Editorial

This summary of the work of the Scientific Committee at the recent annual meeting follows the 2006 meeting of the International Whaling Commission held in St Kitts and Nevis. Details of the Commission meeting will be published in the next *Annual Report of the International Whaling Commission*. The full report of the Scientific Committee will be published in spring 2007 as *J. Cetacean Res. Manage*. 9 (Suppl.).

REVISED MANAGEMENT PROCEDURE

After the adoption of the moratorium on commercial whaling in 1982, the Committee spent over eight years developing the Revised Management Procedure (RMP) for baleen whales. In brief, the RMP is a generic management procedure designed to estimate safe catch limits for commercial whaling of baleen whales. This was adopted some time ago by the Commission, at the 1992 meeting. However, the Commission has stated that it will not set catch limits for commercial whaling for any stocks until it has agreed and adopted a complete Revised Management Scheme (RMS) which will include a number of non-scientific matters, including inspection and enforcement. The RMS has been the subject of a considerable amount of discussion within the Commission. The Commission had received a proposal by the Chair of the Commission for an RMS package of measures that he believed was a fair and balanced approach to move to the rapid completion of the RMS. However, this was not accepted as a package by the Commission, and despite further work, the Commission agreed that it was at an impasse at the 2006 meeting in St Kitts and Nevis.

Process for revision of the *CLA*
The *CLA* (*Catch Limit Algorithm)* is used to determine safe removal limits under the RMP and was agreed in 1992. As a result of a request by Norway, the Committee reviewed the process agreed in 1992 and clarified some issues. The result of the review was to:

(1) agree that comparison of any proposed revision will be for a 100 year time period;
(2) agree an appropriate range of maximum sustainable yield rates for trials after a review at the 2007 meeting;
(3) agree requirements for an appropriate set of trials including additional trials to model environmental degradation;
(4) agree requirements for an appropriate set of performance statistics.

Implementation Simulation Trials
Implementation Simulation Trials are trials that are carried out before using the RMP to calculate a catch limit and involve investigating the full range of plausible hypotheses related to a specific species and geographic area, particularly with respect to issues of stock structure.

The process of developing *Implementation Simulation Trials* is not the same as identifying the 'best' assessment for the species/region, but involves considering a set of alternative models to examine a broad range of uncertainties with a view to excluding variants of the RMP that show performance that is not sufficiently robust across the trials. Account needs to be taken of the plausibility of the various trial scenarios when evaluating RMP variants.

In the light of difficulties experienced in recent years, particularly with respect to the North Pacific region (common minke whales and Bryde's whales), the Committee has spent some time discussing the general question of how best to ensure that the process of carrying out *Implementations* (or *Implementation Reviews*) is efficient and prompt, whilst taking into account the available information. To achieve this it agreed that they should be conducted at discrete intervals, using the data available at one point in time. This year, the Committee reviewed the process from '*pre-Implementation Assessment*' to initial *Implementation* and *Implementation Reviews* based on the experience gained thus far, and particularly with respect to the difficulties faced during the *Implementation* process for western North Pacific common minke whales. As a result, the Committee developed detailed the requirements and guidelines for the *Implementation* process as well as updating its document detailing requirements and guidelines for conducting surveys and analysing data within the Revised Management Procedure. These were published in *J. Cetacean Res. Manage*. 7 (Suppl.).

North Pacific Bryde's whales
The Committee had made relatively slow progress up to 2005 on completing the *Implementation* for western North Pacific Bryde's whales *inter alia* due to its heavy workload. While noting that it was in the *pre-Implementation Assessment* stage, the Committee noted the considerable work already undertaken and agreed that it should be possible to move faster towards *Implementation* than would be the case for new situations. The Committee held an intersessional Workshop in March 2005 and at the 2005 annual meeting it was agreed that the *pre-Implementation* stage had been completed and that the *Implementation* process would now begin, following the new guidelines referred to above. The first intersessional Workshop under the new guidelines took place in Shimizu, Japan in October 2005 and further progress was made at the 2006 Annual Meeting. The second intersessional workshop will be held in December 2006 and the *Implementation* should be completed at the 2007 Annual Meeting in Anchorage, USA.

North Atlantic fin whales
The Committee reviewed the available information in order to determine whether there was sufficient information to warrant the initiation of a *pre-Implementation Assessment* for North Atlantic fin whales. It agreed that there was and the Commission agreed with its recommendation that the Committee initiate the *pre-Implementation Assessment*. The first stage of this was reviewed at the 2006 annual meeting and it is hoped to complete the *pre-Implementation* stage at the 2007 annual meeting. To progress this work, a co-operative intersessional Workshop was held in March 2006 with the NAMMCO scientific committee on general scientific issues of common interest, particularly with respect to stock structure, abundance and catch history. The

results of that workshop were discussed and endorsed at the 2006 Annual Meeting and it was agreed that the *pre-Implementation Assessment* was complete. For practical reasons, it was agreed that the *Implementation* would begin after the 2007 Annual Meeting.

Bycatches of large whales
The RMP estimates a limit for the number of non-natural removals, not simply a catch limit for commercial whaling. It is therefore important to estimate the numbers of whales removed from the population by indirect means including bycatches in fishing gear and ship strikes, for example.

