Managing Information for the Chukchi Sea Marine Ecosystem

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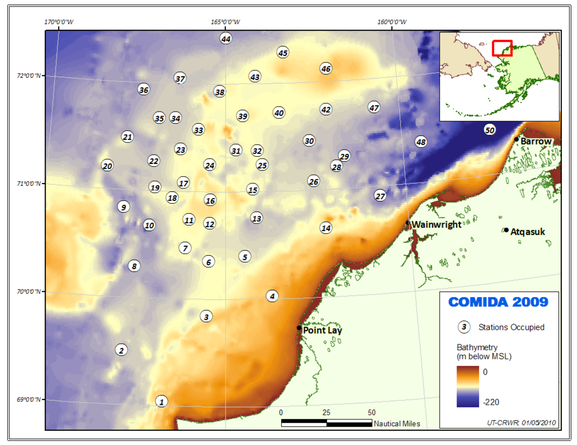
COMIDA CAB

Real-time, ship-based data management and Geographic Information System (GIS) support for the Chukchi Sea Offshore Monitoring in Drilling Area (COMIDA) Chemical and Benthos (CAB) project.

Photo: Nathan McTigue, UT MSI

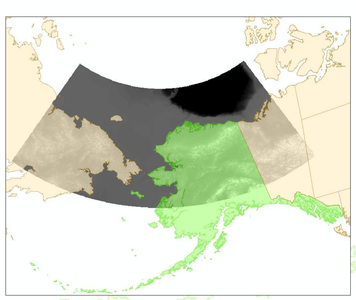
Project Goals

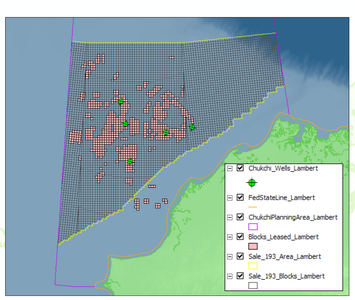
The COMIDA CAB project is a robust, comprehensive effort to characterize the lease area biota and chemistry, to conduct a baseline assessment of the continental shelf ecosystem, and to develop a workable food web model. In the 2009 field season, 48 stations were occupied in the northeastern Chukchi Sea (see map below).



Basemap Development

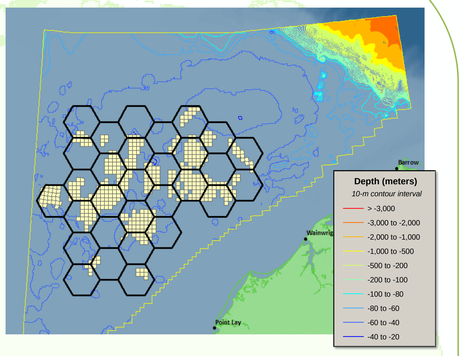
Bathymetric data was obtained from the NOAA National Geophysical Data Center (NGDC, 2008). The ETOPO1 1-Arc Minute Global Relief Model integrates land topography and ocean bathymetry from numerous global and regional data sets (below, left). Oil and gas wells, Lease Sale 193 information, existing moorings, and previous sampling locations were added to create a project basemap (below, right).





Sampling Design

Thirty stations were chosen using a general randomized tessellation stratified design (GRTS, at right) and 20 more were chosen using a spatially-oriented, nearshore-to-offshore grid; 10 ten stations were chosen as overlap stations for calibration and QA/QC. Selected sites will be resampled in the 2010 field season to initiate a time-series of benthic and water column parameters.



Data Collection

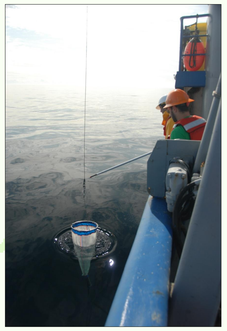


Photo: Lee Cooper, UMCES-CBL

270 sampling events from 11 components, comprising 142 hours of total sampling time – trawls, grab samples, sondes, plankton nets, cores, benthic camera, and water pumping.

