Annex L
Report of the Sub-Committee on Whalewatching

Members: Kato (Chair), Berggren, Carlson, Clapham, Clark, C., Collins, Corkeron, Fulford-Gardiner, Gales, Garrigue, Guiste, Haug, Iniguez, Lawrence, Lens, Manzanilla, Mattila, Minton, Murase, Nagatomo, Nishiwaki, Oosthuizen, Otani, Palazzo, Parsons, Peddemors, Rambally, Reijnders, Robbins, Rose, Sakamoto, Simmonds, M., Stachowitsch, Swartz, Urban, Walters, Weinrich, Williams, Wilson, Yoshida.

1. OPENING REMARKS AND TERMS OF REFERENCE

Kato welcomed the participants and noted the priority items identified by the Scientific Committee:

(1) Review the work of the Intersessional Correspondence Groups:
   (a) Data Collection Correspondence Group; and
   (b) Whalewatching Management Correspondence Group.
(2) Review information on the significance of noise production from vessels and aircraft in a joint session with the Standing Working Group on Environmental Concerns.
(3) Review of the research on the effectiveness of and compliance with national whalewatching guidelines and regulations.

Additional work would be to review new information on: (1) dolphin feeding programmes; (2) 'swim-with' whale and dolphin programmes; and (3) national guidelines and regulations.

2. ELECTION OF CHAIR AND RAPPORTEURS

Kato was elected Chair. Carlson acted as rapporteur, assisted by Rose, Weinrich and Williams.

3. ADOPTION OF AGENDA

The adopted agenda is given as Appendix 1.

Sakamoto stated that it is the Government of Japan's position that whalewatching is outside the competence of the IWC. Japan does not deny that studying the effects of whalewatching on whale stocks is beneficial in order to obtain better understanding of the stocks. However, the IWC has limited financial and human resources and should be focusing its efforts on important matters such as stock assessment.

Clapham responded that, in contrast to the views expressed by Sakamoto, it should be noted that in many locations, whalewatching has provided a free or low-cost platform for data collection that has proved of considerable importance to the assessment and understanding of local cetacean populations. In the Gulf of Maine, for example, numerous studies have been published that are based in part or entirely upon data collected from whalewatching vessels. Indeed, from this region alone, whalewatching-based studies have resulted in at least 30 peer-reviewed publications in international journals. These papers concern several species of large whales, and many topics of importance to management such as abundance, distribution, population characteristics, reproductive rates, population structure and composition, social structure, age at sexual maturity, migratory movements, mating systems, sex ratio, and changes in distribution in relation to the abundance of prey. Because of the free access provided by whalewatching vessels, these studies have been conducted at essentially no survey cost. Consequently, to state that the IWC should ignore whalewatching and instead concentrate its scarce resources on 'assessments' ignores the considerable contribution to the latter that can be made by whalewatching data.

4. REVIEW OF AVAILABLE DOCUMENTS AND REPORTS

The following documents were considered: SC/54/WW1-4; SC/54/E7-8; SC/54/O7; SC/54/SM24; Bain (2001; 2002); Constantine (2001); Erbe (2000; 2001); Heckel *et al.* (2001); McCarthy (2001); McCauley and Cato (2002); Morton and Symonds (2002); Richardson and Würsig (1997); Williams *et al.* (2002a; b).

5. REPORT OF INTERSESSIONAL WORKING GROUPS

5.1 Data Collection Correspondence Group

SC/54/WW2 reported on the further development of the Data Recording System (DRS) initiated at the two previous meetings of the Whalewatching sub-committee. The paper provided two brief reviews: (1) the history of research associated with whalewatching operations (as background to those who may be new to this issue); and (2) the kinds of reactions that cetaceans can show to vessels (providing illustrations of what kinds of behaviour can be observed and measured). It was noted that SC/54/E7 is also helpful in this respect in that it provides a list of reported interactions between vessels and cetaceans. Based on consultations conducted intersessionally, and a review of comments made at the previous sub-committee meeting, SC/54/WW2 provided a revised version of the DRS and preliminary instructions for its use. One correspondent noted that, for some time, a comprehensive and global approach has been required for the collection of scientific data on board whalewatching vessels. Not only because the collection of such data, even in its simplest form, can yield important information relating to research and conservation; but also,

and of equal importance, such studies provide whalewatching operators with a stake in the learning process.

Data collectors would enter appropriate figures (e.g. times or distances) or just a 'Y' for yes or 'N' for no in the relevant data fields. Where possible, they could add the number of animals in the boxes relating to the described behaviours or group formations. For example, if mother and calf are seen in tight formation and six animals are tightly grouped around them, the response would be 'Y/6'. The collection of some data (i.e. the Interaction Record, Boat Record and Behavioural and Group Composition Record) can be at regular intervals and the data fields are designed to facilitate this.

In the development of the form and subsequent data collection, it is strongly recommended that the advice of an experienced field researcher be sought. Training, for example in the recognition of species and behaviours, is also recommended. Consideration also needs to be given as to who will analyse the data. Collecting the data is only part of any research project and provision should be made for appropriate analyses.

Quality control is very important and if, for example, there is a dedicated and trained researcher on board, she/he can be expected to collect high quality data such as a continuous record of behaviour during sightings. However, if the observer doubles as the skipper, tour guide and data collector, she/he should probably aim for a simpler level of data collection; for example, species identity combined with precise location information. Even simpler levels of data collection can prove valuable over time if data are collected systematically.

