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Planning for Responsible Whale Watching in Oman

Robert Baldwin, Andrew Willson, Asma al-Baluchi, Aida al-Jabri

INTERNATIONAL
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Robert Baldwin*, Andrew Willson*, Asma al Baluchi^ and Aida Al-Jabri[+]

*Five Oceans Environmental Services, PO Box 660, PC131, Sultanate of Oman
^Environment Society of Oman, P.O. Box 3955, PC112, Sultanate of Oman
[+]Ministry of Environment and Climate Affairs, P.O. Box 323, PC100, Sultanate of Oman

Abstract
The emerging whale watching industry in Oman includes one small-scale tour operator targeting Endangered Arabian Sea humpback whales, as well as other operators that opportunistically encounter this species. Guidelines for whale watching in Oman were developed in 2013/14 as part of an IWC-supported project that also included awareness-raising and initial training of tour operators and vessel captains in key locations. This formed the basis of the current study which aims to identify requirements to minimise the potentially negative impacts of whale watching on Arabian Sea humpback whales specifically, whilst also highlighting some key business approaches for achieving responsibly-managed whale watching in Oman. The whale watching industry in Oman has potential for growth and should be appropriately guided in advance of expansion. A road map of actions towards this goal is outlined, aimed at government and private sector stakeholders. Recommendations are also made for monitoring and controlling whale watching activities pending further research. Further training of operators (especially vessel captains) is still required to ensure responsible boat handling around whales and improved planning towards a more sustainable industry. The use of whale watching vessel as a platform for collection of scientific data has been initiated at one location. Draft regulations to help govern the industry in Oman have been prepared and are under review by Oman's Ministry of Environment and Climate Affairs. Although focused on humpback whales, the study also recommends that results are applied to other species and identifies priorities for data collection to fill existing knowledge gaps.

Introduction
Oman's whale watching industry has experienced gradual growth over the last 10 years, reflecting a steady increase in tourism and a growing awareness of cetacean fauna (Ponnampalam, 2011; IWC, 2012). Most operators target coastal and offshore dolphins off Muscat, Musandam and Dhofar. The Arabian Sea humpback whale has recently become a target of small-scale, unregulated and opportunistic whale watching at the Hallaniyat Islands in southern Oman (IWC, 2012).

The earliest published records of humpback whales (*Megaptera novaeangliae*) in the Arabian Sea region were sightings reports of observers on merchant vessels (Brown, 1957; Slijper et al., 1964). For many years it was assumed that these animals belonged to either an Indian Ocean stock of Southern Hemisphere origin or a North Pacific stock. A review completed by Reeves et al. (1991) concluded that they were more likely to be a resident population. Evidence for this was supported by data from the illegal catch of 242 humpback whales in the Arabian Sea between 1964 and 1966 by a Soviet whaling fleet (Mikhalev, 1997).

Genetic study has confirmed that Arabian Sea humpback whales are non-migratory and may have been isolated for approximately 70,000 years (Pomilla, Amaral et al., 2014). The portion of the population that occurs off Oman is small with photographic mark-recapture estimates suggesting around or just under 100 individuals (Minton et al. 2008). This likely represents a subset of a regional population, although data from other areas are very limited. Genetic indicators of effective population size suggest that the total population size is small, perhaps less than 250 individuals (Pomilla, Amaral et al. 2014). This population is recognized by the International Whaling Commission (IWC, 2016), the IUCN Red List of Threatened Species (Minton et al*.,* 2008) and the United States National Oceanic and Atmospheric Administration as an Endangered, discreet and non-migratory stock of whales (Bettridge et al., 2015, NOAA, 2016). High primary productivity associated with the upwelling of cold, nutrient-rich waters during the southwest monsoon presumably provides the mechanism that allows humpback whales to feed and breed year round

in the Arabian Sea when their conspecifics elsewhere undertake long annual migrations between feeding and breeding grounds (Baldwin, 2003).

