

Annex E

Report of the Workshop on Whale Killing Methods and Associated Welfare Issues

The Workshop took place at the Estrel Hotel and Conference Centre, Berlin from 7-9 June 2003.

1. INTRODUCTORY ITEMS

1.1 Appointment of Chair

Joe Geraci, National Aquarium in Baltimore, was appointed as Chair. He welcomed the participants (see Appendix 1) and observers.

1.2 Appointment of Vice-Chair

In his opening remarks the Chair explained that he would only be able to attend the Workshop for the two first days and that therefore it would be necessary to appoint a Vice-Chair to chair the meeting on the third day. Norway proposed Nick Gales (Australia) as Vice-Chair. This was supported by Japan and New Zealand, and Gales was appointed Vice-Chair.

1.3 Appointment of rapporteurs

Laila Sadler (UK) and Sidsel Grønvik (Norway) were appointed as rapporteurs.

1.4 Review of documents

All documents submitted for consideration by the Workshop had been submitted by or through Contracting Governments. The Chair referred participants to the list of documents (Appendix 2). A total of 25 documents had been submitted for discussion. Additional documents that were available as background and for information are also listed in Appendix 2. The Chair went through the document list to indicate which documents should be discussed under which agenda items.

2. TERMS OF REFERENCE AND BACKGROUND TO THE WORKSHOP

At its 43rd Annual Meeting in May 1991, the Commission adopted the following Terms of Reference for a Workshop on Whale Killing Methods (*Rep. int. Whal. Commn* 42:49) that was subsequently held in Glasgow in June 1992 prior to the 42nd Annual Meeting. The relevant parts of these Terms of Reference are shown below:

‘That a Workshop including but not limited to veterinarians, weapons explosive experts, physiologists, forensic pathologists experienced with trauma and practicing whalers be convened.

The purpose of the Workshop would be to:

- (1) Consider all methods currently in use in whaling or known to be in development;
- (2) Assess the methods, their efficacy and physiological effects;
- (3) Evaluate the times to death achieved by the various methods;
- (4) Evaluate progress since 1980; complete a comparative analysis of the methods.’

These Terms of Reference were slightly extended for the 1995 Workshop (*Rep. int. Whal. Commn* 45:16), i.e.:

‘To:

- (1) Consider all methods currently in use in whaling or known to be in development;
- (2) Assess the methods, their efficacy and physiological effects;
- (3) Evaluate the times to death achieved by the various methods;
- (4) Review and evaluate all data, relevant to the Workshop, available through the IWC or held by national governments or organisations;
- (5) Complete a comparative analysis of the methods and consider revision of the Action Plan as appropriate, with a view to improving the humaneness of whale killing techniques while paying proper regard to the safety of the crew.’

The Chair referred to last year’s meeting of the Working Group on Whale Killing Methods and Associated Welfare Issues (*Ann. Rep. Whal. Comm.* 2002:76-82) when an *ad hoc* task force was appointed to develop a proposed draft agenda for this Workshop. He noted that the items proposed by the task force and included on the draft agenda are:

- (1) a review and assessment of killing methods in use and under development for commercial whaling, aboriginal whaling, whaling under scientific permit, and for the euthanasia of stranded and entrapped cetaceans;
- (2) a review of times to death and evaluation of criteria for death; and
- (3) hunter safety and associated problems.

He noted that the Workshops held in 1995 and 1999 had resulted in Plans of Action and that an important part of the present Workshop would be a review of the most recent Plan, including recommending changes where necessary. The Chair noted that previous Workshops have considered relevant comparative data from the killing of other large mammals (*Ann. Rep. Whal. Comm* 2001: 54-55, Resolution 2001-2).

The Chair drew attention to the fact that at a private meeting of Commissioners/Alternate Commissioners on the Revised Management Scheme held in Cambridge in October 2002, it was agreed to ask the Workshop Steering Committee to include on the Workshop agenda:

- (1) a review of current and proposed requirements for the collection of animal welfare data;
- (2) development of a consolidated list of data that might be collected by international observers (should the Commission so choose); and
- (3) recommendations of appropriate analyses of such data.

These items would be addressed under proposed Agenda item 7, Collection of animal welfare data.

The Chair requested that individuals refrain from taking the floor unless they had new points to add to discussion, thus avoiding interventions intended simply to support the statement of another speaker.

Japan stated that it participates in, and provides information (obtained through considerable research effort over the years) to, the Workshop on a voluntary basis. However, this Workshop is not an appropriate forum to

discuss welfare issues to be incorporated into an RMS because these matters are outside the Terms of Reference of the IWC. Japan further stated that significant improvements in killing methods and a corresponding reduction in times to death had been achieved and encouraged scientific exchange and constructive discussion at the Workshop.

The UK welcomed Japan's willingness to take part in the Workshop, but did not share Japan's position regarding the collection of animal welfare data. Germany and New Zealand expressed similar views. The Secretary recalled that at the private meeting of Commissioners on the RMS it had been agreed to include the item on data collection on the understanding that it was addressing only the scientific aspects.

Norway stated that it had on a voluntary basis collected and presented data on whale killing matters to the IWC since 1980. In regard to Resolution 2001-2, it indicated that it would like to see killing data from other large mammals presented.

In a reply to Norway, the UK stated that it had provided information regarding the hunting of deer in Scotland to the Whale Killing Workshop in 1999 (IWC/51/12, Appendix 4). The UK was, however, doubtful of the relevance of comparison with data from terrestrial animals.

3. ADOPTION OF THE AGENDA

The Chair asked if the Workshop would adopt the agenda including Item 7, Collection of animal welfare data.

Japan reiterated its position that animal welfare issues are outside the Terms of Reference of the IWC and should not be included in an RMS and that Item 7 should be deleted.

The Chair noted that the Commission had asked the Workshop to include this item and that it therefore would be inappropriate not to deal with it. Australia, UK and USA supported the Chair and said that comments in the discussions should be kept to strictly technical matters.

The Workshop adopted the Agenda (Appendix 3).

4. DESCRIPTION OF KILLING METHODS IN USE AND UNDER DEVELOPMENT

4.1 Commercial whaling

IWC/55/WK17 (Improvements in hunting and killing methods for minke whales in Norway 1981-2003)

Øen (Norway) presented paper IWC/55/WK17. The paper describes improvements in hunting and killing methods for minke whales in Norway during 1981-2003. The minke whale hunt is carried out on small fishing boats which are rigged for hunting in the seasons. It is a part time occupation, and the license holder must own the boat or the main part of it to get a license. A 50 or 60mm harpoon gun is mounted in the bow and the harpoons are equipped with penthrate grenades. Rifles of minimum calibre 9.3mm are used as back-up weapons. When these small guns and harpoons were first introduced to minke whaling in the 1920s the grenade was not filled with explosives. The reason was probably that the fuse and trigger system of the black powder grenade was difficult to adjust to the

relatively small minke whale and would not be particularly effective. However, the empty grenade housing (cold grenade) was continued used on the harpoon head until it gradually was replaced with a pointed iron head (cold harpoon).

A five-year programme to improve the weapons and hunting methods used in the Norwegian minke whale hunt started in 1981. Norway was encouraged to investigate the possible use of high-velocity projectiles (IWC, 1980) in the minke whale hunt. The programme included a more comprehensive study of possible alternatives and also the design and adaptation of new equipment and training of personnel.

Field trials were performed on high-velocity projectiles, traditional and modified cold harpoons and penthrate grenades and a new penthrate grenade was developed and introduced in the Norwegian hunt in 1984. The cold harpoon was simultaneously banned. Prior to the whaling season of 1992 the harpoons on each boat were required to be consistent in weight, and specific instructions concerning shooting and catching routines were given to the gunners. The recommended maximum range for harpoon shots was 30m. Animals were to be shot from the side whenever possible, and then hauled in to the boat immediately to determine whether re-shooting with the rifle was needed. During the active hunt the rifle had to be kept beside the gunner at all times.

Before the traditional hunt was resumed in 1993, the 60mm harpoon guns were modified by the introduction of a new trigger mechanism. The required tensile strength of harpoons, fore-runners, wires, winches and braking devices was increased from 1,500 to 5,000kg. The harpoons were standardised in weight, and the harpoon claws were modified and reinforced. Gunners and licence-holders were required to take part in obligatory training courses covering issues like safety and maintenance of weapons, weapons ballistics, hunting techniques, shooting with rifle, etc. Each gunner was required to pass a shooting test using harpoon gun and rifle. The obligatory courses for the licence holders and gunners continued in the following years.

In late 1996 a new penthrate grenade was designed and constructed in a co-operation between the Norwegian School of Veterinary Science and the Norwegian Defence Research Establishment. Field trials were carried out in 1997, 1998 and 1999. After the 1999 season some minor changes were made on the trigger hooks and the grenade was subjected to the official testing regime for Competent Authority Approval as set by the Directorate of Fire and Explosion Prevention. All these tests were issued on the basis of evaluation of tests carried out in accordance with UN recommendations. The tests were passed and the new grenade was approved under the name 'Whale grenade-99' in January 2000. The surplus stock of the former penthrate grenade was simultaneously banned.

COMMENTS AND DISCUSSION

The Netherlands expressed its appreciation for the valuable and interesting information provided in IWC/55/WK17 which showed the efforts by Norway to improve whale killing techniques and asked a question about the interpretation of the data. The Chair ruled that it was more appropriate to take this up under Agenda Item 5.1.

4.2 Aboriginal subsistence whaling

IWC/55/WK1 (*Report on Alaska Eskimo Whaling Commission Progress Concerning Improvement of Whale Killing Methods*)

IWC/55/WK2 (*Report of the Makah Tribe on Whale Killing Methods*)

In presenting IWC/55/WK2, the USA commented that the Makah Tribe's hunting methods are designed to preserve traditional hunting methods in a manner that is consistent with the goal of minimising time to death. The whale is first struck from a whaling canoe with a hand-thrown harpoon, and is then killed as quickly as possible with a high-powered rifle fired from a motorised chase boat. The preferred weapon is a .577 calibre rifle, with a .50 calibre rifle carried as a reserve. The USA reported that in 2001 the Makah Tribe implemented changes to its hunting methods to increase the safety of the hunt which include a safety officer to supervise the hunt and authorise the discharge of the rifle.

