

***Ice Seal Monitoring in the Bering-Chukchi Sea Region***

**Award Number NA08NMF4390544**

***Semi-Annual Performance Report***

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## Progress Report

### A. Project Identifiers

- 1) Award Number: NA08NMF4390544
- 2) Grant Program/CFDA#:
- 3) Name of Recipient Organization: Alaska Department of Fish and Game
- 4) Principal Investigator: Lori Quakenbush
- 5) Project Title: Ice Seal Monitoring in the Bering-Chukchi Sea Region
- 6) Federal Funding: \$ 345,402 Match: \$ 0
- 7) Award Period Start Date: 8/01/2008 Award End Date: 1/31/2010
- 8) Report Start Date: 2/01/2009 Report End Date: 7/31/2009

### B. Project Summary

Bearded (*Erignathus barbatus*), ringed (*Phoca hispida*), spotted (*P. largha*), and ribbon (*P. fasciata*) seals are the species of Alaska's seals collectively called ice seals because of their association with sea ice and their dependence on it for feeding, resting, and pupping. Ice seals are important components of the Bering, Chukchi, and Beaufort Sea ecosystems and they are important to the subsistence culture of Alaska Natives for food and raw materials. There are concerns regarding the status, health, and availability of ice seals due to changes occurring in thickness, persistence, and distribution of sea ice. All four species of ice seals have been petitioned for listing as threatened or endangered under the Endangered Species Act because of the affects of climate change on sea ice. Oil and gas activities, increasing concentrations of contaminants in the Arctic, and large biomass removals by commercial fisheries in the Bering Sea may also be affecting seal populations. Little is known about the biology and ecology of ice seals and they have received little attention compared with other Bering Sea species known to be in decline. Population estimates for ice seals are not available and not easily attainable due to their wide distribution and the problems related to marine mammal surveys in remote, ice-covered waters. Large decreases in abundance could be occurring and are likely to go undetected until low numbers affect subsistence harvests.

By collecting and analyzing harvest information and biological samples from subsistence-harvested seals at selected locations annually, we can assess the health and status of each species. Information about the status and health of the population can be obtained from sex and age of seals harvested, age at first reproduction, pregnancy rate, growth rate, body condition, diet, and contaminant load. It is believed that the arctic marine ecosystem is changing and data collected from this monitoring program would provide a means to detect and monitor such changes. For example, changes in the prey available to ice seals today could be known by comparing diet data collected during this project with that collected in the 1960s, 1970s, and 1980s. These historic data are available at the Alaska Department of Fish and Game (ADF&G). Similarly, changes in species distribution and body condition would also be detectable by comparison. This project will provide essential information on the health and status of ice seals and will allow us to monitor, document, and evaluate changes in population status, species distribution, availability to subsistence hunters, and contaminant load.

### C. Summary of Progress and Results

**Objective 1: Conduct an ice seal monitoring program.** Visits were made to Point Hope, Shishmaref, Diomedede, Savoonga, Gambell, and Hooper Bay to collect samples, work with current samplers, train new samplers, answer questions about the program, and report sampling results to the communities.

**Objective 2: Collect samples from ice seals harvested for subsistence.** We received 621 samples from the spring 2009 harvest for a total of 2,753 seals sampled since 2002 (Table 1). Samples were collected under NMFS Permit No. 358-1787.

#### **Objective 3: Sample Analysis.**

During this reporting period we analyzed 40 years of data from spotted seals in order to provide as much information as possible for NMFS to prepare a status review of the species in response to the 28 May 2008 petition to list under the Endangered Species Act (Quakenbush et al. 2009). We are preparing our bearded and ringed seal database for similar analyses by checking, updating, and entering data from 40 years of collections.

Diet – Stomachs from 1,151 seals have been processed since 2002 (Table 2). Prey items are sorted into major groups, and identified to the lowest taxonomic level possible. Otoliths are classified to species by William Walker at the National Marine Mammal Laboratory and invertebrates are classified to the lowest taxonomic level at the Institute of Marine Science at the University of Alaska, Fairbanks.

