

Article

# “An ounce of Prevention is Worth a Pound of Cure”: Adopting Landscape-Level Precautionary Approaches to Preserve Arctic Coastal Heritage Resources

**Bradley W. Barr**

Visiting Faculty, Master’s Program in Coastal and Marine Management,  
Háskóla­setur Vestfjarða/University Centre of the Westfjords, Suðurgötu 12, 400 Ísafjörður, Iceland

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**Abstract:** The Arctic region is changing rapidly and dramatically as a result of climate change, perhaps two to three times faster than other areas of the world. Its inaccessibility, remoteness, and low population density no longer offers sufficient protection from expanding human use and development for its rich and diverse natural and cultural heritage. While considerable attention is being focused on better understanding and more effectively protecting its natural resources, far less is being done to identify and preserve this region’s significant maritime heritage resources. This remoteness and inaccessibility that has protected Arctic resources for so long has also constrained our capacity to conduct sufficient archaeological studies to inform and guide the place-specific identification and preservation of what remains of this compelling history and heritage. The wilderness landscape of the Arctic has a rich and relatively well-documented historical record, spanning more than 2000 years of exploration and commerce, and of Indigenous cultures stretching further back over 4000–6000 years. More effectively using this historical record to identify significant maritime cultural landscapes in the Arctic and expanding the use of precautionary approaches to the preservation of these landscapes will not only assist in establishing regional priorities for targeted archaeological surveys and investigations, but will also likely minimize what will be lost forever as the inevitable “ice-free Arctic”, as well as its expanded human footprint, approaches.

**Keywords:** Arctic; maritime heritage resources; precautionary approaches; maritime cultural landscapes

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## 1. Introduction

Many words have been used to attempt to appropriately describe the Arctic, including “vast”, “remote”, “unforgiving”, “harsh”, and “wilderness”. It has also been described as a place attracting privileged white men engaging in the “masculinist fantasy” of exploration [1], which apparently has potential and profound geopolitical repercussions that shape the way that it is perceived, governed, and exploited [2]. It is a place that has always attracted the interest of people in more southerly latitudes, either for inspiration or for the many and diverse resources it might provide. Unlike the other pole, it is inhabited, albeit sparsely, and has been for thousands of years. In recent times, it has also been the subject of much debate, stirring deep scientific and geopolitical controversy and concern as a result of the rapidly changing climate, its effect on the socio-ecological systems operating there, and the interplay of countries with various interests in this region [3]. Every year has brought reports of changes like the unprecedented retreat of multi-year sea-ice extent and thinning [4], and a greater frequency and severity of storms and unprecedented coastal erosion that is threatening some coastal villages, critical infrastructure, and, increasingly, culturally-significant sites [5].

As the sea-ice retreats, what was once a region where only intrepid mariners and explorers dared to navigate and Indigenous communities subsisted in relative isolation, is now becoming more

accessible. With this greater access, more people are coming to the Arctic, not only to find and exploit the resources that have so long been protected by the ice and harsh conditions, but to experience an iconic wilderness that is likely to be, in the not so distant future, melting away, forever changed as the climate warms. This expanding human access and use is accompanied by increasing threats to Arctic resources, compounding what is happening as a direct result of climate change. While addressing and mitigating the underlying drivers of climate change may, at this point, present greater challenges than the global community is able or willing to confront, the active management and preservation of both natural and cultural resources of the Arctic will be required to sustain at least some of what will be lost. Therefore, the underlying purpose of this paper is to discuss, and perhaps begin a dialogue about, how this more effective stewardship might be accomplished.

### *1.1. Expanded Human Uses in the Arctic May Be Slower than Expected*

Recently, as reflected in some presentations at November 2016's Arctic Circle Conference in Iceland, expert opinion has begun to partially back away from the crisis narrative surrounding climate change in the Arctic that has been offered in the past few years. It now suggests that some of the expanded human uses on the horizon for the Arctic, including commercial shipping and oil and gas exploration and development, still constitute "opportunities" or "threats" (depending on one's point of view), but it may take a little more time before we see a sufficiently "ice-free" Arctic which is economically favorable to these activities. Such a recalibration of expectations may offer some "breathing room" for thinking about, and actually beginning the process of, preserving significant natural and historical resources before the ships are able to more routinely navigate through what remains of the ice, the needed deep-water ports are developed, and rigs and pipelines are constructed and operational.

The term "historical resource" is defined here as encompassing prehistoric/historical archaeological sites and/or the built environment which includes historic sites, structures, objects, districts, and landscapes [6]. It is used interchangeably with "maritime heritage resource" throughout this discussion.

### *1.2. Tourism May Be the Exception*

This anticipated delay in the growth and expansion of commercial shipping and petroleum exploration and development in the waters of the Arctic may not, however, be the case with regard to Arctic tourism. Illustrative of this continuing expansion, the Northwest Passage, identified as "the most popular expedition cruise area in the Canadian Arctic" [7] (p. 142) was projected to experience "an increase in planned cruises by 70% over the period 2006–2010" [8]. Hall and Saarinen [9] (p. 8) report that, as of 2010, "well over five million tourist trips" were taken to the Arctic each year, and also offered, for context, the following observation:

*... the number of tourists is continuing to grow and represents a significant figure in relation to permanent populations and concentration in a relatively small number of accessible areas in space and time. For example, the number of fly-in tourists per year now exceeds the population of Greenland, with the number of cruise guests already being over half. A similar situation with respect to number of visitors per year in relation to permanent population also exists in Iceland, Svalbard, and northern Norway, Sweden and Finland above the Arctic Circle. (p. 417)*

This "more visitors than residents" situation is further supported by the reported estimate [9], as of 2010, that five million tourists visit the Arctic each year, while the population of the Arctic has been contemporaneously estimated [10] (p. 121) at around four million residents. Currently, the number of tourists visiting Iceland has been estimated at four times the resident population [11]. This all suggests that the enthusiasm for Arctic tourism continues to grow and expand.

