Annex M

Report of the Sub-Committee on Whalewatching

Members: Kato (Chair), Abdoulkarim, Abramson, Aguayo, An, Baker, Belgrano, Best, Bjørge, Bolaños, Carlson, Chilvers, Choi, Cozzi, Dahood, Dawson, de Andrade, de Stephanis, Dulan, Etienne, Farais, Flores, M., Flores, P., Fortuna, Freitas, Fuentes, Funahashi, Jaramillo, Jeremie, Gallego, Galletti, Garrigue, Gedamke, Groch, Heinrich, Hucke-Gaete, Hurbungs, Iñiguez, Kasuya, Lens, Levy, Marcondes, Mattila, Moon, Moraga, Olafsdottir, Palma, Panigada, Parsons, Ponce, Prieto, Ray, Razafindrakoto, Robbins, Rose, Rossi-Santos, Rowntree, Sanino, Schaffar, Scheidat, Senu, Sequeira, Simmonds, Sironi, Slooten, Stachowitsch, Štrbenac, Taylor, Urbán, Vely, Weinrich, Wilkin, Williams, Yanez.

1. CONVENOR'S OPENING REMARKS AND TERMS OF REFERENCE

Kato welcomed the members of the sub-committee and noted the priority items identified by the Scientific Committee: (1) review of the report of the workshop on strategic planning of large-scale whalewatching research; (2) developing methodology of and assessing the biological impacts of whalewatching on cetaceans; (3) identifying data sources from platforms of opportunity of potential value to the Scientific Committee. In addition, the following items were identified: (1) review reports from Intersessional Working Groups: preparation and conduct of a meta-analysis to assess the influence of cetacean biology and ecology on short-term impact effect size from whalewatching vessel traffic; identifying data sources from platforms of opportunity of potential value to the Scientific Committee; and further development of a questionnaire to assess the extent and potential impact of swim-with-whale operations; (2) review of whalewatching guidelines and regulations; (3) review of risks to cetaceans from whalewatching vessel collisions; and (4) review of whalewatching in South America.

2. ELECTION OF CHAIR AND APPOINTMENT OF RAPPORTEURS

Kato was elected Chair and Carlson was appointed rapporteur with assistance from Rose.

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/60/WW1-5, 7-11; SC/60/BC1; SC/60/BRG1, 2; SC/60/DW3, 18; SC/60/SH19; SC/60/SM11; SC/60/Rep6; Bolaños *et al.,*2007; Pereira *et al.,* 2007; Simmonds and Stansfield, 2007.

5. REVIEW OF THE REPORT OF THE WORKSHOP ON STRATEGIC PLANNING OF LARGE-SCALE WHALEWATCHING RESEARCH

Bjørge introduced SC/60/Rep6, the Report of the Intersessional Workshop to Plan a Large-Scale Whalewatching Experiment (LaWE), held in Bunbury, Australia, 30 March to 4 April 2008. Topics discussed at the Workshop included: status and knowledge of whalewatching - strengths and weaknesses of current EIAs; cetacean biology and ecology - key variables to monitor; data requirements for modelling approaches; study design - prioritising of variable to sample; study site feasibility; and the development of a proposal for a large-scale study (LaWE). The full report of the workshop can be found as SC/60/Rep6.

Participants of the Workshop noted the importance of having experts from a variety of disciplines, in particular a good statistician, to give advice on experimental design, and a physiologist to link behaviour to energetic responses. Some members noted specific species and locations that may be suitable for this experiment. It was clarified that the Workshop's remit was to develop a general experimental design, prioritise variables to monitor and identify available and novel techniques to monitor these. The Workshop did not finalize a list of experimental species and sites.

The sub-committee expressed their thanks to Bjørge (Chair), Lusseau (convenor), Bejder (logistics) and Weinrich (rapporteur) for their efforts and endorsed the report of the Workshop.

Section 7 of the Workshop report addressed a proposal for a large scale study (LaWE). In discussion, Bjørge clarified that the report contains only brief details of the workshop discussion on that topic and that a more formal proposal is in the process of being crafted. The Workshop had formed an Editorial Board to complete this task, which now is planned for presentation at SC/61. The sub-committee encouraged that this work be completed and agreed that the Editorial Board from the Workshop be elevated to an intersessional steering group whose main task is to finalize a draft proposal for a LaWE (Table 2).

The Workshop was originally planned as a pre-meeting of the IWC Scientific Committee, but ultimately was held in Australia, independently of the Scientific Committee. Some members commented that they were unaware of the change in planning and felt that this prevented some of those with interest from participating. The chair of the Workshop clarified that there were logistical reasons for this change and that additional funding outside of the IWC allowed the expansion of the Workshop from a 2-day pre-meeting to a 4-day workshop. He further noted that the topic of Scientific Committee pre-meetings would be discussed in a broader context during the Plenary.

The sub-committee expressed appreciation for this clarification but recommended improved communication both with regard to the logistics and the scope of the Workshop and further work on the LaWE. After discussion, the sub-committee agreed that a second intersessional working group, representing regional and species expertise, would be established to interface with and advise the steering group (Table 2). In addition, the sub-committee agreed that the Excel spreadsheet presented at the Workshop detailing whalewatching sites be expanded by convening a small working

group. Some members expressed interest in discussion papers from the Workshop not previously discussed in the Sub-committee. It was suggested that these papers be made available through the Secretariat. Weinrich noted that he would facilitate their availability to the sub-committee.

6. REVIEW OF WHALEWATCHING IN SOUTH AMERICA

Iñíguez and colleagues presented an overview of whalewatching in South America, providing for each country information on target species, communities where whale watching occurs, platforms, research studies (res) related to whale watching and existing laws (reg) regulating the activity (Table 1). Information also was extracted from Hoyt and Iñíguez (2008) and Mardecetaceos (www.mardecetaceos.net).

