

Report Of The Workshop On Whale Killing Methods And Associated Welfare Issues

St Kitts, Sunday 11 – Tuesday 13 June 2006

1. INTRODUCTORY ITEMS

1.1 Appointment of chair

Dr Torsten Mörner, Head of Department of Wildlife, Fish and Environment of the Swedish National Veterinary Institute, was confirmed as Chair of the meeting. In welcoming participants (Appendix 1) and observers, Dr Mörner gave a brief overview of his background.

The Chair thanked the delegation of St Kitts and Nevis for inviting the IWC to meet here and the Organising Committee for arranging the Workshop.

1.2 Appointment of rapporteurs

Pam Eiser (Australia) and Sidsel Grønvik (Norway) were appointed as rapporteurs.

1.3 Review of documents

The Chair reviewed the list of documents (Appendix 2), noting that 25 papers had been submitted for presentation. In addition, a copy of the Revised Action Plan on Whale Killing Methods, agreed by the 2003 Workshop, was provided for information. Also, Dr Mörner noted a paper provided by the Government of Japan as an Information Paper and not for presentation or discussion. Dr Mörner advised that his intention was to take documents under the relevant agenda item/s.

Japan, supported by Norway and Iceland, raised concerns re paper IWC/58/WKM&AWI 23, submitted by Australia, both with respect to the content of the paper and the way it was structured and asked the authors to withdraw it. Australia recognised Japan's sensitivities and offered to discuss bilaterally with Japan how the paper might be handled.

Denmark also raised issues concerning paper IWC/58/WKM&AWI 8, and asked New Zealand to withdraw it. New Zealand declined, but agreed to meet with Denmark to see if some sort of resolution could be attained.

As no consensus existed to delete consideration of either of these papers they were presented under the appropriate agenda item.

2. TERMS OF REFERENCE AND BACKGROUND TO THE WORKSHOP

The Chair reviewed the terms of reference for the Workshop, as adopted by the International Whaling Commission at IWC/57 in Ulsan, Republic of Korea. He stressed the importance of delegates keeping in mind the terms of reference during discussions and in framing recommendations at the conclusion of the Workshop. He expressed the hope that all participants could contribute to the general report of the meeting, and work in a positive manner. As Chair, Dr Mörner noted that his responsibility is to manage the Workshop.

3. ADOPTION OF AGENDA

In reviewing the Agenda, the Chair asked if there were any items to be raised under item 7, Other Matters. The NAMMCO observer requested an opportunity to make a short oral presentation under this item.

The Chair outlined his plan for the handling of the meeting.

The Workshop adopted the Agenda in Appendix 3.

4. DESCRIPTION OF WHALE HUNTING/EUTHANASIA PRACTICES, IMPROVEMENTS SEEN AND REMAINING PROBLEM AREAS

4.1 Aboriginal subsistence whaling

The USA advised that, in preparation for the Workshop, there had been a meeting the previous day of aboriginal subsistence whalers. This was the first time that such a meeting had occurred. Harry Brower, Chairman of the Alaska Eskimo Whaling Commission, was introduced to present a statement on behalf of aboriginal subsistence whaling countries (Appendix 4).

Mr Brower reported that on June 10, 2006, aboriginal subsistence whalers from the countries of Denmark on behalf of Greenland (Organisation of Fishermen and Hunters in Greenland), the Russian Federation (Association of Traditional Marine Mammal Hunters of Chukotka), and the USA (Alaska Eskimo Whaling Commission and Makah Whaling Commission) met for an historic first-time meeting to share information on whale killing methods and animal welfare issues. He thanked the organising committee of the current IWC workshop for recognising the need to involve the aboriginal subsistence hunters in the workshop and their recognition of the need to seek practical solutions in advancing the recommendations of the workshop.

The aboriginal subsistence whalers' meeting had unanimously agreed that in their communities, subsistence whaling is a critical activity; providing food for nutrition and serving to reinforce and maintain cultural identity. Four major points affecting each aboriginal hunt had been agreed:

1. Subsistence hunting is for food to meet cultural and nutritional needs.
2. The safety of his crew is a whaling captain's most important responsibility
3. With safety assured, achieving a humane death for the whale is the highest priority.
4. Efforts to modernise whaling equipment and practices can be made only within the context of each communities' economic resources and the need to preserve the continuity of its hunting traditions.

The aboriginal subsistence whalers found they had benefited from this opportunity to talk and learn about each other's hunting methods and found many similarities. Differences in environmental conditions and cultural traditions of the hunts were noted. But, it is clear that within each culture, achieving safe, humane, and efficient harvest methods is the most important goal of subsistence hunts provided that it is economically viable and consistent with traditions.

St Vincent and the Grenadines applauded the efforts made by the organisers of the meeting of aboriginal subsistence hunters and expressed the hope that discussions will continue interessionally and that the necessary support will be provided to assist this. Disappointment was expressed on behalf of the aboriginal whalers of St Vincent and the Grenadines at not being able to attend this meeting. St Vincent and the Grenadines endorsed the comments made by Mr Brower and noted that the statement reflected the situation which exists in its own aboriginal subsistence hunt.

The following papers from Denmark (Greenland) were introduced.

<u>IWC/58/WKM&AWI 3</u>	(A note regarding information encouraged in the IWC Resolution 1999-1 for the Greenland catch of 2005)
<u>IWC/58/WKM&AWI 4</u>	(Report on improvements in ASW in Greenland)
<u>IWC/58/WKM&AWI 5</u>	(Status for Greenland Action Plan on Whale Hunting Methods)
<u>IWC/58/WKM&AWI 6</u>	(Summary of activities related to the Action Plan on Whaling Killing Methods)
<u>IWC/58/WKM&AWI 17</u>	(Whale killing methods and associated welfare issues in Greenland)

Denmark mentioned that whaling has considerable cultural and socio-economic importance in Greenland. An Action Plan on Whale hunting methods started in 1989, and was implemented in 1991. The plan included the introduction of the Norwegian penthrite grenade, as well as renovation of harpoon cannons and training on handling and use of whaling equipment, including the penthrite grenade. Training was directed to hunters, personnel in shipyards and distributors of the grenade. Documents 3-6 and 17 contain information about the Action Plan, as well as descriptions of the Greenlandic hunt, including requirements for hunters, times to death and struck and lost rates.

Fontaine (Denmark), a full time hunter and fisherman from the hunter's organisation of Greenland, explained that, in order to obtain a licence for whaling with harpoon, the captain of the boat has to document that the special course in handling the harpoon and grenade has been taken, and that the harpoon cannon mounted in the boat has been checked. The captain is responsible for organising the hunt, and for all the equipment and the security of the crew. Whaling is affected by conditions such as the behaviour of the whale and the weather. Harpoons are fired when the targets are less

than forty meters away. Gunners usually aim at the thorax. Well placed hits result in quick death and sinking of the whale. Hits at a distance of 10 meters into the base of the skull make the whale die immediately and sink. Back up weapons are used when the whale does not die quickly. These are 7.62 mm (30.06), .375 or .458 rifles, with 7.62mm as the minimum requirement. For fin whales, the back up weapon is a second harpoon with grenade. Greenlandic whalers believe that killing methods can improve with the help of seminars where whalers and other experts can exchange experiences and views.

Denmark acknowledged the important work to improve hunting methods carried out by the North Atlantic Marine Mammal Commission (NAMMCO). Denmark also expressed its sincere thanks to the organising committee of the IWC Workshop on Whale Killing Methods for involving the aboriginal subsistence whalers in the workshop.

Comments and discussion

Øen (Norway) provided additional comment on Greenland's efforts to improve hunting methods over many years. This has included the upgrading of harpoon guns, the convening of several training workshops for hunters and the participation, despite limited resources, in NAMMCO workshops on hunting efficiency and hunter safety. These efforts have been very much appreciated.

IWC/58/WKM&AWI 15 (A review of the technique employed by the Makah Tribe to harvest gray whales)

The USA introduced Keith Johnson, president of the Makah Whaling Commission, to present this paper.

Johnson noted that a Makah whale hunt invokes ancient rituals and ceremonies that are deeply spiritual to the tribe. The physical, mental, and spiritual preparations to carry out a successful whale hunt have been passed down from family to family since time immemorial. He outlined the history concerning the Makah hunt, noting that under the 1855 Treaty of Neah Bay the Makah Tribe had reserved their pre-existing right to whale in traditional areas. Following the recovery of the gray whale stock in the 1990's, the Tribe sought to resume hunting following their voluntary cessation in the 1920's due to depletion by unregulated commercial whaling. In May 1999, the Tribe harvested their first whale in 70 years but since 2000 they have been unable to hunt because of domestic legal requirements.

The traditional hunting methods and equipment of the Makah Tribe were described. On seeking to resume their traditional whale hunt, they sought to develop it in a manner that incorporated and retained its traditional aspects at the same time employing a safe and humane harvest method. A veterinarian with a background in ballistics was contracted and the performance of several high calibre firearms was investigated. It was found the .50 calibre and .577 calibre rifles to be the most potent combination. For the 1999 hunt the .577 calibre was selected as it was a substantially lighter rifle and had a 3-round capacity. Johnson also emphasised the importance of safety during whaling operations and outlined measures taken to ensure the crew's safety. This includes the designation of a safety officer who ensures that, prior to giving authorisation to fire, the vessel is in close proximity to the whale and that the field of view is clear of all persons and vessels.

Harvest techniques are more than sufficient to quickly and humanely dispatch gray whales and provide a good balance between retaining and protecting their traditions in the hunt at the same time as ensuring a safe and humane harvest.

Comments and discussion

In response to a question from Sweden as to whether any consideration was being given to the use of an exploding harpoon, Johnson advised that in the tradition of passing information down, there was a time when some black powder was brought to the whalers and rejected by them. The .50 calibre or .577 calibre rifles now used has sufficient impact power to dispatch the whale.

IWC/58/WKM&AWI16

(Summary of activities related to the Action Plan on Whale Killing Methods)

The Russian Federation summarised that 115 gray whales and 2 bowhead whales were harvested in 2005. Hunting methods used to harvest these whales were not significantly different from hunting methods used in previous years.

The Russian Federation then presented Gennadiy Inankeuyas, Chairman of the Association of Traditional Marine Mammal Hunters of Chukotka and a traditional aboriginal hunter. Inankeuyas presented a PowerPoint presentation entitled *Whale killing methods and related issues in Chukotka, Russia*. In his presentation, Inankeuyas noted that in Chukotka there is a single general hunting method used. There is a difference based on the size of the whale and a difference between gray whale and bowhead whale hunting. For providing hunter safety and reducing the time of the hunt, three or four boats are used. Since weather conditions can worsen very quickly in Chukotka, reducing the time of the hunt is critical to the goal of providing hunter safety.

In the gray whale hunt, so that the gray whale does not sink, it is first harpooned and floats attached, enough times so that it can hold the whale buoyant on the surface. If whales have a length up to ten metres (32 feet), then the priority weapon is the rifle. The rifle is powerful enough (calibre 7.62mm) to kill the whale with the bullets fired. Hunters aim at the area near the neck and head. If the length of the whale is greater than ten metres, then the priority weapon is the darting gun. The darting gun is aimed in the area of the neck and the area of the heart.

In the bowhead whale hunt, as in the gray whale hunt, so as not to lose the bowhead whale it is first harpooned, with a harpoon with a toggle harpoon head and a float attached to the whale with a line. One float is often sufficient in order not to lose the whale during the hunt. After the harpoon and line is attached, a darting gun is used. As a rule, it is necessary to use two or three darting gun projectiles, since the sea is rarely calm, which interferes with aiming the darting gun. The darting gun is aimed at the heart and lungs.

Time to death is estimated by the whaling captain. Since the animal is dangerous and large, hunters fire several rounds in order to ensure the death of a whale, and will even fire upon a presumably dead whale. This is done to ensure hunter safety, and, on occasion, will be carried out to train young hunters.

