

ARCTIC WHALE ECOLOGY STUDY  
(ARCWEST):  
USE OF THE CHUKCHI SEA BY  
ENDANGERED BALEEN AND  
OTHER WHALES  
(WESTWARD EXTENSION OF THE BOWFEST)

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## Executive Summary

Through an Inter-Agency agreement (IA) between the National Marine Mammal Laboratory (NMML) and the Bureau of Ocean Energy Management (BOEM), NMML is conducting a dedicated multi-year study to determine relationships between dominant currents passing from the Bering Sea into and through the Chukchi Sea and prey resources delivered to the Barrow Arch area (an area of high bowhead whale and prey concentrations between Wainwright and Smith Bay), and to provide information about the dynamic nature of those relationships relative to whale distribution and habitat utilization in the eastern Chukchi and extreme western Beaufort Seas. This study will also provide important baseline data on the occurrence, distribution, and habitat use of large whales in an area that is subject to rapid change in climate and human industrial development. This quarterly report covers the period of this study between April and June 2013.

The major activity during this period consisted of planning for the 2013 vessel survey.

## Introduction and objectives

The western Arctic physical climate is rapidly changing. The summer Arctic minimum sea ice extent in September 2012 reached a new record of 3.61 million square kilometers, a further 16% reduction from a record set in 2007 (4.30 million square kilometers). This area was more than 50% less than that of two decades ago. The speed of this ice loss was unexpected, as the consensus of the climate research community was that this level of ice reduction would not be seen for another thirty years. As sea temperature, oceanographic currents, and prey availability are altered by climate change, parallel changes in baleen whale species composition, abundance and distribution are expected (and evidenced already by local knowledge and opportunistic sightings). In addition, the observed northward retreat of the minimum extent of summer sea ice has the potential to create opportunities for the expansion of oil and gas-related exploration and development into previously closed seasons and localities in the Alaskan Arctic. It will also open maritime transportation lanes across the Arctic adding (to a potentially dramatic degree) to the ambient noise in the environment. This combination of increasing anthropogenic impacts, coupled with the steadily increasing abundance and related seasonal range expansion by bowhead (*Balaena mysticetus*), gray (*Eschrichtius robustus*), humpback (*Megaptera novaeangliae*) and fin whales (*Balaenoptera physalus*), mandates that more complete information on the year-round presence of large whales is needed in the Chukchi Sea planning area. Timing and location of whale migrations may play an important role in assessing where, when or how exploration or access to petroleum reserves may be conducted, to mitigate or minimize the impact on protected species.

The ARCWEST study has five component projects: visual observation, satellite tagging, passive acoustics, lower trophic level sampling, and physical oceanographic sampling. Each component project is a technical discipline and is coordinated by a Project Leader with extensive experience in that discipline. Visual surveys, along with sonobuoy deployments, will provide distributional data on baleen whales and other marine mammals. Satellite tagging will provide valuable information on both large- and fine-scale movements and habitat use of baleen whales. Passive acoustic moorings will provide year-round assessments of the seasonal occurrence of baleen whales. Concurrently deployed bio-physical moorings offer the potential of correlating whale distribution with biological and physical oceanographic conditions and indices of potential prey density. Satellite-tracked drifters will examine potential pathways to the areas of high biological importance. Our goal is to use these tools to understand the

mechanisms responsible for the high biological activity so that we can predict, in a qualitative way, the effects of climate change on these preferred habitats.

The overall goal of this multi-year IA is to use passive acoustic recorder deployments, visual and passive acoustic surveys, and satellite tagging to explore the distribution and movements of baleen whales in the Bering and Chukchi Seas, particularly the Chukchi Sea planning areas. In addition, oceanographic and lower trophic level sampling and moorings will be used to explore the relationships between currents passing through the Bering Strait and resources delivered to the Barrow Arch area (an area of high bowhead whale and prey concentrations between Wainwright and Smith Bay), and the dynamic nature of those relationships relative to whale distribution and habitat utilization in the eastern Chukchi and extreme western Beaufort Seas.

