

Logistic and Other Factors Constraining Conservation of Heritage Sites in Antarctica

While there are important conservation projects being conducted at many worldwide sites where access and environmental factors create major difficulties, many of the most complex problems presented to managers and conservators arguably occur in polar regions. Some of the world's most unique historic sites are located in the Antarctic and Arctic and the challenges that must be overcome in order to conserve them, make them subject to risks that are normally less severe in other parts of the globe.

Perhaps the most obvious difficulty arises because these higher latitudes experience long periods of darkness during winter so conservation work is necessarily restricted to a few weeks during the summer. Freezing temperatures and extreme weather conditions, however, continue to create practical problems, even in summer. What is less obvious though, is that problems of access to polar sites generate complex logistical challenges. Combined, these factors severely limit the opportunities to reach the sites and periods of work when conservation activities are possible.

Access

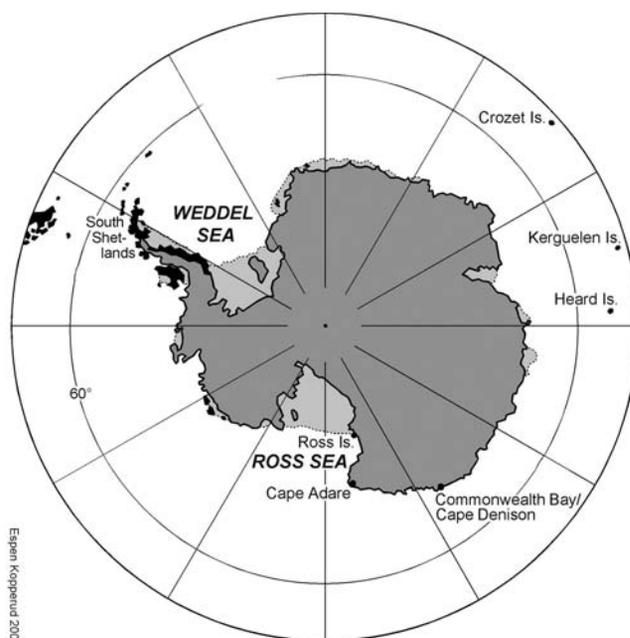
No matter where you depart from, you must cross over 1,000 km of some of the roughest seas in the world to reach any part of the Antarctic continent. In winter sea ice spreads north from the continent, so a landfall by sea is impossible until mid-summer. Even then sea access is only possible in favourable conditions for a period of six to eight weeks before the ice returns.

While it is possible to travel by air to some parts of Antarctica, air transport is restricted and specialist aircraft are required. Limited private services are available into a very few parts of the continent but the only flights into most areas are managed by government research programmes. Use of these may be granted to reach one of the government bases but once there, helicopter transport or some form of surface travel is needed to reach the historic sites.

Given such problems of access, the need to carefully plan work at any of these sites becomes paramount. In addition to the requisites of the conservation work itself, practical and safety considerations demand meticulous planning of transport, provisioning and shelter.

Environmental constraints

In Antarctica additional constraints are presented by the need to comply with the provisions of international agreements that were originally designed to protect flora, fauna and the environment. Now the Antarctic Treaty and its associated protocols provide a regulatory framework to protect the natural, as well as the historic values of the continent. Clearly there are significant benefits that come from these internationally recognised mechanisms for protection of historic sites, but the same regulatory system places onerous conditions on the way conservation work is conducted. Compliance



Map of Antarctica (Credit: International Polar Heritage Committee)

with these conditions can in some cases limit aspects of the work, but at the very least compliance demands extremely detailed planning and preparation.

The physical environment in Antarctica creates additional difficulties. The same harsh weather that accelerates the wear and tear on the structures also poses challenges (and some risk) for those engaged in the conservation work. Conservators can of course adapt to the discomfort of working in extreme weather conditions and living in primitive accommodation, but the limitations of such basic needs as fresh water and "portable energy sources" make the task of conservation very difficult. Safety also becomes an issue when the isolation of the site makes rescue difficult if not impossible.

For the purpose of illustrating these problems, this article focuses on a site in Antarctica.

Borchgrevink's huts – Cape Adare

Cape Adare lies at the western entrance to the Ross Sea. Further south, on Ross Island, can be found three other historic sites where the better-known explorers Robert F. Scott and Ernest Shackleton made their bases. These four sites date from the so-called "heroic era", a period generally regarded as being from 1889 until 1917.

Cape Adare is without doubt one of the world's most isolated historic places and where the first structures ever built on the Antarctic continent still stand. They were erected on the same rocky beach where, in 1895, the first documented landing on the continent took place. These two unique huts were built five years later by Norwegian Carsten Borchgrevink as his base for the

"British Antarctic ("Southern Cross") Expedition" - 1898-1900. This expedition became the first to winter-over on the Antarctic mainland. The two wooden structures, built side by side, were originally connected by an improvised annex.

