

**Monitoring progress in Norway's development  
of a DNA register as part of its domestic  
management system for whale meat,  
investigating local whale meat trade, and  
investigating reports of illegal trade in blubber**

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Cover picture:

*View in the Lofoten Islands and a whaling vessel (right) under maintenance during the winter season (Caroline Raymakers, November 1999)*

## INTRODUCTION

In Norway, for certain fishing communities whaling is a centuries old tradition. Embarked on small wooden vessels, less than 30m long, fishermen hunted whales armed with a hand harpoon and a rifle. Nowadays, vessels have engines, powerful winches to haul the whale on board, the harpoon is fired with a cannon and is equipped with a grenade to kill the whale more rapidly but the size of the vessels has not changed and their hull is still in wood. Until 1986, Norway used to export large quantities of whale products to Japan. According to Japanese Customs Statistics, a total of 3970 tonnes of whale products (both meat and blubber) was imported by Japan from Norway from 1980 to 1986 (Anon. 1997a). It is therefore not surprising that Norway and Japan are turning to CITES in an attempt to break deadlocks. CITES deals with international trade and it is principally this aspect of the whaling issue that should be dealt with in that forum.

Norway ratified CITES on 27 July 1976 (entry into force on 25 October 1976), but took reservations for three species of baleen whales, minke whale *Balaenoptera acutorostrata* (except West Greenland stock), sei whale *B. borealis* (reservation not applicable to stocks (A) in North Pacific and (B) in area from 0° longitude to 70° east longitude, from the equator to the Antarctic Continent) and fin whale *B. physalus* and for one species of tooth whale, sperm whale *Physeter catodon*.

For the third time, the Norwegian government submitted a proposal to transfer the Northeast Atlantic and North Atlantic Central stocks of minke whale *Balaenoptera acutorostrata* from Appendix I to II at the meeting of the Conference of the Parties (COP) of CITES in April 2000 (Annex 1). On both previous occasions, in 1994 at COP 9 and in 1997 at COP 10, Parties opposing the proposals expressed concern about acting counter to CITES's own precautionary measures, or against the International Whaling Commission (IWC) decisions, the moratorium on whaling since 1986, while those supporting the proposals argued that there was no scientific basis for maintaining the populations in Appendix I.

IWC has come under increased criticism and is behind schedule regarding the finalisation of the Revised Management Scheme (RMS) and the adoption of the Revised Management Procedure (RMP). In the past 10 years, the Norwegian government has worked on improving the control of whaling and of trade in whale products. Legislation has been adopted and specific measures imposed on Norwegian whalers and traders. Such efforts are mentioned in the supporting statements prepared by Norway for CITES COP11.

An addendum to the supporting statement of the proposal submitted by Norway at COP10 in 1997 described a trade control system based on a DNA register of whale specimens. The present study reviews the basis of this system, looks at the progress made by the Norwegian authorities in setting-up this system and attempting to verify its efficiency. Other aspects of Norwegian control of whaling and marketing of related products are described.

## 1. WHALING IN NORWAY

### 1.1 Description of the whaling operations, and of control/management procedures

#### 1.1.1 Hunting zones

Norwegian whalers are operating in waters under Norwegian jurisdiction only, i.e. inside the 200 nautical miles Exclusive Economical Zone (EEZ) (Act of 3 June 1983 No. 40). Areas where whaling is allowed are divided into five sub-areas: the Svalbard-Bear Island (ES; also called Spitsbergen); the eastern Norwegian Sea and central and north-eastern Barents Sea (EB); the Lofoten area (EC, also called the Vestfjorden); the North Sea (EN); and the western Norwegian Sea/Jan Mayen area (CM)(Figure 1) The quotas per hunting zone in are as follows,

	1997	1998	1999	2000
• Spitsbergen ES:	129	129	135	103
• Barents Sea EB:	283	283	310	228
• Vestfjorden EC:	14	15	14	16
• North Sea EN:	129	178	215	244
• Jan Mayen CM:	25	66	79	64
<b>Total</b>	<b>580</b>	<b>671</b>	<b>753</b>	<b>655</b>

(Source: Norwegian Ministry of Fisheries, December 1999)

A limited number of vessels are allowed to operate in each of these hunting zones and there are quotas allocated to each vessel for each hunting zone. The range of quotas for three of the hunting zones are as follows,

- Spitsbergen, 14 to 21 whales/vessel
- North Sea, 40 to 50 whales/vessel
- Jan Mayen, 28 to 30 whales/vessel

According to a whaler based in the Lofoten Islands, whalers usually prefer to hunt in the northern zones where they have hunted for many years. Furthermore, with outside temperatures lower in the north, the shipment can be kept on board the whaling vessel for much longer. Southern zones such as the North Sea have only more recently become hunting grounds. In addition, the meat of whales caught further north is believed to be of higher quality, maybe because of the whales' food source which is mainly sand eels in the North Sea (Mr Bendiksen, *pers. com.* to TRAFFIC Europe, 8 November 1999).

#### 1.1.2 Licences

In 1999, 36 whaling vessels were given a license to hunt whales in Norwegian waters. A new licence is issued every year based on the report of an official inspector and on the test passed by one member of the crew, the "gunner". The number of licences issued in previous years were

	1938	1950	1958	1972	1979
Number of licences issued	381	301	202	123	91

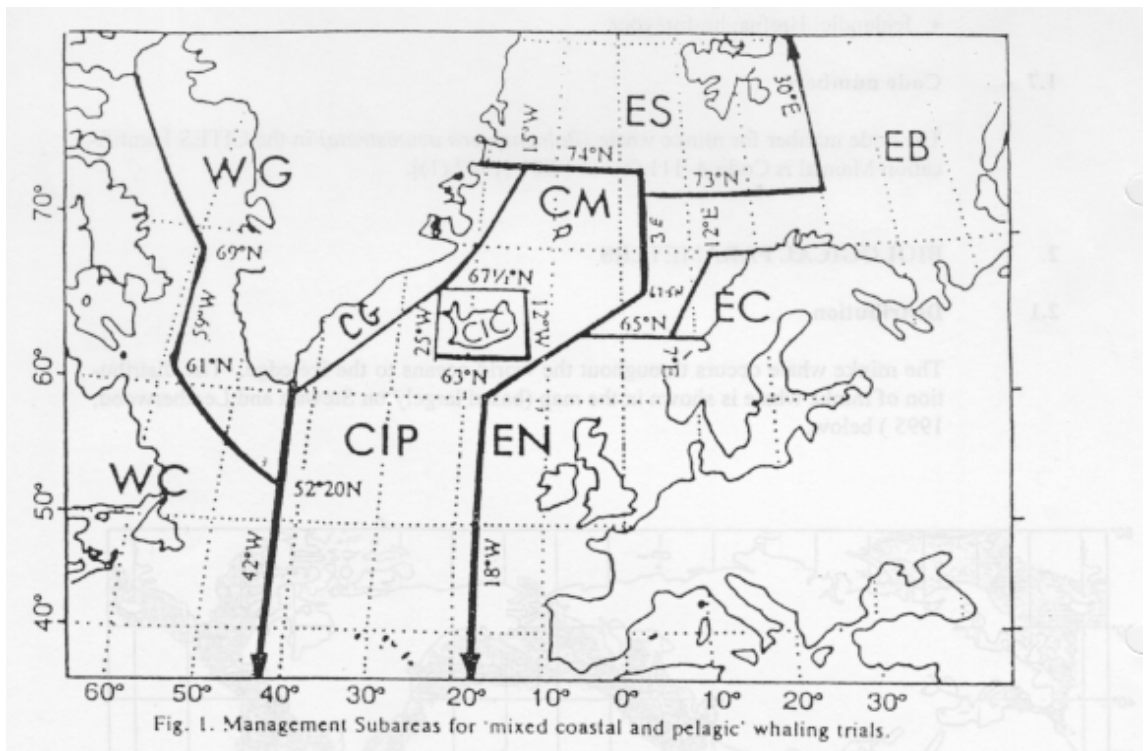
(Anderson *et. al.* 1987)

Each Norwegian whaling vessel receives a quota of whales to be caught during the current year. If the vessel is allowed to hunt in more than one Norwegian hunting zone, its quota is divided into numbers of whales to be caught in each zone where the vessel operates.