Analyses of small vessel survey data completed by Minton et al. (2010) provided initial assessments of habitat utilization. These were subsequently improved by Corkeron et al. (2011) using a habitat modeling approach that accounted for sampling biases. Both of these identified suspected 'hot spots' on the Oman Arabian Sea coast including the Hallaniyats Bay and the Gulf of Masirah. The movements of satellite-tagged animals provided confirmation of these hotspots and demonstrated the movement of whales through areas of existing and escalating threats (Willson et al., 2014; Willson et al., 2016). Satellite tracking data reveals whales (n=9) ranging within a 1,150 km corridor along the southern coast of Oman. Individuals spent an average of 83% (SD = 17%) of their time engaged in localised or 'area restricted search' that is likely associated with foraging, breeding and resting behavior, and is centered in the Gulf of Masirah and the Hallaniyats Bay (Tagging Location) (Figure 1). Sightings histories include those for several individuals which have been observed between years (some with 17+ year sighting histories), across seasons, and in three separate survey areas (Minton et al., 2011). Some individuals appear to have high site fidelity, with multiple recaptures in each study area (Willson et al., 2016; Willson et al., 2015).

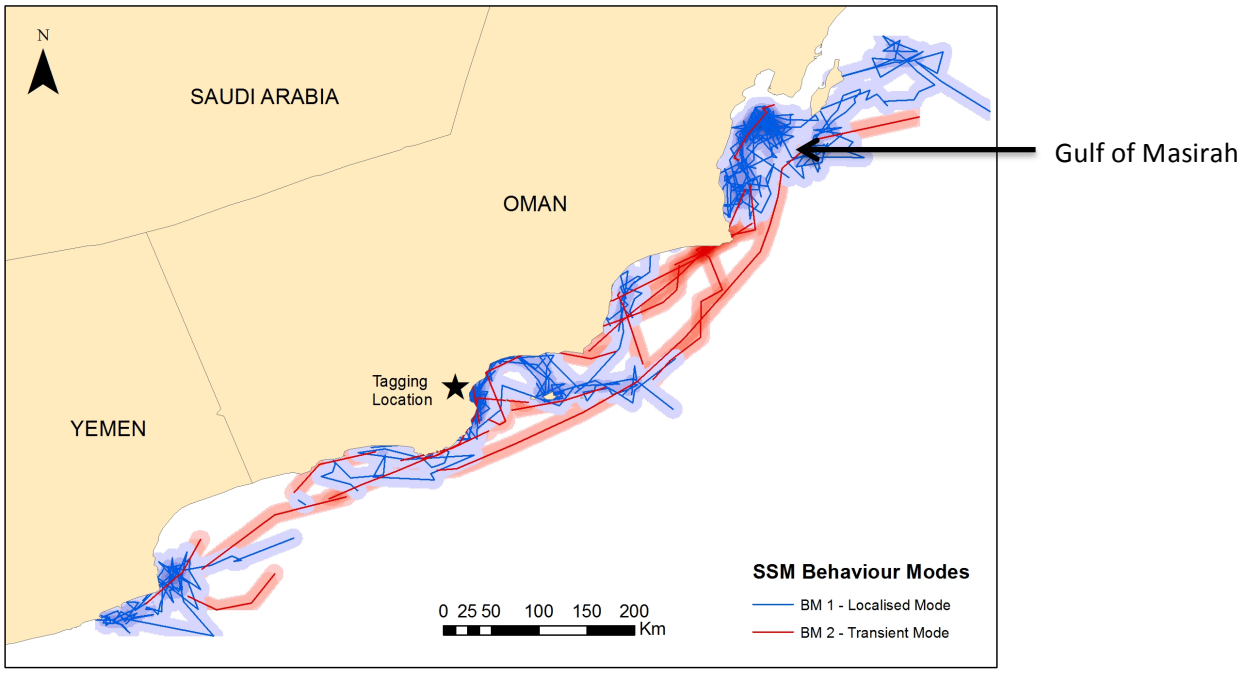

Figure 1. Movements and behavior modes of satellite tracked Arabian Sea humpback whales (n=9) in Oman.

The Arabian Sea humpback whale is demonstrably vulnerable to anthropogenic threats (Baldwin *et al.* 1999, Minton *et al.* 2008; Baldwin *et al.* 2010), such as fishing, commercial vessel traffic and oil and gas exploration. Concerns around the growth of the whale watching industry and related potential impacts have also been raised (IWC, 2012) leading to study of the whale watching industry in Oman, publication of guidelines for operators and training of tour business representatives and vessel captains (IWC, 2016).

Here we report on progress of on-going work which aims to better understand and regulate current and potentially emerging Arabian Sea humpback whale watching operations, and highlight some key business approaches for achieving responsibly-managed whale watching in Oman.