The Russian Federation expressed the hope that, following this presentation, countries would now better understand what hunting means in Arctic conditions. These are very harsh and difficult, but the people are working to improve the efficiency of the hunt. He thanked those countries and individuals which had provided technical assistance, scientific advice and funding to assist in the implementation of humane killing methods

Comments and discussion

In response to a question from Belgium as to what part of the animal is targeted by the darting gun, the Russian Federation said that most often in the gray whale hunt, this is pointed towards the heart. Hunters also attempt to hit the area of the neck when the animal tries to move quickly. In order to land the whale on shore, tractors or similar equipment is used when available; otherwise people are used, often by rolling the whale onshore. The UK enquired as to what calibre of rifle is used and whether it is possible for a more powerful weapon to be employed. The Russian Federation explained that for the most part the 7.62 calibre rifle is used. There has been some attempt to use a larger calibre weapon, but for economic reasons these have been difficult to acquire and so the 7.62 calibre rifle is the weapon of choice. In addition to economic factors, larger calibre rifles are geared to the hunting of terrestrial animals and the lack of jacketing does not act as effectively as the 7.62 calibre rifle. Sweden recalled that at the working group meeting in 2005 there had been some discussion about the Greenland hunt and that a similar calibre of rifle is used there. Sweden asked Norway to confirm its understanding that the minimum calibre used in its hunt is 9.3mm. Øen (Norway) confirmed this as the minimum but added that the most used commonly used calibres are .375 and .458.

IWC/58/HKM&AWI 22

(Report on weapons, techniques and observations in the Alaskan bowhead whale subsistence hunt)

The paper was presented by Eugene Brower, Chairman of the Alaska Eskimo Whaling Commission Weapons Improvement Program Committee (WIP Committee), on behalf of the USA.

The Alaskan Eskimo bowhead whale subsistence hunt takes place in 10 villages of northern Alaska, spread across more than 1,000 miles. The spring hunt by eight villages is conducted from the shore-fast ice as the bowheads migrate north and east through the spring leads, using small skin boats. The fall hunt by three villages takes place from small skiffs with outboard motors in ice-choked waters and under conditions that often include high winds and rough seas. In both hunts, the whale may be many times the size of the boat. The primary weapon is a hand-thrown darting gun, armed with an explosive projectile and a harpoon (toggled iron) that attaches a line and float to the whale to assist in recovery. The secondary weapon is a smooth bore, eight gauge shoulder gun. The shoulder gun cannot be fired until after a line and float have been attached to the whale.

Subsistence hunters make every effort to dispatch the whale as quickly as possible to provide a humane death for the whale, to reduce the chance of losing the whale, and to reduce the amount of time hunters in small boats must spend in the treacherous waters of the Arctic Ocean. Fatal accidents are not uncommon in Arctic subsistence hunts. Between one and six people die annually in the Alaskan and Chukotkan hunts, combined.

Within this context, the Alaska Eskimo Whaling Commission, through its WIP Committee, has undertaken an extensive program to upgrade the safety and humaneness of its traditional weapons used in the bowhead whale subsistence hunt. The AEWC is in the process of introducing a specially designed penthrate projectile for use in the hand-held darting gun, and a modified darting gun barrel made to fit the new projectile. This equipment has been designed and tested with the assistance of Dr Egil Øen of Norway. The AEWC expressed appreciation for his work. Field trials of the penthrate projectile ended in 2004. Also working with Dr Øen, the AEWC has prepared a training manual for introducing the penthrate projectile and modified barrel to the hunters. The manual is being used as the basis for training and certification of whaling captains and harpooners before they are given the new equipment. Training and certification are under way in Barrow and have been completed in three other villages.

During field trials in Barrow, hunter observations indicate that, when placed near the blow hole or within the thorax, the penthrate projectiles appear to give a more rapid time to death than the traditional black powder projectile.

Two of the other villages receiving the new projectile report similar experiences. Training and certification sessions will continue in the other six villages as soon as possible, as funding for travel becomes available.

Difficulty in obtaining a critical component for future production of the penthrate projectile is discussed more fully under Agenda Item 6.1.

The AEWC also provided a PowerPoint presentation showing conditions of the Alaskan bowhead hunt, including photos of the skin boats, the hand-held weapons, and the extensive sea ice.

Comments and discussion

Sweden commented that when the IWC considers aboriginal subsistence whaling quotas, it talks about cultural and nutritional aspects. These considerations are not however in the terms of reference for the workshop. The Russian Federation disagreed with this statement, pointing out that in their view the humaneness of the hunt is very clearly tied to cultural and nutritional needs.

4.2 Commercial whaling

IWC/58/WKM&AWI 25

(Norwegian minke whaling. Research to improve hunting and killing methods for minke whales in Norway)

This paper, presented by Øen (Norway), describes research to improve hunting and killing methods for minke whales in Norway during 1981–2006. Hunting of whales in Norway goes way back in history. The first written sources of hunting of whales in Norway are from the 9th century AC. Today's hunt is conducted with small (50 feet) or medium sized (60–120 feet) fishing boats that are rigged for whaling in the season with 50 or 60 mm harpoon guns and harpoons equipped with a penthrite grenade with 30 g penthrite and rifles with full metal jacket, round nosed ammunition of calibres 9.3, .375 and .458 as back-up weapons. The harpoon is connected to a line of synthetic materials connected to a winch. The detonation is triggered when the grenade has penetrated 70 cm into the whale. The whales are searched in relatively slow speed (4–6 knots/h) and it is not unusual that the whales comes to the boat, or the boat idles up where the whale is expected to blow or starts following the whale in a moderate speed to get close enough to fire the harpoon. No instruments are used. The hunter aims the harpoon at the thorax from the side whenever possible. As a whale is hit fatally it rises to the surface to blow, normally stops swimming and rolls on to its back or pulls out some of the harpoon line before stopping. If it does not lose consciousness or die rapidly, it maintains its normal position in the water and dives actively and resurfaces. Therefore, the whale should be hauled to the boat as fast as possible to check whether it is dead, and the gunner will be ready to fire the back-up rifle at close range at the brain when the whale's head is over water. The whale is hauled on to the boat across the deck to be flensed. Each gunner is required to pass an annual and obligatory shooting test, both with rifle and harpoon gun prior to the hunt and hunting gears are controlled and approved for hunting by governmental institutions. Formalised, obligatory workshops and training courses for hunters were carried out on a regular basis from 1984 to 2005.

From 1981 to 2004 scientists at the Norwegian School of Veterinary Science have conducted three major research projects to improve and assess the hunting and killing methods for minke whales in Norway. These projects have 1) aimed to develop alternative methods to improve the animal welfare and the hunter's safety associated with the hunting and 2) to verify the efficacy of the methods by autopsy and neuropathological studies of animals killed. The research programs had its most extensive research periods in 1981–86, 1992–95 and 1997–2004. The research has resulted in development of new weapons technology, improved hunting techniques and routines and obligatory education and training of hunters and inspectors. Four types of whale grenades with the explosive penthrite have been developed; two harpoon grenades for 50mm and 60mm harpoons, one for 90 mm harpoons used for fin and sei whales and one grenade for the traditional darting gun used by hunters of bowhead whales in Alaska. The data on the performance of different killing methods have been collected for scientific purposes for 5,552 minke whales. The statistics show a considerable increase in the instant death rate (IDR), decrease in the time to death (TTD) and losses of wounded animals. The percentage of IDR in 1981–83 was 17%. The average TTD was 11 min. and 17% were re-shot with harpoons. In 2000 to 2002 the corresponding figures were 80% and 2 min 17 sec using the criteria adopted by IWC which may include periods when the animal may have been unconscious or already dead. Only 0.5% needed a second shot with harpoon grenade. Two doctoral theses on developments in whaling and killing efficiency in whaling have been defended at the Norwegian School of Veterinary Science. From 1992 to 2003, twenty-eight extensive reports and publications in scientific journals have been presented to five workshops in IWC, in addition to annual reports.

The weapons and ammunitions used in the Norwegian hunt for minke whales today are, when applied as recommended, highly effective in causing instantaneous or very rapid deaths. The harpoon grenade used today must be regarded as having a wide lethal area compared to conventional weapons used in other forms of big game hunts. And the results from the Norwegian studies support the already established recommendation that for welfare reasons the whales should be shot from the side at the thorax or neck, and that all animals should be hauled in fast for control. As a precaution the hunters should still be recommended to re-shoot any animal that moves or otherwise shows any possible signs of life as a matter of routine, even though some of these animals are unconscious and dead. This recommendation is based on that it is a good and responsible hunting practice for all large animal hunting to fire too many rounds than too few.

To further possible improvements of the TTD in Norwegian minke whale hunt, factors like more training, improved marksmanship, and maintenance of weapons and hunting gears are identified as the probably most important elements.

Comments and discussion

The UK expressed its appreciation for the valuable and interesting information provided in WKM&AWI 25 showing improvements in TTD during recent decades, noting that these results were obtained based on close monitoring of what goes on in the hunt. The UK hoped that the Norwegian Government will continue supporting this research and will urge continued close monitoring to perceive further refinements that could be made. The Netherlands supported the UK comment.

Mexico asked on what criteria it was judged to use rifle shots as a secondary killing method. Øen (Norway) answered that it was much more rapid to use a rifle. A winch is used to haul the whales in rapidly and the whale usually gets its head out of the water so the rifle can be fired within a matter of seconds. To use a second harpoon will take 5-10 minutes to re-load the cannon and collect the forerunner and that is too long in an ordinary hunt.

The UK noted the importance of close monitoring of the hunt and further research and asked if it was likely that Norway will continue to make future progress on killing methods. Øen (Norway) answered that there is no intention to continue research projects in the near future.

IWC/58/WKM&AWI 12 (A review of a Norwegian whale hunt)

Lonsdale (UK) presented this paper which is an analysis of film of a minke whale hunt that took place in northern Norway on 18th May 2005. The authors acknowledge that this is an analysis of only one hunt and is not representative of all Norwegian whale hunts. It provides a detailed record of hunting in adverse conditions and demonstrates the changes that can occur which may affect the impact and position of the harpoon strike and the subsequent time to death.

The filmed sequence of events includes:

- The pursuit
- The harpooning
- The use of the rifle
- The movement of the whale post harpooning
- The last sighting of the whale's signs of vitality
- The hauling the whale aboard the vessel
- The entry point of the harpoon into the whale

It also shows the sea and weather conditions, the movements of the whaling vessel and some of the activities of the crew. The estimated wind speed was up to 20 knots in a south westerly direction. The sea had moderate waves of an estimated height of about 1–2 metres and visibility was good, with no rain during the hunt.

The whale took 14 minutes and 30 seconds to die, having been struck by the harpoon in the abdomen. The 7 rifle shots were fired at the whale from a distance of several metres. The first shot being fired 11 minutes 2 seconds after the firing of the harpoon.

The analysis identifies several factors beyond the control of the crew that presented key challenges to achieving immediate loss of consciousness and death. These included the sea conditions and the movement of the vessel, the striking of the whale in the abdomen, the problems encountered with drawing the whale quickly to the side of the vessel, the repeated firing of the rifle at the whale from a distance and not with the head above the water and close to the vessel.

The analysis provides valuable information which can be collected by independent observers beyond the capabilities of the Norwegian Blue Box and suggests it would be advantageous to define acceptable weather conditions for whale hunts.

Comments and discussion

Øen (Norway) commented that the TTD of 14 minutes observed in this case was within what has been reported from the Norwegian whale hunt in IWC/58/WKM&AWI 25. He also commented that this hunt had taken place during weather conditions that were not favourable and that the hunters had not followed the recommendations given. In an interview the skipper had confirmed the information given in the just presented paper. The skipper had also explained that the forerunner had turned around the tail of the animal and it therefore was not towed in as fast as it should. He also said that a second whale was shot soon after the filmed one had been flensed and that this second animal was killed immediately. The logbook, the skipper and information registered in the “blue box” all confirmed this.

The UK returned to the issue of weather conditions and asked whether, when conditions are judged unfavourable, there is any requirement to restrict whaling. Norway advised that recommendations are given that whaling should not proceed but such advisements cannot be enforced.

IWC/58/WKM&AWI 13 (Immediate immobilization of a minke whale using a grenade harpoon requires striking a restricted target area)

Paper presented by the UK. Previously published schematic data has shown the harpoon detonation sites from two groups of whales. In this analysis, the data for the two papers were amalgamated and the longitudinal distance of the detonation from the tip of the lower jaw, relative to the total length of the whale was calculated from the schematic diagrams, the total body length being measured from the tip of the lower jaw to the point where the flukes divide. The detonation sites were recorded as either having or not having resulted in immediate immobility based on the IWC criteria. Using a simple model of longitudinal distance of detonation site alone it was possible to correctly classify 77.8% of the whales as being immediately immobile and this resulted in a binary logistic regression model that included just two explanatory variables: the longitudinal distance along the whale and whether the detonation was above or below a mid-line differentiating a ventral from a dorsal explosion. The extreme anterior of the target area begins at the anterior of the brain, approximately 22% of the total body length from the tip of the lower jaw. The target area extends from this point to approximately 30% the length of the whale from the tip of the lower jaw dorsally, and ventrally to 49% the length of the whale from the tip of the lower jaw. These distances are given as the furthest detonation sites which caused immediate immobility.

