Glaciers in the Anthropocene
A Biocultural View

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Abstract: Disappearing glaciers are one of the most evident signals of climate change of the current period in Earth's history, the Anthropocene. In this article, we discuss the side effects of the glacier melt from a biocultural standpoint, moving from the Southern European Alps to a global context. Specifically, we highlight what we are losing from a cultural and naturalistic perspective but also, paradoxically, what we could "gain" if we were able to understand more deeply, and with an interdisciplinary approach, glacial dynamics and their role for human society. Glaciers can teach us several stories, but we are quickly approaching the last chance to listen to them.

Keywords: bioarchaeology, climate change, disappearing ice, geomorphosites, glacial archaeology, glacial ecology, mountain heritage, WWI

Glaciers are key features of high mountain landscapes, and landforms where everyone can easily observe one of the most evident consequences of climate change: the disappearing ice. For this reason, in the current period in Earth's history—called Anthropocene—in which human activity started to have a significant impact on the planet's climate and ecosystems (Crutzen and Stoermer 2000), glaciers have become powerful cultural symbols linked to the philosophical and ethical dimension of climate change (Morehouse and Cigliano 2019), in particular in mountain areas.

A growing amount of literature is able to tell us the effect of glaciers' changing dynamics and disappearance on ecosystems and, consequently, on human beings. The scientific community agrees with the relevance of glaciers for humans, particularly for provisioning (e.g., tourism, industrial activities and "water tower" *sensu*; Immerzeel et al. 2020), as cultural heritage (including recreation, e.g., mountain sports, theaters of World War I, and exclusive biodiversity) and for providing ecosystem services (Gobbi et al. 2021; Milner et al. 2017; Palomo 2017; Stewart et al. 2016).

Glaciers are able to tell us several stories, stories we need to listen to because, as pointed out by Morehouse and Cigliano (2020: 917)

in their paper focused on cultures and concepts of disappearing ice "listening will feel like remembering. If we remember, then we might better enact other futures." Unfortunately, we cannot wait much longer: we are approaching our last chance to listen to them before glaciers completely vanish; we should remember that glaciers are not a replaceable landform and habitat.

In *The Eight Mountains*, one of Paolo Cognetti's most famous novels talks, by means of one of his characters, about the glacier as follows: "The glacier…is the memory of past winters which the mountain safeguards for us. Above a certain altitude it stores the memory, and if we wish to know about a winter in the distant past, it's up there that we need to go" (2018: 39). These words, besides being correct in scientific terms, describe well the preciousness of this environment. An environment, which in the last decades, has been inexorably getting lost. This is an obvious effect of climate change, which results in dramatic alterations of this environment.

Through this article, we want to share our views and concerns about the side effects of glacier melt from a biocultural point of view. "Biocultural" implies an established link between cultural diversity and biological diversity, a state "resulting from the interaction of people and nature at a given time and in a given place" (Bridgewater and Rotherham 2019: 302). Specifically, in this context, we want to point out the effect of glacial decline to highlight what we are losing from the cultural and naturalistic point of view but also—here lies a paradox—what we can actually "gain" from this loss if we are able to act quickly and with awareness. We are going to focus on the Southern European Alps, since the literature on biocultural effects of glacial decline in this area is still incomplete, although the biological and cultural specificities of this region require an incentivization in the protection and management of glaciers. In doing this we will additionally move from a "local" dimension to a global view in order to provide examples across different mountain and glacial systems to show the biocultural connections among them.

Glaciers: A Biocultural View

During the last decades scientists and journalists commonly used the terms "retreat", "melt", and "shrinkage" to describe glacier dynamics. Now, more and more frequently, the terms "extinction", "vanishing" and "disappearing" have taken the place of the previous terms

due to the increasing number of glaciers already lost or close to disappearing (Bosson et al. 2019; Diolaiuti et al. 2022; Morehouse and Cigliano 2019).

This phenomenon has several negative effects and threats, but there are scientific disciplines that can have a remarkable importance in gathering the items, scientific data, and "stories" disclosed by the melting glacier. Let us provide some examples to support our thinking.

