

Hunted

still
Dead or Alive?

A report on the cruelty of whaling

By WDCS, the Whale and Dolphin Conservation Society
& The Humane Society of the United States (The HSUS)

**THE HUMANE SOCIETY
OF THE UNITED STATES**

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Introduction

The high degree of cruelty inherent in whaling has long been recognised as one of the most potent arguments against its continuation and, more recently, against the lifting of the moratorium on commercial whaling. Even in this era of smart technology, the time that a harpooned whale takes to die still ranges from a few minutes to more than an hour. During that time, one can only imagine the pain and fear felt by an animal with an exploded missile embedded in its flesh and attached to a rope preventing its escape. Other methods, including rifles and hand-held non-exploding harpoons, are no better at dispatching a whale or dolphin, and many are much worse. Not surprisingly, considering the strict standards set in most countries for the slaughter of domestic livestock, experts have concluded that ‘welfare standards achieved in current whaling operations ...fall well short of those required in other sectors where animals are slaughtered commercially or killed for scientific research purposes, and would not be tolerated in those sectors’.¹ The chilling reality is that in some instances we cannot be certain, using the currently accepted criteria, that a whale is really dead when it is pulled up onto the flensing deck or even when butchering commences.

This report by WDCS, the Whale and Dolphin Conservation Society, and The Humane Society of the United States (The HSUS) highlights some important issues facing the International Whaling Commission at its 2003 meeting and makes recommendations for those contracting governments that still persist in permitting the hunting of cetaceans (whales, dolphins and porpoises).

It concludes:

- The IWC’s current criteria for determining the onset of death and insensibility in cetaceans are inadequate. There is a risk that some whales may still be alive when pulled up onto the flensing deck.
- The most extensively used whale killing methods do not adequately cater for the wide range of species taken. For example, the same harpoon is used to kill minke whales as sperm whales, which are nearly six times heavier and have a different anatomy. Similarly, if rifles are to achieve a swift kill, the bullets need to penetrate blubber and bone and still provide sufficient energy to the brain.
- The weapons used in both Aboriginal Subsistence Whaling operations and hunts of small cetaceans are inadequate, leading to high struck and lost rates and unacceptably long times to death. For example, it took 180 bullets and 3 hours and 40 minutes to kill a single gray whale in Russia, and belugas caught in Greenland have a struck and lost rate of up to 50%.
- External variables, such as weather conditions, may affect the efficiency of whaling operations to such an extent that the IWC should consider setting closed seasons or areas to take account of seasonal variability in weather conditions.

- The IWC should set ‘strike’ as well as ‘take’ limits for all hunts and should work towards developing struck and lost caps for all hunts.
- The IWC should consider the welfare of hunted whales, not only in terms of the time taken to kill the animal, but also in terms of the extent of wounding during the kill. It should also consider the stress of pursuit, in order to build a more complete picture of each hunt.

Welfare Issues and the IWC

Despite the objection of some whaling nations, the International Whaling Commission (IWC) has well-established legal competence to advance the humane treatment of whales. The 1946 International Convention for the Regulation of Whaling (ICRW), which established the IWC, grants the Commission a specific mandate to consider the “time, methods, and intensity of whaling”² and the “type and specifications of gear and apparatus and appliances which may be used”³. In addition, the Schedule to the ICRW and a number of Resolutions provide a specific list of data that Contracting Governments must collect in whaling operations and provide to the IWC in order for it to review killing methods and make recommendations to improve the welfare of hunted whales.

Since 1959, when the IWC established a ‘Working Party on Humane and Expeditious Methods of Killing Whales’, it has taken numerous steps to ensure that the most appropriate methods are used to kill whales and are based on scientific findings. In 1992, the Commission established an IWC Workshop on Whale Killing Methods – an expert forum that has been re-convened regularly to develop recommendations on equipment and methods, indications of insensibility and death, assessment of cause of death, collection and provision of information on time to death, and assessment of the physiological status of hunted animals.

In June 2003, in Berlin, Germany, the IWC will host its 4th Workshop on Whale Killing Methods. This report reviews the most important issues that this Workshop will address, as well as other concerns that WDCS and The HSUS believe it should consider. These include:

1. Humane killing – what is it and how do you measure it? p3
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By Philippa Brakes and Sue Fisher

Killing Kindly

The Oxford English Dictionary defines a ‘humane-killer’ as an instrument for painless slaughter of animals. During the 1992 IWC Workshop on Whale Killing Methods, ‘humane killing’ of a whale was affirmed by the IWC to be ‘causing its death without pain, stress or distress perceptible to the animal’. Furthermore it was noted that ‘any humane killing technique aims to render an animal insensitive to pain as swiftly as technically possible’⁴.

During the 1999 IWC Workshop on Whale Killing Methods, one expert noted that ‘causing humane death without pain in meat animals usually includes the induction of instantaneous insensibility by stunning’⁵. Instantaneous in this

context is embodied in European Union Legislation⁶ which requires a limit of about 100 milliseconds between stimulus (application of stunning device) and unconsciousness. The figure of 100 milliseconds is based on the pain perception delay of 100 to 150 milliseconds⁷ found in meat animals.⁸

Clearly, modern whaling techniques do not come close to delivering ‘death without pain, stress or distress’. All current whaling methods include a chase and, even in hunts where more powerful killing weapons are used, irreversible insensibility or instantaneous death – the key to a humane kill – is still not achieved in a significant number of cases.

Current whaling methods

Commercial whaling

Following the International Whaling Commission’s ban on the use of the cold (non-exploding) harpoon from 1983, an exploding harpoon was developed for minke whaling and is now the primary killing method employed in all today’s commercial (by Norway) and scientific (by Japan) whaling operations.

‘Hvalgranat-99’, or ‘Whalegrenade-99’⁹, which is manufactured in Norway and exported for use in Greenland and Japan, contains explosive penthrite and is fired from a cannon mounted on the prow of a whaling boat. The harpoon is intended to penetrate to about a foot into a whale and then detonate, creating sufficient energy to kill the whale either by the trauma or laceration, or by the creation of shock waves to the brain. Upon impact, spring-loaded claws are released by the harpoon and embed in the surrounding flesh when the line strains.

The likelihood of the strike killing the whale instantly, or at least rendering it permanently and irreversibly insensible, depends on a number of factors. Hunt-related factors will affect the accuracy of the shot and are dependent on the experience of the harpooner/gunner, the distance from the vessel, speed and direction of the whale, the weather conditions, the angle of the shot and, ultimately, the target area hit. Whale-specific factors, such as the species, size and age of the whale, will determine whether that shot is effective. (See page 6 for further details).

