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The use of marine wildlife-watching codes and their role in managing activities within marine protected areas in Scotland

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ABSTRACT

Marine wildlife-watching is a developing industry in Scotland contributing to overall growth and aspirations of the marine tourism sector. Despite European-level legal protection of cetaceans, and Scottish legislation for the protection of seals at designated haul-out sites, there are currently no formal or mandatory regulations to specifically manage tourism activities in relation to marine wildlife. However, most Scottish wildlife-watching operators adopt one, or more, five key voluntary codes of conduct which have been developed in the UK since 2003. In this paper, we review the consistency of policy messages and recommendations across voluntary codes of conduct for the UK and Scotland, taking into consideration global use and effectiveness in the use of similar codes. In this context, we specifically examine the potential impacts of wildlife watching and management of future activities, both within and outwith marine protected areas (MPAs) in Scotland. For this, the research also incorporates data from field surveys, *in-situ* observations and operator questionnaires conducted in Scotland relating to the implementation of the codes in practice. Key findings highlighting consistencies in some of the key recommendations across the five UK codes in particular, the distance and speed when approaching an animal. However, all of the codes also have some similarities, including advising against deliberate human interaction, e.g. swimming with marine megafauna, including a separate code on basking sharks, published by the Shark Trust in the UK. In light of the growing network of wildlife-focused MPAs in Scotland (in particular the Sea of Hebrides proposed MPA for mobile species), and national aspirations for the growth of the marine tourism sector, we consider the potential implications of unregulated wildlife watching and the conservation objectives of protected areas for marine mammals and basking sharks. We also provide recommendations on how more formal wildlife-watching regulations could enhance MPA effectiveness and contribute to the emerging processes for Regional Marine Plans across Scotland and provide some insights for global marine wildlife tourism.

1. Introduction

Wildlife-watching is a relatively recent development within the global tourism industry, which involves the organised or incidental viewing of animals in their natural environment. It is broadly considered to be an 'environmentally-friendly' form of tourism and is increasingly contributing to tourism portfolios and economies for many countries (Duffus and Dearden, 1990; Tapper, 2006). Wildlife-watching and ecotourism can have multiple benefits, such as supporting conservation efforts through data collection, employing and uniting local communities, and increasing public awareness about environmental issues (Stem et al., 2003; Stronza and Gordillo, 2008). Marine wildlife-watching tours can be used as platforms for scientific research and used to educate the public on conservation issues relating to cetaceans (whales, dolphins and porpoises – IWC, 2013). This can sensitise people to the conservation threats of these species, and as a result, raise environmental awareness (Garrod and Fennel, 2004). However, emerging evidence

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indicates that there can be potential negative impacts of human interactions with wildlife, primarily on the species of interest to marine wildlife-watching, which can have immediate and cumulative effects on the animals behaviour (Green and Giese, 2004).

Unlike other boat traffic, marine wildlife-watching boats repeatedly targetand remain with an animal rather than passing by (Wursig and Evans, 2001; Erbe, 2002; Lusseau and Bejder, 2007). Boat presence can interfere with the ability of marine wildlife to communicate due to boat noise, and disrupt behaviour such as feeding, during which an animal may avoid interacting with a boat (Erbe, 2002; Lusseau, 2004; Williams et al., 2006; Parsons, 2012). These changes in energy expenditure can have short- and long-term negative impacts on individuals and populations, potentially reducing fitness, the reproductive capability of individuals and the overall health of a population, and pose a threat to small populations (Erbe, 2002; Lusseau and Bejder, 2007).

1.1. International regulation of marine wildlife-watching in MPAs

A 'protected area' is defined by the IUCN as '*a clearly defined geographical space, recognised, dedicated and managed, through legal or other effective means, to achieve the long-term conservation of nature with associated ecosystem services and cultural values*'. There are a number of ways that marine tourism is managed around the world through marine protected areas (MPAs) and other marine designations (such as marine reserves) (Hoyt, 2012). Zoning, permits, codes of conducts, and enforced minimum approach distances are all strategies used to manage marine wildlife-watching activities within protected areas for cetaceans (Reeves, 2000; Notarbartolo-di-Sciara et al., 2008; NOAA, 2014). There are a number of examples globally where there has been poor compliance to statutory and voluntary regulations, such as in South Australia where authorities have had to limit the number of marine wildlife-watching operators in the area Allen et al., 2007. In 2004, approximately one-third of global cetacean-watching codes were regulatory, with two-thirds adopted on a voluntary basis (Garrod and Fennel, 2004; Parsons, 2012).

Species-specific codes of conduct provide more targeted management enabling the establishment of stricter regulations to limit disturbance to species within particular locations (Giles, 2014). For example, in the Hawaiian Islands Humpback Whale Marine Sanctuary, there is a legally enforced minimum approach distance of 100 yards for approaching humpback whales in the sanctuary, which is applicable for both recreational and commercial boat users (NOAA, 2014). These more specific codes of conduct can be designed to allow for seasonal species distributions and tourism cycles, making the management more targeted to the preferences of the animals.

The allocation of an MPA can act as a marketing tool that raises awareness for marine wildlife-watching activities as protected areas are often synonymous with tourists as high-quality examples of a particular habitat, encouraging growth of the industry (Warburton et al., 2001; Reinius and Fredman, 2007). In the process, however, the profile of an MPA can increase pressure and the degradation of the environment (Buckley, 2012). For example, MPA designation in the Medes Islands, Spain, in the 1980's resulted in large increases in unregulated diving activity that damaged benthic communities (Badalementi et al., 2000; Milazzo et al., 2002).

The ideal situation is for a particular marine environmental setting and species to be managed in such a way that the species can actually benefit from tourism and MPA designation. Potts et al. (2014) suggest that '*protection will maintain an ecosystem in good ecological condition, which will have a positive effect on the delivery of ecosystem services*,' which in this case is the marine wildlife-watching industry. Therefore, there is the potential that optimal protection of the environment will benefit both the environment and the industry if appropriate regulations are in place and adhered to.

1.2. Marine protected areas in Scotland

In Scotland, there is a growing network of MPAs, some of which are designated or proposed for the conservation of cetaceans, pinnipeds (seals) and chondricthyan (sharks, rays and skates); these sites are summarised in Table 1. Given the dynamic nature of marine wildlife in time and space across different life-history stages, the management connection with typically static zoning and spatially oriented activity management is a growing area of interest to researchers and practitioners alike (Cañadas et al., 2005; Hooker et al., 2011). MPAs are increasingly considered to be an important tool for biodiversity protection under a number of international frameworks and are beginning to demonstrate some effectiveness where monitoring has been carried out (Gormley et al., 2012; O'Brien and Whitehead, 2013). A number of studies have demonstrated that spatial protection and management within MPAs can lead to an increase in higher predator populations (such as sharks), and furthermore can be highly attractive for marine tourism with economic opportunities through local management (Brunnschweiler, 2010; Jaiteh et al., 2016).

All European cetacean species, pinnipeds and basking sharks are currently protected from deliberate or accidental harassment, injury or death through national transposition of the EU Habitats Directive (1992) and the Nature Conservation (Scotland) Act 2004. Some are listed as qualifying species for spatial protection within Special Areas of Conservation (SACs), including bottlenose dolphin and harbour porpoise. Furthermore, in Scotland, since the introduction of the Marine (Scotland) Act 2010, nature conservation marine protected areas (ncMPAs) have been identified for selected mobile species based on evidence of significant areas where species aggregate for key functions or life stages (e.g. feeding or spawning). Nature conservation MPAs mandate considerations for licensable activities, through the environmental impact assessment stage, and a separate process is currently underway in Scotland to determine ncMPA and SAC management measures for non-licensable activities, including commercial fisheries. At present, based on the current implementation of MPA management options in Scotland, it appears no additional statutory management considerations will be given to recreational use and wildlife-watching within MPAs under the Act, and there is little evidence available that these activities have a site-level impact on protected species within many of these sites (although these are not formally monitored). However, voluntary measures within the Moray Firth bottlenose dolphin SAC, where impacts have been demonstrated (Hastie et al., 2003; Cheney et al., 2012) and the industry is considered to be at capacity (Lusseau, 2013), are currently being tested (personal observation, S. Dolman).