The specific objectives are:

1. Assess patterns of spatial and temporal use of the Chukchi Sea by endangered bowhead, fin and humpback whales, and beluga and gray whales.
2. Assess the population structure and origin of whales in the region.
3. Evaluate ecological relationships for the species, including physical and biological oceanography that affect critical habitat for these species.
4. Conduct physical and biological oceanographic sampling to further understand the transport and advection of krill and nutrients from the northern Bering Sea through the Bering Strait and to the Barrow Arch area.

### **Cruise activities and summary**

Planning for the 2013 vessel survey is well underway. Sampling station and mooring locations and survey plans have been developed. A cruise track and schedule has been developed and will be revised as needed during the survey. The Western Acquisition Division (WAD) is processing the paperwork necessary to charter a vessel. The solicitation closed on 23 May. The initial technical evaluation was completed by NMML staff on 30 May. The final technical evaluation report was requested by WAD on 3 July and was completed by NMML staff on 5 July. Paperwork has been submitted to the WAD to hire survey personnel. Field equipment and supplies have been purchased. Informational fliers are being developed for distribution to Alaska villages describing the ARCWEST project in general and the tagging operations in specific.

### **Post-cruise data analysis results and planning**

#### Visual Observations Component:

Paperwork has been submitted to the Western Acquisition Division to hire visual observers for the 2013 vessel survey. Field equipment and supplies have been purchased.

### Satellite Tagging Component:

Field equipment and supplies have been purchased for the 2013 vessel survey. Prototypes of a new satellite transmitter design were delivered for laboratory testing on 15 April 2013. Initial tests have shown the anchoring system of the new tags is robust, and therefore, it is unlikely that deployment on whales will result in previously observed failures. The new satellite transmitter design was developed to make tags more robust to body contact among whales. Changes relative to former designs include a new configuration of the antenna, conductivity switch, and the stopper at the posterior end of the tag. The new satellite transmitter includes an integrated transmitter-anchor design.

### Passive Acoustic Component:

#### *NMML Long-term moorings:*

The preliminary ARCWEST passive acoustic moorings are still deployed. Analysis will begin after their retrieval during the 2013 vessel survey. Locations for the 2013 moorings (Fig. 1, yellow triangles and stars) were determined in coordination with the oceanographic and lower trophic level components of ARCWEST, and a vessel schedule was developed. Field equipment and supplies have been purchased.

#### *Sonobuoys:*

We will begin to deploy sonobuoys for ARCWEST during the 2013 vessel survey. Thanks to the continued support of Theresa Yost (Naval Operational Logistics Support Center), Jeffrey Leonhard, Todd Mequet, and Edward Rainey (Naval Surface Warfare Center, Crane Division), and Robin Fitch (I&E Director Marine Science, Office of the Assistant Secretary of the Navy) we have a sufficient supply of sonobuoys for the 2013 ARCWEST field season. We plan to deploy these buoys every three hours along the entire cruise track.

### Oceanographic and Lower Trophic Level Component:

#### *Moorings:*

The preliminary ARCWEST oceanographic moorings were deployed in August 2012 and are still in the water. Analyses will begin after retrieval during the 2013 vessel survey. Locations for the 2013 moorings (Fig. 1, yellow stars and diamonds) were determined based on current knowledge and in coordination with the passive acoustic component of ARCWEST.

