

Understanding human-whale interactions: a multidisciplinary approach

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ABSTRACT

Management of wildlife tourism is multi-faceted, requiring an understanding of the long-term biological impacts as well as the needs of tourists, industry and other stakeholders. Successful management for the sustainability of wildlife tourism is most likely to succeed under an adaptive management system. The benefits of this type of integrated and holistic approach are widely recognised but rarely adopted in the management of whale-watching. This study examines both the human and animal dimensions of whale-watching by incorporating both social and biological sciences. A framework for management of the New South Wales humpback whale-watching industry based on the findings of this research is provided. This framework aims to maximise the benefits of whale-watching for tourists, industry and conservation while minimising the adverse effects on whales. This study has identified techniques for education, research and vessel management as three fundamental components of sustainable management strategies for the whale-watching industry. Mechanisms by which management, can incorporate all three of these components, are given.

Key words: Wildlife tourism management, humpback whales, whale watching, adaptive management

Introduction

Current research on nature-based tourism suggests that there is a high level of interest in wildlife viewing in Australia (Moscardo *et al.* 2001; Moscardo and Slatzer 2005). In Australia wildlife tourism is thought to attract well over 10 million participants annually (Green and Higginbottom 2001). As the popularity of wildlife tourism grows so too does the concern over its impacts on the wildlife being viewed. Sustainable management of the industry which ensures conservation and protection of the species being viewed, as well as the ecosystem in which it occurs, is an objective of all stakeholders including: government agencies responsible for wildlife management; tourism operators and local communities who stand to benefit financially from ongoing wildlife tourism; and tourists who want access to wildlife experiences now and into the future.

The multi-dimensional nature of wildlife tourism requires that sustainable management of the industry is considered at a number of levels. According to Higginbottom (2002), tourism based on viewing free-ranging animals must meet the following criteria to be sustainable: 1) customers must be satisfied with their experiences; 2) operators must make sufficient profits; 3) the activities must not cause the wildlife population(s) to decline, or to become less viewable over time and; 4) if the population is declining due to other causes, the activities should contribute positively to its conservation. The value placed on each of the criteria varies between and within stakeholder groups and it is in these inconsistencies that conflict arises; e.g., operators are likely to object to strategies aimed at mitigating tourism impacts if they will also compromise customer satisfaction and/or the operator's ability to make sufficient profits.

Finding the balance between the needs of wildlife, tourists and industry is the key to successful wildlife tourism management. Research, which provides science on which to base management regimes, is an important step in the process of finding this balance. Wildlife tourism research must provide quantitative measures of the effects of wildlife tourism that can be monitored and provide insight into the perspectives and needs of industry, regional communities and tourists. Thus an understanding of the wildlife-human interactions must draw on research from both social and biological sciences. This type of integrated approach is the basis for adaptive management (Newsome *et al.* 2005) and its importance to marine mammal tourism has been documented by a number of authors (e.g. Berrow 2003; Orams 1999; Valentine and Birtles 2004; Waples 2003). Adaptive management is a systematic and continuous process of improving management practices based on information learnt through research and monitoring. It is a widely accepted approach for management of wildlife tourism (Newsome *et al.* 2005) and is recognised by the Secretariat of the Convention on Biological Diversity as "... an essential part of any management for sustainable use" (Secretariat of the Convention on Biological Diversity 2006, p. 123). Despite this recognition, such an approach is rarely used for managing whale-watching in Australia (Birtles *et al.* 2001; Valentine and Birtles 2004).

This paper summarises the key findings of a 4-year study of the NSW humpback whale watching industry as an example of how multidisciplinary research can be applied to wildlife tourism management. This work examines both the human and animal dimensions of the interface between whale-watching tourism and the whales to create a management framework aimed at sustaining the whale watching industry in NSW. Three perspectives for management were considered in this study:

- 1) The whale-watchers' perspective – are their needs being satisfied?
- 2) The ecotourism perspective - does whale-watching educate and contribute to conservation?
- 3) The biological conservation perspective – is the welfare of the whales being protected?

Whale-watchers' perspective

In order to manage whale watching successfully it is imperative that the human-whale relationship is fully understood including the interest and motivation to interact with whales. The importance of understanding the human dimension of wildlife encounters through information on visitor characteristics, expectations, motivations, benefits and satisfaction has been recognised in many studies (Duffus and Dearden 1993; Muloin 1998; Muloin 2000; Orams, 2000; Moscardo *et al.* 2001; Reynolds and Braithwaite 2001; Moscardo and Saltzer 2005) and some knowledge of this kind has been published for whale-watchers (Reid 1993; Muloin 1998; Muloin 2000; Orams 2000; Neil *et al.* 2003; Orams *et al.* 2003; Valentine *et al.* 2004). To investigate the demographics, expectations, experience and satisfaction of whale-watchers in NSW, 1569 land-based whale-watchers were surveyed over three years from 2002 to 2004 at a land-based site at Cape Solander (near Sydney) and 1018 boat-based whale-watchers were surveyed in 2002, 2003 and 2005 on the south coast of NSW (from Narooma to Eden).

