Antarctic Whales and Antarctic Tourism

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Since the founding of the modern Antarctic tourism industry in 1969, the number of visitors to Antarctica has grown from a few hundred to over 20,000 each austral summer. In 1991, recognising the potential environmental impacts that tourism could cause, seven private tour operators conducting excursions in Antarctica joined together to found a self-regulatory, member organisation. The specific aim of this organisation, the International Association of Antarctica Tour Operators (IAATO) is to advocate, promote and practice safe and environmentally responsible private-sector travel to the Antarctic. Since its inception, IAATO has grown to nearly 80 members – currently incorporating all but two Antarctic tour operators.

Thus far, Antarctic tourism has been primarily seaborne with a geographic focus overwhelmingly biased toward the Peninsula Region (*c.* 90% of all tourist activity, incorporating 211 voyages during the 2005/6 season; http://www.iaato.org/tourism_stats.html); *c.* 5% go to other sectors of the Southern Ocean – the remaining 5% being land-based tourism. From mid-December onwards, whale sightings on each Peninsula cruise voyage are an increasingly regular occurrence. Specific geographic areas have become renowned for certain species – for example, fin whales are often sighted near the continental shelves of the Peninsula and South Georgia, humpback and minke whales are most frequently found in the shallower, coastal waters and killer whales are known to hunt in very specific areas of the Peninsula. Consistently, anecdotal and photographic evidence indicates that certain animals, particularly minke and humpback whales, at specific sites will repeatedly approach ships and small boats.

Encounters with other species are rarer, but do occur – for example, blue whales, southern right whales and Arnoux's beaked whales are sighted annually, but the duration of the encounter is dictated primarily by the behaviour of the animals, but also to a lesser extent on the weather conditions, the ship's schedule, and the interest of the captain and expedition leader.

Antarctic whale tourism – Potential impacts on the animals

Concern has been voiced regarding demonstrable short-term impacts of whalewatching on cetaceans (Bejder *et al*. 1999, Lusseau 2003, Williams *et al*. 2002ab). As these studies have progressed, they have lent increasing strength to concerns that human activities may be influencing the fitness of these animals (*e.g.*, Corkeron 2004); although the links between short- and long-term impacts are being forged primarily for small, closed populations of coastal odontocetes (*i.e.*, bottlenose dolphins (Bejder 2005, Bejder *et al*. In press, Lusseau 2004, 2005, SC/58/WW7) and killer whales (Williams 2003, SC/58/For Info. 18)). Certainly, vessel-based whalewatching can elicit short-term behavioural responses from large baleen whales (*e.g.*, humpbacks: Scheidat *et al*. 2002; fin whales: Jahoda *et al*. 2003). On their migration routes, whalewatching in a fixed location will diffuse impacts of whalewatching on individual baleen whales, however the Peninsula region of course represents critical feeding habitat for humpback whales. In the most frequently visited sites (Cierva Cove, Lemaire Channel, Gerlache Strait, Paradise Bay, *e.g.*), individuals may be approached repeatedly.

Aware of the potential for disturbance, IAATO developed Marine Wildlife Watching Guidelines for Vessel and Small Boat Operations (http://www.iaato.org/wildlife.html) in 2001. The aim of these guidelines is to ensure that all operators consistently have interactions with marine birds and mammals in a way that avoids harmful disturbance - such as displacement from important feeding areas, disruption of feeding, disruption of reproductive and other social behaviours, stress from interaction, injury or increased mortality - while ensuring a high quality wildlife-watching experience, which is critical in developing public support for the conservation of these species. In effect, the guidelines make sure that the animals dictate the encounter and emphasise the importance for vessel operators to be able to evaluate the animals' behavioural patterns. The guidelines take into account the approach towards the animals, arrival at, and departure from, an optimal viewing area, and recommended distances from the animals. They are intended for use by the operator of any vessel (ship, yacht, small boat, kayak). A selection of the specific requirements from the guidelines relating to whale watching are listed in Table 1.

55 Table 1: Abbreviated extract from IAATO's Marine Wildlife Watching Guidelines (Whales & Dolphins, Seals
56 and Seabirds) For Vessel & Zodiac Operations (http://www.iaato.org/wildlife.html)

Approaching Marine Mammals and Recommended Distances

General Principles
The animal/s should dictate all encounters.
Sometimes an animal will approach a vessel. If a marine mammal wants to interact, it may remain with the vessel. The vessel can then drift passively. If the animal is moving away from the vessel, it is choosing not to interact with or approach the vessel. Take all care to avoid collisions. This may include stopping, slowing down, and/or steering away from the animal/s. Do not chase or pursue animals.