Marine tourism is considered as part of Scotland's National Marine Plan, which was adopted in March 2015 and includes marine planning policies to comply with codes of conduct for marine wildlife-watching. Scotland's National Marine Plan also contains reference points for the development of Regional Marine Plans. These will be important mechanisms for considering the management of wildlife-watching within specific MPAs and local sea areas for specific species. Furthermore, Scotland, a country with a strong commitment and reputation for nature-based tourism, plans to increase its marine tourism industry, including wildlife-watching., as evidenced through an action plan[1], launched in November

[1] Awakening the Giant, a Strategic Framework for Scotland's Marine Tourism Sector: http://scottishtourismalliance.co.uk/wp-content/uploads/2014/02/Awakening-the-Giant-final.pdf.

Table 1
Summary of spatial protection measures for cetaceans, pinniped and chondricthyan species in Scotland (up-to-date March 2016).

Species	Designation	Directive	Current status	Management measures
Cetaceans				
Bottlenose dolphin (*Tursiops truncatus*)	Special Area of Conservation (Moray Firth)	EC Habitats Directive	Designated	Moray Firth SAC Management Scheme
Minke whale (*Balænoptera acutorostrata*)	Nature Conservation MPA (Sea of the Hebrides; Southern Trench)	Marine (Scotland) Act 2010	Proposed	N/A
Risso's dolphin (*Grampus griseus*)	Nature Conservation MPA (Northern Minch)	Marine (Scotland) Act 2010	Proposed	N/A
Pinnipeds				
Harbour seal (*Phoca vitulina*)	Special Area of Conservation (Ascrib, Isay and Dunvegan; Dornoch Firth and Morrich More; Eileanan agus Sgeiran Lios mór; Firth of Tay & Eden Estuary; Mousa; Sanday; South-East Islay Skerries; Yell Sound Coast)	EC Habitats Directive	Designated	Fisheries management measures under development
	Seal Haulout Sites (194, Scotland-wide, both species)	The Protection of Seals (Designation of Haul-Out Sites) (Scotland) Order 2014 (under Marine (Scotland) Act 2010)	Designated	Harassment of seals at designated sites prohibited
Grey seal (*Halichoerus grypus*)	Special Area of Conservation (Faray and Holm of Faray; Isle of May; Monach Isles; North Rona; Treshnish Isles)	EC Habitats Directive	Designated	Fisheries management measures under development
	Seal Haulout Sites (194, Scotland-wide, both species)	The Protection of Seals (Designation of Haul-Out Sites) (Scotland) Order 2014 (under Marine (Scotland) Act 2010)	Designated	Harassment of seals at designated sites prohibited
Chondricthyans				
Flapper [prev. common] skate (*Dipturus flossada*)	Nature Conservation MPA (Loch Sunart to the Sound of Jura)	Marine (Scotland) Act 2010	Designated	Zonal demersal trawling and dredging restrictions.
Basking shark (*Cetorhinus maximus*)	Nature Conservation MPA (Sea of the Hebrides)	Marine (Scotland) Act 2010	Proposed	N/A

2015, to enhance the value of the marine tourism industry by nearly £100 million.

1.3. Regulation of marine wildlife-watching in Scotland

The regulation of marine wildlife-watching can be divided into two forms of management: formal and voluntary (Duprey et al., 2008; Garrod and Fennel, 2004). Formal regulations are mandatory guidelines established by government through administering permits or licences, codes of conduct and area and species restrictions (Gjerdalen and Williams, 2000; Garrod and Fennel, 2004; Duprey et al., 2008; Queensland Government, 2013; Giles, 2014). Voluntary management depends on informal agreements and is increasingly used to incorporate conservation goals and concerns without requiring government regulations (Garrod and Fennel, 2004; Duprey et al., 2008; Wiley et al., 2008). For marine wildlife-watching activities in particular, codes of conduct are commonly used as a way of managing the industry on a voluntary, self-regulatory level by the operators (Gjerdalen and Williams, 2000), and/or in conjunction with regulatory measures (Allen et al., 2007). Wildlife tour operators, along with other types of nature-based tourism businesses (e.g. SCUBA diving companies) tend to be locally owned and play an important role in their local communities. For example, through employment or attracting visitors – Parsons et al., 2003), with some becoming involved in local management initiatives, such as the Moray Firth 'Dolphin Space Programme' (Arnold, 1997).

There are advantages and disadvantages to voluntary and statutory codes of conduct for wildlife-watching. Statutory regulations ensure the accountability of operators or leisure users by establishing requirements to monitor and enforce wildlife-watching activities. However 'top-down' approaches to management require oversight may beless well-received by operators, and there is a general preference for non-statutory NGO- or operator-led regulation (Parsons and Woods-Ballard, 2003). Handing management over to operators and local wildlife guides can impart a moral duty towards protecting the communities' best interests and can encourage compliance with the code (Gjerdalen and Williams, 2000; Parsons and Woods-Ballard, 2003; Garrod and Fennel, 2004). Operators need to feel confident that the codes will also help support sustainability of the tourism industry, and providing protection to wildlife (Hughes, 2001). However, voluntary codes rely on the integrity of the operators to adhere to the guidelines and are harder to enforce. The risk of disturbance to wildlife may be less certain; operators who follow good practice may be disadvantaged by others who fail to do so. Furthermore, voluntary guidelines can enable the perception that the tourism industry is being regulated and disturbance to wildlife is understood and being minimised. It may be assumed that no other form of regulation is needed, resulting is less confirmation that the voluntary guidelines are being monitored and are effective (Wiley et al., 2008). Unlike mandatory regulations, voluntary codes of conduct need to be constantly reinforced through education and awareness campaigns and may not necessarily be self-sustaining as a long-term measure particularly in a growing industry (Berrow, 2003).

The marine wildlife-watching industry in Scotland is managed largely through using voluntary codes of conduct (Woods-Ballard et al., 2003), incorporating local knowledge and demonstrating a high degree of engagement and responsibility (Garrod and Fennel, 2004). Parsons and Woods-Ballard (2003) reviewed the use of the different types of codes of conducts being used specifically by whale-watching operators, at which time the primary code in use was the 'Scottish Marine Wildlife Operators Association code of conduct for marine wildlife operators'. O'Connor et al. (2009) found that at the time of their study there are five main codes of conduct used by over 50 operators in Scotland. In 2006 Scottish Natural

Heritage (SNH), the Scottish Government's statutory nature conservation advisers, produced the *Scottish Marine Wildlife Watching Code*[2] (SMWWC), as a duty under part 3 section 1 of the Nature Conservation (Scotland) Act 2004. The other four codes have been produced by non-governmental organisations (NGOs) over the past 13 years: the WiSe (**Wi**ldlife **Sa**fe) accreditation scheme, Wild Scotland (Scottish Wildlife & Adventure Tourism Association), Whale and Dolphin Conservation, and the Sea Watch Foundation. A sixth code of conduct produced by the Shark Trust (a UK NGO) provides specific guidance for viewing and swimming with basking sharks and is also followed by some operators. Collectively, these codes of conduct provide recommendations for recreational and commercial boat users on human behaviour that seek to limit disturbance to marine wildlife (Gjerdalen and Williams, 2000). However there is limited documented evaluation of the efficacy of the codes and few examples of monitoring. Therefore, it is difficult to suggest whether, or how well, the codes have been rigorously tested or evaluated through on-site monitoring and analysis.

In light of the diverse approaches outlined above and respective tensions and opportunities associated with marine wildlife tourism, this study sought to build on the work by Parsons and Woods-Ballard (2003) with a focus on reviewing the current consistency and effectiveness of voluntary marine wildlife-watching codes in Scotland. The degree to which formal regulation could contribute to achieving marine megafaunal conservation objectives was reviewed in order to align with innovative and emerging approaches of marine planning.

2. Materials and methods

2.1. Review of Scottish marine wildlife-watching codes of conduct

A review of the five main voluntary codes of conduct used in Scotland was conducted in 2015: the Scottish Marine Wildlife Watching Code, Sea Watch Foundation, Whale and Dolphin Conservation, Wild Scotland and the WiSe Scheme Cetacean Code of Conduct. A compilation of the recommendations within these codes of conduct was assembled, with each recommendation being recorded once, even if present in multiple codes of conduct. The recommendations that differed between organisations were also noted, as well as analysed in more detail. Given the breadth of species that the codes of conduct apply, this study concentrates on the main groups and species that were considered to be the primary focus of marine wildlife-watching in Scotland, namely cetaceans (whales, dolphins and porpoises) and basking sharks (*Cetorhinus maximus*). They may be referred to collectively as *marine megafauna*.