#### 1.1.3 Whale stocks estimates

In order to calculate national catch quotas the wild population of minke whale must be estimated. In 1987, 1989, 1994 and 1995, synchronised large scale cetacean sightings surveys, known as the North Atlantic Sighting Surveys (NASS) were conducted on board of vessels and aircraft allocated by several North Atlantic nations, including Norway. The total survey area covered by the Norwegian vessels in 1995 was 824,336 square nautical miles (n miles).

**Figure 1**  
**Norwegian whale hunting zones: Barents Sea (EB), Spitsbergen (ES), Vestfjorden (EV), North Sea (EN), and Jan Mayen (CM).**



The eleven participating vessels travelled for 13,522 n miles on 'primary effort', i.e. under "acceptable" weather conditions for conducting minke whale sightings (Beaufort 4 or less; visibility greater than 1 n mile). The minke whale estimates based on the Norwegian 1995 shipboard survey (Schweder *et al.* 1996) have been the subject of a major review by the IWC Scientific Committee (IWC/SC)(*Rep. int. Whal. Comm.* 48, 1998). The NAMMCO (North Atlantic Marine Mammals Commission) Working Group on Abundance Estimates did not feel that they could add much to those discussions, and estimates agreed by the IWC/SC were tabulated at face values. The overall estimate for the Norwegian survey blocks was 118,299 individuals (CV=0.103; 95% CI 93,746-138,720)(Anon. 1998). According to the RMP, a new estimate must be made every six years. The current six-year period runs from 1996 to 2001. In Norway the estimate of the north-eastern stock (Barents Sea and Spitsbergen hunting zones) is higher than the estimate of the Central stock (Jan Mayen, Vestfjorden and North Sea hunting zones)(Annex 1, map on the last page).

#### **1.1.4 Catch quotas**

The RMP developed by IWC includes a formula, the "catch limit algorithm" (CLA) for calculation of quotas. It is used by the Norwegian authorities to establish the total number of minke whales that may be caught over a 6-year period; the average annual catch quota and the number of specimens that may be carried over from one year to the next year within the 6 year period. Annual quotas calculated by the Norwegian experts are based on IWC estimates of abundance of minke whale population in Norway. The annual Norwegian whaling quota in 1999 was 753 whales (see Annex 2), representing a 12% increase compared to 1998 (671 whales). The quota allocated for 2000 is 655 specimens, a 13% decrease compared to the 1999 quota. In 1999, only 589 whales were caught of which 9 were lost before being hauled on board. According to the Norwegian fisheries authorities the fact that only 78% of the quota was hunted in 1999 was due to bad weather conditions in May. It is almost impossible to hit the whale in rough seas. The surface of the water must be very calm to have a good sighting and to maximise the chances for the harpoon to hit the whale on target and kill it almost instantly. If the whale is only wounded it could dive and drag the harpoon and the line underwater.

#### **1.1.5 Hunting season**

The whaling season in Norway is usually from May to the end of July. The season might be extended into August, particularly in the south, i.e. the North Sea. It usually stops earlier in the north, around 10 July. The whaling season is declared open by a specific regulation adopted every year by the Directorate of Fisheries. The Directorate is subsidiary to the Ministry of Fisheries. The Ministry deals with policy issues, while the Directorate is responsible for the implementation side. However, there is no clear distinction between the Terms of Reference of these two government bodies. Basically, the season is declared open in Norway when fishermen and the whalers' association report to have observed high numbers of minke whales in Norwegian waters.

#### **1.1.6 Gear**

The legal gear for hunting whales in Norway is a harpoon equipped with a grenade. A limited number of grenades is distributed per vessel by the responsible government agency. In 1999, the whalers paid USD400 per grenade. The number of grenades allocated per vessel is based on the quota of whales allocated to the vessel. On each grenade an official number is engraved. This number is recorded by the government agency. New grenades will be used in 2000. This new model will only explode if the whale is hit. This improvement should decrease the number of grenades declared lost because the target (whale) was missed.

#### **1.1.7 Whaling procedures and storage of products**

The harpoon is only be fired when the target (whale) is at 30m or less of the front of the vessel. Two observers stand in the "look out", at 12m above sea level at the front of the vessel and

indicate to the gunner where the whale is located/surfaces. Observers' shifts are of six hours. Where there is 24 hours daylight, whaling happens round the clock and there are four shifts for the observers, but when a whale is caught all crewmembers work. Once the harpoon hits the whale, it is pulled towards the vessel and hauled on board (transversally). Every step is reportedly carried out very carefully to minimise the risk of losing the whale, as it would sink rapidly. All measurements (morphological parameters) are taken at the time of capture, including samples for the DNA fingerprints identification.

Meat and blubber are taken from the carcass. This takes about one and half-hour. The rest of the carcass is thrown back in the sea (bones, head, stomach, etc.). For sanitary and gastronomic reasons, all products of the whale must slowly be cooled (from the whale's body temperature, about 37°C to less than 7°C) and are therefore kept on the deck for 48 hours. Chunks of meat of 50 to 100kg are stored in ice. The deck size of an average Norwegian whaler is a limiting factor: the maximum daily catch is 8 whales for an average size vessel. A classic Norwegian whaler has a total capacity of about 37 tonnes, of which maximum 30 tonnes of whale meat. The storage facility on board of the whaling vessel and the Norwegian sanitary regulation allow the whale meat to be kept on board for a maximum of three weeks. Beyond this time, the meat should either be frozen at less than minus 20°C or be sold as fresh whale meat and consumed maximum 3 to 4 weeks after the landing date. It means that whalers must return to the harbour and land their catch at the latest three weeks after the first whale was caught.

#### ***1.1.8 Whalers' training: Tests for the gunners***

Before the start of the whaling season, the gunner and its alternate of each whaling vessel must follow a two days training course and pass a test on the use of the harpoon and of the rifle. All participants meet in a location for about 2 days. The programme of the course changes from year to year, depending on the issues to be dealt with. For instance, in 1999 the course focused on sanitary issues concerning whale products and the use of the new type of grenade will be explained in the spring 2000 course. The compulsory training costs about USD300/whaler to be paid by the participants.

#### ***1.1.9 Vessel inspection***

The whaling vessel is inspected by an official inspector (an engineer) every year before the whaling season.

#### ***1.1.10 Inspector on board during the whaling trip***

Once the whaling season is open, the presence of an official inspector, appointed by the Norwegian government, is obligatory on each whaling vessel at any time of the hunt. The inspector is a veterinarian, officially hired and paid by the Ministry of Fisheries. The mandate of the inspector is to ensure that all legal measures are followed on board of the whaling vessel, i.e. ensure that all whales are caught legally. The inspector records all necessary information and eventual infraction and collects the sample for the DNA fingerprints identification.

The whaling company provides for food and accommodation of the inspector on board. Legally the government only covers 6 weeks of the inspector's salary, but in reality, reimbursement has never been claimed if whalers needed more than 6 weeks to catch the annual quota allocated to the vessel.