The Scientific Committee began to consider this issue in some detail three years ago. It agreed that priority should be given to those areas where the RMP is likely to be implemented – such as the northwestern Pacific and the northeastern Atlantic. Four steps are required: (1) identification of the relevant fisheries; (2) description and categorisation of those fisheries to allow a sampling scheme to be devised; (3) identification of a suitable sampling strategy or strategies; and (4) design and implementation of the sampling scheme to enable estimation of the total bycatch.

The Committee has reviewed general methods for estimating bycatches. These fall under two headings: (1) those based on fisheries data and observer programmes; and (2) those based on genetic data. The former have been used successfully for several small cetacean populations. The Committee agreed that independent observer schemes are generally the most reliable means of estimating bycatch rates in a statistically rigorous manner, but that they may not always be practical and will require careful design.

Genetic approaches potentially represent a new way of estimating bycatches. The Committee has agreed that although genetic methods based on market samples may not be the primary approach to estimating bycatch, they could provide useful supplementary data that could not be obtained in another way. The use of market samples to provide absolute estimates should not be ruled out. However, further developments in sampling design with input from experts with detailed knowledge of market sampling issues are needed. A Workshop on that subject was held immediately prior to the 2005 meeting, in Ulsan, Korea. The objectives of the Workshop were:

(1) to review available methods that have been used to provide estimates of large cetacean bycatches via market samples, including a consideration of their associated confidence intervals in the context of the RMP;
(2) to provide advice as to whether market-sampling-based methods can be used to reliably estimate bycatch for use in addressing the Commissions objectives regarding total removals over time and, if so, the requirements for such methods.

The Committee agreed that market sampling provided potentially useful methods to supplement bycatch reporting schemes and agreed to a proposal for a follow-up workshop to investigate this further. It also agreed that any such bycatch estimates obtained from market surveys would be improved considerably if carried out in conjunction with the use of data from DNA registers on whales entering the market. Whilst recognising the political sensitivity of market-related issues in an IWC context, the Committee respectfully requested relevant governments to consider a collaborative effort to investigate these methods as a potentially valuable source of information for management

and use in the RMP. At the 2006 Annual Meeting it was noted that considerable progress had been made and a list of further work requirements was agreed as a pre-requisite to holding a second workshop; this will probably occur after the 2007 Annual Meeting.

Other sources of anthropogenic mortality: vessel strikes
The Committee reviewed the report of a workshop on large whale ship strikes in the Mediterranean held by ACCOBAMS and the Pelagos Sanctuary and endorsed its recommendations on work related to estimating the number of whales struck and possible mitigation measures. It also agreed on the need to establish an international database of vessel strikes and established a working group to take this forward. It also recommended further work on histopathological techniques to determine if whales have been struck by vessels. It also made a number of recommendations related to improved reporting of ship strikes.

REGIONAL WORKSHOPS TO ADDRESS CETACEAN BYCATCH ISSUES

Outside the context of the RMP, the IWC Scientific Committee and others have identified the incidental capture of cetaceans in fishing gear as one of the most important threats to the conservation and management of their populations and it is known to be a significant threat to survival in certain cases (e.g. the North Atlantic right whale, and the vaquita). In order to address the full management implications, reliable information is needed on bycatch numbers, stock identity and movements, the abundance of the affected population(s), and the population dynamics of the cetaceans.

In some areas, considerable advances have been made in the assessment and mitigation of cetacean by-catch since the pioneering IWC La Jolla Workshop held in 1990. In other areas, however, little progress has been made and, as a result, a growing number of cetacean species (both large and small) face critical conservation problems as a result of fisheries bycatch. Rather than holding another large generic workshop, it was agreed that given the case- and area-specific nature of the problem, a series of broad-based regional workshops would be more effective, focusing on regions where bycatch problems have been given priority by the Scientific Committee and are not already being addressed.

The general objectives of such workshops will be to develop a short- and long-term approach to the successful management and mitigation of the cetacean bycatch problems in the region, building upon work already undertaken by the Committee. The Committee agreed a mechanism whereby this process can be facilitated. It also recommended collaboration with other organisations with an interest in this matter (e.g. the Convention on Migratory Species, the Committee on Fisheries of the UN Food and Agriculture Organisation, IUCN and relevant international and regional fishery organisations). Work to set up the first such workshop is continuing.

DEVELOPMENT OF AN ABORIGINAL WHALING MANAGEMENT PROCEDURE

With the completion of the RMP, the Commission asked the Scientific Committee to begin the process of developing a new procedure for the management of aboriginal subsistence whaling. Such a procedure must take into

account the different management objectives for such whaling when compared to commercial whaling. This is an iterative and ongoing effort. The Commission will establish an Aboriginal Whaling Scheme that comprises the scientific and logistical (e.g. inspection/observation) aspects of the management of all aboriginal fisheries. Within this, the scientific component might comprise some general aspects common to all fisheries (e.g. guidelines and requirements for surveys and for data c.f. the RMP) and an overall AWMP within which there will be common components and case-specific components.