Norwegian whalers aim the explosive harpoon at the whale’s head, or just behind it, which results in a greater number of animals dying instantaneously (79.7% in 2001) and a shorter average time to death (2 minutes and 25 seconds). In contrast, their Japanese counterparts deliberately avoid the whale’s head in order not to damage the fragile “ear-plugs” which they collect as part of the study that supports their claim to be conducting ‘scientific whaling’. A strike to the body of the whale can cause extensive tissue and organ damage, but may deliver insufficient energy to the brain. Japan only achieved instantaneous death in 33% of its minke whale hunts in Antarctica in the 2001/2002 season and an average time to death of 3 minutes and 23 seconds. Since 2000, Japan has expanded its hunts to species much larger than minke whales (Bryde’s whales are at least twice as heavy, sei whales about five times heavier and male sperm whales

are not only nearly six times heavier but have an entirely different anatomy). Despite this wide variation, Japan is believed to use the same size harpoon on each species, but refuses to provide data on the time they take to die.

Once harpooned, the whale is then hauled on the harpoon line to the capture vessel. (In Japan’s ‘scientific whaling’ operations where a factory vessel accompanies the catcher boats, the whale is towed to the factory ship and hauled aboard by its tail). If the whale has not died instantaneously from the first harpoon, a ‘secondary killing method’ may then be employed to dispatch it. In most cases, the secondary killing method is a rifle, but Japan authorises the use of a ‘cold’ harpoon in some instances (and has only recently stopped using electrocution). Section 4 assesses secondary killing methods in more detail.

Aboriginal Subsistence Whaling

A variety of different killing methods are used during Aboriginal Subsistence Whaling (ASW). Penthrite grenades are used to kill minke and fin whales in Greenland. However, in Greenland’s ‘collective hunts’ on minke whales, hunters use smaller vessels and the killing method is the rifle. Many nations have expressed concern that the rifles used in Greenland’s hunts may not be sufficiently powerful and may, therefore, be responsible for some of the long times to death in these hunts (average nearly 20 minutes in 2001 and maximum 50 minutes). Similar concerns have been expressed about the hunting of gray and bowhead whales by the Chukotka people of the Russian Federation. Here whales are first ‘secured’ by firing a harpoon with a number of floats attached into the body (to prevent it from sinking). Then rifles, and sometimes spears, are used to kill the whales. The number of bullets used in these hunts is often excessive – up to 180 in 1999.

The Alaskan Inuit hunt for bowhead whales uses a darting gun. This fires a harpoon with a 35 fathom line with an attached float into the whale to slow it down before further harpoons are fired. In some cases a 7-gauge shoulder gun is also used. Alaskan hunters have recently tested a penthrite grenade designed to be used with the darting gun.

The methods used in the St Vincent and the Grenadines hunt on humpback whales are complex. They can involve the use of a cold harpoon, or darting gun followed by a steel tipped lance, bomb lance, or bomb gun (section 6). Often in these hunts calves are killed in order that a female may be taken.

Front cover picture: © WDCS/Votier

¹ Kestin S C, 1999, Current Animal Welfare Concerns Relating to Commercial and Special Permit Whaling, IWC/51/WK2

² Article V.1. e ICRW

³ Article V.1.f ICRW

² Dead or Alive? A report on the cruelty of whaling

⁴ IWC/44/18SUP, Report of the Workshop on Whale Killing Methods, 1992

⁵ Wotton S, 1996, New advances in stunning techniques for slaughter animals. Meat Focus, December: 461-465

⁶ Anon, 1993, Council directive on the protection of animals at the time of killing, 93/119/EC

⁷ Wotton S, 1996, New advances in stunning techniques for slaughter animals. Meat Focus, December: 461-465

⁸ Madie P, 1999, Incompatibilities of whaling and whale welfare, IWC/51/WK3

⁹ Developed in Norway in 1997-1999, IWC/51/WK9 and IWC/51/WK11

How to measure 'humaneness'?



Currently the IWC considers the cruelty of whaling just in terms of Time to Death. The IWC should also turn attention to injuries caused to whales during whaling and how this may affect the degree of suffering. © Mark Carwardine

'Time to Death'

Currently the IWC assesses the 'humaneness' of a whaling method quantitatively, by measuring the time elapsing between the application of the primary killing method and a determination that the whale is dead – its Time to Death (TTD). There are several problems with this approach: Not only has the IWC not adopted scientifically credible criteria for determining that a whale is dead or insensible to pain (see section 3), but different contracting governments apply different criteria and few employ experts to make the determination. For example, Greenland admits¹⁰ that the information collected from its hunters is not scientifically based and that a lack of veterinary assistance prevents it from developing more accurate indicators than its existing criteria for determining death ("when the whale does not move and the flippers are immovable"¹¹). These ignore the risk that the whale is paralysed, but still conscious and able to perceive pain.

The IWC's quantitative approach also ignores the fact that whales will experience a different intensity of pain and suffering, even if their Times to Death are similar, depending on the damage caused by the harpoon or bullets entering the body and the power of the weapon used. Other welfare considerations must also include the trauma of the chase itself and, for social species, the effects on other members of the whale's pod. However, these issues are not currently considered by the IWC.

Although the IWC's Treaty and Schedule mandate the collection and reporting of some useful data¹², and Resolutions make further requests, the information collected by the Secretariat is not comprehensive, and few Contracting Governments provide all the data sought. For example, Japan only reports some of the data for one of the four species it hunts and Greenland only records data for a proportion of the whales that it lands and does not distinguish between hunting methods when a hunt uses more than one method.

As a result, the IWC rarely has sufficient quantity and quality of data to make a fully informed assessment, or comparison, of whaling methods. It is not even clear if the IWC is seeking the most useful data to assess humaneness, as is evidenced by the longstanding, and still unresolved, debate about the correct criteria for measuring the onset of insensibility and death in whales.

Determining when a whale is dead



Stranded sperm whale being euthanased in New Zealand, using a device and method specifically designed for this species. The photograph was taken just before the whale in the foreground was euthanased. It was exhibiting approx. 8 shallow breaths per minute. The whale in the background had been declared dead some time before. Note that the jaw in both the dead and the live animals are both slack and that it would be impossible to distinguish between them. © Courtesy of Craig Bamber and the Department of Conservation, NZ

Probably the most fundamental consideration in assessing the humaneness of whaling operations is to be certain when a whale is dead or, at the very least, permanently and irreversibly insensible to pain. The criteria currently used by the IWC for determining death in cetaceans are:

- Relaxation of lower jaw or mandible; or
- Cessation of flipper movement; or
- Sinking without active swimming

WDCS and The HSUS believe that these criteria are profoundly inadequate to measure the onset of death. As marine mammal veterinarians will attest, the lower mandible in small cetaceans loses muscle tone and becomes relaxed under anaesthetic. The photograph above demonstrates that in the sperm whale, the lower jaw may be relaxed when the animal is still alive. A cetacean whose spinal column has been damaged may not be able to move its flippers but, despite being paralysed, may still be fully conscious. Furthermore, cessation of movement may be an indication of exhaustion and indeed, rigid or unmoving flippers may also be a response to severe pain. For example, a stranded sperm whale euthanased on the beach in New Zealand was immobile and pronounced dead by a veterinarian on the basis of more extensive criteria than are currently used by the IWC. However, after 30 minutes, this animal resumed breathing and died approximately two and half hours later¹³.