The addition of one crew member may raise unexpected logistical problems, for instance when it is a female inspector (most common) and the space to accommodate the crew is limited to one room plus one small cabin for the captain. This is often the case on Norwegian whaling vessels that are small (less than 30m long) and the captain gives his privilege up to provide privacy to the lady. The limited space available must be taken into consideration in the context of the IWC demand for the presence of an international observer on every vessel. If the English language proficiency of the crew and the Norwegian language proficiency of the observer are not sufficient, the presence of an interpreter would be needed as well.



### **1.1.11 Information recorded on board of the whaling vessel**

The inspector keeps detailed records of each catch: time of the catch (hour and minute), location of the catch (GPS position) and time to death for each individual (checking the efficiency of the grenade). The following biological data of the specimen are recorded as well:

1. Sex of the whale;
2. Length (7.5 to 8m on average) and circumference of the body of the whale;
3. Thickness of blubber at three different places on the body (as an indication of growth and health condition);
4. Weight (on average 1.5t of meat and 0.5t of blubber (3 different thickness at various places on the body) and skin);
5. Ear bones (age determination);
6. Length of foetus, when applicable;
7. Tissue samples for DNA fingerprints identification
8. Stomach content is collected for some specimens;
9. Checking the brain is done at certain occasions, in relation with the time to death; and
10. Samples of blubber are taken for some specimens to perform toxic tests.

### **1.2 Bycatch (incidental catch of whales)**

“Bycatch” is the incidental catch of specimens that are not targeted by the fishing gear. For instance whales can get entangled in large nets, particularly in huge driftnets that are still in use in certain fishing zones. Under Norwegian law, the discard of bycatch at sea is prohibited. Any whale bycatch therefore must be landed and recorded. The resulting products may be processed and marketed as any other whale catch. In Norway, no case of incidental catch of whale has been recorded since commercial whaling was resumed in Norwegian waters in 1993. The absence of recorded whale bycatch may reflect the strict regulation on fishing gears in force in Norway. For each fishery stock it is the Norwegian Ministry of Fishery that determines which fishing gear are allowed, for instance the mesh size and the length of a driftnet. Restrictions are also set regarding the time when and areas where each type of gear maybe used. These legal measures increase the selectivity of the gear and significantly decrease the risk of incidental catch.

### **1.3 Overview of the legislation**

#### **1.3.1 List of all relevant legal texts**

- “Råfiskloven”, Raw Fish Act 1951 (revised version of the 1938 Raw Fish Act) amended in 1983 and in 1998.
- Section 15 of Act of 16 June 1939 relating to Whaling
- Section 1 of the Maritime Act regarding the term Norwegian vessel
- Act of 17 December 1976 No 91 relating to the Economic Zone of Norway.
- Act of 5 December 1917 No 1 relating to the registration and marking of fishing vessels
- Provisions of Act of 22 May 1981 No 25 relating to legal procedure in criminal cases
- Section 253a and 254 of Act of 13 August 1915 No 7 relating to the enforcement of claims
- Section 37c of the Penal Code
- Customs Act of 10 July 1986

#### **1.3.2 Implementation of CITES provisions regarding “Introduction from the Sea”**

Any landing of specimens captured within a Party’s territorial waters does not constitute trade in the CITES sense, as the transaction remains within territorial borders. If the capture of specimens takes place in international waters, the landing of these specimens is “introduction from the sea.

Introduction from the sea constitutes trade under CITES, and refers to the transport/import of specimens taken in the marine environment not under the jurisdiction of any State. This refers to waters beyond territorial limits, but these limits are not defined in CITES. Therefore, it remains unclear whether this refers to waters beyond 12-mile territorial boundaries, or beyond the 200-mile exclusive economic zones (EEZ) that some countries have claimed. In all cases the Management Authority of the State of introduction must issue a certificate of introduction from the sea, on advice of its Scientific Authority.”

The legal standard limit for fisheries activities around the world is the 200 nautical miles Exclusive Economic Zone (EEZ) as set by members of UNCLOS (United Nations Convention on the Law Of the Sea). In narrow border straits, less than 400 nautical miles, the two border states usually agree upon a limit set in the middle of the strait, called the “median line”. With regard to territorial waters and to the application of Customs regulations, there is no common international agreement and each nation establishes its own limit in legal texts. The limit of Norwegian customs jurisdiction is 4 nautical miles.

The introduction from the sea of any specimen of a species included in Appendix I and II is regulated under Article III, paragraph 5 and IV paragraph 6 and 7 of the Convention and of Resolution Conf. 2.8 on the “Introduction from the Sea”. In brief, the introduction from the sea of CITES specimens shall require the prior grant of a certificate from the Management Authority of the State of introduction.

In view of the absence of CITES definition of “adjacent seas” or of a uniform CITES limit for Parties jurisdiction on their adjacent coastal waters, it is recommended that “the Parties use their best endeavours to apply their responsibilities”.

According to the Norwegian authorities,

1. A 4 nautical miles limit is applied regarding Norwegian Customs provisions (Ms. Elizabeth Jernqvist, Norwegian CITES Management Authority, *pers. com.*, 27 January 2000); and
2. The EEZ is applied for fisheries and the management of natural marine resources.

The Norwegian authorities do not require/issue “CITES introduction from sea certificates” for all CITES specimens caught within the Norwegian EEZ (Mr Stein Owe, Norwegian Ministry of Fisheries, *pers. com.* 3 February 2000).

### **1.3.3 Responsible agencies**

The implementation of the legislation on annual quota setting, hunting zones, season, gear, etc. is under the responsibility of the King of Norway and of the Norwegian government.

The enforcement of the law and related decisions are under the responsibility of the Coast Guard Officials (police authority) and the application of the law in case of infraction are to be the prosecuting authority.

### **1.4 Illegal activities**

Examples of practices defined as legal infractions by the Norwegian authorities are as follows: conduct whaling without permission from the Ministry, as well as participation and/or attempts to perform such illegal hunting. Act of 16 June 1939 No 7 relating to Whaling has been mostly abolished and its amended sections were included in other Acts. Regarding violation of the laws on whaling, the fine can be up to NOK 1 million (USD 135,000) and the violator can be put in prison for one year.

If a whale is caught in contravention of the law, the fisherman/whaler may be fined for the amount equivalent to the market value (price set at landing site) of all products extracted from the whale. In 1999, the estimated amount was NOK (Norwegian Kroner) 80,000 to 90,000 (USD 11,000 to 12,500) per whale caught (Mrs Ragnhild Movik, Office Manager, Råfisklag, Svolvær, Lofoten Islands, Norway; *pers. com.* to TRAFFIC Europe, 8 November 1999). Moreover, the provisions of the Penal Code establish that when lawful and unlawful catches have been mixed together, the entire catch may be confiscated.

#### **1.4.1 Court case, fine and sanction**

Norwegian whalers have been prosecuted for not complying with Norwegian laws on whaling. In 1994, the Norwegian coastguard discovered that a whaling vessel had caught one whale more than its assigned quota. The inspector on board was allegedly asleep when the whale was harpooned and brought on board. The owner of the vessel was fined NOK 10,000 (USD 1,600 – 1994 exchange rate). In addition, both the owner and its vessel have been excluded from taking part in whaling for five years (Anon. 1997b).

## **2. MARKETING OF WHALE PRODUCTS IN NORWAY**

### **2.1 Landing**

In Norway, sales of all fisheries products, from Pollack and Haddock to minke whale, are dealt with by a special institution, “Råfisklag” (Norwegian Raw Fish Association). Råfisklag is divided in six organisations, each one dealing with a limited area of the Norwegian coast. Norges Råfisklag is the largest one, both in the area covered and in the economic value of fisheries products sold, and most whale products are sold through this organisation. The headquarters of Norges Råfisklag is in Tromsø, but the sale of whale products and the determination of the minimum first hand prices, are done through the office in Svolvær in the Lofoten Islands since it is by far the most important area for whaling. Norges Råfisklag has six offices in total. Three other organisations have been involved in the sale of whale products, the catch of one whaling vessel only for each organisation in 1999, they might decide to fix different minimum prices than Norges Råfisklag.