Vanishing Glaciers, the History and the Stories beneath Them

Rogers et al. (2014) reported that by 2090, 93 percent of glacier areas in the Pennine Alps (Italy) are expected to have disappeared. In an attempt to avoid the risk of losing cultural and archaeological finds, the authors combined geospatial and glaciological modeling in GIS to gauge glacial archaeological potential in the Pennine Alps of Italy. The reappearance of archaeological finds from melting glaciers and frozen environments is a global phenomenon, and this has promoted (relatively) new scientific journals, such as the *Journal of Glacial Archaeology*, and scientific programs, such as The Glacier Archaeology Program in Innlandet, Norway (Finstad and Pilø 2021) and the Glacier Archaeological Project in the Valaisan Alps, Switzerland, supported by the Swiss National Science Foundation (Lugon and Curdy 2021).

As in other areas of the world, the Italian Alps contain human artifacts and relics from the past. Actually, they also contain "human beings" from the past. The most impressive example of a human stored by an Alpine glacier is probably the famous Ötzi, the Tyrolean Iceman. Discovered in 1991 in an Eastern Italian Alps glacier, this 5,300-year-old Copper Age individual represents the most ancient glacier mummy in the world, and thanks to his exceptional state of preservation, he is one of the world's best investigated ancient human remains (Zink and Maixner 2019). Are there other "Ötzis" that might resurface from glaciers in the future? The question is not new, and obviously we cannot answer this, but the possibility cannot be excluded. Considering the huge amount of information obtained from the Tyrolean Iceman (e.g., origin, life habits, manner of death, diet, disease, etc.), and consequently about the Alpine Copper Age, the role of the glacier as a human bioarchaeological archive emerges in all its potency. However, the fact that the increasing rate of melting glaciers can lead to new discoveries of human remains is actually well observed in World War I (WWI) casualties.

Between 2007 and 2020, 17 soldiers who fought during the White War were recovered and analyzed as a consequence of them resurfacing from thawing glaciers (Gaudio et al. 2019, 2020). The White War (1915–1918) was a series of battles that took place on glaciers of the European Alps during WWI, in one of the highest altitude front lines in human history. This frozen scenario (evoked by the word "white") was the "grave" for hundreds of Italian, Austrian, and other nationality soldiers who lost their lives during those fights, since many of them have never been recovered. Their bodies have been preserved by the glaciers for decades, but with the melting ice, the discovery of these soldiers is a regular phenomenon, especially during the summer season. The resurfacing of these remains leads to several issues and challenges: firstly, the medicolegal significance of the bodies must be excluded (for instance, disappeared hiker, victims of murder, etc.), then the historical and archaeological context needs to be established. In the case of soldiers, this can be easily done if their personal items are preserved (e.g., parts of the uniform, military objects, ID tags, etc.). Unfortunately, these objects are extremely appealing to relic hunters, who often prey on the resurfaced remains (for examples, see Gaudio et al. 2020). Through their looting activities, they not only complicate the subsequent investigations, but in the case of removed ID tags, they cause the permanent loss of the soldier's identity. The Archaeology Office of the Autonomous Province of Trento (Trento is a city in Northern Italy close to the White War's glaciers), in collaboration with *Onorcaduti* (a suborganization of the Italian Ministry of Defense appointed to the custody and management of the database of missing in action soldiers, including the two World Wars), applies a protocol of best practices (Gaudio et al. 2020). This protocol aims to tackle this phenomenon and to ensure the scientific management of the soldiers. However, in the absence of explicit laws that specifically protect this environment, the brave efforts of the Archaeological Office of Trento and its collaborators may result in a "chase" in a frustrating attempt to limit the damage.

