Annex M

Report of the Sub-Committee on Whalewatching

Members: Urbán (Chair), Carlson (Co-chair), Acosta, Baldwin, Bjørge, Choi, Cosentino, Debrot, Funahashi, Gales, Gallego, Galletti Vernazzani, Genov, Hinten, Holm, Iñíguez, Jaramillo-Legoretta, Jensen, Kato, Kaufman, Luna, Lusseau, Mattila, Panigada, Parsons, Ritter, Rose, Simmonds, Stachowitsch, Štrbenac, Vély, Víkingsson, Whitehead, Williams.

1. CONVENOR'S OPENING REMARKS AND TERMS OF REFERENCE

Urbán welcomed the members of the sub-committee and noted the priority items identified by the Scientific Committee: (1) assess the impacts of whalewatching on cetaceans (methods and results of changes in behaviour and movement patterns; methods and results of physiological changes to individuals; and methods and results of demographic and distributional changes); and (2) review whalewatching in Norway. In addition, the following items were identified: (1) review reports from Intersessional Working Groups: large-scale whalewatching experiment (LaWE) steering group; LaWE budget development group; on-line database for world-wide tracking of commercial whalewatching and associated data collection; and swim-with-whale operations; (2) consider information from platforms of opportunity of potential value to the Scientific Committee; (3) review of whalewatching guidelines and regulations; and (4) review of risks to cetaceans from whalewatching vessel collisions. The sub-committee also reviewed the scientific aspects of the report from the Commission's intersessional whalewatching workshop held in Argentina in November 2010.

Kato noted that Mason Weinrich, a regular member of the sub-committee, was ill and wished him a speedy recovery on behalf of the sub-committee.

2. ELECTION OF CHAIR AND APPOINTMENT OF RAPPORTEURS

Urbán was elected Chair, Carlson was elected Co-chair, and Rose was appointed rapporteur.

3. ADOPTION OF AGENDA

The adopted Agenda is given as Appendix 1.

4. REVIEW OF AVAILABLE DOCUMENTS

The documents available to the sub-committee were identified as: SC/63/WW1-5, SC/63/WW7; SC/63/BC2; SC/63/E4, E9; Scheer (2010).

5. ASSESS THE IMPACTS OF WHALEWATCHING ON CETACEANS

SC/63/WW1 reviewed recent advances in whalewatching research. In Japan, Matsuda *et al.* (2011) observed the behavioural effects of dolphin-watching boat traffic on Indo-Pacific bottlenose dolphins (*Tursiops aduncus*) off the island of Amakusa-Shinoshima. In response to one boat, time spent underwater and speed of movement at the surface increased and in response to 4-5 boats, distances travelled underwater increased and surface interval duration decreased.

In the Azores, Visser *et al.* (2010) used a land-based vantage point to document that an increase in whalewatching vessel abundance and the presence of more than five vessels correlated with a decrease in resting and an increase in social behaviour of Risso's dolphins. The authors suggested that these changes could have a negative impact on these dolphins.

Seuront and Cribb (2011) investigated the diving behaviour of Indo-Pacific bottlenose dolphins (*Tursiops aduncus*) from a land-based site overlooking the Port Adelaide River-Baker Inlet Estuary; an area which has been declared a 'dolphin sanctuary'. There were no significant differences in dive duration between control observations and observations in the presence of kayaks, inflatable power boats, powerboats and fishing boats. However, the presence of boats (except kayaks) did affect dive pattern complexity; the authors suggested that documenting behaviour in the presence and absence of boats may be inadequate to detect subtle impacts.

Tseng *et al*. (2011) analysed behaviour of cetaceans in response to whalewatching activity in Taiwan, an area where there are no statutory whalewatching regulations. Analyses indicated that mother-calf pairs were less likely to show avoidance behaviour than non-calf pairs and the larger the cetacean group the lower the degree of avoidance. Furthermore, vessel avoidance increased with vessel proximity.

In Cockburn Sound, Western Australia, bottlenose dolphins have been food provisioned illegally since 1993. Donaldson *et al*. (2010) investigated the scope of anthropogenic injury to dolphins, behaviour of dolphins during feeding interactions and the correlation between rates of entanglement and boat strikes with dolphins that interact with humans for food and found a higher incidence of boat strike injury and fishing line entanglement in food-provisioned dolphins. These empirical data validate that dolphin feeding should remain illegal and enforcement of the law should be instituted in the region; they also support the conclusion that feeding cetaceans is an inappropriate form of cetacean tourism.

Lachmuth *et al.* (2011) investigated the potential impacts of exhaust gases from whalewatching vessels on the population of southern resident killer whales in British Columbia, Canada and Washington State, USA. They determined that current whalewatching guidelines would keep pollutant exposure to levels at or just below those at which adverse health effects would be expected, but such levels could be exceeded under certain conditions. They recommended positioning vessels downwind of whales and to restrict the number of vessels within 800m of whales to 20 vessels at any given time, along with limiting viewing periods.

Parsons clarified that the review is intended as a summary of studies of interest to the sub-committee and is not a critique of research methodologies or results. The sub-committee thanked him for his comprehensive review and asked him to prepare a review for the next meeting.

Lusseau presented SC/63/WW2. The behaviour of minke whale was compared in the presence and absence of

whalewatching boats in Faxaflói Bay, Iceland. Individual focal follows were conducted from a land site (control) and from commercial whalewatching boats (impact). This study is still underway and the authors reported on data collected over one year.

A linear mixed effect model was used to determine whether the effect of the focal follow individual's directness index on its inter-breath interval changed depending on the presence of boats. The best fitting model included a random effect of follow to account for between-follow variability and a variance component to account for heteroscedasticity between impact and control follows. The presence of boats influenced the interaction between dive interval and directness index. Minke whales avoided whalewatching boats by performing shorter dives while increasing path sinuosity. A relative increase in respiration rate in relation to directness index in the presence of whalewatching boats could reflect an increased energetic expenditure caused by avoidance behaviour. In addition, the long and relatively sinuous dives observed during foraging behaviour were absent during interactions with whalewatching boats. The authors concluded that this foraging disruption could be of biological importance.

