Recent advances in whalewatching research: 2005-2006

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ABSTRACT

Whalewatching research encompasses a wide variety of disciplines and fields of study including monitoring the biological impacts of whalewatching activities on cetaceans and assessments of the effectiveness of whalewatching management and regulations, to the sociological and economic aspects of whalewatching on communities hosting such activities. Many of these research activities are of interest to the Whalewatching Sub-Committee of the International Whaling Commission, in particular research on the impacts of whalewatching, and whalewatching as a source of scientific data that could be used in management decisions. This paper is the latest of a series of annual digests that describes the variety and findings of whalewatching studies published since the 57th Annual meeting of the IWC, in 2005.

KEYWORDS: WHALEWATCHING; CODE-OF CONDUCT; REGULATIONS; MANAGEMENT; WHALE-WATCHERS; PROTECTED AREAS

INTRODUCTION

Recognising the difficulties of keeping up to date on the wealth of research on whalewatching activities, in particular the impacts of these activities on cetaceans, and considering the increasingly small amount of time available to discuss whalewatching matters during the International Whaling Commission (IWC) Scientific Committee meetings, a summary paper of the breadth and variety of whalewatching research, published during the previous year, was presented to the IWC Whalewatching Sub-Committee (Parsons *et al*., 2004) during the 56th Meeting of the IWC. As this was deemed to be a useful digest of recently published articles, and as such assisted the work of the Sub-Committee, similar digests in following years were requested. This is the third of these review papers detailing a summary of whalewatching research published over the past year, since the 57th meeting of the IWC.

IMPACTS OF WHALEWATCHING ACTIVITIES ON CETACEANS

Richter *et al*. (2006) conducted research on the behaviour of sperm whales (*Physeter macrocephalus*) at Kaikoura, New Zealand, in response to whalewatching activity.

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Kaikoura is arguably one of the most famous whalewatching locations in the world. The target of this activity are male sperm whales which may be resident, spending several weeks in inshore waters that return to the area repeatedly in subsequent seasons (Childerhouse *et al*., 1995). There are also transient animals, which occur further offshore, but only spend a limited time in the Kaikoura area (Childerhouse *et al*., 1995). Under New Zealand law, whalewatching operations must be permitted and licensed by the Department of Conservation, and whalewatching boats are limited on the number of trips that they can take within a certain period of time.

There are two main forms of commercial whalewatching activity in the Kaikoura area 'boat-based' and 'aerial' whalewatching, both of which are 'powered' (see Parsons *et al.,* 2006 for definitions of whalewatching activity types). Boat-based whalewatching trips were run by one company equipped with five vessels ranging from a small 12.6 outboard driven boat to four catamarans ranging from 12 to 18m (Richter et al., 2006). Aerial whalewatching was via two fixed wing aircraft and a helicopter (Richter et al., 2006).

Richter *et al*. (2006) primarily studied the reactions of sperm whales via a 6m boat (from 1998 to 2001), although land-based observations were also undertaken (between 2000 and 2001), primarily to investigate impacts that the presence of the research vessel might have on the behaviour of the whales. A total of 1676 sperm whale encounters were recorded, 64% of which were not accompanied by whalewatching vessels. In the remaining 56% of encounters whales were primarily exposed to boat-based whalewatching (63%), although in 17% of encounters whales were exposed to just aerial whalewatching (21%), or both aerial and boat based (17%) whalewatching (Richter *et al.,* 2006). Thirty-eight percent of the whales observed by the land-based surveys were unaccompanied, 41% we exposed to the research vessel alone, and 17% and 5% were exposed to the both research vessel and boat-based or aerial whalewatching, respectively (Richter *et al.*, 2006).

Behaviours that were quantified in the study included blow durations, surface times and time until first click production after a 'fluking up'. Generally there was little change in blow duration whether whales were exposed to the research vessel or boat-based or aerial whalewatching (i.e. durations ranged from 15.2 to 16.9 seconds) although there was one observation of a much lower blow duration for a transient exposed to both research and whalewatching boats. Surface times were also similar (i.e. 9 to 9.9 minutes), with slightly shorter durations when exposed to boat-based whalewatching vessels and longer durations for aerial whalewatching, although two observations of transient whales with the research vessel present and exposed to aerial whalewatching had a substantially shorter mean surface duration of 7 minutes (Richter *et al.*, 2006). Although the sample size was small, transient whales tended to respond more strongly to disturbance than resident animals, perhaps suggesting some habituation to whalewatching in the resident animals (Richter *et al.*, 2006).

A greater effect was seen on the time to first click production after a sperm whale performed a deep dive, in which their flukes were raised above the surface ('fluking up'): resident whales clicked sooner when whalewatching boats were present (Richter *et al.*,

2006).The researchers suggested that the presence of whalewatching boats, and the noise they produce, perhaps decreases effectiveness of clicking to find prey, so whales would begin clicking sooner to compensate (Richter *et al.*, 2006).