Important features of a whale watching experience

Whale-watchers were given a list of 14 features that people may look for when seeking a good whale-watching experience and were asked to rate each as either 'important', 'neutral' or 'not important'. The two most important features for a good whale watching experience were consistent for both land- and boat-based whale-watchers and were: 'seeing whales in their natural environment' and 'seeing whales behaving naturally'. Other studies of wildlife tourism have also found that the 'naturalness' of the experience was a highly important factor contributing to visitor enjoyment and overall satisfaction (Pearce and Wilson 1995; Davis *et al.* 1997; Muloin 1998; Muloin 2000; Woods 2001; Moscardo and Saltzer 2005). Seeing whales up close, having the opportunity to learn more about whales and having a chance to do something new, exciting and different were also considered important for a good whale-watching experience (Table 1).

Table 1. The six most important features of a whale watching experience for boat-based whale watchers (*n* between 950 and 989) and land-based whale watchers (*n* between 1495 and 1524). Percentages represent the proportion of respondents who answered 'important'.

Boat-based whale watchers		Land-based whale watchers	
Features	%	Features	%
Seeing whales in their natural environment	95	Seeing whales in their natural environment	90
Seeing whales behaving naturally	95	Seeing whales behaving naturally	90
Seeing whales up close	92	Opportunity to spend time with family and friends	68
An opportunity to learn more about whales	76	Seeing whales up close	63
A chance to do something new, exciting and different	77	A chance to do something new, exciting and different	62
An opportunity to take photos	69	An opportunity to learn more about whales	56

Whale-watchers' satisfaction

Whale-watchers were asked to rate the satisfaction level of their experience on a 7-point scale (1 = boring, 4 = acceptable and 7 = fascinating). Land-based whale-watchers were only moderately satisfied with their experience whilst boat-based whale-watchers were highly satisfied with their experience. Median satisfaction ratings were 4 and 6, respectively. Some of the factors which influenced whale-watchers' satisfaction included the

- Degree to which expectations were met
- Proximity to whales
- Number of whales
- Whale behavioural displays
- Amount whale-watchers thought they had learnt.

Once these factors are understood, measures can be taken to enhance satisfaction, providing they are consistent with the objectives of sustainable tourism. Managing expectations and improving education should be used to help solve the inconsistencies between tourists' desires and animal welfare needs. For example, whilst the satisfaction of whale-watchers in this study correlated with proximity to whales, giving whale-watchers deliberate close up experiences (i.e. <100 m) is not compatible with animal welfare objectives of the sustainable management of whale-watching. In this instance an increased understanding of reasoning behind approach limits and attainment of realistic expectations through improved education for whale-watchers can be an indirect way of increasing satisfaction without compromising the welfare of the whales. If seeing whales behaving naturally is truly the desire of whale-watchers (as indicated in Table 1), then this shift in attitudes should be easily achieved. In addition some measures can be taken to enhance viewing quality without physically imposing on the whales, such as providing fixed binoculars and/or telescopes at these sites.

In general, wildlife tourists often have unrealistically high expectations of wildlife viewing (Green and Higginbottom 2001; Higginbottom *et al.* 2001; Moscardo *et al.* 2001) as was the case with land-based whale-watchers in this study. Managing these expectations will help people form realistic expectations and beliefs about their experience and ultimately lead to a more satisfied wildlife tourist (Hammit *et al.* 1993; O'Neill *et al.* 2004). Management of whale-watchers' expectations should include the

promotion of realistic expectations which should be incorporated into media releases and interviews; on websites; in promotional brochures or other handouts; in information given prior to the whale-watching experience including telephone enquires; and in information given when arriving at the whale-watching site or boarding the vessel, including interpretive displays and welcoming commentary. Information should include: what species of whale they should be looking for; how close they can expect to get to the whales; legislation or guidelines governing whale-watching in the area and the rationale behind these; why the whales are in the area; and what behaviours they are likely to see and not see, and why. For example: it is important that Cape Solander whale-watchers are educated on the migration pattern of the humpback whales. Watching humpbacks near Sydney is much different to whale watching further north (e.g. Hervey Bay). Whale-watchers at Cape Solander should not expect to see whales staying in the one area for any length of time, nor should they expect to see a humpback mother and calf. The humpback whales passing Cape Solander are swimming steadily to their calving grounds further north and Cape Solander whale-watchers should consider it a rare privilege to see whales take time out from their journey to breach or to display any other active surface behaviours. Whale-watchers should never be under the impression that they are guaranteed to see whales. The results of this study suggest that there is a 36% chance that they will not see any whales at Cape Solander. Most whale-watchers in this study were spending between 30 minutes and two hours at Cape Solander. The chances of seeing whales at Cape Solander increased to 79% for people spending longer than 2 hours at Cape Solander.

The constraints in managing expectations of wildlife tourists are outlined by Higginbottom (2004) and include the difficulty in striking a balance between promoting a tourism product whilst not unduly raising expectations. Most land-based whale-watching occurs in areas managed by the government agency responsible for sustainable management of whale-watching. Therefore managing land-based whale-watchers' expectations should not be constrained by commercial considerations.

Land based whale watching opportunities often occur in the context of other outdoor/nature experiences such as nature walking, bird watching, sightseeing and picnicking. Taking the emphasis off the whales and focusing on the broader nature experience, with the possibility of seeing whales, is another way of achieving realistic expectations for whale-watching. The beauty of the area and the ability to incorporate other activities such as bushwalking was appreciated by many land-based whale watchers surveyed in this study.