Sediment

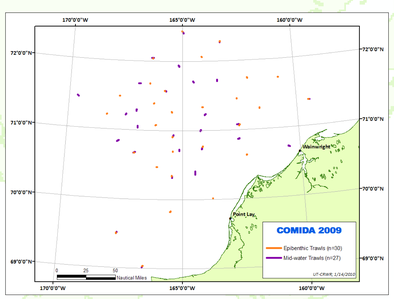
- Hydrocarbons
- 19 anthropogenic metals
- Cesium and lead dating
- TOC, POC, TSS, nutrients
- Sediment chlorophyll
- Stable isotopes
- Biomass
- Community composition
- Biomarkers
- Grain size distribution

Water Column

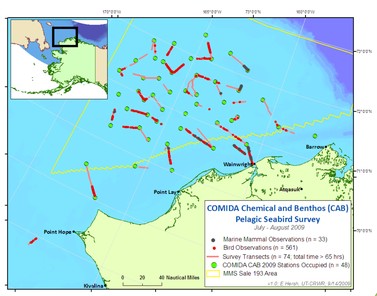
- Surface & subsurface PAR
- POM
- Zooplankton
- Phytoplankton
- Sonde profiles
- Turbidity, TSS, nutrients
- Community composition

Summary of Selected Data

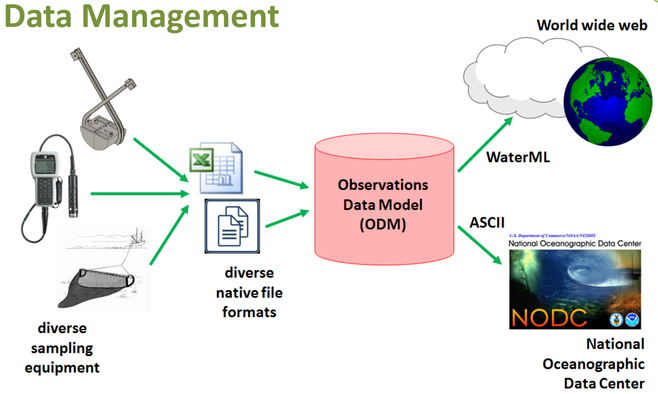
- 48 stations with over 1,600 benthic, epibenthic, and pelagic organisms from 177 species encompassing 15 phyla and 110 genera



- 27 mid-water trawls, average length = 1.35 nautical miles, total length = 36.5 nm
- 30 epibenthic trawls, average length = 0.51 nm, total length = 15.4 nm (at left)
- 74 pelagic seabird surveys totaling 64 hours on-transect and 314 square kilometers surveyed; 561 bird observations of 1,733 individual birds from 32 unique taxa
- 32 official marine mammal observations totaling 52 individuals from six taxa (at right)



Data Management

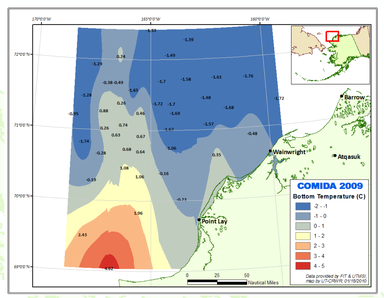


Data management is accomplished via SQL/Server relational database and Observations Data Model (ODM) schema (see workflow, above). The ODM is used extensively for storing observations of the water environment and was developed by the Consortium of Universities for the Advancement of Hydrologic Science, Inc. (CUAHSI), a National Science Foundation-supported cyberinfrastructure project.

CUAHSI HIS *Sharing hydrologic data*

Data Analysis

ESRI ArcGIS 9.3.1 and the Geostatistical Analyst extension are being used for the analysis of observational data. The GIS provides for management, analysis, and display of spatially-referenced point samples and the interpolation of surfaces of such parameters as benthic biomass, water column chlorophyll a, chemical concentrations, sea surface and seafloor water temperature (below).



Conclusion

A dedicated ship-based project data manager allows for:

- detailed basemap development and customization,
- streamlined cruise logistics and event recording,
- improved communication between the ship's crew and the science team,
- improved data access and sharing,
- near real-time awareness and understanding of sampling results, and
- decision support to respond to dynamic field conditions including sea ice, weather, marine mammals, timing, transit, and vessel and equipment considerations

which we believe will ultimately increase the utility and value of the scientific results of the COMIDA CAB program.

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