Out at sea, on its way back to port, the whaler reports the total weight of his shipment, one figure for the whale meat and one for the blubber, to the relevant Råfisklag organisation. The organisation sells the meat on behalf of the whaler. There is an immediate auction, the name of the successful bidder is communicated to the whaling vessel which then delivers the shipment immediately at the landing site of the buyer.

#### **2.1.1 Procedure**

At the landing site, whale meat is first processed, cut into marketable pieces (400gr to a few kilograms). Some of the meat is not frozen and will be sold fresh. The rest of the meat and the blubber are stored in two separate rooms of the cold storage at minus 20°C to minus 25°C.

#### **2.1.2 Sites**

Each fisheries processing company has a landing site. All fisheries processing companies that want to trade whale products must get a special licence. The licence is issued after sanitary inspection of the processing plant. There is a limited number of landing sites in Norway. One of the reasons is that they must be equipped with the necessary facility to freeze large amounts of fisheries products. Most buyers/wholesalers of whale products store the meat and the blubber upon their landing. The number of landing sites for whale products and the number of companies that buy and sell the products, was 18 in 1999. Most of them are located in the area of the Lofoten Islands and neighbouring fjords, above the Arctic Circle (66° northern latitude).

### **2.2 Auction**

At the beginning of every whaling season, all relevant organisations of Råfisklag, in conjunction with the buyers’ organisations, set their minimum prices for meat (Annex 2) and blubber. This price may be revised if it appears that the set prices do not correspond to market trends. As soon as an organisation of Råfisklag is informed of the volume of meat and blubber that the whaling

vessel has on board, it advertises the sale of the shipment to the companies that have the necessary processing license. In 1999, 18 companies were involved in buying, processing and selling whale meat in Norway. The auction starts at the minimum prices set for the year for meat and blubber.

### **2.2.1 Prices and volumes (both meat and blubber)**

The deal is made between the organisation of Råfisklag and the buyer. Agreement is made on two prices, one for the meat and one for the blubber and the buyer must buy the entire shipment of one vessel, about 30 tonnes of meat and 7 tonnes of blubber. Usually the buyer makes subsequent deals with other buyers to resell the blubber. Processing (cut the 50kg to 100kg chunks in a few kilograms to 400gr marketable pieces) and packaging of whale meat are performed by the buyer. The sale to the retail market, supermarket or independent shops, is often done by phone. The first hand buyer contacts his customers, wholesalers and retailers, or vice versa.

## **2.3 Storage**

### **2.3.1 Whale meat, technical aspects**

When the whale meat arrives at the landing site, three weeks maximum after the death of the whale, whale meat can still be sold fresh for 3 to 4 weeks. All products that will not be sold fresh should be stored frozen at minus 20°C to minus 25°C. Norwegian whaling vessels are not equipped to provide for such low temperatures. They must therefore come back and land their shipment at the latest 3 weeks after the first whale was caught.

The shelf-life of fresh whale meat after its landing from the vessel is 3 to 4 weeks. Retail prices are the highest at the beginning of the season, in June. Once it has been frozen and if is properly stored, whale meat may be kept for several years. However, sanitary regulations require that a deadline for consumption is indicated on the packaging. In order to avoid possible problems processing companies usually advise consuming the meat at the latest 18 months after the whale was caught. Therefore, if a standard 400g piece of whale meat sold in supermarkets and wrapped in industrial packaging indicates “Best before: 02.00” (February 2000) it probably means that the meat comes from a specimen caught during the 1998 whaling season.

Long-term storage is only possible for whale meat that was constantly maintained at the required range of temperatures throughout the chain of custody. It is a very fragile product that will immediately have an extremely unpleasant “fishy” taste and smell if it is not properly stored. Although whale meat is a product from the sea, its taste has no resemblance with fish products. Instead, it is similar to a high quality beefsteak, tender, dark red, without any fat and the “fishy” smell is not acceptable at all. Wholesalers, shops, supermarkets, etc. always try to sell the older stock of whale meat first.

### **2.3.2 Blubber**

There is no demand for blubber on the Norwegian market. Therefore the blubber is kept in cold-storage at minus 24°C (see section “BLUBBER” below). In Japan, gourmets like to alternate one mouthful of meat with one of blubber. If the international market for Norwegian whale products is open, the blubber would acquire high commercial value while there is none on the current Norwegian domestic market. Some Norwegian companies speculate and buy blubber from other companies, hoping that export will be allowed in the near future. It is probable that this was what happened in 1995, when the minimum first hand sale price of blubber suddenly peaked at NOK23.11 (USD3.2)/kg. It may also be the reason for the slow increase of this price since 1997, NOK2.02 (USD0.28)/kg, NOK2.62 (USD0.36)/kg and NOK2.92 (USD0.4)/kg in 1997, 1998 and 1999 respectively (see Annex 2).

In January 2001, the Norwegian government announced the lifting of its export ban on minke whale products, stating that it would allow the exports when it had a register of DNA genetic material to track all exports.

## **2.4 Retail market**

Whale meat can be purchased in Norway together with any other fishery products. It is found in supermarkets and fish shops and is not perceived as a special fishery commodity. In Norway the whale meat landings recorded in 1997 and 1998 represented 200g whale meat per citizen in Norway, meaning about one dinner of whale meat per person per year (Østlie, 1999). This represents 1% of all the seafood consumed in Norway (Østlie, 1999).

### **2.4.1 Location**

Whale meat is available in shops and supermarkets throughout the country. According to a 1998 study commissioned by Norges Råfisklag, the demand for whale meat is higher in the northern part of the country (Østlie, 1999). Based on observations made during the random collection of whale meat samples in November 1999, whale meat seems more common and abundant on the retail market in areas where whalers live, mostly the northern part of the country, e.g. the Lofoten Islands.

### **2.4.2 Season**

From June to August, fresh whale meat is sold on the Norwegian retail market. Later in the year and until the next whaling season, to preserve the quality of the product only frozen meat can be found. In November 1999, some retail shops were not able to provide the investigator with whale meat because their usual supplier had sold out their stock. In Oslo, the staff member of a fish shop stated that he had to return the frozen meat that was supplied to him, because it was no longer fit for consumption.

### **2.4.3 Prices**

According to wholesalers, prices for whale products are the highest when the first vessels return from their hunt, mid-June. Every year whaling vessels compete to be the first to land their first shipment of the season in order to be offered the best price because the demand is high. This is probably due to a Norwegian tradition and higher consumers' demand for fresh whale meat when it first appears on the market (similar to "Beaujolais nouveau" wine in France and the "Nieuwe maatjes" (salted herring) in the Netherlands). Also, the whaling season coincides with the feeding season for whales. Meat from specimens caught later in the season has therefore a higher fat content, while Norwegian consumers prefer the taste of whale meat with very little fat.

Retail prices observed in 10 Norwegian outlets in November 1999 ranged from USD10/kg (NOK52.8/700gr Hvalkjøtt) of frozen whale meat to USD24/kg. These prices compare to the ones of expensive fishery products such as halibut, NOK74.5/500gr (USD20/kg). The lowest retail prices, USD10 to 17/kg, were found close to landing sites, in towns where whalers live. This supports the claim that prices rise with the number of middlemen before final distribution (Østlie, 1999). The highest prices for whale meat, USD24/kg, were observed in supermarkets in Oslo and in tourist areas.