At the 2002 meeting, the Committee completed its work with respect to the Bering-Chukchi-Beaufort Seas stock of bowhead whales. It agreed a *Strike Limit Algorithm (SLA)* for bowhead whales and the scientific aspects of a Scheme; this was adopted by the Commission. It noted that should the Commission decide, it would be possible to apply the *Bowhead SLA* at that meeting. After considerable work and two intersessional workshops, the Committee made a formal recommendation to the Commission for a *Strike Limit Algorithm* for gray whales in 2004. It believed that this *SLA* met the objectives of the Commission set out in 1994 and represented the best scientific advice that the Committee could offer the Commission with respect to the management of the Eastern North Pacific stock of gray whales. This was adopted by the Commission.

The situation for the Greenlandic fisheries for fin and minke whales is less promising. A considerable amount of research, especially concerning stock identity, is required and to this end, the Committee has developed a research programme in cooperation with Greenlandic scientists (see below). High priority is being accorded to this work.

ASSESSMENT OF STOCKS SUBJECT TO ABORIGINAL SUBSISTENCE WHALING

Aboriginal subsistence whaling is permitted for Denmark (Greenland, fin and minke whales), the Russian Federation (Siberia, gray and bowhead whales), St Vincent and The Grenadines (Bequia, humpback whales) and the USA (Alaska, bowhead and gray whales). It is the responsibility of the Committee to provide scientific advice on safe catch limits for such stocks and until the AWMP is completed then the Committee provides advice on a more *ad hoc* basis, carrying out major reviews according to the needs of the Commission in terms of establishing catch limits and the availability of data. It also carries out brief annual reviews of each stock.

The present catch limits have been set up to the 2007 season and so at the 2007 meeting, the Committee has to provide management advice for all of the stocks considered. The Commission sets catch limits based on the scientific advice and a 'need' statement from the countries involved.

Eastern gray whales
In 2002, the primary assessment carried out was for the eastern gray whale population (Issue 1 of volume 4 of the *Journal of Cetacean Research and Management* was devoted to gray whale papers). New information on abundance, distribution, catches and ecology was presented. The population is believed to be close to carrying capacity. The Committee agreed that an annual take of up to 463 whales was acceptable; based on the submitted need statement, the Commission set a total for the 2003-07 seasons of 620 with a maximum of 140 in any one year. The Committee confirmed this advice this year using the *Gray Whale SLA*.

Bering-Chukchi-Beaufort Seas stock of bowhead whales
In addition to the work on the *Bowhead SLA*, the Committee has also been examining the status of the Bering-Chukchi-Beaufort Seas stock of bowhead whales. The most recent abundance estimate (for 2001) is 10,500 (95%CI 8,200-13,500) giving a rate of increase between 1978 and 2002 of 3.2% (95%CI 1.4%, 5.1%). The Committee undertook an in-depth assessment at the 2004 meeting. At that meeting, the discussions of uncertainty over stock structure issues made it clear that these must form a major component of the *Implementation Review* to be completed in 2007. However, given the continued evidence of an increase in abundance estimates, the spatio-temporal distribution and opportunistic nature of the hunt and the low numbers of whales struck annually in St. Lawrence Island and Chukotka, the Committee agreed that the *Bowhead SLA* remains the most appropriate tool for providing management advice for this harvest, at least until the 2007 *Implementation Review* is completed. This indicated that no change was required to the already agreed limit for the 2003-2007 (total landed whales not more than 280, with no more than 67 strikes in any one year).

The *Implementation Review* process began in 2006 and in particular is examining the robustness of the *Bowhead SLA* to plausible stock hypotheses via simulation trials. Discussions at the 2006 Annual Meeting focussed on progress being made in stock structure studies and preparation for the 2007 assessment. A timeline for this work was agreed and the second intersessional workshop will take place in January 2007 with a Third Workshop in March 2007.

Minke and fin whales off West Greenland
In 2002, despite a lack of scientific advice, the Commission established the same catch limits for the 2003-07 period as previously in force i.e. West Greenland minke whales – an annual limit of up to 175 strikes; East Greenland minke whales – an annual catch of up to 12 animals; West Greenland fin whales – an annual catch of up to 19 whales. The Committee had been unable to provide scientific advice on safe catch limits at that time and had stressed that its inability to provide any advice on safe catch limits was a matter of great concern.

In 2005, the Committee had received abundance estimates from a new photographic aerial survey technique and new assessments from Greenlandic scientists. The Committee had identified a number of problems with these but was still concerned that taken at face value, the preliminary (and not accepted) estimate of abundance for common minke whales suggests that about a 90% decline has occurred since the previous survey in 1993 although there are several indications that such a decline has probably not occurred. Nonetheless, the Committee urged that considerable caution be exercised in setting catch limits for this fishery because it has no scientific basis for providing advice on safe catch limits. It also made a number of strong recommendations for future scientific work.

Similarly, in 2005, the Committee was not in a position to accept the estimate for fin whales, and also urged that considerable caution be exercised in setting catch limits for this fishery and as interim *ad hoc* advice, the Committee advised that a take of 4-10 animals (approximately 1% of the lower 5th percentile and of the mean of the estimate of abundance) annually was unlikely to harm the stock in the short-term, particularly since this does not take into account

the possibility that the fin whale stock extends beyond West Greenland. This advice would be re-evaluated in the light of the intersessional work recommended.