Cetaceans are adapted to diving through a number of specialised anatomical mechanisms, not least of which is a much greater oxygen carrying capacity in the muscle and the blood than is found in terrestrial mammals. These adaptations enable species such as the sperm whale to stay under water without breathing for over 70 minutes. Our current understanding is that cetaceans are able to direct blood away from organs such as the lungs during a dive, thus conserving oxygen for organs with the greatest need during diving, such as the brain. Many cetacean species feed during dives and it is therefore likely that their brains will be alert for hunting.

The ability of cetaceans to remain alive and possibly sensible to pain, beyond the point estimated by the current IWC criteria, may be related to the species' maximum dive times. It is possible that animals wounded during whaling operations

may initiate a physiological 'dive response' to the pain caused by the weapons used. If this is the case, then it is of great concern that these animals may in fact be able to survive much longer than the current criteria indicate; possibly longer even than their longest dive times (since they may be consuming less oxygen than if they were actively diving).

Clearly, the risk that a whale may be dragged through the sea and out of the water, and even butchered, while it is still alive is too great, and the implications too terrible, to ignore. The IWC must develop new scientifically credible criteria for assessing insensibility and death.

At its 1999 Workshop, the IWC adopted a Revised Action Plan on Whale Killing Methods¹⁴ which requires the Commission to 'Develop better criteria for determining the onset of permanent insensibility in whales, using physiological and behavioural observations'.

To assist this process, the First International Scientific Workshop on Sentience and Potential Suffering in Hunted Whales, hosted by the RSPCA and funded by the UK Government, was convened in June 2001. The aim of this meeting of independent experts was to review existing measures of sensibility in cetaceans and to develop new and more comprehensive criteria for assessing the state of consciousness of compromised cetaceans. The proceedings of the Workshop are, as yet, unpublished, but the experts issued a statement of concern at its conclusion that:

"there is considerable potential for suffering by cetaceans during current whaling practices. Existing IWC criteria for determining death in cetaceans are insufficient to allow the assessment of the onset of insensibility or death. We therefore have serious concerns over the welfare implications resulting from the inadequacies of the criteria."

There is an urgent need for better criteria to be developed, validated in the field and then, once they are proved to be satisfactory in definitively determining the onset of death in whales, endorsed by the Commission and made mandatory for use in all hunts. If however, new criteria are tested and it is found that the uncertainty regarding the onset of death in whales cannot be eliminated, this is reason enough to ban all whaling on welfare grounds, as we simply cannot be sure when these animals are dead.

¹⁰ Greenland Home Rule Government, 2001, A note regarding information encouraged in the IWC-Resolution 1999-1, IWC/53/WKM&AWI 1

¹¹ IWC Secretariat, 2002, Compilation of Data on Whales Killed, IWC/54/WKM&AWI10

¹² Article VI (Information Required) of the Schedule to the ICRW provides a specific list of information that is required to be reported for each whale killed in various whaling operations. In an Appendix to the Schedule, a daily record sheet is provided that seeks details of the vessel involved, the amount of time spent chasing each animal, the primary killing method used and the weather conditions during the hunt. In addition, paragraphs 25 and 27 seek a report on the number of whales that are struck and lost.

¹³ Marsh N & Bamber C, 1999, Development of a specialised round and firearm for the humane euthanasia of stranded sperm whales (*Physeter macrocephalus*) in New Zealand, IWC/51/WK5

¹⁴ Appendix 8, Report of the Workshop on Whale Killing Methods, 1999, IWC/51/12

The adequacy of primary and secondary killing methods



Killing methods are often not specifically adapted for the species taken. © WDACS/Notier

As the box below shows, several factors will influence the efficiency of any killing method. The fact that secondary killing methods are needed at all in current whaling operations illustrates the inadequacy of primary killing methods, like penthrite harpoons and rifles, to achieve an instantaneous kill. For example, in Norway's 2001 hunt, nearly half the whales had to be struck again when the first penthrite harpoon failed to kill them. Out of a total of 553 whales, twenty-six whales were struck again with harpoon grenades and 249 shot with rifles. For Japan's 2001/2002 hunt in Antarctica, out of 440 whales, 55 were struck again with a harpoon and 301 shot by rifle (the average number of shots per whale was 2.2¹⁵).

Concerns exist about the secondary killing methods used in several hunts. Clearly, the objective of applying a secondary killing method should be to ensure the quickest possible kill of an already wounded animal. This is most efficiently achieved by administering at least equal, or greater, energy straight to its brain. However, although a penthrite harpoon is the most powerful weapon currently able to deliver sufficient energy to the brain to cause death or insensibility, most hunters use the cheaper, and more easily available and operated, rifle.

For example, in West Greenland where penthrite grenades are expensive and only one is issued for each minke whale permitted to be hunted, hunters use rifles as a secondary killing method, even though Norwegian experts have stated that the calibre used is probably insufficient to penetrate the skull of a minke whale and may only cause concussion¹⁷.

A number of factors will influence the efficiency of any killing method (and the degree of pain suffered):–

Relating to the weapon

- **The calibre of the weapon and the nature of the ammunition used.** This must be sufficient to accurately penetrate blubber, muscle and bone of the particular species taken, in order to reach the target with enough energy to cause instantaneous death or insensibility.
- **The area targeted.** Different times to death and degrees of pain will result from shots to the brain, thorax, spinal cord or other region.
- **The angle at which the shot is fired.** Japan has commented that if a rifle shot is aimed laterally at a minke whale, it might miss the brain, through deflection by the cranial skull bone¹⁶.
- **Proximity and orientation of the whale to the vessel.**

Relating to the conditions of the hunt

- **The accuracy of the gunner.** This is important, both in terms of his marksmanship and use of external landmarks to identify the correct location for a lethal shot, depending on the species taken.
- **Prevailing weather conditions.** Sea state will influence the stability of the platform from which the secondary killing method is applied and visibility will affect accuracy.

Relating to the whale

- **Species-specific factors.** Variation in the size (in terms of mass and length) and anatomy of species taken will affect the course of projectiles through the body. Blubber thickness and consistency varies among species, for example sperm whale blubber is particularly coarse. External landmarks used to locate internal organs will also vary among species.
- **Individual characteristics.** The size of a whale (and therefore the effectiveness of different methods) is determined by its age and sex. Variations in blubber thickness and mass will vary according to season and health of the animal.