SC/63/WW2 also used photogrammetry to estimate the position of whales in relation to the boat. A Monte Carlo approach was used to propagate the errors in whale position estimation in the estimation of the parameters of the best fitting model described above. This showed that results were not sensitive to these field sampling errors. This method is therefore a cheap and reliable technique to estimate these key biological parameters from boats and can therefore be deployed from many whalewatching boats to boost data collection in impact situations. Importantly, it offers the possibility to have clear quality control and assurance procedures to ensure the reliability of data collected.

The sub-committee noted that the photographic technique for determining range from the boat described in SC/63/WW2 was innovative and useful. During discussion, some sub-committee members asked if it was possible that the different behaviours seen in the two locations were due to different oceanographic conditions and differing prey distributions within the bay rather than boat presence. It was noted that the west coast of Scotland has very different ecological and topographic features within short distances of each other, leading to differing foraging and surfacing behaviour. It was suggested that use of a pole-mounted underwater video camera from a boat would clarify whether minke whales in different areas of the bay were surface foraging or deep diving, as has been done in other areas. The presenter replied that the topography and availability of prey was essentially homogeneous throughout the bay. He noted that the authors had also planned this year to introduce experimental boat approaches in the 'control' area off the Garður Lighthouse on the peninsula to confirm that location and boat presence were not confounded. One member familiar with the area added that the land site might have differences on the western side (facing the sea) as opposed to the side facing the bay, but overall the two sites were as close as it was possible to get to being the same in terms of bottom topography and oceanography.

When it was noted that making observations before, during, and after boats were present would be a more direct way of measuring disturbance, the reply was that 'before, during, and after' was a different methodological framework from the boat/no boat control framework used here, but the researchers intended to use this approach in the summer. Some members noted that it was difficult to distinguish what a minke whale was doing from a land station and surfacings could be missed. Ground-truthing experiments in Scotland had found that surfacings of minke whales within a sequence were missed by a land-based platform when compared to a boat platform. Even from a boat, behavioural distinctions could be difficult. In response, the presenter noted that the observers at the lighthouse discontinued their observations when they could not distinguish the animal's respirations or direction. He noted that the model accounted for measurement errors as well.

Some members expressed concern about equating the whales' behaviour around whalewatching boats to their behaviour around predators, as well as extrapolating specific short term, individual behavioural responses to long-term, population level effects without scientific evidence to support these claims. However, the presenter noted that the predator parallel has been made in the literature for several years now and that drawing connections between short term responses to long term consequences was the ultimate goal of the exercise.

It was noted that this bay used to have one of the densest populations of minke whales around Iceland but since 2001 there has been a reduction in density (Pike *et al.*, 2009). This coincided with a northward shift in distribution of several whale and fish species, some of which are important prey for cetaceans (Asthorsson *et al.*, 2007). The reasons for these changes are not clear, but a concurrent increase in ocean temperatures may have contributed to them.

Although there was some debate on the validity of stomach content data from Iceland's lethal science program, one member commented that the Icelandic aerial minke whale surveys and prey distribution data combined could provide useful information on the impacts of climate change on cetacean distribution and could add to research from other regions suggesting climate-induced shifts in minke whale distribution. He further noted that data collected from whalewatching vessels could be particularly useful in monitoring climate change effects on cetaceans due to long-term data sets in fixed locations, and such information might be useful for other sub-committees.

SC/63/WW5 tested whether the tactics that killer whales used to avoid boats differed depending on the type of boat approaching them to account for the difference in perceived risk factors. The authors compared variation in activity state disruption in killer whales during control conditions and three kinds of whale-boat interactions: whale-oriented powerboats (e.g. recreational boats, whalewatching boats); non-whale-oriented powerboats (e.g. fishing boats, tankers); and kayaks (i.e. silent boats). The authors determined that the effect of boat presence on activity state transition probabilities changed depending on the type of boat present. They used generalised estimating equations, incorporating an autoregressive correlation structure, to estimate the influence of boats on the likelihood that an activity was observed in contrast to others. Models were selected using Pan's Quasi-AIC and likelihood ratio tests for nested models.

Killer whales responded differently to whale-oriented boat traffic than they did to other powerboats. They spent significantly more time travelling when in the presence of kayaks than they did under control conditions. They also significantly reduced time spent feeding in the presence of kayaks and powerboats. The presence of whale-oriented vessels decreased the odds that killer whales were feeding. The presence of kayaks increased the odds that they were travelling. Silent vessels can therefore elicit avoidance

tactics in the same way that boats which have an acoustic signature do. The effect of whale-oriented boats also varied inter-annually in accordance with the variation in the site's ecological conditions. The observed avoidance strategies have different energetic consequences. While both kayaks and powerboats affect feeding and travelling behaviour, kayaks tend to increase the whales' energetic demand, while powerboats tend to simultaneously increase their energetic demand and decrease their opportunities to acquire energy.

In response to a question, it was clarified that this work was contracted by the US National Oceanic and Atmospheric Administration, as part of a regulatory process in which restrictions on vessel traffic around the southern resident population of killer whales, designated as endangered under the US Endangered Species Act, were being proposed (and ultimately enacted). The sub-committee welcomed this paper, as it provides useful information on the effects of kayaks on an odontocete species, as the debate over 'silent' boats like kayaks is ongoing in other locations as well.

Lusseau presented SC/63/WW7. A study is underway to assess the influence of whalewatching interactions on the behaviour of blue whales in Sri Lanka. The study has focussed on behavioural data collected from whalewatching vessels and control data collection is in progress. The authors modelled the hidden dive cycle of focal individual blue whales from observed inter-breath intervals using a state-space model and showed that when whales are interacting with boats they tend to spend 75% of their time at the surface.