Also, resident whales changed their heading more frequently (although there was no noticeable effect on the angle through which the animal turned) in the presence of whalewatching boats; there was no data on whether transient whales showed a similar reaction (Richter *et al.*, 2006). There did not appear to be a similar reaction to aerial whalewatching activity, which perhaps was due to less noise entering the water, and thus fewer disturbances, or an inability for the whales to discriminate the position of the airplane or helicopter, therefore being unable to reposition itself appropriately to reduce or avoid the disturbance (Richter *et al.*, 2006).

The researchers cautioned that the presence of the research vessel did have an effect on the studied whales, particularly for transient whales, so the observable disturbance reactions of whales to aerial and boat-based whalewatching may have been lessened as the whales would be displaying a 'disturbed' behaviour patterns as a result of the presence of the research vessel (Richter *et al.*, 2006).

Although there were some minor changes in behaviour of the sperm whales as the result of whalewatching activity, the actual impacts on the whales have not been addressed. Gordon *et al.* (1992) had suggested that a reduction in surface intervals of 17% could lead to a 36% reduction in the time sperm whales spend feeding, which could have significant biological impacts. However, in the Richter *et al.* (2006) study changes in surface intervals were very small and would be unlikely to seriously diminish the fitness of the animals. Increased clicking may have a slight energetic cost, but again this would be likely to have miniscule impacts to the whales.

The researchers suggested that the resident whales in Kaikoura had become habituated to whalewatching activities, displaying less altered behaviour, particularly in comparison to transient whales, but Richter *et al.* (2006) cautioned that habituation may cause negative impacts, for example whales may be less likely to avoid boats, increasing the chances of ship strikes and resulting injuries. The researchers also highlighted the proportion of time that animals were exposed to whalewatching activity: an individual whale may be exposed to whalewatching craft for half of the time that they are at the surface (Richter *et al*., 2006). This continued exposure might increase stress levels in whales, which in turn might have physiological impacts, but signs of this stress may not be expressed as changes in whale behaviour.

Richter *et al.* (2006) also highlight the fact that there was no baseline study on the behaviour of whales that were not disturbed by whalewatching – all studies in Kaikoura have been conducted after the establishment of the whalewatching industry. It is possible that the natural, pre-whalewatching, behaviour of the sperm whales could have been significantly different to the current observed behaviour.

Finally, Richter et al. (2006) highlight precautionary measures the New Zealand government has taken to limit the impacts of whalewatching on their target species, i.e. introducing a ten year moratorium on the issuing of new whalewatching permits, which expires at the end of May in 2012.

Mattson *et al.* (2005) observed common bottlenose dolphins from a land-based platform in Calibogue Sound, off Hilton Head Island, South Carolina, and described their reactions to boat traffic, a major component of which were dolphin-watching boats (108 out of 215 boats observed). Mattson *et al.* (2005) found that the size of dolphin groups was significantly larger in the presence of boats, compared to periods with no boat traffic. Moreover, group sizes were significantly larger again when there were multiple boats present, as opposed to single vessels. Inter-animal distance, i.e. group cohesion, was not affected by boat traffic, but distance between dolphins and boats did have a significant effect, making it more likely that animals would exhibit a change in movement, direction or behaviour, i.e. shifting from foraging or resting behaviour to another type of behaviour.

With respect to their responses to dolphin-watching boats, which were typically 6m inflatable zodiacs, 6% of dolphin groups exhibited a change in behaviour in response to dolphin-watching boats, 4% a change in direction, and 10% exhibited both (Mattson *et al.,* 2005). However, responses of dolphins to some non-dolphin-watching boats were much more pronounced. For example, 55% of dolphin groups were affected by powerboats with 22% changing their behaviour, 11% changing their direction of movement, and 22% changing both direction and behaviour (Mattson *et al.,* 2005). Jet skis elicited even greater changes: behaviour changed in 56% of groups and a further 11% changed both behaviour and direction (Mattson *et al.,* 2005). When jet skis were present most dolphin groups submerged and did not reappear at the surface (Mattson *et al.,* 2005). Shrimp boats also always caused changes in behaviour or direction of movement (Mattson *et al.,* 2005), but this was more of a positive behavioural change as animals would follow the shrimp boat to obtain food, and so this was not an aversive reaction. The presence of larger ships (e.g. commercial ferries or cargo ships) produced less effects than dolphin-watching vessels, i.e. they only resulted in a change in behaviour in 11% of the groups, with no response being observed for the remainder (Mattson *et al.,* 2005).

