Annex O

Report of the Standing Working Group on Scientific Permit Proposals

Members: Bjørge (Chair), Baba, Baker, Berggren, Brownell, Butterworth, Childerhouse, Cipriano, Clapham, Cooke, Danielsdottir, DeMaster, Diake, Forde, Fortuna, Friday, Fujise, Fukui, Funahashi, Gales, Gidding, Givens, Goodman, Goto, Groch, Grønvik, Gunnlaugsson, Hakamada, Hatanaka, Hedley, Hester, Iñiguez, Kanda, Kasuya, Kato, Kawahara, Kell, Kim, Z.G., Kim, K.W., Kitakado, Lawrence, Leaper, Lee, Lens, Lima, Lyrholm, Manzanilla, Matsuda, Matsuoka, Mori, Morishita, Nagatomo, Nakatsuka, Northridge, Ohsumi, Øien, Olafsdottir, Oosthuizen, Palazzo, Pastene, Perrin, Perry, Punt, Rambally, Reeves, Reijnders, Ridoux, Robbins, Rogan, Rose, Sadler, Sigurjónsson, Simmonds, Smith, Sohn, Stachowitsch, Tanaka, Tomita, Vikingsson, Wade, Walløe, Walters, Weinrich, Williams, Yamakage, Yoshida.

1. INTRODUCTORY ITEMS

1.1 Convenor's opening remarks
The Convenor welcomed the participants and informed the group that it had been allocated four sessions to complete its work.

1.2 Election of Chair
Bjørge was elected Chair.

1.3 Appointment of rapporteurs
Northridge, Robbins and Smith acted as rapporteurs.

2. ADOPTION OF AGENDA

The adopted agenda is given as Appendix 1.

3. REVIEW OF AVAILABLE DOCUMENTS

The Working Group identified SC/55/O1, O2, O5-O8 and SC/55/ProgRep Japan as relevant to its work.

4. PROPOSALS TO FACILITATE THE REVIEW PROCESS

At last year's meeting, a Standing Working Group was established to review scientific permit proposals and consider improvements to the way in which scientific permit results and proposals are reviewed. It was also discussed how this group would make recommendations for streamlining the existing guidelines, which had developed over a number of years and included duplication and overlap within the broad headings used. While it was anticipated that this issue would be discussed in 2003, it was instead **agreed** to postpone and revisit the issue in a year in which there are no major new scientific permit proposals to review.

The Working Group discussed plans for review of the final JARPA results, which are expected in 2005. One member commented on the usefulness of the Working Group assembled in 1987 to review permitted research on common minke whales. The Working Group **recommended** that a small intersessional working group be formed to begin the planning process. The exact composition of this group was not determined, although it was felt that it would be most fruitful if limited to a few Japanese scientists and a few scientists from various other countries. Schweder, Brownell and Childerhouse were tentatively identified for the latter group.

5. REVIEW OF RESULTS FROM EXISTING PERMITS

5.1 JARPA – Southern Hemisphere minke whale
The Working Group received a summary of the JARPA cruise report for the 2002/2003 season (SC/55/O6). The sixteenth JARPA survey was conducted in Area V and the western part of Area VI from 2 December 2002 to 8 March 2003. Searching distances of the sightings vessel (SV) and the average of the three sighting/sampling vessels (SSVs) were 5,413.5 and 4,237.6 n.miles, respectively. The total sightings of Antarctic minke whales were 7,290 individuals in 2,677 schools. Fifteen species of whales were confirmed on the cruise. Antarctic minke whales were the most dominant species and widely distributed in the entire research area. Out of 1,582 schools (4,506 individuals) recorded in the primary sightings of Antarctic minke whales by SSVs, 479 schools and 928 individuals were targeted for sampling. A total of 440 individuals were sampled. Mature females were dominant in the East-South stratum of Area V. Mature males were dominant in the North strata in Area V and Area VIW. A total of 128 pregnant females with 131 foetuses were sampled in the entire research area.

A total of 23 biopsy skin samples were collected. CTD and XCTD castings were conducted in all research areas. Sea surface environmental data recording using EPCS was conducted in the entire research area. Hydro-acoustic survey was conducted in all research areas. Recordings of whale song by sonobuoy was attempted at five stations in the western part of Area VI and the eastern part of Area V.

On this cruise, Antarctic minke whales were remarkably high in number and widely distributed over the whole strata except in the East-North stratum in V and VIW. A high surface water temperature was locally recorded north of the West-North stratum in Area V. Results from the 2000/2001 cruise suggested that Antarctic minke whales could avoid high surface water temperature. It was suggested that yearly fluctuation of high water temperature affects the distribution and density of Antarctic minke whales.

The Japanese leader expressed special thanks to the SOWER cruise leader Paul Ensor and crew, noting the successful collaboration between the SOWER and JARPA Antarctic cetacean research projects. Another member agreed, but mentioned that the JARPA programme surveyed one 5° sector just one week prior to the SOWER work in the same area. In response, it was explained that the JARPA cruise proceeded only because the SOWER survey vessel had been delayed by ice conditions.

Further comment was made on the success of biopsy sampling efforts during the previous season and the apparent feasibility of performing that work in conjunction with other efforts. In response, it was clarified that biopsy is performed opportunistically and focussed primarily on humpback whales.

When queried on the status of satellite tagging attempts, it was noted that the work did not proceed due to equipment failure.

5.2 JARPN II – North Pacific minke, Bryde's, sei and sperm whales

SC/55/O7 outlined the offshore component of the 2002 full scale survey under JARPN II, which aimed: (1) to study feeding ecology and the ecosystem, involving studies of prey consumption by cetaceans, prey preferences of cetaceans and ecosystem modelling; (2) to monitor environmental pollutants; and (3) to study stock structure, particularly for minke whales. Target species were the common minke, Bryde's, sei and sperm whales. The research area covered sub-areas 7, 8 and 9 in the western North Pacific. The survey consisted of a whale survey and prey survey. The survey used a total of six research vessels: 1 trawl survey vessel equipped with scientific echo sounder (TSV), 1 dedicated sightings vessel (SV), 3 sighting/sampling vessels (SSVs) and 1 research base vessel. A total of 11,497.3 n.miles was surveyed over a period of 76 days. During that period, 141 common minke, 129 Bryde's, 212 sei and 556 sperm whales were sighted by the SSVs. A total of 100 common minke, 50 Bryde's, 39 sei and 5 sperm whales were sampled by the SSVs. A cooperative ecosystem survey involving five vessels was conducted in part of sub-areas 8 and 9 (from 18 July to 1 August) and in part of sub-area 7 (from 7-17 August). All whales sampled were examined on board the research base vessel.

Major prey species of minke whales were Japanese anchovy and common squid in sub-area 7 and Pacific saury in sub-areas 8 and 9. Small-sized Japanese anchovy, including larva, were found in the stomach of Bryde's whales. Copepods, krill, Pacific saury, Japanese anchovy and Japanese common squid were observed in the stomachs of sei whales. Dominant prey in the stomach of five sperm whales were different kinds of squids which inhabit mid- and deep-waters.

SC/55/O8 outlined the coastal component of the full scale JARPN II survey conducted in 2002. In this component, the sampling of 50 minke whales was planned in the coastal areas of Japan using small-type whaling catcher boats in order to cover the temporal and spatial gap of the research of the offshore component. The first survey was conducted from 10 September to 12 October 2002 in the coastal waters off Kushiro, northeast Japan (northern part of sub-area 7). Research vessels were three small-type whaling catcher boats, one echo sounder-trawl survey vessel and one dedicated sightings survey vessel. Whale sampling was conducted within 30 n.miles from the Kushiro port, and all whales were landed in Kushiro port at the newly established biological research land station. A total of 3,523 n.miles

(330.4 hours) was surveyed for whale sampling; 171 schools (177 individuals) were sighted and 50 minke whales were sampled. Major prey species found in the stomach contents were Japanese anchovy, walleye pollock, Pacific saury, Japanese common squid and krill. These results suggested that minke whales could use various prey species, and the coastal area off Kushiro was one of the major feeding grounds for the whales in the autumn season. There were no serious practical problems and the 2002 coastal whale survey off Kushiro was conducted successfully.

As sperm whales were the most commonly encountered cetacean, one member inquired whether biopsy samples had been obtained, given their potential value in resolving issues of stock structure. It was noted that there had been no opportunity to do so in the most recent cruise, but it was planned in the future. The use of non-lethal sampling was again noted. Another member added that there appeared to be value in combining lethal and non-lethal sampling methods.

The Japanese scientists extended thanks to scientists from the Republic of Korea and Russia who had participated in the JARPN II research.

The Working Group **agreed** that a more detailed review would be undertaken after the completion of the two years of research under JARPN II. For this review, comprehensive results will be provided, including recalculation of sample sizes.

6. REVIEW OF NEW OR REVISED PROPOSALS
6.1 JARPA

SC/55/O1 outlined the JARPA survey plan for the 2003/2004 season. The survey will be the 17th full-scale survey, and the objectives, survey items and methods are the same as in previous years. Specifically, the survey for the coming season will cover Area IV and the eastern half of Area III in order to focus on the issue of distribution of stocks.

As explained in SC/55/IA8, the results of genetic analyses are not yet conclusive. As a result, surveys will again be performed in the Eastern half of Area III to address the temporal/spatial distribution of stocks in Areas III East and IV. This work will also examine morphometric and reproductive parameters of whales sampled in eastern Area III.

The progress of some JARPA tasks and other studies using JARPA samples were presented in other working groups and are described in the following documents: SC/55/IA3 (minke whale abundance); SC/55/IA8 (minke whale mtDNA analysis); SC/55/SH10 (humpback whale abundance and trend); SC/55/SD6 (fin whale mtDNA); SC/55/O5 (research activities of ICR); and SC/55/O6 (2002/2003 cruise report).

The schedule for the 2003/2004 JARPA survey is as follows:

(1) Research vessels will leave Japan at the beginning of November 2003 and return in the middle of April 2004.
(2) The sample size is 300 animals in Area IV and 100 animals in Area III with a 10% allowance.
(3) The type and number of vessels are the same as in previous years: one research base vessel, three sighting and sampling vessels and one dedicated sighting vessel.
(4) The survey period for the 2003/2004 JARPA sample size remains unchanged to ensure comparability of data.

Foreign scientists are welcome to participate in the planned research.