The USA then gave a PowerPoint presentation related to document IWC/55/WK1, outlining efforts to improve hunting efficiency and time to death in the Alaskan Eskimo bowhead aboriginal subsistence hunt (see Agenda Item 5.2). This presentation covered the continuing field trials of the penthrate projectile in Barrow, production of a new darting gun barrel for the penthrate projectile, improved hunting efficiency, methods for estimated time to death (TTD) determinations, and examination of landed whales.

With respect to hunting efficiency over the past 20+ years, the data demonstrate improved efficiency during the 1990s. These data are annually reported to the IWC Scientific Committee and show a 4-year 'running average' of 76.2% for the past four years. Factors that can affect hunt efficiency include sea ice conditions, wind speed and direction, weather (i.e. fog), ocean current speed and direction, and hunt coordination and communication.

Efforts to further improve this efficiency were detailed, the most important being the receipt of 160 new penthrate projectile barrels for use beginning in fall 2003. The presentation gave details of the weapons improvement programme, including a review of the 2000-2001 hunts in Barrow using the penthrate projectile. It was reported that during spring 2001 five whales were landed using penthrate-containing projectiles; and in autumn 2001 one penthrate projectile was used secondarily to land a whale. In spring 2002 a single whale was struck with a penthrate projectile and landed but abandoned (strong current and unstable shorefast ice prevented butchering), and during fall 2002 two penthrate projectiles were used to land a single whale (possible detonation problem with one). The present sample size for evaluating the performance of the penthrate projectile and associated TTD is very limited due to confounding variables such as body site struck, depth of penetration, size of whales, sequence used, site of secondary weapon detonation and projectile failure or unusual detonation.

The presentation also indicated that Alaska hunters would like to present TTD, but that the best data that can be reliably presented is an estimated time to death. The AEWC has introduced a new data form for use by crews landing a whale to help in the collection of this data. The time to prayer occurs at a recognisable moment when the crews have traditionally confirmed the death of the whale; but it is recognised that this is not the same as TTD. The USA noted that for hunters in a small boat, it is dangerous

to remain close to the whale following the strike thus affecting the ability to immediately assess death. The crew must monitor the whale from a distance for at least 5-10 minutes post strike and then crews gradually approach and secure the whale to prepare it for towing once it is confirmed dead. The traditional prayer is conducted when the whale is confirmed dead (i.e. lack of movement, no response to touch).

COMMENTS AND QUESTIONS

The Netherlands noted that the Makah Tribe's hunt is suspended when visibility is less than 500 yards and asked why this distance is chosen. The USA stated that it was based upon a procedure established by the US Coastguard and their decision process was not known.

IWC/55/WK8 (*Greenland Home Rule Government: Efficiency in the Greenlandic hunt of minke whales and fin whales 1991-2002*)

IWC/55/WK9 (*Greenland Home Rule Government: A note regarding information encouraged in the IWC-Resolution 1999-1*)

IWC/55/WK10 (*Greenland Home Rule Government: Report on improvements in ASW in Greenland*)

IWC/55/WK11 (*Greenland Home Rule Government: Status for Greenland action plan on whale hunting methods, 2002*)

IWC/55/WK12 (*Greenland Home Rule Government: Times to death in the Greenlandic minke and fin whale hunt in 2002*)

Jessen (Denmark) gave an overview of whaling off West and East Greenland. She began by referring to all documents that have been submitted to IWC and earlier workshops on Whale Killing Methods, in which detailed descriptions have been given on whale hunting methods. In the old days, whale hunting was conducted from umiaqs and qajaqs with handheld harpoons in near coast areas and at the ice edge. Nowadays, whale hunting is very different. The first vessel with a harpoon cannon was introduced in 1948, mounted with the Norwegian Kongsberg 50mm cannon which used cold harpoons. The cold harpoon was used until the introduction of the penthrate grenade in 1990-1991.

There are three types of hunting methods used in Greenland for large cetaceans:

- (a) Minke whale hunting from vessels mounted with Kongsberg 50mm harpoon cannons and the new penthrate grenade, imported from Norway. As secondary weapons, 30.06 or 7.62mm or .375 or .458 rifles are used. Vessel sizes are between 30 feet and 72 feet long. There are no vessels with harpoon cannons in East Greenland.
- (b) Minke whale hunting from small boats with rifles, with the above-mentioned calibres, is used both in West and East Greenland, mostly in settlement areas, where there are no vessels with harpoon cannons. The secondary weapon is the handheld harpoon with float, which is also used in order to secure the whale.
- (c) Fin whale hunting is conducted in West Greenland from vessels 36 feet to 72 feet long with Kongsberg 50mm harpoon cannon and an especially constructed penthrate grenade for fin whales with a longer trigger line compared to that used in the minke whale hunt.

Greenland Home Rule has conducted, and will continue to conduct, hunter/user instruction courses regarding the use, handling and storing of the penthrate grenades. The courses include the maintenance of harpoon cannons and other hunting gear and improvements of routines in general. The courses include instructions in data collection, training in the safe handling and effective use of killing equipment and shooting distance. In most of the instruction workshops that have been conducted since 1991, Greenland Home Rule has invited weapons experts from Norway.

Denmark then made reference to documents IWC/55/WK8-12.

COMMENTS AND QUESTIONS

The Netherlands asked whether killing methods differed between West and East Greenland. Denmark clarified that 71 vessels with harpoon cannon operate in West Greenland whereas small boats with only rifles operate in East Greenland. The Netherlands then suggested separating rifle data for West and East Greenland and New Zealand suggested separating rifle data from cannon data for minke whales. Denmark stated that IWC/55/WK12 would be revised, and later presented the revised document to the Secretariat. When asked whether the large variation in efficiency of fin whale killing was due to the method used, Denmark replied it was likely to be a result of weather and practical conditions.

IWC/55/WK13 (Report on whale killing methods employed in the aboriginal subsistence harvest of the Russian Federation, 2002)

Borodin (Russian Federation) presented a summary of data, indicating that at IWC54 they had presented an analysis of the efficiency of their aboriginal whaling, so this paper (IWC/55/WK13) was for one season only. Their aboriginal whaling uses three methods: harpoon, darting gun and rifles. On gray whales, all three methods were used. Times to death were provided by the captains. The hunter group has a captain responsible for reporting and an inspector on the coast at the start and end of a hunt. Every whale has a record. All harvested whales are inspected by inspectors and 25% of these are inspected by scientific advisors. Whaling captains provide 100% of the data.

In 2002, 131 gray whales (70 male and 61 female) and 3 bowhead whales (1 male, 1 female, 1 struck and lost) were harvested during the aboriginal subsistence harvest season. A harpoon and float was used during the harvest of all whales. A darting gun was used during the harvest of 94 whales. 'Tiger' (125), 'Vepr' (25) and 'Carabine CKS' rifles were also used during the harvest of whales.

In the harvest from 3 to 100 bullets were used per whale. In the 2002 harvest season, an average of 52 bullets were used per whale, an improvement over the 2000 harvest (average 64 bullets per whale) and 2001 harvest (average 54 bullets). In 2002, the average number of darting gun projectiles used on the gray whales was 2.7 projectiles per whale shot by darting gun. The maximum estimated TTD for gray whales was 56 minutes, and for bowhead whales 53 minutes. Mean TTD for gray whales was 32 minutes, and for bowhead whales 41 minutes.

It was noted that the large number of bullets and darting gun projectiles are used in the gray whale hunt for two major reasons. First, the gray whale is aggressive, the hunt is very dangerous, and is carried out from a moving boat. Hunters, particularly new hunters, sometimes shoot but miss the whale, even though they count these toward the

overall number of bullets and/or projectiles. Second, the aboriginal hunters tend to overuse bullets to make absolutely sure that the gray whale is actually dead and the whale is harvested as quickly as possible. Hunters may also overestimate the time to death because they consider death to be when they are absolutely sure that the whale is not moving. It is extremely dangerous for the hunters to approach a gray whale until there is no chance that the animal may be merely wounded and could become enraged. All of the above subjective factors tend towards an overestimation of the time to death.

The aboriginal subsistence harvest is regulated by federal fish inspectors and officials from the Chukotka Special Marine Inspectorate. Additionally the hunters self-regulate their harvests and scientists are present.

COMMENTS AND QUESTIONS

New Zealand asked why the hunters continue to use a small calibre rifle and relatively low powered cartridges when significantly more powerful cartridges were available. The Russian Federation replied that they use those weapons they have available. In response to a question from South Africa on struck and lost animals, the Russian Federation responded that no data were available on gray whales however the data on bowhead whales had been reported.

The UK noted that data from Greenland, the USA and the Russian Federation were useful and asked that data on times to death, number of rounds etc. for each animal be provided in order to aid discussion. Mexico noted the difficulties for hunters and asked whether the Russian Federation planned to address the long TTD in another way. The Russian Federation replied that there had been increases in efficiency and that they would continue to try to introduce darting guns more widely. The Netherlands questioned whether sole use of a CKS rifle as the killing method could be called aboriginal subsistence whaling. The Russian Federation noted that harvesting regulations permit use of these weapons and they were used approximately ten times. Norway explained that the harpoon is not the primary killing method in the Chukotka hunts but is used to secure the whale. Rifle or darting gun are used to kill the whale.

Summarising the discussions, the Chair noted that killing efficiency had improved although more could still be achieved, and noted the inconsistencies in data collection and presentation, indicating that uniformity is important.

The USA indicated that differences in information provided from aboriginal whaling reflect the different cultural traditions and the different stages of weapons improvement in the different hunts. Denmark supported this comment, noting that it had no veterinary or expert assistance in data collection. Dominica stated that there were cultural differences in the way people lived and although moves should be made to improve techniques, this should not force cultural change.