Members of the sub-committee raised concern about the aerial whalewatching activities reported in Chile and Brazil and the potential disturbance to whales, in particular those activities involving helicopters. Angle of approach, acoustic disturbance and casting of shadows were discussed. It was noted that this activity is common in Kaikoura, New Zealand and although regulated to minimize disturbance, instead of hovering over the animals to minimize noise, helicopters often circled animals for better viewing. After discussion, the sub-committee agreed that more information on aerial whalewatching would be of interest and asked Parsons to collate information for presentation at SC/61.

Bolaños *et al.* (2007) presented a review of the origin and development of whalewatching in Aragua State, Venezuela, where a proposal for the development of responsible dolphin watching is being promoted by NGOs, local community leaders and entrepreneurs. The proposal is based on scientific data collected since 1996 and training courses have been offered routinely to the local community since 2003. The proposal called for a code of conduct that includes a 'rest period' of 1 or 2 days per week in which operators would not offer dolphin watching trips and a request that scientific research and monitoring be conducted on permitted vessels. Such guidelines could benefit environmental authorities responsible for regulating dolphin watching in other areas, including Mochima National Park, Wildlife Refuge Caño Guaritico, Lake of Maracaibo and Orinoco Basin, where dolphin watching operations occur and vulnerable freshwater species are targeted.

Members of the sub-committee commended the development of the guidelines, in particular the concept of a full day 'rest period'. Having a full day with no boat exposure from whalewatching activities allows cetacean to pursue all of their activities within a 24-hour period and prevents disruption during potentially important periods. It was noted that in Kaikoura, New Zealand, dolphin tour operations are requested to respect a voluntary mid-day rest period during summer. However, a spotting vessel is used at other times of the year so that tour boats will not lose track of the dolphins when they resume operation.

It was suggested that as SC/61 will be held in Madeira, Portugal, local scientists should be encouraged to submit information on whalewatching in the region. The sub-committee agreed that a review of whalewatching in Portugal (Azores, Madeira), the Canary Islands and the Strait of Gibraltar would be of interest for next years' meeting. Sequeira offered to collate information on whalewatching in these areas for presentation to the sub-committee at SC/61.

7. DEVELOPING METHODOLOGY AND ASSESSING THE BIOLOGICAL IMPACTS OF WHALEWATCHING ON CETACEANS

7.1 Short-term methods and results

SC/60/WW1 presents a review of recent advances in whalewatching research and summarizes five papers on short-term impacts. This includes Stockin *et al*. (2008), which described behavioural changes of common dolphins (*Delphinus* sp.) as the result of boat activity in the Hauraki Gulf, a shallow semi-enclosed coastal sea on the east coast of the North Island of New Zealand, an area where boat traffic is diverse. Common dolphins spent more time 'travelling', 'milling' and 'socializing' in the presence of tour boats and less time 'foraging' and 'resting'. Foraging time was reduced by nearly 12% and could ultimately result in population level impacts.

Stamation *et al.* (2007) monitored migrating humpback whales (*Megaptera novaeangliae*) from whalewatching vessels (2002, 2003 and 2005) and two land-based whale-watching sites on Montague Island (2002-2005) off the coast of New South Wales, Australia. Results indicate that although the rate of and interval between feeding lunges did not change with the presence of whalewatching vessels, the interval between feeding lunges significantly increased when whalewatching vessels were not compliant with local regulations, or when more than one vessel was present. Based on these data, the authors suggested modifications in the regulations to reduce impacts on the whales' foraging behaviour.

Last year's review (Scarpaci *et al.* 2007) noted two studies that document behavioural changes as the result of tourism traffic in the marine tucuxi or estuarine dolphin *Sotalia guianensis* (do Valle & Cunha Melo, 2006; Santos et al., 2006). Carrera *et al.* (2008) also documented impacts of boat traffic on this species in Baía dos Golfinhos (Dolphin Bay) in northeast Brazil, before, during and after boats entered the Bay. Results show that the average number of dolphins observed in the Bay was significantly higher when no boats were present, and numbers increased slightly, although not significantly, after the boats left the Bay. Behavioural displays associated with foraging also were significantly reduced when boats entered the Bay. The reduction of foraging behaviour could have a population level effect on this population, particularly as this species can display a high degree of residency and site fidelity and may thus be exposed to chronic disturbance and harassment.

Table 1.
Whalewatch activities in South America and related information as presented by Iñíguez, Avila, Belgrano, Bolaños-Jimenez, Castro, Cipolotti, Flores, Fuentes, Galletti, García, Groch, Rossi-Santos and Sironi.

