

# Ecotourism in a pristine environment: A case study of South Georgia and Antarctica

Brian HARRISON

## Abstract

The region encompassed by South Georgia and Antarctica represents one of the last pristine wildernesses on the planet. In recent years, this area has attracted an ever-increasing number of ecotourists who wish to experience the nature at first hand. However, this also poses a potential threat to the delicate ecosystems that exist there.

Based on personal experiences and observations, conversations with well-informed experts, and a study of the relevant literature, this paper considers the reasons why people should wish to journey to such a remote location, the specific dangers that this presents to the environment, and the measures adopted to preserve the unique scenery, fauna and flora. It also examines what strategies have been taken to mitigate past damage to the environment, and assesses the current situation.

## Key Words

Antarctica, South Georgia, ecotourism, environmental conservation, invasive species

## Contents

Introduction

Tourism in Antarctica

Actions by governments and international organizations

Invasive species in South Georgia

Biosecurity in South Georgia and Antarctica

Other measures to protect the environment in South Georgia and Antarctica

Conclusion

## Introduction

In recent years there has been a boom in ecotourism in general, a main purpose of which is to enable people to witness the wonders of nature without causing any harm to the environment which they are observing. Unfortunately, it is becoming increasingly difficult to experience a true wilderness. Indeed, a study published in the prestigious journal *Nature* stated that outside of Antarctica, a full 77% of land and 87% of oceans had been modified by human intervention. (Cox 2018)

The reason for selecting ecotourism in Antarctica and South Georgia (a spectacular island located approximately halfway between, and to the east of, the Falkland Islands and Antarctica) as a subject for study is that due to the remoteness the region is a rare example of a completely pristine wilderness but is under threat from the ever-increasing numbers of tourists who visit there; for this reason, the environmental integrity of these areas is a matter of particular concern. Indeed, the manner of how tourism there is conducted is perhaps the most extreme case of ecotourism management in the world today.

## Tourism in Antarctica

First, it should be pointed out that the region is essentially uninhabited as nobody lives permanently in Antarctica, and that all tourism to the area is basically ecotourism. Tourism in Antarctica began with ship visits in the 1960s and sightseeing flights in the 1970s. However, the vast majority of tourists travel by ship, and their numbers have been increasing rapidly. Most tourists visit in the November-March summer tour season; this concentration in a limited time period thus increases the pressure on the environment. In 1999-2000 there were just under 15,000 visitors, but exactly a decade later the number had risen to over 37,000 (Wikipedia), and for the 2016-17 season was reported to have reached nearly 45,000. (Cool Antarctica) The attraction of such tourism is the opportunity to observe one of the world's last remote and almost-untouched wildernesses, and witness both the spectacular scenery of mountains and icebergs (in a BBC article, the Antarctic peninsula was described as the most spectacular landscape on earth: Amos 2017) and also the wildlife e.g. various species of penguins, seals, whales, albatrosses and a great variety of other bird species etc. Indeed, on a visit to the region I was able to observe no less than five different species of penguin (gentoo, rockhopper, king, Adelie and chinstrap penguins) and four types of seal (fur, elephant, Weddell and leopard seals), most in abundant numbers, as well as having the opportunity to watch an adult whale and a calf playing amongst the icebergs in the secluded waters of one of the bays.

In my personal opinion, even amongst the many sites with unbelievable scenery and wildlife, a few places are particularly noteworthy for their outstanding beauty e.g. Gold Harbour (South Georgia), Cuverville Island (Antarctic Peninsula) and Half Moon Island (South Shetland islands). In addition to the attractions of nature, there is also the appeal of visiting the sites associated with one of the most famous Antarctic explorers, Sir Ernest Shackleton.

Although it is these attractions that are drawing ever-increasing numbers of tourists to Antarctica, the competition between various operators has also led to some introducing gimmicks to further their appeal, such as enabling the visitors to go hiking and camping on the ice, as well as to participate in

such specialist activities such as mountaineering and snow-shoeing; a range of typical itineraries can be viewed on the websites of various travel agents (e.g. Journey Latin America). It goes without saying that there are no facilities such as hotels and restaurants anywhere on South Georgia or in Antarctica; tourists must sleep and eat on board ship. As mentioned earlier, there are no permanent residents there; on South Georgia in summer there are only a few people at the only settlement of Grytviken to look after the small museum and shop, plus a few staff who are temporarily based year-round at the nearby scientific research station belonging to the British Antarctic Survey team. The situation in Antarctica is similar.

A proposed visit to Antarctica is perhaps made even slightly more attractive by the fact that nobody of any nationality needs to obtain a visa for travel there. However, the holders of Japanese passports and foreign residents in Japan (irrespective of nationality) are legally required to formally register their proposed trip in advance with the Japanese government. (Ministry of the Environment, Japan) This includes a statement of the longitude and latitude of all sites that it is hoped to visit, even though this is in fact impossible as all proposed itineraries are necessarily vague because whether landings are made (or locations changed) depends on the local conditions of ice and wind etc. at the time. It has to be said that the purpose of such a legal obligation is unclear, particularly since there seem to be no penalties for non-compliance.