4.3 Whaling under scientific permit

IWC/55/WK23 (Report of experiments to compare Norwegian and Japanese penthrate grenades and improvement of the Japanese grenade in the Japanese Whale Research Programs)

IWC/55/WK23 presented by Ishikawa (Japan) was a report of experiments to compare Norwegian and Japanese penthrate grenades and improvements to the Japanese

grenade in the Japanese Whale Research Programs. The comparative experiment using Norwegian and Japanese penthrite grenades started under the Revised Action Plan on Whale Killing Methods. To mount the Norwegian grenade that was designed for 50/60mm harpoon onto the Japanese 75mm harpoon, a special connector was developed. The experiments were conducted in the three seasons of JARPA from 2000 to 2003 and in the 2002 JARPNII. All imported grenades have been used for minke whales only. Norwegian grenades showed superiority in every experiment. TTD of Norwegian grenades in every experiment were shorter than Japanese grenade and Instantaneous Death Rate (IDR) of Norwegian grenades in every experiment were higher than for Japanese grenades. Norwegian grenades showed excellent results especially for small individuals. However, financial concerns may be the most important factor related to the decision on whether or not to introduce them to Japan. In parallel with experiments on the Norwegian grenade, Japan began improvement of the Japanese penthrite grenade especially in regard to reducing misfiring of the fuse. It showed good results, matching those for the Norwegian grenade in the first experiment. Japan will continue the experiments to test and improve this grenade.

COMMENTS AND QUESTIONS

Comments were made that it was good to see the development that had taken place. Australia noted that data on struck and lost animals were not presented and that these data would be important in evaluating the performance of the three different grenades.

As Japan had stated that one of the most important factors for not introducing the Norwegian grenades in the Japanese hunt was cost, Germany commented that though this might be a consideration in commercial whaling activities, scientific whaling operations should use the best available techniques irrespective of their cost. Japan replied that in principle it agreed that one should always use the best available alternative and had therefore tested the Norwegian grenade. However if an alternative device could show the same results, they would adopt the less expensive one even if it is scientific research.

IWC/55/WK25 (Report on whale killing methods in the 2002/2003 JARPA and improvement of the time to death in the Japanese Whale Research Programs (JARPA and JARPN))

Ishikawa (Japan) presented IWC/55/WK25 which reported on whale killing methods in the 2002/2003 JARPA and improvement of TTD in the Japanese (Japan) Whale Research Programs (JARPA and JARPN). In the 2002/2003 JARPA 440 Antarctic minke whales were taken. Both the TTD and the instantaneous death rate (IDR) were significantly improved from the previous JARPA. From 1993, post-mortem examinations have been carried out by experienced researchers on a research base ship for all whales taken in JARPA and JARPN. The results are reported to gunners on sighting/sampling vessels as quickly as possible. This 'Necropsy Information Feedback System' has successfully contributed to shorten TTD. Both TTD and IDR in JARPA have improved significantly over these four seasons. Improvement of both TTD and IDR in minke whales taken in the JARPN is also notable. In the first year of the catch of Bryde's whales, both TTD and IDR showed unsatisfactory results. To improve them, analysis of the post-mortem examination data was conducted carefully.

The gunners were recommended to shoot harpoons at a shorter distance. The difference of the shape of the head between minke and Bryde's whales were illustrated with the position of the brain for appropriate secondary killing method. Furthermore, larger calibre (.458) rifles with 500GR bullets were introduced. These measures improved TTD and IDR of Bryde's whales significantly.

COMMENTS AND QUESTIONS

New Zealand asked whether it would be possible to get more detailed data on the Bryde's whales taken and also whether any data on sperm and sei whales from JARPN would be available. Japan answered that it had already stated its policy with regard to individual data and that the necessary data had been submitted on a voluntary basis and JARPN is conducted in accordance with Article VIII of the Convention. The improvements in TTD and IDR were the important points. The UK asked whether any regression analysis had been carried out to determine whether these trends were statistically significant as without such analysis interpretation of the data is difficult. Japan replied that although regression analysis was not conducted, non-parametric comparison detected a significant difference when comparisons were made between recent TTD/IDR data and those of the past. In reply to a question from the Netherlands on TTD data, Japan stated that the median is suitable for comparison when the sample size for each year is small. Norway stated that when the distribution of the data is so skewed then the median is the preferable statistic for comparison. The Netherlands also suggested video or slide information might be useful.

4.4 Euthanasia of stranded and entrapped cetaceans

IWC/55/WK5 (Euthanasia of stranded cetaceans in New Zealand)

Donoghue (New Zealand) informed the Workshop that New Zealand has one of the highest rates of whale strandings in the world. The Department of Conservation (DOC) is the government agency with the legal responsibility for the management of strandings, usually with the active involvement of local Maori and other volunteers. Wherever possible, attempts are made to refloat stranded cetaceans, but many animals are in poor condition when they strand or by the time they are found. DOC officers often need to make a choice between humane euthanasia and leaving stranded cetaceans to die.

The New Zealand Department of Conservation has developed Standard Operating Procedures (SOPs) for a number of the tasks undertaken by its staff. IWC/55/WK5, Annex 1 is an extract dealing with euthanasia, taken from the SOP on marine mammal strandings. Euthanasia of stranded cetaceans is only undertaken by the use of a firearm, handled by a competent and trained DOC officer. Target points have been identified for the euthanasia of toothed and baleen whales. A specialised firearm has been developed for use on stranded sperm whales. The use of explosives, barbiturates or other chemicals, and the severing of blood vessels to euthanase stranded cetaceans are all prohibited. New Zealand is confident that if SOP procedures are followed, euthanased whales will die instantly.

IWC/55/WK7 (Euthanasia of a stranded sperm whale with calibre .458 round nose full-metal jacket rifle bullets)

Øen (Norway) reported on a 12.5m male sperm whale observed in a bay in the Lofoten Islands (IWC/55/WK7)

that was shown to be in distress, listing and swimming in circles. When it finally stranded in shallow water euthanasia was decided upon. A small whaling vessel was unable to reach it so a rifle had to be used for euthanasia from a smaller vessel. The first bullet hit at an oblique angle and passed over the skull due to lack of elevation for the shooter. There was still a corneal reflex so another round was fired perpendicular to the side of the animal at a point about 65cm behind the eye and 30cm above a line between the flipper and the eye. This shot caused the whale to shiver and it immediately expired, the flippers relaxed after a few seconds and there was no corneal reflex. The whole process took some five minutes and three rounds were fired in total from the .458 calibre rifle with full-jacketed round nosed bullets.

COMMENTS AND QUESTIONS

The Chair asked what public reaction was like in New Zealand to shooting a whale on the beach. New Zealand responded that communication with the public is an important element in managing strandings, and that grief counselling is an integral part of people management when whales are euthanased. Responding to a question about the target area for sperm whales, New Zealand commented that the sperm whale skull is very different from baleen whales and the target spot differs from that selected for the sperm whale whose euthanasia is reported in IWC/55/WK7.

4.5 Review papers and Other

IWC/55/WK3 (Sea and weather conditions in Area V region in the Southern Ocean Sanctuary with special reference to whale killing methods)

Van Liere (Netherlands) provided data about sea condition, weather state and ship motions for a region in area V of the Southern Ocean Sanctuary, where Japanese whaling takes place (IWC/55/WK3). A review of temperature, wind speed, precipitation and fog was presented and used to generate a model to predict the characteristics of a Japanese catcher boat on the water. It suggested that 6 sways averaging 1.2 metres, 2 heaves averaging 3.4 metres and 4 surges of 0.6 metre can be expected each minute at the level of the harpoon. In December there is a 50% reduction of the sway and surge and an average heave of 1.8 metres. However the numbers per minute are doubled compared to March, weather and sea conditions in the studied area can be severe. It would be helpful to know how current Japanese operations solve the problems related to low temperatures and poor visibility and how these relate to the proportion of immediate kills, in particular in March and November. Minimum visibility requirements should be agreed upon. The paper also suggests that it would be important to receive direct observations of time and location, depth, wave height, period and direction, on board measurements of the sways, heaves and surges of the harpoon, the ship's speed and time to death data. It would also be important to extend similar research in other geographical areas and types of whaling. The paper encouraged IWC Contracting Governments to:

- (i) submit data about sea and weather conditions and practical difficulties related to these, in all areas where whale observations or whale killings occur; and
- (ii) (develop criteria related to weather condition, sea state and the sway, heave and surge responses of the ship and harpoon on

the basis of which some operations should not be allowed and the proportion of immediate kills could be significantly enhanced.

COMMENTS AND QUESTIONS

Norway asked if the Netherlands had tried to obtain and analyse data from the North Pacific, pointing out that data on IDR and TTD are the same in Japanese North Pacific and Antarctic hunts, suggesting that weather may not play an important role. The Netherlands answered that depending on resources it would be happy to provide these data in the North Pacific. Japan indicated that sighting surveys are an integral part of their research and so require certain conditions, as described in the cruise reports. The Netherlands noted that Japan had in the past stated that TTD was affected by weather conditions.

IWC/55/WK20 (Evaluation of current methods used to kill whales in relation to species taken)

In introducing IWC/55/WK20, Bowman (UK) stated that it attempts to evaluate morphological and physiological differences between species taken under the auspices of the IWC and determine the extent to which the differences can influence the effectiveness of different killing methods. Factors considered include mass, length and tissue thickness. This becomes particularly important when primary or secondary killing methods are used for other (especially larger) species for which they are not designed or tested. When considering methods for killing and determining the onset of insensibility, due consideration should be given to adaptations such as hypoxia. It is also relevant to consider the welfare implications of how whales caught in fishing nets are killed. In summary, with one or two exceptions, killing methods are not well adapted to the specific requirements of the species to which they are applied.

COMMENTS AND QUESTIONS

The UK commented that, for example, IWC/55/WK1 recognised that depth of penetration is closely linked to the size of the whale. IWC/55/WK23 and IWC/55/WK25 showed that instantaneous death rate in Japanese hunts was significantly higher for smaller animals (less than 7.5m) and that TTD and body length are positively related.

Norway provided clarification for various comments made stating that in its development work, the whales' anatomical features are mapped before a new hunting device is designed, and hunters are taught external 'landmarks' on the animal to understand the targeting requirements of different killing methods.

When asked by The Netherlands, Japan clarified that the harpoon used to kill sperm whales is a 75mm harpoon with a penthrate charge 1.7 times that used on minke whales (30g). Upon questioning from the UK and The Netherlands, Denmark also clarified various points, stating that it only imports the new penthrate harpoon from Norway, that sei whales are unusual in Greenland so an accidental misidentification was understandable, and that gunners' skill and weather have an important influence on killing result so it is not always easy to compare one year to the next. Also, the difference between the harpoons used on the fin and minke whales was the length of the line on the grenade.