The data indicate that there is a relatively well defined cut-off point between a detonation which is effective and one which is not. Based on this, the minimum and maximum target area which will result in an immediate immobilisation/stun are shown in Figure 1 in the paper. The data drawn together in this commentary indicate that in order to cause immediate immobilisation and, perhaps, an immediate stun in minke whales it is necessary to hit a significantly restricted target area.

Comments and discussion

Walløe (Norway) had two arguments against the paper. First, details of the regression analysis are not provided. Second, assuming that the regression is okay, the results are only giving information about correlation between hit region and pathological findings in the brain tissue, not between hit region and IDR. Many whales in general die instantaneously from hits which rupture the heart or large blood vessels and which give instantaneous fall in blood pressure and thus a cardiovascular death. Figure 3 in paper IWC/58/WKM&AWI 25 gives IDR in the Norwegian hunt for hits in different body regions. It is clearly shown that IDR is higher for hits in the dorsal part of the body than for hits in the corresponding abdominal part, contrary to the conclusions given in IWC/58/WKM&AWI 13. Norway also criticised as bad scientific habit the use of secondary data when primary data are available in the reference.

In reply, Butterworth (UK) said that he accepted in many ways a number of the points made. He acknowledged that hits to the thorax regularly return higher levels of insensibility and instantaneous death. On the second point re the use of data, Butterworth (UK) said that Knudsen had been invited but declined to contribute to the paper. Knudsen (Norway) explained that whilst she had been contacted about contributing, the first she saw was a completed paper with her name attached. Butterworth added that Knudsen was told that the paper sent was a draft and she would be free to edit and comment.

Referring to comparisons in the paper between its hunt and the Norwegian hunt, Japan said that it has repeatedly explained the reasons for a lower rate of immediate stun (conditions in Antarctic waters; differences in operations of the hunt) but these explanations have been ignored. Japan also took issue with the statement that it has been reluctant to switch to the Norwegian grenade because of the increase in cost. Whilst the Norwegian grenade has been tried, almost similar results are now being achieved using the improved Japanese penthrate grenade.

IWC/58/WKM&AWI 11 (A review of recent research on Norwegian whale killing)

The UK (Butterworth) presented this paper which is a review of recent research on Norwegian whale killing. The authors noted that they considered the Norwegian studies that were reviewed in their paper to be a valuable contribution to the call for science in category 1 of the IWC research. However, they still found it appropriate to raise a number of questions about the studies:

1. Noting that the study was carried out about the time of the introduction of the Whalegrenade 99, were all, none, or a portion of the animals harpooned using this grenade or the earlier version?
2. How IWC criteria could be applied to diving whales if this was to be related to the TBI data provided.

In discussion, Butterworth noted that Walløe, in 2005, had explained that ‘the old grenade, or early versions of the new grenade were used during the four hunting seasons from which Knudsen obtained samples’. He commented that it would thus appear the studies represent results predominately from the old grenade and that any IDR calculable from within the paper is not representative of the Norwegian hunt at that time because it is calculated from a restricted sample and that a correct IDR for this period would be 61.3%, with about 50% surviving grenade detonation according to IWC criteria but recorded dead within the next 5 minutes (IWC/58/WKM&AWI 25).

Comment is made in IWC/58/WKM&AWI 11 that Knudsen & co-authors had also noted that ‘other mechanisms may also explain the intracerebral haemorrhages in the whales, including that the blast causes rapid acceleration of the torso that cause displacement of the brain resulting in deep intracranial haemorrhages and tearing of the many bridging veins in the meninges’. However Butterworth commented that measurements or a calculation of whether the energy available could achieve this acceleration are not provided and that clarification on this point would be very welcome.

The paper also noted the welfare implications of the difficulties of assessing an animal if it dives immediately after harpooning.

Paper IWC/58/WKM&AWI 11 concluded that the procedures reported in the papers produced by Knudsen (et al) are a very positive step forward in achieving the application of science to understand the potential for animal suffering during whaling and that concern for animal welfare will remain a focus for debate within the IWC working groups, and agreed with others that continued improvements should be sought.

Comments and discussion

Knudsen (Norway) responded to several comments in IWC/58/WKM&AWI 11 which was a review of her doctoral thesis. IWC/58/WKM&AWI 18 (A novel method for in situ fixation of whale brains), IWC/58/WKM&AWI 19 (Blast-induced neurotrauma in whales) and IWC/58/WKM&AWI 20 (A review of the criteria used to assess insensibility and death in hunted whales compared to other species) provide background to her response.

Knudsen commented further that two of the UK reviewers had competence in pathology, one being a marine mammal pathologist and the other a certified neuropathologist. Both concluded that the methods used and the interpretations of the pathological findings in the PhD study and associated scientific papers were scientifically sound (see appendix C and D in IWC/58/WKM&AWI 11). Knudsen was surprised to see that the views of the two UK pathologists were not reflected in the UK report. She also commented on the authors' obvious misunderstanding of the aim of the PhD study. The major aims of the study were to investigate and describe gross and histological pathological changes (including on the central nervous system) after detonation of the harpoon grenade (hereafter referred to as Category 1), and the ability to penetrate the skull and the pathological effect of the rifle (Category 2) in the Norwegian hunt for minke whales. The aim of the studies was not to obtain TTD percentages on the different boats or evaluate the skill of individual gunners. The goal of the field sampling was to obtain a significant number of animals within each category (1 and 2) in order to evaluate the effects of different target areas for the harpoon grenade as well as different target areas for rifle shots.

Knudsen also noted:

- The sampling took place during four field seasons (1997-2000). The boats used in the study were chosen exclusively of logistical reasons. All hunted whales were chronologically sampled during the time periods when the scientists were present on the different whaling vessels. During the 1997 and 2000 hunting seasons the scientists were present and sampling occurred only in parts of the hunting season, while in 1998 and 1999 sampling occurred the whole hunting period. The sampling of Category 2 animals (rifle shot animals) started one year earlier (in 1997) as this sub-project was initiated before the PhD program was finally and formally established.
- Regular or standard time to death (TTD) records were collected from *all* whales on these boats during the whole hunting season by the governmental inspectors, and all data were analysed according to the same procedure that were used on all other whaling boats in these years. The data obtained in the PhD project was not used to obtain or adjust the TTD reported to the IWC in the annual reports, as the more comprehensive analyses performed in the PhD project was far from being finalised at the time when these data was reported.
- In the thesis it is clearly stated which samples were excluded from the analyses (Knudsen 2004). TTD percentage analyses were not performed neither in the thesis nor in separate papers, because the material was not suitable for such analyses, as the Category 1 and Category 2 animals were sampled during different time periods. Consequently, Knudsen concluded that the analyses and conclusions on TTD presented in the UK report must be regarded as misinformation.
- Chapter 2.1 in the UK report is referred to as a summary of the PhD thesis. However, none of the calculations in table 2 can be found in the PhD thesis or associated papers and the data presented in table 6 were not at all published or referred to anywhere in the thesis nor in associated papers.
- Chapter 5.0 is one example on how the authors have taken sentences and paragraphs from the thesis out of its context and misused them. The basis of the in situ fixation technique is that the brain stays in the whale's head for at least 2 days prior to excision, so that the brains can be excised at opportunity when hunting activities and other practical circumstances allow for it. Most brains in the PhD study was not excised until 72 hours after the death of the animals, and then the weather conditions may have changed considerably.

Finally, Knudsen responded to what she felt was a serious allegation in the UK report: *"The risk would be that hunters, supported by Dr Knudsen's pathological findings, would assume that animals which dive can be considered as likely to be dead or unconscious."* This statement shows that the authors of IWC/58/WKM&AWI 11 have ignored the recommendations given in the PhD thesis. The way this paper has been written is contra-productive and does not promote a sound and constructive scientific debate on these issues

Walløe (Norway) further commented that based upon the response given by Dr Knudsen it was obvious that the statistical comments of IWC/58/WKM&AWI 11 were invalid. Comments in that paper by Mr Steve Wotton on pp 17-24 deserved some additional comments. This part of the paper was in Walløe's opinion irrelevant to Knudsen's thesis as it described laws and regulations and not practice and in some cases this can be very different. Walløe agreed with the Chair's advice that one should not compare TTD in abattoirs with TTD during hunting, but if such a comparison is

made, it shows that IDR of minke whales in the Norwegian hunt is similar to instantaneous stunning of pigs and bulls in UK abattoirs. TTD in the Norwegian whaling has been observed and recorded for all whales killed during a twenty year period, including 1,667 during 2000-2002. In abattoirs the TTD is only sampled by veterinary surgeons for short periods. Walløe assumed that the IDR was substantially lower when the veterinary surgeon inspector was absent.

In conclusion Walløe noted that none of the accusations made in the paper were valid and that he would like the UK to acknowledge that. Norway further referred to the paper presented to the working group last year (IWC/57/WKM&AWI 10) and suggested that none of the accusations made in that paper were valid. Norway asked the UK to acknowledge this point.

Butterworth thanked Knudsen for her reasoned response, noting that he had only just seen a written version of this. He concurred with her first point that two of the four UK reviewers had concluded that the methods used and the interpretations of the pathological findings in the PhD study and associated scientific papers were scientifically sound. He noted also that the report of the neuropathologist was freely available as an Annex to the paper.

With respect to Knudsen's point concerning the sampling period and the sampling of animals, Butterworth stated that the matter he was most interested in was whether or not Knudsen's studies should be taken to reflect the Norwegian industry and offered his conclusion that they could not. He added that if this is the case, then the next question might be whether this undermines the study but in his opinion it did not. Nevertheless, in his view the data (69 animals) cannot be used as representative of the industry.

With respect to the example provided in Knudsen's response of how sentences and paragraphs from the thesis have been taken out of context and misused, Butterworth noted that he was grateful for the explanation provided on the in situ fixation technique and that most excisions of the brain occurred 72 hours later. He added that it was important to appreciate that researchers are obliged to work from a limited data-set, since only limited data are provided to the Commission.

On the final point raised by Knudsen, Butterworth emphasised that in the presentation the situation of the animal diving was identified as a *potential* animal welfare concern. He noted that the diving animal was difficult to observe and categorise and that this remained a potential animal welfare concern.

In response to Butterworth on this last point, Knudsen said that she could not find in any of her published data any basis for this assumption. Her recommendation is that whales should be hauled as fast as possible into the boat and killed as quickly as possible. It is the whalers decision as to how many times to shoot, and in the whalers interest to kill fast. Her advice is to shoot as many times as possible and to shoot if there is any doubt.

Walløe responded to the point as to whether the data presented in Knudsen's work are representative of the Norwegian hunt. He reiterated that they were never intended to be representative of the Norwegian industry as the sampling was designed to meet the aim of the study as described by Knudsen in her comments. With respect to the effect on the brain from hits in different parts of the whale body, the results are representative of the Norwegian grenade and of the Norwegian whaling.

Further, Walløe said he would still like to hear a response to his question as to whether the UK would now withdraw the accusations contained in IWC/57/WKM&AWI 10, presented in 2005.

On this point the UK noted that the 2005 paper had covered many points This discourse had helped to clarify many points but some remained.

The Russian Federation made a point of order regarding the lengthy discussions on the UK paper. Issues raised concerning the data should have been discussed before the paper was brought to the IWC and the Russian Federation

now requested that the UK and Norway be requested to continue any discussions on a bilateral basis. Both countries agreed.

The Russian Federation then made a further statement that such issues as raised by this paper should have been discussed in the Scientific Committee. The matter touches on questions of falsification by one country and by another. The Russian Federation expressed surprise that the paper had been presented; and at the patience shown by the Scandinavian people considering that the discussion carried a political character. If countries had doubt about each other's data this should be taken up on a bilateral basis. Prior to providing such a report on behalf of a government, a government should have these reports reviewed on a national level. The Russian Federation requested that the workshop keep to its agenda and not discuss scientific issues here.