A number of expedition ships also visit the spectacular sub-Antarctic island of South Georgia. Like the mainland of Antarctica, the island is renowned for its magnificent scenery and abundance of wildlife, particularly penguins and seals. Colonies can be huge, with the penguin colony at Salisbury Plain numbering a few hundred thousand birds at just the one location. South Georgia is also important historically for two reasons. First, it was centre of the whaling industry that flourished in the early 1900s because of the need for oil, before being made redundant when the petrochemical industry began. Today tourists often view the remains of the whaling stations, but must be careful as they were constructed using large amounts of asbestos and are in danger in collapse. In order to assess the situation in the early 20th century and the impact on the region, the University of Cambridge planned to carry out a research project in various parts of South Georgia in February and March 2019. (South Georgia Heritage Trust, 2018)

In addition to being a major base for whaling, South Georgia is famous because of its connections with the famous explorer, Sir Ernest Shackleton. It was Shackleton who, during his ill-fated expedition of 1914-17, was stranded without apparent hope of rescue when his ship was crushed by the pack ice off mainland Antarctica, but then managed to travel with his crew to Elephant Island. While most crew members remained there, Shackleton and a few others somehow managed to navigate in a small boat to the distant shores of South Georgia and then cross the island over extremely hostile and uncharted terrain in order to raise the alarm. (Shackleton 1920) Shackleton was later buried on the island at Grytviken, with many tourists making the pilgrimage to visit his grave. His exploits, sometimes described as the greatest escape there has ever been, inspired the famous quote about some of the famous Antarctic explorers, which is generally attributed to Sir Raymond Priestly, a fellow Antarctic explorer, "For scientific discovery give me Scott; for speed and efficiency of travel give me Amundsen; but when disaster strikes and all hope is gone, get down on your knees and pray for Shackleton." (Priestly, date

unknown)

One danger caused by the tourism is that tourists may inadvertently bring in alien species (this is discussed later). An exacerbating factor of the human impact is that most of the tourism occurs during the limited summer period which unfortunately coincides with the breeding season for many birds; however, this is the only feasible time to visit due to the lack of daylight in the colder months plus the extent of ice. Erosion may also be a worry in places where many landings are made. These worries have increased in recent years because more tourists are now travelling in smaller ships which enable the tourists to make more landings on shore, and because the landings tend to be in the locations which are more accessible, picturesque and rich in wildlife; all of these factors create an increased density of potential harm. (Cool Antarctica) Most of the Antarctic visits occur at sites located in the so-called Antarctic Peninsula, which is the part of the continent closest to South America and which is a mountain chain 1,800 kilometres long; it has been described as “one of the most spectacular places on Earth”. (Fox 2012: 4-6)

There is, however, one aspect of the tourism that is to be welcomed with respect to the environment. The cost of visiting Antarctica can be prohibitive; consequently, the people who travel there tend to be relatively affluent. They are also more likely to be well educated than the average tourist elsewhere and thus be more aware of the damage they could cause to the environment. Additionally, they are likely to be receptive to ideas related to environmental conservation that may be pointed out by the ships' crews. (Cool Antarctica) On top of that, as I myself observed, the educational aspect is amplified by the presentation of numerous lectures given on board by environmental experts; this has the dual benefit of indicating what special care needs to be taken to avoid environmental harm and is also a means to entertain guests during days which are spent solely at sea when travelling between the various sites of natural or historical interest. (Brian Harrison, personal observation)

A further concern is that the commercial ships that carry the ecotourists may be the cause of an oil spill. This was a particular risk in the past when the visiting ships were large (carrying up to 500 passengers) and not ice-strengthened; however, this risk has now diminished as a result of the introduction of a new code of practice whereby firstly, only vessels with strong hulls that can withstand ice would be allowed to sail in the Antarctic (thus reducing the number of ships that are able to visit the region), and secondly, the decision to ban the carriage or use of the potentially badly-polluting heavy or intermediate fuel oil that used to be common. (Lilley 2009) A spillage of such fuel due to an accident etc. (which fortunately has not occurred) could cause devastating and potentially irrecoverable damage to the environment.

### Actions by governments and international organizations

Due to the many environmental concerns regarding tourism in Antarctica, several operators of tours to Antarctica in 1991 founded the International Association of Antarctica Tour Operators (IAATO), which now includes over 100 companies. While membership is voluntary, the organization effectively regulates all aspects of tourism in Antarctica with the aim of ensuring the highest possible environmental standards for their business, from how vessels should operate to staff/passenger ratios to site-specific activity guidelines. (IAATO) It should perhaps be pointed out that not everybody is completely

satisfied with this state of affairs. The Antarctic and Southern Ocean Coalition (ASOC) has been concerned about a possible conflict of interest whereby the tour operators may be tempted to place more emphasis on profits than on protecting the environment, and has called for greater supervision by key Antarctic states, noting that the importance of tourism regulation has been recognized by countries such as France and New Zealand. (ASOC, date unknown, a)

The activities of IAATO come within the range of the Antarctic Treaty which was signed in 1959 and came into effect two years later, and which aimed to set out internationally agreed measures to preserve the continent. One part of this treaty, referred to as the Environmental Protocol, covered environmental impact assessments, the protection of fauna and flora, and waste management etc., while also prohibiting mineral exploitation. (Antarctic Treaty 1959) While the treaty and protocol proscribe measures to protect the land mass of Antarctica, they do not cover protection of the oceans (except for measures introduced by IAATO for tourism-related activities).