In 1995, lethal sampling in Area III was proposed in the framework of a feasibility study. Given that this work is still on-going, the Working Group requested clarification of whether it will continue to proceed as a feasibility study or is now considered to be a part of the full programme. In response, it was noted that when the JARPA research began, it was thought that two stocks occupied the study area. However, evidence now suggests that a core stock may straddle Areas IV and V and that another stock may exist in eastern parts of Area IV and in Area III. It had been hoped that a couple of years of sampling would have resolved this issue of stock structure. However, this has not been the case. It was clarified that this is no longer considered a feasibility study, and acknowledged that the shift away from feasibility could have been spelled out more clearly.

One member noted that the proposal remains unchanged from previous years and that comments made in previous meetings still apply. Specifically: (1) that a sample size of over 5,000 whales killed during the project should be more than adequate to address the hypothesis raised; (2) that there are no agreed abundance estimates and the effect on the stock remains unresolved; and (3) that much of the information collected in this project is not required for management, and of the useful data, most can be collected by non-lethal methods with equal or better results.

In response, it was noted that this long-term programme is intended to address the estimation of natural mortality rate and ecological studies of minke whales. Sample sizes were set to ensure sufficient precision in the estimate of natural mortality. Members were directed to the original JARPA proposal (IWC, 1988) for a detailed explanation of the sample size rationale.

Another member expressed appreciation of this extensive programme.

6.2 A two-year feasibility study on cetaceans in Icelandic waters

Plans for research under special permit were provided to the Working Group in document SC/55/O2 and in an oral presentation to the Scientific Committee. The Working Group thanked Sigurjonsson, Vikingsson and Gunnlaugsson for their informative presentation.

The text below is structured according to the Guidelines for the Review of Scientific Permit Proposals (Donovan, 2001) and the outline of previous Committee scientific permit proposal reviews. Details of the proposal are presented first, followed by comments from the Working Group.

A. The Proposal
The relevant guidelines are as follows:

1. A statement as to whether the permit proposal adequately specifies the four sets of information required under paragraph 30 of the Schedule *(Rep. int. Whal. Commn* 36:133).
2. Objective of the research (Schedule Paragraph 30).
3. Number, sex, size and stock of the animals to be taken (Schedule Paragraph 30).

Proposal (summary of SC/55/O2)
This research proposal is for a two-year feasibility study, submitted by the Marine Research Institute (MRI) upon request by the Government of Iceland. The overall objective of the research programme is to increase understanding of the biology and feeding ecology of three cetacean species in Icelandic waters for improved management of living marine resources based on an ecosystem approach. The proposal

states that the project is intended to strengthen the basis for conservation and sustainable use of cetaceans, but is equally important as a contribution to multi-species management of living resources in Icelandic waters. The proposal is intended as a feasibility study upon which the design of a future sampling scheme will be based.

The proposal specifies the four sets of information required under paragraph 30 of the IWC Schedule: (a) the objectives of the research; (b) number, sex, size and stock of the animals to be taken; (c) opportunities for participation in research by scientists of other nations; and (d) possible effect on conservation of the stock. Three cetacean species, 100 common minke, 100 fin and 50 sei whales, will be lethally sampled for scientific purposes in each of the two study years. As gender is not distinguishable in the field, separate quotas for males and females cannot be set. For fin and common minke whales it is thus assumed that 50 animals of each sex will be caught per year and 25 of each sex for sei whales. Sampling will not be selective with regard to length except that lactating females and accompanying calves will not be sampled. All sampling will take place within the 200 n.mile EEZ of Iceland.

Comments and discussion by the SC Working Group
The Working Group **agreed** that the requirements of guidelines 1-3 had been adequately met.

B. Objectives
The relevant guidelines are as follows:

1. Comments on the objectives of the research to be carried out under the proposed scientific permit, including in particular how they might relate to research needs identified by the Scientific Committee *(Rep. int. Whal. Commn* 36:133);
2. The proposed research is intended and structured accordingly to contribute information essential for rational management of the stock *(Rep. int. Whal. Commn* 37:25);
3. Is required for the purposes of management of the species or stock being researched (Resolution 1999-2);
4. The research addresses a question or questions that should be answered in order to conduct the comprehensive assessment or to meet other critically important research needs *(Rep. int. Whal. Commn* 38:27-28);
5. The number, age and sex of whales to be taken are necessary to complete the research and will facilitate the conduct of the comprehensive assessment *(Rep. int. Whal. Commn* 37:25).

Proposal (summary of SC/55/O2)
The overall objective of the research programme is to increase understanding of the biology and feeding ecology of important cetacean species in Icelandic waters for improved management of living marine resources based on an ecosystem approach. While the project is intended to strengthen the basis for conservation and sustainable use of cetaceans, it is equally important as a contribution to multi-species management of living resources in Icelandic waters. The present proposal is for a feasibility study upon which the design of a future sampling scheme will be based.

This research programme has multiple objectives among which the order of priority differs between the whale species according to differing states of knowledge and research needs:

COMMON MINKE WHALES
(1) Increase the knowledge on feeding ecology of common minke whales in Icelandic waters by studies on diet composition, energetics, seasonal variation in distribution and abundance, consumption of different prey species and multi-species modelling.

(2) Population structure: (a) comparison of the genetic structure of common minke whales off Iceland, Norway (including the Jan Mayen area), the Faroes and Greenland; (b) monitoring the movements of common minke whales by satellite telemetry.

(3) Monitoring and evaluation of the morbidity of potential pathogens.

(4) Temporal changes in biological parameters.

(5) Pollutant burden and evaluation of the health status of individual whales and populations.

(6) The applicability of non-lethal research methods in studies on feeding, energetics and pollutant burden.

FIN WHALES

(1) Development of biological parameters during the apparent increase in population size in recent decades.

(2) Feeding ecology and energetics: (a) geographical variation in feeding ecology of fin whales in Icelandic waters; (b) validation of the representativeness of previous studies showing krill as the main food of fin whales in Icelandic waters by comparing various alternative feeding research methods; (c) potential effects of the 15-year moratorium on energetic condition and seasonal energy deposition; (d) multi-species modelling.

(3) Follow-up study and evaluation of potential mortality induced by effects of *Crassicauda* infections.

(4) Population structure of fin whales in Icelandic waters as compared to other North Atlantic areas and mixing of stocks in the waters west and southwest off Iceland. Potential effects of the 15-year moratorium on genetic variation and stock structure.

(5) Pollutant burden and evaluation of the health status at individual and population level.

(6) The applicability of non-lethal research methods in studies on feeding, energetics and pollutant burden.

SEI WHALES

(1) Biological parameters, including potential changes in reproductive parameters during the 15-year pause in whaling.

(2) A follow-up study and evaluation of potential mortality induced by the effects of pathogens.

(3) Increasing the limited knowledge on the genetic structure of the population.

(4) Pollutant burden and evaluation of the health status at individual and population level.

(5) (a) adding to the limited knowledge of feeding ecology and energetics of sei whales; (b) validation of the representativeness of previous studies showing krill as the main food of sei whales in Icelandic waters by comparing various alternative feeding research methods.

(6) The applicability of non-lethal research methods in studies on feeding, energetics and pollutant burden.

The final impact of the project will be to significantly increase limited knowledge of the feeding ecology of common minke whales and to add significantly to previous knowledge of fin and sei whale feeding ecology and energetics. Knowledge of seasonal abundance and distribution of these whale species will also be improved. Incorporating this information into a multi-species model is aimed at better understanding of the Icelandic marine ecosystem and improved harvesting models for multi-species management of fisheries in the area. The

programme will help clarify stock structure of the involved species in the North Atlantic, which is of vital importance in terms of implementation of the RMP. It will also enable an evaluation of the effect of the temporary pause in commercial whaling and increase in whale abundance on biological parameters and energetic condition.

Comments and discussion by the SC Working Group
FEASIBILITY ASPECTS
Several members questioned whether the proposal could appropriately be described as a feasibility study, as there is already a large amount of information pertaining to the objectives from previous studies, and this information should have been sufficient to draw up a more complete proposal. They maintained that feasibility studies should represent an opportunity to explore new research areas, and are often exempted from the rigorous review that research proposals usually receive, especially concerning the likelihood of meeting goals with the proposed level of sampling. The Icelandic proposal is presented as a two-year feasibility study, but some members believed that this was inappropriate because Iceland and other nations already have considerable experience in conducting the research proposed. Indeed the proposal describes the previous Icelandic research programme (1986-1989) and even includes as part of its justification that the present proposal will allow comparisons with some of the earlier data. Furthermore, some members argued that previous experience should have been sufficient to obviate the need for a feasibility study. Furthermore, the killing of such a large number of animals (250 per year) is not consistent with a feasibility study, nor was there any clear indication of what new methods would be tested nor what was being tested for feasibility. Those members concluded that initiating the research on a feasibility basis is therefore not justified and the proponents should be encouraged to prepare a full research proposal that can be reviewed properly next year. With reference to the previous work conducted in the 1970s and 1980s, it was noted that results from 1,609 fin whale stomachs and 247 sei whale stomachs had not been published.

Other members welcomed the research initiative, recognising that the overall objective of the programme is to increase understanding of the biology and feeding ecology of important cetacean species in Icelandic waters. While the project is intended to strengthen the basis for conservation and sustainable use of cetaceans, these members felt that it is equally important as a contribution to multi-species management of living resources in Icelandic waters. However, they noted that the proposal says too little about the future project that this feasibility study is intended to lead into. An ambitious long-term programme might be inferred from the proposed feasibility study, but they suggested that an explicit formulation of this intended study would have been helpful to set the feasibility study in context. Again, it is not clear what feasibility is to be investigated in the two-year study.

In reply, the proponents stated that the question of whether the programme proposal is called a two-year feasibility study or a full-scale two-year research programme is merely semantic. The proponents felt that it is clear that the ultimate objectives of the investigations will not be met within the two-year time frame, but the results will undoubtedly clarify the situation and provide guidance as to how to proceed with these fundamental questions upon completion of the feasibility period. Thus, they intended 'feasibility' to refer

both to the adaptive nature of the research that is stressed in the investigations and the cautiousness in terms of the limited take that is planned which is well below the sustainable harvest level that recent assessments have demonstrated and far below the past commercial catch levels.

The proponents stressed that the approach adopted was a cautious one, as there were practical difficulties associated with the design of the programme. They believed that for common minke whales in particular there is much uncertainty about their feeding habits in unsampled areas. The intention of the proposal is to go to areas beyond the traditional whaling grounds, and so explore seasons and spatial areas that have not previously been sampled. They noted that in light of the results, future work will be adjusted in order to ensure that the objectives are addressed in an optimal manner. Similarly for fin whales, the proposal plans to sample beyond the previous areas of whaling, and one may anticipate a major difference in the feeding ecology of the fin whales found east and northeast of Iceland compared to those on the traditional western Icelandic whaling grounds. The proponents also pointed out that similar scientific work in Norway had indeed underpinned later decisions about commercial whaling.