Bearing the above points in mind, anyone interested in using the DRS in the field is recommended to follow these steps:

(1) Consider what is practical to collect according to the circumstances in which the whalewatching platform is operating.
(2) Choose from the DRS those data fields that are identified as appropriate and modify into a 'daughter form' (always including the critical information highlighted for each data field).
(3) Test the 'daughter form' in the field – i.e. in the conditions in which it is intended to be used – to ensure that in practice it can be filled in with reasonable ease and accuracy.

The DRS is not intended to be exhaustive but to provide an indication of what data may be collected by whalewatching platforms; which data should be regarded as having priority; and how data may be recorded. It does not facilitate the collection of acoustic or photographic material other than allowing notes to be made of where and when such data were recorded, although both types of research are recommended. The DRS would benefit from further development and, in particular, testing in the field.

It is apparent that the full DRS has been misunderstood repeatedly as being a single form which would-be data collectors have found daunting. It was suggested that it might be possible to produce an interactive computer program based on the DRS that would facilitate the production of site-specific forms to be used in the field. The DRS could also be developed as an interactive web-based or lap-top/palm top system (with the potential for collecting data in real time in a manner similar to the LOGGER program).

Noting that the greater part of the DRS data fields had already been published and that further modification would benefit from field trials, M. Simmonds suggested that further work on the DRS should be conducted intersessionally.

M. Simmonds then demonstrated a simple computer program that allowed would-be researchers to generate simple date-collection forms based on the DRS. The program allowed the researchers to identify the types of data that they wished to collect (or had been advised to collect) by responding to questions and then produced a 'daughter form' as a product which could be printed.

Parsons presented the results of a whalewatching DRS form survey that he and his colleagues conducted in West Scotland. Due to this year's short intersessional period, field tests were not possible. However, the master form and derived 'daughter form' were sent to 21 marine wildlife tour operators in West Scotland for comment. The operations ranged from 'one-man' operations to large vessels with several crew members capable of carrying more than 60 passengers. Most vessels, however, were less than 40 feet in length and carried less than 12 passengers.

Eighteen (out of 21 contacted) tour operators commented on the data forms. Two of the more established operators already had a data-collection system in place. Only two of the remaining 16 operators sent sighting data to scientists for analysis. They did not feel that an onboard computer could be used as a way of recording data due to logistic constraints (e.g. lack of space available or weather-proof facilities), but supported the idea of waterproof logbooks for recording data.

None of the operators had the equipment or training to record more than basic sighting information (i.e. sighting position, species, sea state). However, several were willing to collect more detailed information if equipment and training were provided.

Although the operators considered the master forms to be complicated, 80% considered use of a 'daughter form' feasible. Most thought that check boxes, 'delete where applicable' sections and tables were easier to use than diagrams. They were unwilling to draw a map of their route, as they did not wish to alert other whalewatching operations to their favoured sites. None were prepared to fill in a form several pages long or record environmental data every five minutes during a sighting; recording such data once an hour or several times during the day, however, was considered feasible.

The 16 operators that did not have onboard guides were asked if they were willing to have a dedicated data collector. Thirty-eight percent were agreeable; those that declined did so for practical reasons, e.g. the operation/vessel was too small and a researcher would displace a paying customer.

In summary, there is great potential for data collection in the region and marine wildlife tourism operators represent a potential source of scientific data collection that is largely untapped. There is a high degree of support for a derived 'daughter form' and the critical criterion for data form design is ease of use, as many operators run 'one-man' businesses that operate from small vessels and have to pilot while recording data.

The data that operators collect should initially be limited with minimal time required for completion. The complexity and amount of data recorded can be increased through time. Moreover, a suite of forms should be developed to accommodate various classes of operations and ideally be tailored for individual operators. Finally, DRS forms need not be limited to whalewatching operations but could be applicable to a variety of other marine-user groups.

There was a productive discussion on the development of the DRS and the 'daughter form' used in Parsons' study (developed last year in the sub-committee) and the utility of collecting scientific data from whalewatching vessels. Comments included the need to: simplify data forms for some operations; laminate forms for open boats; include a way to report areas where there was effort but no sightings; provide feedback to operators and tourists; relate other variables to cetacean behaviour; and extend information on vessel behaviour. It was suggested that the scientific question the forms attempt to address should be noted. The group was reminded that the DRS allows the creation of a myriad of daughter forms, and that this process in developing an appropriate daughter form should be driven by the research questions being asked.

Carlson suggested that data forms from whalewatching operations and research groups around the world, as well as the scientific question(s) the forms attempt to address, be gathered and collated. The sub-committee **agreed** with this suggestion and tasked Carlson to collate the information for presentation next year.

Some members noted that there were serious limitations for whalewatching operations to collect data that can be used for the management of whales, but rather dedicated sighting surveys and other research are necessary. Others noted that, in some areas, such data are the only available information on species distribution and that long-term data collected on whalewatching vessels has been used in discussions on the RMP and the Comprehensive Assessment of the North Atlantic humpback whale. It was noted that the sub-committee had discussed this issue in detail at the 2000 and 2001 meetings.

A small group, chaired by M. Simmonds, prepared a document on the terms of reference for an intersessional Correspondence Group to review and further develop the DRS. The sub-committee agreed that an intersessional group be formed to continue the work as described in Appendix 2. Members of the group include: Fulford-Gardiner, Iniguez, Nishiwaki, Oosthuizen, Palazzo, Parsons, Rose, Weinrich, Williams and Yoshida. M. Simmonds will Chair the Correspondence Group.

5.2 Whalewatching Management Correspondence Group

Oosthuizen presented the report of the group regarding planning for a workshop on the development of whale- and dolphin-watching management. He noted that the rationale and need for such a workshop was discussed in detail at the Scientific Committee last year and that instructions to the intersessional correspondence group were to develop the terms of reference and agenda. He further noted that the management framework should be based on the best available scientific evidence.

