

## REVIEW

### RECENT ADVANCES IN WHALE-WATCHING RESEARCH: 2010–2011

CAROL SCARPACI\* and E. C. M. PARSONS†‡

\*School of Engineering and Science (Ecology and Sustainability Group), Victoria University, Victoria, Australia

†Department of Environmental Science and Policy, George Mason University, Fairfax, Virginia, USA

‡University Marine Biological Station Millport (University of London), Isle of Cumbrae, Glasgow, UK

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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 2010.

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Address correspondence to E. C. M. Parsons, Department of Environmental Science and Policy, George Mason University, Fairfax, VA 22030-4444, USA. E-mail: ecm-parsons@earthlink.net

#### 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, Classen, & Bauer, 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 & Scarpaci, 2010; Parsons, Lewandowski & Lück, 2006; Parsons, Lück, & Lewandowski, 2006; Scarpaci, Parsons, & Lück, 2008, 2009; Scarpaci, Lück, & Parsons, 2009). This is the seventh in this series of review articles, detailing a summary of whale-watching research published over the past year (June 2010–May 2011), since the 62st Annual Meeting of the IWC.

#### Impacts of whale-watching activities on cetaceans

##### Behavioral changes in Japanese bottlenose dolphins in response to whale-watching boats

Researchers in Japan observed the behavioral effects of dolphin-watching boat traffic on Indo-Pacific bottlenose dolphin (*Tursiops aduncus*) behavior off the Island of Amakusa-Shinoshima, Japan (Matsuda, Shirahihara & Shirakihara, 2011). The researchers noticed that in response to one boat dolphins spent increase time underwater and their speed of movement at the surface increased. In response to 4-5 boats, the dolphins travelled greater distances underwater before surfacing, and their intervals surface decreased in duration (Matsuda *et al.*, 2011). As a result of

these behavioral changes, the authors suggested that there should be restrictions on the number of vessels that could approach dolphin groups (Matsuda *et al.*, 2011)

### **Risso's dolphins alter daily resting patterns in response to whale-watching in the Azores**

Cetacean tourism was introduced to the Azores in 1992 and has experienced rapid growth (Visser, Hartman, Rood, Hendricks, Zult, Wolff, Huisman, & Pierce, 2010). In 2004, fourteen commercial cetacean tour vessels operated amongst the seven Azores islands (predominantly from Pico and Faial) and managed by a regulatory system since 1999 (Visser *et al.*, 2010). Stipulations in the regulations control for approach distance, interaction time, approach method and maximum vessels per cetacean group. Research conducted on compliance to these regulations documented unsatisfactory compliance (54% of whale-watching vessels complied) during sperm whale interactions Magalhães *et al.* (2002). Tour operators also target Risso's dolphins (*Gampus griseus*) found at the Azores- a suggested nursery ground for these dolphins (Visser *et al.*, 2010). Characteristics of the Azorean Risso's dolphins include high site fidelity, stable associations, mother-calf pairs and age-and sex-specific social segregation (Visser *et al.*, 2010). These population traits could make these dolphins particularly susceptible to disturbance. Visser *et al.* (2010) document behavioral responses of Risso's dolphins to whale-watching vessels (absence and presence) from a land-based vantage point with a maximal 15km offshore visibility range. In general, whale-watching activity in the region is two trips per day, per operator, with trip duration of 3-4 hours.

Behavioral data on Risso's dolphins was collected using a standard behavioral sampling technique for focal follows (Visser *et al.*, 2010). Whale-watching vessels comprised of the majority of vessel traffic (95%) and season influenced vessel abundance the season was divided into "high" and "low" respective to vessel traffic. Increase in vessel abundance (high season) correlated with a decrease in rest and an increase in dolphin social behavior (Visser *et al.*, 2010). Results further indicated that in the presence of more than 5 vessels, Risso's dolphins spent less time in the resting and social states, which could have negative health impacts on these dolphins (Visser *et al.*, 2010). The authors recommend the adoption of a precautionary principle management approach for the cetacean tourism industry in the Azores i.e. to place a cap on vessel abundance and to have a 'no vessel' period to allow the dolphins time to rest (Visser *et al.*, 2010).

