

REVIEW

RECENT ADVANCES IN WHALE-WATCHING RESEARCH: 2013–2014

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Whale-watching research encompasses a wide variety of disciplines and fields of study, including monitoring the biological impacts of whale-watching activities on cetaceans and assessments of the effectiveness of whale-watching management and regulations, to the sociological and economic aspects of whale-watching on communities hosting such activities. This article is the latest in a series of annual digests, which describes the variety and findings of whale-watching studies published over the past year, since June 2013.

Key words: Whalewatching; Code-of-conduct; Regulations; Management; Swim-with-dolphin/whale tourism; Whale watchers; Illegal feeding; Whale ecotourism

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Introduction

Recognizing the difficulties of keeping up to date on the wealth of research on whale-watching activities, in particular the impacts of these activities on cetaceans, a paper summarizing the breadth and variety of whale-watching research, published during the previous year, was presented to the International Whaling Commission (IWC) Scientific Committee's Whalewatching Subcommittee (Parsons et al., 2004) during the 56th Annual 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 Subcommittee, similar digests in following years were requested (see Parsons et al., 2006; Parsons et al., 2006; Scarpaci et al., 2008, 2009; Scarpaci et al., 2009; Parsons & Scarpaci, 2010, Scarpaci & Parsons, 2012, 2013, 2014). This is the eleventh in this series of review articles, detailing a summary of whale-watching research published over the past year (June 2013–May 2014), since the 2013 meeting of the IWC Scientific Committee.

Impacts of Whale-Watching Activities on Cetaceans

There have been many studies on the impacts of cetacean tourism (as summarized in previous versions of this review), but these predominantly focus on behavioural shifts (short and long term impacts). However, minimal literature is available on changes in acoustic activities (e.g., whistles, clicks) of cetaceans in the presence of vessels (underwater noise). Luis et al. (2014) documented the vocal responses of dolphins in a control setting (no vessels) and in the presence of different vessel types (tanker, cargo freighter, ferry boat, trawler, salt galleon, leisure boat, small boat and dolphin tour boat) in the Sado Estuary, Portugal. This location was arguably an ideal setting to conduct the experiment, due to habitat overlap with dolphins with a range of vessel traffic types within a compact study area (approximately 1,000m radius). Vocalization rates were recorded using a calibrated system, categorised and counted per minute and correlated with group size and vessel presence. Data on dolphin whistles consisted of call rates, in addition to data on the spectral aspect of the whistle (start and end frequency, minimum and maximum frequency and the duration of a whistle). The results indicated that the acoustic production rate was not significantly influenced by group size, but in the presence of a vessel, call rates were significantly reduced. In the absence of vessels, call rates (irrespective of category) were an average of 22 calls per min, versus 7 calls per minute in the presence of ferries. The dolphin's mean "creak" vocalization rate per minute was also less in the absence of vessels

than in the presence of both dolphin-watching trip vessels and ferries. Whistle characteristic analysis indicated that the maximum frequency of the whistle contour was significantly higher in the presence of dolphin-watching trip boats and fishing trawlers. The authors suggest that modifications in call rates could be responses to vessels in close proximity, such as dolphin-watching vessels.

There are some studies that have investigated the long-term effects of cetacean tourism on the reproductive success of odontocetes and in turn, their population growth rates (e.g., Bejder, 2006a, 2006b), but the same data are deficient for mysticete whales. Documentation of activity budgets can yield information on the bioenergetic needs of an animal by evaluating the energy uptake and expenditure (Jodice et al., 2003) and this can further be translated into survival and reproduction rates (or "vital rates"). Therefore, human impacts on cetaceans could be evaluated by investigating changes in activity budgets. Christiansen, Rasmussen and Lusseau (2013) evaluated such budgets for the Icelandic population of northern minke whales (*Balaenoptera acutorostrata*) during whale-watching interactions (between 2010-2011 on established minke whale feeding grounds) to determine whether tourism could ultimately threaten the conservation status of the whales. Prior research has established that foraging behaviour of minke whales could be disturbed in the presence of whale-watching activity since the rapid onset of whale-watching tourism (Christiansen et al., 2013). The effect of whale-watching on the whales' activity budget was determined through a novel step-wise modelling approach developed by the authors that incorporated behaviour types in different locations (a "control" area and a separate "impact" area where whale-watching occurred) and then categorised whale behaviour into three activity states (non-feeding, foraging and surface feeding). Using this modelling approach, reduced foraging and surface feeding behaviour was documented during whale-watching vessel interactions and this equated to a decrease of 42% in energy uptake for a 1hr interaction period. Non-feeding activity, in turn, increased in the presence of whale-watching operations and also resulted in an increase in swim speed, which would also influence energy expenditure. This study suggested that whale-watching tourism can impact baleen whale feeding activity, as has been demonstrated in the literature on the impacts of this type of tourism on toothed whales. The study further suggests that short-term behavioural changes could be translated into a decline in energy uptake, which ultimately could lead to a decline in fitness.