Sakamoto stated that it is not appropriate for the sub-committee to discuss management of whalewatching as it is outside of the competence of the IWC. He further noted that the Scientific Committee mandate is to deal with scientific issues and therefore Japan could not support the proposal as written. Palazzo commented that Brazil supports the concept of the workshop as whalewatching is an important use of whale resources in Brazil and other developing countries. Furthermore, the workshop would bridge the gap between scientific assessment and management. Rose and M. Simmonds noted that the workshop was not intended to be an official IWC workshop but that information from the recent deliberations of the sub-committee were expected to be helpful. It was emphasised that funds for the workshop will not be requested from the IWC. Nagatomo commented that the expertise of the Scientific Committee might be useful in providing advice on the scientific aspects of managing whalewatching, but not management *per se*. Kato suggested that members of the sub-committee could comment on the proposal and that a revised proposal be submitted for discussion.

Noting the ongoing proliferation of whalewatching activities worldwide, and concerns about possible impacts of whalewatching activities on cetacean populations, the sub-committee **agreed** that an intersessional workshop would benefit future whalewatching management.

The meeting agenda might include:

(1) a review of available scientific information on cetacean watching;
(2) scientific information needed to develop and manage cetacean watching;
(3) consideration, where feasible, of total allowable effort of specific cetacean watching industries (e.g. boat numbers and size, noise levels, number of trips);
(4) geographical allocation for vessels;
(5) review of current regulations, permit conditions, codes of conduct; and
(6) the role of marine protected areas.

Data required include: existing cetacean watching management plans; specified case studies; Carlson's compendium of whalewatching regulations and codes of conduct on the IWC website; review of relevant scientific literature; and invited papers on specific topics.

The format of the workshop will be a two-day symposium followed by a 3-4 day invitational workshop. As this will not be an official IWC workshop, funds will not be sought from the IWC, but from member nations and other potential sponsors. The workshop will be scheduled before next year's meeting.

The sub-committee **recommended** that:

(1) An Intersessional Advisory Group be established to advise Oosthuizen on the scientific parameters which would be discussed during the proposed workshop; members to include: Carlson (Chair), Iniguez, Palazzo, Parsons, Rose, M. Simmonds and Williams.
(2) The Committee endorse the Workshop and encourage participation by members of the Scientific Committee and IWC member states.

6. WHALEWATCHING ACTIVITIES AND NOISE IMPACTS

This was a joint session with the Standing Working Group on Environmental Concerns

SC/54/E7 considered recent knowledge concerning noise pollution and its implications for cetaceans, with particular reference to vessel noise. It was primarily intended as an update to earlier submissions to the Scientific Committee and considered:

(1) Developments in the theoretical framework (including recent recommendations that seismic surveys avoid areas where densities of marine mammals are known to be high; that initial surveys for marine mammals should

be conducted in the vicinity of deployment; and the recent use of computer models to estimate noise impacts, including in the context of whalewatching).
(2) Technological mitigation (for example using low intensity seismic sources).
(3) Vessel design (including machinery noise reduction).

SC/54/E7 also identified some novel marine noise sources, such as the re-launch of the Acoustic Thermometry of Ocean Climate (ATOC) project (now named the North Pacific Acoustic Laboratory) and the ongoing expansion worldwide of marine wind farms. The authors also provided some new information about established sources including: military activities; vessel noise; acoustically-based anti-predator devices; and seismic exploration, noting that McCauley and Duncan (2001) had commented that, of man-made noises, seismic airgun noises present the greatest environmental threat.

M. Simmonds concluded that, despite increasing concerns about noise pollution, it still receives little attention from policy makers. The need for the regulation of boat traffic when in the vicinity of cetaceans, including in particular (but not limited to) whalewatching vessels, is also indicated. The legal underpinning of mitigation measures in response to all sources of noise is strongly indicated, although it needs to be flexible enough to address the fact that the implications of noise for marine wildlife is still only poorly understood and that knowledge will improve with time. The need to study the implications of changing the marine acoustic environment has never been greater.

SC/54/E7 contained information on avoidance behaviour as well as changes in behaviour and habitat use by cetaceans as a result of vessel traffic. A total of 104 scientific studies involving 22 species of small cetaceans, sperm whales and nine species of baleen whales were presented. Parsons noted that there are additional, published studies on vessel impacts on cetaceans and several more in unpublished governmental reports and scientific literature. Examples of these studies are noted and appear in Appendix 3.

In response to a request for references as to what constitutes 'loud' vessels, M. Simmonds identified Bain (2001), Erbe (2000; 2001), McCauley and Cato (2002), Richardson and Würsig (1997) and Williams *et al.* (2002a).

In regard to the mass stranding of beaked whales in the Bahamas in March 2000 (IWC, 2001, p.255), DeMaster inquired if any beaked whales had been observed after the event or if only photo-identified individuals were not resighted. Rowles replied that few to no *Ziphius* were sighted in the summer of 2000, but some *Ziphius* were sighted the following year. Sighting rates are apparently still depressed. She further noted that *Mesoplodon* were sighted during both years. Rose clarified that even when *Ziphius* individuals were resighted, none of them were animals photo-identified before the stranding. Rowles elaborated that annual sightings of photo-identified individuals were not common before the stranding and long intervals between sightings had been previously known. She commented that it was premature to conclude that all animals present in the area at the time of the stranding had been killed or displaced.