### **Fractal analysis used to detect impacts of boat traffic on dolphin diving behaviour**

Levels of stress induced to bottlenose dolphins by vessel presence were determined by documentation of dive durations in response to vessel traffic (Seuront & Cribb, 2011). The studied dolphin population, inhabit a congested urbanized and industrialized coastal environment (Port Adelaide River-Baker Inlet Estuary) considered important from an ecological and commercial perspective and as a result, the location was declared dolphin sanctuary (the Adelaide Dolphin Sanctuary; Seuront & Cribb, 2011). The diving behavior of dolphins was observed from a land-based platform and dive durations were recorded for observed solitary dolphins in the absence and presence of vessels, and these vessels were categorized as kayaks, inflatable power boats, powerboats and fishing boats (Seuront & Cribb, 2011). The results indicated no significant difference in dive duration between control observations and observations made of individual dolphins in the presence of vessels (Seuront & Cribb, 2011). The presence of boats

did impact the complexity of dive duration patterns and this was a function of vessel type, with significant changes related to motorized boat traffic (but no significant change in response to kayaks; Seuront & Cribb, 2011). The authors suggest that the historical approach to document dive behavior in the presence and absence of vessels (i.e., per first result) may be inadequate to detect changes in the distribution pattern of dive sequences, and thus fail to detect potentially stressful interactions (Seuront & Cribb, 2011).

#### **Modeling patterns avoidance behavior during whale-watching in Taiwan**

Since the onset of cetacean tourism in Taiwan, in 1992, this activity has experienced rapid growth (Tseng, Huang, Kyle, & Yang, 2011). However, no regulations currently exist for cetacean tourism in Taiwan and the management of this industry has proven to be complicated (Tseng *et al.*, 2011). To investigate potential impacts of whale-watching Tseng *et al.* (2011) used empirical data (464 sightings) from 2002-2005 to model the impact of cetacean targeted tourism. The data were analyzed using the Cox proportional hazard model with dependent variables in the analysis being time (duration of interaction) and avoidance (behavioral modification: change in diving behavior, path of travel and cetacean surfaced away from vessel). The independent variables were presence of calves, pod size and distance between vessel and the dolphin/whale (Tseng *et al.*, 2011). The data indicated that avoidance behavior was associated with all of the three independent variables: mother-calf pairs exhibited approximately 50% less avoidance than non-calf pairs, also the larger the group size, the lower the degree of avoidance behavior (Tseng *et al.*, 2011). Distance of vessels was positively associated with avoidance behavior (the closer the vessel, the more avoidance (Tseng *et al.*, 2011). The authors recommend the implementation of guidelines that encompass minimum approach distances (50m) with a “no wake” speed limit, prohibition of approaches towards mother-calf pairs, and targeting larger groups of cetaceans for whale-watching activity (Tseng *et al.*, 2011).

#### **Estimation of southern resident killer whales exposure to exhaust fumes**

The level of exposure faced by southern resident killer whales to exhaust gases from whale-watching vessels, in British Columbia and Washington State, was investigated by Lachmuth, Barrett-Lennard, Steyn, & Milsom (2011). This population of orcas is listed as “depleted” under the US Marine Mammal Protection Act, and as “endangered” by the Canadian Species at Risk Act and the US Endangered Species Act – their current decline is suggested to be a result of a reduction in their food supply (salmon), exposure to toxic chemicals and vessel disturbance (National Marine Fisheries Service, 2008). The respiratory anatomy and physiology of cetaceans makes them more susceptible to airborne pollutants due to their high lung to body ratio, the absence of an olfactory system, and their blowhole structure and nasal cavities expose the trachea to higher levels of airborne pollutants than other mammals (Lachmuth *et al.*, 2011).

