

NORWAY. PROGRESS REPORT ON CETACEAN RESEARCH, JANUARY 2004 TO DECEMBER 2004, WITH STATISTICAL DATA FOR THE CALENDAR YEAR 2004

Compiled by Sidsel Grønvik

Norwegian Institute for Nature Research, The PolarEnvironmental Centre, N-9296 Tromsø, Norway

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, Section of Arctic Veterinary Medicine, Tromsø (NVH-SAV), the National Veterinary Institute (VI), the Institute of Marine Research (IMR), and the Norwegian Polar Institute, Tromsø (NP).

1. Species and stocks studied

Common name	Scientific name	Area/stock(s)	Items referred to
Blue whale	<i>Balaenoptera musculus</i>	Northeast Atlantic	5
Bowhead whale	<i>Balaena mysticetus</i>	Arctic Ocean	9
Fin whale	<i>Balaenoptera physalus</i>	Northeast Atlantic	2.2;5;9
Humpback whale	<i>Megaptera novaeangliae</i>	North Atlantic	2.2;3.1.1; 5
Killer whale	<i>Orcinus orca</i>	Northeast Atlantic	2.1.1;3.2;5;9
Minke whale	<i>Balaenoptera acutorostrata</i>	Northeast Atlantic	2.1.1;3.2;4.2; 4.4; 5; 6.1; 9
Pilot whale	<i>Globicephala melaena</i>	Northeast Atlantic	4.1;5
Sperm whale	<i>Physeter macrocephalus</i>	Northeast Atlantic	2.2;3.2;5;9
White-beaked dolphin	<i>Lagenorhynchus albirostris</i>	Northeast Atlantic	3.1.3;4.1;9
White-sided dolphin	<i>Lagenorhynchus acutus</i>	Northeast Atlantic	3.1.3;4.1;5;9

2. Sightings data

2.1 Field work

2.1.1 SYSTEMATIC

During the period 29 June to 15 August 2004 a sighting survey was conducted with two vessels covering the North Sea and the southern part of the Norwegian Sea, between the latitudes 56°N and 65°N. This was the third year of the recent 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)

In August-September field work was conducted in the Vestfjord area in cooperation with Forsvarets Forskningsinstitutt to study diving behaviour of minke whales and killer whales and the effect of active sonars on their dive patterns. (IMR)

2.1.2 OPPORTUNISTIC, PLATFORMS OF OPPORTUNITY

During the MARECO survey along the mid-Atlantic ridge in June-July, marine mammal sightings were recorded.(IMR)

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

Databases containing incidental observations of marine mammals have been updated. (IMR)

2.2 Analyses/development of techniques

Abundance estimates for fin, sperm and humpback whales based on the 1996-2001 survey cycle have been provided. (IMR)

Data from surveys and incidental observations of cetaceans have been used in contributions towards mapping marine mammal distributions for the Lowfrequency Active Sonar (LFAS) project to study the effects of the sonar on marine life. (IMR)

3. Marking data

3.1 Field work

3.1.1 NATURAL MARKING DATA

In August to September humpback whale photo IDs were collected during the ecosystem surveys in the Barents Sea. (IMR)

The work with cataloguing identification photos of humpback whales from Norwegian and adjacent waters is progressing. (IMR)

3.1.2 ARTIFICIAL MARKING DATA

No new information.

3.1.3 TELEMETRY DATA

In May-June a feasibility study to apply satellite tags on *Lagenorhynchus* dolphins was conducted. (IMR)

3.2 Analyses/development of techniques

Two new dive time series on minke whales and one on a killer whale have been collected in the Vestfjord area during September 2004. Blow rates calculated are comparable to earlier data collected by VHF instrumentation and visual experiments. (IMR)

Photo identification pictures taken of sperm whales on a whale watching site in Vesterålen, North Norway, in 2002 have been compared with similar pictures taken during 1987-2001 in the same area. A total of 55 individuals were identified in the area over a period from late May to early September 2002: 37 of these had not been seen in the area before, whereas 18 had been observed also in the period 1987-2001. For the latter group, there are indications of "residence" times from 1 and up to 14 years in the area. Apparently, when individuals also seen in previous years were present in sufficient numbers, the number of "newcomers" decreased. (NFH-UIT)

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, white-sided dolphin, and pilot whales. (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 three 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. A total of 537 samples were taken for stock identity studies. (IMR)

4.3 Samples from stranded animals

No new information reported from 2004

4.4 Analyses/development of techniques

The Norwegian DNA register for minke whales has been used for paternity studies by using DNA-profiles from 288 mother-fetus pairs to obtain partial DNA-profiles for the fathers of the fetuses. The father profiles have then subsequently been matched against the male part of the DNA-register. This has led to identification of three likely instances of paternity. Such data can be used to obtain new biological information and to estimate the number of reproductively active males in the population. (IMR)