The value of education

Learning about whales was an important aspect of the land-based and boat-based whale-watching experience. Others have also found strong correlations between the amount visitors said they learnt about the wildlife and their overall satisfaction (Higham *et al.* 2001; Lück 2003; O'Neill *et al.* 2004; Moscardo and Saltzer 2005). Even though learning about whales was considered to be a valuable part of the whale-watching experience, most land-based whale-watchers said they learnt little or nothing about whales and just over half of respondents said they learnt only 'a little' about whales. More information about whales was requested by 44% (Figure 1) and 45% of boat-based and

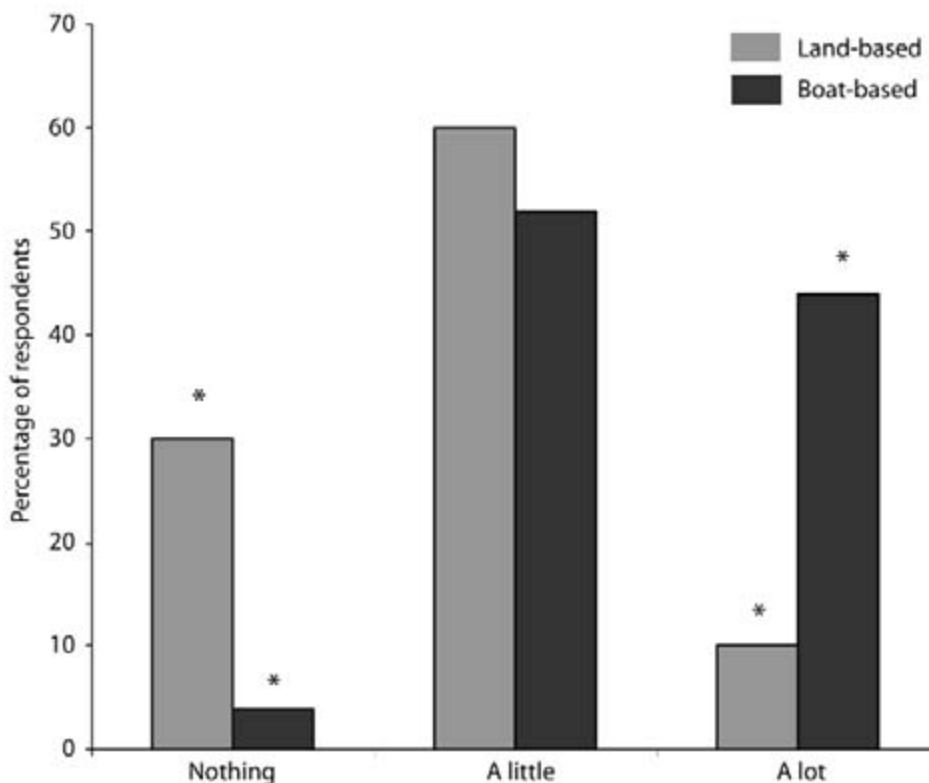


Figure 1. How much land-based whale watchers (n= 1343) and boat-based whale watchers (n = 904) said they learnt about whales during their whale watching experience. $\chi^2 = 471.05$, $df = 2$, $P < < 0.001$. * Standardised residual $P < 0.05$.F

land-based whale-watchers, respectively. Thirty-eight per cent of Cape Solander whale-watchers did not know which type of whales they were watching. This trend is not unique. Findlay (1997) reported that only 44% of land-based whale-watchers in South Africa could correctly identify the species of the whale they were watching. The number of boat-based whale-watchers able to correctly identify the whales was much higher. Ninety-three per cent of boat-based whale-watchers knew that they were watching humpback whales. Boat-based whale-watching is more structured and therefore more conducive to a direct-guided experience. The vessel itself provides for a captive audience where participants are concentrated in a small area. Public address systems and the use of props are therefore often effective on boat-based tours. Furthermore, whale-watchers on boat tours are on board for the same amount of time rather than coming and going at different times as is typical at land-based viewing areas. Providing effective interpretation at a land-based viewing area provides extra challenges. Nevertheless, it is important that land-based whale-watchers are given the same opportunity to learn about whales and the marine environment as those who go on a commercial whale-watching boat tour.

The value of education in wildlife tourism experiences may be three-fold. It can increase visitor satisfaction, it can lead to a greater awareness about wildlife and its conservation (Duffus and Dearden 1993; Higginbottom 2002; Higginbottom *et al.* 2001a; Higham *et al.* 2001; Kimmel 1999; Lück 2003a; Moscardo and Saltzer 2005; Moscardo *et al.* 2001; Orams 1995b; 1996; Reid 1999) and it has proved to be a valuable tool for management of inappropriate behaviours while watching wildlife (Meinhold 2003; Orams and Hill 1998). While the current interpretative material provided during whale-watching experiences in NSW contains some elements of a good interpretation program, its structure requires improvement and it needs to better incorporate conservation themes. The quality of education given to whale-watchers must be improved to enhance visitor satisfaction and to satisfy the conservation objectives of sustainable tourism (see next heading).