Thus, the thawing of the glaciers is an opportunity to provide those soldiers with a proper burial ceremony and to discover their buried stories. The analyses conducted so far have highlighted that those soldiers are, in general, young adults (on average aged 33, Gaudio et al. 2019) and the cause of death is associated with grenade artillery shells, although a person killed by an avalanche was recently found. The majority of these individuals are unidentified but, by a careful action of recovery and subsequent investigation, it is possible to obtain a presumptive identification even in the absence of an ID tag. This happened

in a recent case, when a series of documents were discovered by the Archaeological Office of Trento inside the uniform of a soldier resurfaced from the largest Italian glacier—the Adamello. It was possible to identify him and reconstruct the soldier's history; as a consequence, a reburial at his home village was held one century after his death (Gaudio et al. 2020). Other data and personal "micro stories" might be recovered in the near future because of the ongoing melting of the glaciers, and likely also from other epochs, not only WWI. For instance, between 1984 and the early 1990s, human remains belonging to a tradesman who probably died in AD 1600 were found in a Swiss glacier (Theodul Glacier), and these have recently been reanalyzed (Alterauge et al. 2015). The European Alps were (and are) a passage point between empires and nations. People who lost their lives in attempting to cross the glaciers in ancient and modern European history are likely to be discovered in the period ahead.

Several other examples of hidden "stories" unveiled by glaciers come from glacial contexts outside Europe, such as in the case of the frozen Inca mummies (Ceruti 2015) from the South American Andes, or the human remains, and connected artifacts, of a man found on an icefield in Northwestern British Columbia dated around 1450 BC (Beattie et al. 2000). Glaciers are thus unique and global cultural archives that might inform about the practices of past civilizations, along with human physiological and genetic adaptations, in different mountainous regions around the world.

In glacier environments a new concept of bioarchaeology, a bioarchaeology of memory and identity, will then be necessary and applicable in the near future. Different views of glaciers probably clash from antiquity to modern times: glaciers as hostile, frozen walls that divide local communities; glaciers as containers of war memories; glaciers as esthetic and agonistic experience. It will be a task of bioarchaeology, and also forensic anthropology, to contribute to the reconstruction of these visions, and the cultures embodied in them.

Bodies are, of course, just a tiny part of the archaeological "materials" that might be discovered.

As Hafner (2012) reported, prehistoric finds from the Neolithic period, the Bronze Age, and the Iron Age were recovered from small ice patches in the European Alps. Of particular relevance are the findings of the Schnidejoch site (western Bernese Alp, Switzerland), which represent the earliest evidence of Neolithic human activity at high altitude in the Alps (Hafner 2012) and include artifacts such as fragments of arrows, pieces of leather and wood, and a bowl made of elm wood.

We can expand our perspective and say that glaciers are unique cultural archives because they preserve even nonmaterial finds: Nicolis (2017) described the multi-sensory experience at Punta Linke, one of the most important (and highest) Austro-Hungarian positions of the entire Alpine front during WWI. Here, inside the restored cableway transit station constructed within a tunnel in the ice, it is still possible—literally—to smell the war, thanks to the perfect preservation of the indoor environment and items still present.

Several researchers put their effort into the issue of managing the frozen heritage (see Callanan 2016), which, for the reasons described earlier, could even be portrayed as a *sense-scape* (Nicolis 2017) or a *memory-scape*.

Glaciers also keep the memories of past incidents and natural disasters that caused dozens or even hundreds of fatalities, for example, Mattmark, Switzerland, where, in 1965, an avalanche from Allalin glacier in canton Valais killed 88 people (Ricciardi 1965), or the landslide events at Huascarán Norte, Peru, which in 1970 destroyed the town of Yungay (Mergili et al. 2018) killing hundreds of people. If glaciers are the physical representation of these tragedies and they hold the memories of such events, are we going to lose our remembrance of them? These kinds of questions reflect the necessity for further groundbreaking initiatives to protect these *memory-scapes*.

Finally, cultural anthropological literature describes how the decline of glaciers has a role in molding the identity and self-resilience of the local communities located across mountain regions (for instance, Jurt et al. 2015 describe cases from Italy, Peru, and the United States). As reported by Allison (2015), climate change also poses a challenge in sacred mountain landscapes (such as in the Nepalese Himalaya, the Peruvian Andes, and the Meili Snow Mountains of Yunnan, China) where the locals face the loss of nonmaterial values (e.g., lifeways, belief systems, identity) with implications "for the ways by which local people understand themselves" (Allison 2015: 493).