Data on minke whale predation and competition with other top predators in the Barents Sea have been analysed. (IMR, NFH-UIT)

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. (IMR)

In a small and medium scale experiment, minke whales and cod were collected in the southern Barents Sea to investigate prey preference, niche overlap and niche width for the two species. A resource survey was conducted simultaneously with the whale and cod sampling. The diet of cod consisted mainly of capelin, deep water shrimp, gadoids and krill. The smallest cod preferred capelin whereas the largest cod preferred gadoid species including cod. The minke whale diet consisted mainly of capelin, herring and krill, and showed a particular preference for herring and capelin. Krill were consumed in large quantities, but did not seem to be a preferred food item for either cod or minke whales. In contrast to cod, which fed very little on herring, the minke whale fed heavily on herring in some areas. The niche widths for both cod and minke whales were relatively low, and the diet overlap between minke whale and cod was low, but potentially present. (IMR)

5. Pollution studies

Screening of OC pollutants in the outer blubber layer from biopsy samples of 3 baleen whale species (blue whales, fin whales and humpback whales) and 4 toothed whale species (sperm whales, killer whales, pilot whales and white-sided dolphins) have been finalized. Preliminary results indicate that on a step scale of A (0,1-0,5 ppm Σ PCB/lipid weight), B (1-5 ppm Σ PCB/lipid weight), C (5-10 ppm Σ PCB/lipid weight) and D (>10 ppm Σ PCB/lipid weight), we find all baleen whales in A (blue whales (n=1), fin whales (n=6) and humpback whales (n=4)), the killer whales in B (n=1), the sperm whales in C (n=4), and the pilot whales (n=2) and white-sided dolphins (n=12) in the D category. Previous results located the minke whales in the lower part of the B category. (VI, NVH, IMR)

The development of methods to enable a relatively quicker toxic screening of marine mammal products, especially with regard to the monitoring of TEQ (toxic equivalent factor) concentrations is underway. (VI)

6. Statistics for large cetaceans

6.1 Direct catches for the calendar year 2004

Species	Type of catch	Management Areas					Total catch
Minke whale		EB	EN	ES	EW	CM	
	Small-type whaling	127	90	113	197	17	544

6.2 Non-natural mortality for the calendar year 2004

No new information reported for 2004.

Collection of bycatch data from fishing vessels has been initiated and information material has been produced and distributed. (IMR)

7. Statistics for small cetaceans

No new information reported for 2004.

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 in 2000, 2001 and 2002 have been used to investigate the principal processes underlying distributions of minke, fin and sperm whales and *Lagenorhynchus* dolphins observed along the cruise tracks. The observations were combined with simultaneously collected data on habitat (depth, sea surface temperature, and temperature gradients) and prey (plankton, 0-group fish, capelin and herring) distributions in a Geographic Information System (GIS) to investigate habitat and prey selection. Minke whales were associated with cold waters and herring, and capelin in years with low herring abundance. Fin whales were mainly associated with northern cold and deep waters, as well as capelin, 0-group fish and plankton. *Lagenorhynchus* dolphins were associated with capelin. Finally, sperm whales were associated with deep waters and 0-group fish, probably indirectly attracted to 0-group fish through preying on predatory fish such as *Sebastes spp.* and squid *Gonatus spp.*. The cetacean species responded differently to annual variation in habitat and prey distributions.

Minke and fin whale distributions and abundances remained similar between years within the study area, suggesting that these species are generalists responding to environmental changes by switching between prey species. Conversely, *Lagenorhynchus* dolphins shifted northwards, likely due to tracking the shifting capelin distributions. (IMR)

Vocalisation in killer whales have been analysed and published. (NFH-UIT)

The work on methodological developments on statistical applications has continued. (IMR)

Contributions have been made to developing the scientific basis for environmental quality objectives for the Barents Sea ecosystem. (IMR)

A work to develop an electronic monitoring system to independently monitor the activities of the Norwegian minke whale vessels started in 2001. In 2003 a new prototype was successfully tested on four whaling vessels during the whaling season. The work continued with field testing on a larger number of boats during the whaling season in 2004. (NVH-SAV).

Scientists from NVH-IAV have been engaged in co-operative work with scientists, whale hunters and managers of whaling in Norway, USA (Alaska) and Canada (Nunavut) 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-SAV)

The population structure of bowhead whales during postglacial time is studied using DNA extracted from ancient (bones and baleen) and tissue from extant individuals. The project is performed in cooperation between Natural History Museum, UIO, Zoological Museum, University of Bergen, Institute of Marine Research, Bergen, Norwegian Polar Institute, Tromsø, and Wildlife Conservation Society, NY. The material making the basis for the investigation is about 300 samples of bone remains found along the coasts of Svalbard and the Norwegian mainland. About 200 of these have been ¹⁴C dated and are from recent to about 40,000 years old. Up to now we have managed to sequence parts of the mitochondrial DNA control region from about 80 individuals.

