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Site Guidelines Analysis

Site Guidelines Analysis

IAATO commissioned a paper with a view to look at a "5-year preliminary analysis of Antarctic Peninsula site landing data" in order to further understand the frequency and intensity of tourist ship visits. Included in this submission is the paper itself and the Executive Summary of this paper and the paper itself as Appendix A (**Towards Site Guidelines: A Preliminary Analysis of Antarctic Peninsula Site Landing Data, 1999/00 – 2003/04).** Both the Executive Summary and the paper itself conclude with recommendations and suggestions for future work. The actual paper has color graphs and charts and it is recommended to print on a color printer for better results. IAATO understands that the ATCM papers are in black and while however those interested in color copies can print at their actual offices.

Note *The following paper is being submitted for publication: at present no reproduction without the permission of IAATO is requested.

Towards Site Guidelines: A Preliminary Analysis of Antarctic Peninsula Site Landing Data, 1999/00 – 2003/04.

Kim Crosbie
Commissioned by the International Association of Antarctica Tour Operators (IAATO).

Executive Summary

Introduction

Since 1989 there has been a steady increase in the number of visitors to the Antarctic Peninsula, the number of sites visited, and the frequency of landings being made, particularly at the most popular visitor sites. Tourist activity, as with scientific activity, often coincides with areas of high breeding activity particularly in the Antarctic Peninsula causing concern over potential disturbance. To date studies have concentrated primarily on seabird species, however, seabird populations are known to fluctuate widely from many causes, and given the dynamic nature of ecosystems, there remain many lacunae in our knowledge of the cumulative effects of human disturbance on Antarctic biota.

Acknowledging this lack of information but aware of the need to take stringent steps to limit any potential for cumulative impact IAATO (in addition to a long running series of other conservation and visitor management measures) established and implemented site-specific guidelines in 2003. In the same year, at ATCM XXVI, the UKUnited Kingdom first tabled a set of site guidelines which were re-tabled at ATCM XXVII in 2004, and will be again at ATCM XXVIII.

Aim

The aim of this paper is threefold:

1. To provide a preliminary analysis of trends in Antarctic tourism up to 2003/04 season, particularly in relation to use of the most heavily visited sites, focusing on the period subsequent to that covered by Naveen *et al.*, 2001.
2. To offer a preliminary assessment of the use and validity of the IAATO site guidelines (ATCM XXVI IP72) and those put forward by the U.K. United Kingdom Foreign Office (ATCM XXVI WP26); and

3. To put forward points for discussion regarding the way forward for effective and acceptable site guidelines.

The Data Set

All data are based on information compiled by IAATO and the United States National Science Foundation, in which ATCM Post Visit Site Report Forms (*Part 1, Expedition Record, and Part 2, Site Visit Record*) were used as a source. These forms, developed by NSF and IAATO, have been adopted and approved by the Antarctic Treaty Parties. The data was originally maintained by NSF and IAATO. Since 2003, the data are entirely collected and collated by IAATO.

The data used for this analysis were extracted for trips to the Peninsula area and only included those ships that made landings, focusing only on Zodiac landings.

Some of the data need to be interpreted with caution prior to 2001 as the forms required standardisation. Furthermore, as much of the data were entered by hand into a database only certain elements of the information are available. As of 2003 IAATO also took over the management and maintenance of the data. This is now all computerised, creating an interactive data base which commenced with the 2003/04 season.

Trend Analysis

Analysis of the data looked at the following:

- trends in the five main growth variables (number of ships, passengers, voyages, landings made and sites used) to assess how activity has varied in the last five years in comparison to the previous 10 years and how the different growth variables relate to each other.
- An assessment of site use, selecting 15 of the most heavily visited sites on the basis of number of visits, on the basis of inter and intra seasonal use. The latter focused on variations in seasonality and daily activity before concentrating on how to define a visit in terms of number of people landed and time spent ashore.

The following conclusions were reached:

- While most growth variables have increased appreciably in the five seasons from 1999/00 to 2003/04 there has been no notable increase in the number of sites used.

- Although both number of passengers and number of landings increased between 1989/90 and 2003/04, there was a marked drop in the ratio of passengers per landing during the 1990's which only started to increase during the last season under consideration (2003/04).

- Consistent with previous studies the landings are still concentrated on a small number of sites. Of these most landed at sites, there has been a perceivable increase in activity at all of them, but some sites have seen a proportionately greater increase than others.

- Seasonality continues to impose restrictions and as yet these have not been affected by increases in the growth variables.

- There has been an increase in the number of multiple visits per day, in particular during the last season under review, 2003/04.

- Data for 2003/04 showed that the multiple visits were also concentrated at a few specific sites, broadly similar, but not identical to, those receiving the most number of landings for the same period.

- During 2003/04, five of the fifteen selected sites received visits on approximately two thirds of days during the peak season (1 December to end of February), four sites received visits on half of the days and six sites on around a quarter of the days.

- Defining single and multiple visits on the basis of number of people ashore, it was found that the number of landings made gave no indication of the number of people landed.

- There was, however, a proportional increase in the number of landings made and the time spent ashore.

- Intensity, if measured in number of people and/or time spent ashore, varied hugely between visits. Assessment of the relationship between the number of people ashore and time spent ashore indicated weak or moderate correlations. This means that the amount of time spent ashore does not necessarily relate to the number of people ashore, implying that different uses of the sites are taking place.

The above data supports the widely held contention that there is need for site guidelines at specific sites to ensure that the increased level of activity maintains only a less than minor or transitory impact, particularly if the increases continue.

Site Guidelines

An assessment was made of both the IAATO and U.K. United Kingdom site guidelines identifying weaknesses and strengths. These are summarised below:

IAATO Site Guidelines: Strengths

1. The introduction of the category classification has been a successful, efficient way of limiting traffic at different sites; confining heavy use to sites perceived to be able to cope with heavy visitation.
2. Within the categorising classification they also identify sites with perceived varying sensitivity and acknowledge that site sensitivity might vary through the season.
3. They include safety information in addition to environmental information.
4. They have the capacity to accommodate changes through the season if they are observed.
5. Being industry written and promoted they presumably automatically have the backing and support of the field personnel, so will be followed and certainly are more susceptible to peer pressure for ensuring compliance.
6. They are in an accessible format making quick reference possible for field personnel under pressure. The intention being that they are used in conjunction

with Naveen's Compendium of Antarctic Peninsula Visitor Sites (2003) to provide further descriptions if necessary.

7. They provide a degree of control for a large number of sites (32) which experience different levels of visitation.
8. They were specifically intended to compliment IAATO's existing mandatory codes of conduct and operating procedures and not used in isolation.

IAATO Site Guidelines - weaknesses:

1. The guidelines are based on the assumption that the Expedition Leaders (EL's) know the site in advance of landing passengers.
2. They assume that the EL's have the required knowledge to be able to translate the recommendations into sound environmental practice (for example, using phrases such as be 'extra sensitive', 'beware', 'exercise caution').
3. Beyond the PVR's and word of mouth there is no way of checking to confirm that the guidelines are followed.
4. The mechanism for feedback from field personnel has yet to needs tocould be formalised but works on an ad hoc basis.
5. There is no pressure for non IAATO operators to follow these guidelines.

U.K. United Kingdom Site Guidelines – Strengths:

1. They provide a written overview of the site under consideration.
2. Suggests, and gives details of walking routes, identifies sensitive areas and specifies distances which should be maintained from perceived sensitive species.
3. Sketch maps assist in the interpretation of the written material and identify landing points.
4. Similar to the IAATO guidelines, they have classified the sites in terms of ship size and sensitivity categorisation.
5. Parties would require adherence to the size of ship, number of passengers ashore etc by all users in cases where permits or authorization is required.
6. The Committee for Environmental Protection would be asked to reviewing and monitor the effectiveness of the site guidelines.

U.K. United Kingdom Site Guidelines – Weaknesses:

1. Limitations based on hours alone make no allowance for the form and level of activity taking place. (e.g., 2-3 small vessels visiting a site for a total of 6 hours might place less than 100 people ashore for most of a day wandering at leisure over a larger area of the site, whereas a single larger ship could land up to 500 passengers in the same period of time and have them restricted to a smaller area).
2. By installing time limits there is an increased likelihood that the 'excess' activity or use would be pushed to otherwise less visited sites, creating increased pressure at more sites.
3. Time limits create the potential for increased disturbance as landings are 'rushed' in order to complete the activities in the time available.
4. Hour limitations would be extremely difficult to implement in the field and difficult to regulate.
5. By over emphasising practices which should be standard procedures for *all* shore landings (e.g. maintaining a minimum distance of 5m from wildlife, avoiding skua and tern nesting areas, and Antarctic fur seals) important site specific points for visitor management can be weakened or lost.
6. It is unclear to what extent the industry is able to offer feedback.