The question was again posed regarding performance criteria in the study. Specifically, the proponents were asked to provide, for any aspect of the feasibility study, an indication of results that would cause them to conclude that the proposed research was not feasible. The proponents reiterated that they will, for example, determine if it is practical or not based on whether a clear picture of feeding ecology and life history can be obtained.

Concerning stomach contents data from previous research, the proponents noted that most of the earlier studies were limited to qualitative descriptions of stomach contents. They noted that data from common minke whale stomach samples collected earlier had been published, although those samples had been limited in time and space (68 animals spread over a 20-year period). Although considerably higher numbers of fin whale stomachs have been examined, these were all taken from a limited area and season. These contained 97-98% krill (Rorvik et al., 1976; Sigurjónsson and Víkingsson, 1997), but further details of the diet composition have not been published. A more complete research programme will be devised at the end of the feasibility study. They also reiterated that feeding ecology is not the primary objective of the fin and sei whale studies.

Regarding a perceived lack of explicit hypotheses, the proponents pointed out that for a multi-purpose feasibility programme such as the present one, specification of such hypotheses in advance was difficult and could even detract from the added value of the combined research activities.

RELEVANCE TO IWC: MULTI-SPECIES INTERACTIONS

Many members expressed concerns that were similar to those expressed last year over the Japanese scientific whaling programme in the North Pacific (JARPN II). Specifically, they observed that the major objectives of the Icelandic proposal are either not relevant to the management of whales by the IWC under the RMP, or that the subset of information which was relevant to those management procedures could be much more efficiently obtained by non-lethal methods that are already well-tested in this regard. They maintained that the first objective of the Icelandic proposal, concerning ecosystem-based modelling and management, had nothing to do with the manner in which the IWC assesses and manages whale populations. Furthermore, they felt that the basis of the Icelandic programme ran directly counter to such management: implicit in the proposal was the idea that whale populations should be managed to increase yield in other fisheries, yet this was contradictory to the principle of conservative sustainable management that is the foundation of the RMP. They noted that managing whales to minimise their impact on commercial fisheries would be in effect management by culling, which was the opposite of what the RMP was established to achieve.

These members further drew attention to a statement regarding effects of changes in cetacean abundance on fisheries catches in the report of the recent IWC Modelling Workshop on Cetacean-Fishery Competition (SC/55/Rep1) that '...cetaceans form just one part of the system that needs to be modelled in order to try to answer the IWC question posed in the terms of reference for this Workshop'. They observed that, despite this caveat, the Icelandic proposal did not intend to conduct concurrent studies of prey occurrence or of other important components of any ecosystem model. Article VIII of the International Convention for the Regulation of Whaling (ICRW), the provision governing special permits 'to kill, take and treat whales for purposes of scientific research', was established with the recognition 'that continuous collection and analysis of biological data ... are indispensible to sound and constructive management of the whale fisheries'. These members concluded by saying that Article VIII was not created to provide information with the ultimate intention of managing other fisheries.

In response, the proponents stated that the proposal had multi-purpose objectives and that the criticisms levelled above needed to be considered in the full context of the many facets of the proposal. The proponents stated that in most relevant international fora, multi-species aspects are now regarded as a necessary part of the management of living ocean resources, and the initiation of work on interactions between whale stocks and fisheries within the SC demonstrates that this view is held by the IWC. Several members of the SC agreed with this perspective. The proponents felt that it was far beyond the scope of SC members to judge whether it was 'appropriate' or not for Icelandic authorities to issue scientific permits with reference to what was originally the intention of Article VIII, since the Convention does not specify the nature of scientific activity to be conducted under such permits. In addition, the proponents noted that these are legal questions that could be raised in the Commission if delegations so wish, the task of the SC is only to judge whether the proposal meets the criteria given in the guidelines. The proponents found the suggestion that ecosystem matters are irrelevant to the SC surprising; although management of fish stocks is outside the remit of the IWC, scientists must still ask questions about the role of whales in the ecosystem, as the recent IWC workshop on this subject demonstrates (SC/55/Rep1). The proponents also rejected the idea that the proposal implies that whale populations should be managed to increase yields in other fisheries, as management decisions could also go in the direction of reducing the harvest of certain fishery resources that are preyed upon by marine mammals, if such an action was considered necessary by the management authority in question.

Other members stated that the IWC clearly recognises (Resolution 2001/9: IWC, 2002, p.58) that interactions between whales and fish stocks should be given priority, and furthermore that many fishery regulatory bodies have also called for an ecosystem based approach to management.

They noted that a first priority should be to gather data on the impact of common minke whale feeding on commercially important fish species. It was also pointed out that although this is a difficult area of study, it is a legitimate one and that Norway has already reached some preliminary conclusions in their studies of interactions between whales and fisheries. Furthermore, there may be important interactions both ways, so that fisheries might also need to be managed for the benefit of whales.

With regard to suggestions that there is a critical lack of contemporaneous prey sampling, the proponents noted that in fact a major monitoring scheme on all principal fish resources and environment is regularly conducted in the waters around Iceland, with particular reference to an ecosystem model that is being developed for the area.

RELEVANCE TO THE IWC: RMP

With regard to the proposal's second objective (population dynamics and basic biology), many members referred to comments about data requirements of the RMP made last year in regard to JARPN II. The RMP requires a time series of annual catches, a time series of absolute abundance estimates together with their variance/covariance matrix, and a specification of the distributional form of the absolute abundance estimates (IWC, 1999). Additional information, while not specified by the RMP, potentially served to clarify and restrict the set of plausible scenarios considered in *Implementation Simulation Trials* (ISTs). While it was agreed that population structure data were particularly important to this undertaking, these members argued that the most reliable information on this topic could be obtained from genetic analysis, and from genotype-based mark-recapture data on the movements of individual whales.

These same members pointed out that these analyses are routinely conducted using skin tissue derived from biopsy samples and lethal sampling was not required. It was the view of these members that a biopsy sampling programme, in combination with genetic analysis of existing material, could generate a much larger sample that would substantially increase statistical power. It was further noted that there were no methodological constraints preventing a large-scale biopsying effort on the three species concerned, since numerous samples had already been collected elsewhere. In light of this view, there should be no need to evaluate the applicability of non-lethal research methods for the data on population structure required for the RMP. In their opinion, the efficacy of non-lethal methods had already been well demonstrated in this and other contexts for numerous species over many years.

In response, the proponents noted that the second criterion of the guidelines calls for objectives that address the rational management of the stock. The proponents questioned whether the RMP is actually 'rational management', and added that the RMP is not the only reason for doing such research. They stated that many of the questions being addressed in the proposal are in fact relevant to the RMP. The issue of multi-species interactions, for example, will influence decisions as to whether and where to ask for a quota in the first place. To examine this, detailed modelling with reliable estimates of biological parameters will be needed. Further, for implementation of the RMP, reliable estimates of MSY will be required for simulation trials. With respect to both the RMP and other management aspects of these whale stocks, the proponents noted that updated information of vital parameters is extremely important when

modelling stock dynamics and to provide a better basis to manage the whale stocks. This would also shed light on how rational the RMP is as a management tool.

Other members agreed with the proponents that the proposal addressed biological data that would be essential for comprehensive assessment.

With regard to biopsy sampling, the proponents stated that while biopsy studies can be useful for genetic studies, some of the sub-projects proposed here required supplementary information such as sex, age and reproductive condition which are useful for interpretation of stock structure at a micro-geographic scale as proposed in the research programme. They reiterated that while genetic studies are not a primary objective of the research proposal, knowledge of age and reproductive status would be important for interpretation of genetic data to take account of segregation by age and reproductive status. Thus, they believed that lethal methods were necessary for the research proposed.

In response, some members pointed out that recent work had demonstrated that sex and reproductive status could be obtained by biopsy sampling. Further, they stated that age data are not required for population modelling, as demonstrated during the recent SC Comprehensive Assessment of North Atlantic humpback whales which did not rely on data from lethal sampling.

ISSUES OF SAMPLE SIZE

Many members were concerned by the lack of a rigorous approach to the determination of sample size. Although some arguments are put forward in the proposal, they are not clearly defined which makes it difficult to evaluate whether the samples sizes proposed would be adequate to address the objectives.

One member maintained that in terms of the justification of the sampling design and also the sample size, this proposal would not survive review by major national or international funding agencies (for example the European Commission or the US National Science Foundation).

Some members went further and maintained that under scientific criteria normally adhered to in review of scientific research proposals, this proposal is inadequate especially in its description of sample sizes. They maintained that it does not present useful information on either the effects of the proposed annual sample size or on the number of years that would be required to accumulate sufficient sample sizes to test any of the hypotheses implicit in the proposal. Further, these members stated that even though the proposal is intended to have several objectives, the proposed sample sizes and sampling designs should be justified in terms of how adequately they will address at least some of the implicit hypotheses. For example, for fin whales there is no evaluation presented of the statistical power of possible tests to answer one of the primary goals of the study, to detect changes in biological parameters, especially age at sexual maturity. Further, the proposal offers no hypothesis for how such changes might have occurred previously or how they might be expected to have occurred subsequently. Thus, it is not clear if it will be possible to determine if the age of maturity has changed since the previous long-term decline reversed itself in the mid-1980s. Further, some members were concerned that it was not clear what the proposers thought it might mean if one did find a significant difference.

Some members also noted that in one of the few places that sample size is explicitly discussed (section 4.5) the argument involved a hypothetical calculation of the

proportion in the diet of a single prey species. Sample sizes of 100 and 25 were compared for estimating that proportion, ignoring the decrease in precision resulting from spatial and seasonal stratification that is inherent in the proposed sampling design. Furthermore there is no explicit description of the modelling context in which such a proportion would be used.

Some members noted that several other specific opportunities where sample size analysis would be easy to determine have been overlooked. Further, it would be possible to explore more complex points of interest, such as with common minke whale feeding studies, the effects of alternate sample sizes and sampling design, using the proposed modelling approach. These members stated that it was unfortunate that the modelling structure is insufficiently developed in the proposal to determine the required sample sizes.

One member stated that a sample of 50 sei whales a year seemed unlikely to be able to yield much useful information.