## **2.5 Overview of legislation**

Although Norway has a reservation on CITES Appendix I listing of minke whale *Balaenoptera acutorostrata*, the government does not allow export of whale specimens from Norway without CITES documents. The export of whale products for any purpose, including scientific purpose, requires a CITES document confirmed by a written authorisation from the Ministry of Fisheries. However, as indicated by the CITES Secretariat in its preliminary recommendations to the proposals submitted for CoP11, Norway has not submitted its annual reports since 1996 and therefore the Norwegian trade in minke whale specimens for the past three years is unknown.

In January 2001, the Norwegian government announced the lifting of its export ban on minke whale products, stating that it would allow the exports when it had a register of DNA genetic material to track all exports.

#### **2.5.1 List of all relevant legal texts**

- Act of 14 December 1951 No 3, the Raw Fish Marketing Act; and
- Customs Act of 10 July 1986.

### **2.6 Illegal cases**

#### **2.6.1 Statement/Report by the responsible agency**

There has been one recorded attempt of smuggling of whale meat out of Norway. In 1993, two carriers were stopped and their merchandise seized. The police decided not to forward the case to the Norwegian court of justice. The case was closed six years later, in December 1999, without giving any explanation about the reason for such a long investigation. The whale meat was confiscated and destroyed soon after the seizure was performed. The two smugglers were given fines of NOK 20,000 and 10,000 (USD2800 and 1400) respectively and were charged NOK 40,000 and 20,000 (USD5600 and 2800), the equivalent of the profit they would have made if they had succeeded their attempt, i.e. the commercial value of goods they were smuggling (Moy 1999).

In 1996, the Vietnamese customs seized four tonnes of whale meat allegedly of Norwegian origin destined to Japan. The Norwegian police decided to investigate this case in Norway and concluded that no connection could be established between the shipment seized in Vietnam and Norway (Mr Stein Owe, *pers. com.* to TRAFFIC Europe, 3 November 1999).

#### **2.6.2 Court cases**

The police report does not clearly indicate why the decision was made not to forward the case to the Norwegian court of justice. No other case of illegal whale meat trade is known to have been dealt with by the Norwegian courts.

## **3. BLUBBER**

### **3.1 Landings of blubber recorded in Norway**

Catch and market records of whale products kept by Råfisklag shows that the volume of blubber produced by whale hunting from 1988 to 1999 amounts to almost 850 tonnes, or 77t/year on average (see Annex 2).

After each year, at the latest on 15 January of the following year (deadline set by government authorities), first-hand buyers and wholesalers (not at retail level) must make an inventory of whale meat and blubber that they have in their cold storage. This information must be reported to the Råfisklag organisation where data are computerised and analysed. In December 1999, 400 tonnes seems to be the official figure for the total blubber stockpile in Norway.

### **3.2 Norwegian stockpiles of blubber**

In May 1998, the Norwegian Ministry of Fisheries offered to subsidise companies that store whale blubber at the rate of NOK 3 (USD 0.4)/kg. At that time the blubber stock was estimated at 400 tonnes. The government scheme had an upper limit of NOK 1.5 million (USD 185,000) and was planned to cover costs related to landing, freight and processing of the blubber. The subsidy applied to blubber from whales caught before 1997 only. These are whales from which

no samples for DNA fingerprint identification were taken. When exports of whale products resume, it is anticipated that one condition will be that all products come from whales for which DNA profiles have been obtained. The Norwegian authorities reiterated the offer in 1999, and raised the limit to NOK 3 million (USD 365,000) (Aftenposten, November 1999), but TRAFFIC has not received precise information on the amount of blubber currently stored.

Recently, old stocks of whale blubber have been incinerated by the Norwegian government and by private companies. In 1999, 137 tonnes of old blubber stocks were incinerated.

#### **4. DNA IDENTIFICATION METHODS**

Based on research of the genetic characterisation of whale specimens legally caught by Norwegian whalers, a genetic profile has been defined for use in a Norwegian DNA register of whales. The samples used can be of meat, blubber, skin and almost all other whale parts. A sample is considered fully analysed when a complete genetic profile has been obtained. The genetic profiles will subsequently be used to verify if DNA fingerprints identified from samples match the records in the Norwegian DNA register of minke whales caught during the 1997, 1998 and 1999 seasons. Such matching exercise can be performed provided all records are available. Each genetic profile will allow determination of species as well as if the sample is of North Atlantic origin.

##### **4.1 Procedure for DNA fingerprinting, register and species identification**

The genetic methods used in Norway for the minke whale DNA register are standard genetic methods, which, for instance, are employed in human forensic sciences to identify individuals. The application of genetic tagging to identify animal and plant parts for the purpose of registration and tracing of harvested specimens is new. The minke whale DNA Register in Norway has been developed by specialists in medical forensics over the last couple of years (Dr Per Palsbøll, Lecturer at the University of Whales in Bangor, UK; *pers. com.*, 21 January 2000).

##### **4.1.1 Sampling**

In order to be able to have DNA fingerprints for all whales that have been legally caught, tissue samples of each specimen must be collected and preserved following a standard protocol.

###### **4.1.1.1 Collection of tissue samples from whales caught during the whaling season**

The sampling procedure is conducted by the inspector (veterinarian) appointed by the government (see section “1.1.10 Inspector on board during the whaling trip”). The samples are taken from each specimen as soon as the whale is hauled on board of the whaling vessel.

Upon arrival at the landing site, all samples are sent to a specialised institute in Tromsø. There, the full set of samples of all whales caught since April 1997 is kept at less than  $-20^{\circ}\text{C}$ . Once frozen, the samples may be kept for several years but the temperature must stay below  $-20^{\circ}\text{C}$ .

###### **4.1.1.2 Whale bycatch from Norwegian fisheries**

The collection of tissue samples from whales caught incidentally has never occurred in Norway because there were no whale bycatch has been recorded in Norwegian waters since 1993 (see section “1.2 Bycatch”). No special procedure for sampling of specimens caught incidentally has therefore been needed or set-up until now. However if bycatch occurs in the future, samples of need to be collected to prevent loopholes and ensure that the DNA profile of all whale products present on the Norwegian market is included in the DNA register. The Norwegian Ministry of Fisheries indicated that, if needed, there would be no problem to collect samples of a whale caught incidentally (Mr Stein Owe, *pers. com.* to TRAFFIC Europe, 3 February 2000). The sample would be performed at the landing site by an official inspector.

#### **4.1.2 Test**

By January 2000, only samples of the 1997 whaling season had been tested and were included in the DNA register. The DNA profile of all specimens, i.e. each whale, legally caught in Norwegian waters in 1997 had been identified. For samples collected in 1998, 1999 and in the future, the Norwegian government has invited both Norwegian and foreign laboratories to a tender. The winner was appointed in December 1999 by the government. This specialised laboratory has set-up a full technical protocol for the identification of DNA fingerprints. The analysis of close to 1200 whales caught and landed in 1998 and 1999 started early January 2000, and the final result of this work was expected to be available around mid-March 2000 (Mr Stein Owe, *pers. com.* to TRAFFIC Europe, 3 February 2000). However, it cannot be verified that the DNA register is fully operational at the time of publication of this report.

##### *4.1.2.1 Scientific description*

The first steps of the test are as follows (Baker *et al.* 1995),

- 1) Sub-sampling: A tiny portion is cut from the preserved whale products sub-sampled that is isolated from the large sample purchased on the market, or archived by the Norwegian authorities. Clean and sterile tools must be used to the sub-sample and a new scalpel blade must be used for each new archived sample.
- 2) DNA extraction: The DNA is extracted from the tiny portion, using one of a variety of “instant” techniques, all based on heating a very small quantity of tissue with a prepared reagent. This removes enough of the proteins and other tissue components and breakdown products from solution so that the remaining DNA can be amplified;
- 3) PCR amplification: The PCR amplification uses a thermostable DNA polymerase (enzyme) to copy sections of DNA repeatedly, using a heating/cooling cycle that alternately permits formation of complementary DNA strand. Short sequences of highly variable DNA (such as the vertebrate mitochondrial DNA control region) are selected and amplified.