The later Protocol on Environmental Protection was the result of increasing concern about the environment due to the expansion of tourism. Previously the continent had been protected by its remoteness and inaccessibility, but the rise in tourist numbers from the late 1980s onwards led to the Antarctic Treaty signees to develop the protocol, which came into force in 1998 and aims to govern all human activities in the region. It is regarded as one of the toughest acts of environmental regulation found anywhere in the world. (Shears 2012: 92-95) However, apart from the 2009 decision to prohibit ships using heavy oil, very little had been done before 2016 to protect the oceans around Antarctica, even though these have a great effect on some of the very things that attract ecotourists to the region. Let us therefore briefly consider these issues.

An initiative in 2016 was a decision to establish a relatively small nature sanctuary around the Ross Sea (Taylor 2018a), a move that has been generally recognized as successful. Since then more ambitious targets have been pursued.

In early 2018, a global campaign was launched to also designate a huge 1.8 million square kilometer area of the ocean surrounding Antarctica as a protected sanctuary for wildlife (Taylor 2018a); this would help to ensure that the ecosystem would be protected and that commercial fishing activities etc. would not disrupt the numbers of various species that make up the food chain, particularly by prohibiting the industrial-scale fishing of krill (a tiny shrimp-like crustacean that exists at the bottom of the Antarctic food web), which has been carried out on a large scale since the 1970s. In the Southern Ocean, one species known as Antarctic krill (meaning “young fry of fish” in Norwegian) forms an estimated biomass of more than 500 million tons, approximately twice that of humans; over half of this is consumed each year by whales, penguins, squid and fish, with the numbers replenished by growth and reproduction. The annual harvest of krill is about 150,000-200,000 tonnes, and is used for aquaculture and aquarium feeds, bait for sport fishing, and in the pharmaceutical industry. Without krill, the ecosystem of the Southern Ocean would collapse. (Silversea Expeditions 2017)

Historically, the krill industry has grown slowly but in recent times technological progress has accelerated the numbers of krill being caught. In 2010, for the first time ever, one area of the krill fishery had to be closed because the catch limit had been reached, with calls from partners in the Antarctic Krill Conservation Project for greater supervision of the industry, especially since ships tend to concen-

trate where the largest populations are located in any given year and predators are not always able to move to other areas. (ASOC, date unknown, b) Besides the effect of this widespread fishing, another reason the numbers of krill have been dropping for some time has been the effects of global warming, whereby the organisms that the krill feed on, which live on the underside of the ice, have disappeared as the ice melts. Another disturbing factor due to global warming concerns the distribution of krill in the oceans. In early 2019, it was found that the centre of krill distribution had moved (as had been predicted), and was about 440 kilometres closer to Antarctica, with serious implications both for the food web in the Southern Ocean and also the management of fisheries attempting to catch krill. Furthermore, the average size of krill was increasing, indicating the greater dominance of the population by older and larger creatures, resulting in a decline in the number of krill entering the population. (Amos 2019) Global warming has also had an effect on the location of wildlife. For example, the famous and highly respected naturalist Sir David Attenborough noted that whereas 30 or so years ago there were several Adelie penguin colonies along the coast of the Antarctic Peninsula, there are now only a few, suggesting that either they have starved or (perhaps more likely) moved further southwards to find cooler climes. (Attenborough 2011)

The falling stocks of krill have been decimating the availability of this food that many of the larger creatures rely on, so the prohibition of krill fishing would make sure that the abundant wildlife in the waters around Antarctica would continue to thrive, and in turn this should ensure the continued existence of the ecotourism industry. The campaign petition by the environmental group Greenpeace had attracted no less than 1.7 million signatures by June 2018, and in July 2018 the Association of Responsible Krill harvesting companies (ARK), which represents approximately 85% of the Antarctic krill fishing industry, announced that they would cease krill fishing and would support the introduction of a proposed huge sanctuary in the Weddell Sea. (Gabbatiss 2018; Marshall 2018) In addition to the protection of wildlife, it is believed that the measure would additionally play a key role in the fight against climate change as it would permit the removal of large amounts of carbon dioxide from the atmosphere because krill eat carbon-rich food near the surface and excrete it when they sink to lower water; this occurs at a much greater depth due to the very rapid rate of sinking in what are some of the coldest waters in the world. Various commentators hailed ARK's step as "visionary", and as one member of Greenpeace put it, "The momentum for protection of the Antarctic's waters and wildlife is snowballing". (Taylor 2018b)