Ecotourism perspective

Ecotourism is defined by the Australian National Ecotourism Strategy as nature-based tourism that involves education and interpretation of the natural environment and is managed to be ecologically sustainable (Alcock *et al.* 1994), and by Ecotourism Australia (2006) as ecologically sustainable tourism with a primary focus on experiencing natural areas that fosters environmental and cultural understanding, appreciation and conservation. The requirements for education and contributing to conservation distinguish ecotourism from other forms of nature-based tourism. Whether whale-watching in NSW in its current form can be considered ecotourism is an important question that needs to be asked for if the answer is 'no', then the sustainability of the industry will be compromised.

Many government and non-government organisations (NGOs) involved in the conservation of whales actively support and encourage commercial whale-watching as a sustainably activity (Corkeron 2006; Corkeron 2004). One of the four main arguments used by these organisations is

that whale-watching promotes and induces conservation. The effectiveness of whale-watching to impact positively on biodiversity conservation is largely untested and has led to recent questioning of such sentiment (see Corkeron 2006; Corkeron 2004). This study assessed the effectiveness of whale-watching experiences in NSW in promoting a conservation ethic and provides further insight into this issue.

The results of this study revealed that whale-watching in NSW, in its current form, encouraged most people (70%) to talk about whales generally, and encouraged some (45%) to talk to others about whale conservation. It did little to influence the rate at which whale-watching participants conducted environmentally friendly behaviours upon their return home and there was limited addition to knowledge of whales in the long-term.

For whale-watching in NSW to be an ecotourism experience, its ability to impact positively on conservation needs to be improved. Interpretation, which incorporates effective and cognitive learning processes, is the key in facilitating this. Management of wildlife tourism is often concerned with managing the negative impacts (Higginbottom *et al.* 2001a). Equal effort needs to be applied to maximising the positive contributions of wildlife tourism. The development of effective interpretation that promotes a conservation ethic and understanding of whales is an important step towards ensuring the sustainability of the whale-watching industry in NSW. Models for effective interpretation programs at whale-watching sites have been developed (Forestell and Kaufman 1990; 1993; Orams 1994; 1996; Reid 1999) but are rarely used. Planned and structured interpretation programs based on these models should be considered.

Implementation would be best achieved by incorporating training for operators, crew members, guides and naturalists into a State, or even, national accreditation program for whale-watching operations. An internationally recognised ecotourism accreditation program 'EcoCertification' already exists in Australia (Ecotourism Australia 2006). However, sustainable management of whale-watching would be best served by developing a specific program aimed at certifying responsible whale-watching operations. One of its benefits would be consistent and accurate information for whale-watchers. As well as the provision of high quality interpretation, certification should also require the demonstration of best practices when watching whales (e.g. operators' knowledge of and adherence to current state and national whale-watching regulations and guidelines) and may also acknowledge operators' contributions to conservation and research. Promotion of the accreditation program, in a way that highlights its merits and certification criteria, is crucial. Raising awareness amongst tourists and creating a demand for responsible whale-watching tours will help achieve widespread adoption of the program.

All stakeholders have responsibility to ensure that whale-watching in NSW can be accredited as an ecotourism experience that minimises its negative impacts while maximising the benefits to whales and tourists. Following implementation, the interpretive program should be evaluated to determine whether it is meeting conservation objectives in both the short and long-term, and contributing positively to the sustainability of the industry.

Biological conservation perspective

Biodiversity conservation should be central to the sustainable management of wildlife-tourism. It is essential that we understand the biological consequences of wildlife tourism in order to apply appropriate mitigation strategies, when required. To apply this concept to whale watching, a control-impact comparison study of humpback whale behaviour in the presence and absence of vessels was conducted. Behavioural observations were recorded from five commercial whale watching vessels (belonging to three operators) operating out of three ports on the NSW south coast - Narooma, Merimbula and Eden - and from two land observation sites - Montague Island and Green Cape. Rates of occurrence of behaviours were obtained using a group-follow or survey protocol and continuous sampling technique (Mann, 1999). A sample of 121 h of observations of 206 pods was collected from on board whale watching vessels and 46 h of control observations (no vessels within 5 km) were made of 144 pods from the land-based sites. A pod was defined as one or more whales within 100 m of each other, generally moving in the same direction, and coordinating their behaviour (Corkeron 1995; Mobley and Herman 1985; Whitehead 1983).

Whales' responses to vessels

Responses of southward migrating humpback whales to vessels were highly variable. Whilst some pods (17%) showed obvious signs of horizontal avoidance (changes in speed of travel and orientation in relation to the vessel), others (24%) approached vessels initiating often brief interactions. Mother-calf pods were more sensitive to the presence of vessels than were non-calf pods, spending longer periods submerged when vessels were present. Dive times increased by an average of 60 s and overall percentage of time submerged increased by 30% for calf pods in the presence of whale-watching vessels. In addition, some surface behaviours such as breaches and pectoral slaps were suppressed in the presence of vessels. Whilst there were increases in dive time and the overall percentage of time spent submerged in the presence of vessels, there were no associated changes in respiration intervals. Pods showing no obvious signs of avoidance still demonstrated changes in diving and surface activity when compared to pods in the absence of a vessel. When both approach and avoidance responses of pods were combined, 40% of the pods encountered altered their behaviour in an obvious way.