The amplified “test” sample is then identified as follow, different sequences of the mitochondrial DNA of the “test” sample are compared with a catalogue of “reference” or “type” sequences known to come from specific whale species. This way, unambiguous determination can be made of the species, sex and lineage of the dead specimen. “Type” DNA sequences are available from most species of cetaceans, including the minke whale (Dizon *et al.*, 1995).

##### *4.1.2.2 Cost for random testing*

The cost for performing the DNA fingerprints identification of 200 samples ranges between USD 5000 and USD 12000. As for most services or products, the larger the number of samples to be analysed, the lower the cost per test will be. Therefore the unit cost of such test should decrease once the analysis will be performed systematically and investigations undertaken.

#### **4.1.3 Database or “DNA register”**

The results of the analysis of samples collected during the 1997 whaling season (DNA fingerprints identified for all whales legally hunted and landed in 1997) are already registered in the special database. The database is called the DNA register that will be the reference for all controls that will be made in the future.

##### *4.1.3.1 Brief description of the information that will be included in the database*

According to the Addendum to Proposal submitted by Norway at COP10, “DNA profiles from all minke whales caught during legal Norwegian whaling operations from the 1997 season onwards will be included in the register. The register will gradually be expanded to include DNA profiles from other minke whale stocks and from other whale species to the degree tissue samples are available. It will thus be possible to identify the individual in the case of samples from legally-caught minke whales, and to determine the species and stock for samples from whales that are not in the register.”



For each individual legally caught the following information will be entered in the register (Olaisen 1997),

1. a set of DNA markers which together can be used to identify each individual whale;
2. data from mitochondrial DNA (“maternal DNA”); and
3. data from Y chromosome DNA (“paternal DNA”).

In addition to being so specific that they can be used to identify individuals, the DNA profiles used for this purpose should be specific to species and stock that they provide reasonably reliable information at this level as well. In cases where the profile is found in the register, this will not be of any great importance, but if it is not in the register, it will be useful to establish whether the profile belongs to a minke whale and if so from which stock.

#### *4.1.3.2 Availability of the information*

In order for the information included in the DNA register to be usable at all relevant occasions, each element included in the register must fulfil the requirements for DNA profiles used in international registers. Such requirements were identified by the Norwegian authorities as follows (Olaisen 1997),

1. DNA profiles for use in the register must be composed in a way that ensures they are so characteristic/individual that a match between two profiles in practice proves that they are from the same individual;
2. It must be possible to digitise the DNA profiles and enter them in a searchable register;
3. It must be possible to reproduce the DNA profiles so accurately that the profile in the register is practically always the same as that obtained by drawing up profiles from other samples from the same individual;
4. DNA profiles should also normally be reproducible between various laboratories and countries. This means that the technology needed should be well-known and used in other relevant countries/laboratories, and that it should be possible to communicate profiles unambiguously between laboratories and countries, nomenclature for example.

#### *4.1.3.3 Time between the catch of the whale and the inclusion of its DNA profiles in the register*

Once the appointed laboratory has set up the protocol to systematically undertake the DNA test for whale samples, it is planned that the time between the catch of the whale and the inclusion of its DNA fingerprints in the register could be reduced to less than a couple of months.

#### *4.1.3.4 Registration of specimens caught incidentally (bycatch)*

No whale bycatch has been reported since Norway resumed commercial whaling in 1993 so sampling procedures for inclusion in the DNA register have not been specified for this potential source of whale meat products

#### **4.1.4 Species identification**

According to the Addendum to the Proposal submitted by Norway at COP10, “*The register will gradually be expanded to included DNA profiles from other minke whale stocks and from other whale species to the degree tissue samples are available. ... to determine the species and stock for samples from whales that are not in the register.*” This part of the DNA register would be of use in case of non-matching DNA fingerprints suggesting samples from potential illegal catches, or samples none whale species.

## **4.2 Legislation (legitimacy of the test in court)**

### **4.2.1 Relevant text and sanctions/provisions for confiscation**

As of January 2000, the Norwegian government has not adopted provisions referring specifically to marketed products that would not match with the whale DNA register. However,

the DNA method selected is the one used by forensic experts for samples of human beings in criminal cases. One can therefore expect the court to recognise the legitimacy of the test and consider that a mismatch of samples with the DNA register represents a violation of the “Råfiskloven”, Raw Fish Act and/or of the Raw Fish Marketing Act.

#### **4.2.2 Responsible agencies**

According to the Addendum to Proposal submitted by Norway at COP10, “*The register should be administered by a central public institution with the necessary legal expertise.*”

#### **4.3 Financial contribution**

All costs involved in controlling the distribution and marketing of whale products are currently covered exclusively by Norwegian government funds. These costs include,

1. The collection of the samples;
2. The DNA fingerprints identification test;
3. Recording of data (DNA profiles) in the DNA register;
4. The administration of the information contained in the database in order to make it available to responsible agencies, creation of a website on internet for instance; and
5. Promoting the utilisation of the DNA register to all relevant bodies in Norway and around the world.

### **5. VERIFICATION OF THE SYSTEM**

#### **5.1 Sampling procedure**

Samples of whale products, 19 of whale meat and 1 of whale blubber were purchased or collected randomly by TRAFFIC during October 1999 to March 2000. The investigators tried to gather specimens from the widest geographical range: in Oslo (south), in Tromsø (high north) and in the area with the highest density of whaling vessels: the Lofoten Islands as well as fjords in the neighbouring area on the mainland.

Since there is no market for blubber in Norway, one frozen blubber sample was collected from a first-hand buyer level (wholesaler). It was provided for free by a processing company. Two samples of whale meat were gifts as well: one was given by a whaler of the Lofoten Islands and the second was provided by the representative of the whalers co-operative at a food fair in Oslo. With regard to the first gift, each crewmember of a whaling vessel is allowed to bring home a limited amount of whale meat for personal consumption. All other 17 samples were purchased in normal outlets: shops and supermarkets. The procedure described above under the section “DNA methods” was followed to prepare the sub-samples.

In November 1999, 7 samples of meat and one sample of blubber were ready. This set of samples was supplemented by 12 samples collected in March 2000, when the full set was exported with all necessary CITES documents to be analysed in a university laboratory in United-Kingdom.

#### **5.2 Results of the genetic identification**

In early 2000, TRAFFIC commissioned DNA analysis of the samples by Dr Per Palsbøll, then based at the University of Wales in the UK. The methodology employed for the analysis is detailed in Annex 4, an extract from the consultant’s draft report.

The consultant reported that all samples analysed had different composite genotypes and therefore originate from different individual whales. Furthermore, the genetic analysis strongly

suggests that all samples originated from Minke Whales (barring any hybrids). All but one of the mtDNA control region sequences identified have been previously detected in North Atlantic Minke Whales. The remaining sequence was very similar to a known North Atlantic type. The consultant therefore concluded that, given the high degree of genetic divergence among Minke Whales from different oceans (Hori *et al.* 1994; Pastene *et al.*, 1996), it is unlikely that the samples originate outside the North Atlantic.

The detailed genetic profiles required for identification of individual whales were documented by the consultant and forwarded to the Norwegian authorities in June 2000 for the first stage of a double blind matching exercise. Various discussions have taken place between the consultant and the Norwegian contact point since that time, including preliminary confirmation to the consultant in February 2001 that some of TRAFFIC's partial profiles had been matched with profiles in the register. However, this first stage of the matching exercise remains unresolved at the time of publication of the present report. A formal request by TRAFFIC for an update on progress from the Norwegian Ministry of Fisheries sent on 6 June 2001 had not been answered by late July 2001.