Country	Yr	WW Communities/ Areas	Platfrm	Species	Res?	Reg?	Other
Argentina	1983	Península Valdés, Playa Unión, Puerto Deseado, Puerto San Julián, Rio Negro	Boat Land	*Eubalaena australis, Lagenorhynchus obscurus, Orcinus orca, Cephalorhynchus commersonii, Lagenorhynchus australis*	Yes	Yes	Southern right whale declared a 'National Natural Monument' Provisional Law 5714 from Chabut regulates whalewatching with Southern right whales since 2008
Brazil	1980	Praia do Forte, Abrolhos Bank. Itacare (Bahia State), Laje de Santos Marine State Park, Southeast Brazil., Laguna, Garopaba, Baia Norte (Santa Catarina State), Cananéia, Paraná State, Praia da Pipa, Rio Grande do Norte State, Park of Fernando de Noronha, lagoon-estuaries in southern Brazil, parts of the Amazon	Boat Land Swim	*Inia geoffrensis, Sotalia fluviatilis, Stenella longirostris, Megaptera novaeangliae, Balaenoptera acutorostrata, Steno bredanensis, Tursiops truncatus, Sotalia guianensis, Eubalaena australis, Balaenoptera edeni.*	Yes	Yes	Laguna, Garapoba area designated Right Whale Environmental Protection Area in 2000. Baía Norte and Cananéia have marine protected areas which encompass part of the Guiana's distributional range
Chile	1994	Francisco Coloane Marine Park, Fitzroy Channel (Magallanes, XII Region), Punta de Choros and Chañaral de Aceituno (III and IV Regions), Isla de Chiloe, Guaitecas Archipiélago.	Boat Land Aerial	*Tursiops truncatus, Globicephala spp, Grampus griseus, Delphinus delphis, Physeter macrocephalus, Megaptera novaeangliae, Balaenoptera musculus, Balaenoptera physalus, Lissodelphis peronii, Cephalorhynchus eutropia, Lagenorhynchus australis, Cephalorhynchus commersonii, Orcinus orca, Balaenoptera borealis.*	No	Yes	Guidelines for blue whales and other species have been implemented by the Chilean navy in 2007.
Colombia	1980	lakes adjacent to the Amazon river; Bahía Malaga, Gorgona National Park, Tribuga and Cupica gulfs. Caribbean (Santa Marta, Islas del Rosario National Park): Pacific (Bahia Malaga and Tribuga and Cupica gulfs)	Boat	*Inia geoffrensis, Sotalia fluviatilis, Megaptera novaeangliae*	Yes	Yes	Watching is regulated by the General Maritime Direction (DIMAR: Directiva 001/ 2001 Small boats (30-40')
Ecuador	1980	Machalilla National Park, Guayaquil Gulf (Posorja and El Morro), Galápagos	Boat	*Tursiops truncatus, Balaenoptera brydei, Physeter macrocephalus, Globicephala macrorhynchus; Megaptera novaeangliae, Stenella attenuata, Orcinus orca, Inia geoffrensis, Sotalia fluviatilis, Delphinus delphis.*	Yes	Yes	Puerto Lopez organized first whale festival in 1999 Small vessels with guides
Peru	1985	El Callao, Pucusana, Peruvian forest, Pisco	Boat Land	*Inia geoffrensis, Sotalia fluviatilis, Tursiops truncatus, Lagenorhynchus obscurus, Delphinus spp., Phocoena spinipinnis, Megaptera novaeangliae, Physeter macrocephalus, Balaenoptera brydei*	No	No	
Uruguay	2001	Maldonado	Boat Land	*Eubalaena australis, Tursiops truncatus, Orcinus orca, Pontoporia blainvillei.*	No	Yes	A decree (decreto261/02) was developed regulations for vessel operation was developed
Venezuela	1980	Puerto La Cruz and Mochima, Ocumare de la Costa de Oro	Boat Land Swim	*Delphinus capensis, Balaenoptera brydei, Stenella frontalis, Tursiops truncatus, Sotalia guianensis, Inia geoffrensis*	Yes	No	

Sironi presented SC/60/WW3 and SC/60/WW4, detailing the results of a study to quantify changes in behaviour and movement patterns of southern right whales that resulted from controlled experiments involving the presence of three swimmers in the vicinity of the whales. The study was conducted in response to a request by the local dive operators to the Office of Conservation of Chubut Province in Argentina. Data were collected with a theodolite during the 2005 and 2006 right whale nursery seasons in Golfo Nuevo at Península Valdés. During 153 interactions with swimmers, a total of 465 behavioural transitions were obtained. A significant decrease in transitions from resting to resting (-29%) (i.e., remaining in a resting state) and in social to social activities (-29%) was observed. Resting to travelling transitions significantly increased by 24%, and surface active/social to travelling increased by 26%. Mother/calf pairs showed the greatest changes in movement patterns, avoiding the boat and swimmers, increasing their travel speed and reorienting more. Juveniles did not increase their travel speed but swam in less linear paths, sometimes approaching the swimmers while interrupting their normal activities to do so. Adults and mixed-age groups did not significantly change their movement patterns but they posed a greater risk to swimmers.

The authors conclude that given the difficulty in evaluating the potential impact of this activity on population variables such as reproductive and mortality rates, it is advisable that government authorities follow the Precautionary Principle when making management decisions on commercial activities that involve vulnerable species like the right whale. In addition, if swimming with whales is legalized in Chubut, it will be critical to begin a long-term monitoring program to document the behaviour and movement of the whales in areas where it occurs. The risk to swimmers was not evaluated in this study, but is an important variable to be considered.

The sub-committee congratulated Sironi on his team's work. Some members raised concern that a control was not used to examine and separate the effects of the vessel approaching the whales at 10-20m from the divers' presence. Sironi replied that experiments on controlled vessel approaches to whales with varying distance and speed were conducted by others in the area. The members encouraged Sironi to examine possible impacts of vessel approaches in future swim-with studies.

SC/60/WW8 describes the level of exposure of humpback whales to unregulated whale watching activities in their main reproductive area in New Caledonia. Between 2005 and 2007, 175 independent tracking sessions were completed from a land-based research station using a theodolite. On average, whales were in the presence of 3.4 boats for two hours. Forty-three percent of all groups were in the presence of boats for over two hours, and sometimes up to six hours. Boats tended to spend more time at closer distances with groups containing calves. Humpback whales are highly exposed to boats in New Caledonia with the number of boats, distance of approach and time spent with whales all above the limits usually enforced by management measures worldwide. Therefore, the authors recommended the implementation of regulations.

