NORWAY. PROGRESS REPORT ON CETACEAN RESEARCH, JANUARY 2005 TO DECEMBER 2005, WITH STATISTICAL DATA FOR THE CALENDAR YEAR 2005

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This report summarises information obtained from: the University of Tromsø, the Norwegian College of Fishery Science (UIT-NFH), 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	*Balaenoptera musculus*	Northeast Atlantic	2.1.1
Fin whale	*Balaenoptera physalus*	Northeast Atlantic	2.1.1;2.2;4.1;4.4
Sei whale	*Balaenoptera borealis*	North Atlantic	3.1.3
Humpback whale	*Megaptera novaeangliae*	North Atlantic	2.1.1; 2.2;3.1.1;3.1.3;4.4
Minke whale	*Balaenoptera acutorostrata*	Northeast Atlantic	2.1.1;3.1.3;4.1; 4.2; 4.4; 5; 6.1; 9
White whale	*Delphinapterus leucas*	Svalbard	4.4;5
Sperm whale	*Physeter macrocephalus*	Northeast Atlantic	2.1.1; 2.2

2. Sightings data

2.1 Field work

2.1.1 SYSTEMATIC

During the period 22 June to 10 August 2005 a sighting survey was conducted with two vessels covering the Small Management Area CM, which includes the western parts of the Norwegian Sea and the area around Jan Mayen northwards to 74ºN and southwards to the continental shelf areas north and east off Iceland. This was the fourth 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)

A total of 2,100 nautical miles was surveyed on primary effort and 134 sightings of minke whales were made during this effort. Sightings of other cetacean species include fin whales (47 primary sightings), sperm whales (33 primary sightings), blue whales (7 primary sightings), humpback whales (59 primary sightings) and 21 primary sightings of Northern bottlenose whales.

2.1.2 OPPORTUNISTIC, PLATFORMS OF OPPORTUNITY

In May-June 2005 mapping of whale distributions was conducted during an ecosystem survey in the Norwegian Sea by having dedicated whale observers onboard who collected information following line transect protocols. A similar effort was conducted during the ecosystem surveys in the Barents Sea in August to September 2005. (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 recent surveys have been provided earlier, however, in 2005 trend analyses have been conducted to see whether these species have shown increases or declines over the years covered by surveys, i.e. from 1987 onwards. The variations on a local scale, that is survey blocks, are large from year to year, but seen over a larger joint area comprising the main distributional areas in the Norwegian Sea and associated continental slopes, these three species show an annual increase of about 2-3% but this increase is not statistically significant. (IMR)

3. Marking data

3.1 Field work

3.1.1 NATURAL MARKING DATA

Collection of humpback whale photo IDs continued in 2005, and a total of about 45 individuals were sampled during several effort occasions this year. (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 April 2005 a sei whale was satellite tagged off the Azores, and its migration could be followed until June when it arrived in the Labrador Sea area. (IMR)

In August-September field work was conducted off Spitsbergen and Bear Island in the Barents Sea to instrument whales for studying their migrational behaviour. Six whales, of them five minke whales and one humpback whale, were equipped with satellite tags. Few signals were returned but the signals indicated that all the tagged whales stayed in the same general area where they were tagged for at least three weeks. (IMR)

4. Tissue/biological samples collected

4.1 Biopsy samples

During the minke whale sighting survey covering the Small Management Area CM (see 2.1.1) biopsy samples were collected from one minke whale and two fin whales.

4.2 Samples from directed catches

During the traditional whaling season (April-October), body condition data and tissue materials for studies of DNA identity were collected from all minke whales taken by vessels participating in the Norwegian small type whaling. (IMR)

4.3 Samples from stranded animals

No new information reported from 2005

4.4 Analyses/development of techniques

The Norwegian DNA register for minke whales has been further studied to develop and investigate methods for determining stock structure. (IMR)

In a study of stock structure of fin whales in the North Atlantic Norway has contributed with biopsy samples. Based on analyses of nine microsatellite loci it has been concluded that fin whales at the feeding grounds off Iceland, Norway, Greenland, Canada and Spain probably belong to genetically separate breeding populations. (IMR)

Biopsy samples from humpback whales collected in recent years are in the process of being analysed in cooperation with Per Palsbøll, University of Berkeley. (IMR)