Discussion

The two site guidelines are similar in aim and approach with the exception of the introduction of time limitations imposed in the U.K.United Kingdom version.

Concerns over visitor use in wilderness areas are not new phenomena. For many years the concept of carrying capacity was perceived as fundamental in natural resource and environmental management. Carrying capacity, as with time limits, can be defined as the perceived maximum level of use that an area can sustain without succumbing to a degree of change that is perceived as unacceptable.

Increasingly, however, it is acknowledged that the dynamic nature of ecosystems makes a static determination of carrying capacity difficult, if not impossible, to calculate Furthermore, time limits make no allowances for different people using wilderness areas in different ways – and each use or activity has a different effect, resulting in different carrying capacity and different time limitations.

Imposing time limitations implies a strong cause and effect relationship between the amount of use an area receives and subsequent impact. Many studies have shown that intensity is a poor predictor of total impact. While the season, location and type of use involved are frequently more important in explaining effects.

Taking this one step further, time limitations have the other shortcoming in that they counter the accepted concept that it is preferable to concentrate the activity rather than disperse over a wider area. Time limits create the potential to disperse activity to other more sensitive sites, possibly causing more long term harm.

Considering that tourism in Antarctica is taking place against a backdrop of environmental fluctuation, against which a single cause and effect will be virtually impossible to measure, determining cause and likelihood of impact involves primarily subjective value judgement. That these judgements are subjective is accepted practice for visitor management in wilderness areas (Hendee *et al.*, 1990) but begs the need for consensus and agreement between all users. To that end, guidelines and limitations must be both environmentally sound and practical to operate.

It would therefore appear that a more successful use of site guidelines as an approach visitor management would be to concentrate efforts on defining and managing activities at individual sites, imposing strict limitations on those sites perceived to be highly sensitive and identifying those sites which are best suited for concentrating activity.

Recommendations

Acknowledging the context of the dynamic nature of the ecosystem in which these activities are taking place, and that external environmental factors need to be taking into consideration when analysing for cumulative impact, Tthe following recommendations are made:

- Combine the two guidelines for one single, informative source of information detailing possible and preferred activities for an individual site.
- Limitations and guidelines are strictly site specific.

- In addition to the categorisation labels and the site sensitivity labels, define which sites can cope with concentrated activity – taking into account those sites already experience such activity.
- Remove the concept of standard time limitations from all sites, but identify those sites which require particular care, and set limitations which are specific to that site (e.g. at IAATO category 1 high sensitivity sites[1], only recommend two ship landings per day with a possible option of no landings until after peak egg laying, for example 10 December, define the visiting area with easily identifiable topographical features and detail walking routes)
- Conduct a full assessment of landing site use in terms of number of landings / passengers / hours ashore on an annual basis and use this to identify whether amendments or additional site guidelines for specific sites are required.
- Formalise a feedback mechanism for the site guidelines so field personnel can react and amend / improve on site guidelines during and after each season if necessary.
- Develop a form of accountability for EL's and companies to be encouraged to maintain good practise – ultimately this could be tied to an accreditation scheme.
- Amend IAATO's requirement of 75% previous Antarctic experience to 75% previous Antarctic experience including 50% with previous Antarctic cruise ship experience.
- Encourage appropriate research and monitoring into the understanding of environmental fluxes in the context of both the presence and absence of human activities.

[1] Hannah Point, Paulet Island, Aitcho Island, Penguin Island, Gourdin Island.

Towards Site Guidelines: A Preliminary Analysis of Antarctic Peninsula Site Landing Data, 1999/00 – 2003/04.

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Commissioned by the International Association of Antarctica Tour Operators (IAATO).

Introduction

Since 1989 there has been a steady increase in the number of visitors to the Antarctic Peninsula, the number of sites visited, and the frequency of landings being made, particularly at the most popular visitor sites. The juxtaposition of high density breeding areas and a concentration of human activity at specific points throughout the Antarctic has, inevitably, provoked concern over ecological disturbance (*e.g.* Stonehouse, 1965; Harper *et al.*, 1984; Young, 1990; Peter, 1996; Giese, 1996; Davis, 1998; SCAR & COMNAP, 2000). Most of the Antarctic biota are in coastal locations, with the highest densities located in the Antarctic Peninsula. Such ice-free coastal areas are the sites most accessible for scientists to establish research stations, and for shipborne tourists to go ashore. Some 36 of a total of the 73 permanent and summer-only Antarctic scientific research stations are found within the Peninsula region, and over 95% of shipborne tourist visits are made to this sector.

Studies assessing visitor disturbance to the Antarctic environment have concentrated primarily on seabird species (e.g. Culik *et al.*, 1990; Wilson *et al.*, 1991; Woehler *et al.*, 1994; Culik and Wilson, 1995; Nimon and Stonehouse, 1995; Nimon *et al.,* 1995, 1996; Fraser and Patterson, 1997; Crosbie, 1998; Cobley and Shears, 1999) with little work having been completed on other wildlife species. This is because many of the human activities occur in the vicinity of seabird breeding locations (far more than is the case with marine mammals), and because seabird species are readily apparent and therefore relatively easy to study. However, seabird numbers are known to fluctuate widely from many causes, so there remain many lacunae in our knowledge of the cumulative effects of human disturbance on Antarctic biota (Emslie, 1997; De Poorter and Dalziell, 1997).

Assessment is further complicated by the dynamic nature of ecosystems. It has been argued that the Antarctic and Southern Ocean ecosystems are still adjusting to the major biological perturbation caused by whaling and sealing (Bonner 1987; Knox 1994). While an increase of nearly 3°C in average annual temperature in Antarctic Peninsula temperatures since the 1940's appears to be causing the disintegration of ice shelves and

affecting the success and distribution of certain species (Fraser and Patterson, 1997; Vaughan *et al*, 2001). In this setting, the problem of isolating single, human induced causes and effects is complex, particularly when such changes are subtle or cumulative.

With a view to the environmental complexities and uncertainty over potential tourist impact, since 1991 the International Association of Antarctica Tour Operators (IAATO) has been developing a strategic approach to address the growth in the tourism industry. In addition, a number of limitations were put in place in order to ensure that its members practise safe and environmentally sound tourism (detailed in ATCM XXV IP 72 Guidelines for Tourist Operations in Antarctica). IAATO has made considerable efforts to understand, identify and examine the potential cumulative impacts of tourism in Antarctica. Workshops were held at the Airlie Conference Centre in 1996 and in San Diego in June 2000 (Cumulative Impacts Workshop sponsored by IAATO, the United States National Science Foundation and the United States Environmental Protection Agency).

In the paper, *'Zodiac landings by tourist ships in the Antarctic Peninsula Region, 1989-99'*, Naveen *et al.,* 2001 highlights that 165 sites in the Antarctic Peninsula Region have been visited by tourists. For most of these sites the rate of visitation is so low that the existing Recommendation XVIII-1 (Guidance for Visitors to the Antarctic and Guidance for those Organizing and Conducting Tourism and Non-Governmental Activities), IAATO Bylaws and operating procedures are believed to be sufficient to ensure protection and compliance with the Environmental Protocol. However, Naveen *et al.* also confirmed that only a few sites were receiving the majority of the visits, stating that between 1989/90 and 1998/99 only 10 sites absorbed 55% of all small boat landings made in the region; while a total of twenty sites accounted for 75% of all small boat landings (Naveen *et al.* 2001).

Subsequent to the publishing of Naveen's paper, Antarctic tourism has continued to increase. And while the measures and limitations introduced by IAATO in the 1990's have been effective most of them were initiated when Antarctic tourism was still limited to fewer and smaller expedition vessels. Thus, in 2003, IAATO established site-specific guidelines as work-in-progress to address the foreseeable growth in the tourism industry (ATCM XXVI IP 72) and to further address potential cumulative impacts. In the same year at ATCM XXVI, the United Kingdom first tabled a set of site guidelines based on

Naveen's work and although these were re-tabled at ATCM XXVII in 2004 (WP 031), they have yet to be formally adopted (ATCM XXVI WP 26; ATCM XXVII WP 26). Nevertheless, these United Kingdom Site Guidelines were accepted on a trial basis by IAATO during the 2003/04 and 2004/05 season.

Aim

The aim of this paper is threefold:

4. To provide a preliminary analysis of trends in Antarctic tourism up to 2003/04 season, particularly in relation to use of the most heavily visited sites, focusing on the period subsequent to that covered by Naveen *et al.*, 2001.
5. To offer a preliminary assessment of the use and validity of the IAATO site guidelines and those put forward by the United Kingdom; and
6. To put forward points for discussion regarding the way forward for effective and acceptable site guidelines.

Trends in number of landings and passengers in the last 15 years

Trends in the Antarctic cruise industry's growth variables (number of passengers, number of ships, number of voyages, number of landings made and number of sites used) during the past 15 years reveal patterns of use which can assist in identifying the best way forward in working towards the most effective and practical site guidelines.