11. Publications

11.1 Published or 'In Press'

- Berge, J.A., Brevik, E.M., Bjørge, A., Følsvik, N., Gabrielsen, G.W., Wolkers, H. 2004. Organotins in marine mammals and seabirds from Norwegian territory. *Journal of Environmental Monitoring*, 2004(6):108-112.
- Bérubé, M., Rew, M.B., Cole, T., Swartz, S.L., Zolman, E., Øien, N., Paslbøll, P.J. 2004. Genetic identification of an individual humpback whale between the eastern Caribbean and the Norwegian Sea. *Marine Mammal Science*, 20:657-663.
- Born, E.W., Outridge, P., Riget, F.F., Hobson, K.A., Dietz, R., Øien, N., Haug, T. 2004. Population substructure of North Atlantic minke whales (*Balaenoptera acutorostrata*) inferred from regional variation of elemental and stable isotopic signatures in tissues. *Journal of Marine Systems*, 43:1-17.
- Corkeron, P.J. 2004. Whale watching, iconography, and marine conservation. *Conservation Biology* 18: 847-849.
- Corkeron, P.J. 2004. Fishery management and culling. *Science* 306: 1891.
- Corkeron, P.J. and Martin, A.R. 2004. Ranging and diving behaviour of two "offshore" bottlenose dolphins, *Tursiops* sp., off eastern Australia. *Journal of the Marine Biological Association of the UK* 84: 465-468.
- Jacobsen, K.-O., Marx, M., Øien, N. 2004. Two-way Trans-Atlantic migration of a North Atlantic Right Whale (*Eubalaena glacialis*). *Marine Mammal Science*, 20:161-166.
- Kjeld JM, Alfredsson Á, Ólafsson Ö, Tryland M, Christensen I, Stuen S, Árnason A. 2004. Changes in blood testosterone and progesterone concentrations of the North-Atlantic minke whale (*Balaenoptera acutorostrata*) during the feeding season. *Canadian Journal of Fisheries and Aquatic Sciences* 61(2): 230-237.
- Knudsen, S.K. 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. Doctoral thesis. Tromsø: Norwegian School of Veterinary Science, 2004. ISBN 82-7725-096-7.
- Knudsen, S.K. 2005. A review of the criteria used to assess insensibility and death in hunted whales compared to other species. *The Veterinary Journal*. 169:42-59. Epub 2004 Apr.

- Møller, P., Born, E.W., Dietz, R., Haug, T., Ruzzante, D.E., Øien, N. 2004. Regional differences in fatty acid composition in minke whale (*Balaenoptera acutotostrata*) from the North Atlantic. *Journal of Cetacean Research and Management*, 5(2):115-124.
- Nøttestad, L., Olsen, E. 2004. Whales and seals: Top predators in the ecosystem. pp. 395-434, I: Skjoldal, H.R. (Ed.), *The Norwegian Sea Ecosystem*. Tapir Academic Press, Trondheim, Norway.
- Parra, G.J., Corkeron, P.J. and Marsh, H. 2004. The Indo-Pacific Humpback dolphin, *Sousa chinensis* (Osbeck, 1765), in Australian waters: a summary of current knowledge. *Aquatic Mammals* 30: 197-206.
- Scarpaci, C., Nuggeoda, D. and Corkeron, P.J. 2004. No significant improvement in compliance behaviour by "swim-with-dolphins" tour operations in Port Phillip Bay, Victoria. *Tourism in Marine Environments* 1: 41-48.
- Skaug, H.J., Øien, N., Schweder, T., Bøthun, G. 2004. Abundance of minke whales (*Balaenoptera acutorostrata*) in the Northeastern Atlantic. *Canadian Journal of Fisheries and Aquatic Sciences*, 61:870-886.
- Van Parijs, S. M., Leyssen, T. & Similä, T. 2004. Sounds produced by Norwegian killer whales, *Orcinus orca*, during capture. *Journal of the Acoustical Society of America* 116: 557 – 564.