This raises the question of whether approach responses by the whales can be considered positive interactions or simply another indicator of disturbance. Whale-initiated approaches would have negative long-term effects if they influence the time spent foraging, resting, socializing or suckling or lead to increased incidents of boat strikes (Janik and Thompson 1996; Constantine 2001). There was evidence from this study that approaches by pods interrupted foraging. Feeding pods were seen on 24.5% of all whale-watching trips and in 10% of these observations, pods suspended feeding to approach the

whale-watching vessel. Because resting whales were rarely observed and suckling was not measured, there was no evidence for an impact of whale-watching vessels under the conditions of this study on whale resting or suckling times.

Interruptions to behaviour through whale-initiated vessel interactions are not likely to be prolonged, as most approaches by pods were brief, lasting less than 10 minutes. However, these brief interruptions are potentially one of multiple encounters with whale-watching vessels. There are approximately 88 operators currently offering whale-watching in NSW along most of the NSW coastline (Stamation, unpublished data) and 43 operators reportedly conducting whale-watching throughout QLD in 2003 (IFAW 2004). Given the large size and extent of the whale-watching industry and that the migration route of this humpback whale population follows the east Australian coast closely (Dawbin 1966; Paterson *et al.* 2002), the chance that an individual whale will encounter several vessels during its migration is high. Thus, there is the potential for a cumulative effect of frequent interruptions and changes to behavioural states. Further research into the frequency and duration of whale encounters during the entire migration will be required to assess the importance of this effect. Research may need to be site specific. For example, whale-watching off Sydney occurs mainly during the northern migration when whales are typically without calves and travelling steadily north. There may be differences in responses at that time and location than reported in this study when whales are travelling south, often accompanied by calves, and sometimes engaged in surface feeding.

Increased exposure to vessels may lead to habituation and sensitization. From a whale-watchers' point of view, habituation, which leads to closer views of the whales, can be desirable. However, in addition to interruptions to behaviour states, a reduction in a whale's wariness of boats can increase their vulnerability to threats. Samuels and Bejder (2004) reported that dolphins conditioned to human interaction were often observed in encounters with humans that put them at risk of injury, illness or death. On the other hand, sensitisation through repeated and consistent exposure to vessels can result in higher avoidance of vessels, which may lead to a shift in their distribution. Constantine (2001) found an increase in avoidance of swimmers by bottlenose dolphins with cumulative experiences and shifts in distribution. Abundance of cetacean populations relative to increases in human activity have been documented (Ritter 2003; Bejder *et al.* 2006a). It is important that the whales' responses to whale watching vessels are continually monitored over time to evaluate the cumulative effects of exposure and the subsequent impacts (if any) at a population level.

Seventy-six per cent of all responses (avoidance and approach) occurred within 20 minutes of the vessel moving within 1 km of the pod. Despite this, vessels stayed with a pod showing obvious signs of avoidance for an average of 52 minutes (and a maximum of

115 minutes). Operators generally remained at a minimum approach distance of 100 m from both non-calf and calf pods. Whales were more likely to avoid vessels that were not operating in accordance with the NSW whale-watching regulations and more likely to approach vessels that were operating in accordance with approach regulations. Given that customer satisfaction is fundamental to ensuring the long-term sustainability of the industry, and close viewing correlates with high visitor satisfaction, it is in the operators' best interests to comply with the existing NSW whale-watching regulations for approaching whale pods.

Implications for management

To date, much of the focus of management strategies for the whale-watching industry has been on minimum approach distances. Approach distances are an important part of regulating vessel activities around whales and this study provides justification for the 100 m approach limit. However, the shortcomings with relying too heavily on approach limits need to be recognised. Even when vessels were operating in accordance with approach limits, whales were still showing some behavioural changes when compared to pods in the absence of vessels. Other research has found that the behaviour of humpback whales is affected by vessels as far away as 4 km (Baker and Herman 1989). The biological effectiveness of the extended approach limits for calf pods is yet to be rigorously tested. Experimental testing of approach distances is required to determine their effectiveness in mitigating the negative impacts of whale-watching and to determine what constitutes a 'close enough' view for whale-watchers.

Although harm to individuals or populations through whale-watching activities are yet to be identified for large whales, the growing body of evidence indicates that vessels can influence their short-term activity patterns and behaviours. Therefore we need to be mindful of the cumulative interactions occurring along the migration routes has the potential for greater harm than may be evidenced at any one whale-watching site. Additional management strategies aimed at limiting whales' exposure to vessels and improving knowledge of the long-term implications of vessel interaction should be considered. Management strategies might include: introducing time limits for close observations of whales from boats, limiting the number of trips per day, limiting the hours of operation, regulating the number of whale-watching vessels through a licensing system, long-term monitoring of the population and developing educational programs for operators and recreational vessel users. Many of these recommendations are consistent with those given in the Australian National Guidelines for Whale and Dolphin Watching 2005 under 'Additional Management Considerations for Vessels' but have not been incorporated into NSW state policy as yet.