The sub-committee noted that this paper had relevant information for the Southern Hemisphere sub-committee. The sub-committee welcomed studies on blue whales and encouraged the presentation of additional information from this study at future meetings.

SC/63/E9 raised concerns about the growing popularity of cetaceans with the public in the Dutch Caribbean, which has coincided with a rapid increase in marine tourism and recreational use of the coast. In addition, the widespread use of communications technology such as cell phones has meant that cetaceans near the coast rapidly attract human attention. The animals are then often followed closely and persistently for long distances, during which swimmers may enter the water to swim with the animals at close quarters. The authors urged the development of guidelines for interacting with marine mammals for the region.

In discussion, some members asked if these were commercial whalewatchers or private boaters or if any other factors could be quantified about the traffic surrounding these cetaceans. It was clarified that information currently available was insufficient to make such distinctions or to quantify the situation. It was believed that the island of St Maarten has a large enough number of cetaceans present to support commercial operations, adding to the authors' urgency that guidelines be developed before vessel traffic increases even more. It was suggested that previous Scientific Committee reports and reviews on whalewatching might be useful to local researchers for background and helpful guidance. It was generally noted that studies were currently lacking to assess the impact of recreational boaters on cetaceans. One response noted that a mitigation measure that was nevertheless certain to be effective was the establishment of 'no-go' zones.

6. REVIEW WHALEWATCHING IN NORWAY

Norway has among the most significant whalewatching industries in Europe, with an annual average growth of approximately 5% over the last 10 years. The industry is based in Andenes, the Lofoten Islands and Svolvær (on the south coast of Austvågøy Island) with Stø in Langøya Island offering some trips (IFAW, 2009).

The peak season for whalewatching in Norway is from June to August. Killer whale safaris, once an important aspect of whalewatching tourism, run from late October to January when the killer whales enter the northern fjords to feed on herring. However, the herring stock has recovered to its historical high and also resumed its former migration pattern. It now winters in the open water of the Norwegian Sea and killer whales have changed their winter distribution accordingly. Although still advertised on the web, it is possible that some of the smaller operations no longer offer killer whale safaris due to the decrease in sightings and tourist numbers for the safaris (Broms, pers. comm.).

Appendix 2 represents a web-based search of whalewatching operations in Norway. Although it covers the more established operations in mainland Norway, it may not include some of the smaller, more opportunistic operators that offer a variety of nature and fjord tours.

In discussion, it was clarified that killer whale watching had declined in Norway due not to pressure from whalewatching vessels but because the herring have moved out of the area and the killer whales have followed their prey. Several members commented that snorkelling with killer whales seemed a dangerous activity for swimmers.

In discussion, it was observed that some of the guidelines, such as the approach speed of 5 knots, seemed arbitrary, as some large vessels go 6 knots even when only idling forward. While some repeated that guidelines should have scientific underpinnings whenever possible, precisely to avoid seeming arbitrary, others noted again that some areas with expanding operations should be encouraged to be precautionary and adopt voluntary guidelines, based on 'best practice' if the research has not been conducted yet. Finally, it was noted by local scientists that the guidelines for Arctic Whale Tours had been established with the World Wildlife Fund's input, so were based on 'best practice' rather than developed arbitrarily.

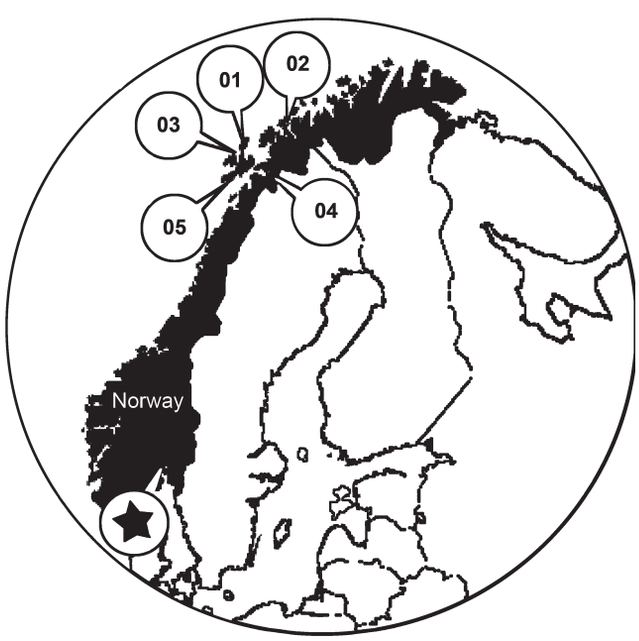

Fig. 1. Whalewatching locations (the star shows the location of the capital city, Oslo, for reference). 01=Andenes; 02=Tromsø; 03=Stø; 04=Narvik; and 05=Svolvær. Adapted from IFAW (2009).

A local scientist noted that there needs to be more inter-company communication and interaction, to maintain the current atmosphere of cooperation. She noted that some boats use hydrophones to locate whales, while others follow the boats with hydrophones. Some companies seek to cooperate, taking turns to observe a single sperm whale, for example, while others, because they rely on the other boats to locate whales, end up watching the same animal(s). She felt that in some circumstances, two boats result in increasing signs of disturbance, especially in Bleik Canyon, which is the most accessible area from land (the continental shelf drops off quickly). One member responded that it was important to conduct impact research to provide the scientific basis for this kind of intuitive observation. In response, it was reported that a study is being designed to do a before/after exposure experiment, work that could become a component of the LaWE. The sub-committee welcomed this proposed land-based before/after experiment and **recommended** additional such research in Norway, especially as there may be increased development of whalewatching here.