This year, the Committee was extremely pleased to receive and accept new abundance estimates for the common minke whale (3,500, 95%CI 1,500-7,700) and fin whale (1,700 95%CI 840-3,500) off West Greenland, based on a traditional aerial survey.

As a result it stressed that it was in a considerably stronger position than it was last year. For the common minke whale, in addition to the new abundance estimate, progress has been made on incorporating the sex ratio data into an assessment and in examining whether the genetic data can be used to obtain a lower bound for the abundance of the total population. It also noted that further progress will be made on these issues during the intersessional period, although it could not guarantee that this work would necessarily result in an acceptable assessment in 2007. The Committee therefore agreed that the Commission should exercise caution when setting catch limits for this stock.

For the fin whale, in addition to the new abundance estimate, which it recognises is an underestimate, considerable progress has been made on developing an assessment method although some have some concerns as to whether the data available are sufficiently informative to use it for providing management advice. It again therefore agreed that it was not in a position to give satisfactory management advice.

Humpback whales off St Vincent and the Grenadines
In 2002, after considerable debate in the Commission, a catch of up to 20 whales for the period 2003-07 was agreed. The Committee has received positive confirmation that eastern Caribbean humpback whales are part of the West Indies breeding population (abundance in 1992/93 – 11,570, 95%CI 10,100-13,200) and agreed that the catch limit set by the Commission would not harm the stock.

HISTORIC ABUNDANCE ESTIMATION, GENETIC METHODS

In 2004, in the light of a genetic modelling paper published in 2003 (Roman, J. and Palumbi, S.R. 2003. Whales before whaling in the North Atlantic. *Science* 301:508-10), the Committee had considered the general methodological issue of estimating carrying capacity and/or pre-exploitation population size in the context of the Committee's assessment work. As a result of its discussions, the Committee agreed that such genetic methods have the potential to be one of a suite of tools that can be used to examine pre-exploitation abundance but that there are a number of limitations and uncertainties that must be considered when examining such data in a present-day management context. The Committee had agreed that the estimates of historic abundance provided in the Roman and Palumbi paper for the initial pre-whaling population sizes of humpback, fin and common minke whales in the North Atlantic have considerably more uncertainty than reported, and can not be considered reliable estimates of immediate pre-whaling population size. Particularly important in this regard is the mismatch between the time-period to which genetic estimates apply (i.e. the time period is difficult to determine and extremely wide) and the population sizes of whales immediately prior to exploitation. It also agreed that the paper provides no information to suggest that changes are required in either the RMP or AWMP approaches to management.

The Committee had identified further work necessary to assess whether genetically-based estimates of 'initial' abundance can provide useful information for the management of cetaceans; little progress has been made in this regard and at the 2006 meeting the Committee agreed that it should not consider this issue further until additional publications describing methodological and analytical progress are available.

STOCK IDENTITY

Of general concern to the assessment of any cetaceans is the question of stock identity. Examination of this concept in the context of management plays an important role in much of the Committee's work, whether in the context of the RMP, AWMP or general conservation and management. In recognition of this, the Committee has established a Working Group to review theoretical and practical aspects of the stock concept in a management context. The Committee has noted that it is important, in any application of stock structure methods, to examine the sensitivity of conclusions to different *a priori* decisions about the definition of initial units, and as to which population structure hypotheses to examine.

A specialist Workshop to examine the use of simulation testing to assess the performance of methods to identify population structure was held in January 2003. The Workshop developed a suitable simulation framework to allow evaluation of genetic methods used in inferring population structure both in general terms (the issue is of great relevance to conservation and management outside the IWC) and from a specifically IWC viewpoint (particularly in an RMP/AWMP context).

This is a complex project that must proceed in an iterative fashion. Great progress was made on the most challenging module, i.e. the development and validation of a program to simulate realistic genetic datasets and the Committee reviewed the results of an intersessional workshop to build on this and begin the testing of some existing methods held at the University of Potsdam in March 2006. The primary achievements of the Workshop are summarised below.

(1) Considerable progress was made in the detailed computing work needed to:
   (a) identify and fix problems in the linking of the coalescent (SIMCOAL) and individual based model (RMETASIM) required for simulating datasets;
   (b) complete the control program that generates genetic samples from the datasets developed by RMETASIM, passes the samples to the boundary setting methods, runs the management algorithms, and collates the performance statistics.
(2) The technical specifications for the initial TOSSM trials (demographic structure, genetic structure, initialising the population matrix, harvesting and catch control, sampling and trials) were completed.
(3) An initial set of methods to be tested within the framework was identified, along with issues related to automation for boundary-setting, and the people who would 'champion' each method.
(4) Preliminary results were available from two population structure methods, showing example boundary-setting algorithms in use through a complete run of TOSSM.

The Committee endorsed the report of the Workshop and the plans to take this work forward during the intersessional period.

COMPREHENSIVE ASSESSMENT OF WHALE STOCKS

The 'Comprehensive Assessment' of whale stocks

The 'Comprehensive Assessment' can be considered as an in-depth evaluation of the status of all whale stocks in the light of management objectives and procedures; this would include the examination of current stock size, recent population trends, carrying capacity and productivity. Clearly, it is not possible to 'comprehensively assess' all whale stocks simultaneously, and the Committee has been working in an iterative manner towards this, initially concentrating on stocks that have recently or are presently being subject to either commercial or aboriginal subsistence whaling. Some of these stocks have already been discussed in the sections on the RMP and AWMP.