Tregenza noted that the increase in the number of high-speed ferries, whalewatching vessels and other ships may lead to high rates of vessel/whale collisions and pose a serious threat to cetaceans that do not show avoidance to their noises. M. Simmonds agreed and added that in some areas jet skis may be a problem as they may produce insufficient noise in the water to cause animals to avoid them. He further noted the problem in the Canary Islands with the increase of large, high-speed ferries and whalewatching vessels. It was noted that within the next few decades, freighters and super tankers would have the capability of travelling at 60mph.

Dizon reported on an increase in average low frequency ambient noise of 10dB off the central California coast in the last two decades. This increase could significantly lower a whale's communication range by several orders of magnitude. Tregenza commented that there is a problem in assuming that disturbance is always negative and that avoidance responses by whales are clearly positive if they avert a ship strike. Fast ferries may in fact be a bigger problem (e.g. in the Ligurian Sea) through direct kills. There is also an assumption that sound is directional and whales will move away; this is not always the case and does not help to avoid collisions. Therefore, further research is needed to determine whether making vessels quiet necessarily confers a net benefit to whale populations.

In the context of mitigation of noise impacts on cetaceans, SC/54/E8 reported on an investigation of the relevance of international law to marine noise. Two types of legal instrument are relevant: (1) instruments where there is provision for the control of pollution that includes noise or energy; and (2) instruments where the disturbance of marine wildlife is specifically addressed. It may be assumed that disturbance primarily relates to noise (for example, vessel noise), but it should also be noted that it may relate to other properties of the source of disturbance (for example, the physical presence of a vessel).

The 1982 United Nations Convention on the Law of the Sea (UNCLOS) establishes duties on its contracting parties in respect to pollution of the marine environment 'from any source' (e.g. see Art 194(1) UNCLOS). Art 1(1)(4)UNCLOS states that:

> '[P]ollution of the marine environment' means the introduction by man, directly or indirectly, of substances or energy into the marine environment, including estuaries, which results or is likely to result in such deleterious effects as harm to living resources and marine life, hazards to human health, hindrance to marine activities, including fishing and other legitimate uses of the sea, impairment of quality for use of sea water and reduction of amenities.

It may be argued that the term 'energy' in UNCLOS includes noise and that the term 'pollution of the marine environment' includes human-induced noise.

MARPOL addresses pollution from ships but focuses solely on substances. There may be scope for defining the term 'substance' such that it includes energy or at least ocean noise. Though this has not been be done in MARPOL, such an approach does appear to have been taken by the International Maritime Organisation in its *Guidelines for the Identification and Designation of Particularly Sensitive Sea Areas* ('the PSSA Guidelines'; see Resolution A.927(22), Annex 2). These refer to noise as a substance (see para 2.2).

M. Simmonds briefly considered some instruments that focus on the protection of marine wildlife (i.e. the provisions of the Ligurian Sea Sanctuary; the EU Habitats and Species Directive; ASCOBANS and ACCOBAMS; and the US Marine Mammal Protection Act). He noted that there was a growing recognition of disturbance in international law, especially relating to cetaceans. There seemed to be a need for 'generally accepted international rules and standards' with respect to noise pollution (although coastal states may still establish and manage 'particularly sensitive sea areas' in response to ocean noise concerns). Finally, he recommended that scientifically supported definitions of what constitutes

unacceptable or dangerous noise pollution, disturbance or harassment would help to inform the development and interpretation of existing and future law.

M. Simmonds drew attention to another legal review recently published by McCarthy (2001). This review came to very similar conclusions to those presented in SC/54/E8. McCarthy reported that 'the [necessary international] legal framework exists but has not yet specifically been applied to underwater noise pollution. The problems of underwater noise pollution are significant and its international regulation is complicated by the transboundary nature of sound in the ocean…[which] effectively necessitates a system of controls on a global scale'.

In her review, McCarthy had also included comment on the work on noise conducted to date under the auspices of the Standing Working Group on Environmental Concerns, noting that 'to date, no scientific research on the effects of noise on marine mammals has been promulgated by the IWC'.

DeMaster pointed out that legal opinions need to come from appropriate authorities. Further, DeMaster noted the need to establish links between noise and demographics (e.g. the Bahamian beaked whale strandings). He commented on the difficulty of defining unacceptable noise levels, as it would have to be species- and frequency-specific.

C. Clark noted that one approach on potential impacts from anthropogenic noise separates impacts into physical harm and behavioural responses. Physical harm, often due to chronic exposure to noise, is evident as a permanent threshold shift (PTS) in hearing ability caused by damage to inner ear sensory receptors, while temporary threshold shift (TTS) is a modification of these receptors that, although not damaging, does serve as an indicator that further exposure is likely to lead to PTS. He further noted that important progress has been made in the ability to estimate levels of noise exposure for individual animals or populations of animals and that this might provide a way forward to better evaluate the potential for noise impacts. This approach combines known characteristics of noise sources with site-specific physical models of sound propagation, and integrates these physical descriptions of noise levels with the distribution, densities and movement patterns of animals over space and time. The output from this type of model provides a quantitative and reasonable estimate of noise exposure for each animal within a hypothetical population (analogous to dosage exposure level), with most uncertainty in exposure as a result of uncertainty in biological variables (i.e. spatial and temporal distributions and the percent of time spent at different depths). One benefit of this approach is to move discussion away from generalised statements on noise impacts into a domain where quantified measures of exposure are available as a function of noise source, ocean environment, and animal movement and distribution. The challenge for biologists is to provide scientifically based information on animal responses to noise exposures as a function of biological context and to develop plausible mechanisms for how such responses impact individual survivorship and fitness, and populations.

C. Clark also commented that noise pollution may have an analogue with anthropogenic light pollution and its reported impact on birds, frogs and sea turtles. He asked if there was any legal reference or legal mechanism enacted to mitigate the effect of light pollution. Swartz stated that in the southern US, there are state and local regulations on coastal lighting to protect turtle hatchlings on nesting beaches. Rose stated that the US Endangered Species Act might make reference to this and suggested that it be investigated.