Cruise ships carried 1.3 million passengers to the Arctic in 2014 [12], which represents more than a quarter of all visitors to the region. In just a single year—2016—a somewhat surprising number of

ice-capable expedition ships—a total of nine—were ordered and under construction, to be available for maiden voyages between 2018 and 2020 [13–15], adding around 1600 passenger berths to the existing fleet. Further encouraged by the successful transit of the Northwest Passage in 2016 by the *Crystal Serenity* [16], other non-Polar Class cruise ships are being repurposed for Arctic routes [17,18], and it is likely that more will follow. There has even been a somewhat speculative proposal for an “all-terrain” amphibious Polar cruise ship that could access coastal areas on tracks or wheels [19]. This rapid expansion, in 2016, of the expedition cruise ship fleet offers something more than simply speculation that a potentially significant increase in cruise ship tourism targeted for the Arctic is on the near horizon. Coastal infrastructure development to support this coming increased activity and presence will also be required, and will not be far behind.

Of course, the Arctic is a big place, and tourism activity is not evenly distributed across the region. Tourism activities are being conducted on both land and sea, are concentrated in particular areas of the Arctic that are attractive both in terms of the natural and historical resources that are present, and where the infrastructure and relative ease of access is favorable [20]. As summarized by Bystrowska and Dolnicki [20], “there is much regional variability in organization of tourism, its structure and trends, depending on endogenous features of a given area that influence type of tourists and tourism” (p. 38). In terms of what may be driving this growing interest in visiting the Arctic, for the most part, people are attracted to the Arctic to experience its wildness and iconic natural resources (e.g., polar bears, whales, scenic wilderness vistas, and ice) [20,21], but many are also interested in visiting places with historical and cultural value [20]. One other additional important element of this attraction seems to be “last chance tourism” [11,22,23], where potential visitors are aware of the unprecedented changes occurring in the Arctic, believe the iconic resources that attract them to the North will be lost as a result of these changes, and therefore want to visit before the opportunity is lost. Clearly, the potential impacts on the natural and historical resources in the Arctic from tourism should be addressed cumulatively with regard to the potential adverse effects from other expanding human activities, but it appears that tourism is perhaps the more immediate concern.

### 1.3. Climate Impacts on Historical Resources

Impacts from the changing climate of the Arctic are no less potentially damaging to historical resources than they are to natural resources. Murphy et al. [24] categorize these climate change-related impacts on coastal and maritime heritage environments as:

- direct physical impacts causing accelerated erosion or increased flooding
- indirect impacts that are a consequence of decisions taken now by coastal managers anticipating future climate change (such as “non-intervention” approaches to coastal defense)
- indirect impacts related to attempts at climate change mitigation (including the expansion of the renewable energy sector)
- northward expansion of alien fauna.

Regarding this last category of impacts, there has been a recent report [25] of the presence of shipworms in the wood of an historic shipwreck near Spitsbergen. This is the first reported occurrence of these wood-boring organisms in the Arctic, raising concerns within the maritime archaeological community about the fate of wooden shipwrecks that heretofore were not exposed to this threat.

As summarized by Barr et al. [26] (p. 162), with regard to the physical alteration of historical resources at submerged and coastal sites diminishing their archaeological integrity, direct impacts that could be relevant to Arctic historical resources include: fill, excavation, or dredging attendant to coastal infrastructure development; artifact collecting or salvage; prop-wash; groundings of ships; and discharges and spills from vessel accidents and cleanup operations. Indirect impacts to archaeological sites may include increased erosion and sedimentation affecting coastal landforms and nearshore sediments resulting from longer ice-free periods combined with more intense and frequent storms, expanded tourist visitation that potentially increases opportunities for disturbing

coastal archaeological sites, and the loss of permafrost (combined with increased erosion) that exposes sensitive coastal archaeological sites to further disturbance and degradation of organic materials and artifacts [27]. Further, with specific reference to expanding cruise ship operation in the Arctic, cruise tourism without appropriate management can overwhelm coastal communities' infrastructure, raise local concerns about vessel discharges (e.g., food, garbage fuel, and sewage) and interference with cultural subsistence (e.g., hunting and fishing), and heighten community and government agency concerns about the capacity (and cost) to respond to the catastrophic sinking of ships in remote areas and ensuing the search and rescue of survivors [7]. Like other maritime transportation operations, such issues of ship collisions with whales, and wildlife disturbance more generally, as well as noise impacts on marine mammals from vessels and infrastructure development activities, are also management concerns that will likely need to be addressed in this region.

#### 1.4. Purpose, Objectives, and Rationale

The call for papers for this special volume of *Resources*, targeted at papers presented at the recent International Polar Tourism Research Conference, held in Iceland in September 2016, sought to include contributions that “explore how expectations towards tourism development in the polar regions can be managed to enhance the conservation of natural resources, the protection of the environment, and the wellbeing of peripheral communities”. While I attended this conference, and presented a paper on another topic, I have contributed this paper identifying the pressing need for the awareness of and action addressing the identification and preservation of coastal and maritime heritage resources in the Arctic precisely because it is a topic not explicitly included in the call for papers. This is an issue that is often overlooked, and deserves some much-needed attention.

Given that what draws tourists to the Arctic is principally its iconic natural resources, the effective preservation of an intact and functioning Arctic ecosystem should be something of a compelling interest to those who have a stake in this potentially important element of the economic sustainability of the region. The identification and preservation of places of high biodiversity and productivity throughout the Arctic would therefore be justified as a priority, ensuring that these places will be sustained intact for not only their intrinsic ecological integrity, but also as venues where tourists will continue to find the iconic natural resources and attributes that are an expected part of the experience of visiting the Arctic. Consistent with this intuitively important focus on natural resource protection and management, the Arctic Council, its constituent Arctic states, and other participants in this deliberative body, as well as a number of environmental non-governmental organizations have adopted the protection of the Arctic environment as a primary focus—and some have a mandate [28]—to address issues of sustainable development and environmental protection. There are many academic and agency scientists conducting important research relevant to acquiring a deeper knowledge of the Arctic environment, its diverse natural resources, and the impacts of the changing climate and its attendant increases in human activity as the sea ice retreats.