7. REVIEW REPORTS FROM INTERSESSIONAL WORKING GROUPS

7.1 Large-scale whalewatching experiment (LaWE) steering group

SC/63/WW4 reported on the LaWE steering group's recent call for collaboration. Thirty-five research groups that hold data relevant to the LaWE proposal were willing to engage with the project. These did not include Scientific Committee members who have already expressed their willingness to contribute data. The studies cover a wide taxonomic and geographic range. The steering group is now in a good position to instigate power analyses as well as re-initiate some of the previously attempted meta-analyses.

The next step will be to insure that quality assurance/quality control protocols are in place. Once studies are filtered for QA/QC, and suggestions are provided on improving data collection to those who do not have QA/QC protocols, power analyses for inter-breath interval data and movement metrics will be conducted. These steps will require data transfer from the data holders. The sub-committee previously discussed using the data sharing protocols already in place (*http://iwcoffice.org/sci_com/data_availability.htm#process*) to do so. However, this will require staff time from the Secretariat that is currently not available. Some steering group members envisage the creation of a new post, with the associated financial implications. In the interim Lusseau has a research assistant available who can initiate these activities. The sub-committee **agreed** that an interim option is to make use of this person's time to initiate data sharing under the auspices of the LaWE steering group, following procedures that will protect data holders' rights. The steering group will then report next year on progress and initial analyses.

The steering group gave a status update on the tasks identified at SC/62. The group has made significant progress on three of seven tasks, including determining LaWE logistics, data handling procedures, and identifying data sources.

It was noted that the data were intended to be stored with the Secretariat and therefore available for other uses, including the determination of $g(0)$. The data would be accessible to the Commission as well, including the Conservation Committee. Accessibility would be governed by Scientific Committee procedures, with requests routed through the Secretariat. It was intended, however, that data-holders would have final say over any use of their data. It was noted that the bulk of initial respondents were academic researchers rather than non-governmental organisations, but there were fewer government-affiliated respondents than was desired. Some of the respondents were academics contracted by government agencies, but problems might arise over data ownership in these cases. The sub-committee **recommended** that Commissioners should encourage their relevant government agencies to participate in the LaWE.

Panigada noted that ACCOBAMS is discussing whalewatching and he believes that ACCOBAMS members will be able to provide data to the LaWE from the Pelagos Sanctuary. The sub-committee welcomed this information and **recommended** greater communication between the sub-committee and ACCOBAMS. This information was received enthusiastically by the steering group, which encouraged collaborations and communication among data holders.

7.2 LaWE budget development group

The importance of this intersessional e-mail group was noted, as the LaWE will require significant funding. Unfortunately the group's progress was delayed due to illness; a co-convenor was appointed to continue its work intersessionally and the group will report back to the sub-committee at SC/64.

7.3 Online database for world-wide tracking of commercial whalewatching and associated data collection

An intersessional e-mail group was convened to guide the development of a database of whalewatching operations and associated data collection. The programmer undertaking this work has been doing so in a volunteer capacity and so the database has progressed only as his time has allowed. The intersessional group was therefore not able to evaluate the work in time for this meeting. However, a beta version of the database is now accessible on a private server and was made available to the sub-committee at the meeting for the first round of review and further development. Robbins will continue discussions with the programmer and proposes to keep the intersessional e-mail group going, with the specific goal of providing feedback to ensure that the database contains information that is useful to the sub-committee. The sub-committee thanked Robbins for continuing to work on the database's development.

It was also reported that, as announced at SC/62, an overview and preliminary inventory of whalewatching in the ACCOBAMS agreement area was presented at the most recent meeting of parties (MOP4), containing comprehensive information about currently existing whalewatching activities, including a preliminary list of the operators with a basic characterisation of their practice. Data collection was based on surveys among ACCOBAMS focal points and on Internet searches. These data can contribute to the IWC's future online database. This information is currently available on the ACCOBAMS web-site (*http://www.accobams.net*).

7.4 Swim-with-whale operations

The intersessional e-mail group was able to report some progress, due to the financial contribution of the Pacific Whale Foundation, which offered travel funds for beta testing the swim-with-whale questionnaire presented in Rose *et al.* (2007). Although the beta testing did not occur in the 2010/11 season, it is set to occur in the Dominican Republic, which has several swim-with-whale operators, in

the 2011/12 season, so results will be presented at SC/64. Other locations, including Australia, may also beta test the questionnaire. New locations with swim-with-whale operations, in Mayotte, La Réunion, Mauritius, Japan and Sri Lanka (where there is swimming with blue whales), were reported. It was also reported that the Kingdom of Tonga has contracted with an experienced individual to train swim-with-whale operators (see also Kessler and Harcourt, 2010).

8. OTHER ISSUES

8.1 Review scientific aspects of the report from the Commission's intersessional whalewatching Workshop

Iñíguez reported on IWC/63/CC3 and IWC/63/CC6. IWC/63/CC6 reported on the conclusions of the whalewatching Workshop held in Puerto Madryn, Argentina on 3-5 November 2010. The workshop was supported by the Governments of Australia and the United States, the Province of Chubut and a non-governmental organisation, the World Society for the Protection of Animals. Thirteen countries attended the workshop and its conclusions provided the basis for the further development of a 5-year Strategic Plan. The workshop recommended that the Conservation Committee's Working Group on Whalewatching consider, as one of the primary methods for achieving the objectives of the Strategic Plan, the development of a web-based 'living' handbook on whalewatching. The handbook would provide advice on governance, capacity building, monitoring, compliance, business, community and education/training/communication.

In discussion of IWC/63/CC6, Iñíguez clarified that the Working Group on Whalewatching seeks advice from the sub-committee on how to inform its work with the best available science. The goal is to set up a joint working group that will include members of the sub-committee, so the development of the Working Group's 5-year Strategic Plan will be informed by the knowledge and expertise available within the sub-committee.