In response, the proponents stated that roughly 20 pregnant fin whales would be expected in the proposed catch per year. The age at sexual maturity has shown significant trends with time, going from a high to a low in about 30 years, but significant differences between individual years can be detected over shorter time spans. Basing a ratio on a number smaller than 20 is generally avoided in statistical practice. However, the proponents said that if sample sizes were increased to exceed the numbers previously taken during the commercial catch period and subsequent scientific whaling period, there would be only a small increase in statistical power. It was also pointed out that whereas it is clear that small sample sizes are a constraint for the proposed research, many of the components of the programme are descriptive in nature, including the monitoring of parameters necessary for the future management of the stocks and related resources. With regard to sei whales, the proponents conceded that sample sizes were small, but that in 1986-1989 only half of the proposed catch was taken, so that this proposed catch is supplementary to the previous programme. The sample may also allow some comparisons with the previous samples. The proponents stated that the low sample sizes are a precautionary measure because no formal assessment has been conducted on this stock by an international organisation.

Summary and Conclusions
Relative to guidelines 1 and 4, some members maintained that the proposal addresses two research areas that have been identified by the Scientific Committee. One is the need for research on fisheries and cetaceans and some members believed that in this area the research would be useful. Other members maintained that such research has no bearing on the IWC's management of whale stocks. A second area is the need for research on pollutant loads. While some members believed that the proposed work would help to address this research area, others noted that the Committee had not recommended lethal sampling for pollutant studies. Further, they had also not given high priority to pollution studies for baleen whales generally. While not necessary for the application of the RMP, stock definition has proven important in the development of an *Implementation* of the RMP. The proposed research addresses this issue, although many members believed that more appropriate and effective methods are available to address the question.

Relative to guidelines 2 and 3, the proposal addresses the issue of the problem of deciding on the advisability of initiating whaling or changing fisheries to account for whale and fish interactions. Many members of the Working Group thought that the proposal did not address questions relevant for management of the respective whale stocks and therefore did not meet the criteria of guidelines 2 and 3.

Relative to guideline 5, the proposal did not provide scientific justification for the proposed sample sizes, although the proponents argued that sizes were sufficient for the planning purposes of a feasibility study. Some members argued that the proposal should not be taken as a feasibility study because in many aspects it was an extension of the 1986-1989 research programme, and as such, evaluation of the sufficiency of sample sizes was appropriate. In contrast, the proponents argued that the proposal was primarily to determine the feasibility of sampling of common minke whales, and to a degree, fin whales in previously unsampled areas.

C. Methodology
The relevant guidelines are as follows:

1. 'Comments on the methodology of the proposed research and an evaluation of the likelihood that the methodology will lead to achievement of the scientific objectives. These comments may also include evaluation of the methodology in terms of current scientific knowledge' *(Rep. int. Whal. Commn 36:133)*;
2. 'The objectives of the research are not practically and scientifically feasible through non-lethal research techniques' *(Rep. int. Whal. Commn 37:25)*;
3. '...whether the information sought could be obtained by non-lethal means' (Resolution 1999-2);
4. 'The research addresses a question or questions that cannot be answered by analysis of existing data and/or use of non-lethal research techniques' *(Rep. int. Whal. Commn 38:27-28)*;
5. 'Whales will be killed in a manner consistent with the provisions of Section III of the Schedule, due regard being had to whether there are compelling scientific reasons to the contrary' *(Rep. int. Whal. Commn 37:25)*;
6. 'The research is likely to yield results leading to reliable answers to the questions being addressed' *(Rep. int. Whal. Commn 38:27-28)*.

Proposal (summary of SC/55/O2)
The proponents summarised the methodologies of the proposed research. Common minke whale sampling will be performed within area divisions already used in Icelandic multi-species research, commonly termed 'BorMiCon areas' (Stefánsson and Pálsson, 1997), as feeding ecology and multi-species interactions are the main objectives of that research. To ensure comparability with previous data on biological parameters, the bulk of the fin whale sampling will take place on traditional whaling grounds west and southwest of Iceland. However, to examine feeding ecology and stock structure, attempts will also be made to sample 10 fin whales off eastern Iceland in the initial study year. If that work is deemed feasible and worthwhile, a larger portion (up to half) of the catch may be taken in this area in the second year of the feasibility study. Sei whale occurrence in Icelandic waters is irregular, and so this species will be sampled opportunistically upon encounter by the whaling vessels.

Standard observations and measurements will be made during dissection, including morphometrics, blubber thickness and girth measurements, necropsy for parasites and pathology purposes, sampling and measurement of stomach contents, and extensive sampling of various other tissues for sub-projects described below.

Reproductive organs will be analysed for sexual maturity, pregnancy status and reproductive history. All prey species from stomach samples/sub-samples will be identified to

species as far as possible. Fatty acid profiles from different layers of the blubber, as well as stable isotope ratios in blood and skin from common minke (30), fin (30) and sei (15) whales will be analysed for comparison with the stomach content analysis to test the validity of biopsy sampling in feeding ecology studies. Stock structure will be analysed by genetic methods (microsatellites and mtDNA), satellite monitoring and other methods, including non-genetic chemical signals.

Studies on health issues and pathology will include blood chemistry, serology, microbiology, urinalysis and parasitology. Pollutant analysis will include trace elements, PCBs, pesticides, PBDEs, dioxins and dioxin-like PCBs and PAHs. All pollutant analyses will be performed by laboratories that have obtained satisfactory results in inter-comparison exercises e.g. Quasimeme.

Seasonal variation in cetacean abundance will be determined by aerial surveys performed annually in July, August and September. This work will be combined with fish-oceanograpy-cetacean shipboard surveys. Whale observers will be placed onboard during regular research surveys for cetacean distribution monitoring in spring and autumn.

Attempts will be made to instrument up to 10 common minke and 10 fin whales with satellite-linked radio transmitters in each of the study years using methods that have been successfully applied to a number of baleen whale species in the North Atlantic and elsewhere. If sei whales are encountered during fin whale tagging cruises, attempts will be made to tag these as well. In addition, attempts will be made to instrument no more than 10 common minke whales with time-depth recorders.

All available information on potential prey species of common minke whales in Icelandic waters will be analysed in conjunction with stomach contents results with respect to prey preference, as done by Norwegian scientists. Based on the results of this analysis and the feasibility study to estimate plankton abundance, the need and feasibility for further sampling in the second year will be evaluated.

Multi-species modelling will be done by extending the modelling framework of the BorMiCon/Gadget multi-species model to include common minke whales and other cetaceans.

Comments and discussion by the SC Working Group
SAMPLING DESIGN
Some members noted that the proposed methods for animal dissection and measurement are well-established and should be adequate to achieve sampling objectives. Concerns raised about other aspects of the methods for several specific areas of investigation are described below.

FEEDING ECOLOGY
Several members agreed with the need to obtain a better understanding of cetacean feeding ecology in Icelandic waters. However, concerns were raised regarding the adequacy of the sampling scheme to meet the intended objectives, especially the proposed spatial distribution and timing of the proposed sampling.

Some members noted that the sampling plan for common minke whales is comparable to recent Norwegian studies, which have proven useful in the study of population ecology. Common minke whale study areas were chosen based on distributional overlap with cod, and issues of cod consumption and competition are key points under

investigation. However, fin and sei whale sampling will focus primarily on the areas investigated in previous years (1986-1989). Some members maintained that although this is undoubtedly sufficient for the primary objectives for those species (the study of biological parameters), it was considered unlikely to provide an adequate picture of the feeding ecology of those species.

Other members expressed concern that there was no specific plan to integrate prey base research with stomach content sampling, as prey abundance and distribution from regular resource surveys would not be sufficient to assess prey selectivity patterns. These members recalled that Norwegian scientists made useful suggestions last year in reviewing the JARPN proposal on the relative priority for macro-, meso- and micro-scale research and noted the value of meso-scale designs for feeding studies. It was suggested that this advice had not been heeded in the Icelandic proposal, where the focus appears to be on macro- and micro-scale research. The spatial and temporal spread of samples implied by the proposed macro-scale sampling calls into question the amount of information that can usefully be obtained at either scale. Following this concern, the design is such that if the sample sizes are insufficient to meet at least some of the scientific objectives, then one may end up with too few samples at the appropriate scales to accomplish anything useful scientifically, even over several years.

More specifically, it was stated that the proposal indicates that common minke whale sampling would occur primarily in regions where cod and common minke whales overlap in distribution. One member noted that such samples will not provide information on what common minke whales eat elsewhere. Other members pointed out that estimating the functional responses of these three predators at various temporal and spatial scales is theoretically a daunting, but not impossible, task. They pointed out that scientific whaling under special permit in Norwegian waters, followed by routine sampling during commercial whaling, had yielded a useful time series permitting assessment of spatial, seasonal and year-to-year variations in diet, foraging behaviour and prey selectivity. The Norwegian data had also enabled multi-species modelling exercises to be conducted, along the lines of those intended under the present proposal.

However, these members noted that the proposal intends to obtain the necessary prey distribution and abundance data from regular resource surveys aimed to map fish resources at a large scale. They felt that such large scale information about the prey base is, however, not sufficient to assess prey selectivity among individual whales or small groups of whales at the micro-scale. Micro- and meso-scale investigations have provided useful information on the selectivity patterns of whales in Norwegian common minke whale studies. Unfortunately however, no contemporaneous micro-scale prey sampling has been planned in the current proposal so that it will not be possible to address issues such as prey preference or functional responses which are so important in understanding the impacts of whales on fish stocks.

In response to these criticisms, the proponents noted that this is a feasibility study, and therefore sample sizes may not be large enough to resolve all of the objectives put forth. The scale of prey monitoring both in time and space is always a difficult question, whether a macro-scale approach (describing the overall prey abundance), a meso-scale approach (implying extensive surveys once or more each year), or whether a micro-scale approach (implying study of prey availability simultaneously with the take of the animals) is adopted. In this feasibility study, use will be made of the

numerous and extensive surveys regularly carried out in Icelandic waters to provide data on prey abundance at the macro-/meso-scale. In the future, micro-scale sampling will be considered as suggested above.

Reservations were also raised by some members regarding the lack of overlap in the sampling periods proposed for the first and second years of the study. This had been a difficult issue to resolve in the analysis of Norwegian data, and could be avoided by delaying field work another year. Some members recommended that Iceland delay their field sampling programme so that the sampling could be balanced on season.

The authors responded that the decision as to whether or not to proceed with the project in 2003 would be determined by the Icelandic government sometime after the end of the meeting.

A further sampling concern was in regard to the omission of lactating females. It was unclear to one member how it would be possible to examine the feeding ecology of these species satisfactorily when one demographic element would not be sampled. The proponents commented that lactating females were not anticipated to comprise a large portion of animals encountered; although that additional information did not ultimately satisfy the concern. Another member noted that this issue had also been considered in the design of JARPN II. They argued that lethal sampling of lactating females would require that calves also be taken, and it was clear that the latter would provide relatively little additional data on the subject of feeding ecology, nor would they benefit other areas of research interest. Thus, it had been deemed more appropriate to exclude them in that case.