Glaciers as Unique Ecology Field Laboratories

Climate fluctuations as well as the impact of human activities on the structure and functioning of the Earth's ecosystems have been investigated for decades in a wide range of habitat types. Glaciers are a landform type, and a habitat type, and provide historical records about climate and human activities; they are like a big encyclopedia: each

page (layer of ice) preserves and shows multiple proxies of various environmental correlates (air, temperature, precipitation, atmospheric chemistry, volcanic depositions, etc.) (Zang et al. 2015) and is a sink and archive of pollutants originating from human activities. For instance, glaciers have recorded, accumulated, and are now releasing, due to their melt, pollution by microplastics (Ambrosini et al. 2019; Zang et al. 2021), pesticides (Hermanson et al. 2020; Rizzi et al. 2019), heavy metals (Jiao et al. 2021), metals used for explosives and munitions manufacturing during the White War (Laterza 2013), fragrances from personal care products (Ferrario et al. 2017; Gobbi and Lencioni 2020), garbage originating from past hut managers, and remains of abandoned ski lifts and cableways. These new sources of contamination found on the glaciers have recently been documented for ice meltwaters in the Italian Alps, and their accumulation and effect on aquatic insect behavior and metabolism were also proven (Lencioni et al. 2020; Villa et al. 2018).

In addition, there is increasing concern about the potential of emerging dormant-but-viable microorganisms (including human pathogens) entrapped in the ice for millennia and now released from melting glaciers. Yarzábal et al. (2021) published a review paper presenting evidence that allows us to imagine a near future in which epidemic outbreaks could occur as a consequence of the release of microbes from glaciers. The authors assert that tons of microbes immured for millennia in glacial ice, many of which are closely related to human and animal pathogens, are being reactivated and released into aquatic and terrestrial environments.

Last, but not least, retreating glaciers are leaving behind large areas of barren ground, the glacier forelands, that can be used as unique field laboratories to investigate how plant and animal communities are reacting to climate warming. A glacier foreland gives the opportunity to observe when pioneer life forms arrive (e.g., bacteria, mosses, plants, and arthropods), describe how biological communities establish themselves and how ecological networks develop year after year (Ficetola et al. 2021). When the chronological sequence of glacier retreats has been well documented over time, it is possible to provide a maximum date for the biological community establishment (the time since deglaciation). Thus, it is possible to analyze the chronosequences of life form colonization, assuming that time is a major factor in the evolution of ecosystems.

Newly deglaciated terrains represent increasingly important components of mountain areas due to climate change, and paradoxically,

they are giving an exciting opportunity to the scientific community to monitor life forms' conquest, establishment and competition, in space and time, in relation to the disappearing glacier (Hågvar et al. 2020). The obtained information on organisms' reactions triggered by glacier retreat provides important tools to develop scenarios on how mountain environments may change over the next century. For instance, Cauvy-Fraunié and Dangles (2019) performed a global meta-analysis of published papers on biodiversity surveys in glacial areas of the world and demonstrated that organism abundance and richness generally increase locally as glaciers retreat. Retreating glaciers open up the glacier forelands to colonization, from downstream, of competitive and generalist species, the so-called winners; these species benefit from global warming. However, this evidence could be misleading, because, as highlighted by Losapio et al. (2021) who modeled the distribution of Alpine plant species in relation to glacier retreat, the consequences of glacier retreat are uneven between plant species. Specifically, up to 22 percent of the analyzed plants living on recently deglacierized terrains of the European Alps may disappear locally or even go extinct once the glaciers are gone. Most of these plants are specialist species, poor dispersers, uniquely adapted to glacial conditions, thus "losers" to global warming. Winners and losers were also found, for instance, in mountain insects, birds, and mammals that permanently or periodically spend their life on or near glaciers (Gobbi 2020; Gobbi et al. 2021; Rosvold 2016). Consequently, there is evidence that the landscape physiognomy of the glacial areas is changing due not only to the disappearing glacier but also to the structural changes (i.e., species assemblages composition) in biological communities hosted there due to the disappearing of some ice-related species and the arrival of others, thermally more tolerant, from lower altitudes. A quickly evolving high-altitude landscape change is ongoing; the most impressive evidence we have is that during the lifespan of each of us, this change is clearly observable, year after year.