Norway clarified a point on diving physiology, agreeing that diving mammals (seals and whales) have much larger

oxygen stores in the blood vessels and muscles than terrestrial mammals, and that a special physiological mechanism – the dive response – operates during dives, shunting blood away from most organs except the brain and some endocrine glands¹. However the brain has no extra store of oxygen nor, with the exception of one minor mechanism, any means of making it more resistant to hypoxia. (The mechanism possibly cools the brain by ~2°C so reducing metabolic rate.²) The consequence of this is that a whale entangled in fishing gear may suffer for a long time before dying, however a whale harpooned in a way that damages the heart or ruptures major vessels in the cardiovascular system will die within a few minutes due to lack of oxygen to the brain (as in terrestrial mammals), if not killed instantaneously by the blast.

Australia noted that IWC/55/WK20 indicates that behaviour, physiology and anatomy must be incorporated into the consideration of killing methods and the developments by Norway and others should be encouraged.

5. ASSESSMENT OF METHODS INCLUDING REVIEW OF TIMES TO DEATH, HUNTER SAFETY AND ASSOCIATED PROBLEMS

IWC/55/WK22 (Review of secondary killing methods employed for whales hunted under special permit, commercial whaling and aboriginal subsistence whaling)

Stachowitsch (Austria) presented IWC/55/WK22 that examines secondary killing methods, an issue that has received less attention than primary killing methods. Secondary killing methods in the three categories of whaling are neither as uniformly conducted nor is their application as clearly defined. IWC/55/WK22 attempted to extract some commonalities. The relatively low level of instantaneous kills and the frequent use of secondary killing methods highlights the inefficiency of some primary killing methods. Moreover, the efficiency of secondary killing methods often remains unsatisfactory.

IWC/55/WK22 therefore calls for: more information to be provided on variables that will influence the efficacy of secondary killing methods; these data to be provided separately to enable a more detailed assessment; establishing criteria for determining when to apply a secondary killing method; the use of sufficiently powerful secondary killing methods that render an already wounded animal irreversibly insensible to pain or dead as swiftly as possible, with emphasis on targeting the brain; qualitative aspects of the injuries to be considered (i.e. providing details of extent of wounding, as opposed solely to time to death). This approach would help to establish procedures that would improve times to death.

COMMENTS AND QUESTIONS

The USA pointed out that in the bowhead hunt, the primary strike is immediately followed by the secondary kill method, so the basic premise that the primary method is ineffective in this hunt is flawed. It also noted that the data in IWC/55/WK22 should be corrected to reflect that the

secondary weapon was used on all 49 animals landed in the 2001 bowhead hunt.

5.1 Commercial whaling

IWC/55/WK17 (Improvements in hunting and killing methods for minke whales in Norway 1981-2003)

The part of IWC/55/WK17 relevant to this agenda item was presented by Walløe (Norway). No data on the efficiency of the killing of minke whales with cold harpoon by Norwegian whalers had been collected prior to 1981. It was therefore necessary to start to collect data on the cold harpoon to serve as a reference data bank. Data obtained from the hunt in the years 1981 to 1983 showed that 17% of the whales were killed instantaneously (IWC death criteria fulfilled <10s) with cold harpoons. The first penthrite grenade harpoon was used in the hunt in 1984-86, and the percentage instantaneous death increased to 45%. This penthrite grenade became from 1985 onwards the only permitted killing method used for minke whales until 2000 when a new penthrite grenade (Whale grenade-99) took over. Small technical improvements were, however, introduced in the 1990s.

The collection of data on killing efficiency started again with the resumption of Norwegian whaling in 1993. From this year on a number of covariates have also been recorded and analysed. The influence of the covariates year, whale size, shooting range and shooting angle on survival time for the traditional hunt were studied by Cox regression (proportional hazard) and by a combination of logistic regression for whales killed instantaneously and Cox regression for whales surviving >10s. The analyses showed that year and size of the animal did not significantly influence the percentage of whales that died instantaneously (<10s) or survival times for whales that survived for more than 10s. The shooting range and shooting angle, however, had a significant influence on survival time. Based on the results of the analyses whalers were advised how to improve their hunting methods. This in combination with technical improvements of the weapon resulted in a steady increase in the percentage of instantaneous kills during the 1990s to 60% for the period 1996-98.

The new penthrite grenade harpoon has been used in the years 2000-2002. Preliminary analysis shows that the percentage of instantaneous kills has increased to 80%. Covariates have been recorded, but not yet analysed.

COMMENTS AND QUESTIONS

The Netherlands asked whether there were differences in the results between the different boats. Norway replied that the data analyses had not yet been finalised and that a definite answer therefore could not be given at this stage, but that the observation had been made that in several boats, all whales were killed immediately, and that others were not that efficient. Japan commented that the improvement in IDR over the last two decades had been impressive and asked whether this was due only to the new

¹ Blix, A.S. and Folkow, B. 1983. Cardiovascular adjustments to diving in mammals and birds. pp. 917-945. In: J.T. Shepherd and F.M. Abboud (Eds.). *Handbook of Physiology, Section 2: The Cardiovascular System*. American Physiology Society, Bethesda.

² Blix, A.S., Folkow, B. and Walløe, L. 2002. How seals may cool their brains during prolonged diving. *J. Physiol.* 543:7 [Abstract].

penthrith grenade. Norway answered that the improvement probably was a combination of different factors including higher skills of the whalers and better ballistics and larger penthrith charge in the grenade.

5.2 Aboriginal subsistence whaling

IWC/55/WK1 (Report on Alaska Eskimo Whaling Commission Progress Concerning Improvement of Whale Killing Methods)

IWC/55/WK2 (Report of the Makah Tribe on Whale Killing Methods)

Referring to its earlier presentation of IWC/55/WK1, the USA reported that it had no reliable TTD data to report for the bowhead hunt. The USA stated that the Eskimo hunters wished to be responsive to the request for TTD data and noted that, as described in the document, the AEWC had embarked on a programme to develop a set of visual and post-mortem examinations, including of brains similar to Norwegian efforts. These would serve as key indicators of time to unconsciousness and death with the goal of further enhancing the humaneness of the hunt.

With respect to the Makah hunt for gray whales, the USA noted that TTD had been previously reported for the single animal landed in 1999. As reported in IWC/55/WK2, this whale was struck by a harpoon and killed within eight minutes following two shots from a .577 calibre rifle. A necropsy performed after the hunt indicated that the first shot hit the skull and stunned the whale, while the second shot penetrated the whale's brain and likely killed the whale instantly.

The USA also commented that, while this Workshop was focusing on data reporting, it should not lose sight of the considerable efforts many aboriginal subsistence groups had gone through to implement weapons improvements programs. For example, in the bowhead hunt, the AEWC has brought the development of the penthrith bomb to such a stage that it plans to begin implementation of its usage during the fall 2003 hunt. Consequently, whereas the requested data or analyses could not or had not been submitted, the Workshop should pay due regard to the practical solutions being implemented to address the issues of efficiency and humaneness in these hunts.

QUESTIONS AND COMMENTS

Clarification of 'instantaneous death' was requested by Sweden, as in the USA bowhead hunt five to ten minutes was considered instantaneous, but in the Norwegian hunt instantaneous was defined as less than ten seconds. Discussion followed on the time taken to assess whether a whale is dead and the need to ensure hunter safety whilst attempting to kill whales efficiently. Australia pointed out that estimates of TTD could be presented with a clear definition of how the estimation process was carried out.

Some discussion on whether different species and hunts should have different requirements for TTD were clarified by Australia, which reminded the Workshop of the IWC definition of humane killing: Death brought about without pain, stress or distress to the animal by aiming to render an animal insensitive to pain as quickly as possible.

IWC/55/WK8 (Greenland Home Rule Government: Efficiency in the Greenlandic hunt of minke whales and fin whales 1991-2002)

Jessen (Denmark) indicated that information from Greenland is anecdotal as there are no vets or statisticians available to collect the data, and presented information on

Greenland's progress (IWC/55/WK8). Whaling regulation states that the hunters are obliged to complete a questionnaire regarding TTD, hunting methods used, and so on. The municipal office then sends the questionnaire to the department that puts the data into figures. It is required that for each struck large whale, a hunter is obliged to make a report. In 2002 there was a quota of 139 minke whales in West Greenland for vessels with mounted harpoon cannons. There were 131 returned questionnaires - a very high percentage (see IWC/55/WK12). The Greenland Home Rule stated that it has no manpower or resources to analyse the collected data and is very aware of that problem. They also noted the importance of the safety aspect of the present methods. In choosing new hunting methods or equipment, safety questions were taken into consideration. Space on board is very limited both in the vessels mounted with harpoon cannons and also in the small boats used in the rifle hunt. Safety for the crew and practicality of the hunt has to be taken into account, but also the effectiveness of the whale killing.

The size of the harpoon cannon boat in minke whaling has to be from 30 feet long (from 36 feet in fin whaling). Considering weather and ice conditions in some areas, it has been decided to start minke whale hunting on 1 April. The hunters have also to take the tide into consideration, because a whale has to be flensed during low tide in order for the hunters to turn the whale during the flensing. Flensing is mostly carried out on small islands.

IWC/55/WK12 (Greenland Home Rule Government: Times to death in the Greenlandic minke and fin whale hunt in 2002)

Denmark stated that it would provide data subdivided by species (IWC/55/WK12Rev). They also commented that a seminar on whale killing had not been held due to lack of funds however courses were held for whale hunters and rifle hunters. The Workshop was referred to the NAMMCO report of 2001. The change to high calibre rifles is slow as these rifles are prohibitively expensive on a hunter's income. The Government does not have the money to pay for the rifles. Denmark also clarified that the hand held harpoon is still used in the collective hunt of minke whales.

IWC/55/WK13 (Report on whale killing methods employed in the aboriginal subsistence harvest of the Russian Federation, 2002)

Borodin (Russian Federation) stated that harvest efficiency in the Russian Federation has increased over recent years (IWC/55/WK13), although each year new hunters join who lack experience. It is difficult to increase efficiency whilst guaranteeing hunter safety, as gray whales are aggressive.

