

Sample Design for the 2010 - 2011 Chukchi Sea Alaska Monitoring and Assessment Program Survey

Douglas Dasher^{1*}, Stephen Jewett², Brenda Norcross², Brenda Holladay², Terri Lomax¹, Arny Blanchard², and Robert Day³

Abstract

The Alaska Department of Environmental Conservation and the University of Alaska Fairbanks Institute of Marine Science jointly conduct the Alaska Monitoring and Assessment Program (AKMAP). Program focus is on applied environmental research using a sampling survey design to estimate the spatial extent of water quality status based on stressors, such as chemical contaminants, water quality parameters and indicators, such as benthic fish abundance. Sea bird and marine mammal transects and ocean acidification work is also part of the Chukchi Sea survey. The 2010 survey was conducted in the region from Pt. Hope to Pt. Lay, with work in Ledyard Bay, and 2011 will focus on the region from Pt. Lay to Barrow, Alaska. This posters discusses the survey sampling design methodology, parameters to be sampled, and provides some preliminary information gathered in the 2010 survey.

Sample Survey Design

A probabilistic survey design for an area resource was used to establish the status of aquatic resources of interest using a representative sample take from a relatively few number of sites (Stevens and Olsen, 1999; U.S. EPA, 2010).

Objective

Obtain estimates of the current environmental status, (i.e., water quality, sediment chemistry, demersal fish, epibenthic and macroinvertebrates) within the target population. A modified sediment quality triad approach is used in assessing the data.

Target Population

- Chukchi Sea Shelf Ecoregion (Piatt and Springer, 2007).
- 10-40m depth

Sample Frame

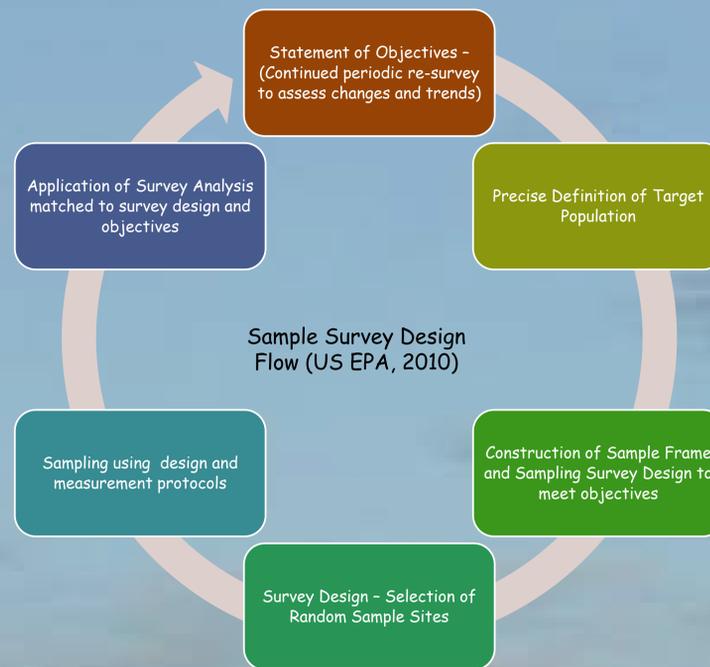
Various GIS data sets from State of Alaska, US Fish and Wildlife, Alaska Marine Ecoregions, and Bureau-of-Ocean-Energy-Management-Regulation-and-Enforcement were used to establish the sampling frame.

Stratums

- Ledyard Bay (30)
- Peard Bay (30)
- North Chukchi (30)
- Barrow Canyon (12)

Precision

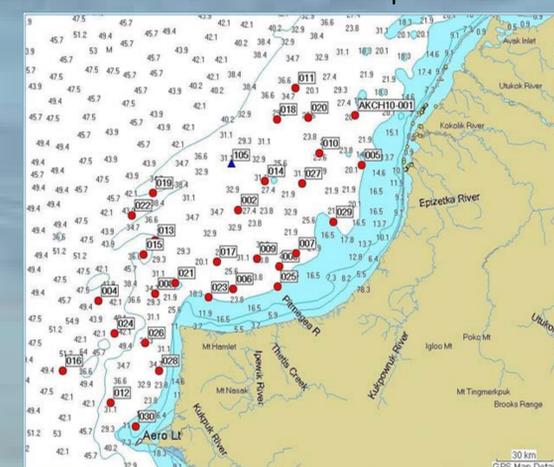
For Ledyard Bay, Peard Bay and North Chukchi 30 sites were allocated with the objective of characterizing the stratums with a 90% confidence interval of $\pm 10\%$ around estimates of areal extent (U.S. EPA, 2010).