Two workshops, relevant to the discussion were announced: a NMFS workshop on shipping noise, impacts on marine mammals and mitigation; and a workshop on resonance effects.

Williams *et al.* (2002a) reported results from a shore-based experimental study of behavioural responses of killer whales to a vessel operating in western Canadian waters at two operating speeds. Killer whales responded to high-speed experimental approach by adopting paths that were significantly less predictable than those observed during preceding no-boat conditions. The tendency for whales to swim further along a circuitous route during experimental treatment appears to be an attempt to evade the boat. Short-term behavioural responses such as these may carry energetic costs to whales. It was noted that the source level of the experimental boat noise was 14dB higher when speeding up than when operating at slow speed. Using a reasonable model of transmission loss, the boat would need to be 700m away for the whales' received noise level to equal the noise level received by the same boat operating at slow speed at 100m from the whale.

Kato commented that studies such as these are valuable as they demonstrate that noise level can be used to determine biologically relevant approach distances for vessels watching whales.

Williams presented attempts to model the cumulative effects of such short-term energetic costs (Bain, 2002). This study considered the increased energy expenditure due to avoidance responses and reduced energy acquisition due to acoustic impairment of foraging efficiency. The models synthesised a variety of experimental and observational studies on wild and captive killer whales, to link real-world data on energetic costs of whalewatching, the extent of whalewatching day and season, and masking effects of boat noise, with real-world data on resident killer whale population dynamics. The models considered energetic costs in competition with growth in a food-limited population, and allowed prey acquisition to be impaired to a range of extents as a function of search pattern. The models suggest that population-level effects are negligible for killer whale populations well below carrying capacity. This indicates that population growth in the presence of disturbance cannot be used to conclude that disturbance will not affect the population at other densities as it approaches carrying capacity. The models suggested that missed prey due to noise was a more prominent mechanism than excess energy expenditure. The authors cautioned that these findings are linked to a unique aspect of resident killer whale population dynamics, a high-shape parameter ($z = 11.3$). But they warned that if they had not known the stock-specific parameter, the default shape parameter of $z = 1$ would underestimate maximum net productivity level and overestimate potential biological removal. The authors reported continuing efforts to verify that some of the assumptions made in the model are valid. However, they cited the precautionary principle as impetus for enacting management procedures that mitigate potential impacts until data become available to indicate that the regulations are unnecessary.

Weinrich noted that the effects reported by Bain (2002) may or may not be related to noise exposure. However, increased exposure to vessel noise could lead to a series of temporary threshold shifts, which can eventually result in a permanent threshold shift. A model of this work was published by Erbe (2001). He further noted that combined with the work reported by Morton and Symonds (2002), there is an indication that killer whale populations appear to

be susceptible to noise-generated disturbance. Williams noted that the models indicated that missing prey was a greater contributor to population dynamics than avoidance, which suggests that noise is the link.

It was noted that the study demonstrates how physical acoustic and biological information can be merged and serves as an excellent model of how to integrate the two fields.

7. REVIEW OF RESEARCH ON EFFECTIVENESS AND COMPLIANCE WITH WHALEWATCHING GUIDELINES AND REGULATIONS

SC/54/WW1 investigated short-term impacts on Indo-Pacific bottlenose dolphins (*Tursiops aduncus*) in Menai Bay, Zanzibar. Observations were made from tourist boats and from a research boat in order to evaluate the impact of violating guidelines. Changes in group activity (resting, travelling, socialising and foraging) during boat approaches, and the occurrences of stress-related behaviours (leaps, tail-slaps and coughing) during 30 minute follows were studied using scan sampling. The results showed that the dolphins were more likely to change their group activity when guidelines were violated during boat approaches compared to when they were followed. Further stress-related behaviours were significantly more frequent during group follows when guidelines were violated. Results indicate that the behaviour of the Indo-Pacific bottlenose dolphins in Menai Bay is significantly affected by dolphin tourism in its present form. The adoption, implementation and enforcement of suggested guidelines could be an important step towards the sustainable development of dolphin tourism in Menai Bay. Dolphins were hunted in Menai Bay (for human consumption and for bait in the long-line shark fishery) until 1997 when this activity was replaced by the dolphin tourism as a long-term economic alternative. Careful monitoring of the development of the tourism in Menai Bay will be crucial in years to come in order to protect this valuable resource for the local community.

Weinrich asked whether violating the spatial or temporal component of the guidelines elicited a stronger response from the dolphins. Berggren responded that although the dataset was limited, the more important factor was how the vessel was operated during approach and while following groups of dolphins. Robbins asked if whalewatching operators were more likely to make aggressive approaches to dolphins when certain behaviours were exhibited. Berggren replied that more aggressive approaches occurred when the dolphins were travelling away from the vessel. He added that some tourists tip the operators to encourage closer approaches to the animals.

In discussions on identifying 'negative' impacts, Peddemors suggested that the research be conducted in selected areas. He noted that in South Africa, *Tursiops* appear to use specific locations for specific activities. When asked if researchers will separately examine both sets of violations, boat-based and in-water, Berggren replied that they will do so in the future, and ideally would like the swimming activities to be terminated. However, if in-water encounters are allowed, swimmers should be 'attached' to the vessel as this may elicit less of a response from the dolphins.