As humpback whales are migratory and cross State and Commonwealth jurisdictions, management needs to be considered on a national level to address the potential cumulative impacts of whale watching activities

throughout the species migratory pathway and breeding areas. Licences which regulate the number of whale-watching vessels could be considered on a national scale to limit exposure during the entire migration. An operators' register would also assist with identification of the industry and its growth and help managers liaise with operators. A thorough assessment of the potential benefits, costs and risks associated with a licensing system for the NSW whale-watching industry including a review of the value of other State's licensing system should be conducted to determine the feasibility of such a management strategy.

Many whale-watching regulations and guidelines around the world include time limits for encounters (Carlson 2004). The most common time limit is 30 minutes (UNEP MAP RAC/SPA 2003). There are no limits for whale-watching operations in Australia. A time limit of 30-40 minutes for each pod encountered in any given trip could be considered. This time limit is consistent with the average time vessels were spending with pods (i.e. 35 min), although observations close to 2 h did occur. Results of this study suggest that if a pod has not approached a vessel within this time frame, then it is unlikely to do so. Time limits will help prevent prolonged pursuit of non-responsive and avoiding pods. To further reduce exposure to traffic the practice of operators calling other vessels to the area should be discouraged. A quiet period for mother-calf pods should be considered when no mother-calf pods should be subjected to whale-watching activities by any vessels (including recreational vessels). This has been recommended for whale-watching in other parts of the world (UNEP MAP RAC/SPA 2003).

Feeding whales need to be given special consideration. In this study, interruption to feeding was noted when the vessels approached feeding pods closer than 100 m. Commercial operators and recreational vessel users should be educated on how to manoeuvre vessels around feeding whales. Skippers need to be aware of where the prey patches (generally these are easily recognised by a change in water colour, surface disturbance) and make every attempt not to drive through and disturb these aggregations. Feeding whales often change their direction of travel, which makes it harder for the skipper to predict where they will next surface. It is recommended that operators remain at least 300 m from pods initially and observe the pod for several surfacings before moving to the appropriate approach limit. The skipper should wait for all members of the pod to surface before manoeuvring the vessel to ensure that they do not approach within 100 m of an individual whale.

Educating operators on best practices whilst watching whales should be incorporated in to an accreditation program for responsible whale-watching as discussed below (see Ecotourism perspective). Providing operators with evidence that good vessel practices around whales led to better experiences and more satisfied customers is an important step in promoting responsible whale-watching. The commercial operators who participated in this study were very experienced, having operated in the area for more than 16 years. Their experience should

be utilised in developing education programs for new operators and recreational vessel users.

Workshops, which include participation from researchers, managers, operators and other members of the regional community, could be incorporated into management plans for the whale-watching industry. These workshops should provide the opportunity for researchers and management to explain current management strategies, propose future strategies and to present findings of research. Workshops of this nature are an important part of the stakeholder participation process (Newsome *et al.* 2005). Operator input into the practicalities of current and proposed recommendations is vital to the success and acceptance of management strategies. This approach has proved successful in the development and implementation of a Code of Practice for commercial swimming-with-dwarf minke whale operations in the Great Barrier Reef (Birtles *et al.* 2002a).

Future research needs

The long-term implications of the short-term behavioural responses noted in this study are unknown and will only be understood through further research. Ongoing research should be incorporated into the framework for management of whale-watching in NSW. Priorities for future research include:

- Long-term monitoring of the distribution and abundance of the east coast humpback whale population, especially in areas where whale-watching occurs.
- Identification of the importance of southern NSW waters in providing nutritional resources for migrating humpbacks. The proportion of the population feeding in this area as well as the sex and age class of feeding whales should be quantified. An understanding of prey density and seasonal variations in prey availability and how these relate to migration pathways is essential in interpreting any future shifts in whale distribution; e.g. whether changes in whale distribution are related to prey distribution or to the avoidance of vessels.
- Identification of resting areas.
- Genetic studies of pod composition in conjunction with behavioural studies to provide better insight into behavioural functions and hence effects of whale-watching on these behaviours.
- Understanding of diving and energy expenditure of migrating humpback whales in the presence and absence of whale-watching vessels.
- Experimental testing of approach distances including identifying their biological effectiveness and whale-watchers' attitudes towards various observation distances.
- An examination of recreational whale-watching practices. This should include Identifying areas where such interactions with whales are high, documenting whales' responses to recreational vessels in these areas and profiling recreational vessel users including evaluating their knowledge of and adherence to guidelines and regulations.

Management framework

Adaptive management system

There are five steps in the development and implementation of successful management strategies for ongoing management of sustainable tourism (Figure 2).

This system uses an adaptive management approach (see Newsome *et al.* 2005) and hence is a repeated process requiring ongoing monitoring and improvement of knowledge through long-term research and testing of management recommendations. The five components of this system are outlined in more detail below.

A: Research

Objectives of research should be to:

- Identify threats to the conservation objectives of sustainable tourism and required mitigation.
- Understand the needs, values and attitudes of stakeholders and identify the inconsistencies that cause conflict.
- Evaluate current management strategies to ensure objectives are being met.

B: Preliminary development of management strategies

Management agencies should develop strategies incorporating the findings from phase A which should involve consultation with researchers.