Tissues sampled for stock identity studies of minke whales have been archived and analysed using DNA techniques. (IMR)

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

Based on data from annual studies, effects of ecological changes in the Barents Sea ecosystem on the diet and food consumption of minke whales have been assessed for the whole period 1992-2004. Samples collected in 2000-2004 are now being analysed in detail, and publication of the entire time series 1992-2004, including information about the size composition of fish prey, are in progress. (IMR, NFH-UIT)

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 analyses demonstrate that incorporating predation by high trophic-level predators such as

the minke whale in standard assessment models is feasible and can be a valuable tool in fish stock assessment. The results given also demonstrate the usefulness of performing ecological investigations over a range of scales. The minimum requirements of data for both the small, medium and large scale investigations are information on the relative diet composition of the predators. To put the large scale results in an ecological perspective, one needs 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)

One small scale study was conducted to analyse the multispecies functional response of minke whales. Available data on undigested stomach contents was used to assess the consumption rates of the whales. To assess the availability of potential prey in the sea, standard acoustic surveys were run parallel to the whale sampling. General additive models were fitted to model the spatial distribution of prey in each small scale area. The spatial overlap between the whales and their prey was estimated to generate a measure of prey availability to the whale. The uncertainty of this measure was estimated by Monte Carlo simulations. A multispecies functional response model was then fitted to the consumption and prey availability data using Bayesian inference and MCMC. The results suggested that minke whales display type II functional response towards all the tested prey (capelin, herring and krill). Putting these results into predator-prey dynamics imply that minke whales have the potential of destabilising predator-prey dynamics because they cause an inverse density dependent mortality of prey. This study suggested that minke whales display a strong type III functional response. (IMR)

Data on serum chemistry parameters has been obtained from white whales from Svalbard. These results represent baseline data of expected blood levels of enzymes, proteins, metabolites, minerals and cortisol. The results have been presented in a manuscript accepted for publication in Veterinary Clinical Pathology. (NVH-SAV Tromsø, NVH Oslo, NP).

5. Pollution studies

Biopsy samples of beluga sampled at Spitsbergen were analysed for organic pollutants and pesticides, PCB, toxaphenes and brominated fire retardants were detected (VI/NVH).

Results from analyses of toxic equivalents (TEQ) in blubber of minke whales caught in Norwegian waters showed that the DL-PCBs were the major contributors to ΣTEQ concentrations in all blubber compartments. The mean level of TEQ DL-PCB6 (dioxin like mono-ortho polychlorinated biphenyls) and TEQ DL-PCB4 (dioxin like non-ortho polychlorinated biphenyls) was represented with 51% and 45% of ΣTEQ in grey blubber, respectively. The mean ratio TEQ dioxins to the ΣTEQ was 4 %. However, the ratio of TEQ dioxins to ΣTEQ was significantly different in minke whales from the southern and northern location, with the highest ratio detected in the Barents Sea catch representing 6% of ΣTEQ. Furthermore, the ratios of TEQ DL-PCB6 and TEQ DL-PCB4 to ΣTEQ in the Barents Sea catch were 46% and 48%, respectively. Corresponding ratios in minke whales from the North Sea were 3%, 55% and 42%, respectively (VI/NIFES).

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 2005

Species	Type of catch	Management Areas					Total catch
Minke whale		EB	EN	ES	EW	CM	
	Small-type whaling	284	7	99	244	5	639

6.2 Non-natural mortality for the calendar year 2005

6.2.1 STRANDINGS OR DEAD WHALES ENCOUNTERED AT SEA

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

6.2.2 OBSERVED OR REPORTED SHIP STRIKES

No observations or reports from 2005.

6.2.3 FISHERY BYCATCH

No large cetaceans were reported bycaught during the observed fishing operations in 2005 in Norwegian shelf and offshore fisheries and in the coastal and inshore fisheries.

7. Statistics for small cetaceans

7.1 For the calendar year 2005

7.2 Direct catches (commercial, aboriginal and scientific permits)

No direct catches

7.3 Non-natural mortality for the calendar year 2005

7.3.1 STRANDINGS OR DEAD SMALL CETACEANS ENCOUNTERED AT SEA

Information on strandings has been collected by the Institute of Marine Research in Bergen (IMR).