Swim-With-Whale Tourism

Concerns about swim-with-whale programs have been identified in prior research (e.g., Kessler et al., 2013), in particular swim-with-whale tourism in Tonga. However, the economic value of this activity has not been evaluated. Orams (2013) reports on the economics of snorkel-with-whale tourism in Tonga. The study region was part of a group of islands (Vava'u) located in the northern part of Tonga. The whale-watching season occurs from June through October and prior research assessed the whale-watching industry to be worth US\$500,000 per year for the local community (Orams, 1999). In further research, Orams (2001) suggested that the snorkel-with-whale activity could act as an economic driver for the islands. Snorkel-with-whale operations generally target mother-calf pairs, as their slow movement, sheltered water location and surface swimming make them ideal for the snorkel program from a logistical/operational perspective. To assess the economic impact of whale-based tourism, data were collected from both tourists (tourists that arrived via plane, n = 499; or by cruise/yacht, n=52) and the tour operators (n =10). Tourist participants completed questionnaires on various topics (how much they spent, their motivations, their satisfaction levels, plus socio-demographic questions) and the tour operators were interviewed face-to-face (on their business patrons, history and finances). Direct tourist expenditure was deemed to be US\$600,000 per annum; indirect expenditure was US\$4 million (e.g., associated transport, accommodation, food). This demonstrates that whale-tourism provides a significant financial contribution to the Tongan economy. However, the rapid growth of the snorkel-with-whale programs in Tonga has raised concerns about the potential effect this activity may pose on humpback whales and the necessity to conduct independent research on the impacts of these activities. The economic sustainability of this industry will be dependent on a range of independent factors such as flight reliability, tourist attitudes towards swim-with-whale programs and the emergence of this form of tourism in alternative, but perhaps cheaper, destinations.

Whale-Watching Management

Whale-watching is an important economic activity in Australia. However, as various studies on impacts of whale-watching have demonstrated, this tourism activity is not necessarily benign. As a result, effective management is required to mitigate negative consequences of these activities on targeted whales. Fundamental to the success of effective management is the development of respectful working relationships between the stakeholders and the ability to implement adaptive management through research-informed stakeholders. Dimmock et al. (2014) studied the perspectives of two stakeholder groups (resource managers and commercial whale-watching operators) in

relation to industry knowledge and information exchange. A total of 20 commercial tour operators and 9 resource managers responded to study questionnaires. The results demonstrate inconsistent perspectives across the two stakeholder groups; for example, resource managers scored whale biology and ecology as the highest priority information exchange required (33.3%), whereas tour operators scored regulations as the highest priority (45%). Furthermore, only half of tour operators had access to research materials or researchers, and generally managers perceived the whale-watching industry as generally without professional qualifications. The results indicated that 34% of tour operations stayed informed by, and got their information from, the internet and just 20% got information from researchers. Dimmock et al. (2014) proposed that contact between the two stakeholder groups could be limited for some Australian government agencies. However, and importantly, there was a general lack of information on regulatory requirements, but there were requests for training specifically on these requirements. At present whale-watching in Australia is effectively a “passive management system”, assuming that no active intervention is needed (i.e., simply providing regulations is enough to result in management without oversight and training) – the results of this study suggest that this passive management system is ineffective due to a lack of information transfer/exchange, and as a result it is likely that compliance levels in whale-watching operations are low.

Aragones et al. (2013) assessed perceptions of cetacean-watching tourists and local knowledge (looking at both local fishers and non-fishers) about environmental management in the southern Tanon Strait, Philippines and the marine mammals in this region. The rationale of the study was to help develop effective conservation and management plans in the protected seascape region of Tanon Strait, and to collect baseline information on public perceptions. The Tanon Strait is ranked first amongst the ten major fishing grounds in the Philippines. A total of 27 species of cetaceans have been documented in the Philippine archipelago. However, marine mammals are undervalued in the region and considered a nuisance, as they are considered to compete with fishers for marine resources. However, cetacean tourism occurs in several regions of the Philippines, including the Tanon Strait, and in fact has been encouraged in the latter area by the local government since 1995. Participants in the study were provided with questionnaires and to promote environmental awareness focus group discussions were held. A total of 95 whale-watching tourists, 100 local fishers and 64 local non-fishers completed the survey. Tourists were highly satisfied with their whale-watching trips and 77% were content with their trip based on its cost, proximity to dolphins, number of dolphins observed and habitat quality. However, 91% noted that a tailored marine conservation management plan was required. The authors state that given the outcomes of the surveys – the perception of marine mammals as competitors to fishers and the lack of a management plan – a dedicated management strategy is warranted. The authors also state that the focus groups could be an important vector to facilitate a participatory management process.