The greater emphasis on protecting natural resources and preserving the integrity of the Arctic ecosystem is likely to have some indirect benefits to identifying and preserving maritime heritage resources. The increased seabed mapping of habitats and features, for example, is likely to produce data that can be used to locate shipwrecks and potential submerged archaeological sites. Protected areas established to preserve natural resources may also offer some protection and an oversight of historic resources located within the boundaries of that site. It is reasonable to suspect that sites possessing high biodiversity, including iconic species which were once commercially hunted, would be sites where human activity might also have been concentrated at some point in the past. While these indirect benefits may be helpful, effective preservation of maritime heritage resources requires supporting research be conducted by knowledgeable and qualified maritime archaeologists to address somewhat different management and preservation actions than ecosystem protection. Additionally, the management strategies that may be adopted to accomplish place-based historical resource preservation are different, involving those such as managing the impacts related to the

disturbance from expanded access and directed archaeological surveys to identify significant historical resources. These two different management goals can be accomplished together [29], but both need to be explicitly included in the goals and scope of the authority for that protected area.

As a general observation, far fewer of the many academic, agency, and policy researchers who have an interest in the Arctic are engaged in conducting the much-needed research and policy analysis directed specifically at identifying and preserving historical resources. Nor are there, relative to research on natural resources, nearly as many research programs (or available funding sources) targeted at better understanding, mitigating, or adapting to potential climate change impacts on historical resources. There also seems to be a somewhat greater, and justified, emphasis in the Arctic Council and other intergovernmental and advocacy organizations for understanding and incorporating Indigenous cultural interests in their deliberations, as well as in the science that they encourage and support to inform their actions and recommendations. In this emphasis, at least one element of “cultural heritage” is being addressed to some degree, but arguably, the broader scope of historical resource identification and preservation has attracted far less attention.

It is the purpose of this paper, therefore, to attempt to raise the profile and to increase awareness of the pressing need of place-based historical resource identification and preservation in the Arctic. In addition, ideas and recommendations are offered regarding how key places could be identified, and might be effectively preserved utilizing the existing management tools available, when our knowledge of the spatial distribution of these resources is limited. This constitutes the foundation for the central question posed by this paper:

*Is there an effective and efficient way to identify the most potentially significant Arctic heritage areas, recognizing that the terrestrial and maritime archaeological information available may be insufficient in many places throughout the region to accomplish this task, and acknowledging the rapid pace of climate change in the Arctic and the attendant threats posed to historical resources?*

Realistically, not every historical resource in the Arctic is worthy of protection, nor could they all be preserved even if they were. As a purely practical matter, if significant historical resources are lost due to climate change and inadequate management, there will be fewer interesting places in the Arctic for tourists to visit. If these places are not identified and preserved, as well as effectively managed and interpreted appropriately so that visitors are aware of what they are experiencing and can learn the important lessons these places can teach us, something important will be lost.

As the Arctic Council’s Conservation of Arctic Flora and Fauna (CAFF) committee has observed [30], there are important cultural and societal reasons for establishing protected areas:

- *Cultural and Heritage values can include the importance of protected areas in representing the characteristics that formed a society’s distinct character and the historical importance of a site in shaping a society or people; spiritual values attributed to a site are also included.*
- *Recreation values can include the worth of a site for consumptive (i.e., sport hunting) or non-consumptive (hiking, camping, photography, etc.) activities.*
- *Societal values can include the importance of a protected area to a society at large often reflected in the funding or political priority attached to the site.*
- *Landscape values can include the visual characteristics and their relative importance to local communities, nations or internationally.*
- *Educational values can include the use of a site to train or teach people and make them aware of their physical and natural surroundings and its biodiversity.*
- *Scientific and research values can include the importance of a site in contributing to an overall understanding of the natural environment and the consequences of natural vs. human-caused, or anthropogenic, changes. (p. 110)*

Rey [31] has eloquently offered that “the Arctic is a unique feature which is part of the common heritage of mankind and, as such, deserves reverence and protection”. The UNESCO World Heritage Program [32] (p. 8) has made a similar statement about the need to preserve Arctic resources:

*... the Arctic region is important for global processes and is to be considered as precious heritage for humankind. The region includes a number of unique and outstanding natural and cultural heritage places which require protection, improved management and international recognition due to their vulnerability. (p. 8)*

All of the Arctic states have formally adopted laws, regulations, and policies—as statements of the collective will of their citizens—to identify and preserve terrestrial and submerged heritage. These heritage protection laws are implemented both through governmental agencies responsible for the stewardship of historical resources throughout that country and its sovereign waters, as well as through national protected areas programs charged with the place-based preservation of natural and historical resources. Therefore, the question should be not whether we act affirmatively to meet these legal mandates, but how to best accomplish the task.

## **2. Background—The Importance of Arctic History to Inform Preservation Priorities**

Frontiers have always been important in our collective history, but particularly to North Americans. Exploring and, ultimately, “taming” the wilderness frontier is a central element in shaping this continent and its people. Certainly, the collected essays of Fredrick Jackson Turner [33] provide ample evidence of this importance in the United States, and no less so in Canada [34]. No frontier has seemingly been more alluring to North Americans than the Arctic. While Canadians have, arguably, more of an “Arctic identity” than Americans, including reference to the “True North Strong and Free” in their national anthem, every license plate in Alaska includes the words, “The Last Frontier”. While the geographic focus of this discussion is the North American Arctic and Greenland, north of the Arctic Circle, it is also relevant to the entire Arctic region more generally.

### *2.1. Indigenous Migration and Habitation*

As early as 6000 years ago, representatives of the Birnirk culture migrated across the Bering Strait from Siberia, based on the most recent, extensive genetic analyses of Raghaven et al. [35]. This research further suggested that a number of “Paleo-Eskimo” cultures arose from this initial pulse of migration, including the Saqqaq, Denbigh, and Dorset, became established during an Eastward expansion through the North American Arctic, and persisted for around 4000 years. There was a separate migration of what were call “Neo-Eskimo” Thule cultures that were the predecessors to the contemporary Inuit, replacing the “Paleo-Eskimo” cultures around 1000–700 BCE. The Paleo-Eskimo and Neo-Eskimo people were thought to have distinct cultural traditions and lifeways, and left a complex, if somewhat elusive and unsurprisingly limited, archaeological record.

Over these thousands of years, many habitation sites have been occupied and abandoned, and culturally and spiritually meaningful places have been constructed and reclaimed over time by the land and the sea. These Paleo-Eskimo and Neo-Eskimo cultures were, to one degree or another, maritime peoples, living on the coasts and relying on sea mammals and other marine species for sustenance, and there are remnants of their lives scattered throughout the North American Arctic. There is little doubt that only a small fraction of this valuable archaeological record has been located and studied. These cultures experienced and adapted to past documented climate change events, which makes the potential to learn from their experiences, through archaeological investigations, even more important.