2.2. Marine wildlife-watching surveys

Over the summer of 2015, surveys were conducted with a marine wildlife-watching tour operator in the Sea of Hebrides to establish the effectiveness of codes of conduct at limiting disturbance to marine wildlife and to observe basking shark behaviour in response to swim-with interactions. The following surveys were conducted:

a) Marine wildlife-watching survey

Marine wildlife-watching surveys were completed on a marine wildlife-watching tour boat operating out of Tobermory, Isle of Mull, which adheres to the WiSe Scheme code of conduct[3]. The survey was carried out over a three-week period at the end of June until the beginning of July 2015. The following information was recorded when a sighting was made by the observer:

- **length of encounter:** the time from when an animal was first sighted to when the animal was last sighted;
- **location of sighting:** using the on board Global Positioning System (GPS);
- **species and number sighted** (including recording the presence of a mother and calf/juvenile);
- **minimum approach distance:** the closest approach made by the boat to the animal, or by the animal to the boat;
- behaviour of the animal when first sighted;
- behaviour of the animal when last sighted;
- **number of other boats within a 0–300m radius and a 300m–1km radius** (0–300 m is considered the caution zone for observing marine wildlife).

Sightings were recorded only when made by the observer; the sightings made by crew or passengers were not recorded. The minimum approach distance was estimated by unaided eye, using boat length to calibrate distance (Dawson et al., 2008). This technique was used because no laser finder was available to the observer and the nature of the tours meant that line transect surveys were not possible (Dawson et al., 2008).

The minimum approach distance, the length of the encounter and the presence of other boats were recorded to determine whether the code of conduct was being correctly followed.

Behaviour was recorded when the animal was first sighted and when the animal was last sighted. This was to establish if any changes in behaviour occurred as a result of boat presence to evaluate whether disturbance had resulted from the encounter (Lusseau, 2004). Behaviour was categorised as travelling, milling, socialising or foraging, modelled using Gill et al. (2000), Constantine et al. (2004) and Stockin et al. (2009) descriptors for common bottlenose dolphin (*Tursiops truncatus*), short-beaked common dolphin (*Delphinus delphis*) and northern minke whale (*Balaenoptera acutorostrata*) behaviours, respectively. The different behaviours are defined as follows:

1. Travelling: making headway with constant movement in one direction;
2. Socialising: close contact between individuals, with leaping sometimes being observed;
3. Foraging: observed attempting to catch prey. Behaviour may include rapidly swimming in circles and deep diving, but distinct from socialising in that no contact between individuals is observed;
4. Milling: frequent changes in direction, making no headway.

Lusseau (2004) suggests that horizontal avoidance techniques, such as travelling, are used by bottlenose dolphins to avoid interactions with boats. Therefore in this study a behavioural change that results in a horizontal avoidance technique that removes an animal from an interaction will be considered avoidance behaviour in response to disturbance from boat presence (Lusseau, 2004).

b) Basking shark behaviour

In light of the growing interest in basking-shark tourism in Scotland and a proposed MPA for this species (Sea of Hebrides), there is a need to better understand the potential effects of the presence of human swimmers on basking sharks and the respective codes of practice. Observational and anecdotal information was

[2] http://www.marinecode.org/documents/Scottish-Marine-Code-web.pdf.
[3] http://www.wisescheme.org/?page_id=1128.

obtained from three basking shark swim-with charters from 11 to 25th July 2015; however, the touristic focus of the charter precluded employing a more formal quantitative approach.

The first two charters were five-day long trips and involved experienced divers and photographers, many of which had previously carried out in-water filming of marine mega-faunal species. The third charter was one-day long and consisted of mixed-experience snorkelers, some of whom had previously interacted with basking sharks.

Despite the previous experience of the swimmers, they were briefed by the crew regarding how to adhere to the Shark Trust Basking Shark Code of Conduct at the beginning of each charter. Swimmers were advised to swim on their side to minimise splashes as potential disturbance from finning as well as staying in their pairs rather than forming groups in the water. The swimmers were taken within 100 m of a shark and 2 at a time entered the water from a dive platform at the back of the boat. Once a pair had entered the water another 2 swimmers would be taken within 100 m of the same shark but from the other side to its swimming trajectory. The skipper and crew then observed swimmers and sharks, signalling from the boat the direction the nearest shark was to them and also standing by if the swimmers were ready to be picked up by the boat. After 10 min, the boat would pick up the swimmers and bring them aboard and another two persons could then enter the water. In the anticipation of a swim-with basking shark encounter, data collection sheets were taken on board by the crew, and information was recorded for each encounter (Appendix A). Comments from the skipper and crew were noted as observational information in an attempt to identify potential factors influencing basking shark behaviour, which in future could direct more specific areas of study or improve the codes of conduct.

The briefing given to the swimmers at the beginning of each charter included the main points emphasised by The Shark Trust Basking Shark Code of Conduct, which are as follows:

- Maintain a distance of at least 4 m from each shark and be wary of the tail
- Do not try to touch the sharks
- Do not swim towards them if they are near you
- Ideally, swimmers should remain on the surface and stay in a small group rather than stringing out around the sharks
- No more than four people should be in the water within 100 m of a shark at any one time

The locations visited to search for sharks depended on the most recent sightings from boats in the area that had contacted the skipper. The first two days of the first charter were spent around the islands of Coll and Tiree (Fig. 1). After sightings from other vessels were reported near St Kilda, the last three days were spent travelling to and searching the surrounding waters of St Kilda (Fig. 1). The next two charters were spent around the north end of Coll, as by this time (22nd–25th July), sharks had been sighted there in larger numbers.

2.3. Marine wildlife tour operator questionnaire

A questionnaire was distributed to 27 marine wildlife-watching tour operators on the west coast of Scotland. These operators were chosen based on information on their websites that suggested their tours travel into the Sea of Hebrides proposed MPA. The questionnaire consisted of eight questions (Appendix B) with the option of providing comments at the end. It was compiled to establish how many tour operators on the West Coast travel into the Sea of Hebrides proposed MPA, how many of them already use codes of conduct and which codes of conduct they follow.

3. Results

3.1. Review of Scottish marine wildlife-watching codes of conduct

In total, 51 recommendations were identified in the codes of conduct of the five organisations (Appendix C). The WiSe Scheme, the Scottish Marine Wildlife Watching Code and Wild Scotland provide species-specific codes of conduct for watching cetaceans, basking sharks and birds. Whale and Dolphin Conservation does not provide species-specific codes of conduct but does recommend using the Scottish Marine Wildlife Watching Code as a reference for appropriate encounter behaviour with different species. The Sea Watch Foundation only provides a code of conduct for cetaceans. In all the cetacean codes of conduct, some recommendations are made specifically for dolphins in relation to bow riding; however, in general there is no distinction made between the recommendations for whales, dolphins and porpoises except for minimum approach distances.

The Sea Watch Foundation, the WiSe Scheme Cetacean Code of Conduct, the Scottish Marine Wildlife Watching Code of Conduct and Whale and Dolphin Conservation provide some explanation of the consequences for marine wildlife if certain recommendations are not followed. Wild Scotland does not provide reasoning behind certain recommendations but does suggest referring to the Scottish Marine Wildlife Watching Code for further reference, which does provide rationales.

There are some points where the above organisations agree in their recommended guidelines for marine wildlife-watching, including:

- do not swim with marine wildlife;
- if an animal approaches to bow ride, maintain a steady course and speed;
- never chase the animals;
- do not interfere or separate mothers and calves and avoid close approaches to mothers and calves;
- do not feed the animals.

However, there are some inconsistencies in the more precise aspects of the codes of conduct (Table 2); for example, the approach speeds, minimum approach distances, minimum approach distances when other boats are present and the maximum length of an encounter.