Mattson *et al.* (2005) noted that anthropogenic activities that cause changes in cetacean behaviour are considered harassment (i.e., level B harassment) under the 1972 US Marine Mammal Protection Act and thus such activities are actually illegal. Furthermore, Mattson *et al. (*2005) concluded that as a result of these rates in changes of dolphin behaviour:

> "*Stricter regulations and enforcement should be placed on human activities in coastal waters and on boating activities, particularly commercial dolphin-watching boats and jet skis. The public needs to be educated and reminded of the laws and regulations concerning dolphins and other wildlife in the area*." (p. 139)

Research on the impacts of whalewatching activities on bottlenose dolphins (*Tursiops truncatus*) in Milford Sound has been described in a previous digest (i.e. Parsons *et al*., 2005). Lusseau (2005) adds to the extensive number of published studies on this population of dolphins. The study notes that approximately ten percent of the population of bottlenose dolphins in Milford Sound bear scars indicating collisions with boats. One animal hit, a 2 week old calf, vanished after being hit, presumably dead, so boat traffic is a direct concern. However, the study conducted by Lusseau (2005) compared the presence of dolphins in Milford Sound with water temperatures and also with the amount of boat traffic. Dolphins are sighted more often during the winter in Milford Sound, and one would assume that water temperature may be a factor in the presence of dolphins. However upon analysis, Lusseau (2005) found no effect of sea surface temperature on the presence of dolphins. However, there was a negative correlation between boat traffic and dolphin residency, i.e. animals spent less time in the Sound when there was a higher level of boat activity (Lusseau, 2005). Moreover, upon analysis, decreasing boat traffic during the winter months explained the increases in dolphin presence more accurately (Lusseau, 2005), i.e. dolphins were present in the sound in winter due to less boat traffic rather than due to environmental conditions.

Lusseau (2005) suggests that boat traffic in Milford Sound results in dolphins avoiding the Sound, and suggests that further growth in whalewatching activity would be detrimental, predicting that a 40-60% increase in boat traffic (mainly whalewatching) may result in the dolphins evacuating the Sound completely. The situation is problematic, and Lusseau (2005) states: "*this impact from tourism activities is clear and potentially serious*" (p. 270).

To adjust for reduced access to the Sound, Lusseau (2005) postulates that the animals would either have to increase their home range (an increased energetic cost) or the population size, which is already small, would have to diminish further. Lusseau (2005) also posits that boat traffic is forcing animals from the Sound into areas where predation from sharks may be more likely, which could result in increased mortality levels. Finally, Lusseau (2005) cautions against allowing the growth of dolphin watching in the region and suggests management actions such as reducing the number of vessels in the sound, or to restrict access of vessels to areas ultilised by the dolphins.

WHALEWATCHING REGULATIONS AND CODES OF CONDUCT

In 2002, the US National Marine Fisheries Service (NMFS) issued an Advance Notice of Proposed Rulemaking involving interactive viewing of wild marine mammals in US waters, i.e. they announced that they were considering a change in regulations, in order to reduce marine mammal harassment, primarily from whalewatching activities, and solicited public comment on these proposed regulations to help determine what type of regulations, if any, NMFS should undertake. Lewandowski (2005) reviewed and analysed public comments on this proposed rulemaking.

The results of this review demonstrated public support for NMFS to take action for the production of regulations addressing several specific activities of concern, e.g., in-water interactions, touching, and whalewatching vessel type restrictions and approach restrictions, i.e., minimum approach distances, speed and time restrictions, and controls to vessel behavior (Lewandowski, 2005). A majority of comments also recommended NMFS pursue increased public outreach and education, and suggested professional certification and enforcement programs.

Based on this public input, available scientific information, and a review of NMFS' current regulatory, enforcement and education/outreach programs related to this issue, Lewandowski (2005) ultimately provided the following set of recommendations for NMFS to consider in further addressing harassment of marine mammals in the wild from interactive viewing activities:

- Promulgate a national level regulation that amends the "take" definition under the US Marine Mammal Protection Act to prohibit all in-water interactions with marine mammals, whether commercial or by private citizens, and prohibit touching (either directly or with an object), posing with or otherwise acting on or with a wild marine mammal.
- Develop regional level regulations to govern commercial and private vessel activity in the vicinity of marine mammals and prohibit jet skis. Regulations should include, but not be limited to, minimum approach distances, speed and vessel limits, angle of approach, restrictions per vessel type, measures to lessen acoustic impacts, and prohibition of certain vessel behaviors (e.g., driving through groups of animals, so-called "J-hooking", placing vessel in the animals' path).
- Regional regulations should identify "areas of special concern" that include the most critical areas for marine mammal conservation (e.g., resting bays, breeding and feeding grounds, migration routes) and provide additional restrictions for vessel activities in these areas. Examples of additional restrictions might include, but are not limited to, increased approach distances to marine mammals, establishment of "no-go zones", closure of areas during specific times of day or season, and no approaches to certain age or sex groups. These areas of special concern should be prioritized according to species/population status and degree of viewing pressures.

Lewandowski (2005) noted that NMFS has already established approach restrictions for humpback whales in Hawai'i and Alaska and for North Atlantic right whales, and NMFS should continue to explore additional priority areas, such as: (1) all resting bays for spinner dolphins in Hawai'i, including permanent or partial closure of selected areas of the bays to swimmers and vessels (motorized and non-motorized) while animals are present or for a selected period of time each day (i.e., during the dolphin resting period) and (2) specific locations of high viewing pressure of southern resident killer whales in the San Juan Islands, Washington.