## CONCLUSION

Based on the present review, it seems that the Norwegian authorities are gradually improving their ability to control whaling and the trade in whale products in Norway. All stocks of whale products, including the stockpiles of blubber, stored by first-hand buyers and wholesalers (not retailers) must be annually reported to the responsible Norwegian agency. Based on reports from these companies, the inventory of whale products remaining in large cold-storage is updated. Sites and volumes of blubber for location are recorded. In December 1999, the estimate of the total stockpile of blubber stored in Norway had not been officially published, but reliable sources mentioned that it is probably close to 400 tonnes.

Since COP 10, the progress made in the set-up of an operational DNA register of all whales legally caught in Norwegian waters since 1997 appears to be significant. DNA profiles from a selection of samples on the Norwegian market were secured by TRAFFIC and in June 2000 presented to the Norwegian government for matching with the register. However, we are concerned that this matching remains unresolved over a year later and keenly await further information from the Norwegian authorities. Until such time, it cannot be verified that the DNA register is fully operational.

Legal texts and implementation procedures appear to be lacking in two main aspects,

- Legislation on CITES provisions related to the "introduction from the sea" in Norway; and
- The sampling of whale tissue and inclusion in the DNA register of the DNA profile of specimens caught incidentally in Norwegian waters. Their products must be landed and may be marketed as all other whaling products.

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**Text of the  
“Proposal submitted by Norway to transfer the Northeast Atlantic and North Atlantic  
Central stocks of minke whale *Balaenoptera acutorostrata* from Appendix I to Appendix II”  
prepared for the 11<sup>th</sup> meeting of the Conference of the Parties (COP11) of CITES**

**Convention on International Trade in Endangered Species  
of Wild Flora and Fauna (CITES)**

**Eleventh meeting of the Conference of the Parties (COP11), Nairobi, Kenya 10. – 20.4.2000**

**Proposal submitted by Norway to transfer the Northeast Atlantic and North Atlantic Central stocks of minke whale *Balaenoptera acutorostrata* from Appendix I to Appendix II**

**A PROPOSAL**

Norway proposes to transfer the Northeast Atlantic stock and the North Atlantic Central stock of minke whale *Balaenoptera acutorostrata*<sup>1</sup> from Appendix I to Appendix II, since Appendix I species according to Article II, paragraph 1 should only be species threatened with extinction which are or may be affected by trade.

This proposal is presented in accordance with Resolution Conf. 9.24 with particular emphasis on the following:

- The biological criteria (cf. Annex 1, Res. Conf. 9.24) for Appendix I species are not met for these stocks.
- The precautionary measures (cf. Annex 4 paragraph B2b, Res. Conf. 9.24) are fulfilled through national measures and establishment of a trade control system based on DNA analysis techniques.

Scientific research shows that the Northeast Atlantic and North Atlantic Central stocks of minke whales are in a healthy state and in no way threatened with extinction. The Northeast Atlantic stock was most recently estimated by the Scientific Committee of the International Whaling Commission (IWC) in 1995, at 112.000 animals. An IWC Scientific Committee estimate from 1990 set the size of the North Atlantic Central stock at 28,000. A new estimate for this stock based on surveys conducted in 1995 (NASS-95), was presented by the North Atlantic Marine Mammal Commission (NAMMCO) in March 1997 (Anon. 1998). Now the number of minke whales in the North Atlantic Central stock was calculated to 72.000. These estimates clearly demonstrates that the two stocks of minke whale may not in any way be regarded as threatened with extinction and therefore do not qualify for inclusion in Appendix I.

Norway has established a trade control system based on DNA analysis techniques with samples taken from each individual whale. This system makes it possible to identify and monitor trade in Norwegian whale products and distinguish such trade from any trade in whale products from other sources. Norway will ensure that systems for proper monitoring and control of trade are implemented by potential importing countries before any export of minke whale products from Norway take place.

(...17 pages +map)

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<sup>1</sup> Cf. IWC 1995. See also 1.5.

## Whale products legally landed in Norway from 1988 to 1999

Year	Quota	Catch*	First hand sale*	Meat (t)	First hand Sale (1000 NOK)	Price (NOK/kg)	Blubber (t)	First hand sale (1000 NOK)	Price (NOK/kg)	Other products (t)	First hand sale (1000 NOK)	Price (NOK/kg)	Total value (1000 NOK)	Minimum meat price set/reviewed
1988	30	29	29	33	808	24.40	0	0	0.00	9	9	1.00		
1989	20	17	17	20	505	25.82	0	0	0.00	3	3	1.00	508	
1990	5	5	5	8	505	27.80	0	0	0.00	1	1	1.00	232	
1991	0													
1992	110	110	95	121	3,274	27.03	28	0	0.01	5	5	1.00	3,279	27.00
1993	296	217	217	353	16,196	45.94	91	46	0.50	10	10	1.00	16,253	31.00
1994	314	273	273	422	15,695	37.21	58	22	0.38	7	7	1.00	15,725	37,00/26,50
1995	232	217	217	335	10,298	30.79	119	2,755	23.11	2	15	6.36	13,068	28.00
1996	425	388	383	556	15,365	27.64	121	12	0.10	2	2	1.00	15,379	28,00/26,50
1997	580	503	496	732	21,864	29.86	46	94	2.02	1	1	1.00	22,059	26.00
1998	671	625	616	912	26,747	29.32	225	592	2.62	6	26	4.17	27,365	27.00
1999	753	589	578	839	23,814	28.39	157	457	2.92	0	0	0.00	24,272	25.50
2000	655													
<b>Total</b>	3,436	2,973	2,926	4,331	135,071		845	3,978		46	79		138,140	
<b>Aver.</b>	286	270	266	393.73	12,279.18	30.38	76.82	361.64	2.88	4.18	7.18	1.68	13,814	27.42

\* Difference between "Catch" and "sale" is due to whales lost after harpooning, e.g. animal killed but freed from harpoon before it was lifted on board and sunk.

Source: Harald Dahl, *in litt.*, 8 November 1999; Rafisklåg, 8300 Svolvær, Lofoten, Noway

((Norwegian Kroner) NOK 1 = US\$ 0.138)