The prevalent use of the rifle as a secondary killing method in both commercial and ASW hunts strongly indicates that its choice is more often determined by economic factors than by a well-informed decision that it is the best option for the welfare of the animal. A rifle is clearly less likely than an exploding harpoon to cause further damage to the whale's body (and therefore reduce its meat yield) – a consideration which may also explain why Japan also permits its scientific whaling vessels in the North Pacific to use a cold (non-exploding) harpoon¹⁸ as the secondary killing method in some circumstances.

As experts at the IWC have stated, the adequacy of the rifle as a killing method depends not just on the calibre used and whale species targeted, but on other variables including the angle of the shot. As one expert noted, the probability of achieving an instantly lethal shot using a rifle is hampered by a number of factors¹⁹:

'To kill a whale immediately, the bullet must accurately strike the animal in the head and after travelling through the soft tissues surrounding the skull (and possibly water) impart sufficient energy to the brain to cause immediate and irredeemable brain failure. The information required to assess whether this is routinely being achieved has not been presented and it is possible that whales are not being shot in the right place and/or that the rifles being used are not powerful enough. Evidence that bullets can penetrate to the brain is not sufficient unless it is backed up by behavioural reports indicating the immediate loss of sensibility'.

Considering the dubious efficiency of primary killing methods in some hunts, it may be more appropriate for the IWC to consider the primary killing method not, in fact, as a 'killing' method, but as a primary 'wounding' method which is used to either secure the whale or slow it down in order that the secondary method can be applied. This being the case, it is all the more important that the secondary method be as powerful as possible, and be applied quickly and accurately to the brain.

'Net whaling' on the increase



Tail of a humpback whale showing damage caused by fishing gear. © Center for Coastal Studies, www.coastalstudies.org

The IWC recognises with concern the problem of the incidental capture (by-catch) of whales in fishing gear, but has not closely examined the way these animals are killed or their subsequent use. For example, it is known that in Greenland, by-caught or otherwise wounded baleen whales may be euthanased and their meat distributed for human consumption. Although around three humpback, fin or minke whales are killed this way each year, the Commission has never factored this source of meat into Greenland's ASW quota nor has it considered the method used to kill the whales²⁰. However, the scale of this issue, and the potential for abuse, has been brought into sharp focus by recent developments in Japan.

In 2001 Japan changed its domestic laws to permit the killing and commercialisation of whales caught in fishing nets. Presumably in response to the new economic incentive, the number of by-caught minke whales reported escalated dramatically – from 29 in 2000²¹, to 123 between July 2001 and July 2002²².

Predictably, Japan has submitted no information to the IWC on the methods used to dispatch the whales.

The IWC must move swiftly to address 'targeted by-catch', including adopting a new definition of 'whaling' that includes the use of nets, so that existing and future regulations and data collection requirements apply.

15 IWC/54/WKM&AW11

16 Report of the Workshop on Whale Killing Methods, 1999, IWC/51/12

17 Report of the Workshop on Whale Killing Methods, 1999, IWC/51/12

18 Japanese Special Permit No. 14-SUIKAN-1063

19 IWC/51/WK2

20 In 2002, two wounded humpbacks were dispatched using harpoons while, in 2000, a rifle was used on a fin whale.

21 <http://www.iwcoffice.org/SCWEB/ProgReps/Japan53.doc>

22 Hokkaido Shimbun

Struck and lost whales



Struck and lost whales are subject to a wide range of injuries, from bullet wounds to large gaping gashes where a harpoon has pulled out. This whale may have been the victim of a struck and lost incident. The hole in this whale was at least 30cm in diameter and was visible from both sides of the animal.

© Courtesy of Bernardo Alps, Whalephoto@earthlink.net



Struck and lost whales may be more susceptible to certain parasites. A gray whale with a stick lodged in its left blowhole, shows a severe infestation of sea lice.

© Courtesy of Bernardo Alps, Whalephoto@earthlink.net

There are specific requirements under the Schedule for reporting animals that have been struck by a harpoon or other weapon, but not landed – i.e. 'struck and lost'²³. However Japan and St Vincent and the Grenadines do not provide information on the number of animals that have been struck and lost to the IWC's annual Working Group on Whale Killing Methods and Associated Welfare Issues.

The number of animals struck and lost in some hunts can be excessive. For example, during the 2001 Alaskan bowhead hunt, 26 whales were struck and lost. It is important, however, to consider these losses not just in terms of absolute numbers, but also in terms of the struck and lost rate. The 26 whales lost in Alaska in 2001 represented a struck and lost rate that year of some 34.7%.

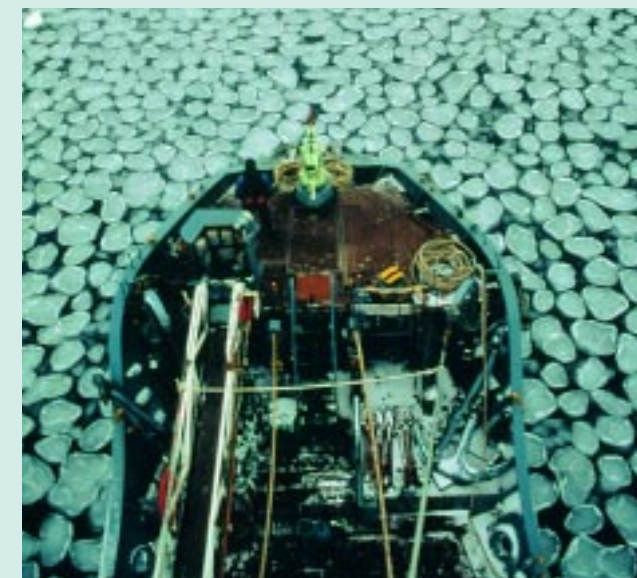
It is clear from data provided by Greenland that, while the harpoon and rifle hunts in west Greenland result in struck and lost whales almost every year, the rifle hunts alone have more significant losses in some years. For example, between 1990 and 2002, West Greenland minke whales were struck and lost in 11 out of 13 years, with an average struck and lost rate of 2.48% per year. In contrast, Central stock minke whales were only struck and lost in three out of 13 years, but the rates were high on each occasion: 3 out of 8 whales in 1992 (37.5%)²⁴; 3 out of 14 in 1997 (21.4%) and 3 out of 17 in 2001 (17.6%)²⁵.

Similarly, Greenland's struck and lost rate for fin whales is particularly poor in some years, but zero in others. In fact, the struck and lost rate for Central minke and fin whale hunts is highest in the same years, which suggests that a common factor, such as the weather, may be to blame.

A number of factors influence struck and lost rates, but the most significant, other than equipment failure, are likely to be the appropriateness of the killing method used for the species taken, the accuracy of the gunner, and the weather conditions. When equipment failure is cited, commonly the harpoon rope (forerunner) broke, the harpoon pulled out, or it did not engage properly²⁶.

