



Is Japan's whaling humane?

Nick Gales^{a,*}, Russell Leaper^b, Vassili Papastavrou^b

^a*Australian Antarctic Division, 203 Channel Highway, Kingston, Tasmania 7050, Australia*

^b*International Fund for Animal Welfare, The Old Chapel, Fairview Drive, Bristol BS6 6PW, UK*

Received 16 July 2007; received in revised form 20 August 2007; accepted 20 August 2007

Abstract

Video taken by Greenpeace of whaling by the Japanese whaling fleet in the Southern Ocean provided a unique opportunity to obtain quantitative data relevant to the welfare aspects of the killing of whales. Catches of 16 individual Antarctic minke whales (*Balaenoptera bonaerensis*) were analysed and in two of these asphyxiation appeared the most likely cause of death. Fewer than one in five whales were killed instantaneously and the average time to death for the remaining whales was around 10 min. The presence of Greenpeace did not result in a reduced accuracy of harpoon shots when compared with previous studies.

© 2007 Elsevier Ltd. All rights reserved.

Keywords: Whaling; Killing methods; Welfare

1. Introduction

For the past two decades, a polarised debate has raged in the Scientific Committee of the International Whaling Commission (IWC) about the relevance, need and quality of the science that results from scientific whaling programs [1–6].

Parallel to this debate has been a less publicised, but equally polarised dispute over concerns about the manner in which whales are killed. This issue has a long history within the IWC, which is recognised as the competent international body responsible for the conservation of whales and the regulation of whaling. Indeed, the 1937 International Whaling Conference, which pre-dates the IWC, recommended that governments “abate something of the undoubted cruelty of present methods of whaling”. The humane killing of whales was first formally put on the IWC's agenda in 1959 [7] following various prior efforts to develop and test electrical harpoons, which at the time were felt to be more humane: however, the technology was later abandoned [8]. In 1980, the IWC took a binding decision to prohibit the use of the cold (i.e. non-exploding) harpoon

for animal welfare reasons for all species except minke whales which were themselves later included [9]. In November 1980, the first special workshop was held on the subject. Since then, there have been a number of workshops and annual Working Groups on humane killing and associated welfare issues. The discussion of welfare issues has thus become firmly established within the IWC over half a century.

Despite this history, the discussion has suffered due to the views of some governments, particularly those of Japan and Iceland, that welfare issues are outside the competence of the IWC. The lack of willingness of these countries to provide appropriate and sufficient data has substantially limited the ability of the IWC to assess aspects of the welfare of whale killing techniques, particularly those used in scientific whaling. The provision of data from the killing of whales for scientific purposes might reasonably be expected to facilitate the independent analyses of killing techniques as well as to encourage improved killing efficiencies and welfare outcomes.

At the annual meeting of the IWC in May 2007, Norway, Japan and Iceland all gave reasons for not providing any welfare related data to the IWC. Norway has taken the position that “it is no longer necessary to collect information on each hunt on a regular basis. As in other activities where animals are killed, for example the

*Corresponding author. Tel.: +61 3 62323437; fax: +61 3 62323449.

E-mail addresses: Nick.Gales@aad.gov.au (N. Gales), rleaper@ifaw.org (R. Leaper), vpapastavrou@ifaw.org (V. Papastavrou).

slaughter of farm animals, common practice is that once a given killing method has been approved and implemented on the basis of scientific scrutiny there is no longer any need for continuous monitoring" [10]. Japan had noted that "it appears to it that the data provided is only used to criticise whaling" [11] and Iceland "expressed concern that the IWC has not been a neutral forum in which to discuss these matters" [10]. Prior to this, the limited data that had been provided by Japan only related to the killing of minke whales and data have not been provided for the much larger species—fin whales (*Balaenoptera physalus*) and sperm whales (*Physeter macrocephalus*) in particular—for which there are even greater concerns over the welfare implications of killing methods. Iceland has not provided any data on the animal welfare aspects of its scientific whaling for minke whales, stating that the sample size (101 whales up to 2005) was too small for analysis [11].