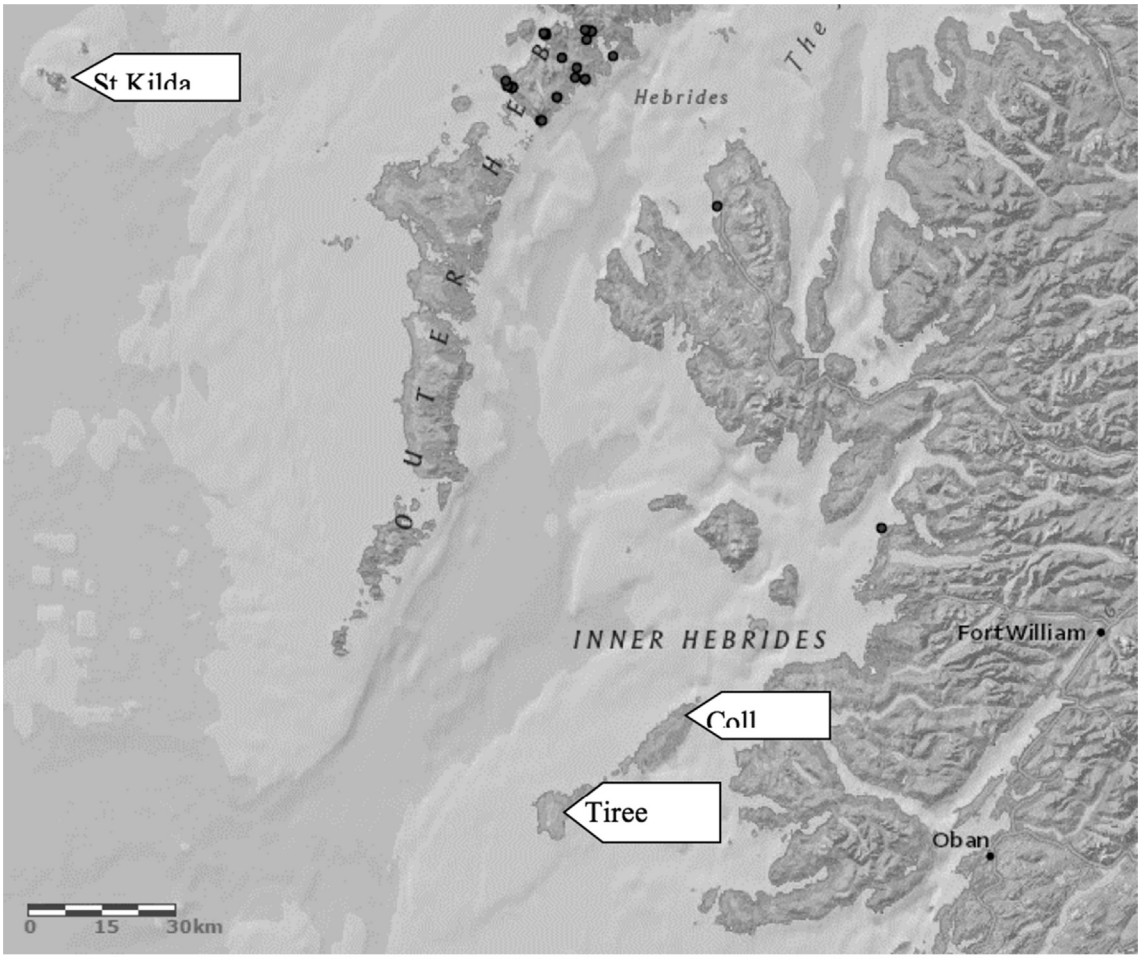
3.2. In situ use of codes of conduct and megafauna behavioural observations

a) Marine Wildlife-Watching Survey

A total of 90.4 h were spent at sea on 17 marine wildlife-watching trips over the three-week period from the end of June to the beginning of July. During that time, there were 55 cetacean sightings on 10 of the trips, but no sightings of marine megafauna on 7 of the trips.

The recommended distance for sighting porpoises, dolphins and whales according to the WiSe Scheme is 100 m. 20% of initial harbour porpoise, bottlenose dolphin or common dolphin sightings occurred within 100 m, and 9% of minke whale sightings were made within 100 m. These occasions were the result of animals approaching the boat or surfacing in close vicinity to the boat, either on first sighting or once an approach was made in the general direction of a distant sighting, resulting in unintentional non-compliance (Wiley et al., 2008).

In total, 11% of interactions (two bottlenose dolphin encounters, three common dolphin encounters and one minke whale



(ArcGIS 2016)

Fig. 1. Locations of encounters during a swim-with basking sharks tours (*Cetorhinus maximus*) in July 2015.

Table 2
Identified inconsistencies between the Scottish voluntary codes of conduct: Scottish Marine Wildlife Watching Code (SMWWC), the WiSe Scheme (WiSe), Wild Scotland (Wild), the Sea Watch Foundation (SWF) and Whale and Dolphin Conservation (WDC).

	SMWWC	WiSe	Wild	SWF	WDC
Minimum approach distance	50 m for dolphins and porpoises, 100 m for whales, 200–400 m for mothers and calves	100 m	50 m for small cetaceans, 100 m for whales	100 m	100 m
Minimum approach distance when other boats present	No more than 2 vessels within 300 m	No more than 2 vessels within 1 km	No more than 2 vessels within 100 m	No more than 2 vessels within 1 km	No more than 2 vessels within 200 m
Time spend in the vicinity of an animal	15 min when other vessels are present, 30 min if single vessel	15 min	No recommendation	20 min	15 min
Speed on approach to animal	Slow down to 6 knots when at least 300 m away, some recommend 1 km	Slow down to 6 knots within 1 km	No recommendation	Do not exceed 10 knots within 1 km	No recommendation

encounter) exceeded the 15 min recommended encounter limit according to the WiSe Scheme. The recommended encounter length was not exceeded in harbour porpoise sightings. During four encounters, bottlenose dolphins and common dolphins were bow riding and travelling with the boat, and when the dolphins left the interaction the boat did not follow. On these occasions, it may appear that the boat was not abiding by the code of conduct, but in practice the boat followed the recommended code of conduct by maintaining a steady speed and course while the dolphins were bow riding. During the minke whale encounter, the minke whale approached the boat, which stopped, and the minke whale proceeded to closely interact with the boat. This may have contributed to exceeding the recommended length of encounter as appropriate protocols were followed for a close approach situation, including maintaining a stationary position. During one of the common dolphin interactions, the dolphins were spotted at a distance of 1 km and approached to a distance of 200 m. On approach, the dolphins began travelling in the opposite direction to the boat, at which point the boat remained stationary. The recommended encounter length was exceeded; however, the majority of the encounter was not spent in close proximity to the dolphins but at a considerable distance.

The WiSe Scheme recommends that no more than two boats are present within 1 km during an encounter. There were no sightings where more than two boats were present within 300 m (the caution zone) during an encounter, and six sightings where three or four other boats were present during an encounter within 300 m–1km. In most cases when an animal was sighted, other boats within 1 km were likely unaware of the presence of the animal, and no crowding of an animal was recorded. This could account for the presence of more than the recommended number of boats within the 1 km range.

Surface changes in behaviour may suggest that boat presence had an impact on harbour porpoise behaviour from first to last sighting on two occasions, however, on both these occasions the boat was already stationary or stopped in response to the sighting, and no other boats were present within 300 m. Therefore the crew could be considered to have reacted appropriately for the situation and along the recommended guidelines to limit disturbance. Minke whale behaviour observed during the surveys was always travelling, both on first and last sighting.

On four of the five occasions when a change in behaviour was recorded for bottlenose and common dolphins, it was not considered disturbance because the change was a result of the dolphins interacting with the boat. On one of those occasions, however, a group of common dolphins were sighted approximately 1 km away and an approach was made to around 200 m. On approach, the dolphins travelled away from the boat which could be considered avoidance behaviour in response to disturbance. The boat did not follow, as per the recommended guidelines, and later that day the same group was spotted and interacted with the boat for 26 min before leaving the encounter. Therefore, it could be suggested that the boat caused an initial disturbance during the first encounter. However, it did not have a long-term negative effect on the dolphins as they later interacted with the boat.

b) Swim-With Basking Sharks Observations

From observational experiences (Tables 3 and 4) from the skipper and crew during the two week period of swim-with shark charters, the more experienced group of swimmers (encounters 1&2) were more relaxed in the water and maintained their separated pairs, which made their movement in the water more gentle and controlled. The less experienced group, however (encounters 3&4), despite being briefed on the code of conduct prior to entering the water, put more effort in to energetic finning in the water and also tended to cluster into larger groups, despite being prompted to stay in groups of two by the skipper.