One primary goal of the proposed work is to evaluate whether there has been a significant shift in fin whale diet from krill to fish. Some members noted that considerable information already exists to suggest that fin and sei whale diet is comprised principally of krill. They therefore suggested that in the feasibility study, genetic analysis of whale scats would provide an ideal, non-lethal method of determining whether fish are now a more important component of the diet. They stated that researchers have demonstrated that it is possible to obtain sufficient faecal samples for DNA analysis when collection is performed in feeding aggregations of fin whales.

One member commented on the unique potential for investigating diurnal activity patterns during the long Icelandic summer days. The proponents commented that this had been attempted in previous years, but that additional samples would be needed to strengthen any conclusions.

One member noted that it is difficult to evaluate the proposed work in relation to multi-species modelling because little detail has been made available of how cetaceans will be included in the model. The proponents clarified that part of the proposed work would be to perform the programming necessary to incorporate cetaceans into the model.

Another member questioned the stated priority of cetaceans in the management of cod stocks. He quoted from the 2002 report of the ICES Northwestern Atlantic Working Group, in which it states that 'the 2000 ICES assessment showed that the stocks had been seriously over-estimated in recent years' and that ' ...the assessments of Icelandic cod in recent years were partly data-driven and partly a result of model mis-specification' (ICES, 2002). On the subject of biological interactions, he noted that the report identified the cod-capelin interaction as most important, followed by cannibalism, and marine mammal predation. The report states that 'it has been illustrated that not only may cetaceans

have a considerable impact on future yields from cod in Division Va, but that seals may have an even greater impact' (ICES, 2002).

The proponents were unfamiliar with that report, but noted first that Icelandic fisheries management interest goes beyond stock assessment in any particular year. Secondly, they considered it likely that seals are responsible for considerably less cod consumption than cetaceans in Icelandic waters, as indicated by preliminary multi-species modelling exercises (Stefánsson and Pálsson, 1997).

BIOLOGICAL PARAMETERS
Some members noted that proposed work on biological parameters will contribute greatly to the comprehensive assessment and application of the RMP and its ISTs. They further noted that biopsy sampling techniques can not be used to obtain data on age, sexual maturity and pregnancy.

However, information was also presented on a new technique to determine pregnancy from progesterone concentrations in biopsy samples. The analytical method was developed by Memorial University of Newfoundland (Canada) using blubber samples from harvested common minke whales. The technique has since been refined for small samples and tested on free-ranging Gulf of Maine humpback whales of known reproductive status.

The proponents welcomed this new information, but noted that the technique provides no biological data on non-pregnant animals, such as males and resting females. It was agreed that this is presently a limitation of the method; however, Memorial University is attempting to address this issue through further developmental work. Another member noted that analysis of faecal steroids has shown great promise in detecting both the reproductive state and the maturational class of North Atlantic right whales.

One planned application of the biopsy-based technique in 2003 is the study of the fate of pregnancy across a feeding season. Another member commented that lethal sampling provides no avenues for research in this area. The proponents commented that such work would require frequent re-sightings of individuals, which is not often possible in studies of cetaceans. They noted that whaling data had played an important role in the development of the biopsy-based pregnancy testing method.

On the subject of ear plug analysis methods, the proponents indicated that reference samples would be used to ensure consistency between new readers and readers in the earlier study.

STOCK STRUCTURE
The view of many members was that non-lethal techniques, notably genetic analysis based upon skin biopsies, were widely accepted as a reliable method of investigating stock structure in a wide variety of taxa. They further noted that lethal sampling was not necessary for these investigations, and that this method compromised the statistical power of the analyses through limited sample sizes and the inability to detect individual movements through resampling of animals in different areas. They added that this and other non-lethal techniques have the added advantage of providing a longitudinal dimension to the study of stock structure, with the potential to contribute substantially to a long-term research programme such as the one envisioned here.

The proponents reiterated their view that although genetic samples and sex determination can be obtained by biopsy sampling, genetic studies are not a primary objective of the proposed research.

PARASITES AND PATHOLOGY

The proposal was criticised for the absence of a clear testable hypothesis on disease and also for the lack of evidence that disease processes are likely to be operating at a population scale. It was noted that the general data gathering approach of the proposal was unlikely to yield useful results. Furthermore, some members noted that biological data of interest in that field of study (such as blood chemistry) are potentially compromised by the stressful conditions of the catch. Other members stated that no significant differences in blood hormones have been documented when animals are killed quickly as specified in the proposal.

One member asked why necropsies would only be performed for half of the common minke whales obtained, particularly given that sample sizes would be further reduced when the data were stratified by age and sex. The proponents responded that sampled common minke whales would be landed at several locations and, as such, necropsies would have to be conducted either on board the vessel, or at land stations poorly suited for full necropsy. Thus, the limitation was primarily due to logistical constraints.

In response to a query, the proponents clarified that accurate measurement of parasite loads remains a subject of debate in the study of all large animals. However, both necropsies and examination of parasites would be conducted following standard procedures. Estimates of the number of lesions and parasites will be based on sub-samples from the various sites within each sampled whale.

POLLUTANTS

The proposal describes an urgent need for pollutant mapping of cetaceans off Iceland. However, the reason for this urgency was not clear to some members. They referred to the fact that a considerable amount of contaminant monitoring is already underway in the North Atlantic. Furthermore, a recent study of organochlorides in North Atlantic common minke whales found pollutant levels to be geographically homogenous, likely due to the highly mobile nature of the animals (Hobbs *et al.*, 2003).

The proponents pointed out that, in fact, pollutant research is not a primary objective for any of the three cetacean species studied. However, they referred members to the IWC special issue on chemical pollutants and cetaceans, in which it states '... cetaceans are long lived, have extensive fat stores and are often top predators, some species carry tissue pollutant levels that are among the highest recorded. This has obviously raised concern over the potential impacts of these chemicals on the long-term survival of the affected species and populations' (Reijnders *et al.*, 1999, p.v). As Iceland relies largely on marine resources, it considers investigations of pollutants in the ecosystem, and potential effects on animal health to be important.

Others responded that a study of pollutants would be more effective if it was based on a specific concern. To their knowledge, there is no problem identified in the proposal. For example, if the goal is to conduct more general screening, then other approaches could potentially be pursued, such as the use of published data, archived samples or use of blubber biopsy sampling. With respect to the latter, it was also stated that the stable, outer layer of the blubber provides the best measure of pollutant exposure levels over time. It was pointed out that there have been several studies comparing pollutant levels in various cetacean tissues and reiterated that all of the pollutants proposed including trace elements could be sampled by biopsy (SC/55/E18). If the objective is to study the impact of pollution, then it was suggested by some that biomarkers can be used as general indicators of animal health and monitored using standard biopsy sampling techniques.

One member commented that numerous skin samples obtained in other studies have been archived (e.g. Hobbs *et al.*, 2003). Other tissues and organs of those animals have already been analysed for contaminant concentrations. It would therefore be more efficient to use the archived samples instead of taking new ones.

One member also noted that comparisons of blood chemistry with pollutants is an important component of POLLUTION 2000+ and analysing blood chemistry of pursued and harpooned whales would have skewed results. The pursuit-related stress and subsequent trauma would result in instantaneous and escalating change in many blood chemistry values (such as alkaline phosphatase, adrenocorticoids, blood enzymes and immune response and repair substances).

The proponents responded that although biopsy samples may provide information on chemicals in the skin and outer layer of the blubber, these tissues are not necessarily the most representative of an animal's exposure. Examining the chemical burden gradient in various tissues, along with immunological and physiological factors, may provide essential information on pollutants on an individual and population level. The proposed work will improve the application of biopsy techniques by calibrating results with inner tissues that may be of higher relevance to cetacean health.

It was noted that a method exists for obtaining full depth blubber biopsy samples from free-ranging whales. One member reiterated that existing tissue and data archives could be used to calibrate standard biopsy sampling results.

In response to a query, the proponents clarified that while tissue samples will be collected from all animals, pollutant analysis will only be conducted for a small proportion. The samples selected for analysis will depend on the composition of harvested animals. They noted that the Fisheries Laboratory in Iceland is accredited according to the standard ISO 17025 and will coordinate the chemical analyses. The work will either be performed there or by other equally qualified laboratories.

One member noted that no sampling design had been specified for the pollutant analysis.

Finally, the Working Group discussed the proposed work in relation to POLLUTION 2000+. The proponents pointed out that POLLUTION 2000+ focuses on small cetaceans and entangled animals that are not necessarily necropsied immediately after death. It was later clarified that POLLUTION 2000+ also includes animals that are live captured for sampling. Nevertheless, the proponents argued that pollution studies on small cetaceans are not directly applicable to large whales. One member pointed out the inconsistency of sampling otherwise healthy animals by lethal techniques. The proponents concluded that their work should be considered both complementary to POLLUTION 2000+ and valuable in its own right.

Summary and Conclusions

With respect to guidelines 1 and 6, several members considered the sampling regime to be insufficient to meet the stated objectives. Spatial and temporal elements of the feeding ecology sampling, in particular, were considered unlikely to yield data suitable for the planned multi-species modelling. The proponents countered that this is a feasibility study in which sample sizes may not be large enough.

Furthermore, they argued that the scale of prey monitoring both in time and space is always a difficult question and might be adjusted in future years of the project. Some members also felt that the proposed study of parasites and pathology would benefit from a more clearly identified hypothesis.

With respect to guidelines 3 and 4, some members recommended new non-lethal techniques for pregnancy testing. However, the proponents noted that neither age or sexual maturity could be determined solely by non-lethal methods. Other members also noted that the objectives of the pollutant research could be satisfactorily addressed with standard biopsy sampling. The proponents, however, noted the importance of obtaining pollutant samples from internal organs, because the relationship between contaminant loads in skin and organs have not yet been assessed. With respect to the high priority given to lethal sampling to determine if fin whale diet had changed, some members noted that this could initially be explored using stable isotope analyses of non-lethal samples (skin, faeces).

D. Effects of catches on the stock
The relevant guidelines are:

1. A review of the most recent information on the stock or stocks concerned, including information on any exploitation, stock analysis and recommendations by the Scientific Committee to date (including, where appropriate, alternative analyses and conclusions and point of controversy) *(Rep. int. Whal. Commn* 36:133);
2. An evaluation of the specification in the permit proposal of 'possible effect on conservation of the stock'. As appropriate, the Scientific Committee may carry out its own analysis of the possible effects *(Rep. int. Whal. Commn* 36:133);
3. The research can be conducted without adversely affecting the overall status and trends of the stock in question or the success of the comprehensive assessment of such stocks *(Rep. int. Whal. Commn* 37:27-28).