What Are We Losing? Concerns and Perspectives

The famous broadcaster and natural historian David Attenborough, in the documentary film "A Life on Our Planet" (Attenborough 2020) said unequivocally and worryingly, "Our planet is losing its ice." This message, addressed to the human population is simple but able to touch our consciousness deeply. Although the most widespread human percep-

tion of the glaciers considers them to be harsh environments unable to host living organisms, a growing amount of research papers, published over the last years, support the idea that we should consider glaciers as ecosystems consisting of an ice mass and a biological community of cold-adapted organisms (Anesio et al. 2012; Takeuchi 2011). Various organisms have been reported to live periodically or permanently on, in, and under glaciers; specifically, communities of bacteria, yeasts, algae, plants, arthropods, birds, and mammals were found (Gobbi et al. 2021; Rosvold 2016). The biodiversity hosted by glaciers may be much higher than expected. For instance, different life forms are found on glaciers located on different mountain groups due to the low dispersal ability of some species and consequent biogeographic isolation (Gobbi and Brambilla 2016). Despite the likely existence of large biodiversity, our current knowledge of glacier ecosystems is poor and fragmented. On the other hand, there is a growing amount of literature demonstrating the presence of cryophilic species (i.e., obligate glacier species) hosted by the glaciers; thus, on the glaciers, there is an exclusive "glacial biodiversity." However, we must be aware of, and worried about, the ongoing decline of glacial biodiversity that will likely be lost forever when glaciers disappear. Since the number of studies on glacial biodiversity are still few, we are risking the extinction of species still unknown to science, particularly on some small glaciers of the globe. Thus, we only partially have cognizance about what we are losing, and equally important, about the role of ice-related species in ecosystem functioning and their indirect impact on human existence.

Wildlife has always been important for human life due to the ecological, cultural, and economic functions that it represents. Societies have developed a cultural predisposition for emotional reactions toward wildlife and the landforms in which it can be found, and protection attitude is passing through the emotion that threatened wildlife is able to transmit (Castillo-Huitrón et al. 2020). Knowledge is a relevant element for the expression of emotions and glaciers are, fundamentally, a huge biocultural archive and public heritage (see Figure 1).

Most of glaciers have already been officially recognized as "geomorphosites"—that is, landforms that have acquired a scientific, cultural/historical, esthetic, and/or social/economic value due to human perception or exploitation (Diolaiuti and Smiraglia 2010; Panizza 2001). Due to their previously mentioned importance in bioarchaeology, glaciers should also be considered as potential archaeological sites, or more correctly, following the definition by Brandolini et al. (2019), geoarchaeomorphosites, a term that links archaeology to geoheritage.