A wounded whale that has escaped may still not survive. A large range of wounds can be inflicted by harpoons and rifles – from lacerations to soft tissue damage, organ damage, bone damage and loss of flippers and flukes. Injured whales that do not die within hours or days may still be prevented by their wounds from functioning normally, including communicating, migrating, feeding and reproducing, and may die a premature death as a result of infection, starvation, or predation. For example, a report by the Russian Federation noted that nine of the gray whales taken during the 1999 hunt had been bitten around the tail and fins by orcas²⁷. As the photograph of an injured whale opposite shows, wounded whales may be particularly susceptible to some parasites which may hinder the healing process, and add to scar tissue which may affect mobility.

The effects of the weather



Clearly sea and weather conditions will have an impact on the stability of a whaling vessel and the range of visibility. The IWC requests Contracting Governments to submit information on the prevailing weather conditions (including sea state, wind force, wind direction and visibility) during whaling operations, but it has never analysed the impact of those variables on the hunt. For example, it has never considered how the heave, roll and pitch of a ship may affect the accuracy of the gunner and, consequently, the Times to Death and struck and lost rates for that hunt.

Japan admitted to the IWC Workshop in 1999 that the differences between the proportion of immediate kills for Japanese and Norwegian hunts could, in part, be attributed to the different sea and weather conditions.

Weather may play a very significant role in the accuracy of whaling and therefore will influence the number of instantaneous kills and the struck and lost rate.
© WDCS/Voiter

If sea and weather conditions are indeed an important factor in a low proportion of immediate kills, or a higher struck and lost rate, in some hunts, it is crucial that the IWC fully understands the relative significance of these variables and take measures to improve the proportion of immediate kills. It could do this by, for example, prohibiting whaling under certain weather conditions, setting a minimum shooting distance, or closing seasons to account for seasonal peaks in wave height or poor visibility.

²³ Article VI 25a & b and Article VI 27 a ICRW

²⁴ Table 1. International Whaling Commission Report 1992-3

²⁵ Based on information provided by IWC Secretariat, April 2003

²⁶ Norway for example, reported that during the 2001 minke whale hunt ten whales were lost because the 'harpoon line broke or the harpoon worked loose'. IWC/54/WKM&AWI6

²⁷ Kuraev S, 2000, Brief report on whaling in the Russian Federation in 1999, IWC/52/WKM&AWI5

Aboriginal Subsistence Whaling

The International Whaling Commission permits ‘aborigines’, whose cultural and nutritional need for whales and whaling it has recognised, to hunt some baleen species ‘exclusively for local consumption’²⁸. The IWC establishes five year blocks of annual Aboriginal Subsistence Whaling (ASW) quotas that are based on the advice of its Scientific Committee. These subsistence quotas are currently taken by indigenous people in the USA, Greenland and Russia, and by Bequians of St Vincent and the Grenadines. The ASW quotas established for 2003 until 2007 are in the table below.

The IWC recognises that killing methods used in ASW hunts are less accurate and efficient than those used in commercial whaling operations, and result in longer Times to Death and higher struck and lost rates. Through a series of resolutions, the IWC has urged aboriginal subsistence whalers to do everything possible to reduce any avoidable suffering caused to whales in such hunts. Contracting Governments are requested to provide relevant data from their hunts for analysis by the Workshop and Working Groups on Whale Killing Methods and Associated Welfare Issues, so that advice on techniques and equipment can be given by experts (including other hunters).

Despite this framework, the Times to Death and struck and lost rates for whales hunted in ASW hunts remain, in many instances, unacceptably high. The Commission has been slow to address welfare concerns relating to ASW and particularly hesitant to consider whether (and if so, how) the integrity of these traditional subsistence hunts should be maintained while making them as humane as possible. For example, if

indigenous hunters used non-traditional equipment to chase and shoot whales, the hunts would likely be more humane, but more expensive and might lose their defining cultural characteristics. Difficult and political as these issues are, they must be confronted by the IWC if improvements in the killing of whales in aboriginal hunts are to be achieved.

Despite concerns about the efficiency of some methods used in aboriginal subsistence hunts, the IWC leaves the decision about which equipment to use to the discretion of the hunters. Advice about techniques and equipment is provided by experts during the Workshops and the Working Groups. Regular assessments of data from these hunts should, in theory, illustrate the relative efficiency of different hunts, as well as comparing aboriginal and commercial hunts using the same techniques. However, the information provided by some Aboriginal Subsistence Whaling nations is incomplete and the data collected by others are not necessarily based on consistently applied criteria. For example, Greenland’s hunters use the same harpoon on the same species as Norway, but apply different criteria for judging the onset of death or insensibility – making it difficult to draw useful conclusions from a comparison. Furthermore, Greenland does not collect welfare data for each whale landed, so any analysis of its data will be incomplete³¹.

At least some analytical problems could be resolved by the IWC revising the data collection form provided by the Secretariat so that contracting governments must differentiate between whales taken in the same area, but with different killing methods.

Species	Quota	Taken by
Gray whale	Up to 140 per year may be <i>taken</i> .	Chukotka people of Far East Russia and Makah tribe of Washington State, USA ²⁹
Fin whale	Up to 19 per year may be <i>taken</i> .	Inuit of Greenland
Minke whale	Up to 12 from the Central Atlantic stock may be <i>taken</i> per year, plus up to 3 unused strikes from previous years.	Inuit of Greenland
	Up to 175 from the West Greenland stock may be <i>struck</i> per year plus up to 15 unused strikes from previous years.	
Humpback whale	Up to 20 ‘for the seasons 2003-2007’ may be <i>taken</i> . ³⁰	Bequians of St Vincent and the Grenadines
Bowhead whale	Up to 67 to be <i>landed</i> per year, plus up to 15 unused strikes from previous years.	Inuit of Alaska, USA and Chukotka people of Far East Russia

²⁸ Paragraph 13 of the Schedule to the ICRW

²⁹ Paragraph 13 of the Schedule does not specify which ‘aborigines’ may take the whales from an ASW quota allocated. Thus, the USA and the Russian Federation have agreed to share the gray and bowhead quota. Russia takes one bowhead per year and the Makah tribe of Washington State were permitted to take up to 5 gray whales. However, in December 2002, the Ninth Circuit of the US Court of Appeals ruled that the USA’s issuance of a gray whale quota to the Makah Tribe of Washington State, without first preparing an Environmental Impact Statement and receiving a waiver under the Marine Mammal Protection Act, violated federal law and the hunt is presently prohibited.