Schaffar noted that new results indicate that the behaviour of whales tracked before the arrival of boats and while boats were present showed that 96% of the groups significantly changed their behaviour when in the presence of boats; re-orientation rate was the variable most affected. There was no general trend in increase or decrease in the behavioural variables measured, emphasising the fact that calculating means may average out the overall response to the presence of boats.

The sub-committee welcomed the report and new information, noting the high rate (96%) of behavioural change observed. and encouraged Schaffar to present the results at next years' meeting. When asked if residency time varied among different classes of individuals to determine if all were likely to be affected evenly and if reproductive rates had been determined, the author responded that there were insufficient data to answer either question.

SC/60/WW10 presented a review and combined analysis of studies on whalewatching effects published to date. A 32,000 entry Microsoft Access database of marine mammal literature was searched for a variety of keywords; additional sources were also searched. In all, 55 sources were reviewed: 43 from peer-reviewed literature and 12 from grey literature (e.g., government reports, theses, conference abstracts). Species most studied were bottlenose dolphins (17 studies), humpback whales (10), and killer whales (*Orcinus orca*; 8), with 14 studies on mysticetes and 40 on odontocetes. Studies took place in N. America (20), Australia/New Zealand (17), South America (10), Europe (5), Africa (2), and Asia (1). A variety of habitat types were studied: Year-round (25), Feeding grounds (11), Combined (7), Breeding/Calving (6), Migratory Corridor (4) and 'Other' (2). Sixteen studies were before/after control-impact (BACI) studies, while 39 did studies on different groups of animals as control and test groups. Each study was given a highly subjective categorical ranking of quality based on a variety of factors, including study design, sample size, and analysis. Thirteen studies were rated as 'excellent', 5 'very good', 28 'good/average' and 9 'fair'." Study reviewers commented that many studies had small sample sizes, authors did not present data sets clearly even when presenting test results, statistical tests were poorly presented with key values missing, and a wide variety of different measures were reported (e.g., s.d., s.e., variance).

The authors acknowledged that the methodology used in the literature search in WW10 may have resulted in missing sources that used titles or keywords that did not reflect relevant content, so additional sources may be contained in future reviews or analyses.

Pereira *et al*. (2007) described surface behavioural responses of marine tucuxi dolphins (*Sotalia guianensis*) to boats were studied in a protected area in southern Brazil from 1993 through 2003. In boat-dolphin encounters 64.3% (n = 428) caused negative responses and 0.03% (n = 2) produced positive ones, while 35.4% (n = 235) resulted in no reaction. Behavioural responses of dolphins showed decreased negative response and increased neutral response over the years. Sixty percent of the encounters occurred inside the Dolphin Exclusive Zone (DEZ), a 3,750-ha marine and coastal Conservation Unit (as stated in Brazil's legislation) created in 1992. The DEZ is an approximately 2-km² zone that encompasses the dolphins' core area where commercial, leisure and tourist boats are not allowed (Edict IBAMA 5N of 20 January 1998). Key factors to reduce impact of boat activity may include increased integration and cooperation between boat operators, the scientific community and local people, as well as adequate boat approach enforcement.

Flores further noted that tourism operations target a population of Guiana dolphins with a restricted, discrete distribution. At least some individuals have extremely small home ranges and show strong site fidelity, some for up to 10 years (Flores 1999, Flores and Bazzalo 2004, Flores and Fontoura 2006). The authors strongly recommended that the existing law be properly enforced and that the Management Plan of the EPAA, which is under revision, should be finalized and implemented.

7.2 Long-term methods and results

SC/60/WW9 discussed the concept of resilience, which is now widely used to understand the vulnerability of complex systems to disturbance. Diverse systems tend to be resilient to disturbance. SC/60/WW9 reported on efforts to develop an understanding of the resilience of behavioural systems, and to assess how this measure is related to the diversity of behavioural sequences that were modelled using Markov chains. Resilience of behaviour was related to its unpredictability, a diversity measure, using simulations and empirical data collected at ten study sites on nine delphinid populations. The more predictable behaviour was, the less resilient it became. While these measures cannot be used to compare effect size of disturbance across populations, the measures are meaningfully related to the influence of disturbances when comparing the same population exposed to different ecological conditions over a period of years. Behavioural predictability may be driven by varying ecological conditions. For example, an increase in food availability can increase the duration of foraging bouts, which may impose constraints on the dynamics of the population's behaviour. This, in turn, may increase behavioural predictability and weaken resilience to disturbance. The authors encourage studies of anthropogenic disturbance to consider the ecological conditions under which tourism activities take place, and offer a quantitative framework to evaluate the consequences of different exposures of animal populations to disturbance.

An apparent paradox in the conclusions of WW9 was noted in that the LaWE report SC/60/REP6 suggested that in times of nutritional stress (e.g. times of lowered food availability) animals would be more susceptible to additional stressors such as whalewatching boats. In contrast, WW9 suggests that at times of high prey density, whales engaged in longer feeding bouts that apparently reduced the resilience of the system. This finding is counter-intuitive. The authors suggested that perhaps killer whales exploit periods of high prey availability by increasing their proportion of time spent feeding, but this and many other interpretations remain hypotheses to be tested as more data are collected. The authors note that the framework in its current form was not meant to guide regulation of boat traffic around whales, but rather to provide a quantitative tool to allow consideration of the ecological context in which disturbance takes place. More generally, there was a question as to whether more complex systems, with greater entropy, were truly less susceptible to disturbance or whether it was just harder to find a true signal through greater noise (e.g. they were situations with inherently less statistical power). The authors noted that the framework deliberately does not aim to make cross - study comparisons, but to allow for within - study comparisons.

Concerns were raised about intensive whalewatching activities on breeding grounds, small, resident populations and on populations where whalewatching activities occur throughout their range (breeding, migration and feeding locations). After discussion, the sub-committee agreed that this applies to any important habitat and stage. However, particular attention should be paid to whalewatching pressure on mother/calf pairs in the first several months of the calf's life.