IWC/63/CC3 reported the conclusions of the Working Group on Whalewatching, which met in Paris in March 2011, along with officials from France and New Zealand, to finalise the 5-year Strategic Plan for Whalewatching. Five objectives – research, assessment (monitoring), capacity building, development and management – form the key components of the Strategic Plan. Within the framework circumscribed by these objectives, the Strategic Plan identifies a suite of short and medium term actions to facilitate development of the sector by Contracting Parties in a responsible manner. Only one long-term action – an integrated research plan – is identified in the Strategic Plan.

The Working Group seeks endorsement of the Strategic Plan and of establishing an ongoing role for the Working Group over the life of the Plan. Draft revised terms of reference for the future of the Working Group on Whalewatching are also attached in the report.

Consistent with its anticipated new role, it is also proposed that the Working Group's membership be expanded to include two members of the Scientific Committee. While the Working Group would continue to report annually to the Commission via the Conservation Committee, its broadened membership would better ensure that proposed management actions are based on the best available science.

In response to IWC/63/CC3, the sub-committee thanked the Working Group on Whalewatching for the opportunity to consider its report. As IWC/63/CC3 has not yet been considered by the Conservation Committee, the sub-committee offered general, overarching comments to assist the Conservation Committee in its deliberations. A more formal and comprehensive review can be conducted at the next meeting if requested.

The Scientific Committee has recognised the importance of rigorous science to underpin management of responsible whalewatching. In this regard, the sub-committee welcomed the approach of establishing a joint Working Group on Whalewatching and the development of a Strategic Plan to guide the work on whalewatching in both the Scientific Committee and the Conservation Committee. The sub-committee therefore **agreed** to nominate its Chair and its Co-Chair, who is also a member of the LaWE steering group, to serve on this joint Working Group.

The sub-committee noted the ambitious scale of the current, science-related work programme proposed in the draft Strategic Plan. Once the Conservation Committee has reviewed this document, the sub-committee looks forward to providing review, revision, and scientific guidance on the nature and scale of priorities in the Strategic Plan, through the joint Working Group and during any future review processes. The sub-committee also looks forward to reviewing the terms of reference for the joint Working Group once the Conservation Committee has conducted its review.

8.2 Consider information from platforms of opportunity of potential value to the Scientific Committee

SC/63/WW3 presented the Pacific Whale Foundation's 'Whale and Dolphin Tracker' (WDT) software (*http://www.pacificwhale.org/content/whale-and-dolphin-sightings*), a novel web-based data management system that provides real-time relative cetacean abundance and distribution data. The WDT software uses the popular open source content management system DRUPAL (*http://www.drupal.org*). DRUPAL's critical feature is its customisability. New cetacean species codes and data fields can be created without editing any code. WDT would be relatively easy to implement on a large scale in consultation and collaboration with whalewatching operations and management agencies.

Benefits of WDT include, *inter alia*:

(1) Real time reporting provides vessels with a synopsis of sightings and minimises time locating cetaceans; web-based accessibility allows broader access to sightings data in real-time. Its immediacy and flexibility make this program very valuable.
(2) Sighting maps provide a predictive tool and help access yearly, seasonal and daily distribution patterns, although with biases due to failure to provide equal coverage of a particular area (non-random coverage).
(3) Real-time maps of cetacean sightings detailed over a 48-hour period can be posted to a whalewatching operator's website and displayed via other public media. Access to this information validates the presence of cetaceans in the area, reinforcing the rationale for best practices on the part of whalewatching operators.

A shared, web-based system such as WDT would substantially contribute to the understanding of distribution and relative abundance of cetaceans in key areas of the world and would be a tremendous research and management tool in combination with other systematic efforts.

The sub-committee welcomed the development of this software. Features that were especially welcomed were its ability to be customised and its affordability (it is free). While clearly such non-effort-corrected data will need to be used

carefully, this software represents an impressive advance when using platforms of opportunity for data collection.

In response to a question regarding how it can minimise time spent with animals (clearly it will minimise search time), it was noted that if operators know where all the animals are, they will not feel compelled to remain with any one cetacean group, but will have confidence that other groups are nearby. When one member praised the software's advantages over Logger but noted that linking it with a GPS system would correct the one disadvantage, the presenter clarified that a grant was recently received to integrate a GIS system with the software. He further clarified that the software would soon be available on smart phones and downloads of data could be delayed, making its use feasible on small, open boats with little protection for electronic gear such as laptops or in areas with little telecommunications coverage. One member expressed concern about attracting excessive numbers of boats to limited groups of animals, but the download delay feature was offered as a way to minimise this risk.

The presenter described how the system will be disseminated, through non-governmental organisations and throughout the operator community. However, he considered the challenge to be getting the software distributed to governmental management agencies worldwide. The sub-committee **recommended** making this software available on the Commission website.

Ritter *et al.* (2011) presented results of a study using platforms of opportunity in the waters of La Gomera (Canary Islands), where 23 cetacean species have been documented. Through collaboration between the non-governmental organisation MEER and local whalewatching operators, a long-term sighting scheme covering 1995-2010 has collected data on relative cetacean abundance year-round from whalewatching vessels. A total of 5,712 sightings were made for six species/species groups. Except for beaked whales, the total number of sightings differed substantially from year to year. For common and rough-toothed dolphins, there was a statistically significant decrease in sighting numbers over the study period, while bottlenose dolphins showed a conspicuous break in abundance after 2002 and a slow increase thereafter. The number of pilot whale sightings increased markedly. Baleen whale sightings overall were low.

Environmental and oceanographic variables act as determining factors, e.g. of prey abundance, and may be highly unpredictable over months or years. As a consequence, inter-annual changes in environmental conditions will influence habitat partitioning. It was concluded that the variation in cetacean abundance off La Gomera reflects such changes in suitability of the environment for each species. Habitat partitioning in a multi-species habitat may be in sensitive equilibrium and changes in abundance will only be possible within the range of a species' general habitat requirements and in accordance with its ability to react to environmental variability. Long-term abundance trends may be related to climate change effects and their consequences for overall habitat quality and suitability. The potential long-term changes in environmental variables and their relation to cetacean abundance will be subject to future investigations.