Although Norway has taken the view that no further efforts to improve welfare standards for its minke whale hunt are necessary, the clash of values as to whether whaling is acceptably humane remains divisive both within the IWC and global opinion. In the absence of objective measures, opinions are most likely to diverge further, but there still remains the question of what data are needed for an informed debate? The limited data that have been provided have generally been restricted to average time to death and proportion of animals judged to be killed immediately. Although such summary data may be used as indicators of improvements in hunting methods they reveal little about the reliability of the technique (the range and variance around the mean of time to death), nor do they provide insights as to how techniques may be further developed to improve welfare outcomes.

2. Analysis of video of whaling

At the 2006 annual meeting of the IWC in St. Kitts, the first independently acquired data on the killing of Antarctic minke whales (*Balaenoptera bonaerensis*) in Japan's Antarctic scientific whaling program was presented to a workshop on whale killing methods [13]. We analysed video of the whale hunt taken by Greenpeace during its anti-whaling campaign in the Southern Ocean in 2005/2006 in order to determine estimates of the location of the harpoon strike on the whale, the instantaneous death rates (IDRs) and the times to death (TTDs) for those animals not killed instantaneously. The analysis of the near-continuous video showed that of 16 observed kills of Antarctic minke whales, fewer than one in five was estimated to have been killed instantaneously. The average TTD for whales not killed instantly was just under 10 min (mean = 598 s, S.D. = 684 s, $n = 10$) and two whales survived for at least 25 min (27 m 25 s and 33 m 12 s). These figures are underestimates since the times were measured to the last time at which the whale was clearly alive and visible to the camera. Whales could have still been alive even when no strong movements or blows were

apparent and in some cases the last time when the whale was seen alive was at the start of a dive. The two kills with the longest TTD were events where the whale was injured by the first harpoon hit but not secured. Such events do not appear to have been included in the previously reported mean TTD data by Japan [14].

In 2 out of 16 events, the Greenpeace video revealed that asphyxiation was the most likely cause of death (Fig. 1). In one of these cases a line was passed around the tail and the whale was transferred from the bow to the side of the catcher vessel, leaving it suspended alongside, unable to bring its blowhole to the surface to breathe, but still clearly alive and struggling. In the other case there was almost continuous, wide angle video from the time of the harpoon shot until the whale appeared dead, 16 m 44 s later. The whale was last seen to be alive 14 m 02 s after the harpoon shot. It had survived without a breath up until that time but appeared to be dead by 16 m 44 s. At 12 m 54 s after the harpoon shot there was a break of 16 s in the filming. However, the video just prior to the break and immediately



Fig. 1. An Antarctic minke whale is suspended from the bow of a catcher vessel by a harpoon line, causing the suffocation of the animal and preventing the whale being killed more rapidly with a rifle as a secondary killing technique. ©Jeremy Sutton-Hilbert/Greenpeace 2006.

afterwards showed the rear half of the whale was suspended by a tight line and there appeared no possibility for it to get its head above water during the break. We are aware of one report of an entangled minke whale surviving underwater for 17 min [15] and theoretical predictions of aerobic dive limit based on stored oxygen are about 16 min for an 8 m minke whale [16]. For a whale that had been subject to an extended, high speed, chase before being harpooned, its oxygen stores are likely to have been depleted and it seems likely that asphyxiation was the ultimate cause of death.

The general procedure for killing whales that survive the first harpoon strike is to winch the whale close to the bow of the ship and use rifles to shoot the animal in the brain. For whales harpooned in the abdomen, or rear half of the body, this practice keeps the head underwater, making it impossible to obtain a clear shot to the brain with a rifle. A substantial proportion of whales are struck in the abdomen and we conclude that these whales would likely die by asphyxiation. Indeed, video taken from an unimpeded catcher vessel in 1992/1993 also showed similar situations of live whales suspended by the tail [17].