In addition to the above regulatory changes, Lewandowski (2005) also recommended that NMFS consider or continue to:

- Include stakeholder participation in developing and updating viewing guidelines.
- Immediately take action in cases of lone, sociable marine mammals.
- Implement adaptive management practices into the agency's harassment policy.
- Increase outreach partnerships with government agencies and private organizations, especially local docent programs and zoo/aquaria facilities hosting interactive programs with captive marine mammals.
- Direct resources to areas of more intense viewing activities.
- Consider partnering with state and local agencies in developing creative mechanisms for regulating and/or enforcing against interactive activities.
- Enforce current regulations and publicize enforcement campaigns.
- Reduce advertisements by commercial operators that depict illegal or inappropriate activities.
- Fund research assessing the impacts from viewing pressures and/or monitoring the effectiveness of policies and programs.

REDUCTION OF WHALEWATCHING IMPACTS (WHALEWATCHING MANAGEMENT)

The phenomenon of lone solitary dolphins (i.e. animals that have little or no contact with conspecifics, see Müller and Bossley, 2002) associating with humans is not a new one, with examples of such associations dating back into antiquity. However, humans wanting to associate with these animals can often lead to negative impacts on the target animal, such as harassment, injury or even death as the result of boat strikes, stabbings (with knives, lances or harpoons) or even being shot by humans (Alpers, 1963; Lockyer, 1978; Dobbs, 1981; Doak, 1989; Müller *et al.*, 1998; Frohoff, 2000).There has also been one instance of a human being killed by one of these lone solitary dolphins, although a history of harassment and inappropriate behavior directed towards the dolphin by humans preceded this fatality (Santos 1987).

Wilke *et al.* (2005) describe the stages by which lone solitary dolphins become increasingly associated with humans, and the development of problems that occur as a result of such interactions. The initial stage is when the dolphin first appears new to human activities, such as a harbor or a bay, and the animal may initially follow boats, but does not associate with humans. In the next stage dolphins may start investigating anthropogenic objects such as anchors or buoys, and may bow ride at the front of boats. Human interactions also start during this stage with people trying to swim with the dolphins but the animal stays aloof and keeps a distance from swimming humans and does not physically interact with them. The third stage has one or more humans having made efforts for the dolphin to habituate to humans, and the dolphin may physically interact with a limited number of people, allowing touching, or even "hitching a ride", with the human holding onto the dolphin's dorsal fin or flippers as it swims, towing the human.

The final stage has the dolphin becoming well known, attracting media attention and bringing tourists to the areas where the dolphin resides. The number of humans trying to physically interact with the dolphin increases, likewise inappropriate contact and actions by humans towards the dolphin increases. The dolphin in turn becomes more aggressive and injury to either humans or dolphins may occur.

Wilke *et al.* (2005) consider that inappropriate actions (for example aggressive handling, or inadvertent or deliberate touching of sensitive areas such as the eyes, blowhole or genital slit) by humans towards the dolphin result from "anthropomorphic attribution of human desires to the dolphin" (p. 429) for example by the by media, or perhaps, although not considered by the researchers, captive dolphin facilities which have opportunities for humans to physically interact with humans (e.g. petting pools) or shows that have trainers physically interacting with cetaceans. They also suggest such inappropriate behaviour may be due to a lack of awareness of the needs of wild animals, or a self-centered desire to swim with a dolphin but a lack of consideration about the effects and impacts of this desire on the target animal (Wilke *et al.,* 2005).

The researchers also describe "inappropriate" behaviours by dolphins directed towards humans, as being an example of "reverse anthropomorphism", i.e. the dolphins begin to act towards humans as if they were conspecifics, such as initiating sexual behaviour or trying to exert dominance, which in turn could lead to human injury (Wilke *et al.,* 2005).

New Zealand has, in several instances, enacted special laws to deal with the management of lone sociable cetaceans. In general, management of such lone cetaceans tends to be at a local level, perhaps involving a "friends of the dolphin committee", or "guardians" overseeing human dolphin interactions, ideally with scientific oversight (Wilke *et al.,* 2005). However, it was pointed out that interactions between humans and a lone bottlenose dolphin ("Fungie") in southern Ireland has had no formal management despite over a decade of human/dolphin interaction.

Wilke *et al.* (2005) set out proposals for management for lone sociable dolphins, although note that specifics will vary and depend on factors such as the age, gender and "personality" of the specific animals. It was emphasized that cooperation with industries, such as fishing and tourism, is important, and the formation of a committee of concerned locals to deal with management issues is an option, although there should be official oversight and specific people with a supervisory, enforcement or management role should be officially recognized to prevent "excessive possessiveness or self-aggrandizement" of self-appointed or unofficial human "guardians" of the lone sociable cetacean.