COMMON MINKE WHALES
Proposal (summary of SC/55/O2)
The IWC 1990 Comprehensive Assessment assigned the central North Atlantic common minke whale stock as an initial management stock (IWC, 1991, pp.63-69). Recent NASS surveys yielded higher point estimates of population abundance than those used in the Comprehensive Assessment. The most recent estimate was 43,633 animals (CV = 0.19) for the CIC small area only (SC/55/NAM3).

The Scientific Committee of NAMMCO's Working Group on Management Procedures also assessed this stock and used the HITTER model with a fixed *MSYR* (focusing on values around 1-2%) to project past exploitation patterns through recent population estimates. Using conservative assumption about stock size (lower 95% confidence interval) and stock structure (discrete stock in Icelandic coastal waters) and a 2% *MSYR* the NAMMCO Scientific Committee concluded that the mean annual catch during 1961-1985 of 185 whales per year was sustainable.

Comments and discussion by the SC Working Group
There was no dissention from the Icelandic position regarding the likely impact of the proposed take on common minke whale stocks. The Working Group therefore **agreed** that it is unlikely that the proposed take of 100 common minke whales per year will have a significant impact on the Central North Atlantic Stock of common minke whales.

FIN WHALES
Proposal (summary of SC/55/O2)
The proposal stated that in 1999 the Scientific Committee of NAMMCO undertook an assessment of fin whales in the North Atlantic as a response to a specific request from the

Council (NAMMCO, 2000). It noted that population trajectories incorporating past catch series were conducted to hit recent abundance estimates, and projected with catch levels of 0, 50, 100 and 200 whales per year until the year 2020 using the HITTER technique. It stated that a conservative *MSYR* value of 2% was chosen to assess the effects of future catches. With respect to the EGI stock area the proposal stated that the NAMMCO Scientific Committee had concluded that a short to medium term (next 10 years) catch of up to 200 fin whales per year is unlikely to bring the population down below 70% of its pre-exploitation level under the least optimistic scenarios. It further noted that because of uncertainties in stock structure, the NAMMCO Scientific Committee recommended a spread of catches throughout the EGI area in proportion to the relative abundance within the area[1]. Finally, it stated that a series of sightings surveys in the East Greenland-Iceland area have generated population estimates with an increasing trend, most recently to 25,000 animals in 2001. These latest estimates post-dated the NAMMCO analysis. It concluded that the increasing trend coupled with the results of the NAMMCO analysis suggest that takes of 100 animals per year for two years under the present proposal would be highly unlikely to have any detectable effect on the stock.

Comments and discussion by the SC Working Group
Some members expressed agreement with the proponents that the proposed takes would be highly unlikely to have any detectable effect on the stock. However, the Working Group could not agree on the effects of the proposed take on the conservation status of fin whales. The 1991 Special Meeting of the IWC on the Comprehensive Assessment of North Atlantic Fin Whales reached no consensus, mainly due to disagreements on stock structure (IWC, 1992).

Cooke re-ran the HITTER/FITTER analyses referred to in the proposal, with the inclusion of the more recent (NASS 2001) abundance estimates that had been accepted by the RMP Working Group. The programme yielded an *MSYR*(1+) estimate of 1.8% which is very close to the value of 2% assumed in the proposal. However, the HITTER/FITTER trajectory provides a very poor fit to the abundance data, in that it does not match the increasing trend observed in recent years. To explain the increasing trend, Cooke stated that it would be necessary either to hypothesise an increase in carrying-capacity (for which no evidence is presented in SC/55/O2), or to accept that the population may have been more severely impacted by the whaling occurring during 1948-1989 than the HITTER/FITTER model predicts.

He concluded that the evidence presented in the proposal to justify the assertion that the catches would have no significant effect on the stock is based on the predictions of a model that does not fit the available data. Such evidence cannot be considered adequate. He called for the Committee to address the issue properly by conducting an update of its 1991 assessment of North Atlantic fin whale stocks.

[1] The NAMMCO Scientific Committee carried out an assessment of fin whales in the East Greenland-Iceland stock area in 1999 (NAMMCO, 2000). The Committee used the HITTER technique to generate population trajectories using the catch series, and abundance estimates from the NASS-87, NASS-89 and NASS-95 surveys, and biological parameters identical to those used by the IWC in their assessment of fin whales in 1991. A variety of potential stock areas and *MSYR* ranging from 1-4% were considered in the assessment. The Committee concluded that catches up to 200 animals per year would be highly unlikely to bring the stock below 70% of its pre-exploitation size in the short to medium term, even under the most conservative assumptions. The Committee went on to recommend that any catches be spread throughout the stock area in proportion to the observed abundance.

On the possibility that the assumed increasing trend was due to shifts in distribution, it was stated during discussion that there had indeed been large-scale shifts in distribution of animals between survey years, and considerable genetic heterogeneity. One member asserted that this would be enough to increase the confidence intervals on the population estimates, and make them more compatible with the model. However, if this is the case then it raises the possibility that animals may have migrated into the area from adjacent areas. The results of a stock assessment depend on there being a single stock to assess, and if the stock is linked to other stocks with animals migrating between stocks, then the implication is that the population is more depleted than would be suggested by the assessment models. Others asserted that a larger effective stock size should mean that there is less reason for concern over the current status, and that the poor fit obtained by Cooke would have been reflected in a larger estimated variance, and therefore a higher probability of some adverse effect, thus he should have presented such figures to substantiate his point.

Butterworth and Cunningham (2001) had also run the HITTER/FITTER model using recent CPUE series, abundance estimates and historic CPUE series, but without using the most recent 2001 estimate. Like Cooke, the authors could not get a good fit to the data with a single stock. The stock was therefore split into two component stocks with diffuse mixing between the two, these being nearshore and offshore components respectively. The nearshore component represents that from which historic catches have been taken. This two-component model structure resulted in a good fit to the data, including a predicted increasing population size. The global estimate of *MSY* is 386 if the stock is treated as single management unit, but this drops to 275 if only the nearshore component is considered. This implies that during the 1960s and 1970s Icelandic fin whales may have been exploited close to *MSY*, and that a take of 100 per year would be unlikely to affect the population adversely.

During discussion it was noted that the possibility of a coastal stock had been raised previously when mark-recapture experiments among coastal animals had yielded population estimates that did not fit well with sightings survey estimates for the whole stock. Nevertheless, some members believed that the most recent population estimates from 2001 do not fit with the split-stock model, with the population estimates lying above those predicted by the HITTER/FITTER model. Again that would indicate a poor fit of the model to the data. This suggestion was refuted, and it was stated that the 2001 estimate was consistent with the model output, and this difference of opinion remained unresolved.

The sub-committee did not agree on a common interpretation of the model results. For some it seems clear that the existing data can be adequately explained by an increasing population trend and an *MSY* that is well above the proposed take of 100 animals per year. For others, the model predictions are not consistent with the observed data, and this lack of a good fit warrants caution in determining *MSY* levels, especially if there is uncertainty about the degree of mixing with adjacent stocks.

SEI WHALES
Proposal (summary of SC/55/O2)
There has been no formal assessment of sei whales, and previous catches (post-1948) averaged 68 animals per year. Sei whales exhibit different migration patterns to fin whales, which has restricted the possibility for conducting joint

assessment surveys. The NASS 1989 survey alone had explicitly attempted to estimate sei whale abundance. Sei whale numbers on the whaling grounds to the west of Iceland peak in late August and September, but the NASS-89 survey was conducted from late July to mid-August, as after this time survey conditions deteriorate. The 1989 survey resulted in an estimate of 10,207 sei whales (CV = 0.272). If this were taken as an estimate of the stock size, then the previous takes of 68 per year would represent 0.7% of the current stock, which by analogy with other baleen whale species is unlikely to approach *MSY*. It was also suggested that the 1989 estimate might have been negatively biased, as it did not cover the entire range of the sei whale.

Comments and discussion by the SC Working Group
The Working Group could not agree a common position on sei whales. Discussion was focused on the interpretation of the NASS-89 survey results. The survey covered an area extending from 55°N to 60°N, and sei whale sightings were concentrated in two main areas. The first was southwest of Iceland between around 60° and 63°N. This area was estimated to have contained around 1,600 animals at the time of the NASS-89 survey and covers the main whaling grounds for sei whales, and the area for the proposed scientific takes. The second area was further south, centred between 50° and 55°N, where higher densities were observed and most of the estimated remaining 8,400 whales were located. There was an apparent hiatus between the two areas. The question was therefore raised as to whether in fact the whales in the northern area represented the Iceland-Denmark Strait stock, or whether the two groups should be counted together. The southern group was geographically closer to the location of sei whales taken in earlier years from the Nova Scotia stock, which is classified as a Protection Stock. It was also noted that although there is good genetic evidence that animals found on the Icelandic whaling grounds in the Denmark Strait are all from the same population, there is no evidence to say how other animals in the North Atlantic including those sighted in the southern region might be related or separated, and that the management areas currently recognised are not based on any genetic analyses.

The proposed catch of 50 sei whales represents 3.1% of the NASS-89 estimate of 1,589 for the Icelandic whaling grounds and adjacent waters. The IWC has long recognised that catches from an area should be supported by abundance from that same area, as for example is made explicit in the use of *Small Areas* in the RMP. One member noted the abundance on the whaling grounds appeared to be low, if it assumed that the stock size in 1989 was 1,589, a simple HITTER-type calculation indicated the commercial catch might have caused depletion of the stock. Given that the proposed scientific catch level is similar to the commercial catch level, some members agreed that there was concern over what conclusions could be made about the effect of catches on the stock. One member expressed alarm about the resumption of catches without a formal assessment being done. It was suggested that genetic samples from adjacent regions such as Nova Scotia and the Labrador Sea should be obtained to clarify sei whale stock structure in the western North Atlantic. It was noted that the collection of samples from adjacent regions was not part of the proposed research plan.

In response the proponents reiterated that the relative seasonal abundance of sei whales peaked in late August and September on the former whaling grounds west of Iceland and most of the sei whale catch was taken in this period (Sigurjónsson and Víkingsson, 1997). The NASS-89 survey

however had taken place earlier in the season. The difference between mid-summer and late summer/autumn abundance in this area appears to be about 10 fold (Sigurjónsson and Víkingsson, 1997). However, in some years sei whales appeared somewhat earlier in the summer. One such occurrence was in 1995, when the NASS-95 survey estimated 8,768 sei whales, mainly in the area off West Iceland (NAMMCO, 1998). The proponents therefore held the view that the summer estimate from the former whaling grounds from a portion of the NASS-89 survey area should not be taken to represent the total abundance of the stock in the area. The coverage of more southerly waters in the NASS-89 cruise had been intended to sample sei whales during their migration north, as the survey had been timed too early to coincide with their peak arrival on the more northerly whaling grounds. It was stated that the animals sighted in the southerly region were assumed to be mostly migrating north. Observations from the North Pacific and Southern Oceans were said to support the contention that wide latitudinal migrations of sei whales were the norm. The proponents therefore assumed that the southerly animals were a part of the same stock as those already on the whaling grounds.