The Government of Japan challenged our conclusions [11] suggesting that the presence of the Greenpeace vessels impeded their usual hunting practices and that consequently the data were not representative. Clearly, our sample size is small and although Japan reported that 26 whales were killed while Greenpeace was present, video was only available for 17 events. It is possible that quicker kills were less likely to be captured on video, resulting in some selectivity bias. Concerns were expressed that interference may have impeded the ability of the gunner to obtain an accurate shot or hindered application of secondary killing methods. In order to evaluate whether such concerns were justified we measured the locations of each of the harpoon strikes. Whales struck closer to the tail are less likely to experience a near instantaneous death [19,20]. Previous sources showing the locations at which minke whales were hit by harpoons include data from Japanese commercial whaling during the 1978/1979 seasons [21], data from the 1992/1993 JARPA [17], and data from Norwegian minke whale hunts 2000–2002 [20]. The 2005/2006 video allowed the locations of 17 harpoon shots to be measured based on previously reported measurements of body parts as a proportion of body length [22]. Corrections were applied for estimated viewing angle and where possible the mean of multiple measurements was used to give the locations shown in Fig. 2. Both sides of the whale have been combined for the purposes of this figure

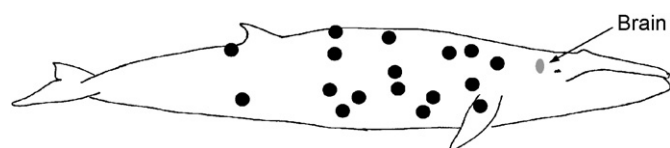


Fig. 2. Location of harpoon impacts based on photogrammetric analysis of 2005/2006 video.

Table 1
Number of harpoon hits of minke whales relative to position along body

Number of harpoon hits relative to a line 47% of body length from snout	Japanese commercial whaling 1978/1979 (1)	Norwegian commercial whaling 2000–2002 (2)	2005/2006 video
Forward (Cranial)	100	1129	9
Aft (Caudal)	52	477	7

and only harpoon entry points are shown. Two cases are included where a whale was shot twice. One of these shots was to a whale that was already tethered and was excluded from further analysis due to not being representative of shooting a freely moving animal.

The mean location expressed as the proportion of body length caudal (aft) of the snout for the remaining 16 hits was 0.48 (S.D. = 0.12). Based on observations of seven hits made from whaling vessels during the 1992/1993 JARPA [17] we calculated an equivalent mean location of approximately 0.53 (S.D. = 0.17) of the body length. Thus, the mean of observed hits in 2005/2006 was slightly closer to the brain, but the difference was not significant (T -test, $p = 0.45$). A common boundary between studies of hit locations on the whale's body is a line approximately 47% of the whale's body length from the snout [20,21]. There were no significant differences between the number of hits forward (cranial) or aft (caudal) of this line ($\chi^2 = 2.74$, d.f. = 2, $p = 0.25$) from either Japanese commercial whaling, Norwegian commercial whaling or the 2005/2006 video of Japanese scientific whaling (Table 1). Hence, the accuracy of the initial shot, and thus the IDR did not appear to have been affected by the presence of Greenpeace. Similarly, for the whales not killed instantly, our estimate of mean TTD is within the range of those previously reported by Japan for whales that were struck and eventually killed [14].

3. Whaling in the context of other experiments involving live animals

The legislative framework and ethical standards that determine animal killing practices and govern the scientific use of laboratory and free-ranging animals vary internationally. Where these guidelines exist, the standards applied to the use of animals for science—particularly for free ranging animals—are generally substantially higher than for other uses. These standards for science are a modern and relatively consistent international norm, less influenced by cultural, political or religious factors than practices such as recreational hunting, subsistence hunting or commercial slaughter. In Japan, animal welfare laws that are applied to the use of animals in science are over three decades old, and have been recognised as being in need of updating—indeed a representative of the Science Council of Japan commented that, in this context, Japan has a reputation “as an outlaw country without rules” [23].