This site is designated within the Antarctic Treaty System as an "Antarctic Specially Managed Area" (ASMA No. 159). It also embraces the ruins of the hut built later by Scott's Northern Party during the British Antarctic Expedition of 1910-13. Conservation of the site is being undertaken by Antarctic Heritage Trust (AHT), an international organisation based in New Zealand. The Trust is responsible for the three other sites in the Ross Sea region and has charitable status in several countries.

The flat shingle beach on which the huts are constructed is about 45 hectares in area and presented an appealing location for the early explorers. Unfortunately though, it is also an appealing site for penguins and now one of the greatest difficulties faced by conservators is that it is the location of the largest breeding colony of Adelie penguins in the world. From October to February each year, 500,000 pairs of Adelies converge on the beach to build nests that cover nearly every square metre of the site to form an almost impenetrable barrier. Like other wildlife on the frozen continent the penguins are protected and cannot be disturbed. Such a concentration of penguins also produces tons of guano which they deposit around the huts and over the many artefacts that now lie buried there.

Logistics

Cape Adare lies about 3,000 km south of New Zealand. It is almost another 1,000 km further south to Ross Island where the Antarctic bases and ice-runways of New Zealand and the USA are located. There are no suitable areas at Cape Adare to land a fixed wing aircraft and without a complex array of fuel depots, it is well out of range of helicopters.

The only practical option for access, therefore, is with ice-strengthened ships. Then the only realistic options depend either on assistance from US Coast Guard icebreakers (through international research programme agreements) or on the goodwill of Antarctic tour operators.

By mid summer the sea-ice has usually broken up enough to approach the Cape by boat. Even then, however, the use of zodiacs to shuttle workers, equipment, fuel and supplies through the drifting sea ice and strong currents remains difficult and often dangerous. After a successful landing it is still difficult to find a space to set up camp. By this time some of the earlier penguin chicks have fledged and begun to leave the beach and the density of birds slowly reduces, but tents must still be erected on a bed of penguin guano. Initial water supplies must be taken ashore until clean ice can be collected from some distance away.

Conservation techniques

The fabric of such Antarctic sites inevitably means conservation of a wide range of materials, and experience has shown that successful techniques in temperate climates can be ineffective in cold climates. Some techniques are simply impractical, especially procedures that require use of water or coatings that react badly to freezing temperatures. The situation is compounded by the fact that all such historic sites in Antarctica are within metres of the coast and its salt-laden atmosphere.

Planning

Getting a conservation party on site and providing them with the essential "life support" materials demands careful and complex planning. In many respects the planning of a conservation project is almost as complex as the expedition itself.

In any event initial planning needs to begin at least two years ahead of the intended work to ensure that the necessary transport is available. The most recent expedition during the summer of 2003 was to a large extent a scoping expedition and since then planning has continued for the next expedition which has no confirmed date. For 2003 the first requirement was to arrange access and with uncertainties about the availability of a US Coast Guard icebreaker, negotiation was required with a tour operator which had itineraries that might suit timing for putting in and picking up the work party. Fortunately, Quark expeditions were able and willing to cooperate, so the party was transported aboard their icebreaker "Kapitan Khlebnikov".

Once transport is confirmed, the employment of appropriate conservators can proceed. Conservators of course need a range of specialist equipment and materials so further detailed planning for these is essential because, once on site, the lack of a relatively minor item can quickly turn success into failure. Once in the field there is no prospect for delivering anything that has been forgotten so such oversights can mean not only a compromised project, but perhaps more seriously, compromised safety.



Cape Adare huts (Credit: Paul Chaplin)

Interior artefacts (Credit: Paul Chaplin)



Because of the complexity of access and on-site accommodation, conservation teams are necessarily small, but even a small team must have large amounts of equipment and provisions if it is to be safe for an extended period in the field. Living conditions in the field in Antarctica are seldom comfortable, but they must provide for adequate rest and shelter if the work programme is to be completed.

Other considerations

Weather. Cape Adare is renowned for its strong winds. Hurricane force winds can sweep in with little warning and not only make work impossible but make moving about the site dangerous. Twenty-four hour daylight does help maximise possible work periods during these summer months, but while temperatures can at times be above zero, the wind chill factor can be a severe limitation. Work parties in the past have also reported problems caused by wind driven salt spray that saturates tents and clothing.

Safety. Should an accident or illness occur that requires an emergency evacuation, this may only be possible with the cooperation of the Italian Antarctic programme and a long range helicopter from their base about 250 km further south.

Fire. Strangely enough, one of greatest risk factors in polar areas is fire. The atmosphere is generally very dry and many of the conservation materials involved are highly combustible. Conservation processes, as well as the comfort of conservators, often require some form of heating. Available forms of energy are limited it is not easy to create heat without some form of naked flame so extreme care is essential. Should a fire begin it could quickly become a disaster given the lack of water in liquid form.

Compliance. Legal constraints are created by the need to comply with the (New Zealand) Antarctic Environmental Protection Act 1994. This requires all on site work to be subject to one or more environmental impact assessments to ensure that the work involved will not have adverse effects on the environment or wildlife. To ensure this often demands compromises that would not become limitations in other parts of the globe.