COMMENTS AND QUESTIONS

Argentina asked, as it was stated that the percentage cover by hunters and inspectors is the same, whether this means they are the same person. Russia repeated its point from Agenda Item 4.1 about the captain of the hunter group being different from the inspector.

It was agreed that great efforts are being made to improve whale killing methods by a number of countries. However the Workshop noted the importance of struck and lost data for the management of stocks and encouraged that this be reported. Some countries noted that valuable data were not forthcoming from, for example, St Vincent and the Grenadines, the Faroes and from Greenland's narwhal and beluga hunts.

Some countries stated their belief that small cetaceans are outside the competency of the IWC. Other countries stated their belief that IWC does have competency.

Denmark stated that a representative of the Faroe Islands would be available the following week and would answer questions on a bilateral basis.

5.3 Whaling under scientific permit

Aspects of IWC/55/WK23 and IWC/55/WK25 relevant to this Agenda Item were presented and discussed, in combination with aspects relevant to Agenda Item 4.3. Much of the discussion is given under Agenda Item 4.3. Additionally, the Netherlands was not convinced by the conclusions of these papers as it was not clear how the statistical analysis had been done. They also indicated that they were not convinced by the explanation of the results and referred to IWC/52/WKM and IWC/52/AWI10 where in the 1999/2000 season, due to fair weather, comparable results were collected as in the 2002/2003 season. In reply, Ishikawa (Japan) stated his belief that it is less important to compare single year samples statistically, as what is important is to reduce TTD as much as possible continuously.

5.4 Euthanasia of stranded and entrapped cetaceans

IWC/55/WK5 (Euthanasia of stranded cetaceans in New Zealand)

Donoghue (New Zealand) presented IWC/55/WK5 which stressed the importance of people management, because widespread public interest in the welfare of whales raises issues of public safety at a stranding. On a few occasions when strandings are on rocky shores and use of firearms would be hazardous, the animals are left to die naturally - although the prime objective is to put the animal out of its suffering, human safety comes first.

COMMENTS AND QUESTIONS

The Netherlands asked Japan to provide information to next year's meeting on the killing methods for minke whales caught in fishing nets. However Japan stated that this was outside the IWC Terms of Reference so they would submit information only on a bilateral basis if they thought it appropriate. In response to a question about traditional utilisation of stranded whales by Maori, New Zealand stated that the Department of Conservation had agreements with a number of tribes regarding access to the bone of stranded whales for cultural purposes. It was further stated that stranded whales were left to die when it was unsafe to euthanase them, e.g. on rocky shorelines. In response to a query about the provision of material from stranded whales for handicrafts, New Zealand said that while there were no problems with the use of whalebone for cultural purposes, there were legal difficulties in permitting trade in whale products, especially internationally.

5.5 Relevant information from other hunts

IWC/55/WK19 (The potential stress effects of whaling operations and the welfare implications for hunted cetaceans)

Maas (UK) commented that whaling is not limited to the application of primary or secondary killing methods, but includes the process of approach and pursuit from the time an animal is spotted and selected for killing, as cetaceans are unlikely to be evolutionarily adapted to prolonged forced exercise (IWC/55/WK19). Pursuit by whaling vessels can have pathological consequences associated with

stress that can lead to disease and unobserved mortality in animals that evade harpooning. Such effects can include impaired immune defence, reduced fecundity, failure to grow and a disease called exertional myopathy (EM). EM is characterised by pathological changes, such as necrosis and lesions in the cardiac and skeletal muscles which tend to be irreversible and fatal and can take days, weeks or months to manifest. Pursuit time is recognised as a major factor in the development of EM, which can occur in cetaceans. Whaling vessels can exceed a minke whale's swimming speed and chase times of 30 minutes are not unusual. Longer chases up to seven hours can occur. Lethal research will be unable to address this issue because blood measurements will vary widely according to inevitable technical sampling constraints during whaling, and because EM develops slowly over time. In addition, pursuit and sampling procedures are recognised stressors that can influence analytes within minutes and any stress effects of pursuit will be masked by the effects of harpooning. Thus, whaling has the potential to impose considerable stress well before the harpoon has been fired. It is therefore recommended that details of unsuccessful hunts should be provided, additional observer data on hunts (e.g. species, pursuit details, breathing rate and surfacing patterns, etc.) should be included in the RMS and that the IWC should consider setting agreed maximum limits for pursuit times. Furthermore all available data should be submitted to the IWC for consideration at the next WKM Meeting.

COMMENTS AND QUESTIONS

Norway questioned the assumptions of IWC/55/WK19 in relation to the Norwegian hunt. They stated that the assumption that whales do not have natural predators and so are unable to withstand chasing, is not true as evidence for killer whale attacks is commonly seen as bite scars on the flippers and flukes of hunted minke whales.

The UK replied that it had not made such claims. Instead it had raised concerns about the evolutionary adaptation of whales to prolonged pursuit. In addition, the UK pointed out that even species that have evolved for efficient 'running', either for predator avoidance or for predation, may develop EM following intensive or prolonged muscular activity associated with extreme stress during pursuit, and that fear too is an important factor. Norway commented that whilst a whaling vessel may sometimes follow a whale for some hours, it does not mean that whales are being chased at high speed. In the Norwegian hunt it is the whale that determines the speed and many whales actually come towards the boat. There is a common misinterpretation that the Norwegian word 'jaging' used in whaling is a chase at high speed. The word 'jag' should more correctly be translated as 'stealthy hunt'. In reply to a question on whether any real cases have been found that demonstrate the premise of IWC/55/WK19, the UK drew attention to research on small cetaceans from the Eastern Tropical Pacific purse-seine fishery that shows minor EM after a 10 to 20 minute chase. Japan asked the author's view on biopsy sampling, recommended by IWC as a nonlethal research method, as Japan believes that it requires a longer chase time than harpooning. The UK replied that biopsy may also skew data as handling can affect sampling efficiency for stress indicators and it is also difficult to get baseline data in field conditions with which to compare. Iceland raised the issue that the points made in paper IWC/55/WK19, to the extent they apply at all, would

apply to whalewatching rather than to whaling. Iceland commented that whalewatching may repeatedly induce stress in the same individual animals for long periods of time.

IWC/55/WK21 (Welfare implications for 'struck and lost' cetaceans)

The UK presented IWC/55/WK21, stating that the ICRW has clear requirements for the reporting of the number of animals struck and lost but detailed information on the number of animals and the extent of injury is not adequately reported. Consequently an informed assessment of the potential welfare implications for these individuals and the scale of struck and lost incidents for different hunting techniques is difficult to make. IWC/55/WK21 highlights the possibility of protracted TTD and extensive suffering of wounded animals and notes that the long-term prognosis of a struck and loss cetacean depends on the location of strike, the device used and age/sex. It also notes that struck and lost whales are an inherent part of whaling. Furthermore, it also notes that the IWC does not consistently document whether a cap is set on 'taking' or 'striking' whales in aboriginal subsistence hunts. IWC/55/WK21 therefore recommends that the IWC: (1) specify the total allowable landings and strikes for each hunt and (2) include struck and lost figures in total catches over time. In addition, Contracting Governments should provide data in accordance with the Schedule to the Working Group on Whale Killing Methods and Associated Welfare Issues and the Commission should develop an action plan regarding practical measures to avoid and reduce struck and loss, and set 'strike' and 'take' limits in the Schedule for each ASW hunt.

COMMENTS AND QUESTIONS

In commenting on the recommendations given by IWC/55/WK21, the USA noted that it already was reporting the required information on strikes and losses to the IWC, where it is discussed in the Infractions Sub-Committee. With regard to the recommendation that information be collected on types of injuries sustained by struck and lost animals and on the injuries sustained and time to 'apparent' death for animals believed to be dead when they are lost, the USA believed that such information would be highly speculative and thus an inappropriate basis for possible management actions. Regarding the recommendation that the IWC develop an action plan, the USA noted that it could not wait upon the development of such a plan and that indeed the AEWC had embarked upon a weapons improvement plan as a matter of high priority to address the issues of improving the efficiency and humaneness of the bowhead hunt. Furthermore, the USA reminded the Workshop that the AEWC planned to implement the use of the penthrate grenade in the 2003 fall hunt.

Australia stated that in both management and welfare contexts struck and lost data were important. Norway indicated that since 1992 all losses had been recaptured and killed, leading to some long TTD but no struck and lost. At times a whale pronounced dead by the vet on board is then lost when the forerunner snaps because of the swell as the whale is hanging alongside the boat. Japan stated that struck and lost data are in its cruise reports which are submitted to the IWC Scientific Committee.

The Chair summarised that excessive stress pursuit in some species can be harmful, and muscle damage may be

manifested over long periods, and possibly may be fatal long-term. Whilst it is not currently known whether the whales being considered at the Workshop experience this physiological stress, it is plausible that they may. He noted that the issue at hand is whether techniques can be improved to reduce stress. New Zealand noted that it was important also to ensure that struck animals are not lost.

The UK stated that data from all animals in the order Cetacea are relevant to this Workshop and were pleased that the agenda recognises that technical data on other cetaceans are also relevant. The UK expressed gratitude to the Government of Japan for the data it has presented to date, and stated that data relating to the following matters from all relevant Contracting Governments would also be helpful: Dall's porpoise hunt with hand harpoons; drive hunting of dolphins and small whales; Baird's beaked whale hunt; the increasing numbers of cetaceans caught in nets and methods to kill them. The UK appreciated that the information may not be immediately available. It requested that a list of questions relating to killing techniques used on small cetaceans be appended to the workshop report. There was no response or discussion to this request when it was raised, as the general discussion moved quickly on to other issues. The United Kingdom understood this lack of comment to indicate a positive response to their question, but when discussion on this point arose again during the process of adopting the report, several countries objected to the inclusion of such questions in an appendix, noting that they did not recall agreement to any such a request in the meeting. During the discussion of this mis-understanding the United Kingdom, as a way to move forward, kindly offered to withdraw the appendix from the report, and the Chair accepted their offer. The United Kingdom noted that they would engage bilaterally with various countries to pose their particular questions. Japan stated that it would provide information regarding small cetaceans, which are outside the Terms of Reference of the IWC, on a bilateral basis on request. Russian Federation also noted that the issue of small cetaceans is not within the competency of the IWC.