Methods

We developed a database of existing whale[1] watching operators in Oman and approached them to determine the nature of their operations, including details of their business (numbers and size of vessels, tour frequency, times, seasonality and locations, etc), details of target species and the typical nature of interactions. We also gathered information about their overall approach to business, safety and professional standards, the level of knowledge about the target species and the marine environment in general, among other information. We also used media and social media outlets, and direct observation, to supplement data collected directly from operators.

Information on Arabian Sea humpback whale watching was extracted from the resulting data to specifically understand operations targeting this species. Based on this information, and a literature review of potential impacts of whale watching on humpback whales elsewhere in the world, we assessed the likely current levels of impacts on Arabian Sea humpback whales from whale watching in Oman.

We reviewed conditions in Oman, such existing and planned coastal infrastructure and facilities, existing tourism operations, tourism growth potential and plans, population growth and job demand, in an attempt to forecast locations at which the potential expansion of whale watching operations may occur. We compared these data with the known high-density locations of Arabian Sea humpback whales. This was a qualitative, rather than a quantitative, assessment designed to rapidly estimate likely areas where tourism, and humpback whale watching in particular, may be expected to arise in the future.

A week-long expedition to the Hallaniyat Islands included training for key personnel at the existing whale watching operation based on the main island of Al Hallaniyah. Training covered a variety of topics, including business approaches and standards, client interaction and expectation management, practical boat handling, interpretation of Oman's whale watching guidelines, general biology, ecology and behavior of Arabian Sea humpback whales (including signs of potential disturbance/impacts due to the presence of whale watching vessels) and use of whale watching operations as a platform of opportunity for scientific data collection. The latter included training in use of a Canon digital SLR camera. A Canon D50 camera body and telephoto lens was donated to the operator with the aim of receiving photographs suitable for ongoing photoidentification studies in Oman. The training also allowed for collection of useful information and feedback from the operator.

Based on existing guidelines which were published, with the support of the IWC Scientific Committee, in 2013, we coordinated with Ministry of Environment and Climate Affairs officials in Oman to draft national regulations for whale watching in Oman, which have been submitted for internal government review.

A road map of actions for continued development of a responsible and sustainable whale watching industry in Oman is in preparation, along with outreach materials providing information on Arabian Sea humpback whales designed to raise levels of awareness and knowledge of operators. This will be accompanied by supporting information to help guide sustainable business planning.

Results and discussion

Compilation of a database of whale watching operators in Oman revealed a total of 16 full time or part time operations. The average number of vessels per operator is three. Under half of all vessels are used for whale watching only; most are used for marine tours with operators taking bookings for whale watching on demand. The industry has expanded since it began in 1998, when a single operator ran tours on a once or twice daily basis. By 2008, there were at least 15 operators in Oman's capital city of Muscat, making two trips per day in the peak season, with some operating two vessels per trip (Ponnampalam, 2011). Since this time, the numbers of operators in Muscat has declined (to approximately 11). One operator gave reasons for closure as a decline in numbers of interested tourists due to the geopolitical scene in the region combined with economic depression associated with global recession and low oil prices. Despite the fall in numbers of operators in Muscat, new operations have opened elsewhere in the country since 2008, including at least two in Musandam, one at Ras al Hadd, one at Masirah Island and three in Dhofar. The

[1] Whale watching in the context of this paper also encompasses dolphin watching

current economic value of whale watching in Oman is not known, though in 2008 the industry was reportedly worth approximately US$1.24 million (Ponnampalam, 2011).

Ponnampalam (2011) described dolphin watching trips off Muscat in 2008 as generally lasting two hours. Boat capacity for each tour was between eight and 25 passengers. Most tour operators used local Omani boat drivers, many of whom neither spoke English well nor had much, if any, specific knowledge or training on cetaceans or other aspects of marine ecology. The dolphin watching trips also lacked an educational component because most operators did not distribute informational material, nor was there a tour guide onboard to provide the tourists with a commentary about the dolphins. This still very accurately describes operations off Muscat, which have therefore apparently neither evolved nor progressed over the past decade.

Target areas and species
All of the whale watching operations in Oman primarily target offshore and/or coastal dolphins, with the exception of one operator targeting Arabian Sea humpback whales at the Hallaniyat Islands.