Wilke *et al.* (2005) then suggested that a set of guidelines of appropriate and inappropriate behavior, or a code of conduct, should be developed. Such a set of guidelines should emphasise the wild and potentially dangerous nature of the solitary cetacean, and should clearly point out to the public that they should not expect to be able to physically interact with the animals, and that they may have to be content to just observe the animal from a distance.

Controlling human access to the animal was a suggested management technique, such as clearly marking areas (with buoys for example) where humans may interact with the cetacean, or alternatively delineating areas where humans are not allowed to go, so that the cetacean may have a 'refuge' from human contact and interaction (Wilke *et al.*, 2005). Limiting the number of human interactors was also suggested, e.g. no more than four humans in the water with a cetacean at a time, for no more than half an hour.

Guidelines common to many whalewatching codes of conduct were also suggested, such as restrictions on the number and type of boats approaching the cetacean, because propeller driven boats might cause injuries to the dolphins. The impacts of noise and high speed in non propeller driven vessels should also be considered (Wilke *et al.*, 2005); avoiding sudden changes in direction or speed when driving a boat near the sociable animal; slowing down and stopping/anchoring after the animal was approached; and avoiding the discharge of pollutants such as oil,[*] near the animal.

Restrictions directed at the human interactors were also suggested: Avoid touching sensitive areas (eyes, blowhole, genitals etc), do not feed the animal and avoid "fin tows". It was emphasized that the reasons behind these guidelines should be carefully explained and that diplomacy and good communication skills is important for the management of these activities (Wilke *et al.*, 2005).

Finally, Wilke *et al.* (2005) noted the numerous whalewatching codes of conduct and regulations which would potentially be appropriate to help reduce impacts on these lone sociable animals, but were concerned with the variety of regulations, differing nature and lack of similar standard in these regulations. It was also noted that there is general agreement in many regulations as to what is and is not appropriate behaviour for activities in proximity of cetaceans. However, lone social cetaceans may have to be dealt with on a case by case basis and may require special and specific regulation, i.e. one size does not necessarily fit all, with respect to managing these animals.

In his review of marine protected areas and ecotourism of the Atlantic Islands, Hoyt (2005) notes that there are 62 known species of cetaceans in the North Atlantic. He also notes that there are 90 existing and 57 proposed Marine Protected Areas (MPAs) in this region, the majority of which have an abundance of cetaceans within them, many with whalewatching activities within the MPAs. Whalewatching in the North Atlantic has been a growing sector of the tourism industry in the North Atlantic since the 1970s and is widespread. However, the growth of ecotourism, i.e. tourism activities that specifically reduce their impact on the environment and/or target species, has not kept up with this rapid growth, leading to several areas with poor quality, unmanaged and undoubtedly detrimental whalewatching industries. Despite often self awarding themselves an "eco" label, many whalewatching and other marine tourism activities are not "ecotourism", for example, *bona fide* ecotourism activities should, for example, have minimal emissions, noise or waste, they should monitor their impacts, and should "promote the conservation ethic" (p. 147, Hoyt, 2005) which many so-called "eco" tourism activities lack.

[*] It should be noted that discharge of pollutants in coastal waters is many countries is typically prohibited under domestic or international legislation (e.g. MARPOL) anyway.

Hoyt (2005) discusses the substantial economic value of whalewatching in the North Atlantic, but also highlights the economic value with respect to the benefits of whalewatching vessels as a platform from which to collect scientific data, e.g. whalewatching vessels in the Stellwagen Bank National Marine Sanctuary provide boat time to researchers that would otherwise cost $0.88 million every year (Hoyt, 1994). In addition, in other areas (e.g. Samana Bay, Dominican Republic) there are surcharges on whalewatching tickets which provide funds for research, conservation and education.

To ensure sustainable whalewatching, Hoyt (2005) suggests a sustainable development framework which could be adopted by communities where whalewatching occurs, or is likely to develop. This framework includes:

(i) the development of a management plan, devised involving stakeholders, that includes plans for baseline research, an impact assessment for marine tourism operations and developments, research to determine the whalewatching "carrying capacity (K)" and preemptive policy goals for whalewatching based on science and education.
(ii) a legal framework, i.e. regulating laws or a marine protected area that control pollution, introduce whalewatching best practice guidelines, protect critical habitats and ensure monitoring research on, and protection of, the resource (i.e. the whales)
(iii) regular environmental audits that evaluate the success or failure of the attempts at sustainability.

To help assess sustainability for a whalewatching industry, Hoyt (2005) also suggests a "sustainability report card" which includes questions such as:

(a) is the whale population growing and is recruitment exceeding mortality rates;
(b) are whales moving out of an area;
(c) are the whales exhibiting changes in behaviour;
(d) what are the levels of biological and chemical pollutants in coastal waters;
(e) are whalewatching operators knowledgeable about cetaceans and local culture;
(f) are they good education providers;
(g) are whalewatching operators concerned about the safety and welfare of their customers;
(g) does the whalewatching activity aid or benefit the local community?