2010 Field Sampling Details

The R/V Norseman II set sail August 21st with a crew of 10 scientists. Dr. Stephen Jewett served as chief scientist. Throughout the 12 day sampling event 31 stations were occupied, two to three stations were sample each day.

AKMAP Chukchi Sea 2010 Sampled Stations



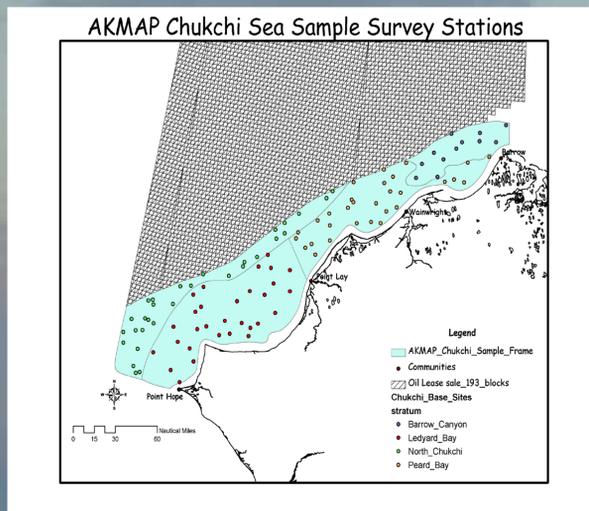
Station sampling activity typically occurred in the following sequence, with number of stations sampled in parentheses:

- vertical plankton tow (31),
- drop camera utilized to record substrate (27),
- Seabird 19plus CTD w/rosette (31),
- 30.5 m plumb beam trawl (31),
- Van Veen grab (30),
- Haps corer (8),
- 9.1 m otter trawl (29),
- rod and reel (11),
- air sampling (17),
- Seabird observations,
- Marine mammal observations.

Beam and otter trawl collections netted 40 different species, totaling 16,046 fish.

2011 Field Sampling

Field work is planned within the Peard Bay stratum in August of 2011. Further survey work within Barrow Canyon and North Chukchi Sea depends upon future funding.



AKMAP Chukchi Sea Assessment Sampled Parameters	
<i>Water Column</i>	
<i>Water Column Profile</i>	
CTD, Chl A (Fluorescence), PAR, pH, DO	
<i>Water Column Chemistry</i>	
~1 M, Mid-Depth, Near Bottom & maximum fluorescence.	
TSS	
DO (QA/QC check against CTD 1M and near bottom)	
Chl A	
Dissolved Nutrients (NH ₄ , NO ₃ , NO ₂ , PO ₄ , Silica)	
Alkalinity (low level/Dr. Mathis)	
DIC (low level/Dr. Mathis)	
<i>Sediment and Biological Tissue Hydrocarbons & Lipids</i>	
Parent and Alkylated PAH	
Petroleum Biomarkers	
Saturated Hydrocarbons	
Total Petroleum Hydrocarbons	
Total Lipids	
<i>Sediment and Fish Tissue Organochlorine Contaminants</i>	
PCBs	
DDT	
<i>Biological</i>	
Demersal Fish	
Epibenthic invertebrates	
Benthic Macroinvertebrates	
Zooplankton	
Sea-Bird and Marine Mammal Surveys	
<i>Other</i>	
Atmospheric Samples for Methane	

Author's Affiliations

- 1 - Alaska Department of Environmental Conservation
- 2 - University of Alaska Fairbanks Institute of Marine Science
- 3 - Alaska Biological Research, Inc.

*Primary contact : Alaska Department of Environmental Conservation,
610 University Avenue, Fairbanks, AK 99709.
E-mail: doug.dasher@alaska.gov
Phone 907-347-7779.

References

Piatt, J. F., and A.M. Springer: 2007, *Marine ecoregions of Alaska*. Pp. 522-526 in: Robert Spies(ed.), *Long-term Ecological Change in the Northern Gulf of Alaska*. Elsevier, Amsterdam

Stevens, D.L., Jr., Olsen, A.R., 1999. Spatially restricted surveys over time for aquatic resources. *Journal of Agricultural, Biological, and Environmental Statistics*, 4, 415-428.

U.S. Environmental Protection Agency (U.S. EPA), 2010. *Aquatic Resource Monitoring*. <http://www.epa.gov/raer/raer/>



This project is funded with qualified outer continental shelf oil and gas revenues by the Coastal Impact Assistance Program, Bureau of Ocean Management Regulation and Enforcement, U.S. Department of Interior.

Funding was also provided by Shell to support the sea bird and marine mammal observers.

The views and conclusions contained in this document are those of the authors and should not be interpreted as representing the opinions or policies of the U.S. Government. Mention of trade names, commercial projects or other partners does not constitute their endorsement by the U.S. Government nor Alaska Department of Environmental Conservation or University of Alaska.