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ANTARCTIC WHALES AND ANTARCTIC TOURISM

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Shipboard visitors to the Antarctic are routinely rewarded with whale sightings. However, careful management and dedicated research are needed to ensure that the growing Antarctic marine tourism industry does not inadvertently harm these populations, which are recovering from heavy exploitation in the early part of the 20th century. Ongoing research by the International Whaling Commission (IWC) aims to monitor whale population recovery, and the International Association of Antarctica Tour Operators (IAATO) has developed operational guidelines to minimize and mitigate potential impacts, some specific to marine mammals and marine wildlife watching. Nonetheless, while boat-based tourism has the potential to affect whales, responsible tourism also has a substantial contribution to make to Antarctic whale conservation and research through collaboration.

Key Words: Whale watching; IAATO; Research; Tourism

Introduction

As was well known to whalers in the early 20th century, the Southern Ocean provides a rich feeding ground for many species of migratory whales, which return each summer to nutrient-rich waters to build up nutritional stores that enable them to survive their long migration to low-latitude mating and calving grounds. Since the 1985–1986 "pause" in commercial whaling, some southern hemisphere whale populations are beginning to show signs of recovery, and visitors to the Antarctic are now routinely rewarded with whale sightings. Although there is concern globally that boat-based tourism can cause disturbance, there is potential for this tourism to be used as a resource to assist with whale research. The intention of this article is to outline some examples of collaboration between the Antarctic tourist industry and whale researchers and identify areas of possible future partnerships to contribute to our overall knowledge.

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 (International Association of Antarctic Tour Operators [IAATO], 2006). In 1991, recognizing the potential environmental impacts that tourism could cause, seven private tour operators

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conducting excursions in Antarctica joined together to found a self-regulatory, member organization. The specific aim of this organization, 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. This article aims to provide an introductory overview of the current state of Antarctic marine tourism as it pertains to whales and whale conservation.

Thus far, Antarctic tourism has been primarily seaborne, with a geographic focus overwhelmingly biased toward the Peninsula region. Ship-based tourism along the Peninsula captures 90% of all tourist activity, incorporating 211 voyages during the 2005–2006 season, while 5% visit other sectors of the Southern Ocean and the remaining 5% being land-based tourism (IAATO, 2006). 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 (*Megaptera novaeangliae*) and minke (*Balaenoptera bonaerensis*) whales are most frequently found in the shallower, coastal waters, and killer whales (*Orcinus orca*) 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 (*Balaenoptera musculus*), southern right whales (*Eubalaena australis*) and Arnoux's beaked whales (*Berardius arnuxii*) are sighted annually, but the duration of the encounter is dictated primarily by the behavior 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

Much concern has been voiced regarding demonstrable short-term impacts of whale watching on cetaceans (Baker & Herman, 1989; Beach & Weinrich, 1989; Bejder, Dawson, & Harraway, 1999; Constantine, 1999; Corkeron, 1995; Forestell & Kaufman, 1990; Gordon, Leaper, Hartley, & Chappell, 1992; Lusseau, 2003; Orams, 1997a; Phillips & Baird, 1993; Williams, Bain, Ford, & Trites, 2002; Williams, Trites, & Bain, 2002). As these studies have progressed, they have lent increasing strength to concerns that human activities may be influencing the fitness of these animals (Corkeron, 2004), although the links between short- and long-term impacts (via energetics, habitat use, fitness, and reproductive parameters) are being forged primarily for small, closed populations of coastal odontocetes [i.e., bottlenose dolphins (*Tursiops truncates*): Bejder, 2005; Bejder et al., 2006; Lusseau, 2004, 2005; and killer whales: Williams, Lusseau, & Hammond, 2006]. Certainly, vessel-based whale watching can elicit short-term behavioral responses from large baleen whales [e.g., humpback whales (~~*Megaptera novaeangliae*~~): Scheidat, Castro, Gonzales, & Williams, 2004; fin whales: Jahoda et al., 2003]. On their migration routes, whale watching in a fixed location may diffuse impacts of whale watching on individual baleen whales; however, the Peninsula region of course represents important feeding habitat for humpback whales. In the most commonly visited sites (Cierva Cove, Lemaire Channel, Gerlache Strait, Paradise Bay, for instance), individual whales may be approached repeatedly and frequently.

Aware of the potential for disturbance, IAATO developed Marine Wildlife Watching Guidelines for Vessel and Small Boat Operations in 2001, with periodic updates (IAATO, 2003). Whale-watching guidelines for Antarctica were developed from those in use elsewhere (e.g., the US and Australia). 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, masking effects of boat noise on echolocation or vocalizations, disruption of feeding, disruption of reproductive and other social behaviors, stress from interaction, injury or increased mortality) while ensuring a good wildlife-watching experience, which is thought to be a key component in developing public support for the conservation of these species (Orams, 1997b). In effect, the guide-

lines aim to ensure that the animals dictate the encounter, and emphasize the importance for vessel operators to be able to evaluate the animals' behavioral 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, etc.). A selection of the specific requirements from the guidelines relating to whale watching is listed in Figure 1.