Antarctic minke whales

The Committee has carried out annual surveys in the Antarctic (south of 60°S) since the late 1970s. The last agreed estimates for each of the six management Areas for minke whales were for the period 1982/83 to 1989/90. At the 2000 meeting, the Committee agreed that whilst these represented the best estimates for the years surveyed, they were no longer appropriate as estimates of current abundance. An initial analysis of available recent data had suggested that current estimates might be appreciably lower than the previous estimates.

Subsequently, considerable time has been spent considering Antarctic minke whales with a view to obtaining final estimates of abundance and considering any trend in these. This has included a review of data collection methods and analytical methodology. After considering many of the factors affecting abundance estimates, there is still evidence of a decline in the abundance estimates, although it is not clear how this reflects any actual change in minke abundance. Three hypotheses that might explain these results have been identified:

(1) a real change in minke abundance;
(2) changes in the proportion of the population present in the survey region at the time of the survey;
(3) changes in the survey process over time that compromise the comparability of estimates across years.

A considerable amount of work has been undertaken and further work is ongoing. The final part of the Third Circumpolar Survey undertaken as part of the IWC's SOWER research programme has been completed and preliminary work suggests that the estimated abundance may be down to about 40% of the estimates from the Second Circumpolar Survey. Experimental work to examine possible causes has been undertaken on the 2004/05 and 2005/06 cruises. Further work will be undertaken on the 2006/07 cruise. Work to finalise an assessment of Antarctic minke whale is continuing in a number of ways and will again be a priority item for discussion at the 2007 meeting.

Southern Hemisphere blue whales

The Committee is beginning the process of reviewing the status of Southern Hemisphere blue whales. An important part of this work is to try to develop methods to identify pygmy blue whales from 'true' blue whales at sea and progress is being made on this. Work on genetic and acoustic differentiation techniques is continuing and there is considerable progress with morphological methods. The Committee has agreed that (1) on average, the Antarctic blue whale population is increasing at a mean rate of 7.3% per annum (1.4–11.6%); (2) had an estimated circumpolar population size of 1,700 (860–2,900) in 1996; and (3) that this population is still severely depleted with the 1996 population estimate estimated to be at 0.7% (0.3–1.3%) of the estimated pre-exploitation level.

The Committee reviewed progress towards undertaking an in-depth assessment at its 2006 meeting and has developed a workplan for next year.

Southern Hemisphere humpback whales

Considerable progress has been made in recent years in working towards an assessment of humpback whales. Attention has focussed both on data from historic whaling operations and on newly acquired photo-identification, biopsy and sightings data. Considerable progress has been made towards completing an assessment for three Breeding Stocks (A: off eastern South America, D: off western Australia and G: off western South America), particularly as a result of an intersessional workshop held in Hobart, Australia in April 2006. At the Annual Meeting, the Committee reviewed and endorsed the report of the Workshop and its recommendations. It also reviewed the results of assessment modelling. The Committee agreed that of the three stocks assessed, the most reliable results were those for Breeding Stock A. This is because there was trend information from surveys on the breeding grounds and less uncertainty about catch allocation from the feeding grounds. It agreed that there has been an increase in abundance in recent decades but that the stock remains well below initial unexploited levels. For Breeding Stock G, the only trend information available was for the feeding grounds and there was also uncertainty about possible stock structure within this stock. For Breeding Stock D, although there is breeding ground trend information and an absolute estimate of abundance, catch allocation is less certain and perhaps influenced by mixing with Breeding Stock E.

North Pacific common minke whales

After the completion of the *Implementation* of North Pacific common minke whales in 2003, it was agreed that preparations should begin for an in-depth assessment of common minke whales in the North Pacific, with special emphasis on the J-stock.

This year, the Committee was pleased with the substantial intersessional progress made including receiving results from three cruises and a successful collaboration between Japanese and Korean scientist for genetic analysis. With respect to stock structure, there is now sufficient information available to begin specifying some plausible hypotheses for stock structure but recommends biopsy sampling for some areas where data are sparse. This will require co-operation amongst range states.

Similarly in terms of distribution and abundance, the Committee requested co-operative work by all range states to fill in information gaps. This will be facilitated by a workshop of range state scientists being held in Korea in late 2006.

North Atlantic right whales

The Committee has paid particular attention to the status of the North Atlantic right whale in the western North Atlantic in recent year and is extremely concerned about this population, which, whilst probably the only potentially viable population of this species, is in serious danger (*ca* 300 animals). By any management criteria applied by the

IWC in terms of either commercial whaling or aboriginal subsistence whaling, there should be no direct anthropogenic removals from this stock.

The Committee has on several occasions noted that individuals are continuing to die or become seriously injured as a result of becoming entangled in fishing gear or being struck by ships. It repeated that it is a matter of absolute urgency that every effort be made to reduce anthropogenic mortality in this population to zero. This is perhaps the only way in which its chances of survival can be directly improved. There is no need to wait for further research before implementing any currently available management actions that can reduce anthropogenic mortalities.

The Committee reviewed progress on a number of research and management recommendations concerning this stock.

