

NORWAY. PROGRESS REPORT ON CETACEAN RESEARCH, JANUARY 2003 TO DECEMBER 2003, WITH STATISTICAL DATA FOR THE CALENDAR YEAR 2003

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This report summarises information obtained from: the University of Tromsø: the Department of Arctic Biology (UIT-AAB) and the Norwegian College of Fishery Science (UIT-NFH), the University of Oslo, Zoological Museum (UIO-ZM), the Norwegian School of Veterinary Science, Department of Arctic Veterinary Medicine, Tromsø (NVH-IAV), the Institute of Marine Research (IMR), the Norwegian Institute of Fisheries and Aquaculture, Tromsø (NIFA), and the Norwegian Polar Institute, Tromsø (NP).

1. Species and stocks studied

Common name	Scientific name	Area/stock(s)	Items referred to
Bowhead whale	<i>Balaena mysticetus</i>	Arctic Ocean	9
Fin whale	<i>Balaenoptera physalus</i>	Northeast Atlantic	2.2;3.1.3;4.1
Humpback whale	<i>Megaptera novaeangliae</i>	North Atlantic	2.2;3.1.1;3.1.3; 4.1
Killer whale	<i>Orcinus orca</i>	Northeast Atlantic	3.2
Minke whale	<i>Balaenoptera acutorostrata</i>	Northeast Atlantic	2.1.1; 2.2; 3.1.3;3.2;4.2; 4.4; 6.1; 9
Sperm whale	<i>Physeter macrocephalus</i>	Northeast Atlantic	2.2
White whale	<i>Delphinapterus leucas</i>	Svalbard	9
White-beaked dolphin	<i>Lagenorhynchus albirostris</i>	Northeast Atlantic	4.1

2. Sightings data

2.1 Field work

2.1.1 SYSTEMATIC

During the period 3 July to 12 August 2003 a sighting survey was conducted with two vessels covering the Greenland Sea and the waters around Svalbard. This was the second year of the new six-year program 2002-2007 to cover the northeast Atlantic to provide a new abundance estimate of minke whales every sixth year as part of the management scheme established for this species. (IMR)

2.1.2 OPPORTUNISTIC, PLATFORMS OF OPPORTUNITY

In August/September mapping of whale distributions was conducted during 0-group fish/ecosystem surveys in the Barents Sea by having dedicated whale observers onboard, who collected information following line transect protocols. (IMR)

Incidental observations of marine mammals have been collected from research survey vessels and Coastguard vessels. Recorded data include date, position, species and numbers. (IMR)

2.2 Analyses/development of techniques

A new estimate for Northeast Atlantic minke whales based on the survey data collected over the six-year period 1996-2001 has been approved by the IWC Scientific Committee for use in the RMP. The estimate indicates a more westerly distribution pattern compared to earlier surveys, however, no specific cause of this has been revealed. (IMR)

Abundance estimates for fin, sperm and humpback whales based on the synoptic 1995 survey have been provided.(IMR)

3. Marking data

3.1 Field work

3.1.1 NATURAL MARKING DATA

During the minke whale sightings survey (see 2.1.1) fluke photos of humpback whales were collected. (IMR)

3.1.3 TELEMETRY DATA

Instrumentation of one minke whale with a VHF tag for collecting dive time information was conducted off Spitsbergen during the sightings survey, and the whale was followed for about 24 hours. Satellite tags were applied on one fin whale and one humpback whale, but no signals were received. (IMR)

3.2 Analyses/development of techniques

Dive time data collected by VHF tagging have been further analysed. Blow rates calculated are comparable to earlier data collected by VHF instrumentation and visual experiments. (IMR)

Data from seven killer whales instrumented with satellite tags in 2000 and 2001 are being worked up to describe movement patterns, home ranges and dive behaviour. (IMR)

4. Tissue/biological samples collected

4.1 Biopsy samples

During the minke whale sightings survey (see 2.1.1.) biopsy samples were collected from several whale species, including white-beaked dolphin, humpbacks, fin whales and a blue whale. (IMR)

4.2 Samples from directed catches

During the traditional whaling season (May-June), stomach samples, body condition data and biological material for studies of demography and reproduction were collected from minke whales by scientific personnel on four of the participating vessels. Additionally, governmental inspectors collected tissue materials for studies of stock identity from all whales taken by the other vessels participating in the Norwegian small type whaling. (IMR)

STATUS OF THE NORWEGIAN MINKE WHALE DNA-REGISTER

Year	DNA-register ¹	IWC statistics ²	catch Not landed ³	Landed ⁴	Duplicates ⁵	Missing samples ⁶	Total missing ⁷
1997	488	503	7	496	3	5	8
1998	609	625	11	614	1	4	5
1999	571	591	17	574	2	1	3
2000	470	487	6	481	3	8	11
2001	538	552	11	541	2	1	3
2002	625	634	9	625	0	0	0

The number of individuals contained in the DNA-register, and the number of individuals missing.