The following principles address vessels in general:

1a. Vessels, Officers, Crew, Expedition Staff:
• Keep a good lookout forward (and ideally on the sides and from the stern) where cetaceans may be present.
• Always give the animals the benefit of the doubt.
• Avoid sudden change in speed and direction (including putting vessel in reverse).
• Avoid loud noises, including conversation, whistling, etc.
• Should a vessel get closer than the recommended minimum distance, withdraw at a constant, slow, no-wake speed, to at least the recommended minimum distance.
• If animals approach the vessel, put engines in neutral and do not re-engage propulsion until they are observed well clear of your vessel. If the animals remain in a local area, and if it is safe to do so, you may shut off the vessel's engine. Some whales will approach a silent, stationary vessel.
(Note: Allowing a vessel to drift within accepted recommended distances could constitute an approach.)

1b. Recommended Minimum Approach Distances:
• No intentional approach within 30 meters or 100 feet for Zodiacs, 100 meters or 300 feet for ships (150m/500 ft. if ship over 20,000 tons. 200m/600 ft. if 2 ships present).

1c. Awareness of the Animal/s' Behavioural Patterns:
• Be aware of changes in behaviour of the animal/s.
• If the cetacean is agitated or no longer interested in staying near the vessel, the following behavioural changes may be observed:
• The animal starts to leave the area.
• Regular changes in direction or speed of swimming.
• Hasty dives.
• Changes in respiration patterns.
• Increased time spent diving compared to time spent at the surface.
• Changes in acoustic behaviour.
• Certain surface behaviours such as tail slapping or trumpet blows.
• Changes in travelling direction.
• Repetitive diving.
• General agitation.
• Do not stay with the animal/s too long. Suggested 15 min – 1 hr. If disturbance or change in behaviour occurs, retreat slowly and quietly.
• Never herd (circle), separate, scatter, or pursue a group of marine mammals, particularly mothers and young.
• If a cetacean approaches a vessel to bow-ride, vessels should not change course or speed suddenly. Do not enter a group of dolphins to encourage them to bow-ride.
• If a cetacean surfaces in the vicinity of your vessel, take all necessary precautions to avoid collisions.
• Do not feed any wild animals.
• Avoid touching or sudden movements that might startle the cetacean.
• If a cetacean comes close to shore or your boat, remain quiet.
• Playback of underwater sound of any kind should not occur.

1e. Close Approach Procedure for Vessels and/or Zodiacs:
Approximately 200 meters/600 feet or closer:
• Approach at no faster than 'no-wake' speed or at idle, whichever is slower.
• Approach the animal/s from parallel to and slightly to the rear, e.g. from behind and to one side at 4 or 8 o'clock to the whales heading 12 o'clock
• Never attempt an approach head-on or from directly behind.
• Stay well clear of feeding baleen whales.
• Try to position your vessel downwind of the animals to avoid engine fumes drifting over them.
• Communication between vessels and Zodiacs in multivessel approaches should be established, to coordinate viewing and to ensure that you do not disturb or harass the animals.
• Do not 'box-in' cetaceans or cut off their travel or exit routes. This is particularly important when more than one vessel is present.
• Vessels should position themselves adjacent to each other to ensure the cetaceans have large open avenues to depart through if desired.
• Beware of local geography – never trap animals between the vessel and shore. Assess the presence of obstacles such as other vessels, structures, natural features, rocks and shoreline.
• *Remember: Avoid sudden or repeated changes in direction, speed or changing gears when close to marine mammals.*

1f. In Close Approach Zone:
(Note: Ideally this should be no more than one vessel at a time)
Approximately 30 meters/100 feet for Zodiacs/ 100 meters/300 feet for ships.
• When stopping to watch cetaceans, put your engines in neutral and allow the motor to idle without turning off; or allow the motor to idle for a minute or two before turning off. This prevents abrupt changes in noise that can startle the animals.
• Avoid excess engine use, gear changes, manoeuvring or backing up to the animals.
• Avoid the use of bow or stern lateral thrusters to maintain position. Thrusters can produce intensive cavitations (air bubble implosion) underwater.
• Be aware that whales may surface in unexpected locations.
• Breaching, tail-lobbing or flipper slapping whales may be socialising and may not be aware of boats. Keep your distance.
• Feeding humpback whales often emit sub-surface bubbles before rising to feed at the surface. Avoid these light green bubble patches.
• Emitting periodic noise may help whales know your location and avoid whale and boat collisions. For example, if your Zodiac engine is not running, occasionally tap on the engine casing with a hard object.
• If cetaceans approach within 30 meters or 100 feet of your vessel, put engines in neutral and do not re-engage propulsion until they are observed clear of harm's way from your vessel. On rare occasions, whales have been seen to use ships as 'backscratchers', remain drifting.
• Stay quiet and restrict passenger movement in Zodiacs during close encounters.
• Enjoy the experience.