Finally, although there are numerous MPAs in the North Atlantic, with substantial cetaceans populations, Hoyt (2005) comments that few actually have provisions to plan, manage and develop sustainable whalewatching. However, the Mediterranean is highlighted as an area where MPA management has included consideration of whalewatching activity, that is having economic, educational and scientific benefits.

SWIM-WITH-CETACEAN OPERATIONS

Danil *et al.* (2005) described observations on spinner dolphin (*Stenella longisostris*) behaviour and its relationship to human swimmers at Maku'a Beach, Oahu, Hawaii. The population of spinner dolphins using this bay arrive in the bay between 5:45 and 8:45 am, where they exhibit low activity levels and are presumed to be resting. Between 3 pm and 7 pm, the dolphins leave the bay and travel offshore to forage. During the study, Danil *et al.* (2005) recorded the frequency of aerial behaviour in the dolphins, and also the number of human swimmers in the study area and the number of humans within 100m of the dolphins.

On average there were 67 dolphins in the bay during the daytime (range 51 to 75) decreasing later in the day. Their primary behaviour (69%) involved swimming back and forth across the bay, an activity associated with resting (Danil *et al.,* 2005).

Danil *et al.* (2005) noted swimmers were observed simply treading water near dolphins, or using snorkelling or scuba gear. Some swimmers used kayaks to paddle out into deeper water. There were an average of six (± 0.2 SE) swimmers per day, with more present in the morning, and an increase in swimmers during the weekends (12 ± 0.6 SE; Danil *et al.,* 2005); a maximum of 63 swimmers were in water at any one time. Sixty-five percent of swimmers were observed within 100m of the dolphins (Danil *et al.,* 2005).
A significant correlation was reported between the departure time of the dolphins from the bay and the number of swimmers (Danil *et al*., 2005), i.e. more swimmers meant that less time was spent in the bay and therefore animals had less time to rest. However, there was no relationship between observations of aerial activity and the number of swimmers, so Danil *et al*. (2005) concluded that the occurrence rate of aerial behaviour was not an indicator of disturbance. The researchers noted that dolphin behaviour associated with "deep rest" occurred later in the day, and this may be a result of reduced swimmer presence in the afternoon (Danil *et al*., 2005), but there was no statistical analysis of this observation.

Lack of an ability to rest appropriately due to exposure to whalewatching activity has been highlighted in other studies on the impacts of whalewatching activity, for example, for common bottlenose dolphins (*Tursiops truncatus*) in the Bay of Islands and Doubtful Sound areas in New Zealand (Constantine *et al.,* 2004; Lusseau 2003a, 2003b, 2004; Lusseau and Hingham, 2004) and has led to proposals for protection of areas where cetaceans exhibit biologically important activities, such as resting, with reduced or prohibited access for whalewatching activities in these critical areas (Lusseau and Hingham, 2004). Such an approach may therefore be warranted to reduce impacts on resting spinner dolphins in Oahu.

INTERPRETATION AND EDUCATION

Andersen and Miller (2005) conducted a study on whalewatching tourists on trips to search for killer whales (*Orcinus orca*) around the San Juan Islands, Washington. There

have been concerns over the status of these killer whales and an observed decline in numbers, for which intensive whalewatching targeted on the whales may play a part. As a consequence, in December 2004, the US published a proposed rule to list the resident population of killer whales in this region as "threatened" under the US Endangered Species Act (Federal Register, 2004). The study conducted by Andersen and Miller (2005) in particular looked at the role of on board interpreters/environmental educators in aiding the conservation of the San Juan killer whales

The researchers asked tourists what they were most looking forward to on their whalewatching trip, which unsurprisingly was to sight whales (Andersen and Miller, 2005). However, it was noted that none of the tourists expressed a need to be in close proximity to the whales, nor for the whales to express spectacular behaviour, such as breaching (Andersen and Miller, 2005). This suggests that tourists do not necessarily expect to get close to whales on trips, so distance restrictions in whalewatching codes of conduct or regulations need not be detrimental to the satisfaction of tourists. However, over a third of the tourists interviewed (38.6%) noted that they were looking forward to the educational aspects of the trip, i.e. "learning about whales and the marine environment" (Andersen and Miller, 2005). The implication is, therefore, that if there was no onboard provision of education/interpretation a sizable proportion of the tourists would be unsatisfied with their trip.

When asked what was the most memorable part of their trip, again unsurprisingly sighting whales was the answer for two-thirds of the tourists (Andersen and Miller, 2005). However, about ten percent of those tourists who sighted whales thought the experience of being on a boat and the interactions with the crew, and friends/family on the trip were the most memorable events (Andersen and Miller, 2005). The researchers point to the role of onboard naturalists helping to make the trip memorable for these tourists.