We analyzed diet data for spotted seals from the 1960s to present and found that we could detect changes in diet through time by region, season, and age, but not by sex (Quakenbush et al. 2009). For example, spotted seals consumed arctic cod more frequently in the 2000s (37.46%) than during the 1960s and 1970s (10.86%). Shrimp (Caridae), however, were consumed less frequently in the 2000s (20.27%) than during the 1960s and 1970s (36.57%).

Genetics – During this reporting period we collected skin samples from harvested seals for future analyses. The immediate focus for the genetics work will be to refine the use of microsatellites for stock identification of bearded seals. We have also used DNA to determine species (n = 43) and gender (n = 256) for specimens that were recorded as unknowns. This use of genetic identification is adding greatly to our sample sizes. We are having DNA analyzed from additional specimens that will identify 58 more specimens to species and 91 to gender.

Contaminants – No new contaminants analyses were conducted during this reporting period, however we are compiling a list of samples to be analyzed that augment our current dataset by filling in our sample sizes for sex and age for each species.

Table 1. Number of seals sampled by village and species since 2002.

	<u>Kaktovik</u>	<u>Barrow</u>	<u>Point Hope</u>	<u>Shishmaref</u>	<u>Diomede *</u>	<u>Nome</u>	<u>Gambell</u>	<u>Savoonga</u>	<u>Hooper Bay</u>	<u>Kotzebue</u>	<u>Total</u>
Ringed	0	11	46	397	217	5	45	20	94	111	<b>946</b>
Bearded	4	15	179	184	185	4	44	13	13	84	<b>725</b>
Spotted	1	2	2	696	82	14	47	13	17	26	<b>900</b>
Ribbon	0	0	3	0	42	0	2	3	3	0	<b>53</b>
Unknown	0	0	0	72	23	2	17	13	1	1	<b>129</b>
Totals	<b>5</b>	<b>28</b>	<b>230</b>	<b>1,349</b>	<b>549</b>	<b>25</b>	<b>155</b>	<b>62</b>	<b>128</b>	<b>222</b>	<b>2,753</b>

\* The National Science Foundation (OPP Grant #9910319) provided funding for the collection of samples from Little Diomedede during 2000–2005. The North Pacific Research Board provided partial funding for the collection and analysis of samples for all villages in 2005–2006.

Table 2. Number of stomachs analyzed by village and by species, 2002–January 2009.

	<u>Kaktovik</u>	<u>Barrow</u>	<u>Point Hope</u>	<u>Kivalina</u>	<u>Kotzebue</u>	<u>Shishmaref</u>	<u>Diomedede*</u>	<u>Nome</u>	<u>Gambell</u>	<u>Savoonga</u>	<u>Hooper Bay</u>	<u>Total</u>
Ringed	0	7	6	0	1	173	167	2	33	10	61	<b>459</b>
Bearded	2	7	69	7	0	55	138	1	19	4	10	<b>313</b>
Spotted	1	0	1	0	1	220	52	12	26	4	17	<b>334</b>
Ribbon	0	0	2	0	0	0	40	0	0	0	3	<b>45</b>
Totals	<b>3</b>	<b>14</b>	<b>78</b>	<b>7</b>	<b>2</b>	<b>448</b>	<b>397</b>	<b>15</b>	<b>78</b>	<b>18</b>	<b>91</b>	<b>1151</b>

\* The National Science Foundation (OPP Grant #9910319) provided funding for the collection of samples from Little Diomedede during 2000–2005. The North Pacific Research Board provided partial funding for the collection and analysis of samples for all villages in 2005–2006.

Disease Screening – Blood has been collected when field conditions have allowed (n=204). All samples have been analyzed for exposure to diseases (Table 3). Blood sera were screened for antibodies to canine and phocine distemper, seal herpes virus I and II, Brucella, Toxoplasma, and Leptospira. See Quakenbush and Citta (2008) for a summary of antibodies in ribbon seals and Quakenbush et al. (2009) for a summary in spotted seals. We are working on a summary of results for ringed and bearded seals.

