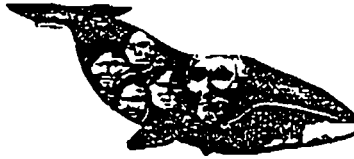


Appendix A

LETTERS COMMENTING ON PROPOSED SALE 202

This section contains copies of the following letters:

Alaska Eskimo Whaling Commission letter to MMS, dated December 12, 2005
Alaska Coalition letter to MMS, dated December 12, 2005



Alaska Eskimo Whaling Commission

P.O. Box 570 • Barrow, Alaska 99723

(907) 852-2392 • Fax: (907) 852-2303 • Toll Free: 1-800-478-2392

December 12, 2005

Via Fax 907-334-5242

Paul Stang
Regional Supervisor, Leasing and Environment
Minerals Management Service
3801 Centerpoint Drive, Suite 500
Anchorage, Alaska 99503-5823

RE: Comments on Request for Information and Notice of Intent to Prepare Environmental Assessment for Beaufort Sea Sale 202

Dear Mr. Stang:

The Alaska Eskimo Whaling Commission (AEWC) appreciates the opportunity to submit the enclosed comments on the U.S. Minerals Management Service's (MMS's) request for information for Beaufort Sea Lease Sale 202.

If you have any questions or would like to discuss these matters, please call me at my office.

Sincerely,

A handwritten signature in cursive script that reads "Harry Brower, Jr.".

Harry Brower, Jr.
Chairman

cc: Maggie Ahmaogak, Executive Director
AEWC Commissioners
The Honorable Edward Itta, Mayor, North Slope Borough
John Goll, Director, Alaska Regional Office

**COMMENTS OF THE ALASKA ESKIMO WHALING COMMISSION
ON THE U.S. MINERALS MANAGEMENT SERVICE'S
REQUEST FOR INFORMATION AND NOTICE OF INTENT TO PREPARE AN
ENVIRONMENTAL ASSESSMENT FOR BEAUFORT SEA LEASE SALE 202**

December 12, 2005

INTRODUCTION

The U.S. Minerals Management Service (MMS) has requested information from the public on proposed Lease Sale 202 in order to "identify impact types and levels that may have changed" since MMS analyzed Lease Sales 186 and 195. The agency will use the information to design the area it will include in Sale 202, and base its environmental assessment (EA) on that lease sale area. 70 FR 62139.

Lease Sale 195 yielded an unprecedented positive response from industry in March of this year. Companies bid on leases in the near, mid and far zones in numbers MMS' analyses of Sales 186 and 195 did not anticipate. Consequently, MMS must analyze the impacts of Sale 202 in light of the intensity of bidding for Sale 195. The agency must prepare for a potentially similar response to Sale 202 by considering stronger lease sale stipulations, expanded whaling deferral areas, and a new cumulative impacts analysis. In addition, MMS must take seriously and respond to the AEWC's request that it develop relevant, appropriate significance thresholds for arctic subsistence communities.

Communities in the Arctic are dealing with a level of offshore and onshore exploration and development that threatens to overwhelm them. The National Environmental Policy Act (NEPA), and Executive Order 12898 on Environmental Justice require that MMS carefully consider and incorporate mitigation measures preferred by those bearing the greatest risk from MMS' activities on the OCS. 42 U.S.C. 4331.

However, MMS has yet to incorporate fully the mitigation measures we have prescribed, namely, deferral areas broad enough to prevent whales from becoming spooked by industrial noise, and a deferral area—of any kind—around Cross Island.

In light of the explosive bidding that took place for Lease Sale 195, MMS must approach its analysis for Lease Sale 202 with a view to strengthening protections for our subsistence communities. This should include the expansion of existing deferral areas around Kaktovik and Barrow, and the implementation of a deferral area around Cross Island in order to protect the whaling village of Nuiqsut.

Further, MMS must abandon its arbitrary significance thresholds and work with our community to develop relevant, realistic and defensible standards of significance for the evaluation of impacts to North Slope subsistence communities. Finally, MMS must conduct a cumulative impacts analysis that incorporates the unexpectedly intense bidding for Sale 195, industry interest and planning revisions for the National Petroleum Reserve-Alaska (NPR-A), and accompanying implications for increased vessel traffic in the Arctic Ocean.

I. **MMS Must Expand Deferral Areas it Set in Sales 186 and 195, and Delineate a Deferral Area Around Cross Island to Protect Nuiqsut Whaling.**

MMS is responsible for managing the OCS in a manner that achieves the "widest range of beneficial uses" of the OCS and "a balance between population and resource use" on the OCS. 43 U.S.C. 1344(a)(1), 42 U.S.C. 4331(b). Even with its arbitrarily low standard of significance, MMS concludes, in its EA for Lease Sale 195, that "potential cumulative effects on subsistence and sociocultural systems would be significant, warrant continued close attention, and effective mitigation measures." Sale 195 EA Section IV.E.2(b)(2), p. 64. To achieve the balance required by the OCSLA, MMS must work with our community to develop mitigation measures that expand current deferrals and that add areas where industrial activities are seasonally restricted to avoid disturbance of migrating bowhead whales and the subsistence hunt.