## Frozen samples of whale product collected in Norway in 1999 and 2000

No	Product (frozen)	Town	Address	Date	Weight	Price/kg (USD/kg)	Picture of sample	Remarks
1	Meat	Oslo	Reidar Sundvall (shop) Torggate 20, Oslo	3 Nov. 99	350gr	21.7	Yes (slices)	Fish smell (probably not properly stored?)
2	Meat	Oslo	ICA (supermarket) Theresegate (Tel: 47-22-46 26 66)	3 Nov. 99	400gr	24	Yes	"Best for: 02.00" (probably 1998 catch)
3	Meat	Tromsø	MEGA (supermarket)	Oct. 99	104gr	13.7	Yes	
4	Meat	Tromsø	(shop)	Oct. 99	~250gr	16.6	No	
5	Meat	Tromsø	(shop)	Oct. 99	~250gr	16	No	
6	Meat	Tysfjord	Tysfjord Turistsenter (supermarket)	6 Nov. 99	400gr	24	No	"Best for: 02.00" (probably 1998 catch)
7	Meat	Moskenes	Gift from a whaler in the Lofoten lshds.	4 Nov. 99	~500gr	gift	No	
8	Blubber	Svolvær	Gift from Råfisklag	8 Nov. 99	~50gr	gift	Yes	Slides of blubber stock
9	Meat	Oslo	Gift at a food fair from the federat° of promotion of whale products	3 Mar. 00	~50gr	gift	No	
10	Meat	Oslo	RIMI (supermaket), Grensen Oslo	3 Mar. 00	400gr	18.7	Yes	
11	Meat	Oslo	Oluf Lorentzen (supermarket) Karl Johans gate 33, Oslo	3 Mar. 00	400gr	17.8	Yes	
12	Meat	Oslo	ICA (supermarket)	3 Mar. 00	400gr	21.8	Yes	
13	Meat	Oslo	Tereseigate 29	3 Mar. 00	400gr	21.8	Yes	
14	Meat	Oslo	Fisk Vilt, Louises g. 21 (22-466174)	3 Mar. 00	144gr	20.8	Yes	Water in the tissue
15	Meat	Oslo	Erling Moe AS, Youngstorget 2 (shop) 22-42 71 01 or 76 71	3 Mar. 00	222gr	18.3	Yes	Water & fat in the tissue, not properly frozen (?)
16	Meat	Oslo	Fisk og Vilt AS (Georg A. Nielsen) Bogstadveien 39, 0366 Oslo	3 Mar. 00	532gr	22.2	Yes	photo of the shop
17	Meat	Oslo	Briksby Vilt-Fisk og Gronnsaksfovretning Till Niels Juels 70 (22-44 95 20)	6 Mar. 00	160gr	12.5	Yes	
18	Meat	Oslo	Frogner Mat (mini market) Frognerveie 42 (22-44 44 64)	6 Mar. 00	400gr	18.8	Yes	
19	Meat	Oslo	Flyvefisker AS, Lilletorget 1 (22-171230)	6 Mar. 00	168gr	16.2	Yes	
20	Meat	Oslo	Fuji (Japanese Rest. & Sushi Bar) Munkedamsveien 100, 0270 Skillebekk	6 Mar. 00	3 port°	5USD/p	Yes	photo of the cook preparing the whale meat sushi

Source: Caroline Raymakers, TRAFFIC Europe, March 2000



## Genetic identification of whale meat collected in Norway: Materials and methods

(Extract from 'GENETIC IDENTIFICATION OF WHALE MEAT COLLECTED IN NORWAY', Per J. Palsbøll and Martine Bérubé, November 2000)

### *DNA extraction*

Total-cell DNA was extracted from muscle, skin or blubber by Chelex-based extraction (Walsh *et al.* 1991). Using clean new scalpel blades and microscope slides a small amount of tissue was minced finely and added to 100  $\mu$ L of Chelex buffer (5% Chelex, BioRad catalogue number 143-2832, in sterile ultrapure water) and placed at 100°C for one hour to release the DNA. DNA extractions were kept at -20°C degrees between PCR amplifications. Two independent extractions were performed on each sample.

### *Sex determination.*

The sex of each sample was determined in the manner described by Palsbøll *et al.* (Palsbøll *et al.* 1992), except that oligo-nucleotide primer ZFX1204 was replaced with ZFX0561 (Bérubé and Palsbøll, unpublished data). PCR\_ (Polymerase chain reaction, Mullis & Faloona 1987) amplifications were each performed in a volume of 20  $\mu$ L, with approximately 10ng of extracted DNA (0.5  $\mu$ L of extraction) in 67mM Tris-HCl, pH 8.8, 2mM MgCl<sub>2</sub>, 16.6mM (NH<sub>4</sub>)<sub>2</sub>SO<sub>4</sub>, 10mM B-mercaptoethanol, 0.2mM dNTPs, 1mM of each oligo-nucleotide primer as well as 0.4 units of *Taq* DNA polymerase. A total of 35 PCR<sup>TM</sup> cycles was performed on a RoboCycler<sup>TM</sup> (Stratagene) each consisting of 60s at 94°C, 60s at 54°C and 240s at 72°C. Ten  $\mu$ L of the amplification product was digested to completion at 65°C with 3 units of *TaqI* restriction endonuclease following the manufacturers instructions. The restriction fragments were separated by electrophoresis through 1.7% NuSieve<sup>TM</sup> agarose (FMC, Inc) in 1xTBE at 200 volts. The pattern of fragments was visualized after staining with Ethidium bromide under UV-light.

### *Sequencing of the mitochondrial control region.*

Initial symmetrical PCR amplifications were conducted in 25 $\mu$ L volumes. Each PCR amplification was carried out under conditions similar to those described for the sex determination above. The oligo-nucleotide primers were, Mt4 (Arnason & Best 1991) and Bp00019 (Bérubé and Palsbøll, unpublished data). The thermo-cycling parameters were identical to those for the sex determination although only 28 cycles were performed. Amplification products were extracted by standard phenol/chloroform procedures (Sambrook *et al.* 1989), precipitated with 96% ethanol, rinsed in 70% ethanol and re-suspended in 15 $\mu$ L ddH<sub>2</sub>O.

Cycle sequencing was conducted using the oligo-nucleotide primer Bp15851 (Larsen *et al.* 1996) or Mn312 (Palsbøll *et al.* 1995) and fluorescent labeled chain terminators (ABI dRhodamine Terminator Cycle Sequencing Kit) using the conditions recommended by the manufacturer.

After a standard ethanol precipitation, the labeled sequencing fragments were resolved by electrophoresis through a 5% denaturing polyacrylamide matrix on an ABI Prism 377<sup>TM</sup> automated sequencer.

### ***Determination of microsatellite genotypes***

The genotype was determined at ten microsatellite loci. For each locus one oligo-nucleotide primer was end-labeled with [ $^{32}$ P]ATP using T4 kinase (Sambrook *et al.* 1989). PCR<sup>TM</sup> amplifications were conducted in 10 $\mu$ L volumes, each with 10ng of genomic DNA, 67mM Tris-HCl, pH 8.8, 2mM MgCl<sub>2</sub>, 16.6mM (NH<sub>4</sub>)<sub>2</sub>SO<sub>4</sub>, 10mM B-mercaptoethanol, 0.2mM dNTPs, 1mM of the unlabeled oligo-nucleotide primer, 40 $\mu$ M of the end-labeled oligo-nucleotide primer as well as 0.4 units of *Taq* DNA polymerase.

The amplification products were separated by electrophoresis through a denaturing 5% polyacrylamide gel. After electrophoresis the gel was fixed in 5% ethanol:5% acetic acid for 40 minutes, followed by a 15 minutes rinse in tap water. The fixed polyacrylamide gel was dried at 80°C for 45 minutes and autoradiography performed with Kodak BioMax<sup>TM</sup> film for 5-48 hours depending on the intensity of radioactive signal.

The size of the amplification products was estimated from *\_M13* sequences and individuals of known genotype included in each run.

### ***Verification***

Two DNA extractions were performed for each sample. From the DNA obtained in the first extraction the sex and the genotype of all ten microsatellite loci was determined as well as the nucleotide sequence of mtDNA control region (oligo-nucleotide primer Bp15851). The second extraction was used to verify the first by determining the genotype at four of the ten microsatellite loci as well as the nucleotide sequence of the mtDNA control region by sequencing the reverse strand (oligo-nucleotide primer Mn312).

### ***Matching to the Norwegian minke whale DNA register***

In addition to samples collected in Norway two minke whale samples from another North Atlantic region were included as well as negative controls.

The matching to the Norwegian minke whale DNA register will be conducted by the Norwegian Ministry of Fisheries in a double blind manner, i.e., the origin and entire genetic profile of the typed samples will not be submitted to the DNA register.

The matching will be conducted in the following manner; the genotype at five microsatellite loci will be submitted to the DNA Register for each analyzed sample. The partial profiles are labeled in an arbitrary manner. The DNA Register will then return to University of Wales the entire genetic profile of those samples that match at all the five loci, i.e., the genotype at the remainder five microsatellite loci, the mtDNA control region sequence and sex. The University of Wales will then verify if any of the returned samples match the entire profile as expected. In this manner neither the DNA Register nor University of Wales will have access to all the data initially, which implies a true blind matching procedure.