From the anecdotal information collected, larger sharks did not appear to change their course of direction according to the boat, whereas smaller sharks (<4 m) tended to dive or change direction on approach to swimmers who entered the water ahead of the shark's trajectory. Sharks that were feeding displayed fewer responses to the swimmers in the water. Feeding behaviour was assumed where sharks were seen swimming with their mouths open, the gill plates clearly visible from the crew on the boat and swimming relatively slowly. Sharks that were recorded as travelling tended to change their course when they were approached by the swimmers. Sharks that displayed courtship behaviour (e.g. nose to tail following) were not approached to comply with the Shark Trust code of conduct.

3.3. Operator questionnaire results

In total, there were seven responses to the questionnaire, resulting in a 26% response rate. Of those seven responses, four of the operators travelled into the Sea of the Hebrides proposed MPA, and all respondents stated that they followed one or more code of conduct. However, from the inconsistencies in the recommendations highlighted by the analysis of the codes of conducts (see 3.1), it may not be possible to clarify which specific recommendations the operators adhere to. All respondents were WiSe Scheme accredited, with the SMWWC and Whale and Dolphin Conservation code being used by five of the respondents. The Wild Scotland and Shark Trust codes were also cited, and three respondents stated that they followed a code of conduct they had developed themselves.

4. Discussion

Through qualitative and quantitative observations of wildlife-watching tour operators and the behaviour of some of the species they seek to encounter, this study has highlighted varied benefits and issues around the regulation of wildlife-watching activities in Scotland. It is evident from the operator questionnaire and by reviewing operators' business websites that the majority of operators place a conservation value on marine wildlife by seeking to abide by at least one authoritative code of conduct. Through *in situ* observations of one operator during the summer season in 2015, it may be concluded that the operator adheres stringently to the code they follow, and in doing so, the impacts on megafauna encountered were likely minimised. However, as the wildlife-watching and marine tourism industry in Scotland has the potential and indeed is poised to expand (Howard and Parsons, 2006), there are a number of issues that need to be addressed going forwards, in addition to scientific and social research needed to better understand the potential impacts of human disturbance on marine megafauna. Lessons must also be learned from other locations where the negative environmental and socio-economic impacts of increasing wildlife-watching have been clear, such as in Crystal River, Florida where regulations to reduce harassment for the federally-protected Florida manatee (*Trichechus manatus latirostris*) are not well enforced (Sorice et al., 2006). This will be essential in order to ensure that the tourism industry can grow within the limits of sustainable development.

4.1. Review of marine wildlife-watching codes in Scotland

The key point under which to frame this discussion is noting the complex and potentially confusing regulatory landscape of the Scottish marine wildlife-watching industry. The five main voluntary codes used in Scotland have changed since Parsons and Wood-Ballard's assessment (2003). This is partly due to legislative provision (i.e. SNH's SMWWC under the Nature Conservation (Scotland) Act 2004), but also potentially also due to increasing scientific understanding of the impacts of wildlife-watching (Parsons, 2012), and increased stakeholder involvement. In addition, some recommendations may have been developed from previous codes, while others have been updated to incorporate advances in scientific understanding. This has resulted in codes containing various recommendations with inconsistencies in some of the precise aspects of the codes (see Table 2), resulting in potential confusion for boat operators as to which guidelines to follow and differences in measures undertaken. As a result, it is not unusual for operators to follow more than one code, as highlighted by the operator survey (see 3.2), or to create their own (Garrod and Fennel, 2004). Inconsistencies in the different codes' recommendations indicate that there are still significant research gaps of the impacts of wildlife-watching on marine animals, including specifically behavioural responses of charismatic marine mega-fauna to boat activity. Whilst there are numerous codes, there is little effort or evidence to ensure that these codes are adhered to, or that they are effective in

Table 3
The environmental and boat conditions and behaviour of basking sharks (*Cetorhinus maximus*) on initial encounter during swim-with tours off the west coast of Scotland, July 2015.

Encounter No.	Date	Time when boat leaves harbour	Sea state	Weather conditions	Location: lat, long	Time of observation	Direction of boat approach to basking shark	Distance between boat and basking shark (m)	Number of other boats within 100m radius	Basking shark behavior before swimmers enter the water	Time when swimmers enter the water
1	16/07/15	0600	2–3	Clear	57.805322, − 8.564308	1430	Side	50	2	Travelling	1445
2	22/07/15	0600	3–4	Overcast	56.556798, − 6.740578	0945	Side/in line	100	0	Feeding	1030
3	23/07/15	0600	2–3	Clear	56.556798, − 6.740578	0900	Side	75	1	Feeding	1030
4	25/07/15	0930	1–2	Clear	56.556798, − 6.740578	1200	Side	100	0	Feeding	1215

Table 4
The behaviour of basking sharks (*Cetorhinus maximus*) and observed interactions by in-water swimmers during swim-with tours off the west coast of Scotland, July 2015.

Encounter No.	Number of basking sharks present during interaction	Size of basking shark(s) (m)	Number of swimmers in water	Direction of swimmers approach to basking shark	Min. distance between swimmers and basking shark (m)	Max. distance between swimmers and basking shark (m)	Was the basking shark touched during the interaction? If yes, how many times?	Time when the swimmers return to the boat	Time when basking shark last observed	Time when boat returns to harbour
1	2	3-4	3	Rear-left	2-3	15+	N	1600	1730	0000
2	7	7-9	3	Side, in line	2-3	15+	N	1230	1330	1600
3	10	6-8	4	Side	2-3	15+	N	1300	1500	1700
4	15	7-9	4	Side	1-3	15+	N	1430	1500	1700

achieving their aim to reduce impacts on marine wildlife.

Not all of the codes of conduct analysed provide explanations for the scientific or obvious basis for respective recommendations. Gjerdalen and Williams (2000) and Garrod and Fennel (2004) suggest that codes of conduct that do not seem reasonable or understandable to the user are usually not practiced. By providing an explanation of why a recommendation has been made (for example, 'Avoid close approach to cetaceans with young. You risk disrupting mother-calf bonds and expose inexperienced young to stress and possible boat strikes' (WiSe Scheme Cetacean Code of Conduct)), the consequences of actions can be better understood, which can encourage the uptake of codes of conduct on a voluntary basis (Gjerdalen and Williams, 2000; Garrod and Fennel, 2004).

One of the commonalities of the five main codes used in Scotland is a recommendation against swimming with marine wildlife. Swim-with programmes are an emerging aspect of marine wildlife-watching, and in Scotland, a small number of operators offer opportunities to swim with basking sharks and seals. As a result, adherence to the majority of existing guidance does not occur and without resulting enforcement or repercussion to date. This is notable given the legal basis of SNH's SMWWC, which recommends against intentionally swimming with any marine animal. As previously mentioned, a specific code of conduct guidance for in-water interactions with basking sharks has been produced by the Shark Trust, upon which at least one operator in Scotland bases their swim-with activities. It should be noted that the Shark Trust code of conduct, while providing guidance for in-water interactions with basking sharks, initially suggests that swimming with sharks is not advisable and that the guidance is offered in the event that this type of interaction is not avoidable. The impacts of direct human interaction with large marine wildlife species are not well understood, which in itself could be rationale for a more precautionary position against the practice. The observational results (see 3.2) collected on the swim-with shark excursions do not provide data suitable to test whether the swimmers had any significant effect on the basking shark behaviour, and the behaviours recorded in this small sample are inadequate to draw any meaningful conclusions.

However, the results raise questions that may be addressed by future behavioural studies to better understand swim-with shark interactions and potential effects on sharks. These experiences may be valuable for education and outreach potential; some existing studies and anecdotal testimonials have highlighted positive effects on humans, particularly in the case of naturally sociable species, such as seals and dolphins. The evidence base for impacts of swim-with on basking sharks is limited; however numerous studies have documented the implications of swimming with whale sharks (*Rhinocodon typus*) in pacific countries where such activities are a major tourist attraction, such as Australia and the Philippines. For example, Quiros (2007) found that whale sharks in the Philippines change their behaviour in response to a variety of human stimuli, such as touching, path obstruction and proximity of swimmers, and the magnitude of the disturbance was also significantly influenced by different approaches. The same study noted that different facets of the code of conduct had different levels of average compliance (e.g. minimum distance = 44%, no flash photography = 99%). A number of human safety considerations are also potential issues for swim-with tours, not least the possible reciprocal transfer of pathogenic organisms between humans and marine wildlife (Baily et al., 2015), which may prevent the introduction or expansion of swim-with-cetacean activities in Scotland. However, this should be a consideration for swim-with-seal activities, as disease can be reciprocally transferred to domestic dogs indirectly (e.g. via wetsuits or towels used during an encounter).

