

## Whaling and whale killing methods

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### History

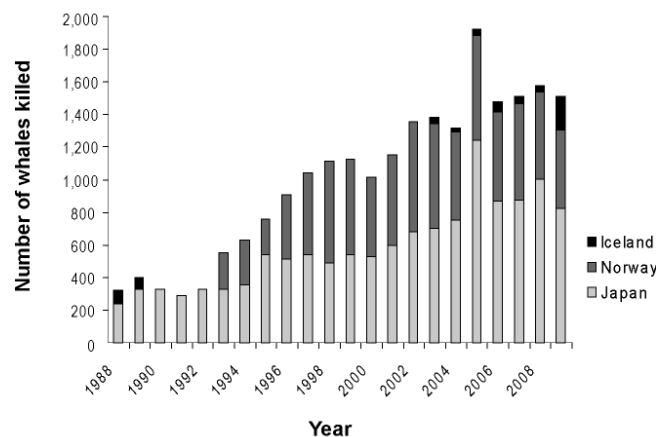
Subsistence whale hunting dates back to 400AD (Perrin *et al* 2009). Large-scale industrialised whaling to provide whale oil commenced in the late nineteenth century. Hunts escalated in the early 20th century and reports to the International Whaling Commission (IWC) show that over two million great whales were killed in hunts in the Southern Ocean between 1925 and 1985 and that unreported 'pirate' whaling was also widespread (Clapham & Ivashenko 2009). In 1982, as several whale species neared extinction, the IWC agreed an international moratorium on commercial whaling, which took effect in 1986.

Distinct from commercialised whaling and exempt from the moratorium are small-scale subsistence hunts, to provide food for indigenous communities. Some of these hunts have been practised for centuries and have cultural significance. However, in recent years, some concerns have been raised by IWC members about increasing commercialisation of some of these hunts.

### Whaling today

The IWC recognises three categories of large whale hunting: commercial, scientific, and aboriginal subsistence whaling. Large whales are currently hunted commercially for their meat in Norway (minke whales [*Balaenoptera acutorostrata*]) and Iceland (minke and fin whales [*Balaenoptera physalus*]), both countries having lodged objections to the moratorium, allowing them to self-award quotas. Japan conducts hunts for five species of large whales in the North Pacific and minke and fin whales in the Southern Ocean. Japan conducts these hunts under Article VIII of the Convention as 'scientific' or 'special permit' whaling, although there has been significant criticism over the need for and value of the research (Clapham *et al* 2003), as well as ongoing political condemnation of the hunts. The meat from these hunts is sold commercially for human consumption in Japan.

Figure 1



Catches of large whales reported to the IWC by Japan, Norway and Iceland (1988–2009). NB Japanese data not yet available (IWC 2010a,b).

Total catches by Japan, Norway and Iceland have been increasing since the early 1990s (Figure 1) (IWC 2010a,b). Norwegian hunts have remained relatively stable, killing an average of 560 whales per year since 1997 but with a slight decline in 2009 and 2010 catches.

Conversely, Icelandic hunts increased in 2009 and 2010, incorporating a large take of fin whales (160 animals in 2010). Quotas set in Japanese hunts have been increasing but the aspirations for these larger catches have not been met consistently. The IWC awards Aboriginal Subsistence Whaling (ASW) quotas for large whale hunts in Russia, the USA, Greenland and St Vincent and the Grenadines. Annual catches by these nations have totalled between 300 and 400 animals over the previous ten years (IWC 2011). In addition, small-scale unregulated

subsistence hunts for large whales take place in Indonesia and the Philippines (World Council of Whalers 2008).

There is disagreement between Commission members on the IWC's legal competency to regulate small whale, dolphin and porpoise hunts. At present, the Commission does not set hunting quotas for species other than those named in the Convention (IWC 2009). In numerous countries, including Japan, Denmark (Greenland and the Faroe Islands) and Canada, hunts are carried out for a range of small cetacean species. Some of these are subsistence hunts, however, Japan currently hunts some 10,000 small whales, dolphins and porpoises annually for commercial sale (Iwasaki 2009).

### Whale killing methods

Commercial and scientific hunts for large whales use the exploding penthrite grenade harpoon as the primary killing method. The aim is to cause blast-induced neurotrauma which renders the animal instantaneously insensible or dead (Knudsen & Øen 2003). Hunters use further harpoons or rifles as secondary killing methods.