1g. Departure Procedures:
• Move off at a slow 'no-wake' speed to the minimum distance of the close approach zone. Avoid engaging propellers within the minimum approach distance, if possible.
• Always move away from the animals to their rear, *i.e.*, not in front of them.
• Do not chase or pursue 'departing' animals.

Increased ship traffic in the Peninsula region has also heightened concern about the potential for ship strikes to impact large whale populations (*e.g.*, Caswell *et al*. 1999). In addition to the above whalewatching guidelines, IAATO has worked with the Marine Mammal Commission since 1998 by distributing a standardised report form to record any collisions with whales that may occur during tourist voyages. These reports note the date, location, species struck, the vessel involved, speed of the vessel at the time, a brief description, the fate of the whale and the source of the information. So far there have only been one or very occasionally two reported incidents each season, primarily involving humpback whales, none of which has involved a fatality.

Antarctic whale tourism – Platform for research

In addition to the efforts to mitigate any potential disturbance to whales, the Antarctic tourism industry has endeavoured to 'give back' by providing invaluable support to a number of whale-oriented research projects since its inception. Existing partnerships include, *inter alia*: logistical support (the industry provides transportation for personnel to and from research bases every year); work with the Antarctic Humpback Whale Catalogue (Allen *et al*., this meeting) and the Antarctic Killer Whale Catalogue (www.akwic.org) to which passengers and naturalists are encouraged to submit photographs of individually recognisable whales; and providing ship time for researchers working on well-defined cetacean research projects that can benefit from non-randomised survey coverage in the Southern Ocean (Williams *et al*. 2006; Pitman & Ensor 2003). In all, this healthy co-operation between industry and science amounts to an estimated million dollars of in-kind support.

The following section summarises a few case studies of existing partnerships, and sources of whale data coming from Antarctic tour operators.

Humpbacks

One partnership between the Antarctic tourism industry and cetacean research has a particularly long and fruitful history, namely that represented by the Antarctic Humpback Whale Catalogue (AHWC; http://199.33.141.23:591/alliedwhale/login.html). This collaborative research project has made concerted efforts to partner with the Antarctic tourism industry, both by having researchers on board a tourist ship each year in the Peninsula region, and by soliciting contributions of humpback identification photographs from Antarctic tourists and naturalists as well as soliciting contributions from Southern Ocean researchers. Over the project's 25-year history, ecotourism and other platform of opportunity sources have contributed 1197 photographs of 568 individual humpbacks (Allen *et al*., this meeting). Approximately half of all individuals represented known from the Peninsula region have been identified from photographs contributed from opportunistic sources. Similarly, these data are contributing to our understanding of stock structure in southern hemisphere humpback whales by elucidating patterns in migration – photos from tourist ships have facilitated matches between the Antarctic Peninsula and on the mating and calving grounds of western South America (Stevick *et al*. 2004), as well as a more recent match between Brazil and South Georgia (Stevick *et al*. In press). This catalogue is more than a mere repository. It promotes and assists partnerships among researchers in diverse regions, and serves as a model for other partnerships between Antarctic tourism and researchers interested in studying cetaceans in the Southern Ocean.

Killer whales

More commonly, partnerships emerge between individual researchers and individual companies offering expedition-style cruises to the Antarctic. One profitable example of this relationship has contributed to our recent increase in understanding of killer whale ecology in the Southern Ocean (Pitman & Ensor 2003). Pitman & Ensor (2003) report that there are three discrete ecotypes of killer whales in the Antarctic, which are morphometrically distinct, and appear to be ecologically isolated as well. The genetic work to test this hypothesis is underway, and Antarctic tourist ships have played a role in facilitating that work as well. Pitman acknowledges the support that he received from the owners and operators of M/S *Explorer*, the first purpose-built Antarctic tourist ship. He notes: "I collected 14 biopsies from three different groups of animals (all Type B, the only samples I have from this form), because they allowed me take a launch out on 5 different occasions. I was able to lecture about my work and the passengers were quite enthusiastic and even supportive of the biopsy sampling." Pitman indicates that overall, the arrangement worked well both for research and the tour operator, and was one that provided an opportunity to get samples and observations that otherwise would not have been available; just not as many opportunities, of course, as one would have had on a dedicated research platform (Pitman, pers. comm).

A recent collection and archive for Antarctic killer whale photographs, called the Antarctic Killer Whale Identification Catalogue, has been implemented by Dr. Ingrid Visser (AKWIC, www.akwic.org). Visser's

project has made use of extensive connections with the Antarctic tourism industry through IAATO, particularly by providing IAATO members with a free slide show about killer whales to be given on each trip. In future, it is hoped that the growing collection of killer whale photographs will yield new information about the species, just as the Antarctic Humpback Whale Catalogue has done.