8. REVIEW REPORTS OF INTERSESSIONAL WORKING GROUPS

8.1 Preparation and conduct of a meta-analysis to assess the influence of cetacean biology and ecology on short-term impact effect size from whalewatching vessel traffic

Weinrich presented SC/60/WW10, a meta-analysis of results from the literature review presented in Item 7.1. From the 55 papers reviewed, 1,138 'results', tests, or comparisons were extracted. Among these, 334 results were based on simple frequency comparisons, 445 were based on parametric tests, and 359 were based on non-parametric tests. Variables included the percentage of time an animal displayed a particular behavioural state, orientated in regard to a compass or boat, and exhibited a suite of respiratory variables. Few studies used multi-variate models to look at a suite of factors, but rather presented a simple comparison of frequencies, percents, or statistical comparison of frequencies or means. Hedges' ĝ tests (Hedges and Olkin 1985) were performed on three variables: swimming speed measured on the surface, blow rates, and inter-breath intervals. Only swimming speed showed significant differences. However, the comparisons made were limited by the large variation in studies and differences in research design. In conclusion, the authors felt that meta-analysis can be an important tool in determining which variables may be important indicators of disturbance, and perhaps to tie behavioural modifications to effects on life history parameters. The authors suggested that standardization of methodology between studies is necessary and an appropriate task for the sub-committee to undertake.

The sub-committee welcomed the information presented in SC/60/WW10, and thanked the authors for presenting it. One member cautioned that in such analyses of cetaceans between taxa, responses to disturbance may differ. For example, sperm whales may respond to disturbance by deep diving (i.e., vertical avoidance), whereas some dolphin species may display horizontal avoidance and spend more time near the surface. Another noted that guidelines for conducting meta-analyses demand inclusion of studies that used the same methods, that report the same dependent variable, and ideally, that restrict analyses to the most rigorous studies. The need to exclude studies that demonstrate complex avoidance responses (e.g. Williams and Ashe 2007) may limit the utility of meta-analyses in these cases, including that presented in SC/60/WW10. In the field of assessing impacts of whalewatching on cetaceans, there has been a tendency over time for researchers to inherit a set of industry-standard dependent variables (speed, respiration rate etc) to measure. Researchers are encouraged to consider whether they are measuring the correct dependent variables rather than simply the ones that historically have been collected, and to consider new methods periodically. However, it was noted that this should be integrated with the need for behavioural response studies that measure a number of dependent variables that are comparable across studies (e.g. those necessary for a meta-analysis), and to report in their publications both the variables that do and do not show relationships with boat traffic. Otherwise, meta-analyses like those reported in SC/60/WW10 risk suffering from a bias in which studies that do not detect effects are less likely to get published and be available for inclusion in meta-analyses.

8.2 Identifying data sources from platforms of opportunity of potential value to the Scientific Committee

Robbins described efforts to maintain and expand a database of data collection programs from whalewatching platforms. The intersessional working group maintains information on the location of data collection programs, the data collector, species studied, data types (including whether effort data is collected), study duration and resulting publications. Robbins commented on the difficulty of tracking these programs by standard techniques and recommended that the working group expand in number and diversity to capture more information through local knowledge. She also recommended combining these and other data into a single database summarizing areas where whalewatching occurs, data collection programs and codes of conduct (already maintained by Carlson). This is expected to facilitate the work of the sub-committee, including the development of scientific projects like the

LaWE. A web-based interface, wherein whalewatching operations can keep their own information up to date, may help to ensure that this information remains current.

8.3 Further development of a questionnaire to assess the extent and potential impact of swim-with-whale operations

Rose stated that no new information was available for presentation to the sub-committee but that an update will be presented at SC/61.

9. OTHER ISSUES

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

SC/60/WW2 reports on the use of data gathered by tour operators to examine dusky dolphin long-term occurrence patterns near Kaikoura, New Zealand. The data set contains more than 5,000 usable records gathered between October 1995 and December 2006 and is the longest continuous sightings record of dusky dolphins in the area. The data represent the location of the group closest to the tour boat launch site and are not a full indication of the location of all dolphin groups in the area. For each GPS position, the depth of the underlying water, distance from shore, and distance to the Kaikoura canyon edge were determined; strong seasonal patterns were evident for all variables. The dolphins were on average closer to shore, in shallower water, and farther from the canyon during summer and fall than winter and spring. A closer look at the summer sightings revealed that boats made more trips further south in the first half of the data set (1995-2000) than in later years, but core areas remained relatively stable. While data collected by tour operators have biases, the authors were able to obtain useful biological information from it. In Kaikoura tour operator data fill a gap in research data collection abilities and allow for the comparison of long-term trends.

The sub-committee thanked the author for presenting this thorough and useful study. Other sub-committees within the Scientific Committee have noted the difficulty of obtaining long-term data sets for analyses essential to their work; data gathered by whalewatching vessels could be a valuable contribution.