ASW hunt weaponry varies between nations. Hunters in West Greenland use exploding penthrite harpoons (IWC 2010c) and hunters in Russia and Alaska use non-exploding harpoons with floats attached to slow the whales and penthrite-loaded darting guns or rifles to kill the whales (IWC 2010d,e). Minke whale hunts in East Greenland use rifles (minimum 7.62-mm calibre) as the primary killing method (IWC 2010c). Small cetacean hunters use a variety of methods to capture and kill animals including hand-thrown harpoons, darting guns, and 'drive' hunts, where pods of animals are driven into shallow coves to be killed using knives (or, in the case of the Japanese drive hunts, a specially designed spike).

### Factors affecting welfare outcome of hunts

A wide range of factors can affect the welfare outcome of cetacean hunts. Hunts involving lengthy pursuit or herding may cause stress to both target animals and conspecifics (Williams & Thorne 1996).

The accuracy of harpoon or rifle shots can be significantly compromised by environmental conditions (notably wave height, swell, and the presence of precipitation) (van Lier 2004). The IWC has formally recognised that seasonal and weather variations can adversely impact times to death (IWC 2001).

Choice of weaponry is another critical factor determining welfare. Exploding penthrite harpoons (such as the Norwegian 'Whale grenade-99') result in the highest reported Instantaneous Death Rates (IDR); based on data from 2000–2002, the Norwegian Government estimates that around 80% of whales die immediately upon harpoon impact (IWC 2010f). However, other hunts using the exploding harpoon report lower IDRs, eg, on average, 44% of harpooned minke whales ( $n = 880$ ) are reported to have died instantaneously during the 2003–2005 Japanese Antarctic hunts (Ishikawa 2005). Subsistence hunts using non-exploding harpoons, darting guns and rifles have, on average, lower IDRs and higher times to death (TTD), eg in the 2009 Russian grey

whale (*Eschrichtius robustus*) hunt the maximum TTD was 77 min and the mean was 27 min (IWC 2010d).

Hunter training and weaponry maintenance have been shown to have a positive influence on hunt welfare, notably in reducing the rates of animals struck but lost and reducing times to death (Ugarte 2007). Norwegian scientists are working co-operatively with hunting bodies in several whaling nations to assist in training of hunters and improvement of hunting methods and weaponry (IWC 2010f).

The location of the harpoon strike is important since a strike outside of the head/upper thoracic region is less likely to induce immediate insensibility (Knowles & Butterworth 2006). It has also been postulated that there is a relationship between whale size and times to death, larger species taking, on average, longer to die and with more frequent use of a second harpoon (Brakes & Donoghue 2006). The only known modification of harpoons for the slaughter of larger whale species is an increased explosive charge and the efficacy of this adaptation has not been ascertained. Financial considerations and a desire to preserve meat have also been cited as considerations when deciding how much explosive charge to use (Hayashi *et al* 2006).

Norwegian research has shown that bullet calibre is important in the effectiveness of rifles as secondary killing methods (Øen & Knudsen 2003). Norway recommends a minimum calibre of 9.3 mm (.365) with round-nose full-jacketed bullets for minke whales. Lower calibre weaponry appears to correlate with an increase in the number of bullets required and longer times to death, for example, in Russian subsistence hunts, in 2009, a maximum of 260 bullets were used on one whale, with a maximum TTD of 77 min (IWC 2010d).

There is concern surrounding the adequacy of the current criteria for assessing death in whales. Current IWC criteria are: relaxation of the lower jaw; or no flipper movement; or sinking without active movement. These criteria have been identified by the IWC as 'inadequate' (IWC 2004). It then follows that data on time to death and instantaneous death rate, which are based on these criteria, may be inaccurate. More sophisticated methods for ascertaining insensibility and death have been proposed (Butterworth 2006) but some present technical challenges and have yet to be implemented in the field.

Finally, it should be noted that despite IWC Resolutions (eg 1999-1; 2004-3) requesting submission of full welfare data for each animal killed, the IWC's ability to monitor hunt welfare outcomes is currently significantly compromised by a lack of such comprehensive welfare data collection or provision by Japan, Norway and Iceland. Review and analysis of the limited data presently collected by these countries (largely TTD data estimated by hunters) is periodically undertaken by technical working groups of the North Atlantic Marine Mammal Commission (eg NAMMCO 2010).

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