Evidence exists in which marine animals, cetaceans in particular, have also been documented to negatively change their behaviour in the presence of humans, including visual or noise-

related disturbance (e.g. reduced resting time, changes in breathing rates – Hastie et al., 2003; Visser et al., 2011; New et al., 2015), avoidance or aggression (Constantine and Baker, 1997; Visser et al., 2006). In addition, some marine animals have been known to become habituated to human presence (Samuels and Bejder, 2004), although habituation and sensitisation can be difficult to distinguish, and it has been demonstrated that an animal might not leave an area because it cannot afford to do so from a bioenergetic perspective (Beale and Monaghan, 2004). However, displacement from cetacean watching has been documented (Richter et al., 2003; Bejder et al., 2006). Approaches by animals can result in unintentional non-compliance as porpoises, dolphins and whales can approach closer than recommended and for longer than recommended (Wiley et al., 2008), and other boats may not be aware of the presence of cetaceans, especially the smaller species such as porpoises. From observations made on the wildlife-watching trips monitored for this study, the crew reacted appropriately according to the recommended guidelines when these situations occurred. As a result, there was only one incident of potential disturbance recorded in this study overall, and it could be considered that following voluntary guidelines keeps disturbance of marine wildlife to a minimum.

4.2. Voluntary or statutory regulation?

All wildlife-watching codes, particularly the SMWWC, have a statutory basis in that it is illegal to harass or harm cetaceans, sharks and seals under the Nature Conservation (Scotland) Act 2004, and codes of conduct provide recommendations for behaviour to prevent such incidents. These recommendations should be considered by operators to be a minimum, ensuring as little impact as possible on wildlife. Given this statutory basis, monitoring to understand the effectiveness of existing guidance and any resulting impacts would also appear to be important. Anecdotal evidence indicates that in Scotland, general adherence to wildlife-watching code guidelines may be relatively high (with the exception of recommendations against swim-with programmes, as previously mentioned), but as with any regulations, there is no guarantee (or indeed evidence) that all operators or indeed their guests will fully abide by them. Whilst the majority of people who engage in wildlife-watching activities are likely to be highly environmentally motivated (by the very nature of the attraction of the activity), appropriate behaviour still requires operators to communicate and enforce codes of conduct to their guests. Statutory regulation ensures a level playing field for all operators, certainty in any rules or 'caps' in numbers of vessels and accountability for any contraventions. Furthermore, a single set of statutory regulations should be more transparent and less confusing than several voluntary codes that offer different recommendations. Monitoring through regulation would provide a better understanding of the current extent and locations of the industry, future changes and perceived 'hot spots' or bottle necks where further management may be required, as well as enabling the assessment of cumulative impacts with other sectors. Enforcement will continue to be a challenge as Scotland's competent authority, the Police service, have little capacity to monitor the marine area (Simmonds, 2000).

Some of the comments in the responses to the operator questionnaire demonstrate practically some of the advantages and disadvantages of the codes of conduct used in Scotland and of voluntary codes of conduct in general. The first is related to operators' compliance to the codes: *'One particular boat that operates in the same area has an adverse effect on whales, and they leave as soon as he arrives.'* This statement is highly subjective and may suggest that the operator may be causing disturbance to marine wildlife, but it may also indicate competitive rivalries between operators. The former, highlights a failing of voluntary codes of conduct as compliance cannot be centrally monitored and enforced (Allen et al., 2007). Another comment relates to the regulation of commercial and recreational boats that may disturb marine wildlife: *'wildlife is affected by more than just tour operators … the leisure users of sensitive areas generally, in my opinion, do not have a level of understanding regarding wildlife and their impact on it.'* This suggests that further outreach may be helpful in order to target a wider audience, as referenced in the marine tourism policies in Scotland's National Marine Plan (Lancaster, 2014). It should be noted that the SMWWC states that it is designed for all recreational sea users and activities, which indicates that the full range of intended audiences of this code may not be aware of its application to their area of interest.

5. Conclusions

As a growing part of the developing marine tourism industry in Scotland, wildlife watching can play a key role in wildlife monitoring and conservation, raise public awareness of environmental issues, and support local coastal communities and contributions to national economies. A coherent code of practice is essential to guide marine users, including wildlife-watching tour operators, to behave responsibly around marine wildlife. Based on the syntheses in this paper, however, inconsistencies and drawbacks of the current multiple codes used in Scotland compromise the benefits of having such codes. Furthermore, a precautionary approach is required to advise against the further development of swim-with programmes in the Scottish tourism industry. Assuming the operations that exist will continue, despite the codes that are in place, dedicated research is needed to quantify the scale and longevity of the effects of swim-with programmes on their target species and participants in Scottish waters. Research might usefully be focused in designated protected areas, such as nature conservation MPAs, SACs and designated seal haul-out sites, where legislation has been established for the protection of key functions or life stages of a population or species (e.g. breeding, resting or feeding). In the meantime and as a precautionary measure, swim-with activities should be brought within a regulatory framework to prevent them expanding. For example, the disturbance of seals at haul-out sites to encourage them into the water should be prohibited.

As a minimum requirement and to curtail unnecessary regulatory burden on an existing and potentially expanding industry, one option could be to introduce local wildlife-watching regulations (potentially based on or additional to local Biodiversity Action Plans) and associated monitoring of effectiveness in protected areas through Regional Marine Plans. This would be a mechanism that could ensure that local data and knowledge is incorporated and the regulations will match the needs of the local conservation objectives, resident and transient wildlife in the region and local operators. Such regulations should be driven by government/statutory agencies, with the support of local operators and communities to cultivate a sense of ownership and ensure suitable compromises where necessary.

The following recommendations are suggested to improve the current approach and appreciation of regulating marine wildlife-watching in Scotland to benefit both nature conservation and the experience of marine users:

- Government-facilitated but locally-led development of a single comprehensive wildlife-watching code where operator and scientific input and support is considered – current codes need to be consolidated and consistent recommendations agreed;
- Area-specific regulations and caps in operator numbers must be scientifically explored and implemented and should account for

local populations (e.g. bottlenose dolphins in the Moray Firth SAC);
- A central database should be set up to include a list of all operators and other pertinent information (such as those who are WiSe-accredited) and collect scientific data, information on which code is followed and primary activities that are undertaken, etc.;
- Greater public awareness of wildlife-watching codes is necessary to ensure good practice by all leisure users (including within MPAs where attention might be focused);
- Further scientific research to better understand the impacts of boat-based watching and swim-with is urgently required (possibly involving operators as platforms – New et al., 2015) and appropriate resulting recommendations and enforcement is necessary;
- Scottish Regional Marine Plans could consider the introduction of statutory regulations in ecologically sensitive areas (e.g. MPAs). This would support the National Marine Plan objectives for marine tourism and could also contribute to the UK's biodiversity and sustainable development commitments, such as the Convention on Biological Diversity and Marine Strategy Framework Directive targets to achieve good environmental status by 2020.

The above recommendations provide opportunities to establish more meaningful codes of conduct for mobile species, and when aligned with MPAs may provide critical life-history anchors for trans-boundary and migratory species, as well as supporting sustainable and ecologically positive tourism. The proposed MPA in Scotland's Sea of the Hebrides provides a potential innovative opportunity to trial effective management for marine wildlife-watching activities. Such efforts, can foster research opportunities and knowledge exchange amongst diverse groups of stakeholders and help ensure long-term protection of these special marine species globally, as well as long-lasting enjoyment by generations of observers.

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Appendix A. Supplementary data

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References

Allen, S., Smith, H., Waples, K., Harcourt, R., 2007. The voluntary code of conduct for dolphin watching in Port Stephens, Australia: is self-regulation an effective management tool? J. Cetacean Res. Manag. 9 (2), 159–166.

Arnold, H., 1997. The Dolphin Space Programme: the Development and Assessment of an Accreditation Scheme for Dolphin Watching Boats in the Moray Firth. A Report for the Scottish Wildlife Trust. Scottish Natural Heritage and the EU LIFE Programme.

Badalementi, F., Ramos, A.A., Voultsiadou, E., Sanchez Lizaso, J.L., D'Anna, G., Pipitone, C., Mas, J., Fernandez, J.A.R., Whitmarsh, D., Riggio, S., 2000. Cultural and socio-economic impacts of Mediterranean marine protected areas. Environ. Conserv. 27 (02), 110–125.