There was a brief discussion on the impact of the research on local operators and the importance of feedback. Berggren informed the sub-committee that the dolphin-watching occurs in two neighbouring villages in Menai Bay. In this area, local scientists and operators meet to discuss research results in relation to guidelines and how the dolphin watching is conducted. The intent is to develop dolphin-watching activities that are conducted in a sustainable manner with a minimal impact on dolphins to ensure that this valuable resource will be available in the future.

The sub-committee welcomed the type of research represented by SC/54/WW1, noting that it was the kind of systematic examination of the impact of whalewatching on cetaceans and the effectiveness of whalewatching guidelines that falls within the terms of reference of this sub-committee. The sub-committee **agreed** that research such as that described in SC/54/WW1 should be encouraged.

8. NEW INFORMATION ON PREVIOUSLY DISCUSSED TOPICS

8.1 Dolphin feeding programmes

Corkeron presented an update on the feeding programme at Tin Can Bay, southeast Queensland, focusing on Indo-Pacific humpback dolphins. Details are discussed in SC/54/SM27. To date, no management programme, such as those in place at Monkey Mia or Tangalooma, has been established.

Gales noted that a book, in the process of publication, contains a chapter on the effects of provisioning dolphins; the study spans 15 years. Other chapters in the book may be relevant to the discussions of the sub-committee. Gales expects that the book will be available for next year's meeting.

8.2 'Swim-with' whale and dolphin programmes

Rose presented information on three 'swim-with' whale programmes discovered during a search of whalewatching operation websites. The number of commercial operations promoting swimming with large whales appears to be increasing. She reported on operations in Tonga and the Caribbean, while one in Australia was reported at the 2000 meeting in Adelaide. In some cases, the activity is tightly controlled with swimmers tethered to a boat by a rope; in others, the swimmers are allowed to approach and even touch the whales. Rose suggested that a thorough review of these proliferating programmes be conducted for discussion next year.

Some members expressed concern over the swim-with programmes, particularly those that are not regulated, which allow free swimming and encourage swimming with mothers with small calves.

The sub-committee **agreed** that research on the impacts of swim-with-whale programmes should be encouraged and **recommended** that a review of these programmes be a priority next year.

8.3 National guidelines and regulations

SC/54/WW3 provided a review of whalewatching guidelines from six areas in Japan. The paper detailed target species, safety zones, minimal approach distances, and general codes of conduct for each area. There are no laws or ordinances in Japan that directly regulate whalewatching activities. There are however, several areas where voluntary codes of conduct have been established by operators, scientists or associations. Since there is no law to regulate whalewatching activities, only operators in the area or members of local associations are affected by the voluntary codes of conduct; self-imposed regulation may be difficult to attain. Furthermore, not all areas have developed voluntary codes

of conduct. In the future, general rules for whalewatching may be established. These general rules would then be tailored to suit specific areas, species and operations.

Rose noted that the situation in Japan is ideal for studying and comparing whale behaviour in whalewatching areas with, and without, written codes of conduct and inquired if such research was planned. Kato explained that the level of scientific expertise varies greatly between these areas: in the Bonin Islands, researchers are conducting scientific studies and the development of codes of conduct is driven by science, while in other areas, local operators have little knowledge of whales. However, meetings between operators in different areas of Japan have been held to exchange information and views.

C. Clark asked if whalewatching boats in Japan used sonar systems for navigation. He noted that for some species, such as *Tursiops*, active sonar is in the best hearing range of the animals and caution needs to be taken into consideration. Kato did not think that active sonar was used to find whales, but in some cases, sonar may be used for other purposes; in some areas, small fishing boats serve as whalewatching platforms, but sonar is used only when fishing.

There was a brief discussion of whalewatching codes of conduct for multiple boats and diving with whales. While there are codes of conduct for both multiple boats and maximum viewing time in Zamami Islands, Okinawa, these codes of conduct are not detailed in many areas. Codes of conduct for SCUBA diving or swimming with cetaceans also vary between areas. For example, SCUBA diving is not allowed in Tosa Bay and Kochi on Bryde's whales, but may be allowed in other areas with other target species.

There was a brief discussion of the development of national whalewatching regulations. Some members felt that it would be difficult to standardise regulations due to several variable factors. Therefore, rules should be overarching with specifics tailored to suit target species, area use (i.e. feeding, breeding, resting and migrating areas) and vessel and operation types. It was noted that the variability of voluntary regulation in Japan was similar to that in the UK and USA where there is a range of guidelines and local approaches to whalewatching management. In the USA, there are few places where whalewatching is regulated. Furthermore, the US Marine Mammal Protection Act facilitates context-specific federal laws although they may be superseded by more restrictive state laws. Recently, the US government requested comment on the development of rules for all human/marine mammal interactions. Iniguez reported that in Argentina, the Province of Chubut regulates the watching of southern right whales by provincial law or regulation. In the Province of Santa Cruz there are two main areas where Commerson's dolphin watching activities are conducted. Although the activity is not regulated, in July 2001, Commerson's dolphins were declared a Provincial Natural Heritage, protecting the species in the waters of Santa Cruz. At St. Julian, studies on dive times, mother/calf pairs and Commerson's dolphin reactions near vessels have been initiated by Fundacion Cethus researchers to provide baseline data to help facilitate the development of regulations, in conjunction with the provincial government, tour operators and researchers. Oosthuizen noted that a co-management system in South Africa, with dialogue between government and operators, has been effective in improving whalewatching management.