During scoping for the Multiple Sale Environmental Impact Statement (analyzing Sales 186, 195, and 202), MMS collapsed the whaling captains' recommended deferral areas into patches of ocean that ultimately could provide little protection for our subsistence whaling activities. These activities include areas of pursuit that range well beyond the boundaries of the deferral areas that MMS submitted for analysis in the EIS. As a result, deferral areas included for analysis in Sales 186 and 195 were dramatically smaller than what AEWC would consider minimally necessary to protect the hunt. With the heightened interest in the Arctic Ocean exhibited by the unprecedented response to Lease Sale 195, MMS must reconsider the size of the current deferral areas and must act to protect Cross Island.

MMS did not incorporate a deferral area for Cross Island in either Sale 186 or 195, despite strenuous urging from the AEWC and the North Slope Borough to do so. Instead, in its Final Notice of Sale for Lease Sale 186, MMS applied an "optional" lease sale stipulation that would prohibit permanent facilities from begin sited within ten miles of Cross Island. By the time MMS finalized Lease Sale 195 two years later, the agency had eliminated even the optional stipulation.

Today, Cross Island is almost completely encircled by leased blocks. There is every chance that Sale 202 would entirely enclose the island, making it useless as a staging area for Nuiqsut hunters as vessel traffic and other noise-generating oil and gas operations drive bowhead whales away.

It therefore is incumbent on MMS to provide, in its design and analysis for Lease Sale 202, protection for our human environment, sociocultural systems and subsistence harvest patterns in particular. The most effective and feasible way to do this is to retain and expand current deferral areas around Barrow and Kaktovik, and to develop a deferral area around Cross Island in consultation with the Nuiqsut whaling captains.

II. **It is Crucial That MMS Revise its Current Significance Thresholds to Provide a Realistic Measure of Adverse Impacts to Subsistence and to Enable the Agency to Implement Appropriate Mitigation.**

The extraordinary response to Lease Sale 195 should alert MMS to the trend of ever increasing industrial activity in the Beaufort Sea and underscore the importance of revising its significance thresholds for our subsistence harvest patterns and culture. MMS' current significance thresholds for sociocultural systems and subsistence harvest patterns bear no relation to the real needs of our subsistence arctic community. If MMS does not use relevant criteria to evaluate potential adverse effects, its analysis will fail to reveal impacts to the human environment as NEPA requires. Therefore, MMS must revise the thresholds it has applied in the

past to evaluate the impacts of oil and gas development on subsistence resources and uses, working with the AEWC and community leaders to develop criteria for evaluating impacts that reflect the actual needs of the community and that are consistent with federal law.

1. The current significance thresholds are arbitrary and capricious.

In its analysis of Lease Sale 202, MMS must revise its significance thresholds so that they rest on the actual needs of the local community. The current criteria that MMS uses to judge whether a given impact on arctic subsistence culture is "significant" are fundamentally illogical and unrealistic when applied to real life in a subsistence community. The thresholds amount to a results-oriented test of what effects the MMS can identify as significant without hindering development. The agency has set thresholds for judging significance that require an impact to be profoundly disruptive for years before the agency will deem it "significant" for NEPA purposes.¹

Therefore, when MMS applies these thresholds to determine levels of impacts for subsistence culture, MMS inevitably finds that routine OCS activities will produce only a minor or moderate impact on our community, so long as the effects fall short of multiple years of disturbance—even if the real-world result is hunger and a sense of displacement from tradition and heritage. If these impacts do not last for years, MMS deems the effect insignificant.

MMS continues to conclude that routine program operations will have a "minor to moderate" effect on sociocultural systems, and that environmental justice would only be a concern if onshore infrastructure affected subsistence foods or harvest patterns.² This is an irresponsible assessment because it ignores the opportunistic nature of subsistence hunting, which is the principal economic activity of the North Slope Native community. It also devalues the cultural significance of the bowhead subsistence hunt to the Native community.

2. MMS should judge significance of an activity by its potential to cause an unmitigable adverse impact on the availability of bowhead whales for subsistence uses.

MMS can correct its analysis by bringing its significance thresholds into line with the standard articulated by Congress in the Marine Mammal Protection Act 16 U.S.C. §1371 (a)(5)(A & D). Through this standard, Congress prohibits any activity that has the potential to disrupt the behavior of subsistence resources in a way that causes an "unmitigable adverse

¹ Subsistence Harvest Patterns: One or more important subsistence resources would become unavailable, undesirable for use, or available only in greatly reduced numbers for a period of 1-2 years.

Sociocultural Systems: Chronic disruption of sociocultural systems occurs for a period of 2-5 years, with a tendency toward the displacement of existing social patterns.

Environmental Justice: Any disproportionate, high adverse human health or environmental effects on minority or low-income populations. These would occur if significance thresholds defined above for subsistence harvest patterns and sociocultural systems is reached.