The above action followed an appeal by the UK and EU to ban krill fishing in coastal zones around the Antarctic Peninsula (including the Weddell Sea), which was made in 2016 to the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR), an organization made up of 24 national governments and the European Union. The appeal aimed at implementing the cessation of operations in vast swathes of ocean around the Antarctic Peninsula from 2020, including "buffer zones" around breeding colonies of penguins. (Gabbatiss 2018; Taylor 2018b) Because of the strongly welcomed (but perhaps surprising) decision to ban krill fishing, there were extremely high expectations at the CCAMLR meeting in Hobart, Australia, in October and November 2018 that approval would be given to the proposal to create a huge marine sanctuary around Antarctica. Unfortunately, these great hopes for the meeting failed to materialize. The only positive news that appeared on the Commission website

at the end of the meeting was that some progress was made in that the Commission agreed the registration of seven new vulnerable marine ecosystems (VMEs), which were made up of four sites in the western Antarctic Peninsula and a further three in the South Orkney islands. However, regarding the main objective of establishing three massive new marine protected areas in East Antarctica, the Weddell Sea, and the western Antarctic Peninsula, the Commission merely stated that members would “continue to work intersessionally” on proposals to be considered again at a meeting in 2019. (CCAMLR 2018)

The proposal for a new sanctuary would have banned all commercial fishing in an area of 1.8 million square kilometres (an area 5 times the size of Germany). Although the proposal was supported by a petition signed by more than 2 million people, and received very strong backing from 22 out of the 25 members of the Commission, under Commission rules the proposal could only be adopted if there was unanimous agreement. The countries which blocked the agreement (Russia, China and Norway) were savagely criticized by a Greenpeace representative who condemned them for failing to argue on the basis of reasoned scientific grounds, making interventions that were “barely engaged with the science”, and merely killing available discussion time using wrecking amendments and filibusters. (Dalton 2018)

In further criticism, another environmentalist from Greenpeace said that despite clear scientific evidence, diplomatic efforts seemed to be concerned more with expanding fisheries than with conservation, in spite of the fact that scientists were clear that it is necessary to have marine sanctuaries covering at least 30% of the world’s oceans by 2030 in order to protect wildlife and ensure food security for billions of people, as well as to combat climate change. According to environmentalists, one of the few positive outcomes of the conference was the support by the UK government for such a proposal, which would be discussed later at a United Nations conference on biodiversity. (Taylor 2018c)

### Invasive species in South Georgia

In many areas of the world the introduction of non-native species is recognized as a problem since the creatures or organisms that are introduced, whether intentionally or by accident, can pose significant dangers to the pre-existing species. Once such invasion has taken place, it is often extremely difficult if not impossible to reverse the process. The introduction of such species is generally regarded as a serious conservation issue which is only becoming aggravated as a result of increased travel around the world. These problems are being further worsened as a result of climate change, with warming weather patterns enabling species to live outside areas they had previously been limited to by temperature concerns (e.g. the ability to survive cold winter temperatures).

Antarctica and South Georgia, due to their remoteness and hence relative lack of human interference, have had very limited experience with introduced non-native species, but it is necessary to always be vigilant (for the preventative measures currently employed, see the following section, “Biosecurity in South Georgia and Antarctica”). Nevertheless, problems with alien species have indeed occurred in South Georgia, both with the deliberate introduction of species (e.g. reindeer) and accidental introduction (e.g. rats). However, in both of these examples countermeasures have been possible, partly due to the island’s unique geography (see later).

The island is about 160 kilometres long, covering about 350,000 hectares, and is very mountainous,

with much of it covered in snow and ice. It is a place renowned for its wildlife, especially seals (it is the breeding ground for approximately 98% of the world's population of fur seals and around 50% of the global population of elephant seals), and four separate species of penguins (including about 450,000 breeding pairs of king penguins), all of which are classified as endangered. Approximately 30 million birds, consisting of 81 different species, are believed to nest and raise chicks on the island. (Harvey 2018)

The first major impact of humans in South Georgia came with the establishment of the sealing and whaling industries at a time when the potential problems of non-native species were not recognized. In the case of South Georgia, various animals were brought in either for food, working animals or pets. (Burton 2016: 50) These included cattle, sheep, horses, rabbits, and poultry. When the settlers left, though, these creatures failed to survive. One species that did survive, even thrived, after introduction were reindeer. They were brought in by settlers from Scandinavia, partly because they were a familiar form of animal but also because they provided a source of meat. Although only a small number were brought to South Georgia, they multiplied in the wild to number in the few thousands. (Luke Kenny, personal communication. Mr Kenny is a marine fisheries expert who was formerly based in these regions, and who also works on cruise vessels as a member of the expedition teams and whose duties include the delivery of lectures about the local environment.)

Unfortunately, the reindeer had a major impact on the native environment because they ate mainly grasses, and in winter would eat almost only tussock grasses. (Burton 2016:51-52) As a result of grazing and walking on such grass they caused considerable habitat damage to the underground burrows used for nesting by certain species of birds; the result was that these birds stopped nesting on the island. Finally, the government decided that action was necessary and carried out a total cull of the reindeer during 2013 and 2014. (Burton 2016:61)

A species that was introduced unintentionally, rats, came about as a result of the rodents escaping from ships that visited South Georgia. The rats would break and eat the eggs that were laid by the various bird species that nested on the island, and they would also eat the young chicks themselves (the birds had to nest on or just below the ground because there are no trees on South Georgia, and the chicks were attacked even though they were far larger than the rats). The rats had a devastating effect on the endemic bird population, e.g. pipits and pintails (the latter being a type of duck). Both of these, which basically only exist on South Georgia, almost completely disappeared, and in addition the population of burrowing petrels was greatly reduced. (Burton 2016: 60) In 2012, pipits were only found on about 20 rat-free offshore islands and those parts of the southern mainland that were isolated from the rat invasion by glaciers. (Burton & Croxall 2012: 108) To rectify the situation, the South Georgia Heritage Trust embarked on a campaign to eradicate rats completely, with a large-scale trial taking place in 2011, and subsequent expansion of the programme in later years. (Burton 2016: 60; and South Georgia Heritage Trust) (Note: a full description of the programme and how it was implemented can be found in the publication "Reclaiming South Georgia" by Tony Martin and Team Rat, published in 2016).