Western North Pacific gray whales

This is one of the most endangered populations of great whales in the world. It numbers less than 100 animals and there are a number of proposed oil and gas-related projects in and near its only known feeding ground. The population is very small (about 120), and suffers from a low number of reproductive females (about 23), low calf survival, male-biased sex ratio, dependence upon a restricted feeding area and apparent nutritional stress (as reflected in a large number of skinny whales in some years – about 15% in 2006). Other major potential concerns include behavioural reactions to noise (notably in light of increasing industrial activity in the area) and the threat of an oil spill off Sakhalin which could cover all or part of the Piltun area and thus potentially exclude animals from this feeding ground. Again, this year, the Committee stressed the urgency of reducing anthropogenic mortality to zero – particularly in the light of three fatal entanglements in fishing gear in 2005.

Last year, the Committee welcomed and supported the report and recommendations of the independent scientific review panel (ISRP) that had included five members of the IWC Scientific Committee (Brownell, Cooke, Donovan, Moore and Reeves). It commended SEIC (the Sakhalin Energy Investment Corporation) for requesting this review and IUCN for facilitating the process. Despite some difficulties, it believes that this process represented an important step forward for western gray whale conservation.

The Committee strongly supported efforts to build upon this in the future and to develop a framework for collaborative research, monitoring and mitigation efforts between oil companies, independent experts, national programmes and authorities and the IWC and other intergovernmental organisations. It particularly urged that other companies in the area co-operate with this process. It was therefore pleased to hear this year that plans for a long-term group were proceeding (see *http://www.iucn.org/ themes/marine/sakhalin/*). The Committee made a number of research recommendations, particularly with respect to telemetry work.

The Committee has also concurred with need identified by the ISRP for a comprehensive strategy to save western gray whales. In addition to time spent in the Sakhalin region, gray whales spend approximately half their time in other waters in eastern Asia (Japan, the Republic of Korea, the Democratic People's Republic of Korea and China) and there is a need for mitigation measures for the many potential threats to the western gray whale throughout its range. The IWC has agreed to play an active and facilitating role in the process.

EFFECTS OF ENVIRONMENTAL CHANGE ON CETACEANS

There is an increasing awareness that whales should not be considered in isolation but as part of the marine environment; detrimental changes to their habitat may pose a serious threat to whale stocks. The Committee has examined this issue in the context of the RMP and agreed that the RMP adequately addresses such concerns. However, it has also emphasised that the species most vulnerable to environmental threats might well be those reduced to levels at which the RMP, even if applied, would result in zero catches. Over a period of several years, the Committee has developed two multi-national, multi-disciplinary research proposals. One of these, POLLUTION 2000+, has two aims: to determine whether predictive and quantitative relationships exist between biomarkers (of exposure to and/or effect of PCBs) and PCB levels in certain tissues; and to validate/calibrate sampling and analytical techniques. The other, SOWER 2000, is to examine the influence of temporal and spatial variability in the physical and biological Antarctic environment on the distribution, abundance and migration of whales.

At the 2006 meeting, a pre-meeting was held on the potential for seismic surveys to impact cetaceans. This included members of the Scientific Committee as well as industry representatives, geophysical contractors, members of national regulatory agencies and individuals representing funding bodies.

The issues addressed are complex and it was agreed that any approach to addressing the potential impacts of seismic surveys on cetaceans needs to be scientifically-based and risk-averse. Overall, the scientific presentations and discussions considerably advanced the Committee's ability to:

(1) evaluate the potential impacts from seismic surveys on cetaceans;
(2) help interpret observed scientific results in the context of effects on critical life functions and on animals at the population level;
(3) provide a current synthesis of studies addressing issues related to seismic surveys and cetaceans;
(4) advance the dialogue, communication and exchange of ideas and information between the IWC Scientific Committee, the wider scientific community and members of industry in order to address this issue effectively;
(5) identify areas where additional research, review and discussion are needed (especially related to measuring and translating scientific results into assessments biological significance, as well as to improving existing and developing new mitigation and monitoring approaches);
(6) highlight areas where risk to cetaceans may be reduced by greater consideration to these issues in the planning stages of seismic surveys; and
(7) to serve as a resource for member nations that issue permits authorising seismic surveys within their EEZ.

The Committee made a large number of recommendations for further work on this important issue, stressing the need for co-operation amongst stakeholders including governments. Particularly important were recommendations on monitoring and mitigation measures, and advice to member governments. Governments were recommended to implement appropriate monitoring programmes, develop and/or evaluate nationally relevant mitigation procedures

and identify and facilitate research and monitoring and mitigation measures that address the recommendations detailed in the Committee's report. The Committee also recommended the earliest possible establishment of long-term monitoring programmes for vulnerable species, and that seismic surveys be designed to use only the amount of acoustic output required for the desired geological objectives.