A total of 39 (74 vessels) dedicated whale-watching companies operate in the studied region and vessel interaction is most intense from May-September (Lachmuth *et al.*, 2011). Exposure of exhaust gases from whale-watching vessels was investigated by a simple dispersion model that incorporated data on whale and vessel behavior, atmospheric conditions and output of airborne pollutants (Lachmuth *et al.*, 2011). Results from the study indicate that the current whale-watching regulations are effective in protecting the orcas from exhaust gas emissions

as detected exposure levels were deemed acceptable (Lachmuth *et al.*, 2011) although in worst-case scenarios safe levels of exposure could be exceeded. To minimize exposure to exhaust gases Lachmuth *et al.* (2011) recommend vessels be positioned downwind of the whales, and the number of whale-watching vessels within 800m of a whale not to exceed 20 boats at any given time, accompanied by enforcement of such regulations and appropriate levels of regulation compliance.

## **Whale-watching guidelines, regulations and management**

### **Ineffectiveness of signs as a means of regulating tourist interactions with marine mammals**

The effectiveness of guidelines and regulations is an area of particular concern with respect to whale-watching management, and studies that look at the effectiveness of methods to reduce impacts is an area of interest. Although, looking at management of tourist interactions with fur seals (*Arctocephalus forsteri*) in Kaikoura, New Zealand, researchers found that signs stating prohibited approach distances were ineffective (Acevedo-Guitierrez, Acevedo, Belonovich, & Boren, 2010). Approximately one third of the tourists got closer to the fur seals than 5 seal body lengths (approximately 7 or 8 m; the signs stated that tourists should stay more than 10m away), and there was no significant difference between tourists that viewed the warning signs or not (Acevedo-Guitierrez *et al.*, 2010). Also approximately 2% of tourists attempted to touch the fur seals and again there was no significant difference between those tourists that had seen the warning signs and those that had not (Acevedo-Guitierrez *et al.*, 2010). The researchers concluded that “*posted signs are ineffective in increasing compliance to regulations and that alternative approaches must be considered to increase regulation compliance*” (p. 40, Acevedo-Guitierrez *et al.*, 2010).

### **Observations of whale-watching activities towards humpback whales in New Caledonia**

Humpback whales (*Megaptera novaeangliae*) have become the focal point of cetacean tourism in New Caledonia with an industry growth that consists of 26 whale-watching vessels that are, as yet, unregulated (Schaffar, Garrigue, & Constantine, 2010). The humpback whales wintering in New Caledonia could be susceptible to whale-watching tourism due to their small population size (472 individuals), strong site fidelity, demographic and reproductive isolation and the cumulative exposure of whale tourism across time. Schaffar *et al.* (2010) collected data on vessel interactions with humpback whales, and the resultant whale behavior, from a land-based vantage point with the aid of a theodolite (visibility range was 8 nautical miles). Observations were conducted across a three year time period that accounted for 275 groups of humpback whales, with an average of 1.8 groups per day; of these 52% of groups were observed in the proximity of at least one whale-watching vessel (and average of 2.5 vessels; Schaffar *et al.*, 2010). More than 3 vessels would be within 300m of group of whales 30% of the time (Schaffar *et al.*, 2010). Average vessel interaction time with whales was 112 minutes but could exceed 120 minutes 37% of the time (Schaffar *et al.*, 2010). Vessels were more likely to interact longer with adult groups (54 min) than groups containing a calf (42 min; Schaffar *et al.*, 2010). The proportion of time vessels were present with whales was significantly less for recreational vessels than commercial whale-watching vessels (Schaffar *et al.*, 2010). Approaches were made closer than 100m to a whale group with calf on 86% of observations, but approached to this

distance 55% for non-calf groups (Schaffar *et al.*, 2010). The average approach distance for non-calf groups was 137.3m, and 67.7m for adult-calf groups (Schaffar *et al.*, 2010). This level of interaction was a concern and Schaffar *et al.* (2010) recommended that regulations and management of the whale-watching be implemented to protect these humpback whales.