SC/60/WW11 presented results of an attempt to assess biases of SPUE data from whalewatching vessels. The goal of this project was to analyze three potential sources of bias in whalewatching data. The data set was obtained by using whalewatching companies operating out of two ports (Gloucester and Boston, Massachusetts, USA) and accessing Stellwagen Bank, Massachusetts (a feeding ground for fin, humpback, and minke whales) during summer 2007. Vessel and sightings data were obtained via GPS for the duration of each cruise. Whale sightings data were combined with vessel trackline data to calculate species-specific sightings-per-unit-effort (SPUE) values and compared to 'control values' taken from a 2006 Stellwagen Bank 'Ecological Assessment' (derived from non-whalewatching databases from the same area). Additionally, sightings data from whale watches from 1994-2006 were analyzed for long-term trends in abundance and distribution. Whale watches were broken into two phases: search time and 'whale' time. Compared to the control values, SPUE from whale time and the total trip over-estimated SPUE for all species, while sightings from search time underestimated SPUE values for humpback and fin, but not minke, whales. The departure port for the whalewatching trip had a significant influence on the encounter rate of whales throughout the trip. Gloucester whale watches had SPUE values that were more similar to the control values. The analysis of the long-term trends of marine mammal sightings made clear that the distribution of past sightings affects the survey coverage of a particular habitat and in turn, the interpretation of the distribution of whales based on data coming from whalewatching vessels. The results from this work are useful for developing protocols for standardized data collection aboard whalewatching vessels. Such data collected in a standardized fashion can contribute significantly to studies of cetacean abundance, distribution, and biology.

The sub-committee noted that whalewatchers often find whales by expectation or by using spotting networks. In such cases, trackline information may underestimate effort and lead to overestimates of SPUE. It was noted in discussion that standard suites of effort data already are collected by some long – term data collection programs, including in the Stellwagen Bank area. These data, from multiple whalewatch programs, have been shared to facilitate maximum understanding and significant management decisions by the Sanctuary (i.e. to move an existing shipping lane), due in large part, to the findings of data collected on whalewatch vessels, have been made. It was further noted that labor and cost to collect track data in particular has been reduced with the availability of hand-held GPS units and other logging devices.

Given the importance of such information for the analysis of long-term trends in distribution, the sub-committee recommended the collection of trackline data (a/k/a effort data) from whalewatch platforms. Additionally, data on environmental factors that would affect sightability (e.g. weather conditions) and when observers were on watch, should be collected to the maximum extent possible.

SC/60/SH19 reported on the progress of the Antarctic Humpback Whale Catalogue. Progress continues to stimulate submission of opportunistic data from eco-tourism cruise ships in the Southern Ocean and from research organizations and expeditions working throughout the region. For the period 1981 through 2008, photographs of 627 individuals have been submitted from opportunistic platforms. The availability of these data has broadened our understanding of exchange between areas in the region and in some cases provided information previously unavailable.

SC/60/SM11 reported on a cetacean survey in the Chilean fiords (Usuhaia to Puerto Montt on a platform-of-opportunity (POP). Peale's dolphins were seen over the entire latitudinal range of the survey but Chilean dolphin's were seen in only five locations. The authors conclude that Chilean dolphins were very rare in the main fiords and major channels. They further noted that although POP surveys can involve compromises and resulting data cannot be used to estimate abundance, the data can help design a dedicated survey.

During discussions it was noted that POP surveys can provide valuable information on the distribution of targeted species. Some members suggested that such data can be useful to the Scientific Committee as it provides valuable information that can be used to design robust abundance surveys.

SC/60/DW3 and DW18 describe skin lesions on humpback whales and SC/60/BC1 reviewed entanglement impacts on Gulf of Maine humpback whales. Subsets of data used in these studies were collected on whalewatching vessels. Members of the sub-committee noted that these are examples of other areas of research, besides abundance and distributional data, where information has been gathered by whalewatching vessels. The sub-committee agreed that such data are invaluable contributions to studies on individual and population health as well as understanding rare events.

9.2 Review of whalewatching guidelines and regulations

SC/60/WW1 described several studies which evaluated the effectiveness of codes of conduct and whalewatching guidelines. Allen *et al.* (2007) reported that in New South Wales, cetacean tourism has increased by 37% across a five-year period (1998-2003). Furthermore, 3,000 recreational boats are registered in this 140km² estuary. Due to concerns over the industry's impacts on dolphins in the region, a whalewatching code of conduct was developed in 1995, which was amended to incorporate the Australian National Guidelines for Cetacean Observation in 2000. The code of conduct recommends a maximum of two interacting boats per dolphin school. Vessels were compliant with this code of conduct during 65% of interactions. Tour boats complied 71-97% of the time; however, individual tour operator compliance decreased by 6-25% when both recreational and tour boats were interacting with dolphin schools.

The median time tour boats interacted with dolphins was 8-24min (of a suggested 30 minute maximum) and compliance ranged between 74-98%. However, the percentage of time dolphins were exposed to tour boats for more than 30 min was 76% during sequential interactions and some dolphin schools could be subjected to vessels for several hours despite vessels being technically in compliance. The authors concluded that there was an acceptable level of code of conduct compliance (80% or above), but cautioned that this does not mean the animals are not being impacted by tourism pressures.

Anwar *et al*. (2007) produced a model to investigate whalewatching operator strategies in the St Lawrence Estuary and the benefits or disadvantages of cooperation between whalewatching operators. When operators were not in compliance and not sharing information on the location of whales, whalewatching tourists on the modelled vessels theoretically would be more satisfied due to more time spent with animals, although the chances of encountering cetaceans would be lower. However, the data suggest that communication between tour operators may result in more exposure to boat traffic for the whales.

Chilvers presented SC/60/WW7. In 2007 New Zealand undertook to report back to the sub-committee on the actions that had been taken by the New Zealand Government to increase protection of bottlenose dolphins within the isolated Doubtful Sound Complex. In January 2008, after extensive public consultation and input from independent experts, a management strategy was implemented which included: (1) A voluntary code of management of all vessels, both commercial and recreational within the Doubtful Sound Complex that includes boat speed and distance regulations and boat exclusion zones where, if dolphins are present, boats are excluded; (2) A research and monitoring strategy; (3) Education and awareness programs for all vessels; and (4) Measurement of compliance and monitoring of voluntary measures. These management measures and their effectiveness will be reviewed in 2009. The remoteness of this area emphasizes the importance for cooperation with stakeholders in order to achieve the best possible protection.