Spinner dolphins (*Stenella longirostris*) are targeted year-round on continental slope habitat off Ras al Hadd and especially off Muscat where long-beaked common dolphins (*Delphinus capensis*) are a secondary target. Several other species are encountered opportunistically, including common bottlenose dolphins (*Tursiops truncatus*), Risso's dolphins (*Grampus griseus*), Bryde's whales (*Balaenoptera brydei*), false killer whales (*Pseudorca crassidens*), sperm whales (*Physeter macrocephalus*) and, very rarely, killer whales (*Orcinus orca*), blue whales (*B. musculus*) and Arabian Sea humpback whales.

The Indo-Pacific humpback dolphin (*Sousa plumbea*) is a year-round target in shallow water inlets of the Musandam peninsula in northern Oman and a seasonal (September to May) target along the shores of mainland Dhofar in the south of the country, especially at Taqa, Salalah and Mughsayl. Arabian Sea humpback whales are opportunistically encountered at these latter locations.

Also in Dhofar, the Indo-Pacific bottlenose dolphin (*Tursiops aduncus*) has recently become a seasonal (September to May) target for swim-with operations near Hasik, at Ras Nuss. Operations currently involve at least two operators traveling to the site by road from a base in Salalah. Swimmers enter the water via a beach. Concerns were raised about human and dolphin safety and wellbeing after an article about the first tours appeared in local newspapers in November 2016, prompting a visit by Ministry of Environment and Climate Affairs (MECA) personnel (Aida al Jabri, pers. comm.). The programme currently continues, unregulated. This area is also known as one of the highest density habitats for Arabian Sea humpback whales. There is therefore a possibility that operations could expand to include targeted humpback whale watching in this area given the regularity with which humpback whales have been encountered here during small-boat research surveys over the past decade (Willson et al., 2016).

The Indo-Pacific bottlenose dolphin is a secondary target at the Hallaniyat Islands, where the Arabian Sea humpback whale is the primary target. A single operator currently offers whale watching excursions from a base on the main island of Al Hallaniyah between mid-September and mid-April. The Hallaniyat Islands, between 30 and 100kms off the coast of Hasik, Dhofar, are another area known to be important habitat for the Arabian Sea humpback whale and at which relatively high densities of whales occur. Whale watching operations have been running there since 2014. At least one other operator frequents this area on week-long live-aboard 'dive safaris' between November and May inclusive, and reports opportunistic encounters with humpback whales. The operator allows, and even promotes, diving and/or snorkelling with whales when encounters occur.

At one other location, namely Masirah Island, local operators apparently offer seasonal (September to May) whale watching trips if requested. There are no specific target species identified, but the area is known to host a high diversity of cetacean fauna (Baldwin, 2003), including high densities of Arabian Sea humpback whales.

A summary of the key locations at which whale watching occurs, and the primary target species, are indicated in Figure 2 below.