³⁰ The quota for the seasons 2006 and 2007 shall only become operative after the Commission has received advice from the Scientific Committee that the take of 4 humpback whales for each season is unlikely to endanger the stock

¹⁰ Dead or Alive? A report on the cruelty of whaling

ASW strike limits

The IWC sets ‘strike limits’ (i.e. the quota sets a maximum number of whales that may be struck with a harpoon or shot) for some ASW hunts while, for others, it sets a limit on the number of whales that may be landed. There appears to be no rationale for the difference, but it has significant implications for hunts with high struck and lost rates. For example, the IWC sets a strike limit for West Greenland minke whales, but only a landing limit for the Central stock of minke whales and for fin whales, both of which have a tendency towards high struck and lost rates in some years. Greenland could, therefore, land the maximum number of fin and Central stock whales permitted in the IWC quota, but strike and lose an unlimited number in addition. This is not just a serious welfare issue for the whales injured or killed, but also has important conservation implications in light of the fact that the IWC’s Scientific Committee has stated for several years that it cannot give the Commission safe management advice – i.e. quotas – on these stocks.

The following specific concerns about various Aboriginal Subsistence hunts arose from discussions at the IWC’s last Workshop in 1999 and subsequent Working Group meetings:

Russian gray whale and bowhead hunt

The figures provided by the Russian Federation on Times to Death in the Chukotka hunt for gray whales strongly indicate a serious lack of efficiency in both the primary and secondary killing methods employed. The overall average Time to Death for gray whales taken in 1999, 2000 and 2001 was 53 minutes with an average of 47 bullets used per whale. In one 1999 hunt, it took 180 bullets and 3 hours and 40 minutes to kill a single gray whale.

The efficiency in the Russian hunt for bowhead whales is also of considerable concern. During 2001, one bowhead whale was taken. Although the Time to Death for this animal was not supplied, six harpoons and floats and five darting gun projectiles were used. Rifles are also often used in the hunt for this species and, during the 2000 hunt, harpoons and floats and darting gun projectiles, plus an additional 30 rifle bullets were required to kill a single bowhead whale.

Alaska bowhead hunt

The USA did not provide data on the Time to Death in the 2001 bowhead hunt, but reported that 31 of the 49 whales landed were killed using secondary killing methods³², equivalent to 63.3%. This indicates a very poor efficiency rate in the primary killing methods used in this hunt and points to a very low rate of instantaneous kills that year. In addition that year, 26 whales struck were lost (34.7%), making 2001 a particularly inefficient year for the USA’s bowhead hunt.

Greenland minke hunt

There is concern that the calibre of some of the rifles increasingly used in Greenland’s minke whale hunts is insufficient to provide a rapid kill (see section 4). In East Greenland, where all minke whales are killed by rifles, the Times to Death and struck and lost rates are worse than for West Greenland where either rifles or harpoons may be used. (During the 2000 East Greenland hunt, the average time to death for minke whales was 40 minutes and the maximum time taken for one whale to die was 2 hours.) However, because Greenland does not break down the data it reports for the West Greenland hunt according to the method used, and does not provide reports for all animals landed anyway, it is difficult for the IWC to compare the relative efficiency of the two methods.

St Vincent humpback hunt

St Vincent has provided no data to the IWC in recent years on Times to Death for humpback whales killed in Bequia, where a calf is often targeted to lure its mother to the boat. According to various reports, the adult whale is secured using a cold harpoon and brought alongside the vessel. Then an 8-foot lance is ‘repeatedly thrown in attempts to puncture the whale’s heart or lungs’³³. Often the whale is finally killed by the ‘bomb lance’, an exploding projectile discharged from a shoulder gun. In some instances, however, it appears that the bomb lance is administered at the same time as the initial cold harpoon. A final killing method, which may be applied in some extreme cases, is a projectile from a 40-pound bronze shoulder gun or ‘bomb gun’.

In light of our developing understanding of the dying process in cetaceans and their adaptation to low levels of oxygen (see section 2), it is particularly alarming that the objective in this hunt is to pierce the lungs or the heart of the whale, rather than to aim for a lethal shot to the brain.

³¹ Greenland reported in 2001 that 12 minke whales were killed within 2 minutes (IWC/53/WKM&AWI1). In 2002 Greenland reported that 27 minke whales were killed within 1 minute (IWC/54/WKM&AWI2), implying that 1 or 2 minutes is close to instantaneous.

³² IWC/54/WKM&AWI10

³³ For Information Document 2, submitted to the 1999 Workshop on Whale Killing Methods by the Government of St Vincent and the Grenadines

Small Cetaceans



Pilot whale hunting in the Faeroe Islands. Whaler in the background is holding the old sharp ended gaff or hook used for securing the whales.
© J McMillan

There is much debate within the IWC as to whether the Commission has competence for dealing with matters relating to small cetaceans (dolphins, porpoises and small whales). Nevertheless, the Scientific Committee has established a Sub-committee on Small Cetaceans, which considers conservation issues and offers management advice, and the Workshop on Whale Killing Methods has specifically addressed small cetacean struck and lost rates in its Action Plan³⁴. This section is far from comprehensive, but provides some examples of current small cetacean hunts around the world.

Greenland (Home Rule territory of Denmark)

No quotas are set for small cetacean hunts in Greenland, but catches are high. Reported beluga catches in West Greenland averaged 577 annually in the 1990s (although some reports give an average of 659³⁵). Professional and leisure hunters in Greenland killed 609 belugas in 2000. No catch data are yet available for 2001 or 2002, but the hunt, which has been declared unsustainable by two regional management bodies, is not believed to have been reduced to 100 belugas a year as they recommended. Unreported catches are thought to occur in at least some years in some localities and may be substantial. In addition, although struck and lost rates vary depending on local conditions, it is estimated that 1.2 – 1.5 belugas are struck and lost for every one landed. This represents a struck and lost rate of up to 50%³⁶.

The average reported landed catch of narwhals in West Greenland between 1993 and 1999 was also 577 per year. However, these figures do not include any correction for non-reporting, which is thought to have been fairly high, and does not include any correction for narwhals that are struck and lost. Reported numbers of struck and lost narwhals range from below 10% of landed catches to above 30%. Experts have concluded that “considering just reported catches and reasonable allowances for narwhal killed and lost, mortality due to hunting has been in excess of 1,000 narwhal annually through the 1990s and there is a high likelihood that removals due to hunting have increased recently”.

Other small cetaceans hunted in Greenland include the northern bottlenose whale, Atlantic white-sided dolphin, white-beaked dolphin, orca, long-finned pilot whale and harbour porpoise. Few data are available on their status, numbers killed or methods used, but it is known that 32 orcas were killed in 2002³⁷ and two were killed and several more injured in 2003³⁸. Between 1998 and 2001, an average of 1,795 harbour porpoises were hunted annually in West Greenland. There are currently no regulations on the hunting of small cetaceans, other than belugas and narwhals, for which the regulations require ammunition with a minimum 7.62 mm calibre (30.06), although a 5.64 mm calibre (.222) may be used for killing at very close range. It is presumed that these weapons are also used on other small cetaceans, even though the bottlenose whale and orca are considerably larger than the narwhal and beluga.