Multi-species research

Conventional distance sampling methods to estimate animal abundance require a systematic survey design that gives each point in a study area equal probability of being sampled (Buckland *et al*. 2001). Recently developed spatial modelling techniques (*e.g.*, Hedley *et al*. 1999) relax this assumption, by turning animal density from a parameter assumed to have been measured along a representative sample of transects to a parameter to be estimated from the data using a statistical model. Antarctic tourism ships were used for the collection of data to try out these new methods, which were found to work reasonably well for Antarctic minke, humpback and fin whales in the South Atlantic sector of the Southern Ocean (Williams *et al*. 2006). That study mapped gradients in density of three baleen whale species as functions of simple spatial and environmental covariates, and estimated animal abundance reasonably accurately with a moderate degree of precision. But the resulting data are available for addressing questions of interest to colleagues working on other species, or on other questions relating to the target species, and have been combined with the Southern Ocean Globec shared database.

Census of Antarctic Marine Life

Currently, the potential for a working partnership between IAATO and the proposed forthcoming Census of Antarctic Marine Life (CAML, http://www.caml.aq) in conjunction with the International Polar Year (IPY) is being developed. This project has the advantage of being able to use the tour vessels as platforms for opportunistic data collection for oceanographic and zoological studies.

Methodological development

Antarctic tourist ships (and indeed ships of opportunity generally) are useful for conducting research that requires ship time that need not follow a randomised survey design. One area that offers particular promise is for methodological development and application of new technologies, such as the emerging techniques for measuring range to free-ranging cetaceans (Leaper & Gordon 2001). All distance sampling methods to estimate abundance assume that radial distances and angles are measured without error (Buckland *et al*. 2001), but in practice, this is a difficult assumption to satisfy in the field. Emerging photogrammetric methods offer promise for allowing ranges to be measured more accurately, but they may also be used for conducting distance estimation calibration experiments to allow post-hoc methods to remove systematic bias in estimated ranges. In collaboration with Philip Hammond, Russell Leaper and Alexandre Zerbini, Williams (2003) conducted such distance calibration experiments aboard Antarctic tourist ships. The resulting relationships between estimated and measured distances were used to remove bias in radial distance estimates from a previous study that altered the estimates of effective strip width by 20% (Williams *et al*. 2006). Such ships could be used for methodological developments to address other outstanding issues of relevance to the process of abundance estimation, such as developing new methods to estimate g(0) or address responsive movement. Finally, these ships provide an invaluable platform for training new observers and for practicing survey protocols without having to pay expensive ship charter fees.

Opportunities for future collaborations

Obviously, many questions of interest to marine scientists cannot be answered without having some degree of control over where their research vessel goes. Conversely, the Antarctic tourism industry can not be expected fill up their ship with keen scientists and no paying guests. However, both the extraordinary cost of accessing the Southern Ocean for scientists and the interest that tourists pay to whales and whale research make these mutually beneficial partnerships worth considering. We believe that these partnerships are particularly worth examining as we prepare for the International Polar Year, when scientists around the world aim to collect and synthesise as much information about our polar regions as possible. In the course of our discussions, several research questions came to mind that might benefit from collaboration between science and tourism. Here we outline a few such studies, *inter alia*:

1. confirming/clarifying potential stock boundaries in southern hemisphere baleen whales by modelling gaps or discontinuities in observed distribution;
2. identifying the timing of peak migration of humpback whales. Tourist ships stay in the Peninsula region from November to March, and their repeated visits could be used to estimate the point at which

whale encounter rate peaks, indicating that most whales have arrived on the feeding grounds. This point could be used to plan the timing of future surveys;

3. exploring ecological relationships between ice cover and whale distribution;
4. assessing the proportion of fin whales north of 60ºS. Survey effort in the northern waters is quite informative, as we know from looking at encounter rate observed from transit legs on IDCR/SOWER surveys;
5. getting more information on killer whale abundance (or indices of relative abundance), distribution, movement patterns, social structure and diet with respect to the three ecotypes; and
6. collecting ID photographs opportunistically of blue whales anywhere in the southern hemisphere.

In summary, it might be worth considering a definition of ecotourism that refers to a "symbiotic relationship between tourism and conservation." The Antarctic represents a special case for conservation, given its status under the Antarctic Treaty as a region set aside for peaceful and scientific, that is, non-consumptive purposes. The Antarctic tourism industry through IAATO has demonstrated a remarkable willingness to facilitate conservation-minded cetacean research. It remains to be seen whether the opportunities for future collaboration that we have outlined in this section can be achieved from tourism ships with their busy schedules, even with a scientist on board. That said, it seems likely that given the creativity of scientists and the enthusiasm of Antarctic tour operators and tourists, that each of these projects and others could and should be begun by the IPY of 2007-8.

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