### *2.2. History of Commerce and Exploration*

Likewise, this is a region of the Arctic with a storied history of exploration and commerce. Explorers, over the last few centuries, have chased the enticing yet elusive “holy grails” of successfully navigating the Northwest Passage and reaching the North Pole. Along the way, the failed attempts to attain these goals have left, in their wake, many ships of exploration lost, as well as the remains of encampment sites of the surviving crews. These events offer compelling stories of survival—and more often of not surviving these tragic circumstances—that not only captured the imagination of the public,

but were extensively reported in contemporary newspaper accounts and later studied by historians seeking to better understand and interpret these events.

Similarly, the whaling and the fur trade enterprises represented significant and economically important activities in the Arctic at various times from the 16th Century until the beginning of the 20th Century. The highly lucrative fur trade drove European, and later North American, exploration of the Arctic, often involving first contact with, and in many cases the exploitation of, Arctic Indigenous populations. First in the Eastern regions, and later in the Western Arctic, the fur trade filled in the many blank places on the maps, as the competition among the various companies that conducted this enterprise rose and fell with the economic vagaries of supply and demand, and as the sovereign interests in colonial expansion in this new world were pursued [36]. Whaling was another important agent of change, helping to shape the future of the North American Arctic. Like the fur trade, whalers expanded the limits of the “known world”, pushing ever further into the maritime landscape of the Arctic frontier wilderness seeking out new and productive whaling grounds. Whaling was an industry that had a global reach and influence, one that left a profound effect on the places where whales were hunted, and the ports that serviced the industry. Clearly, this was the case in Hawaii [37], where commercial whaling in the 19th Century had a profound effect on the economy, culture, environment, and politics of this island nation. The Eastern Arctic region of North America possessed some of the earliest and most productive of these whaling grounds, which were, at various times, exploited by European and American whalers who risked great peril to find and catch whales surrounded by the ever-present danger of ice. In the latter half of the 19th Century, the key geography was the Western Arctic. It was the previously unexploited populations of bowhead whales that these Yankee whaling fleets pursued until it became economically unsustainable from overexploitation, catastrophic events that resulted in the losses of many whaling ships to ice and storms, and the discovery of oil in Pennsylvania. The Arctic of North America was, without question, a fundamental part of the global landscape of whaling which left, in its wake, places much different than they were when they first arrived. Fortunately, as the whaling industry was of great economic interest to the countries that engaged in this enterprise, it also left a wealth of documentation including ship logs and journals, and extensive contemporary newspaper coverage—and a relatively large number of historians who have collected and interpreted this information—that tell this story in considerable detail. The Arctic whaling heritage landscape is, therefore, well defined and documented.

### *2.3. How This History Can Be Relevant in Guiding the Identification and Preservation of Arctic Historical Resources . . . and What More May Need to Be Done*

While Arctic history may be reasonably well documented, the archaeological research required to provide site-specific information to effectively preserve historical resources is not as well developed. Those participating in the Arctic Council’s efforts to identify “areas of heightened natural and cultural significance” [38] observed:

*Better documentation of areas of heightened cultural significance is also needed throughout the Arctic. Traditional use areas have been recorded in some areas, but in others they are missing or decades out of date. Assessing the ways in which use areas are changing due to climate change as well as technological advances is also necessary, to avoid limiting protection to areas that are not sufficient for current or future needs. Archeological and historical sites are known in many places, but often only superficially, and other regions simply have not been surveyed to determine what is there. (p. 113)*

Such information will be critically important when the predicted expansion of human uses and development occurs as we approach an “ice-free Arctic”. Particularly with regard to maritime archaeology, most of the effort has been devoted to intensive searches for relatively few significant historic shipwrecks, such as the recent discoveries in Canada of the Franklin ships, *Erebus* [39] and *Terror* [40].

What are notably lacking are maritime and coastal archaeological surveys at the landscape scale. For example, in 2014, the Alaska Region of the U.S. Bureau of Ocean Energy Management (BOEM) proposed a project, in their Environmental Studies Program proposal [41], to conduct baseline archaeological surveys in the Beaufort and Chukchi Seas. These baseline surveys would address “limited information available regarding potential submerged cultural resources in areas of potential future industry activity, even though there is high possibility that archeological sites exist in these locations” [41] (p. 156). This important proposed work was not funded in 2014, and subsequent yearly updates of this planning document have not continued to include this proposal. Such surveys can help to better identify regional priorities regarding where additional site-specific research is needed, and perhaps more importantly, to help raise awareness about the pressing need for expanded attention to, and funding of, Arctic heritage preservation efforts and the research needed to support this work. Without question, it will take time and considerable funding to acquire sufficient archaeological documentation to begin to preserve these Arctic maritime heritage landscapes and resources as development and human activities increase. In the interim, perhaps we might begin with a process that could lead to more effectively identifying and preserving these landscapes and resources by using this extensive historical record to, as systematically as possible, help identify the places in the Arctic that may be priorities for more detailed archaeological investigation, and offer some precautionary protection for these landscape areas until the essential archaeological investigations can be completed.

### 3. Discussion—Challenges and Opportunities

Only recently has the pace of discovery of important Arctic maritime heritage resources begun to increase as the sea-ice cover retreats, providing longer windows of opportunity to conduct field research and more open water to facilitate ship-based seabed surveys. However, the region remains insufficiently explored and documented to ensure that even the most significant historical resources are identified and preserved [38]. This slowly expanding knowledge is arriving at a time when increasing human use and development, and climate change itself, are posing significant threats to effective heritage preservation.

