inform various target groups in the Alps such as hikers, hunters, and hut wardens about the archaeological potential of alpine areas as well as the climatic threat to frozen finds. Brochures and flyers on glacial archaeology containing instructions on how to act in case of a discovery have been produced and widely distributed in the study area. Additionally, small exhibition modules in the form of fridges have been placed in alternating mountain huts during the summer season to reach those who might find archaeological material on ice patches in the high mountains.

Future perspectives

As the final season of the project “Altes Eis—Old Ice” rapidly approaches, the continuation of the project must be secured. Fortunately, the Archaeological Service of the Canton of Grisons has participated from the very beginning not only as a partner, but also as a co-initiator of the project. The project was planned as a test case in order to develop a new methodological approach and an appropriate strategy for dealing with the opportunities and challenges associated with glacial archaeology in the Swiss Alps. The new model meets all of these expectations. The core tasks of the
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project, such as the implementation of a monitoring programme and dealing with find reports can be integrated into the daily business of the Archaeological Service in the future. In the meantime the outreach work and the imparting of knowledge on climatic risks and scientific potential of high alpine archaeology will be continued intensively. Finally, the project will be rounded off with an exhibition on the topic in the Raetian Museum in Chur, capital of the Grisons, in summer 2016.

References