The Committee also considered the final report of the two sub-projects comprising Phase 1 of the POLLUTION 2000+. The objectives of the bottlenose dolphin sub-project were (1) to select and examine a number of biomarkers of exposure to and/or effect of PCBs and determine whether a predictive and quantifiable relationship with PCB levels in certain tissues exists and (2) to examine the relationships between concentrations of variables obtained by biopsy sampling with those of concentrations in other tissues that can only be obtained from fresh carcases. For the first time an individual based model was constructed that simulated the accumulation of PCBs in the population and allowed modification of first year calf survival based on maternal blubber PCB levels. The objective of the harbour porpoise sub-project was to determine changes in concentrations of selected variables with post-mortem times. This makes it possible to use incidentally caught animals in pollutant studies. The Committee commended the scientific output of Phase I and agreed that it had certainly contributed to the Commission's request to give priority to research on the effects of environmental changes on cetaceans. The Committee concurred with a recommendation from the POLLUTION 2000+ Steering Group that before any decision is taken on implementing Phase II, an interdisciplinary workshop should be held to identify the needs for a Phase II and, if appropriate, design an outline research proposal for continuation of the programme.

Ecosystem modelling
The question of ecosystem modelling in the context of cetacean conservation is an important one and has been addressed by the Scientific Committee on a number of occasions before. This year the Committee has agreed to work collaboratively with both CCAMLR and FAO initiatives. The Committee agreed on the following with respect to the applicability of ecosystem models for the use of the Committee in providing advice to the Commission:

(1) spatial modelling is a valuable tool to explore possible effects of anthropogenic stressors;
(2) there is a great need for the proper incorporation of uncertainty in ecosystem models;
(3) there is a critical lack of data, in particular at the lower trophic levels, to evaluate the reliability of models;
(4) some models can be useful to generate hypothesis regarding trophic dynamics; and finally
(5) that there is a need for an increased collaboration between scientists designing field studies and those developing analytical models.

Other habitat related matters
The Committee also discussed further collaboration in Southern Ocean research with organisations such as CCAMLR and SO-GLOBEC and other issues related to sea ice. It also agreed to hold a special symposium on infectious and non-infectious diseases in marine mammals prior to the next annual meeting

SMALL CETACEANS

Despite disagreement within the Commission over the management responsibilities of the IWC with respect to small cetaceans, it has been agreed that the Scientific Committee can study and provide advice on them. As part of this programme, the Committee has reviewed the biology and status of a number of species and carried out major reviews of significant directed and incidental catches of small cetaceans.

In 2001, the Government of Japan had indicated that it would no longer co-operate with the Committee on small cetacean related matters. In 2002, the Committee referred to the great value of the information provided by the Government of Japan on the status of small cetaceans in previous years and respectfully requested that the Government of Japan reconsider its position on this matter and resume the valuable contribution of Japanese scientists to its work on small cetaceans. Unfortunately, this has still not yet happened.

This year, the primary topic was small cetaceans in the Caribbean and western tropical Atlantic. In general, although work is being carried out in several areas, considerable additional work is needed to understand the distribution, stock structure, abundance and status of species in the region. Few abundance estimates exist and stock structure remains unknown in most cases. This requires local and international collaboration, co-operation, training and assistance.

Directed takes in this area include subsistence removal for food and live capture for dolphinaria both within the region and globally. There was little new information on the subsistence takes and the extent of current directed hunts is unclear. There is evidence of incidental catches of several species in many fisheries but little information on levels. The situation with respect to live captures and dolphinaria is somewhat unclear. Boat traffic, and habitat degradation, including chemical pollution are also potential threats to cetaceans in the region. A collaborative effort is required to assess the impact of removals and other threats, and to document the status of populations in the region.

The Committee also reviewed progress on previous recommendations, in particular on the baiji of the Yangtze River, the world's most endangered cetacean. It welcomed news of some international collaboration. It noted that there are apparently plans to capture baijis and put them in a semi-natural oxbow reserve. While noting its previous discussions on the relative merits of this approach, it agreed that should any baijis be found and captures attempted, scientists with relevant expertise must be able to contribute directly to the process.

The vaquita is also critically endangered. The Committee welcomed new initiatives to estimate current abundance and to study habitat requirements, but emphasised that highest priority must be the urgent investment of more resources for bycatch mitigation. In this regard, the Committee emphasised that pingers are not an appropriate measure for the vaquita.

The harbour porpoise is exposed to high bycatches throughout most of its range. The Committee therefore welcomed new results on abundance in the North Sea and adjacent waters from the SCANS II project, and plans for further studies in the North Atlantic (e.g. as part of the trans-NASS programme). It noted information from NAMMCO that there are probably substantial levels of bycatch in Icelandic and Norwegian fisheries and endorsed the view of

the NAMMCO Scientific Committee that better estimates are needed to assess the sustainability of these bycatches as well as directed catches in Greenland.

The Committee has also previously expressed concern at the degradation of important habitats for the humpback dolphins. It expressed serious concern over plans for industrial development in Sanniang Bay, Southern China where there is a small resident population in an as yet pristine area. Given information on captures of humpback dolphins in Guinea, the Committee recommended that appropriate surveys be implemented to obtain further information on distribution and abundance.

The Committee reviewed progress on other recommendations, *inter alia* on white whales and narwhals, small cetaceans in the Black Sea, and Dall's porpoise, and reiterated its previous concerns and recommendations. It also endorsed plans for a major survey in the ACCOBAMS region (which includes the Black Sea). In 2004, it had recommended surveys to be undertaken on the abundance of franciscana, and was pleased to receive new information from the southern coast of Brazil.

Finally, the Committee repeated previous requests for all Governments to submit relevant information on direct and incidental catches of small cetaceans in their national progress reports and for improved information on stock identity and abundance.