The plan was only feasible because of certain peculiarities of the island's geography. The island is separated into different regions by the numerous glaciers that come directly down to the sea; it was found that for some reason rats never crossed the glaciers. It was therefore possible for helicopters to

drop chemicals in the separate areas in turn in such a manner as to poison the rat populations but without too much collateral damage to the existing bird populations. The penguins and most seabirds tended to be unaffected by the poison because they generally do not feed on land and therefore would not eat the poison bait. (Burton & Croxall 2012: 20) Initial results were encouraging (it seems that some of the endemic birds that were displaced may be starting to return again, and the populations of birds that were negatively affected by the dropping of poison have started to rebound). I was told during a visit in late 2017 that operators of the programme were cautiously optimistic, with the project in the monitoring phase to check that all rodents have in fact been completely eradicated, as the survival of just a few could again threaten the environment; with the retreating of the glaciers due to global warming it is likely that the programme was implemented just in time – if glaciers retreated from the shoreline, it would provide a way for rats to spread into other areas that have not yet been affected. (Guide from the South Georgia Heritage Trust, December 2018, personal communication) The project did not always go smoothly, though. For example, there were occasions when the scientists believed they had completely cleared one area of rats only for them to return from another part of the island, thus requiring the poisoning to be carried out all over again. This indicates that a return of the rodents combined with a retreat of the glaciers could indeed be catastrophic for the native birdlife. (Harvey 2018) It should be emphasized that the retreat of the glaciers is quite marked, with a full 97% of the glaciers that terminate in the sea having retreated in the past 50 years, most by up to 500 metres, but in one case as much as 4.4 kilometres. (Burton & Croxall 2012: 21)

In order to follow international best practice, the team of exterminators were required to wait for two years before assessing the effects of their work. In late 2017 and early 2018, the team monitored over 1,500 sites using dogs that could smell rats from several metres away, and the dogs were walked for a combined total of more than 2,400 kilometres; traps were also laid. The monitoring was finally finished and the results announced in May 2018; at that time not a single rodent had been detected. (Amos 2018) It was a successful end to what had been the largest rat eradication project of its kind, costing \$14 million, taking place over ten years, and covering an area of 1,087 square kilometres in extremely inaccessible terrain. (Japan Times 2018) Although a small part of the cost was met by the UK government, most of the funding came from private fundraising (especially by the South Georgia Heritage Trust, who raised significant amounts of donations from tourists on passing cruise ships) and philanthropy. (Harvey 2018) It was noted that scientists hope that the success of the rat eradication mission could become a model for other projects around the globe to eliminate invasive species, and especially when those species could drive the native creatures nearly to extinction.

A further problem is that long-established non-native plants have spread following the eradication of reindeer, and more species have arrived. The government began a programme in 2014 to try to eliminate such plants. That is one reason why biosecurity measures for tourists have begun whereby tourists must ensure that they do not inadvertently bring seeds etc. on to the island. (Burton 2016:61)

The problem of invasive species has also affected large birds which roam over much greater distances than penguins etc., such as albatrosses and petrels. Because of this, discussions began in 1999 which led to the Agreement on the Conservation of Albatrosses and Petrels (ACAP), which was signed in 2001 and came into force in February 2004. By 2018, there were 13 member countries who covered

31 species of albatrosses, petrels and shearwaters. (ACAP, 2018) As with the other birds, the numbers of albatrosses have also been drastically reduced. Indeed, several types of albatross have been listed as critically endangered, endangered, or vulnerable by the International Union for the Conservation of Nature (IUCN). (Lowen 2011: 76) In 2015, the ACAP pointed out that the greatest threat facing albatrosses and petrels was related to fishing practices, but there were also dangers posed by introduced predators, diseases, habitat loss and human disturbance. (ACAP, 2015: 3) As stated, the principal threat is due to particular fishing methods that are fatal to the birds, with the problem enhanced because albatrosses take several years to begin nesting and produce very few chicks. (Burton 2016: 36) After high-sea drift nets were banned in 1993, fishermen began to use longlines of up to 130 km in length with up to 40,000 baited hooks. Unfortunately, these proved very attractive to albatrosses and other seabirds, who were caught on the hooks and then drowned; by early this century, with about 3 billion hooks set annually, it led to an estimated 300,000 birds dying each year (including 100,000 albatrosses). However, in the last few years some mitigation techniques (such as bird-scaring and line-weighting) have started to have an effect. (Lowen 2011: 18)

### Biosecurity in South Georgia and Antarctica

A primary aim of ecotourism is to protect and preserve the natural environment. This is perhaps most critical in areas which are the most pristine, with prime examples being places such as South Georgia and Antarctica. As mentioned in the previous section, the problem of invasive species is widespread, and one objective of ecotourism in such places ought to be the elimination or minimization of the risk of invasion by potential invasive species. Let us now consider how this aim might be implemented in practice.