#### 3.1. Existing Tools for Preservation of Historical Resources May Be Inadequate

There are requirements in many of the statutory authorities addressing the protection of historical resources, such as the National Historic Preservation Act (NHPA) in the US, as well as similar authorities in other Arctic states. There are also various impact assessment requirements when major development projects are proposed. While these can identify resources that could be adversely affected by the proposed activity, project-specific impact assessments are typically conducted as part of what is usually an environmental impact-focused process, like the National Environmental Policy Act (NEPA) and similar Environmental Impact Assessment (EIA) requirements in other jurisdictions. Usually, these are the responsibility of the oversight agency of the national, and sometimes sub-national, governments, and while the developer proposing the work is required to supply information relevant to identifying and assessing the condition of archaeological resources that might be damaged or adversely impacted by the development, these assessments are, for the most part, based on a review of existing, available information, and sometimes very limited field surveys. Comprehensive assessments are costly, complex, and challenging, particularly in the Arctic, and are often predicated more on minimizing delays to initiating the work than on actually finding and preserving what maritime heritage resources may be present at the site. The agencies responsible for conducting these project reviews are often understaffed and underfunded, and often lack specific expertise in the preservation of archaeological resources, making effective oversight challenging. This is particularly an issue when there are many proposals being evaluated at the same time as a result of some opportunity, like climate change in the Arctic, that creates conditions where development is not just possible, when it was previously more challenging, but economically favorable. There may be competing interests pursuing these opportunities, and political pressure to streamline review processes to ensure

economic opportunities are not lost as a result of satisfying regulatory requirements. Clearly, this was the case in Canada when the government revised the Canadian Environmental Assessment Act in 2012. According to Gibson [42] (p. 179), this resulted in federal environmental assessments being “few, fragmentary, inconsistent and late”. Considering that archaeological resource assessments are generally only a part of and largely ancillary to the environmental impact components of these reviews, such EIA processes are likely to be only cursory at best in terms of identifying and effectively preserving maritime heritage resources. Interestingly, most Indigenous people do not parse resources into “natural” and “cultural”, instead perceiving the environment as infused with culture value [43]. For the Arctic, where many Indigenous people live and, therefore, where their interests and perspectives are especially important, adopting this more expansive and integrated worldview may be particularly appropriate.

An example may help to demonstrate this challenge. In 2007, the US Minerals Management Service (now BOEM), published an Environmental Impact Statement and Environmental Assessment (EIS/EA) for the proposed oil and gas lease sale for the Chukchi Sea [44]. A document of more than 630 pages—constituting just the first volume of this assessment—addressed the potential impacts to prehistoric and maritime archaeological resources from the various activities being proposed, but provided only slightly more than two pages of background information regarding these resources. Throughout the document, the individual proposed activities were briefly evaluated as to their potential impact on archaeological resources, but more often than not, the conclusion was that there could be adverse effects, and site-specific surveys and assessments would be conducted before these activities were initiated. If resources were discovered, avoidable impacts would be minimized or mitigated. When, in 2012, Shell proposed to move forward with drilling operations in the Chukchi, a subsequent assessment was conducted by BOEM [45] and reported that, for the proposed drilling site, “historical properties will be affected” and that “no new information that would modify or change this finding” had been submitted subsequent to the original review [45] (p. 74). That section of the document concluded, perhaps over-broadly, that “no sites have been identified by the Alaska OCS region for the East Chukchi Sea”, notwithstanding the earlier mention in this section of the identification of a small number of historic shipwrecks that could be present in this offshore area of the Chukchi, based on the extensive shipwreck database compiled by BOEM and published online in 2011 [46]. Interestingly, Shell’s submission of “Revision 2” of their exploration plan [45] contains a number of maps showing the proposed drill site that identify multiple magnetic anomalies, which do not seem to be further discussed in the text of that submission. Magnetometry is routinely conducted by maritime archaeologists to identify potential shipwreck sites or parts of sunken ships, and these anomalies identified on the maps could represent potential shipwreck sites, but no further mapping was pursued to confirm or reject this potential. While all of this documentation may represent accurate statements of what was known at the time the assessment was prepared, it appears to be based largely on presumption and little actual site-specific field survey effort. Based on the more than 40 years of experience by the author in evaluating such assessments, however, it represents the rigor of current practice. As King [47] (p. 253) has suggested, “there is plenty of room in most EIA laws for bad work to be done—for serious impacts to be missed, ignored, or buried, for decisions to be made that do not give full consideration to cultural values, for the public to be excluded”.

Another example of this challenge also relates to the proposed oil and gas development in the Chukchi Sea. Shell Oil identified a potential route for a pipeline from this oil field [44], which would come ashore near Wainwright, Alaska, “between Icy Cape and Point Belcher” (p. IV-10). Coincidentally, there is considerable documentation of an event of great historical significance along this stretch of the Chukchi coastline where the pipeline was proposed to make landfall. As reported by Barr et al. [26], in September of 1871, 32 whaling ships were caught in the ice, and 1219 people were left stranded with little hope of rescue. While 31 of the 32 ships were lost, striking a blow to the Yankee whaling industry, all the officers, crew, and captains’ families aboard these ships found their way to safety. This was a profoundly important event in the history of whaling, and recommends this area as a potentially significant element of the global whaling heritage landscape. In 2015, maritime archaeologists from

the U.S. National Oceanic and Atmospheric Administration's Maritime Heritage Program went to this place to conduct systematic seabed surveys to determine if any wreckage still remained and could be located [26]. In the nearly two weeks of field operations, it was not until the last day of the survey that six pieces of wreckage were discovered. While none of the ships were found intact, sections of whaling ships were identified that included a number of artifacts typical of whaling ships of that period (Figure 1). This research demonstrated that targeted and systematic field surveys are required, guided by the available historical documentation of that maritime landscape, to locate sites of maritime heritage resources at what is presumed to be an historically significant site, even after 144 years of increasingly severe and frequent storms, as well as the extraordinary erosion and deposition of coastal sediments and annual disturbance by ice movement at the site. Historical documentation can clearly be sufficient, lacking more detailed archaeological data, to identify places where historically-significant maritime heritage resources are likely to be located.



**Figure 1.** Artifacts from the whaling ship wreck site, off Wainwright, AK [26].

Therefore, as was done along the Chukchi Sea coast [26] for a significant event in the 19th Century history of Yankee whaling, other places might be identified and evaluated, based on the historical record, to begin to more effectively preserve significant maritime heritage landscapes in the Arctic. Clearly, no resource is evenly distributed throughout any area, but is concentrated in specific places for particular reasons. Just as many important species are distributed throughout an area because of their life history characteristics, seeking out habitat characteristics that are favorable to sustaining their population, historical resources, like shipwrecks, are distributed in specific places. Maritime cultural landscape elements “favor” specific locations, because, for example, they are traditional maritime transportation corridors. Ships that pass through such corridors are subject to frequent violent storms—or ice, in the Arctic—that often put these ships in peril. It is no coincidence that shipwrecks are concentrated in what are euphemistically called “graveyards”. By understanding and identifying these landscape elements to find shipwrecks or important paleo-environments, the search for physical remains can be targeted more effectively.