SCIENTIFIC ASPECTS OF WHALEWATCHING

The major topic this year concerned quantitative methods for assessing the impacts of whalewatching on cetaceans. The results of three studies, two carried out in Australia, suggested that cumulative effects could jeopardise the viability of populations already at risk or small closed or resident populations. Long-term studies are essential to assess whether changes at the individual and/or population level are caused by the whalewatching activities. It is also essential to obtain baseline data from prospective whalewatching areas.

The Committee reviewed a number of careful and well designed studies (in New Zealand, Australia, Canada and Croatia) that provided compelling evidence that the fitness of individual odontocetes repeatedly exposed to whalewatching vessel traffic can be compromised and that this can lead to population level effects. The Committee recommended that similar studies be carried out, wherever possible. The Committee also strongly encouraged the development of similar studies on large whales, in particular, research to determine sustainable levels of whalewatching.

The Committee stressed the need for appropriate study design and analytical methods to enable discrimination between natural ecological variability and anthropogenic impacts when examining short-term behavioural changes. The Committee recommended that a dedicated workshop to develop a world-wide research design be held.

The Committee also reviewed: data sources from platform of opportunity of potential value to the Committee; reports from a number of intersessional working groups; potential impacts of 'swim with' programmes; progress on developing a compendium of whalewatching guidelines and regulations from around the world; and risk to cetaceans from colliding with whalewatching vessels.

REVIEW AND COMMENT ON SCIENTIFIC PERMITS ISSUED FOR SCIENTIFIC RESEARCH

All proposed scientific permits have to be submitted for review by the Scientific Committee following guidelines issued by the Commission. However, in accordance with the Convention the ultimate responsibility for issuing them lies with the member nation.

Three continuing permits were discussed this year.

JARPA II was a new proposal last year. Its stated objectives of the new long-term research programme proposal are: (1) monitoring of the Antarctic ecosystem; (2) modelling competition among whale species and developing future management objectives; (3) elucidation of temporal and spatial changes in stock structure; and (4) improving the management procedure for the Antarctic minke whale stocks.

The proposed catches for the full programme were: 850 (with 10% allowance) Antarctic minke whales, 50 humpback whales (not to begin for two years) and 50 fin whales (10 in the first two years). There was considerable disagreement over the value of this research both within the Scientific Committee and the Commission. As in previous years, there was severe disagreement within the Committee regarding advice that should be provided on a number of issues, including: the relevance of the proposed research to management, appropriate sample sizes and applicability of alternate (non-lethal) research methods.

JARPN II is a long-term research programme primarily aimed at feeding ecology in the context of contributing to the 'conservation and sustainable use of marine living resources in the western North Pacific, especially within Japan's EEZ'. The programme involves the taking of 150 minke whales, 50 Bryde's whales, 50 sei whales and 10 sperm whales in the western North Pacific.

A proposed permit by Iceland, primarily for feeding ecology studies for 100 common minke whales, 100 fin whales and 50 sei whales in each of two years was presented two years ago; the government had only given a permit for 25 common minke whales from Iceland in 2004. Again, as in the past, different views on the value of this research were expressed in the Scientific Committee.

The Committee continued preparations for a full review of the JARPA programme (an 18 year programme that finished in 2004). Now that the complete set of results is available, the review workshop will be held in December 2006.

In the absence of any new Special Permit proposals to review, the Committee focused on a discussion on how to improve our procedures for review of such proposals. The Committee agreed that there is a need to improve the review process we currently use and a proposal for a new method will be the starting point for discussions next year. In the meantime, the Committee agreed on a *pro forma* to be used by the proponents of special permit proposals when submitting such proposals to the Scientific Committee.

WHALE SANCTUARIES

In 2004, when reviewing the Southern Ocean Sanctuary (SOS), the Committee endorsed a number of recommendations that were to be implemented generically to the review of sanctuary proposals.

(1) The purpose(s) of IWC Sanctuaries should be better articulated through a set of refined overall objectives (e.g., preserving species biodiversity; promoting recovery of depleted stocks; increasing whaling yield).

In particular, the relationships between the RMP and the Sanctuary programme should be articulated.

(2) Appropriate performance measures both for Sanctuaries in general, and the SOS in particular, should be developed. These performance measures should link the refined objectives of the SOS with monitoring programmes in the field.

(3) Systematic inventory and research programmes should be established or further developed so as to build the required information base for a Sanctuary management plan and subsequent monitoring programmes.

(4) A Sanctuary management plan should clearly outline the broad strategies and specific actions needed to achieve Sanctuary objectives.

(5) A monitoring strategy that measures progress toward achieving the Sanctuary objectives should be developed and subsequently implemented. A key component of this monitoring strategy would be the development of tangible indicators to monitor progress.

(6) Review criteria that reflect the goals and objectives of the Sanctuary (as described above) should be established.

(7) The Sanctuary management plan should be refined periodically to account for ecological, oceanographic and possible other changes in an adaptive fashion.

In previous years, the Committee has received requests to review proposals for a South Atlantic Sanctuary and a South Pacific Sanctuary. There has been disagreement within the Committee over whether such Sanctuaries were justified scientifically. This year no proposals were received for review.