The sub-committee noted that due to isolation or limited resources available for enforcement of compliance, adherence to regulations governing vessel behaviour around whales and dolphins, or to codes of conduct, is sometimes poor (e.g. Lusseau, 2003; SC/60/WW1) and there may be resistance to 'top down' management (Parsons & Woods-Ballard, 2003). Nevertheless, the sub-committee expressed concern at the worldwide trend for government agencies to put in place voluntary codes of conduct rather than legal regulations governing behaviour (e.g. SC/60/WW7). Voluntary 'codes of conduct' have proven to be of limited value in a wide variety of other locations (e.g. SC/60/WW8; Scarpaci *et al*., 2003; Whitt and Read, 2006; Allen *et al*., 2007; Wiley *et al*., 2008).

In some areas a mixture of a 'top down' regulatory approach combined with stakeholder involvement in drafting discussions ('bottom up') including appropriate involvement of scientists, appears to be effective (Parsons *et al*., in press). The sub-committee recommends that, in general, to be effective, codes of conduct should be supported by appropriate legal regulations so that they are enforceable, and modified if necessary as new biological information emerges.

SC/60/BRG2 reviewed data collected on Southern right whales in the Natural Protected Area Bahía San Antonio, province of Río Negro, Northern Patagonia, Argentina. Data may suggest that the area is not a main breeding area, possibly favouring the region for whale-based tourism. On the other hand, the unpredictability of the whales' daily presence and the average distance between the whales and shore raise questions on the viability of such an activity.

Lens described a new Spanish regulation for the protection of cetaceans (R.D. 1727/2007). In January 2008 a Royal Decree for the establishment of protection measures for cetaceans entered into force in Spain. The regulation applies to all waters under national jurisdiction. The Decree introduces a 'Mobile Area for the Protection of Cetaceans', defined as a cylinder with a radius of 500m, a height of 500m and a depth of 60m, surrounding a cetacean or group of cetaceans. The mobile area distinguishes five different sub areas: Exclusion; with a radius of at least 60m from the cetacean; Restricted Stay; with a surface that covers an area from 60m to 300m; Approximation; with a surface that covers an area from 300m to 500m; Aerial Area; an air cylinder 500m above the cetacean and a radius of 500m from the cetacean; and a Submarine Area; a water cylinder 60m below the cetacean and a radius of 500m from the cetacean.

Within the 'Mobile Area for the Protection of Cetaceans' several rules of conduct have to be followed in order to minimize the negative impacts of human activities. Special attention is given to impacts coming from whalewatching activities, for which the Royal Decree provides a specific code of conduct. Electronic copies of the original Decree can be provided on request.

The sub-committee thanked Lens for his presentation and commended the Spanish government for this development.

Carlson noted that the compendium of whalewatching guidelines and regulations around the world has been updated and is available on the IWC's website.

Galletti presented an update on the proposed guidelines for blue whale and other cetacean watching presented to and endorsed by the sub-committee last year (Cabrera *et al*., 2007). Based in part on this endorsement, the Chilean Navy implemented the guidelines in August 2007. The sub-committee thanked Galletti for the information and noted that it was a further example of positive government response to recommendations from the IWC Scientific Committee.

9.3 Review of risk to cetaceans from collisions with whalewatching vessels

In a review of national progress reports, the only reference to a possible vessel collision was in the Australian report where two collisions, witnessed by a tourism operator, were reported; one source was listed as a 'commercial' vessel. In Hawaii, collisions with whalewatching boats have continued to occur. An update of this on-going situation is expected at SC/61 from Mattila.

The sub-committee remains interested in this issue, and encouraged continued reporting of both collisions and trends in the types and speeds of whalewatching vessels (which may be used to model risk of collisions, as is being done in the bycatch sub-committee (*J Cet. Res. Mgmt. (Supp.)* 10: 239-242). It was agreed that progress on this issue should remain on the sub-committee's agenda.

9.4 Other

At the 2006 sub-committee meeting in St Kitts & Nevis, Fortuna presented Cañadas et al. (2006). Analyses, based on a dataset of nine years (1995-2003), highlighted: (1) the appearance of an 'exclusion zone' in later years caused by the intense seasonal unregulated recreational boat traffic (mainly speedboats) and (2) a 'bottlenose dolphin sanctuary' for years of high traffic intensity, in an area of the north-eastern Adriatic Sea (Mediterranean Sea). The sub-committee welcomed this study, together with three others conducted in Australia, New Zealand and Canada, as good examples of quantitative approaches to assess long-term effects of disturbance on cetaceans.

In Croatia in July 2006, the Ministry of Culture declared the preventative protection for the Cres-Losinj Special Marine Reserve (Class: UP/I-612-07/06-33/676, Reg no 532-08-02-1/5-06-1, July 26, 2006). The original proposal for an MPA dedicated to dolphins was written in 1993 (Bearzi *et al*., 1993) and included the 'Management Plan for the Conservation of the Cres-Lošinj Archipelago' (Island Development Centre, 1997). At that time, maritime traffic was not an issue in the area, given the political instability caused by several wars that occurred in the Balkan region. However, in 2002 the Blue World Institute of Marine Research and Conservation, a Croatian NGO, developed a new proposal (Mackelworth *et al*., 2002). This new proposal was based primarily on the findings of two ongoing PhD studies, one of which included the study presented to the Sub-committee in 2006.

The discussion generated within the sub-committee in 2006 became an important component behind the declaration of preventive protection towards the MPA dedicated to dolphins. In fact, this 'exclusion zone' was right in the core of the proposed MPA. Given that a plan for the construction of a new 400-berth marina within the proposed MPA was presented to the Ministry at the same time, the declaration of the preventive protection effectively blocked this potentially detrimental development.