Throughout the last 15 years the industry has gone through several stages of growth. The initial stage was that of the preliminary expedition cruises such as those operated onboard *Explorer*, *World Discoverer*, *Bremen*, *Hanseatic* etc. Following the availability of the small capacity Russian ice-strengthened vessels at competitive prices the industry entered a new phase with a rapid increase in the number of vessels and a trend towards shorter trips and more landings with fewer passengers. More recently the trend has shifted towards an increase in the number of larger vessels (200-500 passenger capacity) offering a more traditional form of cruising with an element of expedition orientated activities where more passengers make fewer landings. In addition an increasing number of considerably larger vessels (c. 1000 passengers) offer cruise only, no landing, programme.

Naveen *et al.* 2001 offer a detailed analysis of the five growth variables for the ten years from 1989/90 to 1998/99. Thus for the purposes of this analysis the emphasis is on the subsequent five seasons (1999/2000 to 2003/04), while setting them in context of the previous ten years.

The Data Set

All data are based on information compiled by IAATO and the United States National Science Foundation, in which ATCM Post Visit Site Report Forms (*Part 1, Expedition Record, and Part 2, Site Visit Record*) were used as a source. These forms, developed by NSF and IAATO, have been adopted and approved by the Antarctic Treaty Parties. The database was originally maintained by NSF and IAATO. Since 2003, the data are entirely collected and collated by IAATO. In this way, records exist for the activity of tour operators in Antarctica on a seasonal basis, the number of ships involved, the number of visitors and time spent ashore, in addition to demographic data on nationalities of passengers, staff, and crew.

The data used for this analysis were extracted for trips to the Peninsula area and only included those ships that made landings. In addition only small boat landings, by far the most popular and frequent activity, have been considered. Activities involving small boat cruising only, as well as specialised activities such as kayaking, snorkelling, scuba diving which do not involve setting foot ashore are not included in the analysis.

Some of the data need to be interpreted with caution prior to 2001. For example, it is known that initially some recorders, inadvertently, entered names of landing sites and numbers of passengers ashore inaccurately, and inclusion of certain activities, such as scruises, versus landings, was haphazard. Furthermore, as much of the data were entered by hand into a database only certain elements of the information are available. Acknowledging these problems, IAATO have made – and continue to make - huge efforts to standardize collection, recording and collation procedures to improve accuracy. As of 2003 IAATO also took over the management and maintenance of the data, creating an interactive data base which commenced with the 2003/04 season.

While yacht data have been included in this analysis it should be noted that this is not necessarily representative of that activity as a whole. Yachts only started submitting

PVR's to IAATO in 2000/01 and as yet only IAATO Member yacht operators contribute to these data. By including their data it is possible to show how much the range of activities that tourists partake of affects the analysis of landing site use, and when their data is removed how this can affect patterns in landing site use.

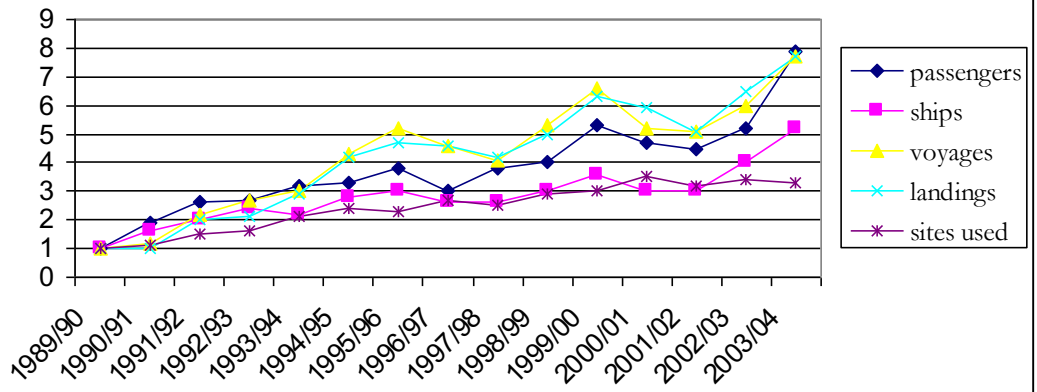
Finally, while the mandate for this paper is an analysis of tourism activity between 1999/00 and 2003/04, where available, indications from the 2004/05 season are also included. This 2004/05 data are, however, still raw and at the time of writing had not been counter checked. Thus, these 2004/05 data can only be used to give initial indications.

Taking into account these restrictions, the data still provides many insights, and as such is worth consideration. Ultimately, these data will prove useful in the event that behavioural studies of wildlife indicate that long-term, cumulative, or repetitive visitation of some sites might be harmful, in which case remedial action can be taken.

Inter-relationships between no. of ships, visitors, voyages, landings and sites used

The clearest way to compare the increases in the five growth variables is by measuring them in a factor increase (FI) where data for 1989/90 FI = 1 (i.e. FI 2 = a doubling of number and FI 3 = a tripling etc.) Figure 1 shows all the trends for all the variables.

Figure 1. Factor Increase in Antarctic Peninsula Tourist Activity (1989/90 = 1)



The five seasons under discussion (1999/2000 to 2003/04), have seen a dip in the level of activity followed by a sharp growth. In part this can be explained by the increase in level of activity in the 1999/2000 season presumably prompted by the concept of offering Millennium in Antarctica celebrations. The subsequent dip in activities in the 2000/01 and 2001/02, followed by a sharp increase in activities, may be explained in part by the effects of world events (e.g. 9/11, SARS etc.) initially reducing willingness of people to travel and subsequently resulting in the perception that Antarctica constitutes a 'safe' area of the world to visit. While this reasoning for the trend is unquantifiable, initial indications for the 2004/05 season imply that a high level of activity has been maintained.

When these different variables are isolated, relationships between them can be identified. For example, the consistently strongest relationship, unsurprisingly, is that between the number of voyages taking place and landings made (r=0.9843) i.e. indicating that on average each departure requires a certain number of landings. This relationship remains consistent in the five years under discussion.

Figure 2 isolates trends in number of passengers and number of landings. It indicates that while the relationship between the number of passengers and the number of landings made is also strong overall (r=0.92875) the number of passengers overtook the number of landings per season. When this is looked at in terms of the factor increase in ratio of

number of passengers to landings (Figure 2a), there is a sharp decrease in 1993/94 and the 1994/95 season – and remained low until the last season under question, 2003/04.

Figure 2. Factor increase in number of passengers and number of landings

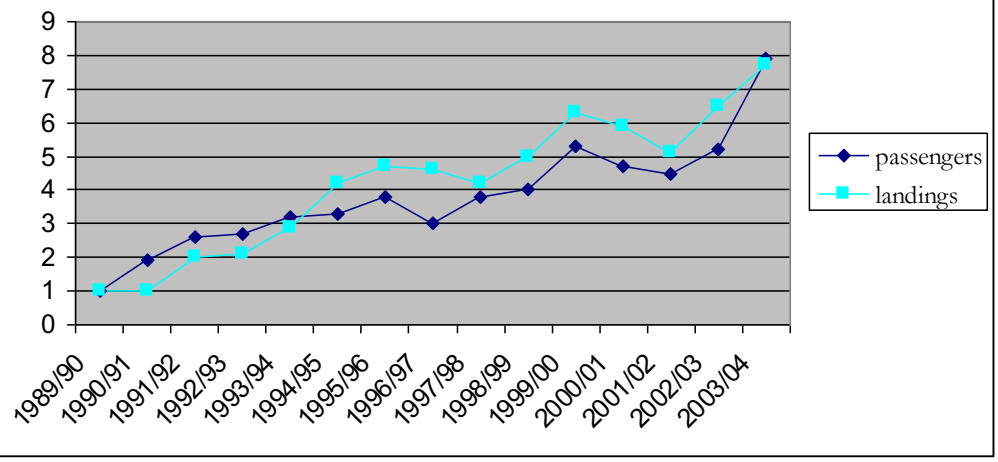
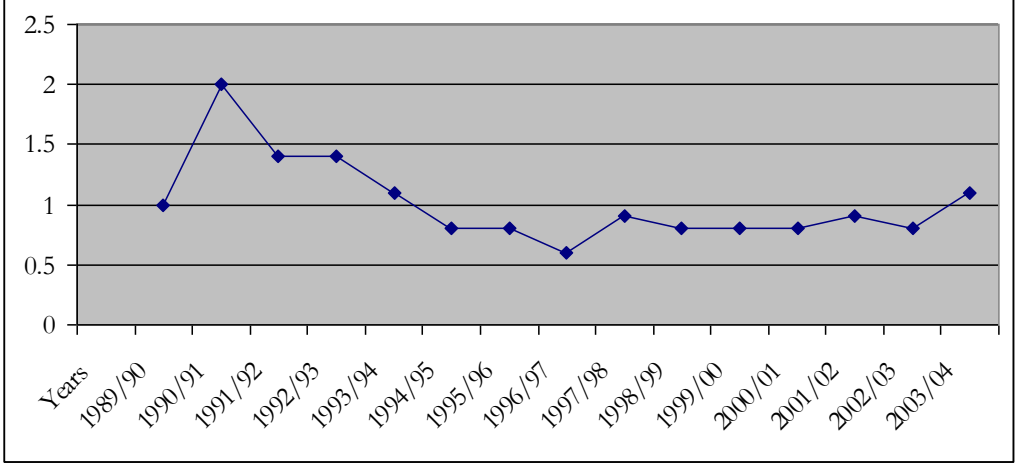