² Outer Continental Shelf Oil & Gas Leasing Program: 2002-2007, Final Environmental Impact Statement, Vol 1, p. 4-294, April 2002.

impact on the availability of [a] species or stock for taking for subsistence uses" in a given season. *Id.* Under this analysis, an activity whose impacts have the potential to reduce the availability of a resource below the level necessary to meet subsistence need for the season are allowed only if those impacts can be mitigated so as to preserve availability of the resource at the necessary level.³

This threshold depicts honestly the fact that when subsistence resources become unavailable to meet subsistence need, people go hungry. No measure of years should be the benchmark for hunger in Native people.

Whenever the potential exists for the take of subsistence resources to fall below the level required to meet subsistence need for a season, the impacts must be considered to be "significant", and significant impacts must be categorized as "major" in the programmatic analysis. This more realistic approach will provide motivation for the use of mitigation measures that can satisfy the needs of all stakeholders in the Arctic.

III. MMS Must Completely Revamp its Cumulative Effects Analysis to Account for the Increased Industrial Interest in the Beaufort Sea, as Evidenced by the Response to Lease Sale 195.

MMS must revamp its cumulative effects analysis for Sale 202 because the cumulative effects analysis in the multiple sale EIS and the EA for Sale 195 do not account for the dramatic escalation in bidding that accompanied Lease Sale 195 and which is now likely to result from Sale 202. In addition to the response from Sale 195, cumulative adverse effects to subsistence are likely to intensify, given the level of industry interest in NPR-A and the prospect of a re-invigorated Liberty project. Inevitably, vessel traffic in support of onshore activities will only grow heavier.

Although MMS has disclaimed responsibility for vessel traffic associated with onshore resource development, the agency must acknowledge, and include in a revised cumulative effects analysis, that adverse effects from offshore industrial activity occur in concert with vessel traffic supporting onshore activity in a way that could alter the migration path and behavior of bowhead whales so that they effectively become unavailable to our communities for subsistence use.

MMS did not contemplate cumulative effects at the level of intensity that is likely to result from the combination of Sale 195, NPR-A, Liberty, and even state lease sales in the Beaufort Sea. The NEPA analysis for Lease Sale 202 is a chance for MMS to conduct a thorough, searching analysis of cumulative effects, given existing new information regarding industrial interest in the North Slope, on and offshore, and the likelihood that wide-reaching adverse cumulative effects will alter our subsistence resources and communities unless MMS implements appropriate mitigation measures informed by a thorough cumulative effects analysis.

CONCLUSION

The overwhelming response to Lease Sale 195 constitutes new information upon which MMS

³ Our community's subsistence need for bowhead whales has been documented and quantified, and is accepted by the International Whaling Commission as the basis for setting the bowhead whale subsistence quota. See, "Quantification of Subsistence and Cultural Need for Bowhead Whales by Alaska Eskimos," Braund, Stephen R., Sam W. Stoker, John A. Kruse, International Whaling Commission document TC/40/A52, 1988.

must revise sections of its previous analyses, both in anticipation of an enthusiastic response to Sale 202, and given the recent onslaught of industrial activity on the North Slope, onshore and offshore. Inevitably, the heightened intensity of oil and gas operations will compound adverse impacts to our subsistence bowhead whale hunt and to our way of life.

Accordingly, MMS must consult with the AEWC and individual whaling villages to expand existing deferral areas around Kaktovik and Barrow, and to design a deferral area around Cross Island to protect whaling activities in Nuiqsut. MMS must also revise its significance thresholds to conform with the standard in the Marine Mammal Protection Act prohibiting activity in a single hunting season, that has the potential to disrupt the behavior of subsistence resources in a way that causes an "unmitigable adverse impact on the availability of [a] species or stock for taking for subsistence uses."

Finally, MMS must undertake a new, rigorous cumulative impacts analysis in its environmental review of Lease Sale 202 to account for the trend of dramatically increased industrial activity that the agency failed to anticipate in its earlier analyses. The response to Lease Sale 195 is a harbinger of the level of bidding that is likely to accompany Sale 202. MMS must consider that probability in conjunction with the pace of concurrent development related to NPR-A and the impending revival of the Liberty Project.

**ALASKA COALITION * ALASKA WILDERNESS LEAGUE * ARCTIC CONNECTIONS *
GWICH'IN STEERING COMMITTEE * NATURAL RESOURCES DEFENSE COUNCIL *
SIERRA CLUB * THE WILDERNESS SOCIETY ***

December 12, 2005

VIA E-MAIL

Alaska OCS Region
Minerals Management Service
3801 Centerpoint Drive, Suite 500
Anchorage, AK 99503-5823
akrfi@mms.gov

RE: Comments on Request for Information and Notice of Intent to Prepare an
Environmental Assessment – Lease Sale 202

Dear Sir/Madame:

Thank you for this opportunity to comment in response to the Minerals Management Service's (MMS) Request for Information and Notice of Intent to Prepare an Environmental Assessment for Lease Sale 2002. 70 Fed. Reg. 62,139 (Oct. 28, 2005). These comments are submitted on behalf of the Alaska Coalition, Alaska Wilderness League, Arctic Connections, Gwich'in Steering Committee, Natural Resources Defense Council, Sierra Club, and The Wilderness Society.