M. Simmonds made reference to SC/54/E8 that contains the text of resolution 1.11 from the recent meeting of the Parties to the Agreement for the Conservation of Cetaceans of the Black and Mediterranean Seas (ACCOBAMS). The resolution provides a detailed set of 'Guidelines for Commercial Cetacean Watching Activities'. The resolution recommended that the Contracting Parties should take these Guidelines into consideration when drafting or updating their domestic legislation on cetacean watching and that the ACCOBAMS' Scientific Committee should further develop these guidelines. M. Simmonds noted that this was an unusual example of a set of guidelines being provided to a large region and noted that the Ligurian Sea Sanctuary also had a set of guidelines for watching cetaceans. The latter contains a provision that ships should not approach animals from the rear. The group briefly discussed this recommendation. It was noted that a similar limited approach had been recommended in other areas, but that experts recommend approaching sperm whales from the rear. This seems to be specific for only this species. Weinrich stated that work in the US on manatees, expanded to right whales, showed that in vessels with propellers higher than the hull, there is an area immediately in front of the vessel that is very quiet. This may minimise the impact of noise, but could lead to startle reactions.

Carlson announced that a compendium on whalewatching guidelines and regulations around the world can be found on the IWC website, thanks to the work of the IWC Secretariat. She requested that any new or changed guidelines or regulations be sent to her so that the site can be updated.

M. Simmonds suggested consideration might be given to the meaning of the term 'harassment' and/or what constitutes unacceptable disturbance. Some members were of the opinion that this was an extremely difficult task as there are several confounding variables that may affect whale behaviour. In addition, the term harassment has legal implications and the discussion should be science-based. The sub-committee concluded that:

(1) In order to minimise the risk of negatively impacting a cetacean population, whalewatching operations should take into account the risk of their long-term impact on cetaceans, based on science.
(2) In particular, persistent changes in cetacean behaviour associated with the presence of whalewatching platforms may indicate a negative effect.
(3) Further research is encouraged.

8.4 Other

Morton and Symonds (2002) reported on a natural experiment investigating the deliberate introduction of high-amplitude noise into a portion of the core habitat of resident and transient killer whales in British Columbia, Canada. The killer whales of the Johnstone Strait/Broughton Archipelago region were monitored year-round by two researchers between 1985 and 2000. When open-net Atlantic salmon fish farms began using anti-predator Acoustic Harassment Devices (AHDs) in 1993, sightings of killer whales in that portion of the range declined to near zero. After six years, usage of the devices was terminated, and killer whale usage of that portion of the range returned to baseline levels. In the adjacent (control) area, killer whale presence remained stable across the 15-year study. Careful consideration of alternative explanations for the findings, including changes in prey distribution, led the authors to conclude that acoustic harassment must have displaced killer whales from one part of their range, while usage of the habitat immediately adjacent remained consistent. When asked what impact AHDs have on wild salmon, Williams replied that since both resident (salmon-feeding) and transient (marine mammal-feeding) left the area, prey

distribution was not a factor. The study is an example of a large-scale natural experiment that is applicable to the work of the sub-committee.

SC/54/WW4 discussed behavioural responses of wintering humpback whales to vessels in Ecuador. These vessels focused on natural history tours of a national park, which stopped to watch whales opportunistically. The study aimed to identify components of whale behaviour that changed consistently when boats approached, to provide concrete signs that boat operators could look for to determine when they might be too close, or staying around whales too long. The land-based study compared whale behaviour when no boats were present to the behaviour of the same group as vessels approached, and found that whales increased swimming speed significantly. Park managers were advised to caution boat operators that if they had to increase their boat speed to keep up with whales, this might be a sign that they should end their whalewatching encounter.

Heckel *et al.* (2001) described a study on the influence of whalewatching on the behaviour of migrating gray whales in Todos Santos Bay on the Northwest coast of the Baja California Peninsula. The study showed that during the southbound migration of gray whales, there were no significant differences in swimming direction between whale groups with and without whalewatching boats. By contrast, during the northbound migration, the differences were statistically significant. Although Mexican whalewatching law is explicit concerning manoeuvres around whale groups, an additional suggestion is made to prevent disturbances.

The sub-committee welcomed these papers and noted that the whalewatching management-related research presented represents the type of studies necessary for the development of science-based regulation.

9. OTHER

SC/54/O7 described a novel DNA-based method for identifying krill species present in the faeces of baleen whales. The technique has been applied to blue whale faeces, and has successfully identified the krill species in the diet. Based on the success of this group-specific approach, he and his colleagues are developing similar techniques for identifying species from other key prey groups to enable identification of all prey items in cetacean (and other predator) diet. Gales believes the continued development of this technique will provide a widely applicable, non-invasive method capable of measuring the components of cetacean diet. It was noted that whalewatching vessels offer an ideal platform of opportunity for the collection of cetacean faecal samples, and broad collaboration with researchers who work in targeted parts of this industry is sought. Several researchers expressed interest in collaborating on this work, and discussions were to continue outside the meeting.

Some discussion about the application of this technique to dolphin feeding studies occurred, and it was noted that it may have application to these studies.

Gales made reference to a workshop that occurred on Philip Island, Australia in 2001, during which several papers on the issues of whalewatching, scientific studies of measuring impacts from tourist activities and dolphin feeding programmes were presented. These papers will appear in a proceedings of the conference. Gales undertook to encourage the authors to present these papers for information at the next IWC meeting.

Weinrich noted that the sub-committee might consider the proliferation of high-speed whalewatching vessels around the world, because they target areas where whales are found, and their speed minimises the ability of either the whales or the operators to avoid collisions. Since the sub-committee is charged with assessing the impact of whalewatching on whale populations, this seems relevant. He further commented that he had been tasked, through an intersessional working group of the Standing sub-committee on the Estimation of Bycatch and Other Human-induced Mortality, to review impacts to cetaceans from high-speed ferries. He suggested that this could be expanded to review where high-speed whalewatching vessels operate and what collisions have occurred.