In order to achieve this aim, rules were established to govern the conduct of commercial tourism in these areas. Firstly, all companies that wish to conduct tours in these sensitive areas are required to be members of IAATO (the International Association of Antarctica Tour Operators). (Burton 2016: 62) Visitors on vessels operated by these companies must adhere to all the rules that aim to avoid any adverse effects on the environment.

Before detailing the procedures involved, it is perhaps necessary to explain the process involved in making a landing in such places as South Georgia and Antarctica. In order to minimize the human impact there, no manmade landing facilities are permitted, with the sole exception of a few research stations. That means that the ships need to anchor offshore, and then visitors must initially transfer to small rubber boats known as zodiacs, which carry approximately ten people each. (As a further measure to protect the environment, no more than one hundred people are allowed onshore at a given location at one time.) The zodiacs then carry the passengers close to the shoreline; however, again, there are no manmade structures for the zodiacs to disembark their tourists, who are thus required to make so-called “wet landings”, whereby each person in turn gets out of the zodiac into the ocean and then wades the last few steps to land. This of course means that all visitors must equip themselves with insulated knee-high rubber boots. (Brian Harrison, personal observation)

Prior to the first landing in either South Georgia or Antarctica, tourists are required to undergo a strict examination of their clothing (especially any Velcro fastenings), rucksacks and camera bags by

trained experts to ensure that not even a single seed is inadvertently carried on to land where it could later cause an invasive species problem. (Brian Harrison, personal observation) Every time that a landing party disembarks the main ship, tourists must step into a tray of special disinfectant before stepping into the zodiac.

After the shore excursion is complete, the tourists are required to thoroughly scrub their footwear and overtrousers before re-boarding the zodiac. At the top of the gangway on to the main ship, they again must step into the tray of disinfectant before proceeding to the so-called “mud room”, where they again wash down and scrub their boots, followed by spraying them with more disinfectant. This procedure is repeated for every shore landing.

Besides commercial tourist ships, there are also ships delivering food and stores etc. to the research station on South Georgia at King Edward Point, close to the very small settlement at Grytviken. To avoid the accidental introduction of non-native species, the cargo of such ships is checked first on the Falkland Islands (usually the previous port of call) and again in a special biosecurity building after arrival.

### Other measures to protect the environment in South Georgia and Antarctica

Besides the possibility of invasion by non-native species, a further worry is whether the presence of humans could have an adverse effect on native birds etc. purely by their presence, even if all tourists went to great lengths to avoid disturbing the local wildlife. To address this potential problem, first, IAATO formulated a strictly-adhered-to rule in South Georgia and Antarctica whereby tourists may not approach closer than five metres of wildlife; however, should the wildlife (especially penguins) approach the people themselves (as often happens) then there is no need to back away. [In other sensitive locations outside the region where this rule does not apply, such as in the Falkland Islands, there is just the general guideline that tourists must back away if their presence seems to be disturbing the wildlife in any way]. While this rule was established for the purpose of protecting the wildlife, it should perhaps be added that in some cases it would also be advisable for tourists to observe the rule as a matter of personal safety. For instance, fur seals are known to be prone to becoming suddenly aggressive and may even charge at, and then bite, a perceived intruder.

However, even if people seem to be having no effect on local wildlife populations, it is nevertheless possible that the mere presence of humans could have adverse effects on the penguins in other ways, especially in matters related to breeding. In order to investigate this, a research project known as Penguin Lifelines was established using a platform called Zooniverse which allows ordinary members of the public to participate. When visiting a penguin colony, tourists are only allowed in certain areas of the penguin colony (who could be affected by the human presence) and prohibited from going beyond certain limits where there may be other members of the same species of penguins (who presumably would not be affected). A comparison of the two locations over an extended period of time could then indicate whether the human presence was in fact disturbing the birds, and hence possibly affecting the number of eggs produced and the viability of the chicks. (Luke Kenny, personal communication)

To carry out this monitoring, cameras were set up in a wide range of locations and remotely programmed to take regular photographs at each site (perhaps once a day, and possibly more during

the breeding season). To count the number of penguins at each location each day over a period of years is of course a laborious if not almost impossible task. For this reason, a website was set up (penguinwatch.com) and volunteers encouraged to log on and perform counts, the idea being to eventually “train” the computers to recognize what are penguins (i.e. to distinguish them from other things such as rocks) so that the work can be performed by computers alone in the future. (Luke Kenny, personal communication)

Some bird sites are particularly sensitive, such as Prion Island, where wandering albatrosses nest. Here, some manmade structures were in fact allowed, but limited to the construction of a boardwalk in 2006, so that visitors could see the wildlife without causing any habitat damage. (Burton 2016: 63)

Unrestricted wandering on the part of tourists over native grasses, mosses and lichens is not permitted as it could potentially be extremely harmful. In such a cold environment, the growth of vegetation occurs only very slowly, and even one footprint can cause damage that could last for decades. (ASOC, date unknown, a) Additionally, it is possible that walking on the tussock grass could cause the collapse of the underground burrows that certain species of bird use for nesting.