The conduct of Japan in its whaling activities in the Southern Ocean and elsewhere—which is claimed to be conducted for purely scientific reasons—does little to alter such a view. The justification of hunting practices for scientific whaling that result in lower IDR and longer TTD compared to commercial whaling, in order that the “selected whale should actually be taken to ensure mathematical accuracy” [17], is a case in point.

The assessment as to whether any hunt is humane is generally a relative judgement. For example, beaver hunting with rifles has been judged [24] to be relatively humane compared to red deer (*Cervus elaphus*) shot by professional stalkers [25] or wild impala (*Aepyceros melampus*) culled at night [26], based on over 95% of beavers being immobilised instantly. This compares to estimates of wounding rates of red deer by stalkers which showed that 11% of deer required two or more shots to kill, 7% took 2–15 min to die and 2% escaped wounded [25]. Currently, commercial and scientific whaling hunts primarily target northern (*Balaenoptera acutorostrata*) and Antarctic minke whales, which are among the smallest of the baleen whales. By any standards, the Southern Ocean hunts that achieve extremely low IDRs, have TTD that commonly run substantially over 10 min, and appear to regularly use asphyxiation as a secondary killing technique are an obvious outlier among any animal killing statistics—least of all those that apply to science. The hunting of the larger Bryde’s (*Balaenoptera edeni*), sei (*Balaenoptera borealis*) and sperm whales in the North Pacific, and the plan to expand the scientific hunt in 2007/2008 in the Southern Ocean to include humpback (*Megaptera novaeangliae*) and larger numbers of fin whales—which are some eight times the body mass of minke whales—raises even more serious welfare questions.

4. Recommendations

Alongside conservation implications, animal welfare considerations are also an important component of the management of exploitation of wildlife. Several countries that are members of the IWC have explicitly included welfare concerns in their policy statements and, as summarised earlier, the IWC has considered issues surrounding the humane killing of whales since the 1950s. Within the IWC, there has been more general agreement on appropriate conservation targets than on appropriate welfare targets. This should not however, preclude a debate on what constitutes acceptable welfare criteria. Just as debates about conservation targets have included the consideration of broader international norms, so too should welfare considerations be viewed in the broader context of acceptable welfare targets for the use of animals in science. Unfortunately, the current lack of data does not allow for an informed debate about welfare and there is currently no requirement for the whalers to provide relevant data to IWC.

A first step would therefore be for the IWC to adopt a binding decision (through an amendment to the IWC Schedule which would need a three quarters majority or consensus) requiring certain, agreed data to be collected and made available from both scientific and commercial whaling. Our recommendation is that, at a minimum, this would include the chase time from when the whale is first sighted, the time to death for each individual whale (rather than an overall mean), what, if any, secondary killing methods were used for each whale, struck and lost rates, and equipment failures such as the failure of the harpoon grenade to detonate. In addition continuous video data of the kill, including location of harpoon impact should also be required.

The current situation is that some data, such as struck and lost rates, are required by the IWC Schedule. However, Japan has interpreted these requirements as not applying to scientific whaling and thus does not provide data. Article VIII of the International Convention for the Regulation of Whaling states that the, “killing, taking and treating of whales ...” for the purposes of scientific research is exempt from other IWC decisions. However, a requirement that data must be provided does not restrict the killing, taking and treating of whales and therefore would not be in conflict with Article VIII. In 1979, the IWC took independent legal advice over a similar issue, namely the amendment of the Schedule to require prior review of proposed scientific permits [27]. The advice indicated that a requirement for such prior review is permissible within the Convention and as a result, the IWC adopted this requirement as Schedule paragraph 30. Thus, it would be possible to require scientific data to be reported from scientific whaling programs through an appropriate amendment to the Schedule.

Although whaling nations perceive that by providing data they are supplying ammunition to the critics of whaling, if they do not wish whaling to be judged on the basis of video material from other sources then they need to commit to providing adequate data. An informed debate, and a genuine effort to improve killing efficiencies if and where whaling occurs, will be a substantial improvement on the current impasse.