### *3.2. Identification of Maritime Cultural Landscapes May Be Valuable but Not Sufficient*

However necessary identifying important maritime cultural landscapes in the Arctic—and elsewhere—might be, this is not sufficient, in and of itself, to empower the preservation of these historically-significant places. Another critical element would be the broader adoption of precautionary approaches to the preservation of historical resources. Archaeological sites are extremely fragile and even what might appear to be minor disturbance or damage can destroy the integrity of the site

and diminish what can be learned from careful study and documentation [48]. Understanding site formation processes helps to tell the story of what is there, how it came to be, and what we can learn from the site, not only about the artifacts present, but also the environmental forces and site conditions that created and modified what is observable today. Therefore, even a small and seemingly insignificant alteration of that site, such as tourist digging through a cairn looking for souvenirs or the wake of a passing ship disturbing a shallow shipwreck site, could have a profound impact on the historical and archaeological value of that site. Most of the statutes that protect maritime heritage resources recognize the need to avoid disturbing what has been discovered, but few actually state, a priori as a fundamental principle, that what has not been found but is likely to be present in that place deserves similar, or at least some *de minimus* protection. An analogous approach has been extensively used in managing natural resources. Habitat suitability analysis [49], conducted at the landscape level, is often applied to situations where incomplete spatial information is unavailable regarding the distribution and abundance of species and community types. If the preferred habitat characteristics of these resources are known, and if there is information on the geographical extent of places that possess these preferred physical, chemical, and biological characteristics, suitable habitat areas can be identified. While it may be uncertain whether those particular species or biological assemblages are present in a place, knowledge of the geographic extent of the suitable habitat for supporting that species or community can be used to protect that place from human alterations that might make it less suitable and thereby diminish its ecological value. In the case of historical resources, this analogous application of suitability analysis, where the historical information is used to identify significant maritime landscapes, could be thought of as defining and locating a “heritage habitat”.

A number of authors [50–54] have suggested that, while potentially quite valuable as a resource management strategy, the “precautionary principle” is not particularly well defined. Its origin appears to be linked to controlling the discharges of contaminants into the environment [50,53]. In that context, it has been generally described as, where scientific uncertainty exists, actions that should be taken “in anticipation of environmental harm to ensure that this harm does not occur” [50] (p. 4), rather than waiting for the uncertainty to be resolved. This also shifts the burden of proof from the regulator to those proposing the project, that the action, whatever it might be, will not cause harm to the environment. In a world where development or other human activity involves sometimes substantial financial investment, often contingent on swiftly passing through the regulatory process, the precautionary principle presents challenges in its practical implementation.

Notwithstanding these challenges, applying the “a more flexible version” [53] (p. 578) of precaution to resource protection has been devised through adopting “precautionary approaches”. Principle 15 of the UN’s Rio Declaration on Environment and Development [55] offers something of a consensus definition for this “more flexible version” of precaution:

*In order to protect the environment, the precautionary approach shall be widely applied by States according to their capabilities. Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation.*

Adopting precautionary approaches to the preservation of cultural heritage resources is not a particularly novel idea, either generally or for the Arctic. Hagen et al. [54], for example, discusses the implementation of precautionary approaches for protecting historical resources in Svalbard. However, such contemporary applications are not common. Most statutory protections afforded to cultural heritage resources, and the environment more generally, are intently focused on protecting identified and documented structures, artifacts, and other physical attributes of that place. Notwithstanding this potential limitation, especially as regards EIA laws and processes, “in theory” EIAs “require consideration of impacts on *all* aspects of the environment”, including historical resources [47]. Therefore, a broader application of precautionary approaches to the preservation of maritime heritage resources is not necessarily an idea that should be rejected out of hand as too radical a notion. It may be a somewhat challenging to fully understand, as preventing harm is “a matter of causing the

non-occurrence of an event” [56], but in the end, perhaps expanding the application of precautionary approaches to preserving cultural heritage will benefit from our thinking a bit more abstractly about the task at hand.

### *3.3. Proposed Approach Linking Maritime Cultural Landscapes and Precautionary Approach*

Quite simply, what is being proposed here is to carefully and systematically read Arctic history, and from this extensive historical record, to identify the maritime cultural landscapes where significant things happened. Arctic states could then use existing administrative discretion, as stewards of these resources, to implement precautionary approaches for the preservation of these significant Arctic heritage landscape-scale “habitats”. Perhaps it could begin with just a few particularly important and well-documented landscapes, such as the whaling landscape of the Western Arctic—from the Bering Strait to Hershel Island—or larger geographies like the Northwest Passage, as its storied history is both well-known and recognized as globally significant. The intent to apply a more precautionary approach to preservation might most effectively be embodied in national policy, permitting some greater flexibility in its implementation than the much more challenging task of attempting to modify laws and regulations. It would mean that those who want to propose development, or who wish to expand human activities that could have the potential to harm or diminish the Arctic’s cultural legacy, would have to work a bit harder to ensure that the development or expanded use they are proposing will not result in harm to maritime heritage resources. Effective stewardship requires both transparency and predictability, and developing and implementing a national policy affecting these identified landscapes would satisfy these requirements.

### *3.4. Ongoing Initiatives into Which This Approach Might Be Integrated*

There are a number of ongoing initiatives, the most promising and comprehensive under the leadership of the Arctic Council convened by the Protection of the Arctic Marine Environment (PAME), to establish additional marine protected areas (MPAs) in the Arctic [57]. While the outcome of the Arctic Council’s efforts on Arctic MPA planning has not yet produced any progress in actually establishing any MPAs in this region, there seems to be some intent to ultimately move in this direction. In any case, MPAs represent another useful approach to adopting this strategy. MPAs provide place-based management and oversight of resources, and many programs include maritime heritage values within the scope of their protection. As new MPAs are being evaluated, and as existing sites’ management plans are revised and adapted, maritime heritage landscapes, and the intent to preserve these landscapes through a precautionary approach, could be integrated as a management strategy, complementing ecological landscape approaches such as ecosystem-based management [29]. Implementing such a strategy within an MPA may be useful to help ensure that sufficient resources are provided to conduct an oversight of this implementation and an evaluation of its effectiveness. It might also assist, as national MPA systems are generally considered to be areas of significant resource value, in identifying these landscapes as priority areas for investment, attracting additional funding to conduct critical baseline systematic surveys of maritime heritage resources. As Hagen et al. [54] have observed with regard to the preservation of historical resources in Svalbard, it may be useful and appropriate to adopt a precautionary approach, but “a shift towards a more integrated and evidence-based management will contribute to more trusted and reliable, and thereby acceptable, decisions”.