There are also other compliance issues that govern the way in which different tasks must be carried out. New Zealand legislative constraints include the Resource Management Act 1991, The Building Act 1991, The Health and Safety in Employment Act 1992 and The Historic Places Act 1993, all of which dictate minimum standards of various kinds. Few of these pieces of legislation were enacted with any consideration for the unique and demanding conditions that must be faced when working in remote and difficult polar locations.

Causes of deterioration

In addition to the forgoing practical constraints that generate unique problems for work at such sites there are a range of physical factors that impact directly on the historic materials at the sites.

Wind. In addition to the effect that wind has on working conditions it contributes in no small way to the deterioration of historic materials. In winter the frequent hurricane force winds blast the

structures with wind-borne ice and stone particles causing abrasion and erosion of building materials. These extreme forces also place massive physical strains on the structures causing mechanical damage. Evidence of this is very visible at the nearby hut built in 1911 by Captain Scott's so-called Northern Party. This conventionally framed structure has now been reduced to ruins.

Biological decay. There is a popular belief that the freezing conditions prevent biological decay but this is far from the truth. Many forms of organism continue to function in sub-zero temperatures and when temperatures periodically rise above freezing during summer months, bacterial, fungal and other organisms flourish. This not only causes decay in the wooden structures, but in the many other materials that make up the huge variety of artefacts remaining in the huts.

Marine effects. The wind driven salt spray that causes comfort problems for work parties is also the cause of more serious problems for historic materials. Salt acts as a catalyst in the oxidation of all ferrous materials and this has become a major problem with iron fastenings and other components in the hut structure. The ferrous content of the artefacts within, such as food cans and implements, are also adversely affected.

Fluctuations in temperature and relative humidity. It is well known that the effect of temperature change, and in particular freeze/thaw cycles, can cause a breakdown of many materials. The site at Cape Adare is no exception as the wooden structure absorbs water from surrounding snow and ice as well as windborne salt water. The surface layers of the wood are then regularly subjected to freeze/thaw cycles causing mechanical breakdown of the fibres.

These ambient temperature changes are exacerbated by the effect of solar warming which is transmitted into the hut causing changes of internal relative humidity with subsequent problems of condensation and ice build up on items within.

Wildlife. As previously mentioned the constant presence of penguins during the short months of summer hinders work because the prescribed codes of conduct mean that wildlife cannot be disturbed. A greater problem however comes from the guano they deposit. When the original human occupants departed they left many of their stores around the huts and these have now been buried under a thick layer of guano. The same guano provides a fertile medium for bacteria and other organisms that attack historic materials.

Mawson's hut – Cape Denison

This article can only provide a summary of some of the special factors that impact on conservation in Antarctica, and to some extent in Arctic regions. It is by no means a complete overview of the conservation challenges posed in such places. With this in mind it should be noted that, while the historic site at Cape Adare is perhaps a more extreme example of risk factors that apply to such sites, it is by no means unique.

By way of providing a similar example of these problems, it is relevant to mention an equally difficult site built in 1912 by Sir Douglas Mawson for his "Australasian Antarctic Expedition (AAE) 1911-14". The huts he built remain at Cape Denison, in

Commonwealth Bay, over 1,000 km to the west of Cape Adare. Cape Denison has justifiably earned a reputation as "the windiest place on earth". In historic terms, Mawson's achievements were unfortunately overshadowed by the events surrounding Amundsen's and Scott's bids to be first to the South Pole, but he nevertheless left a very important legacy of scientific study and discovery in Antarctica. His former base at Cape Denison remains one of the most significant historic sites on the Antarctic continent.

The primary responsibility for this site lies with the Government of Australia which has vested the management of it in the Australian Antarctic Division (AAD). The Mawson's Hut Foundation, an independent agency, is the major source of funding for the conservation of the site which has a place on the Australian National Heritage List, as well as being listed within the Antarctic Treaty System as an "Antarctic Specially Protected Area" (ASPA No.162).

As with Cape Adare, the remoteness of Cape Denison, not only from Australia but from other Australian bases, creates major logistical constraints on planning and implementing conservation work. Virtually all the conservation problems that exist for the site at Cape Adare apply at Cape Denison and the majority of them apply in varying degrees at a range of other historic sites in the Antarctic.

These factors combine to make conservation of historic sites in Antarctica (and many heritage sites in the Arctic) considerably more challenging than conservation projects in less extreme climates. As a consequence, these unique polar historic sites often face greater risks than the majority of sites in more temperate regions.

Additional information about Cape Adare and the Borchgrevink expedition can be found at: www.norwaysforgottenexplorer.org/, and www.heritage-antarctica.org/index.cfm

More information on the Mawson's Hut site is available from: www.aad.gov.au/default.asp?casid=217, and www.mawsons-huts.org.au/

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Mawson's hut (Credit: Geoff Ashley)