4.3 Samples from stranded animals

No new information reported from 2003

4.4 Analyses/development of techniques

Analyses of minke whale stock structure based on the established DNA register were presented and discussed at the annual meeting of the IWC Scientific Committee. Mitochondrial DNA indicates differences which maintain the

¹ Number of unique individuals contained in the DNA-register (not containing duplicates).

² Number of individuals caught by Norway, including individuals not landed.

³ Number of individuals killed, but not taken onboard the vessel.

⁴ Number of individuals taken onboard the vessel.

⁵ Number of occurrences of (tissue) sample switching on board the vessel as detected by comparison of genetic profiles. The result is that two samples have been returned from one individual, and no sample has been returned for one individual.

⁶ Number of individuals for which tissue samples are missing for other reasons than sample switching.

⁷ The difference between the columns "Landed" and "DNA-register".

separation between the Central and Eastern Medium Area. Within the Eastern Area, there was little or no evidence supporting a difference between EC and the surrounding waters and this Small Area was therefore included in a Norwegian Sea area. There was some evidence for a separate Small Area in the eastern Barents Sea, and a moving of the northern boundary of the North Sea Small Area southwards to 62°N. (IMR)

Based on tissues collected for scientific purposes during Norwegian and Greenland whaling operations in 1998, questions concerning minke whale stock identity were addressed in a joint Greenland-Norwegian program. The methods applied included analyses of DNA, organochlorines, heavy metals, stable isotopes and fatty acid signatures. The results, which are now being published, indicate some sub-structuring of minke whales within the entire study area, e.g., with animals from the North Sea possibly being different from animals taken elsewhere in the northeast Atlantic. (IMR)

Stomach content samples from minke whales have been analysed using traditional methods where the original biomass of prey items are reconstructed based on remaining hard parts in the contents. Acoustic and biological data from prey estimate surveys on the whaling grounds have also been analysed. (NIFA, UIT-NFH)

Substantial changes have occurred in the Barents Sea ecosystem over the past 30 years, the most conspicuous being related to the rises and falls of stocks of the two dominant pelagic shoaling fish species: capelin and herring. Based on data from annual studies, effects of these ecological changes on the diet and food consumption of minke whales have been assessed for the whole period 1992-2003. Following a collapse in the capelin stock in 1992/1993, minke whales foraging in the northern Barents Sea apparently switched from a capelin-dominated diet to a diet almost completely comprised of krill. The second half of the 1990s saw a clear improvement of the capelin stock, and the species was again observed on the whale diet in the northern areas in 2000. In the southern area of the Barents Sea, capelin has been observed to be preyed upon by minke whales increasingly after 1995. In this area, also gadoids and, more importantly, krill and herring, are the food items of interest for the whales. The southern region of the Barents Sea includes important nursery areas for the Norwegian spring spawning herring. Good recruitment to this stock gives strong cohorts (e.g., 1991, 1992 and 1998) and large numbers of adolescent herring (0-3 years old) which serve as the main minke whale prey in the area. Recruitment failure with subsequent weak cohorts (e.g., 1993-1997) seems, however, to reduce the availability of adolescent herring to such an extent that minke whales switch to other prey items such as krill, capelin and, to some extent, gadoid fish. In the North Sea (first sampled in 2001), the whale diet appear to be dominated by sand-eels and mackerel. The annual changes in prey abundance and whale body condition, measured as girth and blubber index, were weakly correlated. Apparently, however, immature animals and adult females seemed to be in better condition in years with good abundance of immature herring in the southern Barents Sea. (IMR)

The scientific whaling under special permit and subsequent establishment of a routine sampling scheme during commercial whaling operations have yielded a time series (1992-2003) which permits assessment of spatial, seasonal and year-to-year variations in diets, of foraging behaviour, of prey selectivity, and of the total annual consumption by the minke whales. The collected data have also permitted multispecies modelling exercises with minke whales involved. The dietary composition of the northeast Atlantic minke whales varies considerably both in space and time, presumably due to geographic differences in the distribution and abundance of potential prey. The whales exploit a multiplicity of species, and sizes, of fish and crustaceans. In general, they find capelin, herring and, occasionally, krill more preferable than other prey, which may have several contributory explanations such as mobility, schooling behaviour, prey refuge use and other anti-predator responses. Apparently, minke whales switched to other prey in years of low densities of herring and capelin, thereby reducing the mortality of these two fish species. Although results from the multispecies modelling exercises should be taken as tentative, they all point in the same direction, i.e., that minke whale abundance may effect important fisheries. They suggest that, for the Barents Sea, it is possible to make predictions regarding ecosystem changes, following a specific management manipulation or change in the ecosystem, that are accurate within an order of the actual response. Recent attempts to include minke whale consumption of herring in the model used to assess Norwegian spring spawning herring have shown marked reduction in perceived herring stock size compared with standard "non whale" assessment.