4.3 Whaling under special permit

IWC/58/WKM&AWI 8 (Killing whales under special permit: the special case of the fin whale)

Denmark recalled that during the review of documents in agenda item 1.3, Denmark on behalf of Greenland requested New Zealand to withdraw document IWC/58/WKM&AWI 8. No agreement on this could be reached. The reason Denmark made this request is that the New Zealand paper compares information on Greenlandic time to death (TTD) in fin whale hunting in relation to a discussion on special permits issues which is a completely different hunting activity undertaken in different conditions and using different equipment. Furthermore the character of collecting data in Greenland is anecdotal, not based on science.

New Zealand's response, Denmark noted, is that no comparison has been made. This is true and wrong at the same time, but the New Zealand point of departure is the Greenland hunt, and New Zealand is very selective in its comparison. Maximum time to death in the Greenland hunt is quoted and not the average time and that paper goes on immediately to state that, because of the difficulty of the hunt, protracted times to death may become a common feature of special permits hunt. So a comparison has in fact been made but a very selective one.

Denmark said that the use of Greenland's information in this paper is inappropriate. The information has been used without advance warning and without consent. The document has been submitted through IWC website without consulting the involved party/parties.

Denmark suggested that the only conclusion which can be drawn from the New Zealand document is that time to death might be long, but this is not known so it is assumed. Denmark observed that this IWC workshop is normally seen as a scientific and technical forum but IWC/58/WKM&AWI 8 is not scientifically based. Another conclusion is that when information is provided to the IWC, whether voluntary or not, it can be misused against you or another party.

Denmark again called on the paper to be withdrawn.

New Zealand explained that the purpose of this paper is to try and inform the Workshop and respond to points 7 and 4 of the Revised Action Plan. It is clear that the paper is entirely the work of New Zealand scientists. All of the data used was in the public domain. New Zealand regretted any difficulties caused to the Danish delegation.

Turning to the paper itself, New Zealand stated that one of the aims of this paper was to consider the possible consequences of using harpoons designed for minke whaling on fin and other larger species of whales.

New Zealand said that using the reported Instantaneous Death Rates for minke whale killed in previous JARPA hunts, an estimate could be made of the number of minke whales (between 510 and 529) that could be expected not to die instantaneously in the new expanded JARPA II hunt. A number of species of whales are killed in the scientific whaling programmes of Japan. In addition to minke whales larger species such as sperm and sei are currently taken and JARPA II extends the species to be hunted to humpback and fins. New Zealand illustrated the relationship between the

frequency of use of secondary killing methods and the maximum length of each species for which data on TTD which have been recently provided by Japan.

Turning specifically to the fin whale, New Zealand noted that the Southern Hemisphere fin whale is significantly larger than that in the Northern Hemisphere. New Zealand noted that there is currently no data available on the killing of fin whales in JARPA II. It noted however that Japan scientists had acknowledged in the Scientific Committee last year that crews and researchers in JARPA II have no experience in catching and flensing humpback or fin whales. New Zealand also noted a number of other important species specific characteristics in addition to size, such as blubber thickness and composition, skull anatomy etc. that may influence the efficiency of a particular weapon. In addition, 90mm harpoons were used on larger species during commercial whaling several decades ago, but no information has been provided by Japan as to whether new larger harpoons are being employed to take fin whales in JARPA II, or whether the same-sized harpoons are used as those used to kill minke whales.

Whilst acknowledging that conditions in Greenland are very different to that in JARPA II, New Zealand believed that experience in Greenland with fin whales does provide some insight. In many cases there is a lengthy time to death; there are high struck and lost rates; and penthrate is always used as the secondary killing method.

New Zealand then suggested a number of possible causes for a protracted TTD. These could include insufficient harpoon penetration; poor harpoon placement and whales that escape and are later recaptured. Animal welfare issues should be a consideration in any proposal to kill whales under special permit. Noting again that there is no information available for the JARPA II hunt of fin whales, New Zealand invited Japan to provide such information. New Zealand observed that unless powerful primary and secondary methods are used, the TDD for some fin whales may be protracted. The available data suggest that when using similar equipment, the larger the whale the more protracted the TTD is likely to be.

Comments and discussion

Responding to the paper and presentation, Japan said that whilst it has not conducted as detailed a study as New Zealand, Japan acknowledged that fin whales are larger and more difficult to kill than minke whales. Concerning the general premise of the paper, Japan said that devices for killing minke whales could also be used to kill larger species. Japan said the paper contained a number of mistakes and incorrect information. Japan recalled that has pointed out many times and validated that a combination of large calibre rifle with full metal jacketed bullets is the most effective secondary killing method for minke whales. It is for this reason that rifles are used, not economic consideration. Further, the reason the Norwegian grenade is not used is not economic but because Japan has been successful in developing the Japanese grenade with improved fuse which has a similar performance to the Norwegian grenade.

Japan also stated as incorrect the claim that not targeting the shot at the head is inhumane, responding that it has been accepted that to target at the thorax is more effective than at the head area. Japan regretted that this point is still not understood by some. As the body size of the whale increases, the head size increases but the brain size does not increase at the same ratio. At the same time, the thorax does increase at the same rate as body size and therefore it is best to target the thorax. Japan also reported that according to analysis of instantaneous death rate, IDR is 80% when the grenade hits the chest as opposed to 29% when it hits the head area.

With respect to the conclusion that the penthrate grenade is an underpowered weapon and that 400g of black powder is more powerful than 50g of penthrate, Japan responded that this is also incorrect. Black powder is classified as a low powered explosive and in testing using 30g of penthrate compared with 450g of black powder, the penthrate was more powerful. Japan first received examples of the penthrate grenade in 1980 and recognised its excellent potential for producing rapid and humane death in large whales and therefore exerted efforts to develop this weaponry.

New Zealand welcomed constructive debate and responded to a number of the points made by Japan. On the issue of whether economic considerations have influenced Japan's decisions to continue to use rifles as the secondary killing

method and not to use the Norwegian grenade, New Zealand said that its comment was based on extracts from papers submitted to previous WKM working groups and submissions made by Japan.

New Zealand reiterated a number of the questions it put to Japan and asked if Japan can provide TTD and IDR data for fin whales taken this austral summer; is it using 75mm or 90mm cannon for hunting fin whales; and what is the procedure at sea for changing the grenade from that used for minke whales to that for fin whales?

In response, Japan confirmed that it is using the 75mm cannon. This decision to use the 75mm cannon is based on progress and improvements that have been made in the technology over the years, and Japan also noted that the penetration power of the weapon is not affected by the factors suggested by New Zealand in its presentation. Japan also pointed out that the difference in procedures for hunting fin as opposed to minke whales is with respect to secondary killing methods where a secondary harpoon is used in the case of fin whales.

Japan then made a more general statement concerning the provision of data and the use made of that data, noting that it has been providing data to the IWC on a voluntary basis. Japan noted that when data is provided it almost always misunderstood and this leads to greater polarisation. Positive data and good progress is usually ignored. In the past, Japan has presented its programmes and reported on progress and has taken into account constructive comments. Japan welcomes constructive scientific and technical discussions but it appears to it that its data provide is only used to criticise whaling. Japan therefore stated that until the IWC is normalised, it will submit its data to other appropriate forum or publish it in academic journals. Japan believes that this decision will help the IWC to be normalised.

New Zealand recorded its disappointment at Japan's announcement that it intends to present its data to an alternative forum, rather than the IWC, which is the established international body for whales and whaling.

Øen (Norway) acknowledged what was expressed in the report of the importance of sufficient impact from the harpoon/projectiles to penetrate sufficiently into the animal before detonation and also the importance of the size of the charge, but found the conclusions made by New Zealand in IWC/58/WKM&AWI 8 were not always quite correct. He had experienced from his work with whaling that both small projectiles like the darting gun grenade used by Eskimo subsistence whalers in Alaska and the 50mm harpoon used by the Inuits in Greenland had sufficient penetration power to penetrate deep enough into a large whale when directed correctly to the animal. Øen also referred to his report to the IWC in 1987 (TC/39/HK4) where penthrite grenades were used for fin and sei whales in Iceland. When adjusting the trigger cord to set off the detonation 110-130cm inside the animal one fin whale was instantly killed by 22g of penthrite and by increasing the charge to 100g of penthrite fuse, 10 out of 14 fin whales (71%) and 13 of 15 sei whales (87%) were recorded instantly dead.

IWC/58/WKM&AWI 23 (An independent review of the efficacy of killing methods of Antarctic minke whales)

Australia provided some introductory comments on IWC/58/WKM&AWI 23. Australia said that in this paper the authors have taken advantage of a recent, publicly available data source. The authors were not involved in the planning or any other aspect of attaining that information. Australia recognised that the events around the attaining of this data are of significant sensitivity to Japan. Technical merits of the data will be discussed in this workshop, leaving other issues surrounding the collection of the data for discussion in the Commission. The issues raised in the paper relate to normal hunting practice and are relevant to minke whale hunting in the Southern Ocean.

The presentation was then passed to Leaper (UK) as one of the authors of the paper.

Leaper (UK) reported that video footage of the hunting of minke whales by the Japanese whaling fleet in the Southern Ocean taken by Greenpeace from independent observation platforms in 2005/06 was analysed to estimate quantitative data relevant to animal welfare. Catches of 16 individual minke whales were analysed. Of these, 12 events allowed an estimation of minimum time to death or insensibility, and in 2 of these death could potentially have been instantaneous. For the remaining 10 observed kills where times could be estimated, the mean of the estimates of minimum time to

death or insensibility was 10 minutes with a maximum of 33 minutes. These values are likely to be negatively biased due to difficulties of determining whether a whale that was not vigorously moving was indeed dead. Comparison of data from a number of sources indicated no significant differences between the proportion of hits in the forward 47% of the body as observed from the 2005/06 video and previously reported data from Japanese and Norwegian commercial whaling for minke whales. Thus we concluded that the observed locations of harpoon impacts were representative of unimpeded hunting practise.

In 2 of the 16 events, asphyxiation appeared the most likely cause of death. These whales were harpooned aft of their midpoint and winched tight to the bow of the catcher with the head therefore forced underwater. Rifle shots were either not attempted or did not appear effective as a secondary killing method, since a clear shot of the head was not possible. The large proportion of harpoon impacts towards the tail from this and previous Japanese scientific and commercial whaling indicate that winching such whales tight to the bow on the harpoon line will likely result in a substantial proportion dying by asphyxiation. Thus asphyxiation appears to be the *de facto* secondary killing method in these situations.

A simple model was developed to estimate the relative shock to the brain caused by the penthrite grenade at different impact locations on the whale in relation to the likely position of the body relative to the sea surface. These calculations indicate that a harpoon which detonates deeper below the sea surface is likely to cause greater injury. This is consistent with reported differences between the effect of harpoons that hit ventral or dorsal regions. For whales shot during a high speed chase, the harpoons that hit closest to the brain are also likely to detonate close to the sea surface. These factors may contribute to the low instantaneous death rate reported and observed for this hunt.

Comments and discussion

Belgium noted that there appears to be a view that secondary killing with a rifle is ineffective if the head of the whale is underwater. In cases where whales are harpooned in the abdomen or tailstock and winched very tight to the bow, as seen in Figure 5, inevitably the head will be underwater. Thus it appears that new consideration of secondary killing methods is required to reduce times to death, considering that leaving whales in this position, to die of asphyxiation, raises further welfare concerns. Belgium asked for comment from Japan whether these considerations are being made.

Before commenting on the content of the paper, Japan sought to make several points. The paper is based upon filming of JARPA II in the austral summer of 2005-2006. The representative of Japan speaking identified himself as the deputy director of the research activity and said he had personally observed the disturbance activities of Greenpeace. Japan said that Greenpeace had disturbed and sabotaged the research activity by its actions and alleged that Greenpeace had even tried to collide with one of their vessels. In such circumstances, Japan regretted that other, third parties have now used this data and brought it to the IWC.

Japan viewed Greenpeace's activities as having raised serious problems with respect to animal welfare. Japan said that the way these activities had disturbed the hunt, including the splashing with water of gunners and the placing of rubber boats in a straight line between the whale and the harpoon cannon, had prolonged the time to death for these whales. It noted that TTD was 4 minutes 18 seconds in such disturbed situations compared with 2 minutes 2 seconds for undisturbed situations. In the case of one whale where the harpoon came loose, the gunners could not use secondary killing methods because of the presence of Greenpeace members around the harpoon and so the whale was drowned. There were also 2 cases where, due to disturbance of sea conditions caused by Greenpeace's large sized boats, the whales involved lost their sense of orientation and were unable to swim. In addition to animal welfare considerations, Japan said that these activities raised questions as to the scientific validity of the paper as the data collected shows no representativeness of the overall hunt at all. In Japan's view therefore data taken from this film footage does not represent independent observations.