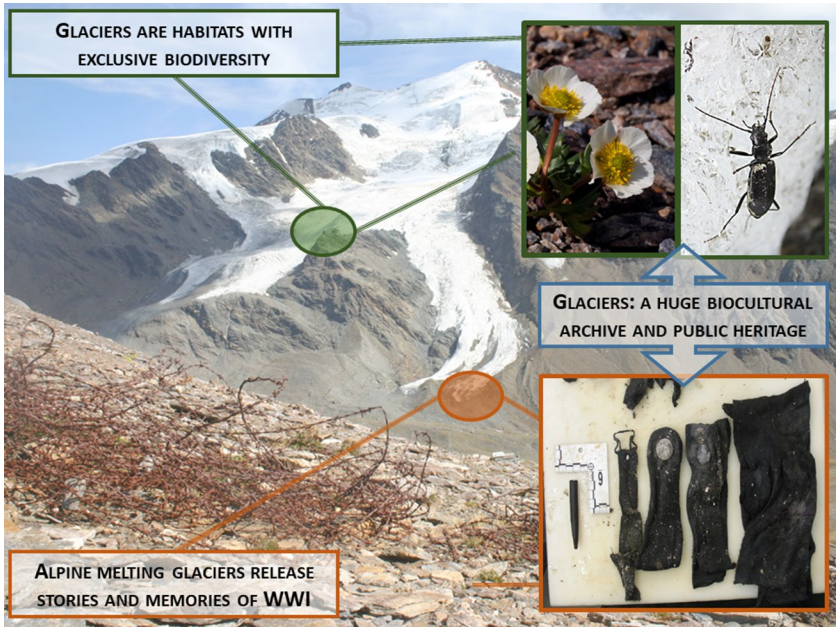

Figure 1 ■ Glaciers are a huge biocultural and public heritage. The picture represents a typical valley glacier of the European Southern Alps; above (right) a peculiar plant (*Ranunculus glacialis*) and beetle (*Nebria* spp.) living near the glacier tongue. Below (on the right), a pencil and fragments of a uniform found on a soldier killed during WWI in a fight which took place on an Italian glacier (Adamello) (photos by the authors).

Glaciers are mainly known to people for their great esthetic value, which is able to attract tourists from all over the world. However, while ongoing global warming is affecting, negatively, the length, size, and color of glaciers, the attractiveness of glacial tourism sites seems not to be threatened, so far, because visitors' dissatisfaction levels remain low (Salim et al. 2021a). In addition, glaciers are becoming a particularly appealing destination for Last Chance Tourism (*sensu* Lemelin et al. 2010), a new form of travel for people who want to learn how human activity is linked to climate change impacts and want messages to take away and act on in their everyday lives (Lemieux et al. 2018). In terms of tourism communication, environmental issues in recent years have generated increasing awareness about climate change, ecological consciousness and, more generally, sustainability. A new and relevant phenomenon is the growing number of "green influencers"

devoted to informing their followers on topics related to sustainability in order to raise awareness and tackle the problems of, for example, "#climatechange" (Lehbrink 2020); their potential ability in increasing the communication on climate-related effects, as #glacierdisappearing, should not be under-considered and has great potentialities.

After all these considerations, does it make sense to protect our glaciers by law? In some countries, such as Argentina and Kyrgyzstan, there are already enacted laws (Glacier Protection Laws [GPLs]) that aim to protect glaciers and permafrost specifically, and in Chile, GPLs are currently under discussion (Schaffer and MacDonell 2022). In Argentina and Chile, GPLs aim to counteract the negative effects of mining activities, but these GPLs are criticized because they are not sufficient or are incomplete in their formulation (see, for instance, Anacona et al. 2018). In Europe, glaciers and permafrost-related landforms are protected by the Habitat Directive (i.e., one of the main tools to ensure the conservation of a wide range of rare, threatened, and endemic plant and animal species and habitats) by the habitat type Permanent Glaciers-Code 8340 (EEA 2021), but their conservation status is currently evaluated as bad (i.e., a habitat is in serious danger of disappearing, at least regionally). However, their management is particularly challenging because only a small fraction of the surface actually covered by permanent glaciers is protected in the European Union network of natural areas, leaving a significant fraction of Habitat 8340 unprotected (Gobbi et al. 2021).

Due to the complexity of the matter, Yolka (2020) proposes creation ("to be invented", *"à inventer"* in original) of a legal protection in the context of French glaciers. In Italy, the potential presence of dozens of human remains and artifacts from the White War complicates this framework even more. Notably, Zimmer et al. (2021: 13) recently proposed "an integrated strategy based on voluntary partnership agreements between local communities and indigenous peoples, state organizations, international actors, and the private sector" for the management of those lands exposed by glacier decline (HiCALL, High Mountain Call to Action for Landscapes and Livelihoods). The debate is open, but from our perspective, melting glaciers are giving us the remarkable possibility to investigate and understand the effects of climate change on biological populations, humans included. Yearly, a large amount of information on naturalistic, economic, and cultural aspects linked to glacier melt derives from different scientific disciplines. Paradoxically, climate change is giving us the opportunity to understand more deeply, and with an interdisciplinary approach, the glaciers' dynamics and role for past and present human society. This knowledge