Faeroe (Faroe) Islands (Home Rule territory of Denmark)

No small cetacean quotas are set in the Faeroe Islands, but between 500 – 1000 pilot whales are killed each year³⁹. In 2002, 581 pilot whales, 774 white-sided dolphins, 18 bottlenose dolphins and 6 bottlenose whales were killed⁴⁰. The animals are driven by boats into a shallow bay where they are held by inserting a blunt ended ‘gaff’ into their blowhole and dispatched by a knife used to sever their spinal column. This ‘drive hunt’ method has long been criticised on welfare grounds, and is believed to be particularly inappropriate for a bottlenose whale (which can reach 9.8m in length and is significantly different in anatomy from the other species hunted).

It has been reported that a new knife is under trial in the Faeroe Island pilot whale hunt⁴¹ which, it is claimed, can improve the average Time to Death in the hunt. No data have been published to support this claim and we are concerned that *apparent* improvements in time to death may, in part, be the result of using the new blunt ended gaff or hook (first introduced in 1996⁴²), which is inserted in the blowhole (rather than straight into the flesh) in order to secure these whales. The new gaff causes no external bleeding and consequently, as it is presumed no wounding results from the insertion of this device into the blowhole, hunters may not count this as the starting point for measuring Time to Death. However, the blunt ended gaff may cause internal wounding, such as damaging the complex organs and tissue that lie below the blowhole (a particularly sensitive region in cetaceans) and burst blood vessels. It may also prevent the whale from breathing properly.

Japan

Japan continues to kill thousands of dolphins every year in a particularly cruel hunt. Hand held harpoons are thrown from boats at Dall’s porpoises and many of these harpoons have electric lines attached which are used to deliver a shock to the harpooned porpoise. These animals are then left attached to flags and buoys, irrespective of whether they are declared dead or not, while the hunt continues for other porpoises. Japan has never supplied information on the use of electricity, the exact methods used, the times to death or the struck and lost rates in these hunts.

In other Japanese hunts, dolphins and small whales are trapped in enclosed bays for a time before they are killed by applying a knife to the ‘throat’, either in the water or once winched to land by their tails. This method of trapping the animals is not only likely to cause extreme panic and additional injury, but the anatomy of a dolphin means that

cutting its throat will not sever the main blood supply to the brain and will result in prolonged suffering as the animal slowly bleeds to death.

Japan also conducts an annual hunt for Baird’s beaked whales, in which it is believed that the cold harpoon may be used to kill at least some of these large animals.

Russia

Russia sets annual capture quotas for subsistence use and what it terms ‘scientific and cultural-educative purposes’. These quotas included 2,100 belugas in 1999, 1,700 belugas in 2001 and 1550 in 2002. A quota of 1220 belugas, 10 orca, 100 white-sided dolphins, five bottlenose dolphins and five pilot whales has been set for 2003. Russia never provides a progress report to the IWC and it is not clear how these hunts are conducted, how they are regulated, and even if the quotas have been met.

Solomon Islands

On 8 April 2003, it was reported that 51 beached whales were slaughtered in the Solomon Islands⁴³. The species concerned has not yet been officially identified, although preliminary investigations suggest that they were pilot whales. The methods used are not clear and Times to Death have not been reported. It is not known if these whales were driven ashore and forced to strand, or if this was an opportunistic hunt occurring once the whales had beached themselves.

Peru

Although 1996 legislation prohibiting dolphin hunting reduced hunts that had previously taken between 15,000 and 20,000 dolphins a year, illegal hunts continue to supply a black market in dolphin meat in Peru. It is estimated that up to 1000 dolphins are killed annually⁴⁴. One eyewitness reported that the dolphins were encircled with boats and trapped in nets, another that they were harpooned and hauled aboard, where it took at least five minutes to club them to death⁴⁵.

From the small amount of information provided in this report, it is evident that a large number of small cetaceans are killed annually in directed hunts around the world. These hunts are largely unregulated, both in terms of the numbers taken and the methods used. These tend to be chosen at the discretion of the hunters who may be more influenced by economic constraints than a consideration of welfare concerns specific to the species taken.

³⁴ Point 9, Revised Action Plan on Whale Killing Methods, Appendix 8, Report of the Workshop on Whale Killing Methods, 1999, IWC/51/12

³⁵ Heide-Jorgensen, M.P. and Rosing-Asvid, A. 2002. Catch Statistics for belugas in West Greenland 1962 to 1999. NAMMCO Sci. Publ. 4: 127-142

³⁶ JCBN & Nammco (2001): Final report of the joint meeting of the Nammco Scientific Committee Working Group on the population status of narwhal and beluga in the North Atlantic and The Canada/Greenland Joint Commission on Conservation and Management of Narwhal and Beluga Scientific Working Group. 9-13 May, 2001 Qeqertarsuaq, Greenland. 101 pp.

³⁷ Various anonymous sources

³⁸ According to e-mail dated 26th March 2003 received by WDCS from an anonymous eye-witness in the Narsaq area.

³⁹ Transcript from Interview with Kate Sanderson (Ministerial Advisor, Faeroe Islands), Radio New Zealand Ltd, 1st March 2002, Document:70827.3

⁴⁰ Figures as of 4th October 2002

⁴¹ <http://www.worldcouncilofwhalers.com/gen-assem-four-frm.htm>

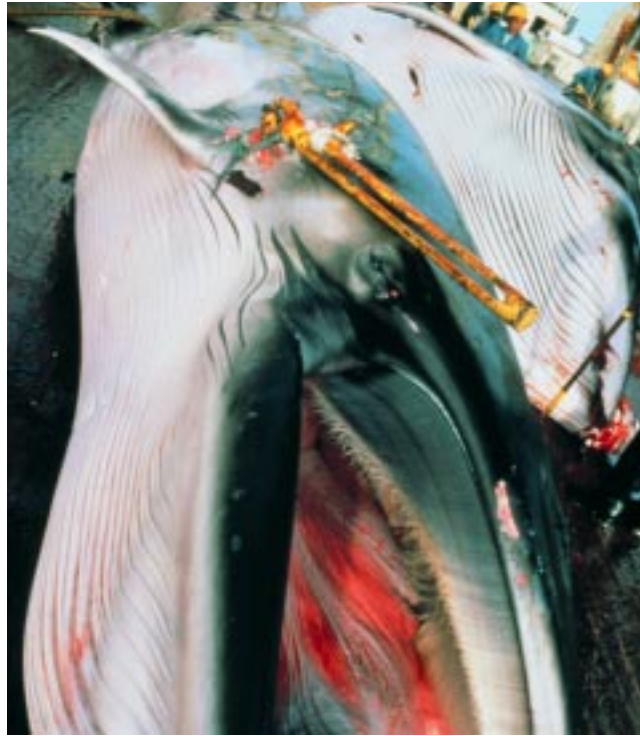
⁴² Anon, 1996, Grindabo No.2- The Newsletter of Whales and Whaling in the Faeroe Islands, Department of Fisheries of the Faeroese Government, Tórshaven, Faeroe Islands

⁴³ <http://www.sibconline.com.sb>

⁴⁴ Mundo Azul, 2003

⁴⁵ Mundo Azul, 2003

Conclusions and Recommendations



Our understanding of the dying process in whales, which are adapted for low levels of oxygen, is incomplete and some animals may still be alive when they are brought up on the flensing deck. © WDCS/Voiter

As this report has illustrated, there are currently many uncertainties surrounding the exact point of death in cetaceans and we simply cannot even be certain that the flensing of some individuals is not initiated whilst they are still alive.