The results given demonstrate the usefulness of performing ecological investigations over a range of scales. The minimum requirement of data for both the small, medium and large scale investigations is information on the relative diet composition of the predators. To put the large scale results in an ecological perspective, one need information about population size and structure, and large scale information about the resource base. More detailed small scale studies of prey selection must, however, be supported with resource mapping studies which occur concurrently and synoptically with the sampling of whale diet data. (IMR)

5. Pollution studies

No new information reported from 2003

6. Statistics for large cetaceans

6.1 Direct catches for the calendar year 2003

Species	Type of catch	Management Areas					Total catch
Minke whale		EB	EN	ES	EC	CM	
	Small-type whaling	329	131	150	16	21	647

8. Strandings

Information on strandings has been collected by the Institute of Marine Research, Bergen, Norway.

9. Other work

Data from ecosystem surveys along the Barents Sea shelf edges are being worked up to elucidate habitat and prey selection by fin, sperm and minke whales, as well as *Lagenorhynchus* species.(IMR)

A study of trauma and its consequences caused by the currently used weapons and ammunition in the Norwegian hunt for minke whales, with special emphasis on the central nervous system to assess the time for occurrence of insensibility and death in hunted minke whales, was concluded in October 2003. The results were compiled in a thesis presented for defence of the degree of Doctor Medicinae Veterinaria (Dr. med. vet.) at the Norwegian School of Veterinary Science. (NVH-IAV)

A work to develop an electronic monitoring system to independently monitor the activities of the Norwegian minke whale vessels started in 2001. The work continued with field experiments in 2003 and a new prototype was successfully tested on four whaling vessels during the whaling season. (NVH-IAV).

Scientists from NVH-IAV have been engaged in co-operative work with scientists, whale hunters and managers of whaling in Norway, Iceland, Greenland, USA (Alaska) and Russia to improve the weapons and gears used for the hunting of whales. The Department has also been engaged in preparation of user's manuals for whale hunters and in planning and performance of workshops on whale killing methods in Nammco and IWC. (NVH-IAV)

Studies on serum chemistry profiles of apparently healthy white whales (beluga) from Svalbard have been conducted. (NVH-IAV)

The population structure of bowhead whales during postglacial time is studied using DNA extracted from ancient (bones and baleen) and recent tissue material. The project is performed in a cooperation between UIO-ZM, IMR and Wildlife Conservation Society, NY.

11. Publications

11.1 Published or 'In Press'

- Andersen, L.W., Born, E.W., Dietz, R., Haug, T., Øien, N. and Bendixen, C. 2003. Population structure of Greenland and Atlantic minke whales (*Balaenoptera acutorostrata*) based on sequence variation of the D-loop of mtDNA and DNA microsatellite variation. *Marine Ecology Progress Series* 247: 263-280.
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- Chilvers, B.L. and Corkeron, P.J. 2003. Abundance of Indo-Pacific bottlenose dolphins *Tursiops aduncus*, off Point Lookout, Australia. *Marine Mammal Science* 19: 85-95
- Chilvers, B.L. Corkeron, P.J. and Puotinen, M.L. 2003. The influence of trawling on the behaviour and spatial distribution of Indo-Pacific bottlenose dolphins, *Tursiops aduncus*, in Moreton Bay, Australia. *Canadian Journal of Zoology*. 81: 1947-1955.