Commenting further on the selection of data for analysis, Japan noted that of 26 events recorded only 16 were taken for analysis and one other whale, which had died instantaneously, was excluded. Japan suggested that this selective choice of data introduced an inherent bias into the analysis.

Japan noted that the authors had extrapolated from the cases chosen to conclude that for the majority the cause of death was asphyxiation but said that the real cause of asphyxiation was the disturbance to the hunt, not the hunting methods. Japan noted that its gunners are trained to immediately use secondary killing methods when death has not been instantaneous, and this is the rifle, not drowning. Despite these disturbances the gunners made their utmost efforts to accurately target the whales and, Japan said, their efforts should be praised.

Iceland associated with the views of Japan. Iceland pointed out that under the circumstances in which the data was collected, it could not be considered as representative and therefore could not constitute a basis for discussion at this workshop. Iceland suggested that the only thing achieved had been to extend the suffering of the animals.

Walløe (Norway) recounted some similar experience in Norway with disturbance to its hunt in 1999, where both the deployment of the harpoon and the use of secondary methods was affected. This resulted in extending the TTD by 5 minutes. Norway referred to earlier discussion of IWC/58/WKM&AWI 13 and said that data used here could not be used in this paper as this was not TTD or IDR information. Norway also re-stated the point previously made concerning reference to a secondary publication rather than the original publication. Other issues concerning statements made in the paper and validity of analyses were made by Norway and it was agreed that such discussions would continue outside of the workshop.

Sweden sought information from Norway on any experience it might have in using the rifle as a back-up in situations where the animal's head is underwater. Øien (Norway) responded that this is always a difficult situation but the recommendation is that if the animal comes to the boat and the head is not out of the water to fire at the heart. This is not a usual situation for the hunter however, who is trained to shoot at the brain. Norway stressed that it is however only an assumption that this is the best method but it has not been proven.

The Chair closed discussion of this paper at this point.

4.4 Euthanasia of stranded or entrapped cetaceans

IWC/58/WKM&AWI 10 (Euthanasia of stranded cetaceans in New Zealand)

New Zealand noted that this presentation was prepared in response to a request from the Secretariat. New Zealand has reported to the Commission on the euthanasia of stranded cetaceans on previous occasions. No new techniques have been developed recently, but New Zealand is very willing to share its experiences with other members and hoped that the information will inform the workshop, and in particular inform point 4 of Revised Action Plan.

Due largely to its location and topography, New Zealand experiences many whale strandings, and maintains a database that goes back to 1840. Strandings are a very high-profile event in New Zealand, and often result in a significant public response, involving up to several hundred people. The Department of Conservation is the government agency charged with the management of whale stranding events, and has developed a Standard Operating Procedure (SOP), to ensure consistency in its response to stranding events. The section of the SOP dealing with euthanasia is attached to the paper, and an electronic copy of the full SOP is available on request.

Also attached to the paper is a report of the euthanasia of 41 pilot whales stranded on Farewell Spit (a site of frequent strandings) on 31 December 2005. Key points of the report, which inform the general approach of the Department of Conservation to euthanasia, are:

- The decision to euthanase stranded whales is not taken lightly; the prospects for the whales, the weather and tidal conditions at the stranding site and public safety are all important considerations;
- Only staff experienced in the use of firearms and trained in the location of target points for placement of a shot that will effect instantaneous death are authorized to conduct euthanasia of stranded whales;
- Only firearms, of adequate power, are used in the euthanasia of stranded whales;
- Crowd management, public safety and the health and safety of the staff engaged in euthanasia are also key issues to be considered in the euthanasia of stranded whales under the Department of Conservation's SOP.

New Zealand reiterated that in its situation and experience, with the exception of sperm whales, the only way to euthanase stranded whales is by shooting. With respect to sperm whales, it noted that it has reported previously on the development of the special Sperm Whale Euthanasia Device (SWED) and that it has not been necessary to deploy the SWED since the last meeting.

Comments and discussion

Øen (Norway) thanked New Zealand for an interesting paper. He noted that Norwegian hunters also attempt to rescue stranded whales and attempts have been made to set up guidelines. A successful refloat is happy news but sometimes difficult decisions have to be made to euthanase and this can result in criticism. The problem however is that some whales cannot be euthanased in the way recognised. He suggested therefore that perhaps reconsideration should be given to the use of the lance which can be an effective killing method if used properly. Øen noted the hundreds of years experience with this method in the Faroe Islands where the method only takes seconds as the spinal column and the cervical artery, which takes blood to the brain, are both being severed. Øen suggested for stranded pilot whales that these techniques could be taught to New Zealand. Denmark, on behalf of the Faroe Islands, offered to provide technical advice to New Zealand.

Argentina requested a copy of the New Zealand protocol which it thought would be useful in the southern right whale stranding network.

IWC/58/WKM&AWI 14 (Consideration of factors affecting time to death for whales following entanglement in fishing gear)

The UK presented this paper which addresses the global issue of cetacean mortality in fishing gear. The death of cetaceans by asphyxiation following entanglement in fishing gear raises serious animal welfare issues. Although the physiological processes related to asphyxiation are relatively well understood from examination of carcasses, there are few data on the time duration over which these processes occur. When attempting to predict a whale's response to entanglement and the likely time to death for a sub-surface entangled animal, there are clearly a large number of unknowns. However, a useful reference point would appear to be the theoretical aerobic dive limit (TADL) as this gives an approximate indication of the time likely to elapse before the animal experiences extensive anaerobic respiration. The minke whale is the large whale species most frequently reported as bycatch.

The study reviewed minke whale diving behaviour and estimated the likely TADL in relation to body size. Minke whales typically exhibit a pattern of a long dive followed by several surfacings at shorter intervals. Typical times for extended dives in minke whales appear to be around 2-5 minutes. Although many diving species appear to regularly exceed their TADL, the *Balaenopterid* whales show much shorter dives than either TADL or predictions of dive times based on body mass. However, there have been reports of *Balaenopterids* that found themselves in life threatening situations showing dive times slightly in excess of TADL and one report of an entangled minke whale surviving submerged for 17 minutes as it was being freed from a fish weir. For minke whales with body lengths in the range 3m and 8m we estimated TADL to be between 8 and 16 minutes. These values are also similar to predicted maximum dive

times based on size based regressions across a range of diving species. Although minke whales would be unlikely to die of asphyxiation in a shorter time than TADL, given the typically short dive durations of this species it seems possible that death could occur within minutes of reaching TADL. On the other hand, it is also possible that death may only occur at some multiple of TADL.

The UK hoped that these figures may at least provide a guide for consideration of gear modification designs, disentanglement programmes or as a last resort, euthanasia of fatally entangled whales.

Comments and discussions

The issue of whether there is a case to consider how nets might be made more visible to avoid entanglement was deferred for possible consideration in a later agenda item.

5. CRITERIA FOR DETERMINING THE ONSET OF IRREVERSIBLE INSENSIBILITY AND DEATH

The Chair introduced this agenda item, noting the terms of objectives set out in the agenda.

5.1 Review of current criteria and practicality of application

5.1.1 Aboriginal subsistence whaling

Denmark drew attention to the discussion of this matter in IWC/58/WKM&AWI 3 previously presented, and indicated that it had nothing further to add under this item.

The USA reported that the Makah Tribe's harvest methods retain all of the ceremonial aspects of the spiritual, physical, and mental preparations required for a traditional Makah whale hunt. The substitution of a high calibre rifle over the traditional killing lance is necessary to ensure a safe and humane harvest and eliminates a prolonged pursuit. The whale harvested in 1999 using this method expired 8 minutes following the initial harpooning. Cessation of movement was used as the indicator that the whale was dead. Time to death was recorded by both hunters and by a government observer. By using the cold harpoon for the initial strike and following it immediately with close-range, accurate shots directed at the central nervous system from a high calibre rifle, the Tribe was able to quickly dispatch the whale and limit damage to subsistence products.

The Russian Federation said that the Statement on Behalf of Aboriginal Subsistence Whaling Countries presented at the beginning of the Workshop contained a good summary concerning this point. In discussions on time to death in the ASW caucus, it was agreed that from a practical standpoint, the 1990 IWC indicators of death were accepted. It was however noted that each aboriginal subsistence hunter may assess them differently. Several differences between hunts, including differences in environmental conditions, species hunted, and equipment used were noted. The conclusion was that there are no "textbook" solutions that can apply to all aboriginal subsistence whale hunts. The Russian Federation had nothing further to add to this statement.

The USA (Alaska Eskimo Whaling Commission – AEWC) advised that information concerning indicators is presented in more detail in IWC/58/WKM&AWI 22. The AEWC noted that during its meeting, the Caucus of Aboriginal Subsistence Whaling Countries agreed that time to death in an Aboriginal hunt can only be discussed in terms of estimates and that the practices that lead to these estimates differ from hunt to hunt. It was also noted that these practices differ from captain to captain within a hunting community and even from whale to whale.

The AEWC reminded the Workshop of the treacherous conditions of the bowhead subsistence hunt and emphasised that human safety is every whaling captain's highest priority given the conditions of the hunt and the fact that the hunters are in small boats very close to the large whales, which have been known to dive or turn suddenly. If crews are unable to pull away fast enough, they might be hit with a flipper, in some cases causing injury.

After striking a whale, crews wait for the whale to stop moving and look for indicators that it has died, including relaxation of its flippers and jaw if the jaw is visible. After observing these indicators of death, the overriding concern for human safety dictates that the whale not be declared dead and ready for towing until it has remained motionless for an indefinite period of time, which varies from hunt to hunt and whale to whale and is affected by environmental conditions. Before attaching a tow line to the whale, hunters touch it with paddles and if the eye is within reach, they touch a paddle to the eye. Once the captain decides it is safe to approach and touch the whale for the purpose of attaching a tow line, he says a prayer for the whale. The time from the first strike to this point is called the "Time to Prayer". Hunters know that the whale died sometime during this period, but can never be sure exactly when.

Many captains have observed whales that appear dead and remain motionless for an extended period, some even turning belly up, which later right themselves and resume swimming. If a crew has attached a tow line to such a whale, its boat could be pulled under and the crew drowned. Brower reported a personal situation from a recent hunt in which a whale taken by his crew was given an hour and a half before being declared dead and ready for towing. During butchering, it was found that the explosive projectile had damaged the skull and brain, likely resulting in a very rapid death, although this was not apparent to the hunters under the conditions of the hunt. The AEWC also noted that bowhead muscle tissue might continue twitching for several hours after the whale has been landed and butchered, sometimes scaring younger hunters. Bowheads might be unique in terms of how long they show movement after death, possibly due to a low metabolic rate.

Techniques for reducing time to death have always been part of the bowhead hunt. Firing a second shot from the shoulder gun is automatic to help ensure a quick kill. Crews tend to hunt close to one another so that they are available to assist each other. Traditions reinforce cooperative hunting by requiring that crews who assist in taking a whale be rewarded with a share of the whale. Also, experienced captains identify and learn to target the areas most likely to result in a quick kill. These target areas are discussed during training sessions and annual weapons improvement workshops.

The most important recent development in this hunt is the introduction of the penthrate projectile. The penthrate projectile is considered more reliable than the black powder projectile and in early use appears to provide a more rapid time to death, especially for shots placed within the thorax region.

5.1.2 Commercial whaling

Øen (Norway) gave a description of criteria used in the Norwegian minke whale hunt. The current criteria of death of whales were established in the four day IWC Workshop on Whale Killing Methods in 1980 where scientists from countries including Japan, Norway, USA, Canada and UK participated. The agreed practical criteria identified were: the slackening of the jaw; the slackening of flippers; hanging motionless at the end of the forerunner. If these three criteria are met, or two if the whale is lying on its back (in which case slackening of the jaw could not be detected), the animal is regarded as dead. These criteria are still used in the Norwegian hunt.

In 1992 when Øen started to sample brains from dead whales he found that these criteria were not quite feasible for scientific purposes as several whales were obviously dead before such criteria were fulfilled. The brains of three whales where one did not move and where two showed movement in tail or flippers, were excised and examined by a neuropathologist. The results showed that all three whales had died instantaneously.