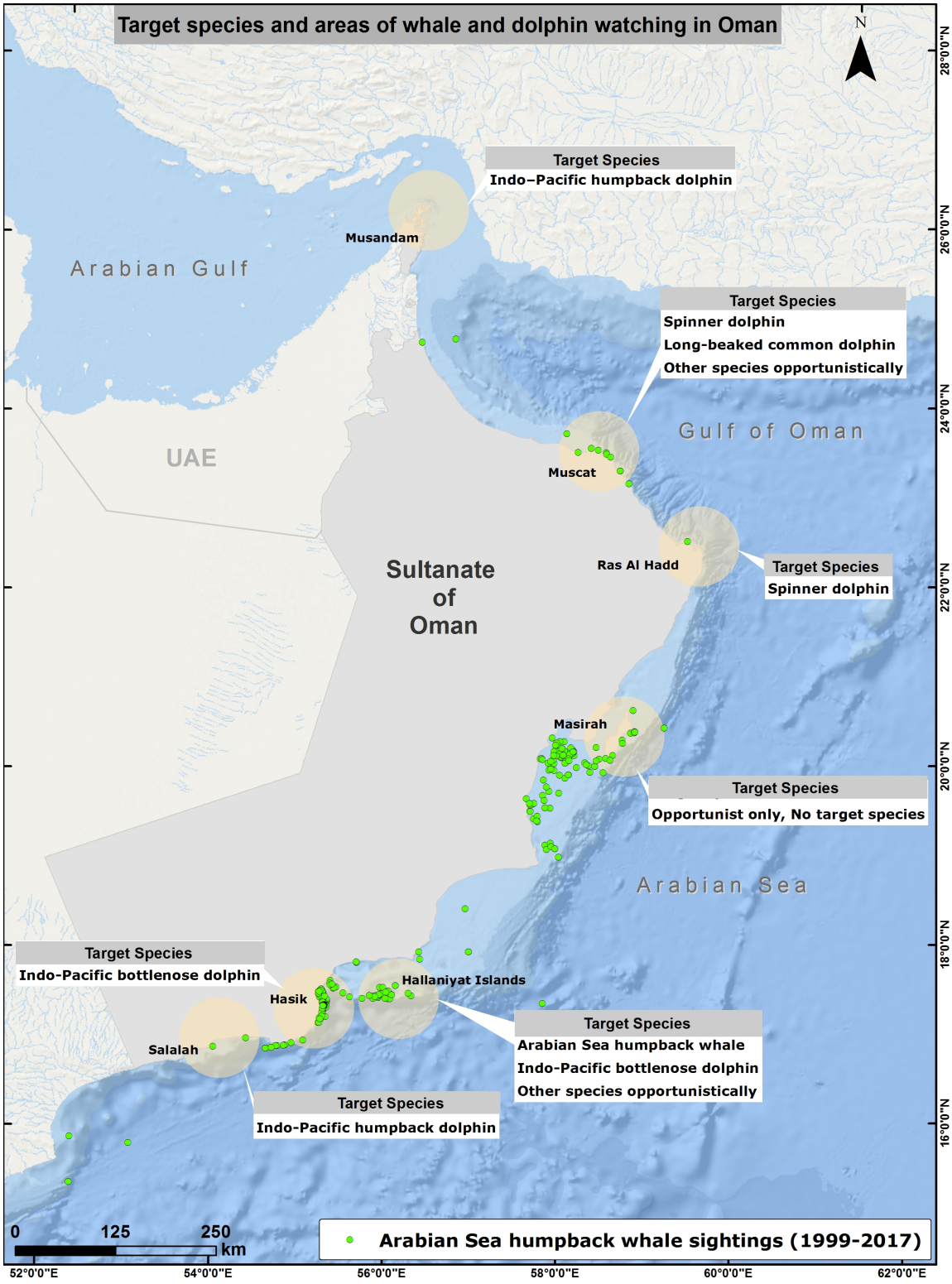

Figure 2. Target species and areas of whale watching in Oman.

Industry approach, standards and training requirements
Hoyt (2007) prepared a 'blueprint' for the development of high quality, sustainable whale watching which was defined by seven key elements: (1) good, long-term financial management, (2) scientific input and output, (3) attention to conservation, (4) investment in people, local and visiting, with good customer care and community relations, (5) educational input and output, (6) enhancement of benefits, and (7) reduction of costs, the latter two points referring to the requirement for cost-benefit analysis (including social, ecological, and financial aspects).

Comparison of whale watching operations in Oman, based on observations made during the course of this study, suggests that the majority of these key elements are absent in the industry and individual businesses. Whale watching businesses in Oman have emerged opportunistically, one after the other, and have been subject to organic growth, when the market has allowed, in a competitive, non-collaborative business environment. Published guidelines for Oman are largely ignored, incorrectly interpreted or deliberately flouted, or operators are unaware of their existence. In general, the industry suffers from low standards of safety, management and self-regulation and there has been little or no attempt at attention to conservation, involvement in scientific study or consideration of community or educational aspects. The static nature of the industry, which has remained largely unchanged for a decade also indicates that there has been little attempt at enhancing benefits or re-investing in the business to allow for improvement and growth.

Encouragingly, the one operation that currently targets Arabian Sea humpback whales has demonstrated signs of greater awareness and understanding of the key elements that define Hoyt's (2007) 'high quality, sustainable whale watching'. In this case, Oman's guidelines for whale watching are routinely followed and practical boat handling training provided by IWC scientific members in 2014 has achieved desired results. An article in the Middle East Eye (2015) quotes the operations manager as saying about the whales: "We don't go to them… we keep quiet. If they come to us, great, but we don't follow."