The tourists were also asked whether there was anything about their trip which disappointed them. Nearly sixty percent said that there were no disappointments, and a fifth were disappointed about not seeing whales, however nearly half of these tourists also expressed that they understood that whales were wild animals, and could not always be seen (Andersen and Miller, 2005). Nearly sixteen percent thought that they spent too little time with whales, although again half noted that they understood why their time had to be curtailed, i.e. that it reduced impacts on the whales (Andersen and Miller, 2005). No tourists mentioned that they were disappointed that they could not get closer to the whales. The researchers emphasized that despite their disappointment those tourists understood restrictions on time limits and exposure to whales. They were on trips where the onboard educator had specifically explained whale conservation issues, the nature of whalewatching regulations and how they helped reduce pressures on the whales. They concluded that "*explaining* why *viewing guidelines are in place may help to avoid abject disappointment when expectations surrounding a sighting are not met*" (Andersen and Miller, 2005).

Finally the researchers provided qualitative data that suggested that the presence of an onboard educator/interpreter increased the tourists' enjoyment and satisfaction with their trip, in addition to providing the tourists with more information about cetaceans and whale conservation. Andersen and Miller (2005) cautioned that onboard interpreters should not just restrict themselves to whales however, and that they "*must also be prepared to discuss local human cultures; sociological, economic, political, and historical patterns; marine mammal and fishery management regulatory regimes and laws; not to mention environmental ethics and education*."

Finally Andersen and Miller (2005) emphasized the role of onboard educators in helping to reduce impacts on whales from whalewatching because "*education can be used to decrease the possible negative effects of harassment of the whales by educated tourists and boat operators who elect to view whales from a proper distance."*

WHALEWATCHING DEVELOPMENT

In order to assess the potential for future growth of whalewatching in Scotland, a country where there is already an established whalewatching industry concentrating on minke whales (*Balaenoptera acutorostrata*) and bottlenose dolphins (Parsons *et al*., 2003), members of the general public were interviewed in major Scottish cities (Howard and Parsons, 2005). When asked which countries they think of first when whalewatching was mentioned, the USA was the country thought by the majority as a whalewatching location, and Scotland came second (Howard and Parsons, 2005). More than half of those interviewed were aware of whalewatching opportunities in Scotland, but fewer could cite specific locations where this could be done (Howard and Parsons, 2005). Only 7.7% of those interviewed had actually been whalewatching, however, half those interviewed said that were interested in taking a whalewatching trip in Scotland, indicating that there was potentially a large, but as yet untapped, domestic market for whalewatching in Scotland and thus a potential for future growth in the industry (Howard and Parsons, 2005). Care should be taken to prepare for such growth, so if, or when it occurs, it should be managed sustainably to maximize economic impact but minimize impacts on the cetaceans being targeted.

CONCLUSIONS

In comparison to the year 2004/2005 (*cf.* Parsons *et al*., 2005) there were fewer published studies dealing with whalewatching research relevant to the work of the International Whaling Commission in the year 2005/2006. However, these studies do reiterate findings and suggestions of previous studies, for example the problem of cetaceans being denied from performing biologically important behaviours such as resting and feeding as the result of exposure to whalewatching activity. It should be emphasised that although the net effect of whalewatching exposure could have significant impact on the health of an animal (i.e. reduced nutrition or exhaustion) at first glance the observed behavioural changes of the cetaceans may be cryptic or seem insignificant.

Hoyt (2005) again highlighted the role that MPAs could play in the reduction of impacts on cetaceans as a result of whalewatching, but emphasises that few MPAs have provisions for planning and management of whalewatching activities. A key issue that Hoyt (2005) introduces is the need to conduct research to determine and evaluate indices of sustainability (i.e. abandonment of habitat or population declines) and to conduct studies on the whalewatching carrying capacity (K), a concept which could be a very important tool to reduce the impacts of whalewatching on cetaceans. But this tool needs further elaboration and could perhaps be a subject that might be considered by the IWC Whalewatching Sub-Committee.

REFERENCES

Alpers, A. 1963. *Dolphins*. London: John Murray. 251pp.

Andersen, M and Miller M.L. 2005. Whale-watching and onboard marine environmental education: tourists' expectations and evaluations in the San Juan Islands, Washington. *Tourism in Marine Environments* 2(2): in press.

Childerhouse, S.J., Dawson, S.M. and Slooten, E. 1995. Abundance and seasonal residence of sperm whales at Kaikoura, New Zealand. *Canadian Journal of Zoology* 73: 723-731.

Constantine, R., Brunton, D.H. and Dennis, T. 2004. Dolphin-watching tour boats change bottlenose dolphin (*Tursiops truncatus*) behaviour. *Biological Conservation* 117:299-307.

Danil, K., Maldini, D. and Marten, K. 2005. Patterns of use of Maku'a Beach, O'ahu, Hawai'i, by spinner dolphins (*Stenella longirostris*) and potential effects of swimmers on their behavior. *Aquatic Mammals* 31(4): 403-412.