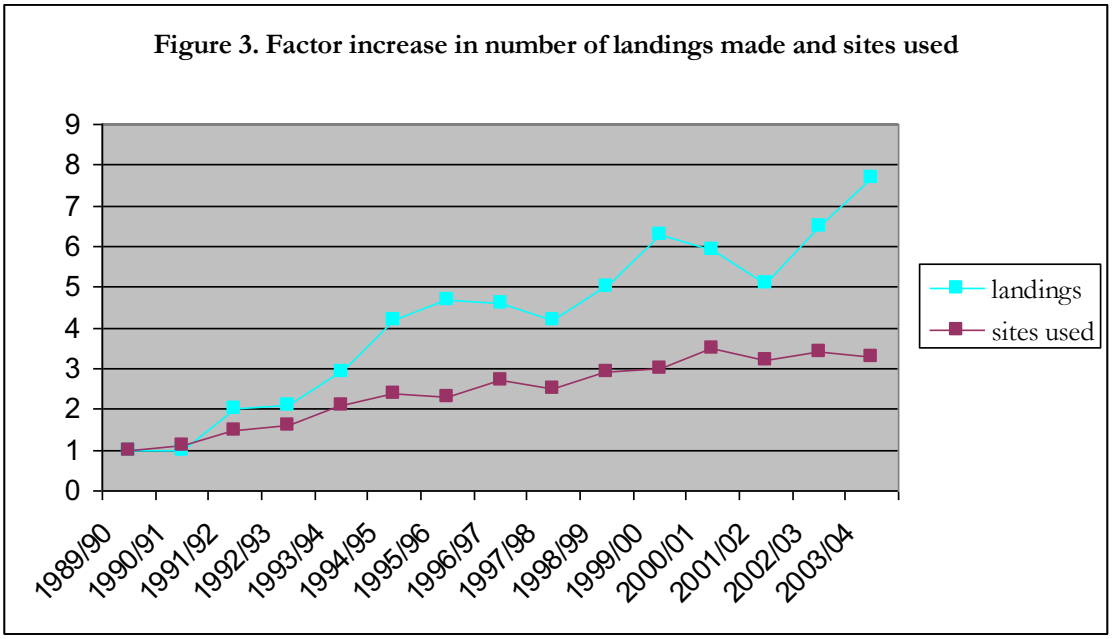
Figure 2a. Factor Increase of Ratio of Passengers to Landings



The primary reason for this change in pattern is the introduction of the smaller expedition vessels. Between 1989/90 and 1993/94 vessels operating in the area tended to be those which are now be regarded as medium sized vessels carrying an average of 130 passengers each. Between 1993/4 and 1998/99, and the introduction of the smaller ships the average number of passengers carried was reduced to 85. Since then the average number of passengers per voyage each season has increased to 120 in 2003/04.

Figure 3 shows the factor increase in the number of landings made and sites used. The factor increase in the number of landings made has increased disproportionately in comparison to the number of sites used; indicating that the optimal number of landing sites has been reached.

Figure 3. Factor increase in number of landings made and sites used



This indication is borne out statistically when looking at the relationship between the two variables. Initially, the relationship proves strong over the 10 years between 1989/90 and 1998/99 (r=0.9525) - even when broken down into two five year blocks - but weakens considerably in the five years being compared in this analysis (1999/00 to 2003/04) to a point where r= 0.0581. This indicates that in the last five years the level of activity at individual landing sites has changed considerably.

Preliminary indications for the 2004/05 season show this trend continuing: there appears to be only a slight increase in the number of landings (FI = 8, 2003/04 = FI 7.7) while the sites used shows no major change (the factor increase for 2004/05 = 3.5; in 2000/01 FI = 3.5 while in 2002/03 FI = 3.4)

Assessing Site Use

As identified by Naveen *et al.*, 2001, the majority of landings take place at only a few sites. Naveen *et al.* quoted over 50% of the landings take place at only 10 sites, while 75% of the landings take place at only 20 different sites. During the period under review that pattern has remained broadly similar. For example in 2003/04, 10 landing sites absorbed

53% of the visits, while 20 landing sites absorbed 71% of the visits. This data is not yet available for 2004/05.

In order to identify high use landing sites a ranking system similar to that used by Naveen *et al* (level of use measured by number of visits) was used to assess use for the seasons 1999/00 to 2003/04. The option of ranking sites on the basis of total number of visitors was also considered however this was deemed not viable - firstly because this data was only readily available for the 2003/04 season while number of ship visits per day was available for all five seasons under review and secondly, by using the data for 2003/04 it would be possible to 'define' what a visit constituted in both number of people and number of hours.

Ranking the sites both on the basis of number of visits a total of 32 different sites were identified amongst the 20 most visited sites per season. Out of these 32 sites, 13 were consistently in the 20 most visited sites for each season , and 14 in all but one of the seasons under consideration – the remaining 18 sites showed no regular pattern in terms of visitation over the five seasons under consideration.

These 14 sites deemed consistently highly used were identified as:

- Whalers Bay,
- Goudier Island (on which is located Bransfield House, the United Kingdom Antarctic Heritage Trust restored base known as Port Lockroy),
- Cuverville Island,
- Neko Harbour,
- Petermann Island,
- Jougla Point,
- Almirante Brown,
- Hannah Point,
- Aitcho Islands,
- Pendulum Cove,
- Halfmoon Island,
- Brown Bluff,
- Baily Head; and

- Paulet Island.

All, bar Petermann Island, featured every season under review in the list of 20 most used sites. Petermann Island does not rank in the 2000/2001 season due to heavy ice preventing access for most ships. Thus, when selecting sites for closer analysis, the inclusion of Petermann Island data ensures no bias caused by natural events prohibiting access.

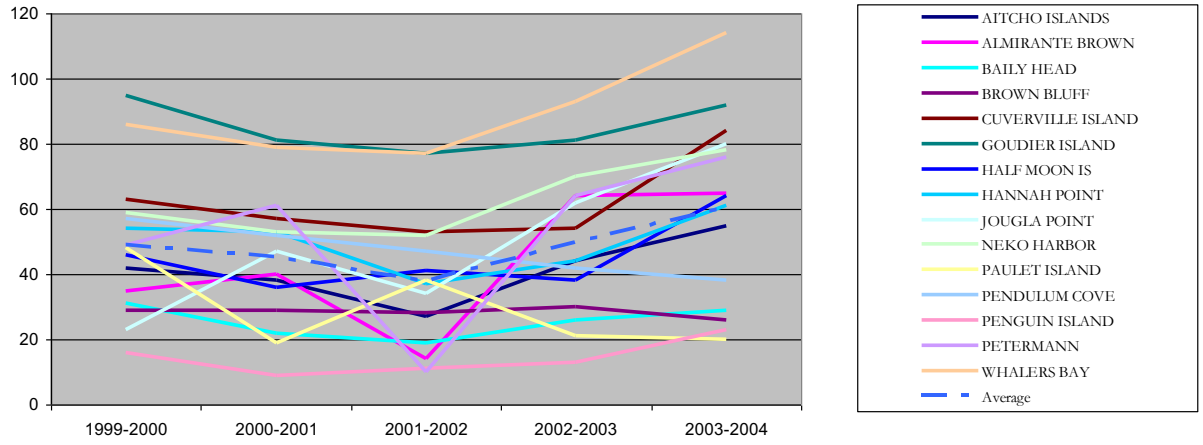
In addition, Penguin Island was also selected to be included in the detailed site analysis. The reason for its inclusion was not statistical (similar to two other sites, Penguin Island appeared in the top 20 on three occasions) but simply because it is one of the initial four sites listed in the United Kingdom Site Guidelines proposal (ATCM XXVIII WP 31) (the other three, Jougla Point, Cuverville and Aitcho Island qualify for further analysis as they qualify as most visited on the basis of the ranking above).

Data from these fifteen sites was compared on the basis of number of landings both inter- and intra- seasonally.

Interseasonal variation in number of landings

Numbers of landings at the 15 selected sites are given in Table 1 and shown in Figure 4.