## **Socioeconomic aspects of whalewatching**

### **Tourists support conservation, education and impact reduction for dolphin-watching in the Dominican Republic**

A study on local bottlenose dolphins in the southeastern Dominican Republic was initiated after illegal captures of bottlenose dolphins (*Tursiops truncatus*) for a local dolphinarium (Parsons *et al.*, 2010). Part of this project was an assessment of tourist attitudes to dolphin watching in the region (Draheim, Bonnelly, Bloom, Rose, N., & Parsons, 2010). The study found that 69% of the tourists in the region were from western European with 22% from North America (Draheim *et al.*, 2010). Nearly half possessed university degrees (47%) and 70% were staying at all-inclusive resorts (Draheim *et al.*, 2010). In terms of dolphins, 68% stated that the local dolphins should be considered to be a “national treasure” of the Dominican Republic, and the vast majority stated that as a tourism experience they would rather see dolphins in the wild than in an aquarium (91.6%), with only 2.5% preferring to see dolphin in an aquarium setting (Draheim *et al.*, 2010). Nearly three quarters stated that they had plans to a boat trip to Saona, a dolphin hotspot and when asked if they would be willing to pay more for such a boat trip if it specifically included dolphin-watching 29% said they would pay <\$30 extra for such a dolphin-watching trip; 56% said they would pay \$30-60 extra; 13% would pay \$61-90 extra; and 2% would pay more than \$91 in addition (Draheim *et al.*, 2010). Sixty-five percent of the tourists said it was very important that dolphin-watching operations be involved with conservation, and 18% stated that this was “somewhat important” and, interestingly, Draheim *et al.*, (2010) found that willing to pay more for a trip was significantly correlated tourists feeling that conservation participation was important. This clearly suggests that through being pro-conservation dolphin-watching companies could gain greater income. Education provision on board dolphin watching trips was also considered to be important (82% of participants agreeing), as well as the dolphin-watching operator being properly trained (84%), and the company being locally owned (70%; which was significantly more important for North Americans; Draheim *et al.*, 2010). The large majority of tourist also thought it was important that trips did not disturb dolphins (85%), although rather contrarily, 57% thought it was important that dolphin watching trips allowed swimming with the dolphins, with the majority (62%) of tourists believing that dolphins “enjoyed swimming with humans” and that they were not dangerous (55%; only 235 thought that swimming with dolphin could be dangerous; Draheim *et al.*, 2010). Sixty-five percent of the tourists did believe however that dolphin-watching could impact the target species (with a third however, believing that it did not), with the North Americans belief impacts from dolphin-watching being significantly higher than Europeans (Draheim *et al.*, 2010). In all, this study conducted on an island with one of the largest cetacean watching industries in the Caribbean, suggest that tourists prefer watching dolphins in the wild to dolphins in a captive setting, and although there is perhaps a worryingly high want to swim with dolphins, and a lack

of understanding as to the possible risks involved, tourists in the Dominican Republic are highly in favor of dolphin-watching companies being pro-active in terms of education, conservation and minimizing their impacts on the target species (Draheim *et al.*, 2010).

#### **Tourist attitudes to cetacean hunting and cetacean conservation and influence on their destination choice**

Whether whaling and whalewatching can occur in the same location, and are compatible, is a topic which has attracted a lot of discussion (Ris, 1993; Hoyt, & Hvenggaard, 2002; Parsons, & Rawles, 2003; Corkeron, 2006; Herrera, & Hoagland, 2006; Higham, & Lusseau, 2007, 2008) and some anecdotal evidence (e.g. Bergland, 2006; Williams, 2006; Endo & Yamao, 2007; Turley, 2007; Iceland Review Online, 2007, 2008) but only a small amount of data to date (Orams, 2001; Parsons, & Rawles, 2003). The issue has been of particular interest in the Caribbean where whale-watching tourism is substantive (Hoyt, & Hvenggaard, 2002) but nations are somewhat divided over the issue of commercial whaling. A survey of tourists in the Dominican Republic found that the majority of tourists participating stated that if a Caribbean country supported the hunting or capture of whales or dolphins they would be less likely to visit it on holiday (77%; more likely: 2.9%; no opinion: 20.0%; Parsons & Draheim, 2010). In addition the study found that an even larger proportion (81%) stated that a strong commitment to whale and dolphin conservation by a country would make them more likely to visit that country on vacation (less likely: 4.9%; no opinion: 14%; Parsons & Draheim, 2010). This adds to the anecdotal and data-based evidence that the two types of whale-related economic activity, i.e., whale-watching and whaling, are antagonistic.