7.3.2 OBSERVED OR REPORTED SHIP STRIKES

No observations or reports from 2005.

7.3.3 FISHERY BYCATCH

Species	No.	Date	Location	Fate	Targeted fish species	Gear	How observed?	Source or contact
Harbour porpoise	21		ICES area IIa	D	Various	GN	F/V	IMR (Arne Bjørge)
Harbour porpoise	5		ICES area IVa	D	Various	GN	F/V	IMR (Arne Bjørge)
Comments:								

8. Strandings

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

9. Other work

A project to develop an electronic tamper-proof automated computing system to independently monitor the whaling activities, a trip recorder, started with governmental funding in 2001 at the Norwegian School of Veterinary Science and was concluded at the end of 2005. The trip recorder, called “Blue Box”, consists of a control and data logger designed to independently monitor and log hunting activity data provided by an independent GPS (time and position), and different sensors like shot transducers, strain transducers and heel sensors placed in critical areas and structures of the boat, data that prove that a whale is shot and taken on board. It is configured and calibrated individually for each vessel and automated with programs designed for the continuous operation and logging of data for at least 4 months. Collected data are encrypted and can be collected either at random checks or after the season is closed. It is sealed, equipped with backup batteries and automatically restarting functions following system interruption.

After 2½ years of development, testing of different computer and sensor systems, the trip recorder has been comprehensively tested and further developed in three field trials including 29 whaling vessels. Official inspectors have been present in many of the vessels. The results from the 2005 season showed that the number of whales taken and time and position for the take were in accordance with the whaler’s logbooks and inspectors journals. The trip recorder will be implemented on every whaling vessel from the 2006 season on. The intention is to make a reassessment and if necessary, an upgrading of the system, after two to three seasons use. (NVH-SAV).

11. Publications

11.1 Published or ‘In Press’

Birkeland, A., Kovacs, K.M., Lydersen, C. & Grahl-Nielsen, O. 2005: Transfer of fatty acids from mothers to their calves during lactation in white whales (*Delphinapterus leucas*). *Mar. Eco.l Progr. Ser*. 298: 287-294.

Borgå, K., Gabrielsen, G.W., Skaare, J.U., Kleivane, L., Norstrom, R.J. & Fisk, A.T. 2005: Why do organochlorine differences between Arctic regions vary among trophic levels? *Environ. Sci. Technol*. 39: 4343-4352.

Knudsen SK. 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.

Kovacs, K.M. 2005. Beluga (White) whale. Pp. 228-230 in Encyclopedia of the Arctic. Routledge, New York.

Mauritzen, M., Skaug, H.J. & Øien, N. 2005. Line transects, environmental data and GIS: cetacean habitat and prey selection along the Barents Sea shelf edge. I Øien, N., Pike, D. (Eds.) North Atlantic Sighting Surveys. *North Atlantic Marine Mammal Commission Scientific Publications*, Tromsø.

Skaug, H.J.& Øien, N. 2005. Genetic tagging of male North Atlantic minke whales through comparison of maternal and foetal DNA-profiles. *J. cetacean Res. Manage*. 7(2):113-117.

Tjelmeland, S. & Lindstrøm, U. 2005. An ecosystem element added to the assessment of Norwegian spring spawning herring: implementing predation by minke whales. *ICES Journal of Marine Science* 62: 285-294.

Trenkel, V.M.& Skaug, H.J. 2005. Disentangling the effects of capture efficiency and population abundance on catch data using random effects models. *ICES Journal of Marine Science* 62:1543-1555.

11.2 Unpublished literature

Bjørge, A. 2005. Bycatch mitigation. Update on the European Union Initiative. NAMMCO/14/MC/BC/5.

Bjørge, A., Kovacs, K., (eds.) 2005. The Scientific Basis for Environmental Quality Objectives (EcoQOs) for the Barents Sea ecosystem. Working group report on Seabirds and Marine Mammals., 30 pp.

Daníelsdóttir, A.K., Stefánsson, M.Ö., Thorgilsson, B., Jörundsdóttir, Th.D., Ragnardsdóttir, A., Árnason, A., Gunnlaugsson, Th., Vikingsson, G.A., Ólafsdóttir, D., Bérubé, M., Palsbøll, P.J., Øien, N., Witting, L., Pampoulie, C. 2005. Genetic analysis of North Atlantic fin whales (*Balaenoptera physalus*): Is there more than one breeding unit at the feeding ground west off Iceland? IWC/SC/57/PFI4, 12 pp.