Baily, J.L., Méric, G., Bayliss, S., Foster, G., Moss, S.E., Watson, E., Pascoe, B., Mikhail, J., Pizzi, R., Goldstone, R.J., Smith, D.G., Willoughby, K., Hall, A.J., Sheppard, S.K., Dagleish, M.P., 2015. Evidence of land-sea transfer of the zoonotic pathogen Campylobacter to a wildlife marine sentinel species. Mol. Ecol. 24 (1), 208–221. http://dx.doi.org/10.1111/mec.13001.

Beale, C.M., Monaghan, P., 2004. Behavioural responses to human disturbance: a matter of choice? Anim. Behav. 68, 1065–1069. http://dx.doi.org/10.1016/j.anbehav.2004.07.002.

Bejder, L., Samuels, A., Whitehead, H., Gales, N., Mann, J., Connor, R., Heithaus, M., Watson-Capps, J., Flaherty, C., Krützen, M., 2006. Decline in relative abundance of bottlenose dolphin exposed to long-term disturbance. Conserv. Biol. 20 (6), 1791–1798. http://dx.doi.org/10.1111/j.1523-1739.2006.00540.x.

Berrow, S.D., 2003. An assessment of the framework, legislation and monitoring required to develop genuinely sustainable whale-watching. Chapter 4. In: Garrod, B., Wilson, J.C. (Eds.), Marine Ecotourism: Issues and Experiences. Channel View Publisher, Clevedon, UK, pp. 66–78.

Brunnschweiler, J.M., 2010. The Shark Reef Marine Reserve: a marine tourism project in Fiji involving local communities. J. Sustain. Tour. 18 (1), 29–42. http://dx.doi.org/10.1080/09669580903071987.

Buckley, R., 2012. Sustainable tourism: research and reality. Ann. Tour. Res. 39 (2), 528–546. http://dx.doi.org/10.1016/j.annals.2012.02.003.

Cañadas, A., Sagarminaga, R., De Stephanis, R., Urquiola, E., Hammond, P.S., 2005. Habitat preference modelling as a conservation tool: proposals for marine protected areas for cetaceans in southern Spanish waters. Aquatic Conserv. Mar. Freshw. Ecosyst. 15 (5), 495–521. http://dx.doi.org/10.1002/aqc.689.

Cheney, B., Corkrey, R., Quick, N.J., Janik, V.M., Islas-Villanueva, V., Hammond, P.S., Thompson, P.M., 2012. Site Condition Monitoring of Bottlenose Dolphins within the Moray Firth Special Area of Conservation: 2008-2010. Scottish Natural Heritage Commissioned Report No.512.

Constantine, R., Baker, C.S., 1997. Monitoring the Commercial Swim-with-dolphin Operations in the Bay of Islands, 59. Department of Conservation, New Zealand.

Constantine, R., Brunton, D.H., Dennis, T., 2004. Dolphin-watching tour boats change bottlenose dolphin (*Tursiops truncatus*) behaviour. Biol. Conserv. 117 (3), 299–307. http://dx.doi.org/10.1016/j.biocon.2003.12.009.

Dawson, S., Wade, P., Slooten, E., Barlow, J., 2008. Design and field methods for sighting surveys of cetaceans in coastal and riverine habitats. Mammal. Rev. 38 (1), 19–49.

Duffus, D.A., Dearden, P., 1990. Non-consumptive wildlife-oriented recreation: a conceptual framework. Biol. Conserv. 53 (3), 213–223. http://dx.doi.org/10.1016/0006-3207(90) 90087–6.

Duprey, N.M., Weir, J.S., Würsig, B., 2008. Effectiveness of a voluntary code of conduct in reducing vessel traffic around dolphins. Ocean Coast. Manag. 51 (8), 632–637. http://dx.doi.org/10.1016/j.ocecoaman.2008.06.013.

Erbe, C., 2002. Underwater noise of whale-watching boats and potential effects on killer whales (*Orcinus orca*), based on an acoustic impact model. Mar. Mammal Sci. 18 (2), 394–418. http://dx.doi.org/10.1111/j.1748-7692.2002.tb01045.x.

Garrod, B., Fennel, D.A., 2004. An analysis of whalewatching codes of conduct. Ann. Tour. Res. 31 (2), 334–352. http://dx.doi.org/10.1016/j.annals.2003.12.003.

Giles, D.A., 2014. Southern Resident Killer Whales (Orcinus orca): the Evolution of Adaptive Management Practices for Vessel-based Killer Whale Watching in the Salish Sea, a Novel Non-invasive Method to Study Southern Resident Killer Whales (Orcinus orca) and Vessel Compliance with Regulations, and the Effect of Vessels on Group Cohesion and Behavior of Southern Resident Killer Whales (Orcinus orca). MA thesis. University of California, Davis. Last accessed 3.08.15 at. http://media.proquest.com/media/pq/classic/doc/3415926081/fmt/ai/rep/NPDF?_s= wtL23W8EWtq9d7dbMy%2BQVTZhwRc%3D.

Gill, A., Fairbairns, B.R., Fairbairns, R.S., 2000. Some observations of minke whale (*Balaenoptera acutorostrata*) feeding behaviour and associations with seabirds in the coastal waters of the Isle of Mull, Scotland. Eur. Res. Cetaceans 13, 61–64.

Gjerdalen, G., Williams, P.W., 2000. An evaluation of the utility of a whale watching code of conduct. Tour. Recreat. Res. 25 (2), 27–36. http://dx.doi.org/10.1080/02508281.2000.11014909.

Gormley, A.M., Slooten, E., Dawson, S., Barker, R.J., Rayment, W., du Fresne, S., Bräger, S., 2012. First evidence that marine protected areas can work for marine mammals. J. Appl. Ecol. 49 (2), 474–480. http://dx.doi.org/10.1111/j.1365-2664.2012.02121.x.

Green, R., Giese, M., 2004. Negative effects of wildlife tourism on wildlife. In: Higginbottom, K. (Ed.), (2004). Wildlife Tourism. Common Ground, Altona. Ch. 5.

Hastie, G.D., Wilson, B., Tufft, L.H., Thompson, P.M., 2003. Bottlenose dolphins increase breathing synchrony in response to boat traffic. Mar. Mammal Sci. 19 (1), 74–84. http://dx.doi.org/10.1111/j.1748-7692.2003.tb01093.x.

Hooker, S.K., Cañadas, A., Hyrenbach, K.D., Corrigan, C., Polovina, J.J., Reeves, R.R., 2011. Making protected area networks effective for marine top predators. Endanger. Species Res. 13, 203–218. http://dx.doi.org/10.3354/esr00322.

Howard, C., Parsons, E.C.M., 2006. Public awareness of whale-watching opportunities in Scotland. Tour. Mar. Environ. 2 (2), 103–109.

Hoyt, E., 2012. Marine Protected Areas for Whales, Dolphins and Porpoises: a World Handbook for Cetacean Habitat Conservation and Planning. Routledge.

Hughes, P., 2001. Animals, values and tourism – structural shifts in UK dolphin tourism provision. J. Sustain. Tour. 18 (1), 1–5. http://dx.doi.org/10.1016/S0261-5177(00) 00070–4.

International Whaling Commission, 2013. Report of the Scientific Committee Annual Meeting. Republic of Korea from 3–15 June 2013. Page 72, Section 15.4.3.

Jaiteh, V.F., Lindfield, S.J., Mangubhai, S., Warren, C., Fitzpatrick, B., Loneragan, N.R., 2016. Higher abundance of marine predators and changes in fishers' behavior following spatial protection within the World's biggest shark fishery. Front. Mar. Sci. 3, 43. http://dx.doi.org/10.3389/fmars.2016.00043.