C: Communication between stakeholders and testing of management recommendations

This phase should include participation of all stakeholders including researchers, managers, operators and NGOs. It should be used to:

- Present research findings and proposed management strategies

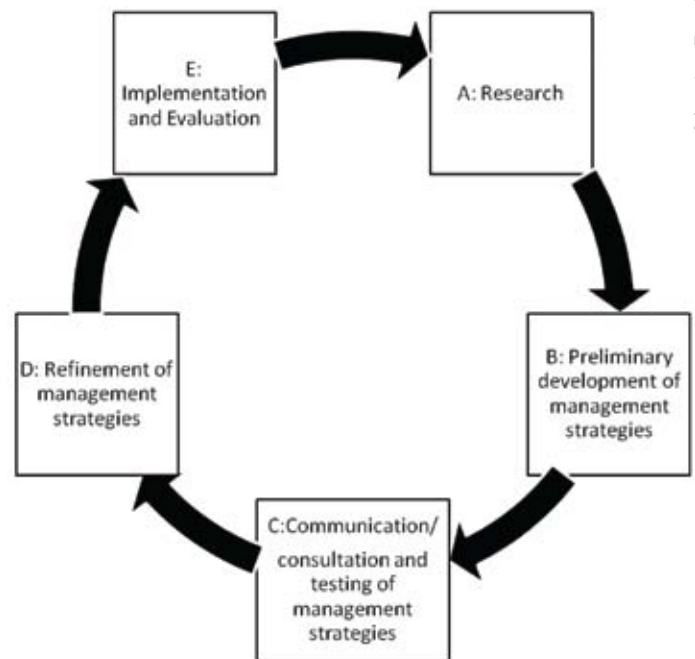


Figure 2. The five steps in the development and implementation of successful management strategies for ongoing management of sustainable tourism.

- Receive input from stakeholders and identify their needs
- Test management strategies
- Establish priorities for sustainable management.

D: Refinement of management strategies

Should be based on A and C.

E: Implementation and Evaluation

The cycle is repeated at periodic intervals.

Sustainable tourism management should not cease at the implementation stage. Evaluation is a key characteristic of adaptive management. Ensuring that objectives of sustainable tourism are being met through a scientific, social and biological monitoring program (i.e. step A) is crucial to the success of sustainable tourism.

Management strategies for the humpback whale-watching industry

Challenges for management of the whale-watching industry

Managers of the whale-watching industry face many challenges. Whilst their primary objective is the conservation of cetaceans, the decisions they make have the potential to impact the lives and livelihoods of individuals, families and communities (Stevens *et al.* 1996). An account of the issues facing whale-watching managers in Australia was provided by Stevens *et al.* (1996) over a decade ago. These include the lack of long-term information on which to base management decisions, the need not to over-regulate and difficulties balancing the welfare and conservation needs of whales with the social and economic needs of industry and regional communities. These issues are still relevant today, highlighting the complexity of the problems and the difficulties of solving them.

Whales hold iconic value for many people and since the 'save the whales movement of the 1970s have been used as the flagship species for environmental issues worldwide. Because of this, management of human-interactions is subject to close scrutiny by many sectors of the community. The diversity of the needs and motivations of interested parties means that it can be extremely difficult to establish appropriate management strategies on which all stakeholders agree, even after extensive public consultation.

Management decisions which are grounded in sound scientific research can help solve this issue, along with socio-economic and cultural considerations. Quantifying the effects of whale-watching on animals which have long life spans and low fecundity requires long-term monitoring. These timeframes are difficult for managers dealing with an expanding industry and public pressure for action. The risk of waiting for adequate long term data is that by the time effects are detected it may be too late to do anything about them. As a consequence, scientists rely on using short-term responses to predict long-term effects. Justifying these predictions for operators and managers understandably can be a difficult. Adding to the difficulties

is that the short-term changes in behaviour are not always obvious to operators during their interactions with whales. In this study many of the behavioural changes were only detected after comparing the behaviour of whales around vessels to a data set in which vessels were absent. A major challenge for management is that it be forward looking and predictive rather than reacting to issues after they appear (Stevens *et al.* 1996).

Managing the positive effects of whale-watching is less challenging, but is rarely a priority. Management agencies should take on a pro-active role in ensuring that whale-watching is delivering quality education and promoting a conservation ethic amongst participants. Providing support to whale-watching operators through hosting interpretation training workshops is one way of doing this. Professional interpretation workshops can also be used as a training tool for DECC (Department of Environment and Climate Change NSW) Discovery Ranger staff employed to give talks at some of the popular land-based whale-watching sites. These will strengthen relationships with whale-watching operators and in turn help with acceptance of industry codes of practice and regulatory management strategies.

Three components for management of the whale-watching industry

This project has identified three fundamental components to be incorporated into the sustainable management strategy for the humpback whale-watching industry:

1) Education

Quality education during whale-watching experiences can be beneficial for whale-watchers, operators, managers and conservation of whales. The provision of effective interpretation programs can help maximise the positive impacts of whale-watching through raising awareness of whales and their conservation, and can also help in the management of the negative impacts of wildlife tourism and manage expectations so that there is less pressure on whales for lengthy and 'close up' experiences. Education for operators on the benefits of good vessel practices around whales and the needs and expectations of whale-watchers is important in encouraging responsible whale-watching practices. Community education programs could also be used to manage expectations prior to whale-watching experiences.