#### **An estimate for the economic benefits of, as yet, unexploited whale-watching opportunities**

An economic model by has attempted to predict the potential number of whale-watchers that countries could be attracted to countries was developed by Cisneros-Montemayor, Sumaila, Kaschner, & Pauly (2010). The model was based on tourist numbers, a predicted diversity of whale species (based on suitable habitat) and the proportion of general tourists that go whalewatching. A total of 144 countries were included in the model, of which 68 already had developed whalewatching to some degree (Cisneros-Montemayor *et al.*, 2010). From this analysis it was estimated that Africa could potentially gain through direct (i.e. ticket sales), and indirect economic benefits (i.e. accommodation, additional food and lodging) and additional US\$15.6 million, Asia an additional \$46.7 million, Europe \$323 million, North and South America \$27.5 and Oceania and additional \$0.3 million (Cisneros-Montemayor *et al.*, 2010). In total, as yet unexploited whale-watching opportunities could potentially derive an additional US\$413 million, which together with the existing value of the industry, could bring the value of whalewatching to US\$2.5 billion globally, with 19,000 jobs employed by the global industry (Cisneros-Montemayor *et al.*, 2010). The authors note that with properly managed whale-watching, that the conservation and protection of marine mammals can potentially bring substantial economic benefits to nations.

#### **Quality assurance and whale-watching in Taiwan**

Taiwan is another nation which has turned from consumptive use of whales in the form of whaling, to a non-consumptive use, i.e., whale-watching (Chen, 2011). Management of this industry in Taiwan primarily through an

eco-labeling program, that attempts to encompass ecological and environmental sustainability, education and customer satisfaction (Chen, 2011). To assess this program, Chen (2011) conducted a survey to find out: do operators comply with the guidelines stipulated in the program, irrespective of whether they have, or have not applied to the eco-label program; and do tourist patrons learn or enjoy their trips as a result of the eco label program. The survey results suggested that tourists on eco-label trips had better basic knowledge when tested via questions on basic whale biology, and although customer satisfaction was on the whole high, there was no difference between eco-label and non-eco-label trips (Chen, 2011). Also, eco-label customers were significantly more likely to “spend more time and effort learning about the marine environment and marine affairs”, to suggest environmentally friendly tours to friends and “and to promote the concept of sustainable utilization of marine resources” (p 14-15, Chen, 2011). However, the financial cost of the eco-label program, even though has market appeal, is a concern to the individual tour operator and as a result could prevent operator participation. As a result, Chen (2011) discusses the need to provide economic incentives for tour operators, in order to promote participation in the eco-label program.

### **Whale-watching in Korea**

A master’s thesis by (Choi, 2010) describes whale-related tourism in Jangsaengpo, South Korea. In this location tourists can take whale-watching trips (to view northern minke whales, *Balaenoptera acutorostrata* and northern right whale dolphins, *Lissodelphis borealis*); visit a whaling museum, which features a dolphinarium (with four bottlenose dolphins *Tursiops* spp. wild captured from Taiji, Japan); see a short show at a 3D movie theatre (featuring a movie on sperm whales and giant squid); tour a retired whaling vessel; and visit some 30 whale meat restaurants - an estimated 200,000 people visit this location every year (Choi, 2010). The facilities are run by the local government who has a strong pro-whaling stance (Choi, 2010). In addition to interviewing selected stakeholder, Choi (2010) interviewed tourists taking whale-watching trips and visiting the whale tourism facilities. Of those questioned, 58% of the respondents were female, the majority were in their 30s and 40s, and half were the city of Ulsan, Korea (Choi, 2010).