might be useful to mitigate and develop adaptation policies and public awareness as occurred for the UNESCO World Heritage Site framework (interestingly, Bosson and Osipova 2019 found that 19,000 glaciers are located in 46 World Heritage sites), and as a suitable tool to further protection initiatives or designation of new UNESCO World Heritage sites. As stated in the Sixth Assessment Report of The Intergovernmental Panel on Climate Change "current trends in cryosphere-related changes in high mountain ecosystems are expected to continue and impacts to intensify" and "cultural assets, such as snow- and ice-covered peaks in many UNESCO World Heritage sites, and tourism and recreation activities, are expected to be negatively affected by future cryospheric change in many regions" (Hock et al. 2019). Thus, according to Zimmer et al. (2021), we call for stewardship of lands exposed by deglaciation from climate change; this must be seen as an opportunity to co-create a transdisciplinary governance structure around this threatened environment.

While we do not have a precise or specific proposal to manage this declining environment (this is not even within our competences), in recognizing its role as a biological, bioarcheological and cultural archive, we agree with Yolka (2020) that a new paradigm in the protection of glaciers and the novel environment emerging from glacier retreat (Zimmer et al. 2021) needs to be invented.

Conclusion

Glaciers disappearing is among the most dramatic evidence that Earth's climate is warming. This phenomenon is touching our consciousness in an ever-increasing way, and we are observing and learning how natural and human systems are closely interconnected but not unbreakable. A better understanding of how cryosphere change affects human-related social and economic activities, biodiversity, and ecological networks is mandatory for planning global and regional actions to mitigate impacts and facilitate adaptation through a knowledge-based dialogue between scientists and public.

In this article we played with the paradox "loss but gain" with the purpose of bringing evidence on how glaciers disappearing is a serious threat toward cultural and naturalistic heritage. Specifically, we highlighted how glacier decline affects the frozen heritage and the remembrance of past events that it embodied but also, as we mentioned, the self-identity and values of local populations. This loss, however, offers

the possibility of new discoveries about human history in different parts of the world due to the emergence of human remains, archaeological artifacts, and historical venues. Additionally, we brought evidence that despite the permanently harsh conditions of glacial habitats, they support a remarkable diversity of life ranging from bacteria to animals and about the risk of extinction of exclusive species belonging to the glacial biodiversity of a specific area. Conversely, the loss of ice offers the possibility to investigate the ability of life forms to conquer terrains left free by receding glaciers, and about the release, in the meltwater, of pollutants and microorganisms accumulated within the ice over decades and centuries.

Restoration of this habitat type is almost impossible, although some local attempts have been performed: the use of non-woven geotextiles were able to reduce snow/ice melt by up to 69 percent compared to the uncovered glacier surface (Senese et al. 2020), but obviously this strategy is not logistically and economically sustainable on a large scale.

In conclusion, glaciers, due to their heritage and naturalistic value, must be considered ambassadors of climate change; the scientific and pedagogic value of glaciers must be viewed as an easily readable marker of the Anthropocene (Salim et al. 2021b). We must treasure glaciers because it is highly likely that we are experiencing our last chance to use and study them, also for educational purposes. We also need to be ready to protect the new environment that is emerging due to the glaciers' decline. Traces of our history are hidden there.

Acknowledgments

Firstly, we are grateful to the professors who fed our different but complementary passions for scientific disciplines when we were classmates during secondary high school. In addition, we would like to acknowledge several colleagues and students who have been cooperating with us for many years in collecting biological data in glacialized areas of the world. Dr. Massimo Bernardi (MUSE-Science Museum of Trento, Italy), Dr. Franco Nicolis (Archaeological office of Autonomous Province of Trento, Italy), Prof. Mike Church, Dr. Tina Jakob and Dr. Anwen Caffell (Durham University, UK), and Dr. Sara Defrancesco (Madonna di Campiglio Official Tourist Board, Italy) provided several important comments, suggestions and brilliant ideas on the first and last draft of the manuscript. Finally, we thank the anonymous reviewers for their excellent suggestions.

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