5.6 Other information

The observer from NAMMCO informed the Workshop about recent work on hunting methods. NAMMCO has so far held two hunting method workshops. The first reviewed existing marine mammal hunting methods and examined technical innovations. The second focused on the details of ballistics, weapons and ammunition. The report from this workshop is available to this meeting as a background document. A third workshop on seal and walrus hunting methods will be held in 2004. The objectives of the NAMMCO workshops are to provide technical evaluation of different hunting methods, and to examine possibilities for innovations and further enhancement of efficiency and safety of hunting methods. The NAMMCO observer wished to draw attention to the fact that the NAMMCO workshops fully involve the hunters in the presentation of methods, in the evaluation and discussions for improvement and in drafting recommendations. NAMMCO has found that it is essential that these workshops are held in close collaboration with the hunters and that the hunters not only are directly involved in the process of improving hunting methods, but also in securing the safety of the hunters themselves.

6. EVALUATION OF CRITERIA FOR DEATH

6.1 Patho-physiological changes in the central nervous system and other vital organs of whales caused by intra body detonation of the penthrite grenade

IWC/55/WK6 (*A novel method for in situ fixation of whale brains*)

IWC/55/WK6³ presented by Knudsen (Norway), described a new method of *in situ* fixation that had been developed, as the traditional ways of fixing brains are poorly suited to the collection of whale brains. The *in situ* method proved to be suitable for preserving these large brains, where excision of undamaged fresh brains is almost impossible. Both the gross and microscopic architecture of the brains were adequately preserved. The method is however time consuming, as the brain has to be fixed *in situ* for at least 70 hours prior to excision.

IWC/55/WK16 (*Blast-induced neurotrauma in whales*)

IWC/55/WK16⁴ on blast-induced neurotrauma in whales, was also presented by Knudsen (Norway). Both observational and experimental studies have clarified that exposure to blast waves and overpressure energy induces changes in neuronal as well as non-neuronal cells in the CNS. The aim of the present study was to answer the questions: depending on where the grenade detonates which pathological changes do the penthrite blast cause in the CNS and what is the role of blast-induced neurotrauma in loss of consciousness and death of hunted minke whales? The study included 37 minke whales killed by a single penthrite grenade detonation. The brains were fixed *in situ*, the animals were examined shipboard and the brains were later subjected to gross and histological examination. Before further examination all fixed brains were randomised so further analyses were conducted blind. Brain damage attributable to the grenade detonation was evident in 35 of the 37 brains. The neuropathological alterations varied from very severe brain tissue laceration with skull fractures and massive gross evident bleedings in meninges and brain substance, to histologically evident intracerebral haemorrhages in central brain areas.

The results demonstrated that intra-body detonation of 30g penthrite causes severe and fatal neurotrauma in minke whales. Depending on the detonation site the neurotrauma produced was similar to either severe traumatic brain injury (TBI) associated blunt trauma or acceleration-induced diffuse traumatic brain injury (dTBI), in which the cardinal symptoms are immediate loss of consciousness without any lucid interval and very high mortality rate. The detonation also caused severe damage to other vital organs that obviously were fatal for some of the whales. In some animals these injuries were not so extensive that an immediate or very rapid death should be expected. The authors therefore considered neurotrauma caused by the blast-generated pressure waves as being the primary cause of the very rapid loss of consciousness.

COMMENTS AND QUESTIONS

Several comments were made on the importance and value of the work reported by Norway. The UK asked whether

TTD had been found to be related to pathological changes in individual animals, to which Norway noted that all analyses had not been completed yet so an answer could not be given at this point. The Netherlands asked why a paper by Blix *et al.* (2000)⁵ on the use of shrapnel explosive in pigs was not referred to. That paper concluded that the shock effect of a blast is relatively minor. In response, Norway commented that the decision was made not to discuss it due to difficulties in scaling, as the results in that paper were from an animal of a much smaller size.

6.2 The effect of large calibre round-nose bullets used for euthanasia (secondary weapons) in minke whales

IWC/55/WK15 (*Euthanasia of whales: Wounding effect of rifle calibre .375 and .458 round nosed metal jacketed bullets on minke whale nervous system*)

Øen and Knudsen (Norway) presented IWC/55/WK15. Knudsen noted that the effect of the 9.3mm 15g/232gr round-nosed, full jacketed bullets used in the Norwegian hunt of minke whales had been reported in previous Workshops showing that the bullets are capable of penetrating the skull of the whales and severely damage the brain (IWC, 1997; 1999). The studies on bullet performance on the CNS of minke whales were continued in Norway with the two larger calibres of .375 and .458, and the present study included examination of 29 minke whales that had been hit with full metal jacketed round-nosed rifle bullets of calibre .375, 19.4g/300gr and calibre .458, 32.4g/500gr, respectively. The whales were examined shipboard and 22 of the brains were fixed *in situ* and later subjected to gross and light microscopy examination. The other brains were examined in the fresh state. The principal gross and histopathological features in the brains of minke whales after impact from a round-nosed full jacketed ammunition .375 or .458 calibre rifle were that direct hits in the brain caused skull fractures, severe brain parenchyma laceration, in-driven bone fragments and in some cases total destruction of the brain. When the projectile penetrated the cranium near the brain (<20 cm) or the upper cervical spinal canal, extensive gross intracranial haemorrhages were generally produced as well as displaced skull fractures in some cases. The brainstem and central areas of the brain were frequent sites of haemorrhages.

The results showed that one single round with round-nosed full metal jacket bullets was fully capable of penetrating the skull and causing severe and massive damage to the central nervous system of minke whales. Whales hit in the brain, in close vicinity to the brain (< 20 cm) and in the upper spinal cord will immediately lose consciousness and die from the shot. It was concluded that only ammunition of minimum calibre 9.3 mm with round nosed, full jacketed bullets or bullets of similar quality should be used for euthanasia of whales the size of a minke whale.

COMMENTS AND QUESTIONS

It was commented that this was a very valuable and interesting paper. In reply to a question about the possible use of these bullets at shooting ranges of up to 50-100m, Øen answered that they had no experience of longer

³ Knudsen, S.K., Mørk, S. and Øen, E.O. 2002. A novel method for *in situ* fixation of whale brains. *J. Neurosci. Methods* 120:35-44

⁴ Knudsen, S.K. and Øen, E.O. In press. Blast-induced neurotrauma in whales. *Neurosci. Research*. [Available at www.sciencedirect.com].

⁵ Blix, A.S., Folkow, L.P. and Sørli, D.G. 2000. Simulation of the effect of currently used grenade harpoons for the killing of whales using a pig model. *Acta Vet. Scand.* 41: 237-242

distances since all the whales in Norway were shot at a much shorter distance. In the present study the mean shooting distance was 9.3m.

6.3 Behavioural observations on whales killed with penthrite and/or high calibre bullets

IWC/55/WK14 (Criteria of insensibility and death in hunted whales. A comparative review)

IWC/55WK14 presented by Knudsen (Norway), was a review of the literature regarding criteria of death and diagnosis of insensibility in various species, and a review of the progress made concerning determination of insensibility and death in whales since 1995. Official criteria of death only exists for human beings and whales. The human criteria are controversial, the kernel of the debate being the definition and diagnosis of brain death. Neurophysiological techniques used to assist diagnosis of brain death in humans and to assess insensibility in food animals have limitations and require some degree of subjective interpretation. They demand skill and appreciation of the technique and relatively sophisticated apparatus. All methods are extremely sensitive to recording artifacts and such advanced and invasive procedures are obviously not suited for regular measurements of slaughter animals, nor for field or ship-based studies. They are only applicable in the experimental phase.

Experimental studies have tried to assess when insensibility commences after stunning in livestock, but unanswered questions and welfare problems still exist. In slaughter animals the time of death is not recorded regularly. An important challenge relates to evaluating stunning efficiency in practice. In slaughter plants, efforts are therefore largely put into periodic controls of the equipment in use and how it is applied, rather than checking the stun efficiency and time to death of each individual animal.

Experimental studies on cetaceans of brain activity after impact of either grenades or rifles might be a valuable contribution to understanding the neurophysiological basis of insensibility and death in hunted whales. However, due to practical and logistical reasons such studies would probably have to be performed on smaller cetacean species. Several of the proposals for such data collection during regular whale hunts would violate the welfare of the animals. Some of the proposed procedures would also endanger hunters' safety.

In the Norwegian minke whale hunt similar control procedures to slaughterhouses are applied. Authorised personnel control all the hunting gear and the hunters must pass practical shooting tests prior to each whaling season. In addition, since 1993 the TTD of each whale hunted in Norway has been recorded as a part of a research programme. The programme has now ended and preliminary results show that according to IWC criteria about 80% of the animals are recorded as instantaneously dead. These studies include *inter alia* neuropathological investigations of hunted minke whales, which have shown that the weapons in current use in Norway are highly effective in causing permanent brain damage of sufficient severity to account for a rapid loss of sensibility. The study has also confirmed that the IWC criteria are not always met in animals that are unconscious or dead. However, from an animal welfare point of view the current criteria of death in whales seem to function well in practice, as the hunters will not hesitate to re-shoot the animal if any doubt exists that it

may still be conscious or alive. Some hunters use this procedure as a matter of routine. Consequently, some animals will be re-shot after insensibility and death has supervened. This is uncontroversial from an animal welfare point of view. In the scientific sense the IWC criteria will, however, not be fully adequate and data collected during regular use of the IWC criteria may underestimate the number of whales that lose sensibility and die instantaneously.

COMMENTS AND QUESTIONS

IWC/55/WK14 was regarded by the Netherlands as a response to its paper (IWC/51/WK15) at the last Workshop, and suggested that Norway had misunderstood the intention of that paper, in which the point was made that a set of factors, including cranial reflexes, had to be used to assess death. Netherlands further noted that the existing IWC criteria may apply for the Norwegian minke whale hunt, but not for all other whaling operations. In her answer the author said that a strict division should be made between the criteria that could be used in experimental situations and those that could be practically used in hunting operations. The UK questioned the assertion made in the paper that more attention was given to the use and control of equipment in slaughterhouses than to assessment of insensibility or death. Norway replied that it did not criticise the competence of authorised slaughterhouse personnel, but emphasised that in certain forms of stunning of livestock, especially electrical stunning, it is regarded as more important to control the equipment in use and its application than checking reflexes, as the animal is in the convulsive state.