The sub-committee **agreed** that this should be a priority for next years' work plan, relevant information should be sent to Weinrich for collation and that a joint session with the Standing sub-committee on the Estimation of Bycatch and Other Human-induced Mortality should be held next year to discuss this issue.

Palazzo suggested that a directory of whalewatching researchers be compiled. There was some discussion of the suitability of collecting information from whalewatching researchers concerning their studies. This exercise would include brief details of their methodologies. Palazzo agreed to compile this information for presentation at next year's meeting.

10. WORK PLAN

The sub-committee **agreed** on the following work plan, which is not prioritised:

(1) Review the report of the Intersessional Whalewatching Data Collection Correspondence Group, and the report of the Intersessional Whalewatching Management Correspondence Group (or a report of a meeting if one is held intersessionally).
(2) Review information on the significance of noise produced from vessels and aircraft with respect to cetaceans.
(3) Review information on 'swim-with' whale programmes.
(4) Review information on high speed vessels and whale/vessel collisions in a joint session with the Standing sub-committee on the Estimation of Bycatch and Other Human-induced Mortality.
(5) Review a compendium of data forms used on whalewatching platforms.
(6) Review a directory of researchers using whalewatching vessels as platforms of opportunity or who are engaged in studies on the impacts of whalewatching, including reference to the research they are conducting.

Other work:

(1) Review of research on the effectiveness of and compliance with national whalewatching guidelines and regulations;
(2) Review of national whalewatching guidelines and regulations;
(3) Review of new information on dolphin feeding programmes; and
(4) Review of new information on 'swim-with' dolphin programmes.

11. ADOPTION OF THE REPORT

The report was adopted on 5 May 2002 at 12:45pm. The sub-committee expressed its appreciation to Kato (in Japanese) for his leadership and to Carlson for rapporteuring.

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Appendix 1

AGENDA

1. Opening remarks and terms of reference
2. Election of chair and rapporteurs
3. Adoption of agenda
4. Review of available documents
5. Report of intersessional working groups
   5.1 Data Collection Correspondence Group
   5.2 Whalewatching Management Correspondence Group
6. Whalewatching activities and noise impacts
7. Review of research on effectiveness and compliance with whalewatching guidelines and regulations
8. New information on previously discussed topics
   8.1 Dolphin feeding programmes
   8.2 'Swim-with' whale and dolphin programmes
   8.3 National guidelines and regulations
   8.4 Other
9. Other
10. Work plan
11 Adoption of report

Appendix 2

WORKPLAN FOR INTERSESSIONAL REVIEW AND DEVELOPMENT OF THE DATA RECORDING SYSTEM (DRS)

Each type of data will be reviewed such that it can be given a priority rating, i.e. essential information; information of lesser importance; information of low importance. There may be a fourth category that relates to information only collected under certain circumstances and/or to address certain questions, or specific to certain geographical areas. The data levels 1-3 and the Critical Response Parameters previously established by the sub-committee will be used in this respect (IWC, 2002, pp.339-340). The review would also encompass consideration of which issues each data-type will help to investigate and would be used to create a matrix of qualifications relating to each data-type. This would then be used to:

(1) improve the DRS;
(2) help to provide further instructions for its application; and
(3) help to design an interactive computer program that would assist whalewatching researchers in designing data-collection forms (similar to the program

demonstrated by Simmonds). This may include the development of pre-set 'daughter forms' for particular investigations.

This review will also be used to provide would-be researchers with an outline of which data might be used to help to investigate certain questions.

This process will also be informed by field-testing of forms derived from the DRS intersessionally with further consultation with field workers and whalewatching operators. Colleagues are invited to take part in this and provide feedback to an intersessional correspondence group.

In addition, consideration will be given to adding information to the DRS to help facilitate the collection of appropriate photo-identification data for a variety of taxa using both standard 35mm photography and digital photography.

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International Whaling Commission. 2002. Report of the Scientific Committee. Annex L. Report of the Sub-Committee on Whalewatching. *J. Cetacean Res. Manage. (Suppl.)* 4:339-60.

Appendix 3

EXAMPLES OF SCIENTIFIC STUDIES SHOWING CHANGES IN CETACEAN BEHAVIOUR AND HABITAT USE AS THE RESULT OF THE PRESENCE OF WHALEWATCHING VESSELS

Table 1 is by no means comprehensive, and many more publications exist on the effects of whalewatching vessels on cetacean behaviour and habitat use. This summary table simply serves to illustrate some examples of scientific studies that have addressed this issue.

Species	Reference
Bottlenose dolphin, *Tursiops truncatus*	Gregory and Rowden (2001)
	Scarpaci *et al*. (2000)
	Janik and Thompson (1996)
Indo-Pacific bottlenose dolphin, *T. aduncus*	SC/54/WW1
Rough-toothed dolphins, *Steno bredanensis*	Ritter (2002)
Hector's dolphin, *Cephalorhynchus hectori*	Bejder *et al.* (1999)
Beluga whale, *Delphinapterus leucas*	Blane and Jaakson (1994)
Sperm whale, *Physeter macrocephalus*	Richter *et al.* (2002)
	Gordon *et al.* (1992)
Killer whale, *Orcinus orca*	Williams *et al.* (2002)
	Williams *et al.* (2002)
	Kruse (1991)
Humpback whales, *Megaptera novaeangliae*	SC/54/WW4
	McCauley and Cato (2001)
	Au and Green (2001)
	Schilling *et al*. (1989)
	Corkeron (1995)
Gray whale, *Eschrichtius robustus*	Heckel *et al.* (2001)
Southern right whale, *Eubalaena australis*	SC/51/WW8
Fin whale, *Balaenoptera physalus*	Stone *et al.* (1992)

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