Human presence can actually have a further impact. It has been found that the approach of humans can cause the heart rates of birds to increase by 20-100%. This might even lead to adult birds abandoning their nests, with predators then having the chance to attack the bird chicks. (ASOC, date unknown, c) This emphasizes the need for both further monitoring the situation and strictly controlling the numbers of visitors and where they are allowed to walk.

## Conclusion

The southerly region in which South Georgia and Antarctica are located is experiencing an increasing threat to the stability of the existing ecosystems due to the growing popularity of ecotours to the region as well as the pressures caused by commercial fishing practices. However, the potential threat was realized many years ago (as far back as the late 1950s), which allowed governments to put into place various measures that would help to conserve the environment.

Later tourist growth has posed further potential problems, but the establishment of international treaties and protocols, together with the founding of organizations such as IAATO, has led to an optimistic situation whereby the ecosystems may be protected while still permitting the visits by ecotourists. In addition, the establishment of the South Georgia Heritage Trust has enabled the mitigation of past environmental damage caused by less-enlightened human activity. Steps that have been taken in recent years, such as the banning of krill fishing and establishment of wildlife sanctuaries, further indicate that international awareness of the uniqueness of the Antarctic region is growing. Although it may be prudent not to permit significant further growth in tourism in the region, the present situation bodes well for the future.

## References

- ACAP (Agreement on the Conservation of Albatrosses and Petrels). (2018). *Welcome to ACAP*. Available at <https://www.acap.aq> Accessed 2 January, 2019.
- ACAP (Agreement on the Conservation of Albatrosses and Petrels). (2015). *Achievements in the first ten years 2004-*

2014. Available at <https://www.acap.aq/all-the-docs/misc-docs/2590-achievements-in-the-first-ten-years-2004-2014/file?lang=en> Accessed 2 January, 2019.
- Amos J. (2017). *Mt Hope installed as 'UK'S highest peak'*. BBC. 11 December, 2017. Available at <http://www.bbc.com/news/science-environment-42238262>. Accessed 6 February, 2018.
- Amos J. (2018). *Rats driven from South Georgia's wildlife paradise*. BBC. 9 May, 2018. Available at <http://www.bbc.com/news/science-environment-44046472>. Accessed 10 May, 2018.
- Amos J. (2019). *Antarctic krill: Key food source moves south*. BBC. 21 January, 2019. Available at <https://www.bbc.com/news/science-environment-46953652>. Accessed 28 January 2019.
- Antarctic and Southern Ocean Coalition. (Date unknown). *Environmental protection: Antarctic tourism*. Available at <https://www.asoc.org/advocacy/antarctic-environmental-protection/antarctic-tourism> Accessed 6 February, 2018.
- Antarctic Treaty. (1959). *The Environmental Protocol*. Available at [http://www.ats.aq/index\\_e.htm](http://www.ats.aq/index_e.htm) Accessed 6 February, 2018.
- ASOC (Antarctic and Southern Ocean Coalition). (Date unknown, a) *Antarctic tourism*. Available at <https://www.asoc.org/advocacy/antarctic-environmental-protection/antarctic-tourism> Accessed 2 January, 2019.
- ASOC (Antarctic and Southern Ocean Coalition). (Date unknown, b) *Krill conservation*. Available at <https://www.asoc.org/advocacy/krill-conservation> Accessed 2 January, 2019.
- ASOC (Antarctic and Southern Ocean Coalition). (Date unknown, c) *Know before you go*. Available at [https://www.asoc.org/storage/documents/tourism/ASOC\\_Know\\_Before\\_You\\_Go\\_tourist\\_pamphlet\\_2009\\_editionv2.pdf](https://www.asoc.org/storage/documents/tourism/ASOC_Know_Before_You_Go_tourist_pamphlet_2009_editionv2.pdf) Accessed 2 January, 2019.
- Attenborough D. (2011). *Frozen planet*. (Episode 7 = "On thin ice") DVD. BBC. Original broadcast 7 December, 2011.
- Burton R. (2016) *South Georgia*. The Government of South Georgia and the South Sandwich Islands.
- Burton R and Croxall J. (2012). *A field guide to the wildlife of South Georgia*. Princeton University Press.
- CCAMLR (Commission for the Conservation of Antarctic Marine Living Resources). (2018) *Meeting of Antarctic experts comes to a close*. Available at <https://www.ccamlr.org/en/news/2018/meeting-antarctic-experts-comes-close> Accessed 3 November 2018.
- Cool Antarctica. *Human impacts on Antarctica – threats to the environment: Tourism*. Available at [https://www.cool-antarctica.com/Antarctica%20fact%20file/science/threats\\_tourism.php](https://www.cool-antarctica.com/Antarctica%20fact%20file/science/threats_tourism.php) Accessed 7 February, 2018.
- Cox L. Five countries hold 70% of world's last wildernesses, map reveals. *The Guardian*. 31 October, 2018. Available at <https://www.theguardian.com/environment/2018/oct/31/five-countries-hold-70-of-worlds-last-wildernesses-map-reveals> Accessed 1 November, 2018.
- Dalton J. (2018). Fury as China Russia and Norway block landmark Antarctic ocean sanctuary plan. *The Independent*. 2 November, 2018. Available at <https://www.independent.co.uk/environment/antarctic-ocean-sanctuary-china-russia-norway-block-wildlife-greenpeace-hobart-tasmania-whales-a8615431.html> accessed 3 November, 2018.
- Fox A. (2012). "The introduction" and "The Peninsula". In: Fox A (editor). *Antarctic Peninsula: A visitor's guide*. London: Natural History Museum.
- Gabbatiss J. (2018). Krill fishing industry backs massive Antarctic ocean sanctuary to protect penguins, seals and whales. *The Independent*. 10 July 2018. Available at <https://www.independent.co.uk/environment/antarctica-krill-fishing-industry-marine-protected-zone-greenpeace-whales-seals-penguins-a8439311.html> Accessed 10 July