IWC/55/WK24 (Case study of the over-estimation of TTD detected by post-mortem examinations in Japanese Whale Research Programs)

Ishikawa (Japan) presented IWC/55/WK24 and gave a case study of the over-estimation of TTD detected by post-mortem examinations in Japanese Whale Research Programs. Comparison of post-mortem examination results with the judgments made by gunners showed that the gunners judged 76.4% of the cases where the researchers for post-mortem examination recorded a 'fatal wound' as 'instantaneous death'. Although the judgment of the gunners are not in principle changed by the results of the post-mortem examination, the researchers conducting post-mortem examination sometimes find cases where whales must obviously be dead or unconscious prior to the time of death judged by the gunner. These examples suggest that the whales sometimes move unconsciously even when the CNS or the heart was destroyed. According to the record of the JARPA, 90.8% of gunner's judgments of the time of death were based on the criterion of being 'motionless'. Many cases of the over estimation of TTD which were proved by the post-mortem examination had also been judged by the criterion of 'motionless'. Safety of crew seems to be an important reason why gunners tend to apply the criterion 'motionless'. Because the gunners command retrieval of carcasses, they have to wait until harpooned whales are motionless for safe operation. In conclusion, the author assumes that there are more cases of overestimation than underestimation of TTD.

COMMENTS AND QUESTIONS

Australia stated that the last few presentations had shown that the estimation of TTD is often not correct. Pathological

examinations in these papers have shown that TTD in many cases are shorter than had been estimated. But it could also be the other way around, and that is not so easy to measure as the pathology will be much harder to interpret. The UK sought clarification as to whether post mortem results showed that gunners had over estimated TTD in 23.6% of cases. Japan explained that the gunners judged instantaneous death in 76.4% of the cases where post mortem examination recorded 'fatal wound'. The Netherlands referred to a Japanese whaling report (SC/32/O24) that showed that in 8 out of 50 minke whales the heart continued to beat after the whale was considered dead, suggesting therefore that underestimation of TTD could be significant. Japan commented that in 1979-1980 in the Antarctic, 50 whales had been subjected to ECG examination and that to avoid the overestimation of TTD, it had been thought that death should be judged not by cessation of heartbeat, but by unconsciousness. Three criteria to judge unconsciousness were used in that study: open jaw, slack flippers and no movement, and have since been used as the IWC criteria for death. In Japan it is the supervisor of the hunt that decides whether a whale is dead and reports TTD and, as he is also responsible for the safety of the crew, he is reluctant to declare that a whale is dead too early. Norwegian hunters act in the same way and Norway pointed out that although errors in the estimation of TTD could go in both directions, there is currently no evidence that Japan and Norway do grossly underestimate TTD.

6.5 Revision of criteria for death

IWC/55/WK4 (Evaluating possible indicators of insensibility and death in cetacea)

Butterworth (UK) began by reporting that a recent independent meeting held by the RSPCA in London assessed existing measures of sensibility in Cetacea, and proposed a series of 34 potential tests which might be applicable in this area. As a precursor to assessing these tests in the field, conjoint analysis, a statistical technique which ascribes weighting or rank to independent measures, was employed to census expert opinion and to identify tests deemed most suitable for establishing valid criteria of sensibility. A ranking of these 34 measures was provided by conjoint analysis of the responses of 30 scientists with cetacean or animal physiological background. The results of IWC/55/WK4 indicated that there was most support for five potential indicators (sensibility, breathing, electrical cardiac activity, heart rate, coordinated swimming and ocular temperature), whilst respondents did not have highest confidence in the IWC criteria. Additionally, respondents indicated that they believed that multiple (rather than single) criteria were important to give confidence in the state of sensibility of the animal. Validation of these tests may enable better assessment of sensibility in stranded and beached Cetacea.

IWC/55/WK18 (A preliminary evaluation of possible indices of sensibility and vitality in captive cetaceans)

Butterworth (UK) reported that following the work reported in IWC/55/WK4, a subsequent study was carried out on captive small, toothed cetacean at Sea World, San Diego, USA (IWC/55/WK18) which evaluates the practical application of tests identified in the previously presented paper. A number of possible indicators of vitality were evaluated for ease of application and reliability in 26

animals of 6 species, and from this preliminary evaluation on captive animals, 12 parameters were determined to be of practical value under captive conditions, these being: jaw tone, pupillary reflex, palpebral reflex, throat reflex, water jet in eye, vestibulo ocular reflex, capillary refill time, ocular/skin temperature differential, heart rate (with stethoscope). After further evaluation in unconscious or compromised (stranded) animals, these measures may prove to be of value for determining the state of sensibility of cetaceans in many environments, including in whaling.

COMMENTS AND QUESTIONS

The Chair recalled current IWC criteria for assessing whether a whale is dead: relaxed lower jaw, no flipper movement, sinking without active movement. Norway stated that these criteria should be used in conjunction with post mortem examination if possible. For example, a whale with rigid pectoral flippers (this is usual when the whale is concussed then dies) may be regarded by the whalers as alive but subsequent post mortem analysis reveals that the whale was dead.

New Zealand commended the UK on this study and enquired as to the feasibility of using the tests in strandings and whaling operations. Butterworth stated they were appropriate for stranded or captive cetaceans, however some of the tests would be inappropriate in the whaling context. Norway recognised the value of such studies to increase knowledge of the physical reactions to stimuli and recommended that further studies be carried out on stranded animals to be euthanased, agreeing with Butterworth that such parameters are not currently suitable for whalers to use.

There was then discussion on whether all three criteria had to be met, or if only one was sufficient to determine death. Norway pointed out some problems with trying to meet all three criteria for all whales, in that dead whales often roll over onto their backs so the jaw will be closed; when held in close to the boat by a rope they are not going to sink; and sometimes the flippers stick out in rigour even if the animal is dead, concluding therefore that sometimes all three criteria will not be met.

The Workshop agreed that, considering operational, logistic and safety constraints associated with examining a struck whale, to determine its vital status the current IWC criteria are currently collectively regarded as best practice. However further research, particularly on stranded animals initially, to determine if other tests might provide an operationally practical approach to determining point of death or insensibility, was strongly supported.

7. COLLECTION OF ANIMAL WELFARE DATA

Japan restated their belief that this Agenda Item was inappropriate for this Workshop. They stated they would not participate in any discussion and accordingly would not join any agreement under this Agenda Item. The Japanese delegation left the room during the presentation and discussion of the paper under this agenda item.

Extract from Document IWC/01/EDG4: (Information on Whale Killing Methods and Associated Welfare Issues)

In introducing an extract from IWC/01/EDG4, Bowman (UK) stressed that collection and provision of data was integral to this Workshop and to future Working Groups. He explained that the information was presented in a series of tables listing proposed reporting requirements needed to assess whale killing methods and associated welfare issues.

The data were categorised as Preliminary data (data categories prior to commencement of the chase), data on Primary Killing Method and (where appropriate) Secondary Killing Method, data on the Target Whale, and Post Mortem data. The UK noted the relevance of the various data to an improvement in understanding of the efficacy of whale killing methods and associated welfare issues.

COMMENTS AND QUESTIONS

In the absence of Japan, the UK questioned why Japan did not want to participate in discussions of data collection that it felt were fundamental to this Workshop.

A lengthy discussion followed with several countries expressing their concern that the paper was presented in such a way that the data were categorised as requirements under an RMS, and that on that basis there would be no consensus as to the value of the data itself. The Chairman reminded the group that the Workshop's Terms of Reference were to discuss technical issues in relation to whale killing methods and associated welfare considerations, and that any link to an RMS was beyond these Terms of Reference. The UK fully agreed, noting that the paper was an extract from a previous Commission document, and that the intent of the presentation at this Workshop was to discuss the usefulness and need of the data themselves, without any reference to an obligation to collect the data, or any inclusion in an RMS.

The USA noted the value of going through each data element as there had never been a formal presentation explaining the relevance of each item. The UK then linked the various data fields in IWC/01/EDG4 to papers and discussions at the Workshop, noting that many of these data were collected routinely, that standardisation would make data presentation more consistent, and that some information was only to be requested where the opportunity arises and appropriate experts are present.

Norway stated that it already provides many of these data on a voluntary basis and, with the exception of the first five bullet points under the Preliminary Data category, it believed that the various data are valuable. However, it noted that the usefulness of the data depends on the background and qualifications of the people collecting and analysing them and the conditions under which they are collected, *inter alia* whether the collection of data is on a voluntary basis or required (which might result in punishment if not provided). Netherlands requested that weather data be considered. The UK stated that any data collection is an iterative process, so that the list could be refined as techniques and expertise improve.

In the context of aboriginal subsistence whaling it was acknowledged that collection of some of the data would be difficult or impossible. It was also pointed out that attempting to fulfil such a data list should not impose a financial burden or impact negatively on the economy of an aboriginal harvest. Additionally, the nature of aboriginal whaling may preclude carrying a scientist in a small boat to collect information.

The Workshop acknowledged the difficulty in collecting some types of data, in particular conditions, and there was no consensus on the usefulness of the data listed under the Preliminary category. However the Workshop agreed that all other data presented by the UK would be useful to better assess whale killing methods and associated welfare issues.

8. REVISED ACTION PLAN

The Chairman presented the Action Plan from the previous Workshop in Grenada in 1999 and proposed some minor modifications. The Workshop agreed that the revised Action Plan represented a positive and constructive framework on which to encourage further improvements in whale killing methods and accepted the minor revisions. The Revised Action Plan is attached as Appendix 4.

9. OTHER MATTERS

Iceland was asked to comment on the killing methods it would use for the minke, sei and fin whales that it proposes to take as part of its Scientific Permit application. Iceland responded that they had not made a final decision on when to implement the plan and so had not decided on killing methods.