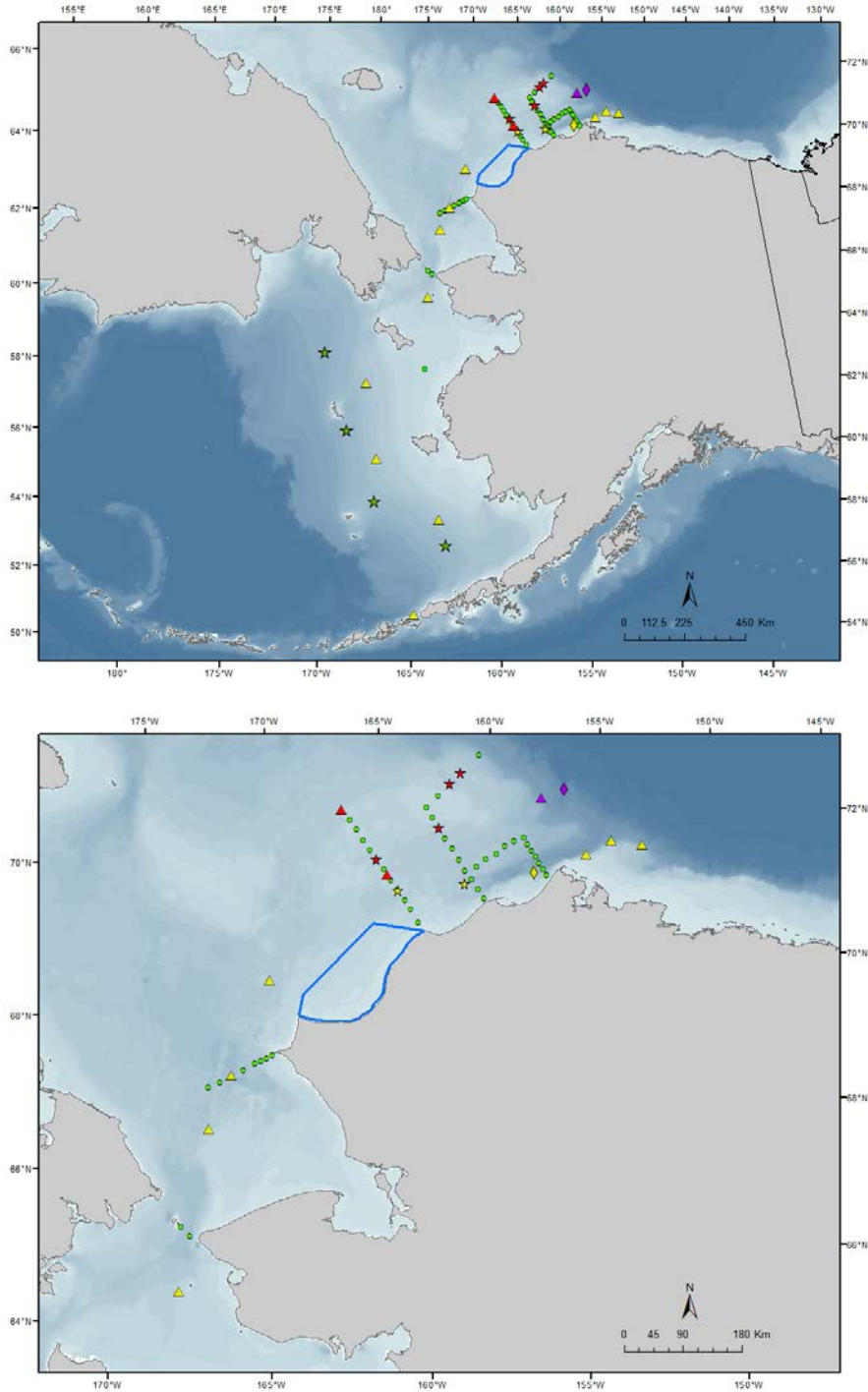


Figure 1. Planned passive acoustic, oceanographic, and biophysical moorings to be deployed in the Chukchi, Beaufort, and Bering Seas (upper panel, zoomed into the Chukchi and Beaufort Seas in the lower panel) for 2013. The yellow moorings will be analyzed under ARCWEST, the red moorings will be analyzed under the CHAOZ extension interagency agreement should it be funded, the green moorings in the Bering Sea include ARCWEST acoustic instruments but the biophysical moorings and ship time are funded from other sources, and the purple moorings will be funded from other sources but the data will be used by ARCWEST and CHAOZ extension. ▲ = acoustics only moorings, ★ = acoustics and biophysical moorings, ◆ = biophysical only moorings, • are biophysical sampling stations

### *Satellite Tracked Drifters:*

Twelve drifters were deployed during 2012 (Fig. 2). Those drifters still transmitting are being tracked. During the first quarter, their movement indicated the speed and direction of the ice rather than the currents. Tracks of those drifters still active during the April, May, and June 2013 can be viewed here: <http://www.pmel.noaa.gov/foci/visualizations/drifter/chuk2013.html>.