Štrbenac further reported on recent progress and noted that Croatian authorities are working with stakeholders to discuss a code of conduct for the protected area. The sub-committee commended Croatia for the measures taken to date and encouraged further development of the codes.

Simmonds and Stansfield (2007) provide a review of recent 'solitary sociable' dolphins in UK waters. These are animals that actively seek human contact and have little or no contact with conspecifics. A number of stages in the development of this unusual behaviour have been proposed (Wilke *et al*. 2005) along with the significant vulnerability of these animals, and also that solitary sociable cetaceans seem to be a growing world-wide phenomenon. This issue inherently concerns a process where naïve, and often young, isolated animals are habituated to the presence of people and water craft in the water with them. Such animals may also be commercially exploited with paying customers brought to see them.

In 2006, there were at least 4 solitary sociable bottlenose dolphins in UK waters. Two of the animals were eventually killed, one by a propeller strike and the second by a virulent pathogen common in polluted coastal waters. The third animal is missing and the fourth (Dave) is the focus of SC/60/WW5, which described the last few months of observation of this animal. The changes over time in Dave's behaviour were in accord with the stages described by Wilke *et al*. (2005); her behaviour at stage 4 included very robust interactions with swimmers and kayaks; and a dedicated study of behaviour was made for six weeks between August and October 2007. A total of 100 hours from shore-based vantage points (Eisfeld *et al*., in prep.) showed that behaviours associated with feeding and resting (e.g. diving and logging or slow swimming near a particular buoy) virtually ceased when people were in the water. One conclusion from these studies, and the other recent examples of this phenomenon in the UK and elsewhere, is that habituation driven by humans, makes the animals vulnerable to harm or being killed and the sub-committee recommended that it should be avoided.

10. WORK PLAN

The work plan prioritised major items as listed below:

(1) review whalewatching in Portugal (Azores, Madeira), Canary Islands and Strait of Gibraltar;

(2) assessing 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:

(3) review reports from Intersessional Working Groups: (i) large-scale whalewatching experiment (LaWE) (Intersessional steering group); (ii) LaWE Advisory Group (Intersessional advisory group); (iii) compile information on whalewatching programs and associated data; and (iv) further develop a questionnaire to assess the extent and potential impact of swim-with-whale operations; and to identify local researchers to distribute questionnaires to operators

(4) consider information from platforms of opportunity of potential value to the Scientific Committee

(5) review of whalewatching guidelines and regulations;

(6) review of risks to cetaceans from whalewatching vessel collisions;

The sub-committee discussed the work plan and prioritised as listed. Terms of reference and members of the Intersessional Working groups as agreed by the sub-committee are listed in Table 2.

Table 2

Intersessional working groups and related information

Group	Terms of Reference	Membership
(1) Large-scale whalewatching experiment (Intersessional steering group)	Further development of LaWE proposal for presentation at SC/61; continue work towards finding funding; establish dialog with LaWE Intersessional Advisory Group	Bejder (convenor), Bjørge, Hammond, Lusseau, Underwood, Weinrich.
(2) LaWE Advisory Group (Intersessional advisory group)	Facilitate communication between the IWC SC WW Sub-Committee and the LaWE steering group and provide advice from regional and species experts.	Rose (convener) Abramson, Avila, Bolaños, Carlson, De Stephanis, Dulan, Etienne, Flores, Fortuna, Freitas, Gallego, Galletti, Groch, Heinrich, Hurbungs, Iniguez, Mattila, Parsons, Robbins, Rossi-Santos, Schaffar, Sequeira, Simmonds, Sironi, Urbán, Vely, Williams
(3) Compendium of whalewatch sites and associated information (Intersessional working group)	Develop a compendium of whalewatch sites and associated information	Robbins (convenor) Bolanos, Carlson, Fortuna, Galletti, Levy, Mattila, Ritter, Parsons, Schaffar, Weinrich.
(4) Swim-with whale operations (Working Group)	Further development of a questionnaire to assess the extent and potential impact of swim-with-whale operations	Rose (convenor) Panigada, Parsons, Ritter, Schaffar, Sironi, Weinrich.

It was noted that a working paper with a request for funding from the sub-committee will be prepared for discussion at the Plenary.

11. ADOPTION OF THE REPORT

The report was adopted at 0945 on June 9, 2008. The sub-committee thanked Kato for his wise guidance during the discussions and thanked Carlson and Rose (and other sub-committee members) for their efficient rapporteuring.

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APPENDIX 1

Agenda for Whalewatching Sub-committee

1. Opening Remarks
2. Election of Chair and Rapporteurs
3. Adoption of Agenda
4. Review of Available documents and information
5. Review report of workshop on strategic planning of large-scale whalewatching research
6. Review whalewatching in South America
7. Develop methodology for assessing biological impacts of whalewatching on cetaceans
    - 7.1 Short-term methods and results
    - 7.2 Long-term methods and results
8. Review reports of intersessional working groups
    - 8.1 A meta-analysis to assess the influence of cetacean biology and ecology of short-term impact effect size from whalewatching vessel traffic
    - 8.2 Identify data sources from platforms of opportunity of potential value to the Scientific Committee
    - 8.3 Further develop a questionnaire to assess the extent and potential impact of swim-with-whale operations; and to identify local researchers to distribute questionnaires to operators
9. Other issues
    - 9.1 Consider information from platforms of opportunity of potential value to the Scientific Committee
    - 9.2 Review of whalewatching guidelines and regulations
    - 9.3 Review of risk to cetaceans from collisions with whalewatching vessels

9.4 Other

10. Work plan

11. Adoption of the report