Of those tourists 81% considered whales to be endangered, and a third 37% noted whales as a food resources. Just slightly more tourists disapproved of the concept of whale meat as a culinary tradition as approved (32% vs 30%) but twice as many disapproved with the concept of whale meat as an “indispensible tourist attraction” than did approve (48.1% vs. 24.4%), whereas local government officials, and to some extent local people too, considered that the provision of whale meat to be essential to tourism efforts (Choi, 2010).

Interesting, although the local council had a pro-whaling stance, and the tourism activities featured whaling extensively more than two and a half times as many tourists stated that they disapproved of whaling than approved of it (59% vs. 23%; Choi, 2010). Perceptions of local government officials also contrasted with tourists in terms of their views whale-watching tourism, with the government viewing it as an economic tool and a means to regenerate the local image, tourists in the large majority (79%) saw it in terms of aiding environmental conservation, and to a much lesser extend socio-cultural development (12%) or economic development (9%) (Choi, 2010). Interestingly,

74% of the tourists agreed with the statement that “through tourism in Jangsaengpo I now better understand the need for whale conservation” (with nearly a quarter-22%- strongly agreeing and only 4.5% disagreeing; Choi, 2010). Whereas, nearly the same proportion disagreed with the statement “through tourism in Jangsaengpo I now better understand the need for whaling” as agreed with it (31.4% vs. 36.6%, respectively; Choi, 2010).

When asked which activity in the area tourists most looked forwards to, two thirds chose activities with live cetaceans, i.e. the whale-watching trips and dolphinarium, in equal numbers, with Choi (2010) noting that “ the great majority of tourists desire live-animal encounters” (p 47). Choi (2010, p. 47) adds: “[n]otwithstanding the low probability of sighting whales, whale-watching boat trips on weekends are fully booked well in advance. The queue for the dolphinarium was over 100 metres long for the first month after it opened. A local resident pointed out the reason: “because they are alive” ”.

However, when asked “to what extent do you think whaling and whale-watching tourism can coexist?” of tourists thought it was not possible and thought it was possible (30.8% vs. 36.6%, respectively), with Choi (2010) further noting that “[s]pecifically, those who took a whale-watching boat trip appeared to object to the coexistence [of whale-watching with whaling] ...however, those who ate whale meat tended to support the coexistence” (p. 39).

When asked “If whaling is resumed in Jangsaengpo, would you visit again or recommend Jangsaengpo for tourism?” a fifth of tourists a quarter (19.2%) of tourists were opposed to revisiting if whaling is resumed, more than would definitely visit again (16%), but 42% said they would probably visit again if whaling was resumed, which is a substantially different result from other studies, a result that Choi (2010) notes might be due to the predominantly local domestic nature of the tourists, as opposed to potential international travellers in previous studies asking similar questions of whale-watching tourists. Choi (2010) emphasizes that the images presented in the whale tourism activities studied are somewhat contrary, stating “[a]s clearly seen from the case of Jangsaengpo, whale-watching tourism in pro-whaling countries exhibits incompatible activities” (p 52) and “Jangsaengpo appears to present a conflicting tourism display: wild whales, captive whales, whaling relics and whale meat are simultaneously offered to tourists” (p. 53).

An interesting comment was made in the study by one of the local people interviewed, with the interviewee admitting to illegally hunting cetaceans and that “he catches 70-80 minke whales per year and around 30 other whalers are working along the southeast coast of Korea” (p. 48) with Choi (2010) stating that “the magnitude of illegal whaling appears to be enormous” (p. 48).

The contradicting and conflicting messages that tourists are receiving at this Korean whale tourism destination messages may be impacting Jangsaengpo as a potential development as tourist destination, certainly with respects to boat trips to view cetaceans. Choi (2010) notes that the sighting rate of cetaceans on these popular boat trips is in fact very low, and expresses concerns about the high level of illegal whaling effecting cetacean abundance, and the potential sustainability of the ‘whale-watching tourism’ in Jangsaengpo.