In discussion, it was noted that Ritter *et al.* (2011) specifically mentioned using whalewatching data to look at climate change effects. It was suggested that Ritter prepare a paper for SC/64 that expands on how this might be best accomplished. One member urged caution when using descriptive data to model climate change effects on cetacean distribution, as descriptive data and data collected over a narrow portion of a species' range are not the best choice for predictive models. Another member noted that studies on climate change and whalewatching are currently being done at Aberdeen University and that long-term data sets such as those collected from whalewatching vessels can nevertheless be valuable in examining long-term environmental trends such as those related to climate change.

8.3 Review whalewatching guidelines and regulations

Carlson reported that the updated compendium will soon be online. Several members noted the compendium's usefulness, with various countries, regional agreements such as ACCOBAMS, and non-governmental organisations consulting it to develop their own guidelines. A discussion about the scientific basis for many of these whalewatching guidelines ensued. It was clarified that one of the motivations for initiating the LaWE was to ground-truth many of the guidelines found in the compendium. Several members noted that developing guidelines based on best practice now, even without scientific underpinnings, is precautionary and removing restrictions as research shows them to be unnecessary is easier logistically than imposing restrictions after an industry is allowed to develop without regulation. The sub-committee **agreed** that the Commission should continue to host the compendium on the website, but that the guidelines developed several years ago by the sub-committee should be revisited at SC/64, and possibly updated.

SC/63/WW1 summarised several studies published over the preceding year that are relevant to the effectiveness of whalewatching guidelines. In New Caledonia, Schaffar *et al.* (2010) collected data on vessel interactions with humpback whales and resultant whale behaviour from a land-based vantage point with the aid of a theodolite. At least one whalewatching vessel was near whale groups 52% of the time and more than three vessels were near whales 30% of the time. Vessels were more likely to interact longer with adult groups with no calves than with groups containing a calf, but the average approach distance was closer (67.7m) for groups with a calf than for non-calf groups (137.3m). The authors recommended that whalewatching regulations be implemented.

Kessler and Harcourt (2010) was a review of swim-with-whale tourism in Tonga. In 1992 there was only one whalewatching operator, but by 2010 there were 24 applications for whalewatching licenses. The Tonga Whale Watching Operators Association developed a set of whalewatching guidelines in 2001, while governmental whalewatching regulations were developed in 2003. However, the latter were not officially approved and therefore are not legally enforceable. In 2008, the Tongan Government passed the 'Whale Watching and Whale Swimming Act', identifying two types of operator licenses: one for operations watching whales, and one for swim-with-whale operations. However, no regulations were introduced, making the guidelines voluntary.

A survey of swim-with-whale tourists gauged tourist support for various potential regulations for whalewatching trips. The least popular potential regulation was a tether line, a method used to control tourist interactions with minke whales during swim-with tours in Australia. The authors highlight a lack of guidelines when swimming with mother-calf pairs, which is of concern as mother whales may be more protective and might injure swimmers, and both mother and calf might be more susceptible to disturbance.

One member urged caution in interpreting this last paper, as a survey before tourists took a trip might have produced completely different results from the 'after' survey conducted here, i.e. tourists actually on a swim-with-whale trip might have fewer concerns about their impacts. Again, the sub-committee welcomed this review and asked Parsons to prepare this review again for the next meeting.

8.4 Review of collision risks to cetaceans from whalewatching vessels

Some aspects of SC/63/E4 were pertinent to the sub-committee's agenda. In Hawaiian waters, an extensive awareness campaign was initiated in 2003-11 to address vessel collisions with whales, resulting in an increase in the number and accuracy of collision reports. Of the 68 confirmed reports of vessel collisions with humpback whales in Hawaiian waters during this period, the vessel type was known in 52 cases and 34 of these were classified as tour boats (e.g. snorkel and whale watch). The authors suggested that this latter category of boat, which carries many passengers, is more likely to report than many other vessel types.

The presenter noted that due to their awareness and concern for this issue, the whalewatching vessels in the area were very helpful to official efforts to respond in real time to ship strike reports, and this had resulted in the ability to gather useful *in situ* data from ship-struck animals. In discussion, he clarified that collisions do not occur between whalewatching boats and whales they are watching, but rather during transit to whalewatching sites.

In response to a question, it was clarified that in only a few instances was the outcome of a collision known to be fatal. In some instances, divers went into the water and found that serious injuries, such as propeller wounds, had been inflicted even though observers on deck felt the collision had had little or no impact. A discussion about whales deliberating colliding with (ramming) boats ensued, with it being noted that some cases had been reported where whales 'charged' boats in certain circumstances that were perceived as potentially being aggressive toward the vessel – during seismic activity, for example. Other examples were given and it was suggested that whales making contact with boats may be a species-specific behaviour, with deliberate approaches possibly being more common than realised.

The presenter noted that there are many variables at play in collisions and in early days of establishing networks for reporting entanglements or (as here) collisions, an increase is noted, which is really an increase in reporting, not in incidents. Before this Hawaiian outreach programme began, a survey found that probably one out of four collisions was recorded, so the outreach effort is seeking to identify the other three-quarters. There was some indication that the collision rate has been decreasing due to the outreach programme, as people realise they need to be more cautious.

SC/63/BC2 reported on a modelling exercise to determine the number of 'surprise encounters' and 'near misses' of humpback whales based on data collected systematically from a fleet of whalewatching vessels in Maui, Hawaii during the 2011 humpback breeding season. Whale density near vessels was estimated during 15-minute scans and recorded a surprise encounter each time a whale surfaced within 300m from the vessel without prior detection by observers and crew. The study found 3% of all sightings were surprise encounters. The majority of surprise encounters were with adults, but the proportion of calves and sub-adults in the 'surprise encounter' category was significantly greater than the proportion found in the general population. Near misses were defined as surprise encounters that occurred off the bow of the moving vessels and at a distance of ≤80m. The authors estimated a corrected value that suggested a 5.5% chance of surprise encounters becoming likely whale-vessel interactions. Further investigation is needed to determine if there is a whale age class or sex bias, or if certain individual whales are more likely to approach vessels and become involved in surprise encounters or near misses.