I. COMMENTS IN RESPONSE TO THE REQUEST FOR INFORMATION

We are deeply concerned about the risks posed to sensitive marine and coastal environments from the proposed oil and gas activities on the Outer Continental Shelf (OCS) of the Beaufort Sea. The Beaufort Sea is home to a rich variety of marine life and is adjacent to some of the most important and spectacular terrestrial public resources in the United States. Because of the serious risks to these ecologically important areas and the nearby communities that depend on coastal resources, we believe MMS should not proceed with Lease Sale 202.

The coastal communities along the Beaufort Sea depend on a variety of subsistence food sources, including bowhead whale, seal, polar bear, walrus, grayling, and whitefish. Subsistence use of fish and marine mammals is an established economy of Native coastal communities and is absolutely central to the survival of Alaska's indigenous cultures. Unlike oil and gas resources, the marine resources of the Beaufort OCS can last indefinitely and should therefore not be jeopardized by non-renewable resource development.

Oil and gas activities endanger the fragile marine environment off the coast of Alaska. Marine mammals, seabirds, fish and their habitat, and coastal communities are at risk from potential blowouts and pipeline oil spills. The risks from unprecedented new technology of buried sub-sea oil and gas pipelines raise major questions about development in the Beaufort Sea. We are also concerned about the chronic effects from smaller spills of dozens of toxic substances typical of North Slope oil field operations (not just spills of crude oil or spills greater than 100 bbl) and from disposal of drilling muds and cuttings in the ocean during exploratory drilling. Even small amounts of oil can negatively affect marine life. Oil pollution increases susceptibility to diseases in fish, inhibits phytoplankton productivity, and interferes with reproduction, development, growth, and behavior of many species throughout the food chain. Marine life is also threatened by noise pollution generated by air and vessel traffic, drilling, platform work and seismic testing, the construction of causeways and docks, and the laying of miles of pipelines in or on the seafloor.

The Beaufort Sea is adjacent to two critically important areas: the Arctic National Wildlife Refuge (Arctic Refuge) and the National Petroleum Reserve-Alaska (Reserve). Lease sales offshore from the Arctic Refuge jeopardize the integrity of its wilderness, wildlife and coastal habitats as well as the marine ecosystem itself. Development off the coast of the Arctic Refuge poses risks to the Porcupine Caribou Herd, bowhead whales, fish, and migratory birds which use areas along or near the Arctic Refuge coastline, lagoons, and barrier islands.

Internationally important polar bear habitat is also at risk, both within the Arctic Refuge and off its coast. Protection of polar bears and their habitat is a specified purpose of the Arctic Refuge, which provides the most important denning habitat for polar bears in the United States. Offshore exploration and development would create intense pressure to construct sprawling onshore airports, pipelines, roads, docks, and other support facilities within the Arctic Refuge. Offshore exploration and development would also cause pollution, aircraft and vessel noise and related industrial activity, and potential oil spills would degrade the Refuge and threaten the integrity of this protected conservation unit, even if there is no construction of infrastructure within its boundaries.

The Reserve is an area of international environmental significance. The biological importance of the area off the coast of Dease Inlet and Smith Bay, from Barrow to the Teshekpuk Lake Special Area, has been documented in Audubon Alaska's report reviewing the exceptional ecosystems of the Western Arctic. *See Alaska's Western Arctic*, a summary and synthesis of resources, Audubon Alaska, December 2002, edited by John Schoen and Stanley Senner (hereinafter "Audubon Report"). This region, especially the area north of Teshekpuk Lake, is particularly important to a number of bird species. For example, it includes a high percentage of the Alaskan breeding population of yellow-billed loons, is the center of the breeding distribution for threatened Steller's eiders, and contains high concentrations of nests for the threatened spectacled eiders. *See Audubon Report Figures II.2-1, IV.5-2, and II.2-4, respectively.* The area also includes high breeding densities and highly populated colonies of black brants. *See Audubon Report Figure II.2-3.*

The Dease Inlet and Smith Bay region is important to marine mammals. For example, the offshore area contains a feeding area for bowhead whales during their fall migration and a late summer use area for beluga whales. *See* Audubon Report Figure II.1-13. Onshore, it provides the most consistently used wintering area for the Teshekpuk Lake Caribou Herd and is part of the outer range of the Western Arctic Caribou Herd. *See* Audubon Report figure II.1-1.

Given the importance of the Beaufort Sea and the adjacent areas onshore, we believe MMS should not hold Lease Sale 202.

II. COMMENTS ON THE NOTICE OF INTENT TO PREPARE AN ENVIRONMENTAL ASSESSMENT

A. MMS Should Prepare An Environmental Impact Statement

If MMS decides to proceed with Lease Sale 202, National Environmental Policy Act (NEPA) requires that it prepare an Environmental Impact Statement (EIS).