There were a number of other discussion points. It was stated that a catch of 50 whales over two years would not likely impact on a stock of 1,589 animals in the longer term, but this assertion was not discussed. However, it was pointed out in response that in 2000 the Scientific Committee had agreed (IWC, 2001, pp.57-58) a general principle that when addressing the effect of scientific permits on catches the effects should be addressed on the assumption that they were ongoing.

Comments were also directed towards the proponents of the research that it would be useful to take genetic samples from the animals observed in the more southerly region to determine whether they were from the same stock as those in the more northerly region. It was pointed out in this context that the Proposal is intended to be a research proposal, but that sampling sei whales only from the Icelandic whaling grounds in the Denmark Strait will not inform the issue of stock structure at all. It was **agreed** that further research into this area would be useful.

The Working Group was unable to agree on the interpretation of the NASS-89 data. For some, the abundance estimate of 10,207 is an estimate of the Iceland-Denmark Strait stock and a take of 50 animals will not represent a significant threat to the conservation status of the stock. For others there is no good reason to assume that the estimate of 10,207 is for animals from the same stock, and indeed some reason to suppose that the bulk of these animals may belong to another stock. If this is accepted then scientific catch limits should be based on the abundance of the animals in the area where the sampling will occur, which is no more than 1,589.

Summary and Conclusions
In relation to guidelines 1 to 3, the most recent relevant information on the stocks concerned was presented and reviewed by the SC for all three species.

The Working Group agreed that the proposed take of 100 common minke whales per year would be unlikely to effect the conservation status of the stock in question. In terms of the possible effects on the conservation of the stocks, and the effects of the proposed research on the overall status and trends of the stocks, there was no overall agreement for fin and sei whales.

For fin whales there was no agreement over the interpretation of the results of modelling exercises. For some these demonstrated that the stock is increasing and that the proposed take of 100 animals would be well below the MSY level and unlikely to effect stock status. According to other members the models did not adequately fit the observed population estimates, casting doubt on the assumptions of stock identity in the region.

For sei whales the Working Group could not agree whether the proposed take should be considered in relation to an abundance estimate relating to an area extending well beyond the whaling grounds and possibly covering more than one stock, or whether it should be considered solely in relation to estimates from the intended whaling area. This disagreement prevented any consensus about the possible effects on the conservation status of the stock concerned.

E. Research cooperation
The relevant guideline is:

1. Comments on the adequacy and implications of specific arrangements for participation by scientists of other nations (*Rep. int. Whal. Commn* 36:133).

Proposal (summary of SC/55/O2)
The proposal stated that participation by external scientists in research on whales sampled in the programme would be welcome, provided that their research does not interfere with, or duplicate research planned in the project. This could be either by direct involvement of foreign scientists in data collection at the dissection sites for their own research projects, or by arrangement that MRI collects data/samples on their behalf. Due to limited space onboard the vessels, possibilities for data collection at sea by external scientists may be limited. Requests for participation should be directed to the MRI. The genetic study will be conducted in close cooperation with Norwegian and Japanese scientists for comparability and comparison of data.

Comments and discussion by the SC Working Group
The Working Group **agreed** that the proposal met the conditions of the guidelines.

6.2.1 General comments by the Scientific Committee Working Group
The Working Group provided a significant number of constructive comments and criticisms and it was **agreed** that it would be useful to obtain specific details of how these were ultimately incorporated into the study design.

The proponents expressed their gratitude for the scientific debate on the research proposal. Many of the comments were constructive and will be considered in the refinement of the project before implementation. This research programme is an ambitious, resource demanding project with a broad scientific scope. It involves many expert scientists from different university and research institutes with extensive experience including participation in national and international cooperative research projects. The proponents thanked all of those that had been involved in the development of the research programme, some of whom were present in the Working Group.

7. ADOPTION OF REPORT

The Working Group noted with concern the unusually heavy Scientific Committee schedule this year, and the few sessions allocated to the Working Group to complete its agenda. The Working Group regretted that there had been

limited time for adequate discussions of the material presented and for review of the resulting report. The Working Group thanked the Chair and the rapporteurs for their hard work, particularly given the time constraints.

The report was adopted on 2 June, 2003.

REFERENCES

Butterworth, D.S. and Cunningham, C.L. 2001. Assessment of the East Greenland-Iceland fin whale population based upon a two sub-stock model with mixing. NAMMCO document SC/8/FW/6 presented to the Eighth meeting of the NAMMCO Scientific Committee, Akraberg, Faroe Islands, 13-16 June 2000 (unpublished). [Available from: *www.nammco.no*].

Donovan, G. 2001. Report of the Scientific Committee. Annex Y. Guidelines for the Review of Scientific Permit Proposals. *J. Cetacean Res. Manage. (Suppl.)* 3:371-2.

Hobbs, K.E., Muir, D.C.G., Born, E.W., Dietz, R., Haug, T., Metcalfe, T., Metcalfe, C. and Øien, N. 2003. Levels and patterns of persistent organochlorines in minke whale (*Balaenoptera acutorostrata*) stocks from the north Atlantic and European Arctic. *Environ. Pollut.* 121:239-52.

ICES. 2002. Report of the Northwestern Working Group. ICES Headquarters 29 April − 8 May 2002. ICES CM 2002/ACFM:20 [Available from: *www.ices.dk*].

International Whaling Commission. 1988. Report of the Scientific Committee, Annex R. The Japanese scientific permit proposal for Southern Hemisphere minke whales: background and comments. *Rep. int. Whal. Commn* 38:139-49.

International Whaling Commission. 1991. Report of the Scientific Committee. *Rep. int. Whal. Commn* 41:51-89.

International Whaling Commission. 1992. Report of the Comprehensive Assessment Special Meeting on North Atlantic Fin Whales, Reykjavík, 25 February − 1 March 1991. *Rep. int. Whal. Commn* 42:595-644.

International Whaling Commission. 1999. Report of the Scientific Committee. Annex N. The Revised Management Procedure (RMP) for baleen whales. *J. Cetacean Res. Manage. (Suppl.)* 1:251-8.

International Whaling Commission. 2001. Report of the Scientific Committee. *J. Cetacean Res. Manage. (Suppl.)* 3:1-76.

International Whaling Commission. 2002. Chair's Report of the Fifty-Third Annual Meeting. Annex C. Resolutions Adopted During the 53rd Annual Meeting. *Ann. Rep. Int. Whaling Comm.* 2001:54-60.

NAMMCO. 1998. Report of the Fifth Meeting of the Scientific Committee, Tromsø, Norway, 10-15 March 1997. *NAMMCO Annual Report* 1998:85-202.

NAMMCO. 2000. Report of the Scientific Committee, Annex 2. Report of the NAMMCO Scientific Committee Working Group on North Atlantic fin whales. *NAMMCO Annual Report* 1999:189-211.

Reijnders, P.J.H., Aguilar, A. and Donovan, G.P. (eds.). 1999. *Special Issue*. 1. *Chemical Pollutants and Cetaceans*. International Whaling Commission, Cambridge, UK. v-viii + 273pp.

Rorvik, C.J., Jónsson, J., Mathiesen, O.A. and Jonsgård, Å. 1976. Fin whales, *Balaenoptera physalus* (L.), off the west coast of Iceland −distribution, segregation by length and exploitation. *Rit Fisk.* 5(5):1-30. Paper number NA 76/9 presented to the Working Group on North Atlantic Whales, Oslo, April 1976.

Sigurjónsson, J. and Víkingsson, G.A. 1997. Seasonal abundance of and estimated food consumption by cetaceans in Icelandic and adjacent waters. *J. Northwest Atl. Fish. Sci.* 22:271-87.

Stefánsson, G. and Pálsson, K. (eds.). 1997. *BORMICON. A Boreal Migration and Consumption Model*. Hafrannsóknastofnunin Fjölrit nr. 58, . 223pp. [Out of print].

Appendix 1

AGENDA

1. Introductory items
   1.1 Convenor's opening remarks
   1.2 Election of Chair
   1.3 Appointment of rapporteurs
2. Adoption of agenda
3. Review of available documents
4. Proposals to facilitate the review process
5. Review of results from existing permits
   5.1 JARPA − Southern Hemisphere minke whales

5.2 JARPN II − North Pacific minke, Bryde's, sei and sperm whales
6. Review of new or revised proposals
   6.1 JARPA
   6.2 A two-year feasibility study on cetaceans in Icelandic waters
      6.2.1 General comments by the Scientific Committee Working Group
7. Adoption of report

Appendix 2

CONCERNS REGARDING SCIENTIFIC PERMITS[1]

A. Read, C.S. Baker, P. Berggren, F. Borsani, R. Brownell, S. Childerhouse, P. Clapham, C. Clark, C. Fortuna, C. Fossi, N. Gales, K. Groch, M. Iniguez, L. Kell, K-H. Kock, M. Krahn, G. Lauriano, R. Leaper, T. Lyrholm, S. Manzanilla, K. Martien, H. Oosthuizen, J. Palazzo, C. Parsons, W. Perrin, C. Perry, R. Pinto de Lima, P. Reijnders, S. Reilly, V. Ridoux, E. Rogan, L. Rojas, L. Sadler, D. Senn, M. Simmonds, M. Stachowitsch, B. Taylor, D. Thiele, P. Wade and B. Wilson.

In its report to the Scientific Committee, the IWC's Working Group on Scientific Permits noted the inadequate time allotted for discussion of scientific permit proposals. In light of this situation, we wish to register serious concerns regarding the Icelandic scientific whaling proposal, and scientific permits in general.

The Icelandic government has submitted to the SC a proposal for a two-year feasibility study involving lethal takes of fin, sei and minke whales. This programme is characterised as a 'feasibility study' despite the existence of substantial data from a very similar study conducted during the last period of Icelandic scientific whaling in the 1980s. By labelling the programme as a feasibility study, the proponents have effectively exempted themselves from the level of scrutiny required of a true research programme. As was the case with a similar 'feasibility study' (JARPN) proposed by the Government of Japan, it is our contention that the Icelandic proposal would not meet the scientific standards required by any major international research agency.