Table 3. Number of serological samples analyzed by village and species between 1998 and 2009.

	<u>Diomede *</u>	<u>Shishmaref</u>	<u>Kotzebue</u>	<u>Pt. Hope</u>	<u>Total</u>
Ringed	12	0	63	0	<b>75</b>
Bearded	20	5	17	26	<b>68</b>
Spotted	29	13	2	0	<b>44</b>
Ribbon	17	0	0	0	<b>17</b>
Totals	<b>78</b>	<b>18</b>	<b>82</b>	<b>26</b>	<b>204</b>

\* The National Science Foundation (OPP Grant #9910319) provided funding for the collection of samples from Little Diomede (2000–2005).

Parasites – Tissues (stomach, intestine, heart, liver, lung, gall bladder) from 69 seals have been collected for parasite screening to evaluate changes in parasite load or species composition (Table 4). We have received preliminary results for 19 seals. We are working with the Alaska SeaLife Center and their collaborators for parasite extraction and identification.

Table 4. Number of samples collected for parasite screening by village and species in 2007–2009.

	<u>Point Hope</u>	<u>Shishmaref</u>	<u>Nome</u>	<u>Diomede</u>	<u>Hooper Bay</u>	<u>Total</u>
Ringed	1	1	0	2	15	<b>19</b>
Bearded	44	0	0	2	0	<b>46</b>
Spotted	1	0	1	0	0	<b>2</b>
Ribbon	2	0	0	0	0	<b>2</b>
Totals	<b>48</b>	<b>1</b>	<b>1</b>	<b>4</b>	<b>15</b>	<b>69</b>

Productivity – We analyzed the reproductive tracts from 271 females (Table 5). Pregnancy rates ranged from 75–92% for sexually mature females of all species. Ribbon seals had the highest pregnancy rate, followed by bearded, spotted, and ringed seals, in descending order (Table 5). Although we have analyzed reproductive tracts collected in fall 2008 for spotted seals (not included in Table 5), we have additional reproductive

tracts from other species from fall 2008 and for all species from spring 2009 that have not yet been analyzed.

Table 5. Reproductive status by species of females sampled between 2000 and 2007.

	Nulliparous <sup>1</sup>		Primiparous <sup>2</sup>		Multiparous <sup>3</sup>		Unknown		No.	Total	Total
	No.	% preg.	No.	% preg.	No.	% preg.	No.	% preg.	mature	% preg.	repros.
Ringed	55	64	11	86	7	86	6	100	24	79	<b>79</b>
Bearded	24	67	3	92	39	92	2	100	44	91	<b>68</b>
Spotted	80	50	8	86	14	86	2	100	24	75	<b>104</b>
Ribbon	8	80	5	100	7	100	0	0	12	92	<b>20</b>

<sup>1</sup> Nulliparous females are reproductively immature.

<sup>2</sup> Primiparous females have ovulated once.

<sup>3</sup> Multiparous females have ovulated more than once and given birth at least once.

### Morphometrics

We analyzed growth rate and body condition for spotted seals and compared the results by time period (Quakenbush et al. 2009) similar to our analyses for ribbon seals (Quakenbush and Citta 2008a).

### Population Parameters

For spotted seals, our sample sizes of age-at-harvest data were large enough per time period to analyze age and sex distribution and survivorship (Quakenbush et al. 2009). For each time period, the proportion of seals harvested in each age group decreased with increasing age; however proportions varied among decades. The proportion of harvested seals aged 0–1 years and 16–20 years were larger in the 1960s and 2000s than during the 1970s.

**Objective 4: Traditional Knowledge.** We are continuing to distribute and collect questionnaires but did not update the summary of responses during this report period. As the proportion of respondents relative to the total number of hunters in each village increases, the results will allow us to understand potential biases created by hunting practices, which will allow us to better interpret our study results. The information gathered to date has been helpful in understanding aspects of the harvest. The questionnaires also provided local residents with an avenue for communicating concerns about seals and the environment.