Lancaster, J., 2014. In: McCallum, S., Lowe, A.C., Taylor, E., Chapman, A., Pomfret, J. (Eds.), Development of Detailed Ecological Guidance to Support the Application

of the Scottish MPA Selection Guidelines in Scotland's Seas. Scottish Natural Heritage Commissioned Report No.491. Minke Whale – Supplementary Document.
Lusseau, D., 2004. The hidden cost of tourism: detecting long-term effects of tourism using behavioral information. Ecol. Soc. 9 (1), 2.
Lusseau, D., 2013. The Cumulative Effects of Development at Three Ports in the Moray Firth on the Bottlenose Dolphin Interest of the Special Area of Conservation, Advice provided to SNH (draft, 13th September 2013).
Lusseau, D., Bejder, L., 2007. The long-term consequences of short-term responses to disturbance experiences from whalewatching impact assessment. Int. J. Comp. Psychol. 20 (2), 228–236.
Milazzo, M., Chemello, R., Badalamenti, F., Camarda, R., Riggio, S., 2002. The impact of human recreational activities in marine protected areas: what lessons should be learnt in the Mediterranean sea? Mar. Ecol. 23 (s1), 280–290. http://dx.doi.org/10.1111/j.1439-0485.2002.tb00026.x.
New, L.F., Hall, A.J., Harcourt, R., Kaufman, G., Parsons, E.C.M., Pearson, H.C., Cosentino, A.M., Schick, R.S., 2015. The modelling and assessment of whale-watching impacts. Ocean Coast. Manag. 115, 10–16. http://dx.doi.org/10.1016/j.ocecoaman.2015.04.006.
NOAA., 2014. Hawaiian Islands Humpback Whale Marine Sanctuary: Resource Protection. Last accessed14.08.15. http://hawaiihumpbackwhale.noaa.gov/res/regulations.html.
Notarbartolo-di-Sciara, G., Agardy, T., Hyrenbach, D., Scovazzi, T., Van Klaveren, P., 2008. The Pelagos sanctuary for Mediterranean marine mammals. Aquatic Conserv. Mar. Freshw. Ecosyst. 18 (4), 367–391. http://dx.doi.org/10.1002/aqc.855.
O'Brien, K., Whitehead, H., 2013. Population analysis of endangered northern bottlenose whales in the Scotian Shelf seven years after the establishment of a Marine Protected Area. Endanger. Species Res. 21, 273–284. http://dx.doi.org/10.3354/esr00533.
O'Connor, S., Campbell, R., Cortez, H., Knowles, T., 2009. Whale Watching Worldwide: Tourism Numbers, Expenditures and Expanding Economic Benefits. A Special Report from the International Fund for Animal Welfare. Yarmouth MA, USA, Prepared by Economists at Large, 228.
Parsons, E.C.M., 2012. The negative impacts of whale-watching. J. Mar. Biol. http://dx.doi.org/10.1155/2012/807294.
Parsons, E.C.M., Woods-Ballard, A., 2003. Acceptance of voluntary whalewatching codes of conduct in West Scotland: the effectiveness of governmental versus industry-led guide-lines. Curr. Issues Tour. 6 (2), 172–182. http://dx.doi.org/10.1080/13683500308667950.
Parsons, E.C.M., Warburton, C.A., Woods-Ballard, A., Hughes, A., Johnston, P., 2003. The value of conserving whales: the impacts of cetacean related tourism on the economy of rural West Scotland. Aquatic Conserv. Mar. Freshw. Ecosyst. 13, 397–415. http://dx.doi.org/10.1002/aqc.582.
Potts, T., Burdon, D., Jackson, E., Atkins, J., Saunders, J., Hastings, E., Langmead, O., 2014. Do marine protected areas deliver flows of ecosystem services to support human welfare? Mar. Policy 44, 139–148. http://dx.doi.org/10.1016/j.marpol.2013.08.011.
Queensland Government, 2013. New Marine Mammal Legislation – Frequently Asked Questions. Department of Environment and Heritage Protection. Last accessed 23.07.15 at. http://www.ehp.qld.gov.au/wildlife/marine-mammals/questions- answered.html.
Quiros, A.L., 2007. Tourist compliance to a Code of Conduct and the resulting effects on whale shark (Rhincodon typus) behavior in Donsol, Philippines. Fish. Res. 84 (1), 102–108. http://dx.doi.org/10.1016/j.fishres.2006.11.017.
Reeves, R.R., 2000. The Value of Sanctuaries, Parks, and Reserves (Protected Areas) as Tools for Conserving Marine Mammals. Final Report to the Marine Mammal Commission. Marine Mammal Commission, Bathesda, MD.
Reinius, S.W., Fredman, P., 2007. Protected areas as attractions. Ann. Tour. Res. 34 (4), 839–854. http://dx.doi.org/10.1016/j.annals.2007.03.011.
Richter, C.F., Dawson, S., Slooten, E., 2003. Sperm Whale Watching off Kaikoura, New Zealand: Effects of Current Activities on Surfacing and Vocalisation Patterns (P. 78). Department of Conservation, Wellington. ISBN 0-478-22400-1.
Samuels, A., Bejder, L., 2004. Chronic interaction between humans and free-ranging bottlenose dolphins near Panama City Beach, Florida. J. Cetacean Res. Manag. 6 (1), 69–77.
Simmonds, M.P., 2000. Chasing Dolphins! 20 P. Bath. The Whale and Dolphin Conservation Society.
Sorice, M.G., Shafer, C.S., Ditton, R.B., 2006. Managing endangered species within the use–preservation paradox: the Florida manatee (*Trichechus manatus latirostris*) as a tourism attraction. Environ. Manag. 37 (1), 69–83. http://dx.doi.org/10.1007/s00267-004-0125-7.
Stem, C.J., Lassoie, J.P., Lee, D.R., Deshler, D.D., Schelhas, J.W., 2003. Community participation in ecotourism benefits: the link to conservation practices and perspectives. Soc. &Natural Resour. 16 (5), 387–413. http://dx.doi.org/10.1080/08941920309177.
Stockin, K.A., Binedell, V., Wiseman, N., Brunton, D.H., Orams, M.B., 2009. Behavior of free-ranging common dolphins (*Delphinus sp.*) in the Hauraki Gulf, New Zealand. Mar. Mammal Sci. 25 (2), 283–301. http://dx.doi.org/10.1111/j.1748-7692.2008.00262.x.
Stronza, A., Gordillo, J., 2008. Community views of ecotourism. Ann. Tour. Res. 35 (2), 448–468. http://dx.doi.org/10.1016/j.annals.2008.01.002.
Tapper, R., 2006. Wildlife Watching and Tourism: a Study on the Benefits and Risks of a Fast Growing Tourism Activity and its Impacts on Species. UNEP/Earthprint. ISBN 3-937429-07-7.
Visser, F., Hartman, K.L., Rood, E.J.J., Hendriks, A.J.E., Wolff, W.J., 2006. Effects of Whale Watching Activities on the Behaviour of Risso's Dolphin at the Azores. IWC Report SC/58 of the Sub-committee on Whale Watching 2006.
Visser, F., Hartman, K.L., Rood, E.J., Hendriks, A.J., Zult, D.B., Wolff, W.J., …, Pierce, G.J., 2011. Risso's dolphins alter daily resting pattern in response to whale watching at the Azores. Mar. Mammal Sci. 27 (2), 366–381. http://dx.doi.org/10.1111/j.1748-7692.2010.00398.x.
Warburton, C.A., Parson, E.C.M., Woods-Ballard, A., Hughes, A., Johnston, P., 2001. Whale-watching in West Scotland. Report by the Hebridean Whale and Dolphin Trust for the Department for Environment, Food and Rural Affairs. Last accessed 1.08.15 at. http://whaledolphintrust.co.uk/cust_images/research%20publications/Whalewatching _WestScotland.pdf.
Wiley, D.N., Miller, J.C., Pace, R.M., Carlson, C., 2008. Effectiveness of voluntary conservation agreements: case study of endangered whales and commercial whale watching. Conserv. Biol. 22 (2), 450–457. http://dx.doi.org/10.1111/j.1523-1739.2008.00897.x.
Williams, R., Lusseau, D., Hammond, P.S., 2006. Estimating relative energetic costs of human disturbance to killer whales (*Orcinus orca*). Biol. Conserv. 133 (3), 301–311. http://dx.doi.org/10.1016/j.biocon.2006.06.010.
Woods-Ballard, A.J., Parsons, E.C.M., Hughes, A.J., Velander, K.A., Ladle, R.J., Warburton, C.A., 2003. The sustainability of whale-watching in Scotland. J. Sustain. Tour. 11 (1), 40–55. http://dx.doi.org/10.1080/09669580308667192.
Wursig, B., Evans, P.G., 2001. Cetaceans and humans: influences of noise. Chapter 1. In: Evans, P.G., Raga, J.A. (Eds.), Marine mammals: Biology and Conservation. Springer Science & Business Media, New York, pp. 565–587. http://dx.doi.org/10.1007/978-1-4615-0529-7. ISBN: 978-1-4615-0529-7.