Increased ship traffic in the Peninsula region also has heightened concern about the potential for ship strikes to impact large whale populations (Caswell, Fujiwara, & Brault, 1999). In addition to the above whale watching guidelines, IAATO has worked with the US Marine Mammal Commission since 1998 by distributing a standardized 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 to our knowledge has resulted in 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 endeavored 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, Carlson, & Stevick, 2006) and the Antarctic Killer Whale Catalogue (Antarctic Killer Whale Identification Catalogue [AKWIC], 2006) to which passengers and naturalists are encouraged to submit photographs of individually recognizable whales; and providing ship time for researchers working on well-defined cetacean research projects that can benefit from nonrandomized survey coverage in the Southern Ocean (Pitman & Ensor, 2003; Williams, Hedley, & Hammond, 2006). In all, this healthy cooperation between industry and science is estimated by the authors to be worth approximately US$1 million of in-kind support. Researchers working aboard these ships also offer to serve as a naturalist and educational resource, which can add value to the tourists' experience at little cost to operators.

Case Studies of Existing Partnerships

The following section summarizes 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 long and fruitful history, namely the Antarctic Humpback Whale Catalogue (Antarctic Humpback Whale Catalogue [AHWC], 2006; Allen, Carlson, & Stevick, 2006). 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 (J. C. Allen, personal communication, May 5, 2006). 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 understanding 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, Paceco de Godoy, McOsker, Engel, & Allen, 2006). 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.

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.

Figure 1. Abbreviated extract from IAATO's Marine Wildlife Watching Guidelines (Whales & Dolphins, Seals and Seabirds) for Vessel & Zodiac Operations (IAATO, 2003).

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 recent increases in understanding of killer whale ecology in the Southern Ocean (Pitman & Ensor, 2003). Pitman and Ensor 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 under way, and Antarctic tourist ships have played a role in facilitating that work as well. Pitman, of the US Southwest Fisheries Science Center, acknowledges the support that he received from the owners and operators of MS *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 indicated 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 (R. L. Pitman, personal communication, January 20, 2006).

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, 2006). 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.

Multispecies Research

Conventional distance sampling methods to estimate animal abundance requires a systematic survey design that gives each point in a study area equal probability of being sampled (Buckland et al., 2001). Recently developed spatial modeling techniques (Hedley, Buckland, & Borchers, 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, Hedley, & Hammond, 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 modest degree of precision. However, 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.

Census of Antarctic Marine Life

Currently, the potential for a working partnership between IAATO and the proposed forthcoming Census of Antarctic Marine Life (Census of Antarctic Marine Life [CAML], 2007) 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 randomized survey design. One area that offers particular promise is for methodological development and application of new technologies of interest to the process of abundance estimation generally. An example is seen in 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. Such distance calibration experiments have been conducted aboard Antarctic tourist ships (Williams, Leaper, Zerbini, & Hammond, 2007). 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., 2007). 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 trackline detection probability for diving animals [i.e., $g(0)$] 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 cannot 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. These partnerships are particularly worth examining with the approach of the International Polar Year, when scientists around the world aim to collect and synthesize as much information about Polar regions as possible. Several research questions that might benefit from collaboration between science and tourism include, inter alia:

1. Confirming/clarifying potential stock boundaries in southern hemisphere baleen whales by modeling 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 60°S. Survey effort in the northern waters is quite informative, which is often restricted in the Southern Ocean to looking at encounter rate observed during the transit legs to and from high-latitude (such as 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.
6. Collecting ID photographs opportunistically of blue whales anywhere in the southern hemisphere.

One research area that is not included in our partial list is the study of potential impacts of Antarctic tourist activities on whales and whale populations. Given the evidence worldwide that cetacean-based tourism can impact targeted populations, and given the growth of whale watching activities along the Antarctic Peninsula, there is reason for both researchers and tour operators to remain mindful of this potential. While studies to detect those impacts can be done from tourist platforms, providing a good insight for successful management, there is need for complimentary work to be done on governmental or scientific vessels also. This is necessary as studies to detect such impacts may be at a disadvantage if they are conducted from the tourism platforms, for example, through the potential criticism that the research may be biased towards the host vessel. As such we would encourage scientific communities also to support this work.

Conclusion

To conclude, it is worth revisiting definitions of ecotourism that relate to a symbiotic relationship between tourism and conservation. The Antarctic represents a special case for conservation, given its status under the Antarctic Treaty System as a region set aside for peaceful and scientific, that is,

nonconsumptive purposes. The Antarctic tourism industry through IAATO has demonstrated a remarkable willingness to facilitate conservation-minded cetacean research. It remains to be seen whether opportunities for future collaboration can be achieved from tourist 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, these projects and others, could be initiated by the IPY of 2007–2009.

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