New Zealand indicated that the research presented to this Workshop suggested a current level of best practice for determining the minimum specifications of rifles used to kill whales (being a minimum calibre of .375 inches with round nosed full metal jacketed bullets) and that it would be appropriate to consider a broad implementation of these best practice standards. While there was general agreement that all countries should be encouraged to use the best available techniques to kill whales, it was acknowledged that there were substantial practical and financial constraints for aboriginal subsistence whalers. It was agreed that the Workshop had been constructive in striving to improve whale killing methods and the encouragement of the adoption of such measures would be warmly welcomed.

10. ADOPTION OF THE REPORT

The Report was adopted on 9 June 2003.

Appendix 1

LIST OF PARTICIPANTS

(I = interpreter)

Antigua and Barbuda

Hynam Forde

Argentina

Miguel Iniguez

Australia

Conall O'Connell

Nick Gales

Stephen Powell

Pam Eiser

Austria

Andrea Nouak

Michael Stachowitsch

Benin

Joseph Ouake

Denmark

Kim Mathiasen
Amalie Jessen

Dominica

Lloyd Pascal
Andrew Magloire

Germany

Peter Bradhering
Marlies Reimann
Karl-Hermann Kock

Grenada

Justin Rennie

Iceland

Stefan Asmundsson
Kristjan Loftsson
Axel Nikulasson

Japan

Joji Morishita
Shuya Nakatsuka
Masayuki Komatsu
Midori Ohta
Seiji Ohsumi
Dan Goodman
Yoshihiro Hayashi
Hajime Ishikawa
Tomita Akiko (I)

Republic of Korea

Zang Geun Kim
Eui Cheol Jeong

Mexico

Silvia Manzanilla Naim
Lorenzo Rojas-Bracho

Netherlands

Peter Reijnders
Diederik van Liere

New Zealand

Geoffrey Palmer
Mike Donoghue
Simon Childerhouse
Craig Bamber
Phillipa Brakes

Norway

Ove Midttun
Lars Walløe
Egil Ole Øen
Sidsel Gronvik
Halvard Johansen
Siri Knudsen

Russian Federation

Valentin Ilyashenko
Rudolf Borodin
Aivana Enmyinkaou (I)

Saint Kitts and Nevis

Joseph Simmonds

Saint Lucia

Jeanine Rambally

Solomon Islands

Sylvester Diake

South Africa

Herman Oosthuizen

Spain

Santiago Lens

Sweden

Bo Fernholm

UK

Richard Cowan
Geoff Jasinski
Rob Bowman
David Stowe
Colin Spedding
Edward Varley
Andrew Butterworth
Laila Sadler
Barbara Maas
Mark Simmonds
Jennifer Lonsdale

USA

Michael Tillman
Chris Yates
George Ahmaogak
Todd O'Hara
Nancy Azzam
Naomi Rose
Robert Brownell
Harry Brower Jr.
George Noongwook

Appendix 2**LIST OF DOCUMENTS****IWC/55/WK**

- Report on Alaska Eskimo Whaling Commission progress concerning improvement of whale killing methods (submitted by the USA)
- Report of the Makah Tribe on whale killing methods (submitted by the USA)
- Sea and weather conditions in Area V region in the Southern Ocean Sanctuary with special reference to whale killing methods (submitted by the Netherlands)
- Evaluating possible indicators of insensibility and death in Cetacea (submitted by the UK)
- Euthanasia of stranded cetaceans in New Zealand (submitted by New Zealand)
- A novel method for *in situ* fixation of whale brains (submitted by Norway)
- Euthanasia of a stranded sperm whale with calibre .458 round nosed full-metal jacketed rifle bullets (submitted by Norway)
- Greenland Home Rule Government: Efficiency in the Greenlandic hunt of minke whales and fin whales 1991-2002 (submitted by Denmark/Greenland)
- Greenland Home Rule Government: A note regarding information encouraged in the IWC-Resolution 1999-1 (submitted by Denmark/Greenland)
- Greenland Home Rule Government: Report on improvements in ASW in Greenland (submitted by Denmark/Greenland)
- Greenland Home Rule Government: Status for Greenland action plan on whale hunting methods, 2002 (submitted by Denmark/Greenland)
- Greenland Home Rule Government: Times to death in the Greenlandic minke and fin whale hunt in 2002 (Submitted by Denmark/Greenland)
- rev. Greenland Home Rule Government: Times to death in the Greenlandic minke and fin whale hunt in 2002 (submitted by Denmark/Greenland)

13. Report on whale killing methods employed in the aboriginal subsistence harvest of the Russian Federation, 2002 (submitted by the Russian Federation)
 14. Criteria of insensibility and death in hunted whales: A comparative review (submitted by Norway)
 15. Euthanasia of whales: Wounding effect of rifle calibre .375 and .458 round nosed full-metal jacketed bullets on minke whale central nervous system (submitted by Norway)
 16. Blast-induced neurotrauma in whales (submitted by Norway)
 17. Improvements in hunting and killing methods for minke whales in Norway 1981-2003 (submitted by Norway)
 18. A preliminary evaluation of possible indices of sensibility and vitality in captive Cetacea (submitted by the UK)
 19. The potential stress effects of whaling operations and the welfare implications for hunted cetaceans (submitted by the UK)
 20. Evaluation of current methods used to kill whales in relation to species taken (submitted by the UK)
 21. Welfare implications for 'struck and lost' cetaceans (submitted by the UK)
 22. Review of secondary killing methods employed for whales hunted under special permit, commercial whaling and aboriginal subsistence whaling (submitted by Austria and co-sponsored by New Zealand)
 23. Report of experiments to compare Norwegian and Japanese penthrate grenades and improvement of the Japanese grenade in the Japanese Whale Research Programs (submitted by Japan)
 24. Case study of the over estimation of TTD detected by postmortem examinations in Japanese Whale Research Programs (submitted by Japan)
 25. Report on whale killing methods in the 2002/2003 JARPA and improvement of the time to death in the Japanese Whale Research Programs (JARPA and JARPN) (submitted by Japan)
- IWC/55/INF
- 5 rev Greenland Home Rule Government: Quota monitoring on minke and fin whale hunting in Greenland, 2002
- IWC/O1/EDG
4. Extract from Document IWC/O1/EDG 4 prepared for the Revised Management Scheme Expert Drafting Group meeting in Oct/Nov 2001. Part 2. Information on Whale Killing Methods and Associated Welfare Issues

Appendix 3

AGENDA

1. Introductory items
 - 1.1 Appointment of Chair
 - 1.2 Appointment of Vice Chair
 - 1.2 Appointment of rapporteur(s)
 - 1.3 Review of documents
2. Terms of Reference and background to the Workshop
3. Adoption of the Agenda
4. Description of killing methods in use and under development
 - 4.1 Commercial whaling
 - 4.2 Aboriginal subsistence whaling
 - 4.3 Whaling under scientific permit
 - 4.4 Euthanasia of stranded and entrapped cetaceans
5. Assessment of methods including review of times to death, hunter safety and associated problems
 - 5.1 Commercial whaling
 - 5.2 Aboriginal subsistence whaling
 - 5.3 Whaling under scientific permit
 - 5.4 Euthanasia of stranded and entrapped cetaceans
 - 5.5 Relevant information from other hunts
6. Evaluation of criteria for death
 - 6.1 Patho-physiological changes in the central nervous system and other vital organs of whales caused by intra body detonation of the penthrate grenade
 - 6.2 The effect of large calibre round-nose bullets used for euthanasia (secondary weapons) in minke whales
 - 6.3 Behavioural observations on whales killed with penthrate and/or high calibre bullets
 - 6.4 Other information
 - 6.5 Revision of criteria for death
7. Collection of animal welfare data
 - 7.1 Objectives of data collection
 - 7.2 Review of current and proposed requirements /guidelines for the collection of animal welfare data
 - 7.3 Consideration of development of a consolidated list of data that might be collected by international observers (taking into account practical considerations) and proposed analyses of such data
8. Development of a Revised Action Plan
9. Other matters
10. Adoption of the Report

Appendix 4

REVISED ACTION PLAN ON WHALE KILLING METHODS

A. Equipment and methods

- (1) Encourage continued co-operation among Contracting Governments to refine the design of penthrite grenades as far as possible.
- (2) Continue improving accuracy of delivery of penthrite grenade harpoons, including assessment of refined sighting equipment suitable for rapid action under conditions encountered at sea. Support and encourage the development and implementation of programmes to provide training in the safe handling and effective use of killing devices including the penthrite grenade and in other aspects of the hunt.
- (3) Continue to review constraints on shooting distance and relative orientation of vessel and whale and encourage reducing times to death.
- (4) Continue to review effectiveness of secondary killing methods with a view to reducing times to death in whales and encourage the application of the most effective methods.

B. Indication of insensibility and death

- (5) Develop better criteria for determining the onset of permanent insensibility in whales, using physiological and behavioural observations.

C. Assessment of cause of death in relation to observed time to death

- (6) Where possible, examine the effects of trauma, and its consequences, caused by harpoons and other devices used to capture whales, and its relationship to the reactions of the captured whale. Develop standardised guidelines for recording major indications of death.

D. Collection and provision of information on time of death

- (7) Encourage collaboration between technical and scientific experts with a view to suggesting evidence based guidelines for the collection and dissemination of information in relation to both primary and secondary killing methods in forms that allow the effectiveness of different methods to be compared. The data should be presented to the maximum extent possible with statistical analysis that allows independent appraisal and analysis.
- (8) Encourage collection and presentation of struck and lost rates and standardised estimated time to death records in all aboriginal subsistence catches of whales and undertake assessment of requirements for controls on the use of rifles to kill unsecured whales.
- (9) Encourage the incorporation of data collection and reduction of struck and lost rates in initiatives in Greenland relating to the beluga and narwhal hunts.

E. Assessment of physiological status of hunted animals

- (10) Develop suggested guidelines for, and where possible implement collection of representative biological samples from whales in extremis with an aim to determine reliable indices of stress for animals killed in whaling operations.

F. Next steps

The Workshop participants encourage the IWC to hold a further scientific and technical Workshop in 3-5 years and to call for further improvements in data collection, analysis and reporting in order to evaluate progress made in improving whale killing methods. In the meantime, information should continue to be provided to the appropriate technical Working Group.