The Notice of Intent (NOI) for Lease Sale 202 indicates that MMS intends to continue its flawed approach of leasing essentially the entire Beaufort Sea OCS (approximately 9.7 million acres) and, at the same time, refusing to do any site-specific analysis because of the “limited information . . . about where and what leasing, exploration, and development is likely occur.” Multi-Sale FEIS at VII-31. NEPA requires MMS to prepare a separate EIS for each lease sale in order to compensate, in part, for the enormous scope of the area at stake and the difficulty of preparing an adequate site-specific assessment of impacts in such a large region.

Further, MMS should prepare a full EIS for Lease Sale 202 because the Multi-Sale FEIS, as we have previously commented, is inadequate in several respects regarding the effects of oil leasing. MMS cannot tier the EA to an inadequate EIS.

The Multi-Sale FEIS failed to consider the effects that seismic surveys have on fish. Recent studies indicate seismic activities related to oil and gas exploration can have substantial impacts on fish, such as harm to fishes’ auditory functions. Attached to this comment letter is a list of studies that MMS should consider and discuss in an EIS.

The Multi-Sale FEIS also failed to include an adequate discussion of current and potential cumulative impacts for all offshore industrial activities in the marine environment in Alaska and Canada, and for all industrial activities on land and coastal waters across Alaska’s North Slope, particularly in the Reserve. MMS has not adequately considered the cumulative impacts from past, present, and reasonably foreseeable on-shore activities. MMS also has not analyzed the effects of exploration or development activities in the Northwest Reserve or in the areas to be opened by the amendment to the Northeast Plan.

The Multi-Sale FEIS did not consider adequately the cumulative impacts from activities in the Canadian Beaufort Sea. In describing the reasonably foreseeable projects

that might contribute to cumulative impacts, the Multi-Sale FEIS did not include Canadian activities. MMS should prepare an EIS that describes the extent of activities in the Canadian Beaufort Sea, past and present, and analyzes the cumulative effects that would result from them.

Finally, MMS has not yet considered sufficiently the effects from global climate change. For example, MMS has not analyze adequately how global climate change will affect the Beaufort Sea area and how those impacts may be compounded by subsequent oil and gas activities, which will be occurring in a changing environment. There is evidence that melting permafrost is causing a massive slump on the seafloor of the Mackenzie shelf that could cause major problems for companies with oil and gas leases in that area. MMS should analyze how these changes will affect oilfield infrastructure and how these impacts will in turn affect Arctic resources. Attached to this comment letter is a list of climate change studies that MMS should consider and discuss in an EIS.

B. New Biological Opinions Are Required

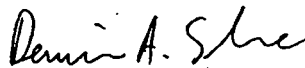
MMS should prepare Biological Evaluations of eiders and bowhead whales for Lease Sale 202 and re-initiate consultation with the United States Fish and Wildlife Service (FWS) and National Marine Fisheries Service (NMFS), respectively. FWS and NMFS should then prepare new biological opinions.

The 2002 Biological Opinion on eiders is incomplete. For example, the cumulative effects analysis ignores onshore and offshore activities by the State of Alaska. Substantial activities have occurred on state lands and waters since the release of the Multi-Sale FEIS. The Endangered Species Act requires that FWS analyze the cumulative impacts from these activities. Accordingly, FWS, in consultation with MMS, should prepare a new biological opinion.

The 2001 Biological Opinion on bowhead whales is outdated. It states that it is based on the "resource estimates and exploration scenario information" from Lease Sale 170. 2001 Arctic Regional Biological Opinion at 4. NMFS should therefore prepare a new biological opinion in consultation with MMS.

Thank you for considering these comments.