Criticism voiced during the SC's review clearly indicates that the proposal is deficient in almost every respect. The proponents have failed to provide adequate justification for the proposed sample sizes, and have offered no performance criteria for how the work's 'feasibility' will subsequently be determined. As noted in the Working Group report, the proponents were repeatedly asked to provide, for any aspect of the study, an example of results that would cause them to conclude that the proposed research was *not* feasible; they did not do so.

Despite the proposal's strong emphasis on multi-species management, the sampling scheme is not designed to obtain the data required for the ecosystem modelling underlying this approach. Furthermore, the recent IWC modelling workshop on cetacean-fishery interactions (SC/55/Rep1) concluded that current ecosystem models are not sufficiently developed to provide reliable management advice in any context.

With regard to the effects of the proposed sampling on stocks of the three species, there has been no recent assessment of fin and minke whales in Icelandic waters, and

no agreement by the SC on management advice. There has never been an assessment of sei whales, and considerable concern was noted during the review with regard to the status of this population, and the deficient manner in which the impacts of the proposed catches were assessed by the Icelandic proposal.

We reiterate that the major objectives of the Icelandic proposal are either not relevant to the management of whales under the Revised Management Procedure (RMP), or that the subset of information which *is* relevant to these management procedures can be, and routinely are, obtained with far greater efficiency by well-established non-lethal methods. Population structure (required for restricting the set of plausible hypotheses used in *Implementation Simulation Trials*) is now widely studied through genetic analysis of skin biopsies; thus the proposed lethal sampling is entirely unnecessary, and unlike a large-scale biopsy programme, will not yield sample sizes with the statistical power to provide a reliable picture of stock structure in the species concerned.

By linking the proposed work to 'multi-species management', and through its repeated references to a need to manage cetaceans to benefit human fisheries, Iceland is in practice proposing a cull of whales, a concept that is in opposition to the conservative principle underlying the RMP. We find it particularly regrettable that the proponents chose to respond to this criticism by questioning whether the RMP is indeed 'rational management'. The RMP was developed by the SC, and is accepted by the IWC as the basis for the management of whale stocks.

As members of the Scientific Committee, we are seriously concerned by what we see as the increasingly frequent abuse of Article VIII of the International Whaling Convention for the Regulation of Whaling by some member nations. This has important ramifications for the IWC and the work of the SC. Member governments that promote poorly conceived research whaling programmes place their scientists in the untenable position of having to defend these proposals in order to support the agendas of their governments. In turn, this causes unnecessary conflict between SC members (as has occurred at the last several SC meetings), damages the credibility of the SC as a whole, and undermines the agreed basis by which the IWC manages stocks of whales.

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[1] This Appendix was submitted to the Plenary after close of Working Group discussions.

Appendix 3

RESPONSE TO APPENDIX 2 REGARDING SCIENTIFIC PERMITS[1]

A.K. Daníelsdóttir, R. Borodin, S. Diake, E. Diaz, Y. Fujise, D. Goodman, M. Goto, T. Gunnlaugsson, T. Hakamada, H. Hatanaka, T. Haug, F. Hester, N. Kanda, H. Kato, S. Kawahara, M. Kingsley, T. Kitakado, N. Lawrence, A. Magloire, H. Matsuda, K. Matsuoka, T. Miyashita, J. Morishita, H. Murase, T. Nagatomo, S. Nakatsuka, S. Nishiwaki, H. Okamura, S. Oshumi, D. Ólafsdóttir, J. Rambally, J. Rennie, H. Shimada, J. Sigurjónsson, G.A. Víkingsson, L. Walløe, H. Walters and H. Yoshida.

Appendix 2 wishes to register 'serious concerns' in the light of 'inadequate time for discussion'. However, it is difficult to find any topic in Appendix 2 not already discussed by the SC and dealt with in Annex O. Regardless, the review process was hampered by time constraints and late arrival of the draft report, and was particularly difficult for members whose first language is not English.

We welcome the proposal and believe that the research detailed in SC/55/O2 will contribute significantly to our knowledge of the research fields outlined in the programme. The research needs for rational management of whale and fish resources are certainly present, and the proposal addresses several other important research needs identified by the IWC Scientific Committee as well as in other scientific fora such as the NAMMCO, ICES and NAFO. We do not agree that the main objectives of the study (feeding ecology for minke whales and biological parameters for fin and sei whales) as stated in the proposal, can be achieved by non-lethal methods at present, but welcome the contribution of the proposal to the development and testing of non-lethal methods.

The scientific permit proposal is a demanding study with a broad scientific scope. Scientists involved in the development of the proposal included specialists in zoology, feeding ecology, population genetics, multi-species modelling, veterinary science, pollution, parasitology, chemistry, physiology and mathematics. The programme is coordinated by the MRI but will entail cooperation with scientists from other research institutes and universities. Their extensive professional experience includes participation in national and international cooperative research projects funded by the EU and various international research agencies.

Given the lapse of time since the previous Icelandic programme and the ecosystem changes including changes in whale stocks that have since taken place in Icelandic waters, as well as the simultaneous progress in research methods, it is prudent to carry out a pilot study (referred to as a feasibility study in SC/55/O2) with restricted but representative sample sizes before embarking on a full research programme. Criticism of the proposal refers frequently to newly developed research methods, but suggests that old data would suffice to design a research programme that would employ them.

Appendix 2 states that 'Criticism … demonstrates that the proposal is deficient'. This is merely a truism, defining the word 'criticism'. Few or none of the criticisms raised commanded universal support.

Sampling of minke whales is stratified according to the blocks defined as appropriate by BORMICON analyses. The criticisms of sampling design have not suggested preferable designs. The research programme will involve development of the GADGET model to incorporate cetaceans. The leading conclusion of SC/55/Rep1 is that 'consideration of ecosystem interactions between fish stocks and cetaceans is a potentially important research topic'. This report acknowledges new methods, but lists the advantages of data obtained by 'identifying and measuring items in . . . gastrointestinal contents'.

The evaluation of the effects of the proposed catches on the Central North Atlantic stock of minke whales is based on assessment by the NAMMCO Scientific Committee in 1998, which concluded that the stock is close to carrying capacity and that the mean annual catch during 1961-1985 (185 minke whales) was sustainable under all parameter values considered appropriate (NAMMCO, 1998). Since this assessment, a new abundance estimate of 43,633 $(CV = 0.19)$ has been accepted by the IWC Scientific Committee and found to be suitable for use under the RMP.

The basis for evaluation of the effect of the proposed catches of fin whales on the stock is:

(1) The results of the IWC Scientific Committee's Comprehensive Assessment of North Atlantic fin whales in 1991 and Central North Atlantic stock of minke whales in 1990.
(2) Assessments by the NAMMCO Scientific Committee in 1999 on the East-Greenland-Iceland stock of fin whales based on an abundance estimate from NASS-95 of 18,932 $(CV = 0.16)$ (NAMMCO, 1998).
(3) A new abundance estimate of 24,887 fin whales $(CV = 0.13)$ from a survey conducted in 2001 (Pike *et al.*, 2003) that has been accepted by the NAMMCO Scientific Committee. In addition, a significant increasing trend in abundance of fin whales in Icelandic waters over the period 1987-2001 (NAMMCO, 2002).

The statement in Appendix 2 that there has been no recent assessment of fin and minke whales in Icelandic waters is therefore simply wrong.

Although there has not been any formal assessment of sei whales in Icelandic waters we are confident that the proposed catches of 50 animals in each of the two years will not have any adverse effect on the Iceland-Denmark Strait stock which was estimated as 10,200 in 1989 (Cattanach *et al.*, 1993).

We cannot concur with the use of the word 'cull' to describe the pilot study. It will not substantially reduce the rate of growth of the stocks, nor, since sampling will be random, will removal rates be biased towards individual age or sex classes. A multi-species approach to management, if implemented, would not necessarily mean that whale populations will be managed to increase fishery yields. The reverse situation could also occur.

[1] This Appendix was submitted to the Plenary after close of Working Group discussions.

Stock-structure information is important in designing an implementation of the RMP, and this programme is not designed to answer stock-structure questions, although it will contribute to identifying them; we note that supplementary information such as age of maturity will help in interpreting genetic stock-structure information. However, other information is not irrelevant to the RMP; in particular, updated estimates of life history variables can be expected to contribute to designing trials and to initiating an implementation e.g. 'Parameters potentially important for management …. can be estimated from age data obtained from the catch' (IWC, 2000, p.27). Results of the programme will aid in evaluating cetacean catches in the context of managing other species, and will influence the RMP implementation that Iceland might request.

The regrets expressed in Appendix 2 regarding the questioning of whether the RMP is indeed rational management are contrary to the rationality of the RMP addressed in a paper to this meeting by Butterworth and Punt (SC/55/RMP10).

The RMP, as a single-minded, single-species management strategy, is appropriate for the IWC, and it may be appropriate for the IWC to focus its evaluation of research proposals on their usefulness to the RMP. Whether the single-species RMP constitutes 'rational management' is a semantic argument: it is recognised that multi-species management is complex and difficult. But national governments, with responsibility for managing a spectrum of marine resources, are entitled to take a broader view of their requirements for information.

Appendix 2 contends that the review of proposals for scientific whaling causes conflicts in the SC and compromises its credibility. We consider, rather, that these reviews merely reveal differences of belief that in any case exist, and that restricting discussions in the SC to an uncontroversial agenda would be an unsatisfactory way of preserving its credibility.

REFERENCES

Cattanach, K.L., Sigurjónsson, J., Buckland, S.T. and Gunnlaugsson, T. 1993. Sei whale abundance in the North Atlantic, estimated from NASS-87 and NASS-89 data. *Rep. int. Whal. Commn* 43:315-21.

International Whaling Commission. 2000. Report of the Scientific Committee. *J. Cetacean Res. Manage. (Suppl.)* 2:1-65.

NAMMCO. 1998. Report of the Fifth Meeting of the Scientific Committee, Tromsø, Norway, 10-15 March 1997. *NAMMCO Annual Report* 1998:85-202.

NAMMCO. 2002. Report of the Tenth Meeting of the Scientific Committee, Reykjavik, Iceland, 17-19 September 2001. *NAMMCO Annual Report* 2002:173-259.

Pike, D.G., Gunnlaugsson, T., Vikingsson, G.A., Desportes, G., Mikkelsen, B. and Bloch, D. 2003. Fin whale abundance in the North Atlantic, from Icelandic and Faroese NASS-2001 shipboard surveys: slightly revised estimates. Submitted to the NAMMCO Scientific Committee as SC/10/AE/8. [Available from *www.nammco.no*].