Figure 4. Number of landings at 15 selected sites over five seasons



From this data it is clear that these 15 sites reflect the dip in activity during the 2000/01 and 2001/02 seasons. By 2002/03 the increase in level of activity becomes apparent at most of the sites. These trends are reflected in the average number of visits over the years at these selected sites (see the blue dotted line in Figure 4). However, the level of increase varies considerably between sites. For example, there is little or no perceivable increase in the level of activity at some of the sites, e.g. Pendulum Cove, Goudier Island, Baily Head, Brown Bluff and Penguin Island, all of which indicate only a small, if any, increase in the number of visits. Conversely, other sites appear to have undergone a significant increase in the number of visits. For example, Whalers Bay, Neko Harbour, Jougla Point, Halfmoon Island and Cuverville Island have all experienced a significant increase in the number of visits during the last season under review.

This observation is further supported by looking at the mean number of landings per season and the standard deviation around these means (Table 1). In 1999/2000, a year of reasonably intense activity, these selected most highly visited sites received on average 49 visits with a standard deviation of ± 22. In the relatively quiet year of 2001/02, the average number of visits at these representative sites dropped by nearly 25% to 38 but maintained a standard deviation of ± 21. Again, these figures imply that it is only a few sites – even amongst those ranking as most frequently visited – that are absorbing most of the visits. In 2003/04 however, the average number of visits at these selected representative sites increased to 60 per season (a 21% increase) with the standard deviation equalling ± 28. This implies that the dispersion of visits between sites changed

for this season – with some sites, for example Whalers Bay and Cuverville Island experiencing an unproportional increase in activity.

Table 1. Number of visits per season at 15 selected sites in the Antarctic Peninsula.

SITES	1999-2000	2000-2001	2001-2002	2002-2003	2003-2004
AITCHO ISLANDS	42	38	27	44	55
ALMIRANTE BROWN	35	40	14	64	65
BAILY HEAD	31	22	19	26	29
BROWN BLUFF	29	29	28	30	26
CUVERVILLE ISLAND	63	57	53	54	84
GOUDIER ISLAND	95	81	77	81	92
HALF MOON IS	46	36	41	38	64
HANNAH POINT	54	53	37	44	61
JOUGLA POINT	23	47	34	62	80
NEKO HARBOR	59	53	52	70	78
PAULET ISLAND	48	19	38	21	20
PENDULUM COVE	57	52	47	42	38
PENGUIN ISLAND	16	9	11	13	23
PETERMANN ISLAND	49	61	10	64	76
WHALERS BAY	86	79	77	93	114
Average	48.86667	45.06667	37.66667	49.73333	60.33333
Standard Deviation	21.73498	20.60675	21.11082	22.72024	28.19743

Intraseasonal Variation

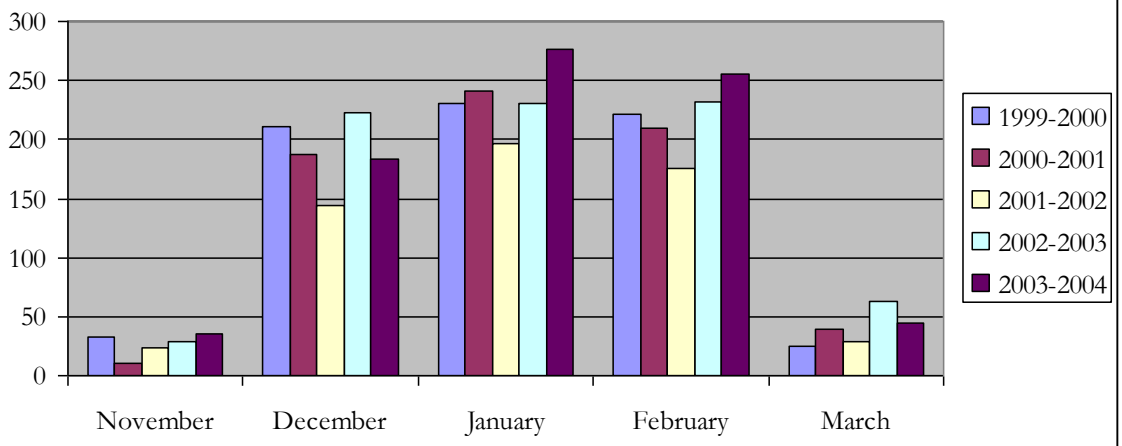
Seasonality

Throughout NSF and IAATO's data collection period it has been readily apparent that patterns of activity within the season can be easily identified. The tables show that tourism activity involving ships and yachts is relatively sparse in November, the onset of the tourist season, but quickens in December and January, and part of February, with most operators gone by March. This coincides with the austral summer period, and the breeding season of most wildlife species. Prior to mid November ice conditions can be unreliable, while by the middle of March a decrease in daylight hours, a general deterioration in weather conditions, and the departure of many of the species at the end of their breeding season all mark the onset of winter.

For the five seasons under review there was no dramatic increase in the total number of landings made in November, indicating that the increase in activity has not spread to the

early season period. March has seen an erratic increase in the number of visits taking place, but the number of visits remains low overall.

Figure 5. Number of Landings per Month



Given the natural restrictions of the season this pattern of activity through the season can be expected to be consistent in future years.

Variations in daily activity

In addition to variation in the level of activity between the months, there is also a variation in the level of activity on a daily basis. While environmental conditions will affect this daily activity, the primary variable is the number of ships in the area on a specified date. During the peak summer months, as identified above, the level of visitation at a particular site can be quantified in terms of numbers of visits received, numbers of hours ashore and numbers of passengers landed.

Number of Visits Received – sites occasionally receive more than one visit per day. Analysis of the 15 selected sites (see table 2) show that on average over three quarters of the visits (between 76-79%) took place on a day when only one ship made a landing at that particular site. Between 18-21% took place on a day when two ships visited a particular site and less than 5% took place on a day when three or more ships visited a site. The number of three visits in a day doubled proportionately in the 2003-2004 season; however, the number is still relatively low accounting for only 4% of landings.

Table 2. Number of visits per day for 15 selected sites during five seasons.

Number of visits per day	1999-2000	2000-2001	2001-2002	2002-2003	2003-2004
1	443 (76%)	425 (78%)	366 (79%)	454 (77%)	556 (77%)
2	124 (21%)	97 (18%)	88 (18%)	126 (21%)	145 (20%)
3	12 (2%)	15 (2.7%)	10 (2.7%)	10 (1.6%)	20 (4.1%)
≥ 4	1 (0.10%)	2 (0.3%)	0	1 (0.10%)	2 (0.2%)

Scrutiny of the 15 selected sites identifies that some receive considerably more multiple visits than others. Table 3 illustrates the level of multiple visit use of the 15 selected sites in 2003-04 -- the season with the maximum number of multiple visits.

Table 3 Level of multiple visit use at 15 selected sites.

SITES	One visit day	Two visit day	Three visit day	>3 visit day	Total visits
PAULET ISLAND	20	0	0	0	20
PENGUIN ISLAND	21	1	0	0	23
BROWN BLUFF	26	0	0	0	26
BAILY HEAD	19	5	0	0	29
PENDULUM COVE	34	2	0	0	38
AITCHO ISLANDS	34	9	1	0	55
HANNAH POINT	38	10	1	0	61
HALF MOON IS	44	10	0	0	64
ALMIRANTE BROWN	42	10	1	0	65
PETERMANN ISLAND	41	13	3	0	76
NEKO HARBOR	55	10	1	0	78
JOUGLA POINT	47	10	2	1 (7 landings*)	80
CUVERVILLE ISLAND	45	18	1	0	84
GOUDIER ISLAND	48	19	2	0	92
WHALERS BAY	39	27	7	0	114

* on this date, two ships landed 82 and 55 people respectively in addition to two yachts making five landings between them with groups of 3 or fewer people.

To illustrate how this may affect a single landing site over a season, Figure 6 shows the number of visits per day over one calendar season (2003-04) at Whalers Bay, consistently the most visited site in the Peninsula. By contrast Figure 7 shows the number of visits at one of the slightly less visited sites, Almirante Brown, and Figure 8 is that of Penguin Island, in 2003/04 one of the least visited sites of the 15 selected.