11.2 Unpublished literature

- Bjørge, A. 2004. Integrated plan for ecosystem based management in the Barents Sea - how to integrate Ecological Quality Objectives and the Precautionary Approach across Management Sectors. STATOIL Environment Network, Hammerfest 20.08.2004..
- Bjørge, A. 2004. Behavioural Ecology of Marine Mammals. Fifth European Seminar on Marine Mammals - Biology and Conservation, University MP, Valencia, 13-17 Sep 2004.
- Bjørge, A., DeMaster, D. 2004. Suggestions for mechanisms to facilitate the review of special permit proposals at scientific committee meetings. IWC SC/56/ SCP 1 presented to the IWC Scientific Committee, June 2004., 6 pp.
- Corkeron, P.J. 2004 The usefulness of marine protected areas in marine mammal management. *ICES Working Group on Marine Mammal Ecology, Pasaia, Spain, March 2004*, working paper.
- Corkeron, P.J. 2004. Whalewatching and the pursuit of ecological sustainability. Poster presented at: *Wildlife conservation: in pursuit of ecological sustainability. The University of Limerick, Limerick, Ireland, June 2004*.
- Hall, A.J., Wells, R.S., Aguiar, A., Borrell, A., Rowles, T.K., Stott, J., Wilson, J.Y., O'Hara, T., Siebert, U., Bjørge, A., Tornero, V., Reijnders, P.J.H. 2004. Biomarkers of contaminant exposure and relationships with blubber contaminant levels in bottlenose dolphins *Tursiops truncatus*. IWC SC/56/ E 15 presented to the IWC Scientific Committee, June 2004, 21 pp.
- ICES, (Bjørge, A., Corkeron, P., Mauritzen, M., m.fl.) 2004. Report of the Working Group on Marine Mammal Ecology. ICES CM 2004/ACE:02, Ref. E, G.
- IWC, (Bjørge, A., Corkeron, P., m.fl.) 2004. Report of the Workshop on the Science for Sustainable Whalewatching, Breakwater Lodge, Cape Town, South Africa, March 2004. IWC SC/56/ WW 12 presented to the IWC Scientific Committee, June 2004, 29 pp.
- IWC, (Bjørge, A., m.fl.) 2004. Report of the Standing Working Group on Scientific Permit Proposals. IWC SC Report, Annex P, 15 pp.
- Nøttestad, L. 2004. Presentasjon av foreløpige resultater fra delprosjektet marine mammals and seabirds (PN3) innenfor MAR-ECO prosjektet for styringsgruppen til Census of Marine Life. Horta, Azorene, Fajal, 3. juli. [A presentation of preliminary results from the Marine Mammals and Seabird project of MAT-ECO]
- Øien, N. 2004. Diving behaviour of minke whales. Workshop on estimation of g(0) in line-transect surveys of cetaceans. European Cetacean Society 18th Annual Meeting, Kolmården, 28 March 2004.
- Øien, N. 2004. Norwegian Independent Line-transect Surveys. Workshop on estimation of g(0) in line-transect surveys of cetaceans. European Cetacean Society 18th Annual Meeting, Kolmården, 28 March 2004.
- Øien, N. 2004. Synoptic distribution and abundance of fin, humpback and sperm whales in the Northeastern Atlantic. European Cetacean Society 18th Annual Meeting, Kolmården, 28-31 March 2004. Poster.
- Øien, N. 2004. Report of the Norwegian 2003 survey for minke whales in the Svalbard area. IWC SC/56/ O 8 presented to the IWC Scientific Committee, June 2004, 6 pp.
- Øien, N. 2004. Norwegian Independent Line transect Survey 2004. Marine mammal research group. Project 411-10258, Survey Protocol. Minke whale survey project, 23 June 2004..
- Øien, N. 2004. Hval. Fisken og havet, særnummer 1-2004: 56-58.

- Øien, N. 2004. Distribution and abundance of large whales in the northeast Atlantic based on data from partial coverages 1996-2001. NAMMCO WG on Fin whales, Oct 2004, 16 pp.
- Reijnders, P., Aguilar, A., Wells, R., O'Hara, T., Rowles, T., Donovan, G., Bjørge, A. 2004. Progress report on POLLUTION 2000+: 2003-2004. IWC SC/56/ E 35 presented to the IWC Scientific Committee, June 2004, 6 pp.
- Skaug, H.J. 2004. A language and a program for fitting nonlinear random effects models by maximum likelihood. Norevent seminar series, University of Oslo, 12 Feb 2004.
- Skaug, H.J. 2004. Automatic evaluation of the marginal likelihood in complex statistical models. Nordstat 2004, Jyväskylä, Finland, 6-20 June 2004.
- Skaug, H.J. 2004. Integration by differentiation; doing modern statistics in AD Model Builder. AD 2004; The 4th International Conference on Automatic Differentiation, Chicago, USA, 19-23 July 2004.
- Skaug, H.J., Øien, N. 2004. Genetic tagging of males in north Atlantic minke whales through comparison of mother and fetus DNA-profiles. IWC SC/56/SD3 presented to the IWC Scientific Committee, June 2004.
- Zanoni, D. 2004. Photo identification studies of sperm whales (*Physeter macrocephalus*) at the head of Bleik Canyon, Northern Norway. Cand.scient. thesis, Norwegian College of Fishery Science, University of Tromsø, Norway. 38 pp.