2) Vessel management techniques

Strategies, including the management of vessel behaviour and density around whale pods as well as accreditation opportunities for operators who demonstrate good vessel practices are recommended to minimise any negative impacts of whale-watching.

3) Research

Science to underpin regulatory and other management strategies, and for educational strategies is required to ensure all four criteria (see Introduction) of sustainable wildlife tourism are being met.

Table 2 summarises some the recommendations based on the results of this research and include education, vessel management techniques and research strategies.

Table 2. Recommendations for management of whale-watching based on the findings of this study.

Findings	Strategies	Expected outcomes
<p>Short-term behavioural changes detected for whales in the presence of vessels including:</p> <p>Longer periods submerged (especially mother-calf pods).</p> <p>Some surface behaviours such as breaches, peduncle slaps, pectoral slaps and rolls less frequent.</p> <p>Behavioural changes around vessels are not always obvious.</p>	<p>Set time limits for encounters (e.g. 30-40 minutes).</p> <p>Discourage the practice of operators calling other vessels to the pod.</p> <p>Establish no-approach times for mothers and calves (e.g. afternoons).</p> <p>Encourage vessels sit at a conservative distance (e.g. 300 m) and observe whales for several surfacings before moving in to 100 m approach limit.</p> <p>Conduct an assessment of the effectiveness of a licensing system for the NSW whale watching industry</p> <p>Enforce regulations through increased presence of NPWS staff on water.</p> <p>Develop educational programs for operators and recreational vessel users with opportunities for accreditation of commercial operations demonstrating responsible whale-watching.</p>	<p>Decrease whales' exposure to vessels along their entire migration.</p> <p>Mitigate the possible long-term effects of cumulative exposure to vessels.</p> <p>Increased compliance with regulations.</p> <p>Increased understanding of regulations and the rationale behind them.</p> <p>Allow operators to identify the initial behaviour of whales and to better detect any changes in behaviour when in close proximity.</p>
<p>Long-term implications of exposure to vessels are unknown.</p> <p>Feeding whales disrupted by vessels approaching < 100 m.</p> <p>Feeding whales disrupted when more than one vessel present.</p> <p>Feeding whales change direction rapidly and surfacings can be hard to predict.</p>	<p>Further research required as per research priorities outlined in this paper:</p> <p>Set limit of one vessel within 300 m of feeding whales</p> <p>Discourage vessels driving through bait-fish and krill patches when near feeding whales.</p> <p>Discourage the manoeuvring of vessels around feeding whales unless all members of the pod have been sighted at the surface > 100 m from vessel.</p>	<p>Fill in knowledge gaps to assist the sustainable management of whale-watching into the future.</p> <p>Limit interruptions to time pods forage.</p>
<p>Satisfaction level of boat-based whale-watchers is high; Satisfaction level of land-based whale-watchers is moderate.</p> <p>Whale-watchers' satisfaction is dependent on the degree to which expectations are met, the amount learnt, the proximity to whales, the number of whales and the whales' behavioural displays.</p>	<p>Promote realistic expectations</p> <p>Improve the quality of education offered during whale-watching experiences</p> <p>Improve viewing quality at land-based sites.</p>	<p>Increased satisfaction of whale-watchers.</p> <p>Attainment of realistic expectations for whale-watchers.</p> <p>Increased understanding of management measures such as approach distances.</p>
<p>Education lacks structure and provides few conservation messages.</p> <p>Whale-watching in NSW has limited impact on whale-watchers' behaviours after their experience and there is limited addition to their knowledge of whales.</p>	<p>Introduce quality interpretive programs for whale-watching based on developed models which have clear conservation objectives.</p> <p>Provide training for operators, crew, and guides.</p> <p>Introduce accreditation programs for whale-watching operations which include the provision of quality education programs</p> <p>Evaluate and improve (if necessary) interpretive programs to ensure conservation objectives are being met.</p>	<p>Increased whale-watchers' awareness of the threats facing whales and the marine ecosystem in general.</p> <p>Increased contribution to conservation and protection of whales, the marine ecosystem and the environment in general.</p> <p>Whale-watching operations to be accredited as an ecotourism experiences.</p>

This project has helped advance sustainable management of the NSW humpback whale-watching industry. It has provided information for management strategies for

whales that can be refined as more knowledge comes to hand to and ensure the sustainable management of the humpback whale population.

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APPENDIX I



Humpback whale spy hopping with tourist on boat in foreground.
Photo, K. Stamation.



Humpback whale spy hopping, off Merimbula, NSW.
Photo, W. Reynolds.



Humpback whale mother and calf floating on their back with pectoral fins waving in Platypus Bay, Qld.
Photo, W. Reynolds.



Humpback whale breaching (ventral view) off Merimbula, NSW.
Photo, W. Reynolds.



Humpback whale sounding, off Merimbula, NSW
Photo, W. Reynolds.



Pod of three Humpback whales lateral lunge feeding, off Merimbula, NSW.
Photo, W. Reynolds.



Close up of a humpback whale lateral lunge feeding with ventral pleats distended, off Merimbula, NSW.
Photo, W. Reynolds.



Humpback whale breaching (lateral view), off Merimbula, NSW.
Photo, W. Reynolds.



Humpback whale floating on its back with a second humpback surfacing in the foreground in Platypus Bay, Qld.
Photo, W. Reynolds.