Figure 6. Visits to Whalers Bay, 2003/04

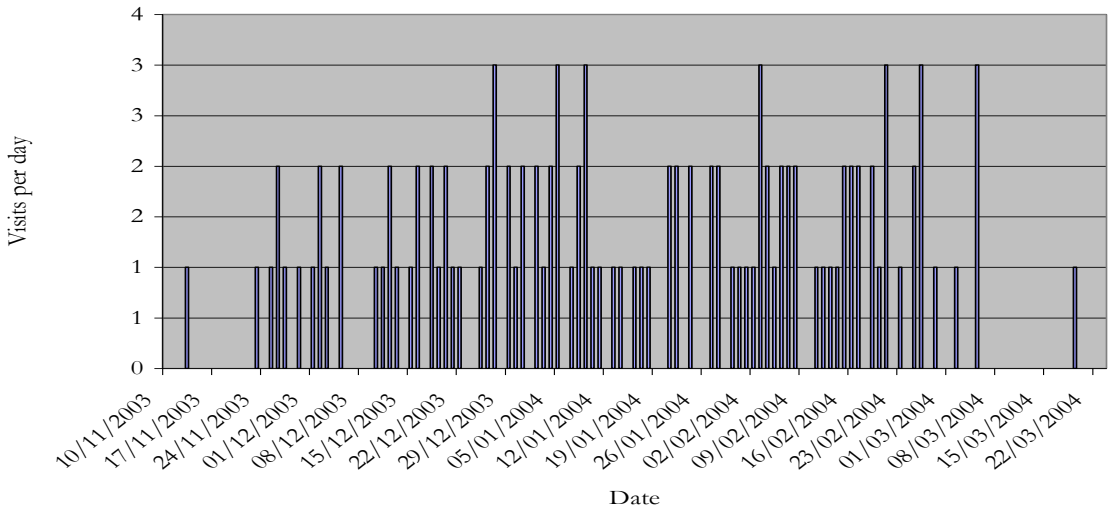


Figure 7. Almirante Brown

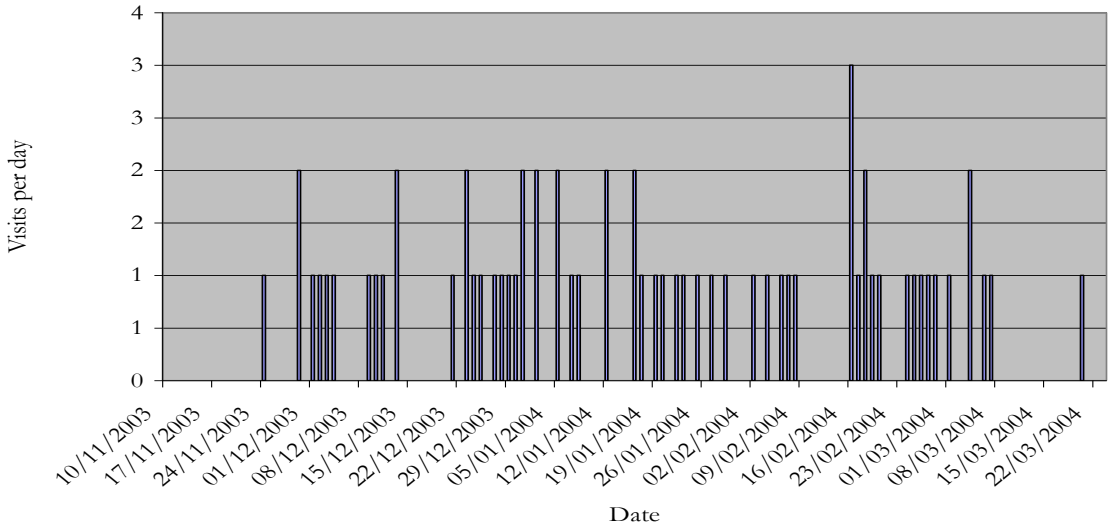
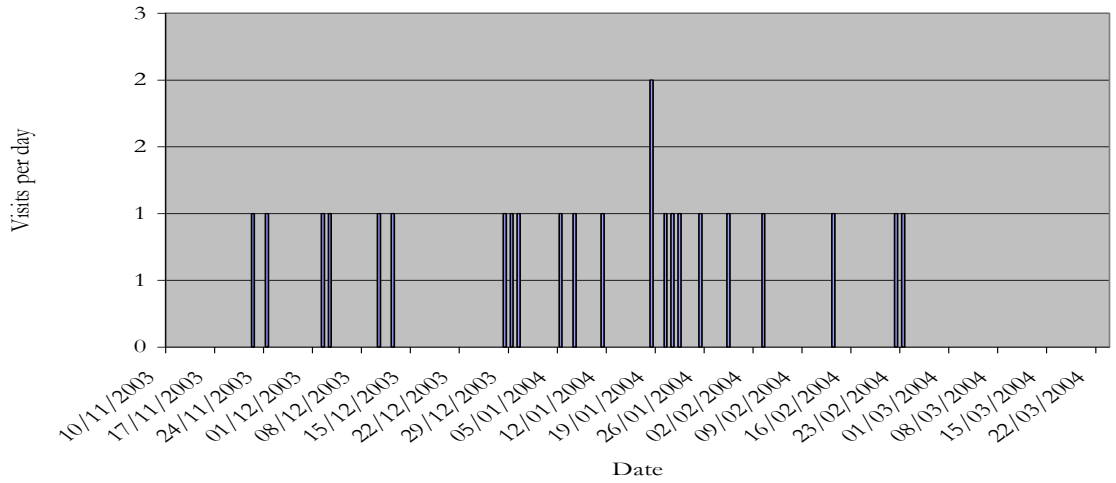


Figure 8. Penguin Island



These figures indicate that some sites have a longer period to 'recover' from any potential impact than others. Looking at the number of 'visitor free' days a site experiences over a season provides another mechanism for assessing level of use.

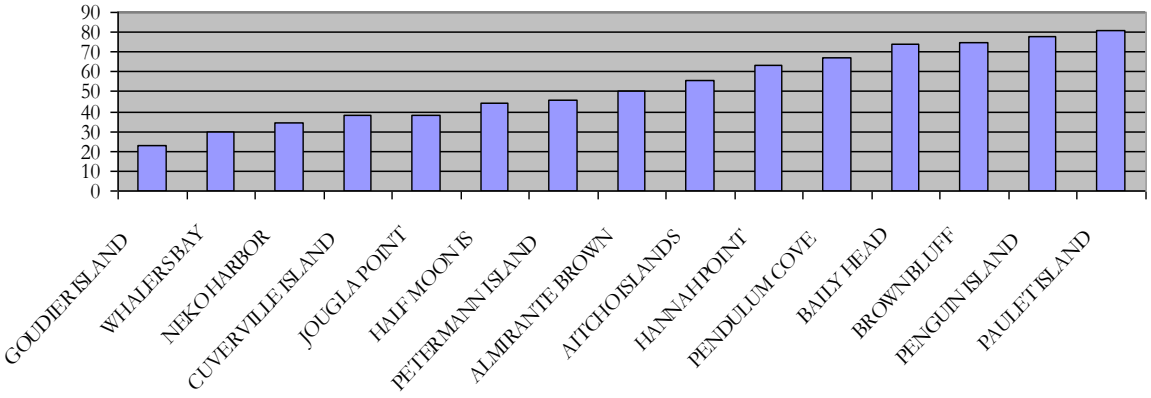
Table 4 illustrates how visitor free days correspond to the level of use, concentrating on the peak period of visitor activity, the 91 day period from December 1 to February 29, which also encompasses peak reproduction period for most Antarctic Peninsula plants and animals.

Table 4. Number of visitor days during December to February, 2003/04, inclusive.

SITES	One visit day	Two visit day	Three visit day	>3 visit day	# Visitor days	# Visitor free days
AITCHO ISLANDS	31	8	1	0	40 (44%)	51 (56%)
ALMIRANTE BROWN	36	9	1	0	46 (50%)	45 (50%)
BAILY HEAD	19	5	0	0	24 (26%)	67 (74%)
BROWN BLUFF	23	0	0	0	23 (25%)	68 (75%)
CUVERVILLE ISLAND	37	18	1	0	56 (62%)	35 (38%)
GOUDIER ISLAND	40	19	2	0	61 (67%)	30 (23%)
HALF MOON IS	42	9	0	0	51 (56%)	40 (44%)
HANNAH POINT	33	10	1	0	44 (27%)	57 (63%)
JOUGLA POINT	43	10	2	1	56 (62%)	35 (38%)
NEKO HARBOR	49	10	1	0	60 (66%)	31 (34%)
PAULET ISLAND	17	0	0	0	17 (17%)	74 (81%)
PENDULUM COVE	28	0	2	0	30 (23%)	61 (67%)
PENGUIN ISLAND	19	0	1	0	20 (22%)	71 (78%)
PETERMANN ISLAND	33	13	3	0	49 (54%)	42 (46%)
WHALERS BAY	32	26	6	0	64 (70%)	27 (30%)

Table 4 shows that five sites receive visitors on over 60% (*c.* 2/3^{rds}) of the days during the peak season, while six sites receive visitors on less than 30% (*c.* 1/3rd) of the peak season. Clearly illustrated in Figure 9 - again, emphasising that some sites are absorbing a high proportion of the activity.