The operator at the Hallaniyat Islands has also willingly accepted scientific input and, via the current study, has received means (equipment and training) to contribute scientific output through acquisition of photographs for on-going photoidentification studies. Attention to conservation and community relations has also been demonstrated through investment in local people, good customer care and use of environmentally-friendly products and approaches where possible.

Further training requirements are nevertheless required for this operation at the Hallaniyat Islands, and especially for other operations in Oman which target other species. Observations of vessel behavior off Muscat, Musandam and Dhofar, around spinner dolphins, long-beaked common dolphins and, especially Indo-Pacific humpback dolphins, suggest that vessel captains in these areas require substantial training, guidance and monitoring. Business managers also require training in most, if not all, of the key elements defined by Hoyt (2007).

Potential impacts of whale watching
Current impacts from whale watching activities on Arabian Sea humpback whales are likely to be minor. There is only one operator who conducts tours during 6-7 months of the year and vessel captains routinely follow whale watching guidelines. Some short-term behavioural impacts can nevertheless be expected. At least one other operator encounters whales regularly in the same area and less is known about the adherence by vessel captains to guidelines in this case. Other operators, elsewhere in the country, also encounter humpback whales from time to time. Given the very small population size of this Arabian Sea population in Oman (n=82 (95% CI=60-111)), these encounters may expose the same individuals to additional pressure from whale watching vessels, albeit on rare occasions.

Studies conducted on humpback whales and other cetacean species elsewhere in the world report increases in swim speed and dive time as a response to the presence of boats (e.g. Nowacek et al., 2001, Lusseau 2003, Scheidat et al., 2004, Morete et al., 2007, Lundquist et al., 2008, Stamation et al., 2010). Another common behavior involves whales and dolphins making directional changes in the presence of boats, such as animals moving away from an approaching vessel (e.g. Baker & Herman 1989, Stamation et al., 2010) or displaying a more erratic path (e.g. Nowacek et al., 2001, Lundquist et al., 2008, Williams et al., 2009; Schaffer et al., 2013).

The only other Endangered population of humpback whales occurs in the South Pacific island waters of New Caledonia, which is considered one of the leading humpback whale watching destinations in the region (Schaffer and Garrigue, 2007). Whale watching activities began in New Caledonia in 1995 and the industry witnessed steady growth (40% annually) involving 26 unregulated tour operators by 2008. Studying whale movements from both land-based and vessel-based observation platforms, Schaffer et al. (2013) demonstrated that over 80% of whales significantly change their behavior when approached by boats in New Caledonia, using horizontal and vertical avoidance tactics, with the threshold for response corresponding to an approach distance of 335m.

Schaffer et al (2013) note that exposure to whale watching activities for humpback whales in New Caledonia is likely to be limited by their residency time (maximum 60 d) and is unlikely to lead to longer-term severe biological effects at the population level. In Oman, humpback whales are resident year-round and individuals show very strong side-fidelity (Willson et al, 2014). Given that some of the short-term behavioural responses to whale watching boats, as described in the literature, may carry energetic costs to individuals (Williams et al., 2006), and cumulatively may have population-level effects (e.g. Bejder et al. 2006), there is a possibility that whale watching could negatively effect Arabian Sea humpback whales in the long-term.

Direct evidence for negative long-term biological effects on humpback whales due to effects of boat exposure appears to be lacking according to studies conducted elsewhere in the world (e.g. Beach and Weinrich, 1989; Clapham et al., 1993; Bauer et al., 1993), including a study on humpback whale feeding grounds in the North Atlantic, Weinrich & Corbelli (2009) which found no direct evidence for negative of effects on calving rates and calf survival. The potential implications on the Arabian Sea humpback whale population, in which feeding and breeding grounds occur in a single location, are nevertheless important to consider. Lactating females may be particularly at risk if they redirect energy from lactation to homeostasis in order to compensate for their own increased energy expenditure (Schaffer et al., 2013). This may compromise calf survival, as an increased energetic cost to the mother may affect lactation or gestation. Calves themselves may also be vulnerable, for example if increased dive times or swim speeds go beyond their physiological limits or limit suckling opportunities (Scheidat et al., 2004). Such considerations led Scheidat et al (2004) in a study in Ecuador to recommend precaution and limit whale watching boats to a closest approach of 100m and the number of vessels to a maximum of two within 1,000m of whales.