Sincerely,



Demian A. Schane
Layla A. Hughes
Earthjustice

ARTICLES ON EFFECTS OF SEISMIC SURVYES NOISE ON FISH

- Anon. 1974. BOLT PAR Air Gun. Manual. Bolt Associates, Inc., Norwalk Conn., USA.
- Anon. 1981. High Pressure Airgun. Manual. Western Geophysical, Houston, Texas, USA.
- Anon. 1989. Sleeve Gun. Manual. Haliburton Geophysical Services, Inc. Houston, Texas, USA.
- Anon. 1985. Tillatelse til undersøkelse etter petroleum (Undersøkelsestillatelsen). Oljedirektoratet. S 12-16 i *Fiskerikyndig person ombord i seismisk fartøy*. Fiskeridirektoratet, Bergen, 1992. (Permission for investigation for petroleum. The Norwegian Petroleum Directorate. P 12 - 16 in *Fishery-proficient person aboard seismic vessel*. The Directorate of Fisheries, Bergen, 1992.)
- Anon. 1990. Rutiner ved behandling av samfunnsmessige og budsjettmessige sider ved forberedelse og forhandlinger av multilaterale miljøavtaler. Rundskriv med vedlegg (vedtatt av Regjeringen 24.sept 1990) til departementene fra statsministerens kontor av 20. nov. 1990, Oslo, 3 s. (Routines concerning social and budgetary aspects at the preparing and negotiating of multilateral environmental agreements. Circular letter with attachment (passed by the Government on Sept. the 24th 1990) for the Ministries from the Prime Minister's Office of Nov. the 20th 1990. 3 p.)
- Anon. 1992. Fiskeriaktivitet i de ulike områdebetegnelser nord for Stad. Fiskeriaktivitet og fiskeriintensive områder i norsk økonomisk sone i Nordsjøen sør for 62° 00'. Fiskeriaktivitet og fiskeriintensive områder i Skagerak. S. 27-43 i *Fiskerikyndig person ombord i seismisk fartøy*. Fiskeridirektoratet, Bergen, 1992. (Fishing activities in different designated areas north of Stad. Fishing activities and fishery-intensive areas in the Norwegian economical zone south of 62° 00'. Fishing activities and fishery-intensive areas in Skagerak. P 27-43 in *Fishery-proficient person aboard seismic vessel*. The Directorate of Fisheries, Bergen, 1992.)
- Anon. 1995. Forskrift til lov om petroleumsvirksomhet. Oljedirektoratet, YA-005, Stavanger: 16 s. (Regulations to the Law of Petroleum Activity. The Norwegian Petroleum Directorate, YA-005, Stavanger, 16 p.)

- Blaxter, J.H.S., Gray, J.A.B., and Denton, E.J. 1981. Sound and startle response in herring shoals. *J. Mar. Biol. Assoc. UK* 61: 851-869.
- Blaxter, J.H.S., and Hoss, D.E. 1981. Startle response in herring: The effect of sound stimulus frequency, size of fish and selective interference with the acoustic-Lateralis system. *J. Mar. Biol. Assoc. UK* 61: 871-879.
- Booman, C., Dalen, J., Leivestad, H., Levsen, A., Van der Meeren, T. and Toklum, K. 1996. Effekter av luftkanonskyting på egg, larver og yngel. Undersøkelser ved Havforsk-ningsinstituttet og Zoologisk Laboratorium, Universitetet i Bergen. *Fisken og Havet*, 3 (1996): 83 s. (Effects from airgun shooting on eggs, larvae and fry. Investigations by The Institute of Marine Research and the Laboratory of Zoology, the Bergen University. *The Fish and the Sea*, 3 (1996): 83 p.)
- Chapman, C.J. and Hawkins, A.D. 1969. The importance of sound in fish behaviour in relation to capture by trawls. *FAO Fisheries Report* 62(3): 717-729.
- Chapman, C.J. and Hawkins, A.D. 1973. A field study of hearing in cod (*Gadus morhua* L.). *Journal of Comparative Physiology* 85: 147-167.
- Dalen, J. 1973. Stimulering av sildestimer. Forsøk i Hopavågen og Imsterfjorden/Verrafjorden 1973. Rapport for NTNF, NTH nr 73-143-T, Trondheim: 36 s. (Stimulating herring shoals. Experiments in Hopavågen and Imsterfjorden/Verrafjorden 1973. Report to NTNF, NTH no. 73-143-T, Trondheim: 36 p.)
- Dalen, J., and Knutsen, G. M. 1987. Scaring effects in fish and harmful effects on eggs, larvae and fry by offshore seismic explorations. S. 93-102 in MERKLINGER, H.M. red. *Progress in Underwater Acoustics*. Plenum Publishing Corporation.
- Engås, A., Løkkeborg, S., Ona, E. and Soldal, A.V. 1996. Effects of seismic shooting on local abundance and catch rates of cod (*Gadus morhua*) and haddock (*Melanogrammus aeglefinus*). *Canadian Journal of Fisheries and Aquatic Sciences* 53(10): 2238-2249.
- Fitch, J.E. & Young, P.H. 1948. Use and effect of explosives in California coastal waters. *Calif. Fish Game*, 34, 53-70.