Figure 9. Percentage of Visitor Free Days During Peak Season, 2003/04



Defining a 'visit' – throughout the analysis, level of use has been analysed on the basis of number of visits. This begs the question of how to define a visit. The two primary variables for defining an individual visit are number of people landed and amount of time spent ashore. Data restrictions mentioned above enable detailed analysis of these variables to only take place for the 2003-04 season. During that period a total of 914 landings were made at the 15 selected sites. These were divided into one, two and three visit days and analysed in terms of number of visitors ashore and number of hours when visitors were present at the site.

Within the data some entries were not usable on the basis of invalid entries – particularly concerning time entries. However, 492 samples were available for one visit days, 125 samples of two visit days and 17 samples of three visit days. Results are given in Table 5.

Table 5. Number of People and Amount of Time Ashore

	Single Visit Days	Two Visit Days	Three Visit Days

Average number of people ashore (with maximum, minimum and standard deviation)	Average = 98.9 people max = 576 min = 1 SD ± 81.2	Average = 205.7 people max = 688 min = 14 SD ± 126	Average = 262 people max = 545 min = 6 SD ± 125
Average amount of time spent ashore (with maximum, minimum and standard deviation)	Average = 2 hrs 50 min max = 23 hrs min = 10 min SD ± 1hr 35 min	Average = 5 hrs 42 min max = 13 hrs min = 1 hr 45 min SD ± 1hr 40 min	Average = 8 hrs 30 min max = 14 hrs 30 min min = 5 hrs 45 mins SD ± 2 hrs 25 mins
Correlation between number of passengers and hours spent ashore	r = 0.3637	r = 0.727	r = 0.0442

Several observations can be made on the basis of this data.

- Assuming a normal distribution, using the single visit only sample of 492, it is possible to infer that approximately two thirds of all landings last between 1 hr 15 mins and 4 hrs 25 mins.
- The difference in average number of people between single visit days and two visit days sees a >107% increase in the number of people landed while the proportional increase between one and three visit days shows an increase of 165%. While the lowest maximum number ashore, 545 people actually took place on a three visit day. This, emphasised by the large standard deviation found, indicates that the number of visits does not necessarily relate to the number of people ashore.
- The difference in average time spent ashore between single visit days and two visit days shows a 101% increase, while between a single and three visit days shows an increase of 200%. This would imply a proportional increase in the number of visits and the amount of time spent ashore.
- Throughout, the range and standard deviation between the amount of people and time spent ashore illustrates the degree of variation in intensity (if intensity is measured in number of people and time spent ashore) that a single visit involves. For example, in the single visit column, the maximum time spent ashore was 23 hours. This involved a one person overnight camping trip from a yacht – other ship and yacht based camping trips lasted on average 10 hours – involving between 6 and 66 people ashore. The minimum of 10 minutes took place from a vessel at Baily Head, a landing presumably cancelled due to bad weather.

- The correlation between the two variables can illustrate whether or not there is a relationship between the number of visits and the two variables identified

(number of people landed and time spent ashore). On single visit days there is only a moderate relationship between the number of people ashore and the time spent ashore, with r = 0.3637 – by removing the outliers, such as the single camper for 23 hrs the correlation does not vary much (r = 0.47601). On three visit days there is a definite weak relationship between numbers of people and amount of time spent ashore (r = 0.0442) even taking into account that this is based on the smallest sample size (SEr = 0.242). This implies that although three visits are made on a specific day that is no true measure of either the number of people who are ashore or the amount of time they spend ashore. In this instance, if the outliers (yacht personnel spending several hours ashore) are removed the relationship becomes stronger with r = 0.43097 (SEr = 0.1469) but not appreciably. Finally, the two visit days show the strongest relationship with r = 0.727. In this instance there were few perceivable outliers within the data. Given that the majority of two visit days took place at sites which are very popular either because they are sheltered, easy landing and have a specific attraction (e.g. the history and easy walking of Whalers Bay, the museum and post office at Port Lockroy or the large gentoo colony and unrestricted movement at Cuverville Island) implies that these sites may be being used more consistently by a variety of different ships.

Conclusions from Data Analysis

The above data analysis offers the following indications:

- While most growth variables have increased appreciably in the five seasons from 1999/00 to 2003/04 there has been no notable increase in the number of sites used.

- There was a sharp increase in the average number of passengers involved in each landing during the last of the five seasons under review.

- Consistent with previous studies the landings are still concentrated on a small number of sites. Of these most landed at sites, there has been a perceivable increase in activity at all of them, but some sites have seen a greater increase than others.

- Seasonality continues to impose restrictions and as yet these have not been affected by increases in the growth variables.

- There has been an increase in the number of multiple visits per day, in particular during the last season under review, 2003/04.

- Data for 2003/04 showed that the multiple visits were also concentrated at a few specific sites, broadly similar but not identical to those receiving the most number of landings for the same period.

- During 2003/04, five of the fifteen selected sites received visits on approximately two thirds of days during the peak season (1 December to end of February), four sites received visits on half of the days and six sites on around a quarter of the days.

- Defining single and multiple visits on the basis of number of people ashore, it was found that the number of landings made gave no indication of the number of people landed.

- There was, however, a proportional increase in the number of landings made and the time spent ashore.

- Intensity, if measured in number of people and/or time spent ashore, varied hugely between visits. Assessment of the relationship between the number of people ashore and time spent ashore indicated weak or moderate correlations. This means that the amount of time spent ashore does not necessarily relate to the number of people ashore, implying that different uses of the sites are taking place.

Site Guidelines

The above data supports the widely held contention that there is need for site guidelines to ensure that the increased level of activity maintains only a less than minor or transitory impact, particularly if the increases continue. At present, in addition to guidelines laid

down by government and field personnel regarding visits to their stations, there are only two formalised sets of guidelines which have been circulated: those put forward by IAATO and those tabled by the United Kingdom. Each will be considered in turn.

IAATO Site Guidelines

Tabled initially at ATCM XXVI in Madrid, 2003, (IP72) these guidelines are set out in tabular form covering a total of 32 sites. The guidelines were produced by IAATO with information collected from field personnel with a cumulative 50 years experience in Antarctic environment and tourism and in consultation with members of the scientific community.

Each of the 32 sites is given a perceived environmental sensitivity rating of low, medium or high. This rating was based on species diversity, potential impact to flora and fauna and amount of space available for visitors to walk around. In addition sites were classified as being appropriate for different categories of ships (Category 1 = vessels carrying less than 200 passengers, Category 2 = vessels carrying between 200-500 passengers). Finally, recommendations for visitor management are given. They are described as 'work-in-progress' with the intention that they would be updated and improved over time.

These guidelines have several strengths:

9. The introduction of the category classification has been a successful, efficient way of limiting traffic at different sites; confining heavy use to sites perceived to be able to cope with heavy visitation.
10. Within the categorising classification they also identify sites with perceived varying sensitivity and acknowledge that site sensitivity might vary through the season.
11. They include safety information in addition to environmental information.
12. They have the capacity to accommodate changes through the season if they are observed.
13. Being industry written and promoted they presumably automatically have the backing and support of the field personnel, so will be followed and certainly are more susceptible to peer pressure for ensuring compliance.

14. They are in an accessible format making quick reference possible for field personnel under pressure. The intention being that they are used in conjunction with Naveen's Compendium of Antarctic Peninsula Visitor Sites (2003) to provide further descriptions if necessary.
15. They provide a degree of control for a large number of sites which experience different levels of visitation.
16. They were specifically intended to compliment IAATO's existing mandatory codes of conduct and operating procedures and not used in isolation.

However, the IAATO guidelines do have several key weaknesses which need to be addressed – particularly given the number of new companies and potential shortage of experienced staff:

6. The guidelines are based on the assumption that the Expedition Leaders (EL's) know the site in advance of landing passengers.
7. They assume that the Expedition Leaders have the required knowledge to be able to translate the recommendations into sound environmental practice (for example, using phrases such as be 'extra sensitive', 'beware', 'exercise caution').
8. The mechanism for feedback from field personnel could be formalised but works on an ad hoc basis.
9. There is no pressure for non IAATO operators to follow these guidelines.

The United Kingdom **Site Guidelines**

The United Kingdom site guidelines cover eleven sites (Penguin Island, Aitcho Islands, Cuverville Island, Jougla Point, Turret Point, Yankee Harbour, Hannah Point, Paulet, Neko, Pleneau, and Petermann). At present, only the first four are being proposed for site guidelines, with the following seven to follow (ATCM XXVIII WP31).

The guidelines are developed from the Compendium of Antarctic Peninsula Visitor Sites (Naveen, 2003). Each site is ranked for sensitivity, using a similar measure of low, moderate or high. Key features are identified and a written description of the site and listing bird, animal and plant species found there are given. A discourse on visitor pressure details level of use and areas perceived to be susceptible to disturbance. Codes of conduct describe preferred landing sites, sets out restricted zones, gives seasonal limitations – including a daily maximum visit time, states ship limitations – i.e.

appropriate for 500 or fewer capacity ships, outlines preferred walking routes, distances to be maintained from wildlife and lists other potential hazards.