At the international level, another potential avenue for advancing this idea of identifying and preserving maritime heritage sites and landscapes in the Arctic is the identification of World Heritage Sites (WHS). As early as 1994 [32] (p. 8), the Arctic was singled out as a significant gap in the WHS System. The IUCN, in their more recent evaluation of the geographic representation of marine WHS [58], found that the Arctic has only one such site inscribed, representing less than 0.1% of the region. Currently, there are only two natural heritage sites inscribed, but no cultural heritage or “mixed” sites (i.e., recognizing both natural and cultural heritage values). As a program established to identify and help preserve places of “outstanding universal value”, one might be intuitively justified in

concluding that the Arctic is underrepresented. The IUCN [59] has evaluated the region to determine where “ecologically and biologically significant areas” (EBSA) are located and identified twelve areas that met or exceeded most or all of the EBSA criteria (areas they termed “Super EBSAs”). While the Super EBSAs identified were not evaluated for their heritage value, they include areas, like the coast of the Chukchi and Beaufort Seas, and areas of the Northwest Passage, that likely would encompass heritage areas of “outstanding universal value”. Recently published findings of another UNESCO Expert Panel [60] identified only potential natural Arctic marine WHS, but such a process could serve as a model for similarly identifying Arctic cultural heritage sites of outstanding universal value. Finally, there are two mixed sites located above the Arctic Circle on the Canadian tentative list [61] and two cultural sites nominated for Greenland [62]. This may be an opportunity to begin to both fill the identified gap of Arctic site representation in the WHS List, and especially to expand the inscription of mixed and cultural heritage sites in this underrepresented region.

There may be a little more time before human use and resource exploitation expand into the places in the Arctic that contain both resources and qualities of economic value, and that are also part of the rich cultural legacy of this region. These are places that are no longer sufficiently protected by seasonal and multi-year sea ice and remoteness. However, there is little doubt that many more people will be coming to the Arctic, and development will occur as the economics become more favorable.

### *3.5. Need to Consider Bigger Picture of Expanding Human Uses*

While the expansion of Arctic tourism may be happening more quickly than some of the other projected activities catalyzed by climate change, there is a need to consider response and adaptation in the larger context. The concern is one involving the consideration, cumulatively, of all human activities and infrastructure developments needed to support this expanded human use of the Arctic.

- As a non-renewable resource, oil and gas reserves will likely become more attractive for development when the price of oil begins to rise once again [63]. Clearly, there are a number of issues with regard to this activity, from the actual drilling and the attendant development of operational drilling sites, to the coastal infrastructure needed to move the product to market, house workers, and provide port facilities for vessels supporting the extraction operations.
- Commercially-important fish species are also headed North with warming Arctic seas. Visions for a coordinated fishery management system, and collaborative research, for the circumpolar Arctic states is still being debated [64]. Existing national efforts to preserve these stocks are under growing threat by fishing interests from around the world who want greater access, which will potentially contribute to both expanding human activity and the need for coastal facilities and infrastructure to support this industry.
- Maritime transportation, both vessels that transport cargo and increased traffic from other development activities (e.g., oil and gas exploration and development, commercial fishing vessels, cruise ships, for example) is also projected to greatly expand [38], but perhaps not as quickly as first thought. The Arctic is a challenging place to navigate. Ice, more frequent and intense storms than in the past, navigation charts that are sometimes based on hydrography from the 19th and early 20th centuries, vessels with limited capabilities to safely operate when unanticipated changes in ice conditions are encountered, and the relatively shallow waters of the narrow passages through the Arctic are all contributing to the threats to both natural and heritage resources and landscapes. Even private vessels are arriving in the Arctic in increasing numbers [65], adding to the challenges of the safe and effective management of navigation. Again, infrastructure to support expanded navigation will also be required. While the International Maritime Organization’s adoption of the Polar Code in 2017 [66] is one step forward in addressing at least some of the most significant shipping safety concerns, how much it may contribute to providing protection from maritime transportation-related impacts to significant natural and historical resources in the Arctic remains to be demonstrated.

One other expanding human activity also results in some particular concern with regard to preserving both the natural and historical resources throughout the Arctic. From 2007, when the Russian Federation supported a scientific expedition [3] (p. 7) which included the planting of a Russian flag on the seabed near the North Pole—an act involving little if any real consequence but which spun-up a storm of controversy over issues of Arctic sovereignty [2]—there has been increasing activity in the Arctic related to an expanding military presence and operational capability. Beyond the potentially important geopolitical implications of this rapidly escalating activity, this expanded presence also contributes to the growing human footprint in the Arctic: more ships result in more coastal support facility development. Given that most of these military-related activities are not subject to many of the EIA requirements of the Arctic states, nor are many environmental and cultural resource preservation laws directly applicable, this element of expanding human activity and development represents a unique challenge.