Eriksen, E., Mauritzen, M., Bjørge, A. 2005. Minke whale (*Balaenoptera acutorostrata*) habitat selection in three ecosystems in the Northeast Atlantic explored using Geographic Information System. 16th Biennial Conference on the Biology of Marine Mammals. San Diego, CA, December 12-16, 2005.

Gwynn, J.P., Andersen, M., Dowdall, M., Lydersen, C. & Kovacs, K.M. 2005: Cesium-137 in Marine Mammals from Svalbard and the Barents and Greenland Seas. In: The 2nd Int. Conf. Radioact. Environ. & the 6th Int. Conf. Environ. Radioact. Arctic & Antarctic, Nice, 2nd to 6th October 2005. Pp. 169-172.

Lindstrøm, U., Haug, T. 2005. On the role of minke whales in the Barents Sea ecosystem. European Cetacean Society, 19th annual conference, La Rochelle, France, 2-7 April 2005. Abstract.

Lindqvist, C., Aars, J., Bachmann, L., Albert, V., Kovacs, K.M., Lydersen, C. & Wiig, Ø. 2005: Going back in time: a discussion on the potential and limitations of genetic analyses of historic and prehistoric samples. 24th Ann. Meet. Willi Hennig Soc.; 25.07.2005 – 29.07.2005, Fagernes, Norway.

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Olsen, E., Nøttestad, L., Kleivane, L., Budgell, P., Prieto, R., Silva, M., Øien, N. 2005. Intelligent migration of a sei whale from the Azores to the Labrador Sea in April to June 2005. 16th Biennial Conference on the Biology of Marine Mammals, San Diego, USA, 11-16 December 2005.

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Pike, D., Gunnlaugsson, T., Øien, N., Desportes, G., Vikingsson, G.A., Paxton, C.G.M., Bloch, D. 2005. Distribution, abundance and trends in abundance of fin and humpback whales in the North Atlantic. ICES CM 2005/R:12.

Skaug, H.J., Palsbøll, P.J., Berube, M., Rew, M.B. 2005. Application of high resolution DNA profiling to management of Northeastern Atlantic minke whales. IWC SC/57/SD.

Smout, S. and Lindstrøm, U. 2005. The multi-species functional response of northeast Atlantic minke whale. ICES CM / R1. Abstract.

Zabavnikov, V. B., Zyryanov, S.V., Tereshchenko, V.V., Nilssen, K.T., Lindstrøm, U. 2005. Distribution and number of marine mammals in the open Barents Sea and their connection with capelin and polar cod

distribution. Pp. 67-76 i: I Shibanov, V. (Ed.) Proceedings of the 11th Joint Russian-Norwegian Symposium: Ecosystem dynamics and optimal long-term harvest in the Barents Sea fisheries. Murmansk, Russia 15-17 August 2005. IMR/PINRO Report series 2/2005. Institute of Marine Research, Bergen.

Øien, N. 2005. Report of the Norwegian 2004 survey for minke whales in the North SEa and southern Norwegian sea. IWC SC/57/O10.

Øien, N., Bøhtun, G. 2005. Trends in local abundance of large whales in the Northeast Atlantic, based on Norwegian surveys 1987-2004. IWC SC/57/O11.

Øien, N., Hartvedt, S. 2005. Sperm whale (*Physeter macrocephalus*) carcasses found stranded and drifting in Norwegian waters. IWC SC/57/IA12.

Øien, N. 2005. Hval. Pp. 54-56, 118 and 161 in: Bakketeig, I., Dommasnes, A., Føyn, L., Haug, T., Iversen, S.A., Røttingen, I., Svendsen, E., Torstensen, E. (Eds.) Havets ressurser og miljø 2005. Fisken og havet, særnummer 1-2005. Havforskningsinstituttet, Bergen.

Øien, N. 2005. Norwegian Independent Line Transect Survey 2005. Survey Protocol, Project 411-10258 Minke whale survey project, Institute of Marine Research, Bergen, Norway, 28 pp.