The strengths of the United Kingdom Site Guidelines lie in the following:

7. They provide a written overview of the site under consideration.
8. Suggests, and gives details of walking routes, identifies sensitive areas and specifies distances which should be maintained from perceived sensitive species.
9. Sketch maps assist in the interpretation of the written material and identifies landing points.
10. Similar to the IAATO guidelines, they have classified the sites in terms of ship size and sensitivity categorisation.
11. Parties would require adherence to the size of ship, number of passengers ashore etc by all users in cases where permits or authorization is required.
12. The Committee for Environmental Protection would be asked to reviewing and monitor the effectiveness of the site guidelines.

Weaknesses:

7. Limitations based on hours alone make no allowance for the form and level of activity taking place. (e.g., 2-3 small vessels visiting a site for a total of 6 hours might place less than 100 people ashore for most of a day wandering at leisure over a larger area of the site, whereas a single larger ship could land up to 500 passengers in the same period of time and have them restricted to a smaller area).
8. By installing time limits there is an increased likelihood that the 'excess' activity or use would be pushed to otherwise less visited sites, creating increased pressure at more sites.
9. There is the potential for increased disturbance as landings are 'rushed' to complete activities in the time available.
10. Hour limitations would be extremely difficult to implement in the field and difficult to regulate.
11. By over emphasising practices which should be standard procedures for *all* shore landings (e.g. maintaining a minimum distance of 5m from wildlife, avoiding skua and tern nesting areas, and Antarctic fur seals) important site specific points for visitor management can be weakened or lost.

12. It is unclear to what extent the industry is able to offer feedback.

Discussion

In essence, and general approach, the two forms of site guidelines are remarkably similar. Both set up restrictions in the size of vessel which should be permitted to visit, both quantify the site on the basis of sensitivity and both offer recommendations for visitor management practices. While one offers lengthy descriptions and a detailed map, the other offers concise pointers on what areas to be careful of and be aware. Both have weaknesses that need to be addressed and both make assumptions on the part of the user that may or may not be appropriate. The aim of both, improved visitor management and minimising the risk of cumulative impact is similar. The methodology varies only in time limitations imposed in the United Kingdom version, used in an attempt to restrict use at the sites in question.

Concerns over visitor use in wilderness areas is not a new phenomenon. Over time different restrictions of use and activity level have been tried and tested and for many years the concept of carrying capacity was perceived as fundamental in natural resource and environmental management (Dasmann 1964, Godschalk and Parker, 1975). Carrying capacity, as with time limits, can be defined as the perceived maximum level of use that an area can sustain without succumbing to a degree of change that is perceived as unacceptable. Increasingly, however, it is acknowledged that the dynamic nature of ecosystems makes a static determination of carrying capacity difficult, if not impossible, to calculate (Hendee *et al.,* 1990). Time limits suffer from similar restrictions, with a single, blunt, restriction making no allowances for the short and long term dynamic nature of the ecosystem being protected.

But most importantly, one of the major reservations behind the use of carrying capacity and time limitations is that different people use wilderness areas in different ways – and each use or activity has a different effect, influencing carrying capacity and, by default, time restrictions (Brown and Haas, 1980).

To simplify: An example could be that one or 20 campers ashore, pitching their tents on snow a discreet distance away from any vegetation or breeding colonies, and ensuring that all evidence of their visit, including any waste, is removed, have no more potential to create disturbance if they are ashore for six, eight or twelve hours – particularly if 90% of

the time they are somnolent. While a group restricted by a one or two hour time limit, could potentially cause more damage by individual passengers feeling 'rushed' while ashore, sacrificing consideration of wildlife in their attempt to 'do' and 'see' everything in the time available.

Imposing time limitations implies a strong cause and effect relationship between the amount of use an area receives and subsequent impact. Many studies have shown that intensity is a poor predictor of total impact (Hendee *et al,* 1990), while the season and type of use involved are frequently more important in explaining effects (Cole, 1985; Kuss, 1986). Thus, although traditionally focus of concern in use and impact management has been on the amount of use – be it measured in numbers of people or time ashore – experience has shown that the impacts are more often related to factors such as seasonality, location, use and visitor behaviour.

Taking this one step further, time limitations have the other shortcoming in that they counter the other widely held view of visitor management in wilderness: the concept that it is preferable to concentrate the activity rather than disperse over a wider area (Hendee *et al*, 1990). Concentration ensures that the activities are focused on sites which are identified as being able to adjust to use without causing unacceptable change or impact – and has the additional benefit of relieving any potential for pressure from other more vulnerable sites. Time limits create the potential to disperse activity to other more sensitive sites, possibly causing more long term harm.

As has been shown above, seasonality of use is, and is assumed to continue to be, consistent in the Antarctic Peninsula area. This therefore is relatively easy to predict and develop management strategies for. Location, as has also been shown above, varies over a total 165 sites, but is consistently concentrated on the same small number of sites. As is apparent in observation and detailed in Naveen's Compendium of Antarctic Peninsula Visitor Sites (2003), within these sites there is a degree of variability both physically and ecologically which needs to be taken into account. The use of the sites also appears to be variable – this conclusion is based on the information of activities shown in the PVRS (extended walk, camping, small boat landing) and borne out through personal observations.

Considering that tourism in Antarctica is taking place against a backdrop of environmental fluctuation, against which a single cause and effect will be virtually impossible to measure, determining cause and likelihood of impact involves primarily subjective value judgement. That these judgements are subjective is accepted practice for visitor management in wilderness areas (Hendee *et al.*, 1990) but begs the need for consensus and agreement between all users. To that end, guidelines and limitations must be both environmentally sound and practical to operate.

It would therefore appear that a more successful use of site guidelines as an approach visitor management would be to concentrate efforts on defining and managing activities at individual sites, imposing strict limitations on those sites perceived to be at high sensitivity and identifying those sites which are best suited for concentrating activity.

For example, by developing consistency of use at high sensitivity sites, it will become easier a) to assess any potential disruption and b) manage visitor's activities ashore to prevent possible cumulative impact. Studies of site use by tourists in the Antarctic Peninsula have shown that 40% of passenger's time ashore was spent in the immediate vicinity of the small boat landing site (Davis, 1995) and on average during only 20% of the possible landing area (within a 500m radius of the small boat landing site) was used by tourist parties (Crosbie, 1998). On the basis of these results alone it would appear that by simply ensuring that passengers are landed in a particular location it is possible to manage and limit their activities. By extending the consistency of the activities to, for example, exact walking routes including suggested view points, it is possible to extend a reasonably tight control on visitor activities.

Finally, with a view to the increasing number of new companies operating in the field, and the potential for a corresponding shortage of experienced field staff, there is an acknowledged need to ensure that all Expedition Leaders and field staff are fully aware and knowledgeable about the site guidelines content, interpretation and enforcement.

Recommendations

Despite the fact that there has not yet been identified any significant adverse affects on the environment caused by tourism, there is a strong feeling amongst both the International Association of Antarctica Tour Operators and governmental communities

that preparation for the future is important. On the basis of the increased levels of activity, and allowing that this increase may well continue, there is a real need for site specific guidelines. Both IAATO and the United Kingdom have guidelines which provide a base on which to build effective and comprehensive site specific guidelines -- incorporating some changes and amendments.

On this premise, the above information, and acknowledging the context of the dynamic nature of the ecosystem, and that external environmental factors need to be taking into consideration when analysing for cumulative impact, the following recommendations are made:

- Combine the two guidelines for one single, informative source of information detailing possible and preferred activities for an individual site.
- Make limitations strictly site specific.
- In addition to the categorisation labels and the site sensitivity labels, define which sites can cope with concentrated activity – taking into account those sites already experience such activity.
- Remove the concept of standard time limitations from all sites, but identify those sites which require particular care, and set limitations which are specific to that site (e.g. at category 1 high sensitivity sites[2], only recommend two ship landings per day with a possible option of no landings until after peak egg laying, for example 10 December, define the visiting area with easily identifiable topographical features and detail walking routes)
- Conduct a full assessment of landing site use in terms of number of landings / passengers / hours ashore on an annual basis and use this to identify whether amendments or additional site guidelines for specific sites are required.
- Formalise a feedback mechanism for the site guidelines so field personnel can react and amend / improve on site guidelines during and after each season if necessary.
- Develop a form of accountability for Expedition Leaders and companies to be encouraged to maintain good practise – ultimately this could be tied to an accreditation scheme.

[2] Hannah Point, Paulet Island, Aitcho Island, Penguin Island, Gourdin Island.

- Amend requirement of 75% previous Antarctic experience to 75% previous Antarctic experience including 50% with previous Antarctic cruise ship experience.
- Encourage appropriate research and monitoring into the understanding of environmental fluxes in the context of both the presence and absence of human activities.

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