- Greene, C.R. 1985. A pilot study of possible effects of marine seismic airgun array operations on rockfish plumes. Prepared for the Seismic Steering Committee by Greeneridge Sciences, Inc., Santa Barbara, California.
- Hassel, A., Knutsen, T., Dalen, J., Skaar, K., Løkkeborg, S., Misund, O.A., Østensen, Ø., Fonn, M. and Haugland, E.K. 2004. Influence of seismic shooting on the lesser sandeel (*Ammodytes marinus*). ICES Marine Science Symposia 61: 1165-1173.
- Hastings, M. C., Popper, A. N., Finneran, J. J., and Lanford, P. J. 1996. Effect of low frequency underwater sound on hair cells of the inner ear and lateral line of the teleost fish *Astronotus ocellatus*, J. Acoust. Soc. Am. 99: 1759–1766.
- Hawkins, A.D. 1981. The hearing abilities of fish. In: W.N. Tavolga, A.N. Popper and P.R. Fay (eds). *Hearing and sound communication*. Springer-Verlag, New York, pp. 109-133.
- Holliday, D.V., Pierer, R.E., Clarke, M.E. and Greenlaw, C.F. 1987. Effect of airgun energy releases on the northern anchovy. API Publ. No 4453, American Petr. Inst. Health and Environmental Sciences Dept. Washington, DC.
- Holmstrøm, S. 1993. Effekter av luftkanonseismikk på larver og yngel til havs – modellering og simulering. (Effects from offshore airgun seismics on larvae and fry – modelling and simulations). SINTEF Report STF48 A93007, Trondheim, Norway.
- Kosheleva, V. 1992. The impact of air guns used in marine seismic explorations on organisms living in the Barents Sea. Contr. Petro Piscis II '92 Conference F-5, Bergen, 6-8 April, 1992: 6.p.
- Kostyuchenko, L.P. 1973. Effects of elastic waves generated in marine seismic prospecting of fish eggs in the Black Sea. *Hydrobiological Journal* 9 (5): 45-48.
- Kramer, F.S., Peterson, R.A. and Walter, W.C. 1968. *Seismic Energy Sources 1968 Handbook*. United Geophysical Corp., Pasadena, USA.
- Løkkeborg, S., and Soldal A.V. 1993. The influence of seismic exploration with air guns on cod (*Gadus morhua*) behaviour and catch rates. ICES mar. Sci. Symp., 196: 62-67.

- McCauley, R.D., Fewtrell, J., and Popper, A.N. 2003. High intensity anthropogenic sound damages fish ears. *J. Acoust. Soc. Am.*, 113: 638-642.
- McCauley, R. D. *et al.*, 2000. Marine Seismic Surveys: Analysis and Propagation of Air-Gun Signals; and Effects of Air-Gun Exposure on Humpback Whales, Sea Turtles, Fishes and Squid, prepared for the Australian Petroleum Production Exploration Ass'n.
- McCauley, R. D. "Seismic surveys," in *Environmental Implications of Offshore Oil and Gas Development in Australia—The Findings of an Independent Scientific Review*, edited by J. M. Swan, J. M. Neff, and P. C. Young, Australian Petroleum Exploration Association, Sydney, pp. 19–122 (1994).
- Malme, C.I., Smith, P.W. and Miles, P.R. 1986. Characterization of geophysical acoustic survey sounds. OCS Study MMS-86-0032. Prepared by BBN Laboratories Inc., Cambridge, Mass., for Battelle Memorial Institute under contract No. 14-11-001-30274 to the Department of the Interior, Mineral Management Service, Pacific Outer Continental Shelf Region, Los Angeles, California.
- Malme, C.I., P.R. Miles, C.W. Clark, P. Tyak, and J.E. Bird. 1983. Investigations of the potential effects of underwater noise from petroleum industry activities on migrating gray whale behavior/Phase II: January 1984 migration. BBN Report 5851, Report from BBN Laboratories Inc., Cambridge, MA for US Minerals Management Service, Anchorage, AK, NTIS PB86-218385.
- Matishov, R.D. 1992. The reaction of bottom-fish larvae to airgun pulses in the context of the vulnerable Barents Sea ecosystem. Fisheries of Offshore Petroleum Exploitation 2nd International Conference, Bergen Norway, 6-8 April 1992.
- National Research Council. *Marine Mammals and Low Frequency Sound: Progress Since 1994*. National Academy, Washington, DC (2000).
- Newman, P. 1978. Water gun fills marine seismic gap. *The Oil and the Gas Journal*, Aug. 1978, pp. 138-150.
- O'Hara, J. and J.R. Wilcox. 1990. Avoidance responses of loggerhead turtles, *Caretta caretta*, to low frequency sound. *Copeia*; (1990) 2:564-567.