### **Objective 5: Ice Seal Committee Support and Co-Management Project Priorities.**

We continue to work with the Ice Seal Committee (ISC) on cooperative projects and assist with various ice seal issues and ISC meetings. During this reporting period we supported a July meeting in Fairbanks. The ISC wanted to revisit committee goals and objectives and build a strategic plan. We assisted in finding a facilitator (Mike Walsh, Foraker Group) and provided him with background information about the committee to assist the strategic planning. The July meeting also included alternates for each regional representative. Because the committee is small (5 representatives) it is important to have

alternates available if a representative can not make a meeting and the alternates need to be informed of the workings of the ISC. During this meeting the ISC agreed to fund 1) harvest monitoring in Tununak, Hooper Bay, and Quinhagak; 2) the printing and distribution of an informational poster and pamphlet developed by Bristol Bay Native Association, Marine Mammal Council (includes what to do when sick or abandoned marine mammals are found, information about MMPA, ESA, and who may hunt MM); and 3) travel for an ISC representative to go to the International Arctic Fisheries Symposium in Anchorage. A regional ISC meeting scheduled for Nome in March 2009 has been postponed but may be held in September or October 2009 and we are assisting with the planning and costs.

**Objective 6: Habitat Use and Movements of Ringed Seals.** We supported the ringed seal tagging project in Kotzebue by providing personnel during tagging, Argos fees, as well as sample and data support. We are compiling the Argos data, providing maps of seal tracks to cooperators and for the Kotzebue IRA website, and analyzing habitat use and movements. Seals were captured by John Goodwin, Chairman of the Ice Seal Committee, and other local hunters in a cooperative project with the Native Village of Kotzebue and Kathy Frost at the University of Alaska. We will also be analyzing the dive data for this project. In addition to the tagged ringed seals, other seals are caught released after measurements (including weights), skin, and blood are collected. These data and samples are added to our biomonitoring database and will be included in our analyses as appropriate. We will be presenting a poster on our analysis of habitat use and movements at the Marine Mammal Society Conference in Quebec City in October 2009 (Crawford et al. 2009).

**Future Objective: Retrospective Analyses.** We have now accomplished retrospective analyses for ribbon and spotted seals (Quakenbush and Citta 2008, Quakenbush et al. 2009) in order to provide as much information as possible for NMFS to prepare status reviews of the species in response to petitions to list under the Endangered Species Act. During this reporting period we analyzed spotted seal data from 1960s, 1970s, and 2000s and found that conditions appeared to be less favorable during the 1970s compared to the 1960s or the 2000s as indicated by a slower growth rate and later age at first reproduction. Diet was also determined to change through time and the frequency of occurrence of fish was highly variable in the 1970s, which could reflect forage fish availability. We have found that by comparing seal data (ribbon and spotted) collected presently with historical data from the same region we can examine the status of the current seal populations relative to the historical ones. Without other methods to evaluate population status, these population indices are especially important. We are currently checking, entering missing data, and updating our historic bearded seal and ringed seal databases in preparation for providing similar retrospective analyses for these species.

#### Recent Products and Publications

Quakenbush, L., and J. Citta. 2008. Biology of the ribbon seal in Alaska. Unpublished report to the National Marine Fisheries Service from the Alaska Department of Fish and Game, Fairbanks, AK. 46 pp.

Quakenbush, L., J. Citta, and J. Crawford. 2009. Biology of the Spotted Seal (*Phoca largha*) in Alaska from 1962 to 2008. Preliminary report to National Marine Fisheries Service from the Alaska Department of Fish and Game, Fairbanks, AK. 66 pp.

Crawford, J., K. Frost, J. Goodwin, and A. Whiting. 2009. Different habitat use strategies by subadult and adult ringed seals. 18<sup>th</sup> Biennial Conference on the Biology of Marine Mammals. (Abstract)

Posters and flyers were prepared to update the villages with results of sample collections. Presentations were given at an ISC meeting.

Prepared by: Lori Quakenbush Date: August 2009  
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