## **Swim-with-whale tourism**

### **Swim-with-whale tourism in Tonga and tourist support of regulations**



In 1992 there was only one whale-watching operator in the nation of Tonga, but by 2010 there were 24 applications for whale-watching licenses (licensed under the 1997 Tourist Act; Kessler, & Harcourt, 2010). Of the tourists flying into the Tongan islands of Vava'u, 83% stated that they went on whale-watching trips (Kessler, & Harcourt, 2010), indicating the influence of the industry. The Tonga Whale Watching Operators Association, which contains the majority of the nation's whale-watching operations, developed a set of whale-watching guidelines in 2001, and in 2003 governmental whale-watching regulations were developed, but not officially approved, and therefore were not legally enforceable (Kessler, & Harcourt, 2010). In 2008, the Tonga Government passed "the Whale Watching and Whale Swimming Act" and identifies two types of whale-watching operator licenses: one for operations watching-whales, and one for swim-with-whale operations (Kessler, & Harcourt, 2010) but there were no regulations of whale-watching operations introduced with this act, thus whale-watching guidelines in the country are effectively voluntary.

Kessler & Harcourt (2010) conducted a survey on swim-with-whale tourists and found that 43.5% of whale-watching tourists were from New Zealand, 21.7% from Australia, 10.1% from the US and 8.7% from the UK. More than 57% of the tourists had completed a degree or higher level of education (Kessler, & Harcourt, 2010). Three-quarters were on their first swim-with-whale trip, but for the repeat tourists, the number of swim-with-whale encounters reported were as high as 180 (with a median value of 3 previous swim-with-whale trips; Kessler, & Harcourt, 2010). Three-quarters thought that swimming with whales was an important part of their holiday (Kessler, & Harcourt, 2010).

The survey also gauged tourist support for various potential regulations for whale-watching trips: licensing (93.5% support); limited license numbers (91.3%); education being provided on the trips (89.8%); that only commercial vessels being allowed within 300m of whales (64.5%) or allow tourists in the water with whales (63.8%); only one vessel with swimmers should be allowed within 100m of a whale group (87.7%); a 10 m exclusion distance (78.9%); a limit of 4 tourist in the water at a time (81.1%); abandoning swims if whales show signs of 'disturbance' (92%); no disturbing noises near whales (86.9%); no rubbish being thrown in the water (95.6%); no artificial light sources to be used when photographing whales (73.2%); no scuba diving with whales (52.95%); boats should not 'prevent' whales leaving an area (93.5%); and the use of a tether line (15.9%; Kessler, & Harcourt, 2010). The least popular potential regulation was a tether line, a method used to control tourist interactions with minke whale (*Balenoptera acutorostrata*) during swim-with tours in Australia (and 42.1% were against this control method; Kessler, & Harcourt, 2010).

The authors of this study suggest that whale-watching fees should be charged which are then returned to help benefit the Tongan people and also to fund enforcement of whale-watching activities (Kessler, & Harcourt, 2010). They also highlight that lack of guidelines when swimming with mother calf pairs (Kessler, & Harcourt, 2010), which is of concern as mother whales may be more protective and might injure swimmers, and both mother and calf might be more susceptible to disturbance. Finally they note that "[t]o reduce pressure on operators to do the wrong thing, visitors need to be educated about what the regulations are and be given realistic expectations of their encounters" (p. 1356, Kessler, & Harcourt, 2010).