- Parkes, G., and Hatton, L. *The Marine Seismic Source*. Reidel, Dor-drecht (1986).
- Pearson, W.H., Skalski, J.R., Sulkin, S.D., and Malme, C.I. 1994. Effects of Seismic Releases on the Survival and Development of Zoeal Larvae of Dungeness Crab (*Cancer magister*). *Mar.Envir. Res.* 38: 93-113.
- Pearson, W.H., Skalski, J.R. and Malme, C.I. 1992. Effects of sounds from a geophysical survey device on behavior of captive rockfish (*Sebastes* spp). *Canadian Journal of Fisheries and Aquatic Sciences* 49(7): 1343-1356.
- Picket, G.D., D.R. Eaton, R.M.H. Seaby, and G.P Arnold. 1994. Results of bass tagging in Poole Bay during 1992. Laboratory Leaflet Number 74. Ministry of Agriculture, Fisheries and Food Directorate of Fisheries Research, 12 pp.
- Platt, C. and Popper, A.N. 1981. Fine structure and function of the ear. *In*: W.N. Tavolga, A.N. Popper and R.R. Fay (eds.), *Hearing and sound communication in fishes*. Springer Verlag, New York, pp. 3-36.
- Popper, A.N. and Carlson, T.J. 1998. Application of sound and other stimuli to control fish behavior. *Transactions of the American Fisheries Society* 127(5): 673-707.
- Popper, A.N., Smith, M.E., Cott, P.A., Hanna, B.W., MacGillivray, A.O., Austin, M.E., and Mann, D.A. 2005. Effects of exposure to seismic airgun use on hearing of three fish species. *J. Acoust. Soc. Am.* 117 (6): 3958-3971.
- Richardson, W.J., Greene, C.R. Jr., Malme, C.I. and Thomson, D.H. 1995. *Marine Mammals and Noise*. Academic Press, San Diego, 576 pp.
- Sand, O. and Karlsen, H.E. 1986. Detection of infrasound by the Atlantic Cod. *J. Exp. Biol.*, 125:197-204.
- Santulli, A., Modica, A., Messina, C., Deffa, L., Curatolo, A., Rivas, G. Fabi, G. and D'Amello, V. 1999. Biochemical responses of European sea bass (*Dicentrarchus labrax* L.) to the stress induced by off shore experimental seismic prospecting. *Marine Pollution Bulletin* 36(12): 1105-1114.
- Skalski, J.R., Pearson, W.H. and Malme, C.I. 1992. Effects of sound from a geophysical survey device on catch-per-unit-effort in a hook-and-line fishery for rockfish

(*Sebastes* spp.). Canadian Journal of Fisheries and Aquatic Sciences 49(7): 1357-1365.

Sverdrup, A., Kjellsby, E., Krüger, P.G., Fløysand, R., Knudsen, F.R., Enger, P.S., Serck-Hanssen, G. and Helle, K.B. 1994. Effects of experimental seismic shock on vasoactivity of arteries, integrity of the vascular endothelium and on primary stress hormones of the Atlantic salmon. *Journal of Fish Biology* 45: 973-995.

Sætre, R., and Ona, E. 1996. Seismiske undersøkelser og skader på fiskeegg og -larver. En vurdering av mulige effekter på betandsnivå. *Fisken og Havet*, 8 (1996): 25 s. (Seismic investigations and damage to fish eggs and larvae. An assessment of possible effects on a population level). *The Fish and the Sea*, 8 (1996): 25 p.

Wardle, C.S., Carter, T.J., Urquhart, G.G., Johnstone, A.D.F., Ziolkowski, A.M., Hampson, G. and Mackie, D. 2001. Effects of seismic air guns on marine fish. *Continental Shelf Research* 21: 1005-1027.

ARTICLES ON GLOBAL CLIMATE CHANGE

ACIA, *Impacts of a Warming Arctic* (2004) <<http://amap.no/acia>> (accessed Oct. 11, 2005).

Center for Biological Diversity, *Petition to List the Polar Bear (*Ursus maritimus*) As A Threatened Species Under the Endangered Species Act* (Feb. 16, 2005) <<http://www.biologicaldiversity.org/swcbd/species/polarbear/petition.pdf>> (accessed Oct. 11, 2005).

Ciccrone, R. J., Pres., Natl. Acad. of Sci., *Climate Change Science and Research: Recent and Upcoming Studies from the National Academies* (July 20, 2005) (available at <http://www7.nationalacademies.org/ocga/testimony/Global_Climate_Change_Policy_and_Budget_Review.asp>) (citing various reports of the National Academies).

Derocher et al., *Polar bears in a warming climate* (2004).

Gibson, M.A. and S.B. Schullinger. 1998. *Answers from the Ice Edge: The consequences of climate change on life in the Bering and Chukchi Seas*. Greenpeace. 32 pp.

Intergovernmental Panel on Climate Change, *Third Assessment Report – Climate Change 2001* (2001) <<http://www.ipcc.ch/pub/reports.htm>> (accessed Apr. 29, 2005).

Millennium Ecosystem Assessment, *Millennium Ecosystem Assessment Synthesis Report* 119 (Mar. 23, 2005) <<http://www.millenniumassessment.org/en/products.aspx>> (accessed Oct. 11, 2005).

NASA, Press Release, *Satellites Continue to See Decline in Arctic Sea Ice in 2005* (Sept. 28, 2005).

National Academy of Sciences, *Joint science academies' statement: Global response to climate change* (June 7, 2005).

NSIDC, Press Release, *Arctic Alaskan Shrubs Reveal Changing Climate* (Sept. 14, 2005).

NSIDC, Press Release, *Sea Ice Decline Intensifies* (Sept. 28, 2005).

PBSG, Press Release, *14th Meeting of the IUCN/SSC Polar Bear Specialist Group* (June 2005).

Pew Center on Global Climate Change, *Observed Impacts of Global Climate Change in the U.S.* (Nov. 9, 2004).

The Wildlife Society, *Global Climate Change and Wildlife in North America* (2004).

U.N. Env. Programme, *GEO Year Book 2004/5: An Overview of Our Changing Environment* 42-46, 80-84 (2005).