Doak, W. 1989. *Encounters with whales and dolphins.* New York: Sheridan House. 289pp.

Dobbs, H.E. 1981. *Save the dolphins.* London: Souvenir Press. 128pp.

Federal Register. 2004. Endangered and threatened wildlife and plants: proposed threatened status for southern resident killer whales. *Federal Register* 69(245): 76673.

Frohoff, T.G. 2000. Behavioral indicators of stress in odontocetes during interactions with humans: a preliminary review and discussion. Paper presented to the Scientific Committee at the 52nd Meeting of the International Whaling Commission, 11-28 June 2000, Australia. SC/52/WW2.

Gordon, J., Leaper, R., Hartley, F.G. and Chappell, O. 1992. *Effects of whale-watching on the surface and underwater acoustic behaviour off Kaikoura, New Zealand.* Science and Research Series 52. Department of Conservation, Wellington, New Zealand.

Howard, C. and Parsons, E.C.M. 2005. Public awareness of whale-watching opportunities in Scotland. *Tourism in Marine Environments* 2(2): in press.

Hoyt, E. 1994. Whale watching worldwide: an overview of the industry and the implications for science and conservation. *European Research on Cetaceans* 8: 24-29.

Hoyt, E. 2005. Sustainable ecotourism on Atlantic Islands, with special reference to whale watching, marine protected areas and sanctuaries for cetaceans. *Proceedings of the Royal Irish Academy* 105B (3): 141-154.

Lewandowski, J.K. 2005. Assessing public input on further regulatory measures by the National Marine Fisheries Service to address harassment of wild marine mammals from interactive viewing activities. MS thesis, George Mason University, Virginia.

Lockyer, C. 1978. The history and behaviour of a solitary wild, but sociable, bottlenose dolphin (*Tursiops truncatus*) on the west coast of England and Wales. *Journal of Natural History* 12: 513-528.

Lusseau, D. 2003a. Male and female bottlenose dolphins *Tursiops* spp. have different strategies to avoid interactions with tour boats in Doubtful Sound, New Zealand. *Marine Ecology Progress Series* 257: 267-274.

Lusseau, D. 2003b. Effects of tour boats on the behavior of bottlenose dolphins: using Markov chains to model anthropogenic impacts. *Conservation Biology* 17:1785-1793.

Lusseau, D. 2004. The hidden cost of tourism: detecting long-term effects of tourism using behavioral information. *Ecology and Society* 9: art 2.

Lusseau, D. 2005. Residency pattern of bottlenose dolphins *Tursiops* spp. in Milford Sound, New Zealand, is related to boat traffic. *Marine Ecology Progress Series* 295: 265-272.

Lusseau, D. and Higham, J.E.S. 2004. Managing the impacts of dolphin-based tourism through definition of critical habitats: the case of bottlenose dolphins (*Tursiops* spp.) in Doubtful Sound, New Zealand. *Tourism Management* 25: 657-667.

Mattson, M.C., Thomas, J.A. and St. Aubin. D. 2005. The effect of boat activity on the behaviour of bottlenose dolphins (*Tursiops truncatus*) in waters surrounding Hilton Head Island, South Carolina. *Aquatic Mammals* 31(1): 133-140.

Müller, M. and Bossley, M. 2002. Solitary bottlenose dolphins in a comparative perspective. *Aquatic Mammals* 28(3): 298-307.

Müller, M., Battersby, M.Z., Buurman, D., Bossley, M. and Doak, W. 1998. Range and sociability of a bottlenose dolphin, *Tursiops truncatus* in New Zealand. *Aquatic Mammals* 24: 93-104.

Parsons, E.C.M., Lewandowski, J. and Lück, M. 2005. Recent advances in whalewatching research: 2004-2005. *Tourism in Marine Environments* 2(2): in press.

Parsons, E.C.M., Fortuna, C.M. Fortuna , Ritter, F., Rose, N.A., Simmonds, M.P., Weinrich, M., Williams, R. and Panigada S. 2006. Glossary of whalewatching terms. *Journal of Cetacean Research and Management* 8 (Suppl.): in press.

Parsons, E.C.M., Warburton, C.A., Woods-Ballard, A., Hughes, A. and Johnston, P. 2003. The value of conserving whales: the impacts of cetacean-related tourism on the economy of rural West Scotland. *Aquatic Conservation* 13: 397-415.

Richter, C., Dawson, S., Slooten, E. 2006. Impacts of commercial whale watching on male sperm whales at Kaikoura, New Zealand. *Marine Mammal Science* 22(1): 46-63.

Santos, M.C. de O. 1997. Lone sociable bottlenose dolphin in Brazil: human fatality and management. *Marine Mammal Science* 13(2): 355-356.

Wilke, M., Bossley, M. and Doak, W. 2005. Managing human interactions with solitary dolphins. *Aquatic Mammals* 31(4): 427-433.