As regards tourism, all indications are that cruise ship operations are expanding ahead of other potential human uses, and, as discussed above, many of these new passengers will want to visit interesting heritage sites, and operators will want to meet this expectation. One would suspect that tourism operators would be seeking new and different historical resource venues to explore, to better service returning passengers, and to optimize the passenger experience generally, which may add new sites and new challenges, but also might result in some “citizen science” contributions to the identification of potentially undiscovered sites. More guidance and oversight of this activity will be required so that this expanded visitation will not harm or diminish the heritage value of these sites. For example, many of the expedition cruise ships are now deploying remotely operated vehicles (ROV) [14], and will be operating very close to the historic shipwrecks that they are exploring with their passengers. Some sort of oversight and guidance (e.g., training requirements for operators, minimum approach distances for ROV to the wreck) will be required to help ensure that the potential for damage to the wreck is minimized. As most of these exploration cruise ships also carry and deploy zodiacs to land passengers on shore for exploring coastal sites, guidance and oversight will also be required here. Tour guides will need to be trained to identify and control passenger behaviors (such as collecting “souvenirs”, particularly, but also perhaps simply treading carefully while ashore, as sites can be fragile and may lose archaeological integrity from even minor, unintentional, disturbance) that might result in some impact to the historic resources that are encountered ashore. Land-based tourism will also likely require similar oversight and guidance. Needed infrastructure development, supporting both land and cruise-based tourism, will require careful and informed assessment and planning to avoid the destruction of places where historical resources are likely to be present. While the fundamental goal of preserving maritime heritage resources is for their intrinsic value and the knowledge they can provide, as a practical matter, if the significant heritage sites are degraded, one would expect that the attractiveness of the Arctic as a tourism venue would also likely diminish.

### *3.6. Additional Recommendations for Targeted Collaboration*

There are many key players with a stake in this enterprise of Arctic heritage preservation. Tourism operators, tourism organizations established to offer advice and often “best practices” guidance, the governmental agencies that oversee place-based management and preservation of protected areas, the local residents who have much to gain and lose with this expanded visitation and human use, archaeologists and historians who study the Arctic, and the visitors themselves. Greater collaboration and communication among and within these stakeholder groups is essential to find a workable and effective solution to help ensure that these resources will be preserved.

#### *3.6.1. Development of a Research Coordination Network (RCN)*

As regards the essential research needed to guide and inform this effort, it might be fruitful to develop some sort of RCN potentially funded by the US National Science Foundation [67]. Such a network, focused on better coordinating and prioritizing archaeological and historical research in the Arctic for

the purpose of supporting and informing the preservation and management of historical resources, would not only provide opportunities for raising the profile of Arctic maritime heritage resource preservation, identifying and developing new collaborations and joint research initiatives, but would also help the scientific community to move, in collaboration with one of the primary funding agencies for this work, toward some consensus on research priorities. This group could also provide expertise in the development of guidance for addressing tourist visitation, as described above, and more generally, the larger challenges related to many of the other expanding human uses. Other organizations, such as the UNESCO International Polar Heritage Committee (IHPHC) [68], might be enlisted to lend support, expertise, and experience in this effort.

### 3.6.2. Expanding National and International Governmental Collaboration on Heritage Protected Areas

The Arctic Council, and the individual Arctic states, have begun processes for the identification of a circumpolar network of marine protected areas [57], which might be encouraged to better integrate place-based historical resource preservation into this initiative. They have already accomplished some related work in the PAME Annex IIc identification of “areas of heightened cultural significance” [38]. Again, international organizations such as UNESCO’s IHPHC [68] and World Heritage Program [32] could also add much to such a collaboration. However, where the larger potential challenge exists here is establishing and fostering collaboration among the protected area programs of the Arctic states. These programs are critically important as it is under their statutory authorities that any marine protected areas will be established. While the Arctic Council’s efforts may potentially be the convening organization for such a collaboration, through their Arctic MPA planning [57], there has not been much apparent progress toward the implementation of this plan as of yet. Support and encouragement by the RCN, discussed in the previous section, might help to speed things along in this regard.

### 3.6.3. Enhanced Coordination with and Among Tourism Operators, Tourism Organizations, and Local Affected Communities

Clearly, the engagement of these stakeholders would be an essential element of any of the aforementioned collaborations. Tourism operators and their representative organizations possess invaluable on-the-ground expertise in the conduct of Arctic tourism, and it is these operators who will be conducting and overseeing future tourism activities in this region. While local communities and residents are already engaged with the relevant governments, industry, and many scientists conducting relevant research (for example [7,20]), their vision of the future state of the North should be respected and honored.

### 3.6.4. Visitor Engagement

Expanded visitation to the Arctic is, after all, what is driving this need to address historical resources and place-based preservation. The expectations of visitors, and their experiences in the North, is an active topic of interest to tourism researchers, as demonstrated at the recent International Polar Tourism Research Conference. These studies are critically important in understanding the role and impact of tourism in the Arctic, and collaborations like the RCN could expand and support these valuable research efforts. The other potential role for visitors may be one of “eyes and ears”. While the ice may be receding in the Arctic, it remains very remote, and an oversight of what transpires there is a challenging and costly task. With the wider use of social media communication mechanisms, such as Twitter and Facebook, and informed about the guidance with which the tour operators are expected to comply, visitor feedback could be invaluable in determining compliance with this guidance. Such a strategy has been attempted with regard to the whale watching industry in the Northeast United States [69] in a place that is far less remote, but heavily visited.

#### 4. Conclusions

There is little doubt that the Arctic is changing rapidly, creating what is now being characterized as a “new ocean” [70]. While some expanded human uses and resource exploitation activities may occur further in the future than originally projected, Arctic tourism seems to be an exception, and deserves some immediate consideration as to how it will be effectively managed so that the historical resources threatened by this expanded visitation can be preserved for future generations. How the international community of Arctic interests addresses the larger questions of management and preservation of this “new ocean” is a work in progress, involving quintessential examples of “wicked problems” [71] which are identified as difficult to resolve because of incomplete, contradictory, and changing requirements that are often difficult to recognize. Precautionary approaches to resource protection and management may be the most likely effective tool available when confronting such great, and “wicked”, uncertainty. In the absence of site-specific resource information, taking a step back and considering the landscape in which those resources are likely to be present is also a strategy for addressing uncertainty, at least until more detailed, place-based resource information can be assembled and analyzed. Additionally, landscape approaches also offer a larger environmental context for resource protection and management, recognizing that place-based natural and historical resources are formed over time, and are likely present because of external influences that may be both natural and the result of human activity. Given the magnitude and complexity, as well as the growing imminence of threats identified, this notion, therefore, of adopting landscape-level, precautionary approaches for preserving the heritage and cultural resources of the Arctic—even as a first step—seems like something worth trying. Certainly, one might argue, it would be preferable to wait for these valued historical resources to be harmed or lost before any action is taken. As Bodansky [50] (p. 4) reminds us, “an ounce of prevention is worth a pound of cure”.

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