It was clarified that when this paper was discussed in the Working Group on Bycatch and other Human-Induced Mortality, there was no agreement on the definition of a near-miss. In response to a question, it was noted that there were no surprise encounters within 50m of vessels, probably because all vessels operate at 15 knots or less when transiting to whalewatching sites, and when watching whales vessels operate at 6 knots or less, and this generally allows for detection of animals within 50m of the vessel, although another member noted that collisions have occurred at slow speeds.

9. WORK PLAN

The work plan prioritised major items as listed below.

(1) Assess the impacts of whalewatching on cetaceans (methods and results of changes in behaviour and movement patterns; methods and results of physiological changes to individuals; and methods and results of demographic and distributional changes).

In addition, the following items were **recommended** for the next meeting.

(2) Review reports from Intersessional Working Groups: (i) Large-Scale Whalewatching Experiment (LaWE) steering group; (ii) LaWE budget development group; (iii) online database for world-wide tracking of commercial whalewatching and associated data collection; (iv) swim-with-whale operations; and (v) in-water interactions.
(3) Review the scientific aspects of the report from the Conservation Commission.
(4) Review whalewatching in the region of the next meeting.
(5) Consider information from platforms of opportunity of potential value to the Scientific Committee.
(6) Review of whalewatching guidelines and regulations.
(7) Review of collision risks to cetaceans from whalewatching vessels.

Next year the sub-committee will focus on:

Item 1: Agent-based models (ABM) of cetacean behaviour are an emerging tool to simulate and test population consequences of disturbances. The sub-committee will review specific case studies of agent-based simulations used in assessing population consequences of disturbances, inviting participants that have implemented such models. The sub-committee will assess their suitability for the particular remits of WW and ascertain data requirements for such models to be implemented in WW case studies. Finally, the sub-committee will encourage communication with other sub-committees that have highlighted their interest in ABM modeling approaches (EM).

Item 4: Central America, in particular Bocas del Toro, Panama, was identified as a location of concern regarding whalewatching impacts on cetaceans and will be a subject of special attention for next year's sub-committee, with appropriate invited participants.

Item 6: In the sub-committee's review of whalewatching guidelines and regulations, it will review, and where appropriate recommend revision of, the IWC guidelines (IWC, 1997). The sub-committee will identify experts who are doing research on efficacy of guidelines and regulations and will bring them forward as invited participants.

10. OTHER MATTERS

Scheer (2010) reviewed 26 scientific publications on free-ranging swim-with-cetacean or provisioning encounters, including those involving 'lone sociable' dolphins. Cetaceans from 10 odontocete and one mysticete species were reported to show 53 different behaviours, with 33 described as affiliative, 18 as aggressive/threatening (defined as those putting humans at risk of injury) and 2 as sexual. An ethogram was created and behaviour occurrences were recorded by species and geographic sites. Due to varying research designs, observational biases could not be excluded and comparability of results was therefore difficult. Aggressive and potentially life threatening behaviours were exhibited by pilot whales (*Globicephala macrorhynchus*) from Hawaii but not from the Canary Islands and the author suggested that this might be due to regulations in the Canary Islands for swim-with-cetacean encounters.

Overall, aggressive/threatening behaviours were reported mainly for food-provisioned and 'lone sociable' dolphins and these might be responses to inappropriate human contact such as teasing dolphins with fish or touching sensitive areas. Sexual behaviours were only described for 'lone sociable' dolphins. This review could be used to instruct swimmers and waders to recognise affiliative, aggressive/threatening or sexual behaviours, so they may judge whether to continue or terminate their encounter. Researchers might use the ethogram *a priori* for future studies.

Simmonds noted that Eisfeld *et al.* (2010) was not included in Scheer (2010). Eisfeld *et al.* (2010) concerned a young female bottlenose dolphin, called a 'solitary, sociable dolphin', off the coast of Kent, UK. The study recognised 39 different behaviours.

Simmonds queried the use of the term 'aggressive' to describe some of the more robust interactions witnessed between dolphins and swimmers, but agreed that behaviour seemed to become more dangerous over time for both swimmers and dolphins.

One member noted that a recent survey in the Dominican Republic found that tourists think that dolphins 'like' to swim with people (Draheim *et al.*, 2010) and there were concerns that people fail to realise that cetaceans can seriously injure or even kill humans. Several other examples were provided of potentially dangerous behaviour by cetaceans. It was also noted that several swimmers have been injured in captive swim-with encounters, so certainly dangerous behaviours occur there and can be identified. The sub-committee noted that sequences of behaviours might be used to predict if an injury will occur in encounters with cetaceans and **agreed** to establish an intersessional email group to further work on this topic (see Table 1).

Carlson presented the observer's report for the Protocol Concerning Specially Protected Areas and Wildlife in the Wider Caribbean (SPAW). One activity was related to the work of the sub-committee. A Marine Mammal Watching Workshop, a priority activity of the Marine Mammal Action Plan, will be held in Panama on 25-29 October 2011. The workshop is designed as a technical, hands-on exercise for regional tour operators. The goals of the Workshop are to:

(1) assess the extent of problems and needs and identify opportunities in existing marine mammal watching operations;
(2) identify areas with potential for marine mammal watching activities;
(3) document existing marine mammal educational materials;
(4) standardise data collection forms and organise baseline research on cetaceans; and
(5) discuss the formulation of regional codes of conduct for observing marine mammals.

The report of this Workshop will be presented at SC/64.

11. ADOPTION OF THE REPORT

The report was adopted at 16:33 on 6 June 2011. The sub-committee thanked Urbán and Carlson for their wise guidance during the discussions and thanked Rose for her efficient rapporteuring.