In the IWC workshop on Whale Killing Methods in Dublin in 1995 a small working group of experts set up by the workshop agreed with Norway that improved criteria were needed to better establish the exact moment of death for hunted whales. This initiated a research program in Norway with the aim to establish criteria based on post mortem examinations of brains and other organs damaged by the detonation of the penthrate grenade, which could be used for scientific purposes and this was a part of Knudsen's doctoral thesis.

Øen (Norway) stated however, that these criteria could not be used by hunters. They need more practical criteria to decide when a whale can be declared dead. Hunters will always be looking for movements in the animal and if an animal is not motionless most hunters regard the animal as being alive. Involuntary movements caused by reflexes can be understood by scientist but do not “exist” for the hunters and as safety for the hunters is paramount they will shoot another round or wait until the animal has ceased to move before they approach the animal.

Øen (Norway) therefore found it necessary to distinguish between criteria used by scientists and criteria used by hunters. It is more similarities in criteria than differences between the different hunts. Norway’s conclusion is that the criteria established by the IWC in 1980 are appropriate for practical use and recommend to Norwegian hunters that they look for these signs to decide when the whales are dead. If they doubt whether the animal is dead, they are encouraged to fire another round as many often do routinely whether the animal moves or not.

Øen (Norway) added that one consequence of using these practical criteria is that some fraction of the animals that are reported as still alive, are brain dead, so the IDR from the Norwegian hunt is therefore an underestimation.

The Chair asked whether there should be two definitions: one scientific and one for practical use. Japan and Norway both responded that the 1980 criteria are the effective ones and that for practical reasons these should be used.

5.1.3 Whaling under special permit

Japan referred to studies done in 1979 in which 50 minke whales, taken in the Southern Ocean, were subject to ECG, and noted that the heart continues to beat after the brain is dead. This would indicate brain death as the more accurate indicator otherwise the time to death will be an overestimate. However, taking an ECG in whaling operations is very difficult and not practical. There has been past criticism of TTD statistics achieved, but Japan pointed out that it considers JARPA and JARPN data for TTD as an estimate. Japan considered the existing criteria as the most satisfactory and urged that they be maintained. If new criteria is to be introduced, these should be easy for gunners to apply and safe in operating conditions.

5.1.4 Euthanasia of stranded or entrapped cetaceans

IWC/58/WKM&AWI 10, previously discussed, also relates to this item. There was no additional reports under this item.

5.2 Recommendations for revision of existing criteria or addition of alternative criteria as appropriate

IWC/58/WKM&AWI 24 (Thermography of respiratory activity in cetacean)

This presentation was made by the UK (Butterworth). The paper presented describes thermography of the thermal energy carried in water droplets in the cetacean exhaled ‘blow’ as a tool which may add objective data on respiratory activity in cetacean. Butterworth explained that when the seawater in which whales live is very cold, there is potential for a significant contrast between core body temperature and seawater temperature. At the core body temperature of a whale, thermal energy in the infrared part of the spectrum is emitted. Using a thermographic camera images of the thermal energy emitted by the warm body of a whale can, in principle, be captured.. However, this is usually not possible for two reasons: whales and dolphins are, for the most part, immersed in sea water and whales in good condition are well insulated by a thick layer of blubber which may account for 40% of the animal’s weight. Butterworth described how in this work, the use of thermal energy emitted by the thermal emission from the respiratory blow of cetacean at the Sea World facility in San Diego, USA has been explored. Additionally, thermal recordings of the ocular temperature of three species of captive whale were examined.

Butterworth suggested the study of the difference in the measured temperature of the surface of the eye and the skin of the area surrounding the eye indicated that a consistent differential between these temperatures can be shown. It is proposed that, as with other animals, after blood circulation has stopped, the surface of the cetacean eye will cool very rapidly, particularly if in contact with seawater.

Time to death (TTD) is an established measure in the IWC deliberations on the efficiency of killing and welfare considerations for these animals. Butterworth reported that these initial studies confirm that thermal imaging of the small amounts of heat energy which escape the whale in the spout, and via the surface of the eye is possible. He proposed that thermal imaging may be able to differentiate between an animal which is vital and one which is dead. The change from 'vital' to the 'dead' state marks the time of death, and could be used to calculate the time it took the animal to die, the TTD.

Butterworth concluded that thermography may have the potential to:

- Permit remote measurement of respiratory frequency in cetacean, particularly in very cold seas
- Add information to the decision as to whether a hunted animal is vital, or if it is dead. This information may be of value in discussions on humane killing within the IWC.

Lastly, a number of limitations were acknowledged: the work was carried out under ideal conditions on captive small, toothed whales; although the transfer of heat to the blow is likely to be universal amongst all species, the technique would need to be tested in baleen whales before it could be concluded that the tests are universally applicable; and, to confirm the hypothesis that thermography could provide information on value in determining consciousness and death would require further study on animals during whaling activity.

Comment and discussion

Japan commented on similar work done to assess the body temperature of a sea lion using a similar technique. Whilst the eyeball of a sea lion can reflect internal body temperature, the restraint in using such a method is that the target area is very limited. Noting the suggestion of Butterworth that it might be possible to ascertain from the temperature of the eye whether the animal is dead or not, Japan asked whether the temperature of the eyeball decreases rapidly when the animal dies and does any change in temperature indicate whether the animal is unconscious or not. Butterworth agreed that the temperature of the eyeball decreases rapidly at death, but just how rapidly it falls was unclear. On the second question, Butterworth said that without carrying out studies, it was not possible to answer whether a decrease in temperature could be an indicator of unconsciousness. Japan suggested, if this research does continue, to look further at ways of measuring unconsciousness of the animal using such techniques.

Norway suggested that the proposal was not very practical and added that it would not be permitted to keep alive or potentially alive animals for scientific purposes during the hunt. Butterworth agreed that animals should be dispatched swiftly and not kept alive during any hunt. He made the point though that some of the debate during the workshop had been about scientific data and ideas for obtaining useful data should not be dismissed out of hand. He emphasised that remote sensing is being proposed and there is no suggestion of attaching devices to animals, nor that this study be done in the Norwegian commercial hunt. This proposal only involves pointing the remote sensing camera at animals in some real situations and testing if any useful information can be found.

IWC/58/WKM&AWI 9 (Investigating criteria for insensibility and death in stranded cetaceans in New Zealand)

New Zealand introduced this paper which provides a suggested next stage in developing better indicators of insensibility and death in cetaceans. A draft protocol for collecting data has been developed, using indicators which were considered to have the best potential value at workshops held in NZ and UK in 2005, that may be of value in determining death and insensibility in stranded cetaceans, taking into consideration the practical constraints of the stranding situation. As well as addressing the aims of Action Point 5 of the Revised Action Plan on Whale Killing

Methods, it is also intended that this research may provide some useful insights into the management of stranded cetaceans. The paper provides the details of the draft protocol (instructions on how to collect the data) and also a draft data collection form. It is intended that the protocol will be a work in progress and will first be tested in NZ over the coming year and will then be further developed. A key theme is that the collection of these data should in no way compromise the care of the stranded cetaceans nor compromise human safety. For this reason collection of these data will only be undertaken in New Zealand by individuals authorised by the Department of Conservation. New Zealand welcomed comments on the draft protocol and possible collaborative efforts to collect these data in other locations.

Comments and discussion

Finland asked a number of questions concerning the draft protocol. In responding to Finland's question as to how the animals would be selected, New Zealand first reminded of the 2 caveats mentioned in the presentation: that collection of data should not compromise the care of the stranded cetaceans nor compromise human safety, which are important in this respect. New Zealand explained that it is attempting to get animals in various states of morbidity. With respect to ongoing review, the protocol is only in a draft form at present, but the intention is to finalise it. The reason why information on weather conditions is included for collection in the draft protocol is for analysis purposes to assess whether any external factors may be affecting the information received.

6. SUMMARY OF RECENT ADVANCES & OUTSTANDING ISSUES, AND DEVELOPMENT OF RECOMMENDATIONS

6.1 Advances and outstanding issues

The Chair proposed that the whaling groups be invited to provide input as to what each saw as significant improvements in the last 5-10 years and also what they identified as remaining problem areas. Other delegations would also then be invited to add their comments and perspectives.

6.1.1 Aboriginal subsistence whaling

The USA asked Eugene Brower to speak on behalf of the AEWC. Brower noted that the AEWC has reported to this Workshop and to the IWC Working Group on Whale Killing Methods each year since 1987 on the development of the penthrate projectile for use in the hand-held darting gun, and the redesign of the darting gun barrel to fit the new projectile.

Advances: Since the last WKM Workshop, field trials of the penthrate projectile in the Alaskan bowhead hunt have been completed. The AEWC Weapons Improvement Program Committee has instituted a training and certification program for use of the new projectiles. Training and certification of Barrow hunters is ongoing, and has occurred in three other villages.

Outstanding issues: The AEWC noted, however, that at this time, its opportunities for continued success with this new equipment is dependent on forces not fully within their control, for two reasons. First, the Norwegian manufacturer of the penthrate projectiles reports that a critical component of the time delay fuse has become unavailable. An easily substituted part is available in France. However, export of the part from France has not been allowed. Second, the cost of purchasing and transporting the modernised equipment is prohibitive. A single penthrate projectile currently costs just under \$1,000, far beyond the means of the subsistence whaling captains. Government funding is not adequate to cover the cost of equipment as well as transport to all villages. The cost of travel for training and certification in the villages also is unfunded.

In concluding, Brower expressed the AEWC's commitment to its weapons improvement program and pride in reporting their progress. The ability however to achieve further progress in this program is beyond its control.

Øen (Norway) elaborated on the situation with respect to the failure to obtain from France permission to export to Norway the required component. This refusal had been on the grounds that whaling is an illegal activity. After discussions within the IWC in 2005, the French Government had said it would re-consider the request, but the seller has now been told that it will not get permission. Norway observed that by such actions, France appeared to be acting contrary to the call by the IWC for members to provide practical assistance. Japan subsequently suggested that this matter might be taken up as a recommendation from the Workshop.

Returning to this issue later in the discussion, the UK expressed concern that the discussion appeared to be touching on matters of national sovereignty, and noted that France was not present. It therefore urged that caution be taken. Denmark suggested some reflection on the implications of the French decision. If the required part is not secured then either the TTD will escalate or the penthrate harpoon cannot be used. Nevertheless, there is still a need for whales. The concern therefore should not just be for national sovereignty, but also for the welfare of the whales themselves. Japan noted that a precedent already exists in the IWC for recommending things to national governments.

Although not present at the time of this discussion France returned to this issue of the exportation of components needed to make harpoons for whaling from France to Norway at a later stage in the meeting. At this time, the representative of France reported that his government was provided with inadequate information to make an appropriate decision. France stated that its support of aboriginal subsistence whaling is a longstanding position, but France considers this issue is not a decision about animal welfare. France said that this is a sovereign trade issue, outside the competence of the workshop and the IWC, which can be dealt with on a bilateral level,

The Chair then invited Greenland, on behalf of Denmark, to outline their advances and outstanding issues.

Advances: Greenland recalled that the Action Plan on Whale Hunting Methods was implemented in 1991 and has been followed up by adjustments as needed until today. Furthermore, Greenland actively participates in the whale killing issues workshops arranged by NAMMCO, besides its own initiatives in Greenland. It affirmed that the issue of whale killing has always been a focus area and will continue to be so in the future. Points noted were:

- Greenland sought advice from Norway in the late 1980's and early 90's regarding the renovation of Norwegian Kongsberg harpoon cannons that were in Greenland. These cannons were very old and neglected. The contact with Norway and Kongsberg resulted in a total overhaul of all harpoon cannons at that time and standardized harpoons.
- Advice had been sought from Norway at the same time regarding the use of penthrate grenades.
- The Action Plan on Whale Hunting Methods has secured well functioning and fully effective harpoon cannons, and the introduction of Norwegian penthrate grenades.
- Hunters, administrators, distributors, personnel in shipyards and wildlife officers have been directly or indirectly involved in all parts of the Action Plan.
- A plan for continuous training on handling and use of penthrate grenade and harpoon cannons has been set.
- Methodical collection of information regarding TTD, struck and lost rates, biological data and catch statistics has been initiated.
- Every year, relevant information on whale killing issues has been submitted openly to the IWC and NAMMCO
- Every year, Greenland has contributed to the planning of and directly participated in all workshops and meetings related to whale hunting methods both in IWC and NAMMCO.