Also investigating public knowledge and opinions, Luksenburg and Parsons (2013) documented attitudes of locals and tourists to marine mammals on the Caribbean island of Aruba prior to the onset of cetacean tourism (16 species of cetaceans are known in the area). This was the first study to isolate attitudes of individuals to marine mammals and their conservation in a region prior to the onset of cetacean tourism (and any other wildlife tourism operation). It is noted that knowledge of values, motivations and expectation of individuals can be pivotal when developing such operations. Such data could also provide insight into the potential threats tourism might pose to wildlife conservation by assessing local support, or lack thereof, for such conservation. A total of 402 individuals were surveyed via a questionnaire. The number of participants were evenly spread across residents (n=204) and tourists (n=198). Just over half of locals had observed marine mammals in the region and just under a quarter of tourists had seen a marine mammal whilst in the area, but only 33.5% of tourists were aware that the region was host to a diversity of marine mammals. All participants felt strongly that a country should be “proud” to have free-ranging marine mammals in their waters and 88.4% indicated that marine conservation was of importance to them, as was research on marine mammals in the area (81.2%). Most residents (67.3%) indicated that it was important to invest in protecting marine mammals in the region and both groups agreed strongly (96.2% residents; 86.3% tourists) that the Aruban Parliament should implement legislation to protect marine mammals. Of interest, participants did not rank underwater noise to be a concerning factor for marine mammals despite the emergence of this issue globally. The majority of participants were attracted to the concept of observing marine mammals (84%), would pay a fee to partake in such an activity, and the preferred setting for observing marine mammals was in the natural environment (as opposed to a captive setting). A total of 76.1% of participants indicated strongly that Arubans could benefit from cetacean tourism. The results indicate strong support to conserve and protect marine mammals in Aruba and that highly pro-conservation attitudes can be present in the absence of cetacean tourism (whether whale-watching or captive display facilities) and/or specific knowledge of marine mammals in a region. The results also indicate that responsible whale-watching operations would be a better alternative than captive dolphin enclosures (which have

been proposed for the island by the local government), as the latter are controversial and could potentially discourage tourism and economic growth.

Whale-watching Benefits: Encouraging Pro-Conservation Behaviour

One of the potential benefits of whale-watching is the educational value that interpretative materials provided on trips can have, and it has been suggested that such materials might encourage tourists to engage in pro-conservation activity (e.g., volunteer work, financial support to environmental groups), but this has not been demonstrated empirically. Haco and Harms (2014) examined the effect that interpretation can have on conservation intentions of whale-watching participants. The authors had groups of whale-watchers exposed to no interpretation, to knowledge-based materials (knowledge group), to information on the effect that human activity can have on whales (responsibility group) and finally to material that would initiate empathy towards whales by anthropomorphizing the animals (emotional group). The researchers measured likelihoods of three conservation intentions: the most passive intention was to communicate with friends and family on protecting whales. The second intention was to donate money to environmental groups and the third, most active intention was to engage in relevant volunteer work. The pre and post-trip surveys were completed by 146 participants. There were 33 to 43 participants per interpretation condition and 71% of participants had never before participated in a whale-watching trip. The results of the study indicated that conservation intention was in fact influenced by the interpretation type. In the absence of interpretation, individuals failed to significantly change the likelihood of their conservation intentions; therefore, observing whales alone is not sufficient to promote conservation behaviour. A significant increase in the first two conservation intentions was noted in the knowledge group and in the third, most active intention in the responsibility group. The emotional group displayed a significant increase in likelihood of all conservation intentions. The authors highlight that whale-watching interpretation can increase pro-conservation behaviour in the public and emotive interpretation material has the greatest effect. This finding demonstrates that anthropomorphic interpretation has the greatest potential to promote conservation behaviour, whereas scientists tend to emphasise factual and anthropomorphosis-free information in interpretation.