The small number of humpback whales in Oman, their strong site fidelity, the paucity of sightings of calves (n=14) over the past 17 years (Environment Society of Oman, unpublished data) and the lack of data on calving rates and calf survival, suggest that similar precaution should be shown in Oman until further studies can be conducted. It is additionally recommended that the number of new operators targeting Arabian Sea humpback whales is carefully monitored and, if necessary, restricted. Interest has already been shown in whale watching in other areas where Arabian Sea humpback whales are becoming well known, such as around Duqm, in the Gulf of Masirah, which is a rapidly developing coastal city.

It should also be noted that long-term impacts to humpback whales and their habitat may occur indirectly due to coastal development attracted by whale watching activities. A parallel example of this in Oman is development of tourism facilities around sea turtle nesting beaches at Ras al Hadd, which now compromise the very attraction that they were designed to exploit. Tourism development in this area has also lead to further interest from government and private sector in other developments, partly due to the new facilitating infrastructure. This additional development includes that which may impact marine wildlife to a greater extent than tourism, such as construction of fishing harbours and growth of the fishing industry in general.

Potential expansion of whale watching in Oman

Conditions are set for the likely expansion of whale watching in Oman. Awareness about whales has increased over the past decade and tourism in Oman continues to grow. According to the Oman National Centre for Statistics and Information, arrival numbers have increased by an average of 7.4% per year over the past decade, rising from 1.1m in 2005 to nearly 2.1m in 2016 (World Travel and Tourism Council, 2015).

Oman recently announced its 'Tanfeedh' initiative ratified by Royal Decree (1/2016), which is a national programme for enhancing economic diversification as part of the 9th Five-Year Development Plan (2016-2020) (Times of Oman, 2016). The targeted sectors identified are manufacturing, tourism, transport and logistics, mining, and fisheries. The programme will focus on raising the contribution of these sectors to the Sultanate's Gross Domestic Product (GDP), increasing investment in these sectors, and creating more job opportunities.

Among the target destinations for tourism are the Gulf of Masirah (including Duqm) and Dhofar, both of which are known as areas with highest incidence of humpback whale sightings in Oman (Corkeron *et al.* 2011, Minton *et al.* 2010, Minton *et al.* 2011; Willson et al., 2014). Rapid development of coastal infrastructure and construction of numerous new large mixed-use tourism development projects are underway in these areas. Demand for jobs is fuelled by a population growth rate which is among the highest in the world at over 6% per annum. Just over 63% of the population is under 30 years of age and includes high numbers of job seekers (Arab Development Portal, 2016).

This combination of characteristics suggests that whale watching is likely to increase in Oman where whales are most frequently encountered, especially as tourism as a whole continues to grow. Overall forecasts for tourism growth in terms of contribution to GDP, suggest a rise by 6.1% pa from 2015-2025 (World Travel and Tourism Council, 2015).

Draft regulations for whale watching in Oman

Based on published guidelines for whale watching in Oman (Figure 3), draft regulations have been prepared to formally legislate the industry. The draft regulations were prepared in collaboration with the Ministry of Environment and Climate Affairs (MECA) as a proposed Ministerial Decision and are currently under internal review.

Central to the draft regulations is the requirement for any person or organization intending to operate commercial whale watching activities to apply to the Ministry to obtain the necessary environmental permit after satisfying pre-qualification criteria. Among the criteria are minimum safety standards, appropriate vessels specifications for minimizing impacts to whales and dolphins, certain levels of experience and training for vessel captains, minimum levels of knowledge of the biology, ecology and behavior of whales and dolphins, and means for enabling scientific inputs and outputs.

Swim-with programmes are currently allowed within the draft regulations by special permit only. There is reasoning, however, that suggests prohibiting swim-with operations in Oman may be appropriate. Apart from the potential impacts to cetaceans, swimming with whales or dolphins is potentially dangerous to people. In Oman, whale and dolphin watching is still an emerging industry and normal safety procedures and equipment are absent or limited in all operations that have been reviewed. There is no sea-rescue/ambulance service in the country and whale and dolphin watching often occurs far from shore or in remote locations subject to rapid weather changes. In addition, the tourist profile is mixed and typically includes non-swimmers. Until sufficient awareness and education is provided to both operators and tourists, allowing swimming with whales and dolphins may also send a contradictory message about the responsible and sustainable direction that the industry in Oman should take in order to maximize its potential.

Figure 3. Whale watching guidelines for Oman (short version).