Greenland concluded that the introduction of the Action Plan has resulted in a reduction of TTD and a more effective hunt.

Outstanding issues: The outstanding issues in Greenland as identified and mentioned in many earlier meetings in the workshops and working group meetings are:

- TTD in the collective hunt on minke whales
- Standardising the hunters routines and practices in collective hunt
- TTD in the fin whale hunt
- Struck and lost issue
- More detailed instruction to the hunters on the target areas in order to reach a quicker kill / shorter TTD and a reduced struck and lost rate.

In reply to a question from the UK as to whether there is any opportunity to use a higher calibre rifle in East Greenland, Denmark explained that the regulations used in East Greenland are the same as those used in West Greenland and these specify that the minimum size is 7.62mm. It noted that the experience of the hunters is that the use of higher calibre rifles can lead to the sinking of the whale and thus result in an increased struck and lost rate.

The Russian Federation introduced two speakers. Firstly, the representative of the Chukotkan Native Peoples stated that their aim is to improve methods and make the hunt more effective. Every year for the last several years, seminars on training and other issues have been held. In these, experienced hunters come into the villages to give on-site training programmes. He noted that good hunting methods and efficiency are dictated by the quality of the equipment. They try therefore to keep the equipment maintained and upgraded. In this respect also the government of Chukotka has assisted with boats, equipment and firearms, but it is not possible for it to do everything so difficulties for the hunters continue. Aboriginal hunting needs to ensure hunter safety and that the hunt is conducted in an orderly, organised manner.

The representative of the Chukotkan Government reported that his government places much attention on the maintenance of traditional hunting. To this end, and in spite of its difficult economic situation, the provincial government has established a project and budget to support marine mammal hunting in the region and provide the necessary equipment. The first priority is hunter safety. This is a multi-year project, as it is not possible to buy at once all the boats, rifles, radios, GPS etc required for everyone involved in marine mammal hunting. There is involvement in international programmes including those of both IWC and Arctic Council. The representative thanked the USA, Japan, Norway and Netherlands that have provided them with technical and financial assistance.

The Russian Federation then reminded Workshop participants of the resolution adopted at the meeting in Grenada concerning increasing the humaneness of aboriginal hunts. Consistent with the resolution, grant assistance had been provided for improvements in aboriginal hunts, but not necessarily by those proponents of the resolution. The Russian Federation hoped therefore that those countries that have in this Workshop expressed interest in more humane killing methods being implemented, especially the use of larger calibre rifles, will also provide technical support to facilitate this.

6.1.2 Commercial whaling

Øen (Norway) presented the recent improvements in Norwegian minke whale hunting and killing methods. Details are given in IWC/58/WKM&AWI 25, presented earlier. The improvements were summarised in the following points -

Technology:

- A new penthrite grenade with 30g penthrite (Whale grenade 99) has been used by all vessels from the 2000 whaling season. The grenade is safer for the users and more effective to kill minke whales.
- Development of improved weapons technology and maintenance for harpoon cannons
- Optical sights are installed on most harpoon guns
- Improved harpoons with better ballistic properties to improve marksmanship and reduce losses.
- Improved harpoon lines with better ballistic properties to improve marksmanship and reduce losses
- Established minimum calibres and prescribed ammunition for back-up rifles

- Improved hunting techniques and practice
- New and more exhaustive control of grenade production and approvals

Education of hunters:

- Formalised and obligatory workshops for hunters and gunners
- Obligatory shooting tests for rifle and harpoon cannon
- Certification of gunners and riflemen

Research:

- Two doctoral theses defended for the veterinary doctoral degree on whale killing issues
- Development of new and improved techniques for post mortem examinations of brains of whales to help to establish the real time to death of whales killed with the Norwegian penthrite grenade.

6.1.3 Whaling under special permit

In terms of advances, Japan emphasised the importance of the introduction of the improved Japanese penthrite grenade in 2002-2003. This improvement has resulted in a reduction of TTD to within 2 minutes and an increase in the IDR to over 50%. With respect to safety, the Institute of Cetacean Research (ICR) and others have conducted training programmes for the crews. Emphasis has been both on procedures for safe operation in the handling of the equipment and in the safety of the equipment itself. There has been no record of fatal accidents in the Japanese research (JARPA and JARPN). ICR and others have also conducted a lecture on the killing methods just before every research cruise.

Iceland reported that it is halfway through its research programme, which involves 200 whales. The Norwegian penthrite grenade is used. The UK observed the difficulty in ascertaining or evaluating advances when so little data for this hunt is available. In response, Iceland pointed out that any submission of data on TTD will be done on a voluntary basis, but that at present it has not taken a sufficient number of whales for meaningful statistical research or evaluation. In the spirit of good cooperation and transparency Iceland will provide its data when available so that it can be shared with others and discussed on a scientific basis with the aim to improve whale killing methods. However, due to concerns at the way data provided in the past has been used in the Working Group on Whale Killing Methods and Associated Animal Welfare or interpreted, Iceland has not yet determined to which international fora it will transmit its data.

6.1.4 Stranded and entrapped cetaceans

No further comment.

6.2 Recommendations for improvements

IWC/58/WKM&AWL 7 (Comprehensive and standardised data on whale killing: welfare consideration)

A short presentation of this paper was made by New Zealand, which began by thanking all the whaling countries for their participation and input into the Workshop. New Zealand noted the importance of complete data in assessing animal welfare implications. The Russian Federation was commended for supplying the most comprehensive data set, but New Zealand noted that most of the data sets supplied to the 2005 working group were not complete. The paper also notes that summary statistics (such as mean and median) mask the outliers in the data set, which are important in welfare terms. New Zealand urged all members to collect comprehensive welfare data for each whale killed and to submit to the IWC complete data sets, using the IWC standardised format.

The UK supported the New Zealand proposal, adding that this meeting has revealed the need for comprehensive, consistent and accurate data and it is very hard to make meaningful analysis without such data. The New Zealand paper provides a disappointing list of areas where data has failed to be provided. It has been suggested by some countries that

they are reluctant to provide data because it will be used against them. However, withholding data puts this organisation in a poor light. It must surely be best international practise to have accurate and consistent data on all whaling operations; it is no excuse to argue that the sample is too small or will be used against you. The fact that some whaling countries are so reluctant to release data does not bode well if there is ever a return to commercial whaling, particularly in view of the sorry history of IUU whaling.

The UK continued that not only is there a reluctance to share information, there has also been a threat to provide this data to another, un-named, organisation. The IWC is the internationally recognised body responsible for whales and whaling. The UK said it could not see what purpose it would serve to give data to another organisation that will not have the same authority or expertise to analysis this data. There is a certain irony in countries bemoaning the polarisation of the IWC and then contributing to this by threatening to send data elsewhere. Lack of transparency cannot be the way forward for any international organisation, it is only with sufficient data in a recognised format that whale killing methods can be improved.

Norway noted that it has submitted data on TTD and IDR on a voluntary basis since 1982. And since 1992 about 25 extensive reports and papers published in scientific journals have been submitted to IWC. Regarding the questionnaire, Norway answered that it has no status in the IWC. It does not find the questionnaire useful and see no reasons to use it as a direct comparison of so different hunts on different species under so different conditions. It also stated that the data submitted from Norway on a voluntary basis are collected for scientific purposes and will be available also through publications and scientific periodicals.

It is Norway's position that individual IWC member states should be trusted to address animal welfare issues in terms of their own national legislation. To the extent that institutionalised inter-governmental co-operation on these matters should be called for, this may be handled through other mechanisms than the IWC and by more appropriate agencies. A crucial element is the rights and responsibilities of the respective national authorities in addressing animal welfare issues humanely and in accordance with generally accepted norms and standards. Unless this element is properly understood and accepted in a spirit of mutual confidence, questions could arise that could conceivably be experienced to be embarrassing. Thus, for example, some member states of the IWC have approved hunting practices which are in accordance with Norwegian animal welfare legislation. However, in the profession of veterinary medicine where animal welfare is an integrated discipline, it is not customary to seek to overrule the killing methods used by other nations as long as it occurs within their domain and under their jurisdiction. It is also common practice that once a given killing method has been introduced and approved on the basis of careful professional scrutiny, there is no need for a continuous monitoring of the kind proposed in document 7. Periodic checks should suffice. The duties of an international observer with regard to the monitoring of the killing of whales would be to check that only lawfully approved killing equipment and methods are used. Which methods are to be used at any given time would be decided by the competent national authorities. Post mortems and other detailed examinations of the animals requiring specialised expertise would in this context be of no relevance for the tasks of an observer.

Iceland stated that its position is very similar to that of Norway, and associated itself with Norway's comments.

Workshop Recommendations

The Chair reminded participants of the terms of reference and task for this item. He identified some key considerations and issues, particularly those of a practical nature, identified during the workshop. Proposals of recommendations were received from a number of countries (UK, Norway, Finland, Switzerland, Sweden and New Zealand). Following consideration and debate, the following recommendations were adopted by the Workshop:

1. To encourage continued efforts in training and dissemination of good practice around the world, for example in promotion of, and further investigation of, the use of heart shots from back up rifle where the head of the animal is under the water.

2. Recommend the best possible type and calibre weapon is used in aboriginal subsistence whaling and continue weapon technology improvement for use in aboriginal subsistence whaling with particular focus on calibre of weaponry. Encourage the development of the aboriginal subsistence whaling caucus to further the exchange of information and best practice.
3. Recommend continued efforts to improve accuracy of placement of primary and back-up shots, to continue improvements towards achieving instantaneous death.
4. Recommend continuing efforts to improve back up/secondary killing methods. Recommend that governments continue to support their scientists and vets in studying welfare aspects and monitoring, evaluating and improving welfare techniques, and to publish the data.
5. Member countries of the IWC exchange information on methods for dealing with entrapped, entangled and stranded cetaceans, drawing on the domestic protocols of member countries; and to review the methods used to euthanase cetaceans at sea when entangled in fishing gear or marine debris.
6. When using explosive devices, for welfare reasons whales should whenever possible be shot from the side at the thorax or neck and all animals should if possible be hauled in as fast as possible to control if the animal needs to be re-shot.
7. When using the rifle as back-up, the recommended target areas are the brain, upper neck and in emergency situations possibly the heart.
8. As a precaution, the hunters should be recommended to re-shoot as a routine any animals that move or in other ways show any signs of life.
9. Recognise the importance of hunter training for the improvement of hunters' safety, animal welfare and minimising struck and lost rate.
10. Recognise the importance of maintaining weapons and hunting gear.
11. Encourage in two years time when progress can be assessed, consideration of the holding of a further scientific and technical Workshop.

6.3 Other recommendations

Walløe recalled that the terms of reference for the workshop had included consideration of relevant comparative data from the killing of other large animals. He recalled discussions during previous workshops asking countries to submit for comparison purposes data from the killing of other large animals. He regretted that such data had not been provided to this workshop and again reiterated this request.

7. OTHER MATTERS

The North Atlantic Marine Mammal Commission (NAMMCO) observer made a statement regarding its work that might be of relevance to the workshop.

The observer noted that NAMMCO is comprised of the Faroe Islands, Greenland, Norway and Iceland and is a competent regional management body for marine mammals in the North Atlantic in accordance with the generally accepted principles of the 1982 United Nations Law of the Sea. NAMMCO therefore stated it is not correct as has been stated in this workshop, that IWC is the only competent management body for large whales in the world.

The NAMMCO observer then outlined the organisation's aim and purpose - ensure efficient conservation and sustainable utilisation and development of these resources - and the method of operation - based on the best available scientific results and taking into account the knowledge and experience of the people dependent of these animals.

A Committee on Hunting Methods was established in 1994 to provide advice on hunting methods. Advice should be given based upon best scientific findings, technological developments and traditional or user knowledge. Due considerations must be given emphasis to hunters safety and efficiency of utilization. The NAMMCO observer gave details on a number of workshops organised under the auspices of the Committee on Hunting Methods which have generated open discussions and recommendations on issues such as hunting techniques and equipment that are applicable on a local level (under different seasons and conditions), struck and lost, hunters training and safety, and minimising animal suffering. The workshops are open to all and the latest was attended by eleven countries.

Attention was also drawn to the recent development of guidelines to test the efficiency of rifle ammunition used for hunting and euthanasia of small whales. More information on this and other NAMMCO projects are given on the NAMMCO website *www.nammco.no*.