Food-Provisioning Tourism and Cetaceans

Only a small number of studies have investigated the impact of provisioning (feeding) wild dolphins (Samuels & Bejder, 2004, Finn, Donaldson & Calver, 2008 and Powell & Wells, 2011), despite the prevalence of these interactions. In 1988, commercial dolphin feeding programs were initiated north of Savannah, Georgia and banned in 1993, as the activity was deemed to violate the US Marine Mammal Protection Act (MMPA). The prohibition was arguably appropriate, given that impacts and "takes" (as the MMPA defines the term), including injury and death, are more evident amongst dolphins that accept food hand-outs (Donaldson, Finn & Calver, 2010). The commercial interactions in Georgia shifted to dolphin-watching tours. However, "begging" dolphins continue to be observed. Perrtree et al. (2014) sought to "determine the prevalence of human-interaction behaviours of bottlenose dolphins in the Savannah" region. Boat-based survey methods included identification of individuals (photo-identification) and noting dolphin behaviour in the presence of vessels/humans. The specific human interaction behaviours studied were "beg", "depredate", "patrol", "provision", and "scavenge" and were consistent with relevant literature. The authors evaluated the proportion of days dolphins were observed in human-interaction behaviour, cross referenced with the identity of individuals and these values were compared to other research. Across 44 survey days, a total of 197 sightings were made and human-interaction behaviour was observed across the whole study region. Human interaction behaviours were observed on the majority of days (61.4%) during almost a quarter (22.8%) of sightings. The most common behaviour observed (expressed as percentage per day) was "begging" (65.2%) followed by "patrol" (11.6%), "scavenge" (7.2%), "other" (4.3) and "provision" (2.9%). Of 294 individuals that comprised the photo-identification catalogue, 42 individuals were found to interact with humans in 2009 and 59 in 2010. Comparing with other study areas, the rates of begging appeared high. Perrtree et al. (2014) recommend implementation of management and educational programs across the study sites, as clearly this is a substantial and growing problem.

Cetacean tourism and its impacts in developing regions have been well documented (e.g., Mustika, Birtles, Welters and Marsh, 2012), including the problems associated with boto (or Amazon River dolphin, *Inia geoffrensis*) tourism in Brazil (Alves et al., 2013a). Alves, et al. (2013b) evaluated the perceptions of the local community in Novo Airao (Central Amazon, Brazil) within the Anavilhanas National Park regarding the river dolphins that live there, and the socioeconomic aspects of a boto feeding program (which has been conducted in the area since 1998, albeit illegally).

A total of 45 interviews were conducted amongst local businesses (n = 21) and community members (n= 24). The survey discovered that river dolphins were regarded as a tourist attraction by both business people and locals. These two groups also perceived tourists/tourism as beneficial to the local community. However, the opinion of the two groups on the benefits of boto tourism was polarized: 42.8% of business participants scored boto tourism as important, as opposed to 4.2% of locals. The business participants were better informed about the risks feeding botos poses: 71.4% were aware of the risks versus 37.5% of locals. A little more than half of the business participants (52.4%) believed that stopping boto tourism would lead to financial losses in the area. Alves et al. (2013) suggested that closure or modification of the dolphin feeding activity would not significantly impact the lives of the local human population. Furthermore, the authors suggested that a shift from dolphin feeding to dolphin watching programs would empower local actors to partake in tourism activities and encourage an attitude of stewardship toward the dolphins. It would increase tourism offerings in the area, which in turn would increase the time tourists spend in the region, thus increasing economic benefits. The authors recommended that codes of conduct be established and projects be instituted that focus on wildlife and natural settings, i.e., move the region toward true ecotourism.

Summary

The effects of whale-watching on whales was explored through: a) call exchange rates of dolphins in the presence and absence of different vessel types (Luis et al., in press) and; b) changes in the activity budgets of minke whales resulting from the presence of whale-watching boats, which could be translated into energy expenditure or loss (Christiansen et al., 2013). Orams (2013) reported on the economic importance of snorkel-with-whale programs in Tonga. Two studies looked at dolphin-provisioning issues – this appears to be a significant and possibly increasing problem for dolphins in Georgia (Perrtree et al., 2014), and public attitudes to Amazon river dolphin feeding tourism in Brazil suggest some locals, but not all, may be aware of the negative impacts on the dolphins and it is currently not of major economic importance where it occurs (Alves et al., 2013).

A large proportion of publications this year on cetacean tourism had a social science perspective and all indicated the importance understanding the values (biocentric, economic) of individuals (tourists, tour operators and community) to help facilitate effective management of cetacean tourism. A paper in the Philippines indicated that marine mammals were undervalued, perceived as a competitor with the local fishing trade and warranted a dedicated management plan to combat these values (Aragones et al., 2013). In the southern Caribbean, in the current absence of cetacean tourism, all groups surveyed (locals and tourists) strongly agreed that marine mammal protection measures should be implemented in the region and cetacean tourism *in situ* would be of benefit to the cetaceans and the local human community (Luksenburg and Parsons, 2014). A careful experimental design assessed whether tourists on whale-watching boats can shift to pro-conservation attitudes based on interpretative materials provided. When on-board naturalist guides provide emotive materials, the greatest potential for positive change in conservation behaviour is elicited (Jacobs and Harms 2014). Finally, a study on whale-watching stakeholders in Australia demonstrated conflicting and inconsistent perspectives between managers and trip operators, which if addressed could help to improve management in the area (Dimmock et al., 2014). These latter studies suggest that whale-watching research is moving beyond monitoring behavioural changes in response to whale-watching vessels to investigating what these changes mean for the health of animals. They used a social science approach to gather evidence of ways that whalewatching could be more sustainably and effectively managed, with benefits for both humans and cetaceans.

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