References

- [1] Brownell RL, Tillman MF, Notarbartolo di Sciara G, Berggren P, Read AJ. Further scrutiny of scientific whaling. *Science* 2000;290:1696.
- [2] de la Mare WK. Problems of ‘scientific’ whaling. *Nature* 1990;345:771.
- [3] Gales NJ, Kasuya T, Clapham PJ, Brownell Jr. RL. Japan’s whaling plan under scrutiny. *Nature* 2005;435:883–4.
- [4] Hatanaka H. Answering the critics of Japanese whale research. *Nature* 2005;436:912.
- [5] Nagasaki F. The case for scientific whaling. *Nature* 1990;344:189–90.
- [6] Normile D. Japan’s whaling program carries heavy baggage. *Science* 2000;289:2264–5.
- [7] IWC. Chairman’s report of the eleventh meeting, 1959. p 19.
- [8] Tonnessen JN, Johnsen AO. The history of modern whaling. London: C. Hurst and Co.; 1982. 798pp.

- [9] IWC. Chairman's report of the 32nd annual meeting, 1981. p. 25.
- [10] IWC. Report of working group on whale killing methods and associated welfare issues, Anchorage, USA; 2007. Document IWC/59/Rep6. Available from office of IWC.
- [11] IWC. Report of the workshop on whale killing methods and associated welfare issues, St. Kitts, June 2006. IWC annex D of annual report of the International Whaling Commission, 2006.
- [13] Leaper R, Papastavrou V, Gales N. An independent review of the efficacy of killing methods of Antarctic minke whales. Paper IWC/58/WKM&AWI23 presented to workshop on whale killing methods and associated welfare issues, 2006. Available from IWC.
- [14] Ishikawa H, Shigemune H. Improvements in more humane killing methods of Antarctic minke whales, *Balaenoptera bonaerensis*, in the Japanese Whale Research Program under Special Permit in the Antarctic Sea (JARPA). Japanese Journal of Zoo and Wildlife Medicine 2005;10(1):27–34.
- [15] Katona SK, Rough V, Richardson DT. A field guide to whales, porpoises and seals from Cape Cod to Newfoundland. Washington: Smithsonian Institution Press; 1993.
- [16] Leaper R, Papastavrou V, Sadler L. Consideration of factors affecting time to death for whales following entanglement in fishing gear. Paper IWC/58/WKM&AWI14 presented to workshop on whale killing methods and associated welfare issues, 2006. Available from IWC.
- [17] McLachlan H. The use of electricity to kill minke whales: humane considerations. Animal Welfare 1995;4:125–9.
- [19] Knudsen SK, Øen EO. Blast-induced neurotrauma in whales. Neuroscience Research 2003;46:377–86.
- [20] Øen EO. Norwegian minke whaling. Research to improve hunting and killing methods for minke whales in Norway. Paper IWC/58/WKM&AWI25 presented to IWC workshop on whale killing methods, St. Kitts and Nevis, June 2006. Available from IWC.
- [21] Best PB. The external locations of harpoon wounds on minke whales taken in Antarctic commercial whaling operations, 1978/79 season. Paper IWC/45/HK5 presented to IWC, Kyoto, 1993. Available from IWC.
- [22] Jønsgård Å. Studies on the little piked whale or minke whale. Norsk Hvalfangst Tidende 1951;5(40):209–32.
- [23] Cyranoski D. Japanese call for more bite in animal rules. Nature 2005;434:6.
- [24] Parker H, Rosell F, Danielsen J. Efficacy of cartridge type and projectile design in the harvest of beaver. Wildlife Society Bulletin 2006;34(1):127–30.
- [25] Bradshaw EL, Bateson P. Welfare implications of culling red deer (*Cervus elaphus*). Animal Welfare 2000;9:3–24.
- [26] Lewis AR, Pinchin AM, Kestin SC. Welfare implications of the night shooting of wild impala (*Aepyceros melampus*). Animal Welfare 1997;6:123–31.
- [27] IWC. Legal opinion on schedule provision for prior review of scientific permits and prohibition of whaling by operations failing to supply all data stipulated. Document IWC/31/9, 1979. Available from office of IWC.