- Hobbs, K.E., Muir, D.C.G., Born, E.W., Dietz, R., Haug, T., Metcalfe, T., Metcalfe, C. and Øien, N. 2003. Levels and patterns of persistent organochlorine in minke whale (*Balaenoptera acutorostrata*) stocks from the North Atlantic and European Arctic. *Environmental Pollution* 121: 239-252.
- Knudsen, S.K. and Øen, E.O. 2003. Blast-induced neurotrauma in whales. *Neuroscience Research* 46(3):265-386.
- Møller, P., Born, E.W., Dietz, R., Haug, T., Ruzzante, D.E. and Øien, N. 2003. Regional differences in fatty acid composition in minke whales (*Balaenoptera acutorostrata*) from the North Atlantic. *Journal of Cetacean Research and Management* 5: 112-124.
- Scarpaci, C., Nugegoda, D., and Corkeron, P.J., 2003. Compliance with regulations by "swim-with-dolphins" operations in Port Phillip Bay, Victoria, Australia. *Environmental Management* 31: 342-347.
- Scarpaci, C., Nugegoda, D. and Corkeron, P.J. 2003. Behaviour and Ecology of the Bottlenose Dolphin (*Tursiops* sp.) in Port Phillip Bay, Victoria, Australia: an annual cycle. *The Victorian Field Naturalist*, 120(2): 48-55.
- Van Parijs, S.M., Lydersen, C. & Kovacs, K.M. 2003: Sound production of individual white whales, *Delphinapterus leucas* during capture. *J. Acoust. Soc. Am.* 113: 57-60.

11.2 Unpublished literature

- Fedak, M., Lydersen, C., Nøst, O.A., Lovell, P., McConell, B.J., Gammelsrød, T., Hunter C. & Kovacs, K.M. 2003: Marine mammals as platforms for oceanographic sampling: salinity and temperature structure of a freezing Arctic fjord monitored by white whales (*Delphinapterus leucas*). 6th Underwater Sci. Symp.: Monitoring and measuring the underwater environment. 3-6 April 2003. Univ. Aberdeen, Scotland.
- Heide-Jørgensen, M.P., Vikingsson, G.A., Øien, N. 2003. Dry periods for baleen whales in the North Atlantic observed satellite telemetry. SC/55/AWMP3 presented to the IWC Scientific Committee, May 2003.
- Knudsen SK. 2004. Assessment of insensibility and death in hunted whales. A study of trauma and its consequences caused by the currently used weapons and ammunition in the Norwegian hunt for minke whales, with special emphasis on the central nervous system. Dissertation. Norwegian School of Veterinary Science, NO-0033 Oslo, ISBN 82-7725-096-7. 210pp.
- Knudsen, S.K. 2003. Criteria of insensibility and death in hunted whales. A comparative review. Workshop on Whale killing methods and associated welfare issues, Berlin, 2003. IWC/55/WK 14.
- Knudsen, S.K. and Øen, E.O. 2003. A novel method for in situ fixation of whale brains. Workshop on Whale killing methods and associated welfare issues, Berlin, 2003. IWC/55/WK 6.
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- Øien, N. 2003. Distribution and abundance of large whales in the northeast Atlantic, 1995. Working Paper NAMMCO SC/11/MF/10 to the Working Group on Minke and Fin Whales, Copenhagen, Denmark, 20.-22.11.2003, 26 pp.
- Øien, N. 2003. Report of the Norwegian 2002 sighting survey for minke whales. IWC SC/55/NAM 6, 5 pp.
- Øien, N., Bøtun, G., Kleivane, L. 2003. Update on available data on surfacing rates of northeastern Atlantic minke whales. IWC SC/55/NAM 7, 7 pp.
- Øien, N., Bøtun, G., Kleivane, L. 2003. Surfacing rates of minke whales in the Norwegian Sea. The European Cetacean Society 17th Annual Meeting, March 2003. Poster.
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- Sivertsen, S.P. 2003. Konkurrerer vågehval (*Balaenoptera acutorostrata*) og torsk (*Gadus morhua*) om mat på Finnmarkskysten? Cand. scient. thesis, Norwegian College of Fishery Science, University of Tromsø, Norway. 62 pp.
- Skaug, H.J. 2003. Historical population assessment when data are sparse. Workshop in Spatial Ecology, Tromsø, 06.-07.05.2003.

- Skaug, H.J. 2003. Markov modulated Poisson processes for clustered line transect data. International Biometric Society, Nordic Regional Conference 2003, Swedish University of Agricultural Sciences, Uppsala, Sweden 12.-14.06.2003.
- Skaug, H.J., Bøthun, G.A. 2003. A comparison of observed surfacing rates in minke whales surveys with surfacing rates of VHF tagged animals. IWC SC/55/NAM5, 4 pp.
- Skaug, H.J., Haug, T., Øien, N. 2003. Spatial genetic structure in NA-minke whales (revised). IWC SC/55/NAM4, 4 pp.
- Skaug, H.J., Øien, N., Schweder, T., Bøthun, G. 2003. Current abundance of minke whales in the northeastern Atlantic; variability in time and space. IWC SC/55/NAM1, 49 pp.