Road map for responsible whale watching in Oman

An intended output of the current study is a road map of actions for relevant stakeholders designed to guide the development a high quality, sustainable whale watching industry. Stakeholders include government regulators, planners and developers, the private business sector, such as tourism agencies, operators and supporting businesses, NGO's, research scientists, and local communities, as well as interested international stakeholders.

This road map is in preparation and is based on 14-step core blueprint devised by Hoyt (2007). This blueprint is summarised as follows:

Initial Planning and Assessment (researchers, NGOs, and government representatives take the lead; other stakeholders assist)
• Identify and form a planning group to refine and approve a draft working plan
• Devise and implement stakeholder involvement strategies.
• Organize baseline research on whales and dolphins.
• Complete an environmental impact assessment and a socioeconomic assessment.

Marketing and Tour Design (tourism agencies, operators, and supporting businesses take the lead; other stakeholders assist)
• Commission a tourism scoping/feasibility study for current and possible future local attractions.
• Commission a tourism marketing analysis (including visitor background and expectations).
• Design the whale watching/marine ecotourism tours or "tour products."
• Shape the brand and overall marketing plan for the community/region.

Focus on Business (operators, supporting businesses, and tourism agencies take the lead; other stakeholders assist)
• Set up business development, training, and assistance programs and workshops.
• Develop business plans for sustainable whale watching, including value-adding techniques and impact-lowering strategies.

Management of the Resource (government as well as NGOs and researchers take the lead; other stakeholders assist)
• Set the overall policies for managing the industry (licensing of operators and boats; devising and establishing regulations). Set the upper limits for whale watching.
• Examine the legal tools for managing the industry and implement them.
• Embed education and research, as well as monitoring of the development of whale watching (to determine the impact on the animals being watched).
• Develop a sustainability evaluation mechanism, both self-evaluation and periodic outside evaluation (including consideration of a big picture sustainability analysis).

The road map will be augmented by direct discussions with key whale watch operators and provision of purpose-designed awareness materials on Arabian Sea humpback whales.

Recommendations

Based on work that began in 2013 including workshops, interviews and discussions with local operators, publication of guidelines, drafting of national regulations, classroom training of operators and practical field training of vessel captains, the following is now recommended:

1. Apply precaution by limiting whale watching of Arabian Sea humpback whales to current levels until dedicated research on the effects of whale watching can be conducted (including taking advantage of available cliff top observations points at the Hallaniyat Islands).
2. Provide further, specific training to operators on the subject of sustainable business planning and development, as well as field training on practical boat handling for vessel captains.
3. Encourage Government offices to finalise draft legislation governing whale watching in Oman and more fully engage government stakeholders in the sustainable development of the industry.
4. Use current whale watching operations as platforms of opportunities for collection of scientific data.
5. Estimate carrying capacity, based partly on the outcome of 1 above, of whale watching in locations where the activity is on-going or likely to emerge in Oman. This may also require further information from other on-going scientific research, for example to define critical habitats, and calving and calf survival rates.

6. Apply lessons learned from research and planning of whale watching in Oman to other target species of the industry. Priorities include Indo-pacific humpback dolphins in Musandam and Dhofar, spinner dolphins and long-beaked common dolphins in Muscat, sperm whales in Dhofar and Muscat, and bottlenose dolphins at Hasik/Ras Nuss, Dhofar.

Conclusions

There is good opportunity to successfully guide humpback whale watching in Oman. Research on humpback whales in Oman has provided important data on distribution and habitat use, and there is now a need for dedicated study of the potential effects of whale watching on this species whilst whale watching operations are still minimal. There is currently only one dedicated operator targeting humpback whales. Activities are centered in a remote location in which operations are seasonally restricted by monsoon weather conditions. Other marine tour operators target humpback whales opportunistically. In general, operators adopt an ill-informed approach to the whale watching business, but are eager to learn how to improve. Government regulators and legislators are open to discussion and a Ministerial Decision for whale watching, based on existing guidelines, has been drafted and is under review. There is a need to act now to help better understand and guide whale watching in Oman so that precedents and boundaries are set that can help foster sustainably-managed businesses in advance of expansion of the industry both at the current location and elsewhere. Whale watching may otherwise put long-term pressure on this small population of Endangered Arabian Sea humpback whales, as well as reducing potential business rewards.

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