### **Affiliative and threatening behaviors described in analysis of human and wild dolphin interactions**

Scheer (2010) conducted a review of 26 articles or report of swim-with-dolphin or provisioning operations involving wild cetaceans, including “lone solitary sociable” dolphins. The review found 53 specific behaviors reported, of which 33 were “affiliative”, 2 were sexual and 18 were aggressive (Scheer, 2010). Aggressive and potentially life threatening behaviours were exhibited by pilot whales (*Globicephala macrorhynchus*) from Hawaii, but not from that species in the Canary Islands and it was suggested that this might be due to regulations in the Canary Islands that control human behavior during swim-with-cetacean encounters (Scheer, 2010). Some aggressive reactions were reported in “habituated” cetaceans, i.e. groups with regular exposure to human swimmers, but there was a lot of variety in responses and most behaviors were described as “affiliative”, with Scheer (2010) noting that “[o]ne might argue that as a result of harassment more aggressive/threatening behaviors occur with habituated cetaceans than for unhabituated ones but that cannot be confirmed here” (p. 462). Provisioned (fed by humans) wild dolphins, were documented as displaying a variety of aggressive behaviors often in response to “inappropriate” human contact such as teasing the dolphins with food or touching sensitive areas such as the eyes or blowhole (Scheer, 2010). “Lone solitary sociable” dolphins were reported as displaying “sexual” behavior towards humans and also the greatest variety of aggressive behaviors, and the latter was suggested to perhaps be a response to inappropriate human contact. Scheer (2010) suggests that tourist be education as to different types of interactions, e.g. to be aware of the difference between affiliative and threatening behaviours, so that encounters can be terminated if potentially dangerous behaviors are observed.

## **Cetacean food-provisioning tourism**

### **Illegal feeding increases risk of boat-strike and entanglement in dolphins**

Dolphin feeding is restricted or forbidden in many nations, based on concerns for the welfare of the dolphin and the interacting tourist. In Cockburn Sound, Western Australia bottlenose dolphins have been food provisioned illegally since 1993. Donaldson, Finn & Calver (2010) investigated the scope of anthropogenic injury to dolphins, behavior of dolphins during feed interactions and the correlation between rates of entanglement and boat strikes with dolphins that interact with humans for food. A photo-identification catalogue was utilized to distinguish between provisioned and non-provisioned dolphins (Donaldson *et al.*, 2010). The results from the study demonstrate a higher incidence of boat strike injury (21% for food-provisioned dolphins and 0% for non-food-provisioned dolphins) and fishing line entanglement (14% for food-provisioned dolphins and 0% for non-food-provisioned dolphins) in food-provisioned dolphins (Donaldson *et al.*, 2010). The authors provide empirical data to validate that dolphin feeding should remain illegal and enforcement of such regulation should be instituted in the region (Donaldson *et al.*, 2010). Given the findings, the study supports the concept that feeding cetaceans is an inappropriate form of cetacean tourism.

## Other

### **Potential impacts of climate change on whale-watching**

Lambert *et al.* (2010) conducted a preliminary review of the potential impacts that climate change could have on the whale-watching industry. The impacts on climate change on prey distribution and abundance may effect cetacean distributions, population health, reproductive rates, and effectively abundance – which in turn effect the whale-watching industry (Lanmbert et al., 2010). She notes that whale-watching in Arctic areas (including Iceland, Norway and Alaska) is likely to see changes before other regions. These could include migrating species arriving earlier and leaving later in their migration, or for native Arctic species, ranges may decrease (Lambert *et al.*, 2010). The species composition and abundance of specific species would be likely to change as ranges shift, which could be positive, or negative, depending on the location (Lambert et al., 2010). Changes in occurrence of more ‘charismatic’ species (such as humpback whales) may affect the ability of whale-watching areas to attract tourists, and tourist satisfaction with their trips (Lambert et al., 2010). Likewise changes in the richness of species, location with respect to ease and quickness of access, and frequency of sightings (which would be linked to abundance) will all be factors that could enhance or detract from whale-watching areas, and if abundance and diversity declines drastically, or species move too far offshore to be economically viable as target species, it could result in the decline of whalewatching operations (Lambert *et al.*, 2010). These factors could also affect tourist types – with higher cetacean diversity and abundance, more predictable sightings and more ‘charismatic’ species, resulting in more general, and less specialist, tourists, with an accompanying shift in tourist demographics and numbers. Conversely a decline in the previous factors could lead to areas with dedicated whale-watching operations shifting to more general wildlife-watching as cetacean sightings become rarer (Lambert *et al.*, 2010).

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