8. REVIEW OF THE REVISED ACTION PLAN

The Workshop did not have time to review the 2003 Revised Action Plan on Whale Killing Methods.

9. ADOPTION OF THE REPORT

The report of the Workshop on Whale Killing Methods and Associated Welfare Issues was adopted on 15 June 2006.

Appendix 1 List of Participants

Antigua & Barbuda
Tricia Lovell

Argentina
Miguel Iniguez
Javier Figueroa

Australia
Conall O'Connell
Virginia Mudie
Gillian Slocum
Zena Armstrong
Pam Eiser
Phil Tracey

Austria
Andrea Nouak
Michael Stachowitsch

Belgium
Koen Van Waerebeek

Chile
Elsa Cabrera

Czech Republic
Pavla Hycova

Denmark
Henrik Fischer
Ole Samsing
Maj Friis Munk
Fernando Ugarte
Leif Fontaine
Ole Heinrich
Amalie Jessen

Dominica
Lloyd Pascal
Andrew Magloire

Finland
Esko Jaakkola
Penina Blankett

France
Stephane Louhaur
Martine Bigan

Germany
Marlies Reimann
Karl-Hermann Kock

Grenada
Frank Hester
Justin Rennie

Iceland
Ásta Einarsdóttir
Gísli Víkingsson
Kristjan Loftsson

Jon Gunnarsson

Italy
Riccardo Rigillo
Caterina Fortuna

Japan
Minoru Morimoto
Joji Morishita
Jiro Hyugaji
Ryoichi Nakamura
Hidehiro Kato
Hajime Ishikawa
Yoshihiro Hayashi
Midori Ota (I)
Saemi Baba (I)

Republic of Korea
Chiguk Ahn
Zang Geun Kim
Hyun Jin Park

Luxembourg
Pierre Gallego

Mexico
Lorenzo Rojas-Bracho

Monaco
Frederic Briand

Netherlands
Stefan Verbunt
Maaik Moolhuijsen

New Zealand
Geoffrey Palmer
Michael Donoghue
Al Gillespie
Indra Prasad
Philipa Brakes
Craig Johnson

Norway
Halvard Johansen
Anniken Ramberg Krutnes
Hild Ynnesdal
Egil Ole Øen
Jan Birger Jørgensen
Siri Knidsen
Lars Walløe

Portugal
Marina Sequeira

Russian Federation
Valentin Ilyashenko
Rudolf Borodin
Igor Mikhno
Gennady Inankeuyas
Nikolai Etyne

Vladimir Etylin
Alexey Ottoy
Edward Zdor
John Tichotsky (I)
Olga Ipatova (I)

Saint Kitts & Nevis
Joseph Simmonds

Saint Lucia
Jeannine Rambally

Saint Vincent and The Grenadines
Raymond Ryan
Sophia Punnett
Lucine Edwards

South Africa
Herman Oosthuizen
Luyanda Antony

Spain
Carmen Asencio
Santiago Lens
Renaud De Stephanis

Sweden
Bo Fernholm
Stellan Hamrin

Switzerland
Bruno Mainini

UK
Trevor Perfect
James Gray
Jenny Lonsdale
Mark Simmonds
Edward Varley
Andy Butterworth
James Kirkwood
Russell Leaper
Vassili Papastavrou
Ruth Thirkettle

USA
William Hogarth
Doug DeMaster
Cheri McCarty
Roger Eckert
Emily Lindow
John Field
Heather Rockwell
Bob Brownell
Greg Silber
Craig George
Harry Brower
Keith Johnson
Nate Pamplin
Eugene Brower

Appendix 2
List of Documents

IWC/58/WKM&AWI	Agenda item
1 Revised Draft Agenda	
2 List of Documents	
3 A note regarding information encouraged in the IWC Resolution 1999-1 for the Greenland catch of 2005 (submitted by the Greenland Home Rule Government)	4.1 & 5.1.1
4 Report on improvements in ASW in Greenland (submitted by the Greenland Home Rule Government)	4.1
5 Status for Greenland Action Plan on Whale Hunting Methods (submitted by the Greenland Home Rule Government)	4.1
6 Summary of activities related to the Action Plan on Whale Killing Methods (submitted by the Greenland Home Rule Government)	4.1 & 5.1.1
7 Comprehensive and standardised data on whale killing: welfare considerations (submitted by the Government of New Zealand)	4
8 Killing whales under Special Permit: the special case of the fin whale (submitted by the Government of New Zealand)	4.3
9 Investigating criteria for insensibility and death in stranded cetaceans in New Zealand (submitted by the Government of New Zealand)	5.2.4
10 Euthanasia of stranded cetaceans in New Zealand (submitted by the Government of New Zealand)	4.4
11 A review of recent research on Norwegian whaling (submitted by the Government of the UK)	4.2
12 A review of a Norwegian whale hunt (submitted by the Government of the UK)	4.2
13 Immediate immobilisation of a minke whale using a grenade harpoon requires striking a restricted target area (submitted by the Government of the UK)	4.2
14 Consideration of factors affecting time to death for whales following entanglement in fishing gear (submitted by the Government of the UK)	4.4
15 A review on the technique employed by the Makah Tribe to harvest gray whales (submitted by the USA)	4.1 & 5.1.1
16 Summary of activities related to the Action Plan on Whale Killing Methods (submitted by the Government of the Russian Federation)	4.1 & 5.1.1
17 Whale killing methods and associated welfare issues in Greenland (submitted by the hunter's organisation and the Ministry of Fisheries, Hunting and Agriculture, Greenland Home Rule Government)	4.1
18 A novel method for in situ fixation of whale brains (submitted by the Norwegian Government)	5.2
19 Blast-induced neurotrauma in whales (submitted by the Norwegian Government)	5.2
20 A review of the criteria used to assess insensibility and death in hunted whales compared to other species (submitted by the Norwegian Government)	5.2
21 Assessment of insensibility and death in hunted whales (submitted by the Norwegian Government)	4.2
22 Report on weapons, techniques and observations in the Alaskan bowhead whale subsistence hunt (submitted by the USA)	4.1 & 5.1.1?
23 An independent review of the efficacy of killing methods of Antarctic minke whales (submitted by Australia)	4.3
24 Thermography of respiratory activity in cetacea (submitted by the UK)	5.2
25 Norwegian minke whaling. Research to improve hunting and killing methods for minke whales in Norway (submitted by the Norwegian Government)	4.2 & 5.1.2
Other	
IWC2003 Revised Action plan on whale killing methods from 2003 Whale Killing Methods and Associated Welfare Issues 2003	8

Appendix 3
Agenda

- 1. INTRODUCTORY ITEMS**
 - 1.1 Appointment of 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 WHALE HUNTING/EUTHANASIA PRACTICES, IMPROVEMENTS SEEN AND REMAINING PROBLEM AREAS**
 - 4.1 Aboriginal subsistence whaling
 - 4.2 Commercial whaling
 - 4.3 Whaling under special permit
 - 4.4 Euthanasia of stranded or entrapped cetaceans
- 5. CRITERIA FOR DETERMINING THE ONSET OF IRREVERSIBLE INSENSIBILITY AND DEATH**
 - 5.1 Review of current criteria and practicality of application in:
 - 5.1.1 Aboriginal subsistence whaling
 - 5.1.2 Commercial whaling
 - 5.1.3 Whaling under special permit
 - 5.1.4 Euthanasia of stranded or entrapped cetaceans
 - 5.2 Recommendations for revision of existing criteria or addition of alternative criteria as appropriate.
 - 5.2.1 Aboriginal subsistence whaling
 - 5.2.2 Commercial whaling
 - 5.2.3 Whaling under special permit
 - 5.2.4 Euthanasia of stranded or entrapped cetaceans
- 6. SUMMARY OF RECENT ADVANCES & OUTSTANDING ISSUES, AND DEVELOPMENT OF RECOMMENDATIONS**
 - 6.1 ADVANCES AND OUTSTANDING ISSUES
 - 6.1.1 Aboriginal subsistence whaling
 - 6.1.2 Commercial whaling
 - 6.1.3 Whaling under special permit
 - 6.1.4 Stranded and entrapped cetaceans
 - 6.2 RECOMMENDATIONS FOR IMPROVEMENTS
 - 6.2.1 Aboriginal subsistence whaling
 - 6.2.2 Commercial whaling
 - 6.2.3 Whaling under special permit
 - 6.2.4 Stranded and entrapped cetaceans
 - 6.3 Other recommendations
- 7. OTHER MATTERS**
- 8. REVIEW OF THE REVISED ACTION PLAN**
- 9. ADOPTION OF THE REPORT**

Appendix 4

Statement of Aboriginal Subsistence Whaling Countries for IWC/58/WKM&AWI Workshop

My name is Harry Brower and I am Chairman of the Alaska Eskimo Whaling Commission. I was asked to present a statement on behalf of several aboriginal subsistence whaling countries.

On June 10, 2006, aboriginal subsistence whalers from the countries of Denmark on behalf of Greenland, the Russian Federation and the USA met for a historic first-time meeting to share information on whale killing methods and animal welfare issues. The meeting participants consisted of the Organisation of Fishermen and Hunters in Greenland, the Association of Traditional Marine Mammal Hunters of Chukotka, the Alaska Eskimo Whaling Commission and the Makah Whaling Commission. On behalf of these groups, we would like to thank the organising committee of the IWC Workshop on Whale Killing Methods for recognising the need to involve the aboriginal subsistence hunters in the workshop and their recognition of the need to seek practical solutions in advancing the recommendations of the workshop.

We unanimously agreed that in our communities, subsistence whaling is a critical activity; providing food for nutrition and serving to reinforce and maintain our cultural identity. As subsistence hunters, our traditions and our concern for other living creatures dictate a rapid and humane death for the whales we hunt. The most highly respected hunters are those who can take a whale quickly, humanely and efficiently. This also serves a practical purpose since the more quickly a whale can be taken, the less chance it will be lost. Finally, we recognise and agree that in all hunting situations human safety must be given first priority.

We agree to four major points affecting each aboriginal hunt:

1. Subsistence hunting is for food to meet cultural and nutritional needs. It guarantees the sustainable survival of the Native people. The human health of our peoples depend on the consumption of traditional marine mammal products.
2. The safety of his crew is a whaling captain's most important responsibility. For example, in the past 5 years, annually from 1 to 6 hunters collectively have died in the Chukotka Native and Alaska Eskimo hunts.
3. With safety assured, achieving a humane death for the whale is the highest priority.
4. Efforts to modernise our whaling equipment and practices can be made only within the context of each communities' economic resources and the need to preserve the continuity of our hunting traditions.

As aboriginal subsistence whalers, we welcome the opportunity to consider incorporating more technologically advanced equipment into our traditional hunts. As we consider these opportunities, we also find that they present us with challenges. We each come from small communities with limited economic resources. Therefore, acquiring more expensive, modern equipment can prove difficult if not impossible. It is also important to be aware that innovations in our hunting techniques must be consistent with our traditional equipment and practices, or we risk losing the very culture we are working to conserve.

Training in whale hunting methods is a critical aspect in continuing the traditional subsistence whale hunt. All aboriginal groups spend significant resources and time on training. Training guarantees efficiency, safety, and transfer of traditional knowledge from the older generation to the younger generation.

In discussions on time to death, we agreed that from a practical standpoint, we accept the 1990 IWC indicators of death which include: open jaw; slack flippers; and cessation of movement which also are consistent with our traditional indicators. However, each aboriginal subsistence hunter may assess them differently. We noted several differences among our hunts, including differences in environmental conditions, differences in the species we hunt, and differences in the equipment we use. There are no "textbook" solutions that can apply to all aboriginal subsistence whale hunts.

We also noted similarities in that all aboriginal subsistence whalers show respect for the animal. As whaling captains, each of us gives greatest priority to the safety of our crew members. Once a whale is struck, we look for indicators that the whale has died, but we recognise that these are just indicators and are not guarantees. So each captain, to protect his crew, gives the whale an additional amount of time based on his experience and judgement. Therefore, when asked to report the time to death, the best we can offer is an estimate.

In summary, we benefited from this opportunity to talk and learn about each other's hunting methods and found many similarities. We noted differences in environmental conditions and cultural traditions of our hunts. But, it is clear that within each of our cultures, achieving safe, humane and efficient harvest methods is the most important goal of our subsistence hunts provided that it is economically viable and consistent with our traditions.