2018.

- Harvey F. (2018). South Georgia declared rat-free after centuries of rodent devastation. *The Guardian*. 9 May 2018. Available at <https://www.theguardian.com/environment/2018/may/09/south-georgia-declared-rat-free-centuries-rodent-devastation> Accessed 15 May 2018.
- IAATO (the International Association of Antarctica Tour Operators). (Date unknown). *What is IAATO?* Available at <https://iaato.org/what-is-iaato> Accessed 6 February 2018.
- Japan Times. (2018). Invasive rats that devastated birds on South Georgia island eradicated after two centuries. *Japan Times*. 10 May 2018. Available at <http://www.japantimes.co.jp/news/2018/05/10/world/science-health-world/invasive-rats-devastated-birds-south-georgia-island-eradicated-two-centuries/#.WvpwWtuB1Bw> Accessed 15 May 2018.
- Journey Latin America. (Date unknown). Antarctica. Available at <https://www.journeylatinamerica.co.uk/destinations/antarctica> Accessed 6 February, 2018.
- Lilley R. (2009). Antarctic nations plan tough new shipping controls. *The Independent*. 12 December 2009. Available at <http://www.independent.co.uk/environment/nature/antarctic-nations-plan-tough-new-shipping-controls-1838967.html> Accessed February 22, 2018.
- Lowen J. (2011). *Antarctic wildlife*. Hampshire, UK: WildGuides.
- Marshall C. (2018). *Krill companies stop Antarctic fishing*. BBC. 10 July 2018. Available at <https://www.bbc.com/news/science-environment-44771943> Accessed 10 July 2018.
- Ministry of the Environment, Japan. (Date unknown). *Nankyoku chiiki no kankyō no hogo ni kansuru houritsu no seitei nit suite* (The establishment of the law concerning the protection of the environment in Antarctic regions). Available at <https://www.env.go.jp/nature/nankyoku/nankyo0.html> Accessed 11 November, 2017. (in Japanese)
- Priestly R. (Date unknown). Available at [https://en.wikiquote.org/wiki/Ernest\\_Shackleton](https://en.wikiquote.org/wiki/Ernest_Shackleton) Accessed 6 February, 2018.
- Shackleton E. (1920). *South!: The story of Shackleton's last expedition 1914-1917*. Reprinted by American History Classics, 2017.
- Silversea Expeditions. (2017). *Krill. Silversea Expeditions Chronicle*. 22 December 22, 2017.
- Shears J. (2012). The Antarctic Treaty. In: Fox A (editor). *Antarctic Peninsula: A visitor's guide*. London: Natural History Museum
- South Georgia Heritage Trust. (Date unknown). *Habitat restoration*. Available at <http://www.sghtonline.gs/Habitat-Restoration/> Accessed 6 February, 2018.
- South Georgia Heritage Trust. (2018). The South Georgia Archaeological Project. Available at <https://www.sght.org/sealing-archaeological-project> Accessed 30 November, 2018.
- Taylor M. (2018a). World's biggest wildlife reserve planned for Antarctica in global campaign. *The Guardian* 13 January, 2018. Available at <https://www.theguardian.com/environment/2018/jan/13/worlds-biggest-wildlife-reserve-planned-for-antarctica-in-global-campaign> Accessed 7 February, 2018.
- Taylor M. (2018b). Krill fishing firms back Antarctic ocean sanctuary. *The Guardian*. 9 July 2018. Available at <https://www.theguardian.com/environment/2018/jul/09/krill-fishing-firms-back-antarctic-ocean-sanctuary> Accessed 10 July 2018.
- Taylor M. (2018c). Antarctic's future in doubt after plan for world's biggest marine reserve is blocked. *The Guardian*. 2 November, 2018. Available at <https://www.theguardian.com/world/2018/nov/02/plan-create->

worlds-biggest-nature-reserve-antarctic-rejected Accessed 3 November, 2018.

Wikipedia. Tourism in Antarctica. (Date unknown). Available at [https://en.wikipedia.org/wiki/Tourism\\_in\\_Antarctica](https://en.wikipedia.org/wiki/Tourism_in_Antarctica) Accessed February 6th, 2018.