To address this, and other problems in ensuring the humaneness of whaling operations, WDCS and The HSUS make the following recommendations to the IWC:

- It is essential that the Commission makes the development of better criteria for determining the onset of death and insensibility in cetaceans during whaling operations an urgent priority. These new criteria will require field trials to determine their accuracy, which in turn will require considerable cooperation from whalers in order that better criteria can be developed and adopted. Furthermore, if new and accurate criteria for the onset of death cannot be established or agreed upon, or the whaling nations refuse to cooperate in the trials, the Commission should take responsibility for ceasing whaling activities on welfare grounds. Until such a time as it can be assured that whales are killed humanely in accordance with the standards required for killing terrestrial mammals for food in many parts of the world, whaling will remain a profoundly unacceptable way of hunting for meat.
- It is of great concern that commonly used whale killing methods may not adequately cater for the range of species on which they are used. For example, the whale grenade-

99, which was specifically developed for killing minke whales, is apparently now being used by Japan to kill much larger species for which it may not be sufficiently powerful. The IWC must proscribe how existing killing methods need to be adapted for different species and under different hunting conditions and, if necessary, forbid the use of certain weapons for some species and under certain conditions.

- From a practical welfare perspective, all methods used to kill whales, whether primary or secondary, should be considered in the same light. Secondary killing methods should be regarded in the context of their ability to quickly dispatch an already wounded animal and, if they are inadequate for this, they should be banned.
- Any device used to kill whales should aim to render the animal either instantaneously and irreversibly insensible to pain or dead as swiftly as possible. It is clear that in many instances, and for various reasons, the methods used in ASW hunts do not meet these standards. It is, therefore, recommended that a thorough review of ASW hunts is undertaken to determine how the responsibility for providing a swift death to whales can be better met whilst maintaining elements of the cultural integrity of the hunt. In particular, there should be greater focus on improving the effectiveness of primary killing methods to eliminate the dependence on secondary methods and reduce Times to Death in these hunts.

- To assist in the better evaluation of the efficiency of whaling methods and equipment, all Contracting Governments must provide data to the maximum extent possible for *all* methods used and *all* animals struck. As the IWC negotiates the Revised Management Scheme for the supervision and control of future commercial whaling, it must seriously consider imposing penalties for failure to report welfare and other relevant data.
- As the stability of a whaling vessel and the extent of visibility can be expected to affect the accuracy of a gunner and, therefore, the Times to Death and struck and lost rates of a hunt, the IWC must consider the important role that sea state and weather conditions play in the humaneness of whaling. If necessary, the IWC must set closed seasons or areas to take account of seasonal variability in weather conditions.
- The IWC should set 'strike' as well as 'take' limits in the Schedule for each ASW hunt and should work towards developing struck and lost caps in all hunts.
- The IWC must address the increase in 'targeted by-catch', including adopting a new definition of 'whaling' that includes the use of nets.

Summary of recent data on whale killing - all data as reported at IWC54, 2002 (unless otherwise stated)

Government	Species	Primary Killing Method	Secondary Killing Methods	Proportion of instantaneous kills	Average time to death	Number of bullets used	Struck and lost	Maximum Mass ¹ (tonnes)
Japan	JARPA Minke	Penthrite grenade harpoon	Rifle or secondary penthrite harpoon	33%	2 minutes 25 seconds	No data, however 4.7% re-shot with harpoon, 45% shot with rifle	No data provided	10
	JARPNII Minke	No data provided	No data provided	No data provided	No data provided	No data provided	No data provided	10
	Bryde's Sei	No data provided	No data provided	No data provided	No data provided	No data provided	No data provided	20
	Sperm	No data provided	No data provided	No data provided	No data provided	No data provided	No data provided	50
								Male up to 57
Norway	Minke	Penthrite grenade harpoon	Rifle - minimum calibre 9.3mm, or secondary penthrite harpoon	79.7%	3 minutes 23 seconds	Average 2.2. 12.5% re-shot with harpoon, 68.4% shot with rifle	10	10
Home Rule Government of Greenland	East Greenland minke	Rifle - minimum calibre 7.62mm	Rifle (minimum 7.62mm)	27 minkes reported killed within one minute for both East and West Greenland (note this is not instantaneous)	19.1 minutes (max. 50 mins)	No data provided	3	10
	West Greenland minke	Part of quota taken with harpoon cannon, rest with rifle - minimum calibre 7.62mm	Rifle (minimum 7.62mm)		13.2 minutes (max. 120 mins)	No data provided	2	10
	Fin	Penthrite grenade	Penthrite grenade	1 reported killed within 1 minute (not instantaneous)	19.9 minutes (max. 45 mins)	No data provided	1	120
The Russian Federation	Gray	Darting guns or Tiger model and Vepr Model rifles and 'sometimes special spears' or harpoons	Darting guns, rifles or harpoons	0	43 minutes (max. of 220 minutes recorded in 1999)	Average 54. Max. 110 (Average no. of darting gun projectiles = 2.5)	0 (however 2 gray whales were struck & lost in both 2000 & 1999)	35 to 36
	Bowhead	As for gray whale	As for gray whale	0	No data provided	6 harpoons and 5 darting gun projectiles were required to kill the bowhead taken in 2001		110
United States Alaskan Inuit	Bowhead	Darting gun with line and floats. Also trials of penthrite grenade with darting gun	Darting gun again or 7-gauge shoulder gun	No data provided. 31 out of 49 required a secondary killing method	No data provided	No data provided	26 (equivalent to a rate of 34.7%)	110
United States Makah ²	Gray	Harpoon with line and floats	.577 calibre gun	0	8 minutes	4 (plus 2 more additional harpoons)	1 other strike was made during the 1999 hunt	35 to 36
St Vincent & The Grenadines	Humpback	Harpoon or Darting gun	Steel tipped lance, bomb lance, darting gun or bomb gun	No data provided	No data provided	No data provided	No data provided	65

¹ Obtained from CRC Handbook of Mammalian Body Masses, Silva M & Downing JA, CRC Press Inc., 1995 and National Audubon Society, Guide to Marine Mammals of the World, Reeves RR, Stewart BS, Clapham PJ and Powell JA, Pub. Alfred A Knopf Inc. 2002

² Data from the 1999 Makah hunt

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