Table 1

Intersessional working groups and related information.

Group	Terms of reference	Membership
Large-scale whalewatching experiment (LaWE) (intersessional Steering Group)	Develop the mechanisms through which LaWE can be implemented, including rationale for the selection of procedures, initiate data collation and perform meta-analysis to assess sample sizes required to detect a plausible range of effect sizes and discuss the possibility to use existing IWC procedures to archive and access data of relevance to LaWE.	Lusseau (Convenor), Bejder, Bjørge, Carlson, Rose, Williams
LaWE budget development group	Advance development of a draft budget and funding mechanism for LaWE.	Kaufman (Convenor), Weinrich (co-Convenor), Lusseau
Online database for world-wide tracking of commercial whalewatching and associated data collection	Advise on the design of a database of whalewatching activities and associated data.	Robbins (Convenor), Bejder, Carlson, Lusseau, Weinrich, Williams
Swim-with-whale operations	Continue developing and distributing a questionnaire to assess the extent and potential impact of swim-with-whale operations.	Rose (Convenor), Kaufman, Parsons, Ritter, Sironi
In-water interactions	Identify and investigate potentially dangerous recreational interactions between free-ranging cetaceans and people in the water, emphasising the extent of the problem and research on behavioural 'warning indicators'; identify research gaps and summarise information.	Ritter (Convenor), Simmonds, Parsons, Rose

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Appendix 1

AGENDA

1. Opening remarks
2. Election of Chair and Rapporteurs
3. Adoption of Agenda
4. Review of available documents and information
5. Assess the impacts of whalewatching on cetaceans (methods and results of changes in behaviour and movement patterns; methods and results of physiological changes to individuals; and methods and results of demographic and distributional changes)
6. Review whalewatching in Norway
7. Review of intersessional working groups
   - 7.1 Large-scale whalewatching experiment (LaWE) steering group
   - 7.2 LaWE budget development group
   - 7.3 Online database for world-wide tracking of commercial whalewatching and associated data collection
   - 7.4 Swim-with-whale operations
8. Other issues
   - 8.1 Review scientific aspects of report from the Commission's intersessional whalewatching Workshop
   - 8.2 Consider information from platforms of opportunity of potential value to the Scientific Committee
   - 8.3 Review of whalewatching guidelines and regulations
   - 8.4 Review of collision risks to cetaceans from whalewatching vessels
9. Work plan
10. Other matters
12. Adoption of the report

Appendix 2

WHALEWATCHING IN NORWAY AND RELATED INFORMATION

Prepared by Frederick Broms and Carole Carlson

WW areas and major operations	Company	Platform	Species	Research?	Guide?	Regulations/ codes of conduct	Other
Andenes, Vesterålen	Whale Safari	Boat (2 vessels)	*Physeter macrocephalus,* occasionally *Orcinus orca, Balaenoptera acutorostrata, Globicephala melas, Phocoena phocoena, Megaptera novaeangliae, Lagenorhynchus acutus, L. albirostris* (rare), *B. physalus*	Yes	Yes, researcher or student	Guidelines in place by company	Largest Arctic whalewatching company. Education centre offers photo-id courses. Sperm whale and killer whale research, using photo-id, acoustics, land-based surveys, and biopsy sampling. Whale museum.
Stø, Vesterålen	Arctic Whale Tours	Boat	*P. macrocephalus, O. orca, B. acutorostrata, G. melas, B. physalus, L. acutus, P. phocoena, M. novaeangliae*	Yes	Yes	Guidelines developed with WDCS	Combine whale, seabird and seal tours to Bleik Canyon and Anda Nature Reserve. Information centre. Sperm whale is the main study species in collaboration with Institute for Marine Research.
Tysfjord	Orca Tysfjord	Boat	*O. orca*	Yes	Yes	Guidelines in place by company	Offer snorkelling with killer whales. Research on photo-id, sound analysis and behavioural observations. The project is named 'NORCA' (Norwegian killer whale project) and consists of a network of researchers studying killer whale behaviour in this area.
Andenes	Sea Safari Andenes	Ribs	*P. macrocephalus,* occasionally *O. orca, B. acutorostrata, G. melas, P. phocoena, M. novaeangliae, L. acutus, L. albirostris* (rare), *B. physalus*	Colla-boration with Whale Safari	Yes	No	Main focus is seabirds but offer seal and whale safaris.
Svolvær, Lofoten	Lofoten Charterbåt AS	Boat	*O. orca*	No	Yes	No	Killer Whale Safari one of many tours offered (coastal tours, Sea-Eagle Safari, fishing trips). Offer killer whale safaris to passengers of the coastal steamer *Hurtigruten*.
Lofoten	Arctic Rib	Boat	*O. orca*	No	Yes	No	Killer Whale Safari one of many tours offered (coastal and mountain, midnight sun, rib and sail).
Lofoten	Lofoten Opplevelser	Boat	*O. orca, G. melas, B. acutorostrata*	No	Yes	No	Offer snorkelling with killer whales.
Narvik	Fjordcruise	Boat	*O. orca*	No	Yes	No	Killer Whale Safari one of many tours offered (fishing and sea eagle tours).
Vesterålen	Photo Expedition Norway	Boat	*P. macrocephalus*	No	Yes - Arctic Whale Tours	Yes - Arctic Whale Tours	Offer 3-day whalewatching excursions leaving from Andenes (Arctic Whale Tours).
Vesterålen	Island Adventures	Boat	*P. macrocephalus, O. orca*	No	?	No	Tour packages include whale safaris.
Beiarn, Øksneshamn	Lødingen Skyss-båtsevice AS	Charter boats	*O. orca*	No	?	No	Charter boat service offering killer whale safaris and possible diving with killer whales.
Various regions	Tornado Adventures	Ribs	*O. orca*	No	?	No	Tour company offering killer whale safaris.