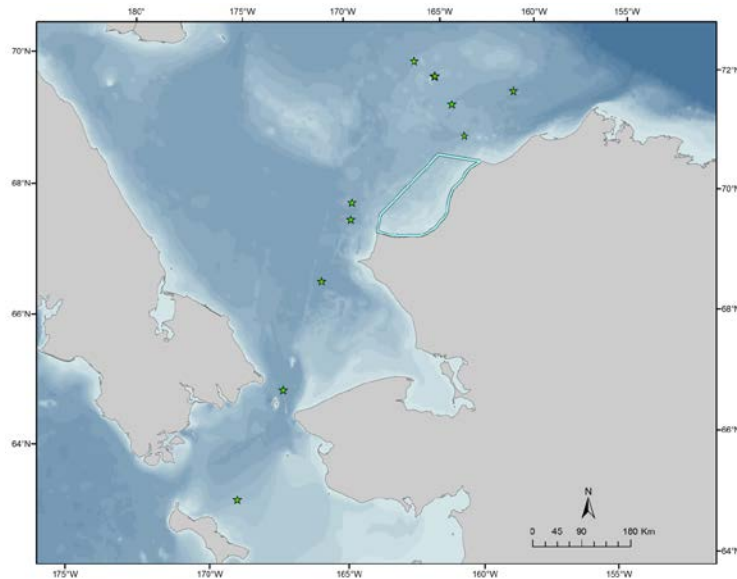


Figure 2. Deployment locations (★) of ARGOS drifters in 2012.

### *Active Acoustics:*

The first of the ARCWEST TAPS-6NG instruments were deployed in August 2012. One instrument is part of the middle Icy Cape mooring cluster and the other is just west of the Wainwright line upstream from the head of Barrow Canyon. Analysis will begin after retrieval of these two instruments during the 2013 vessel survey.

### *Lower Trophic Level Sample and Data Analyses:*

No lower trophic level sampling or data analyses occurred as part of ARCWEST in 2012.

### *Physical/Chemical Oceanographic Sampling:*

No physical/chemical oceanographic sampling occurred as part of ARCWEST in 2012.

### *2013 Field Season Planning:*

The majority of our time was spent acquiring electronic components to build new TAPS-6NG instruments for deployment during August 2013. We procured enough components, transducers, instrument pressure cases, batteries and mooring floats to build 4 new instruments. It was our first effort to build more than 2 instruments at a time, and we learned many things from the exercise, particularly regarding coordination of the many different contracts and suppliers required. Considerable

effort was spent tuning the transducers in the NOAA dive tank in Seattle. One of the time-consuming elements of tuning required us to hand wind magnetic cores for the tuning cards. In addition, we had delays in the delivery of our controller boards when the only company that makes them was stripped of all its copper during a robbery. Assembly and calibration of the instruments was not as early as planned, but is expected to occur early in the new quarter before the cruise

Locations for the 2013 oceanographic and active acoustic mooring (Fig. 1, yellow stars and diamonds) were previously determined based upon preliminary findings from the CHAOZ project as well as results reported by other researchers (e.g. Tom Weingartner, UAF; Robert Pickart, WHOI). Locations for lower trophic level and physical/chemical oceanographic sampling have been determined (Fig. 1, green dots). A vessel schedule was developed. The plan for ARCWEST in 2013 is for three moorings sites, fewer onshore/offshore transects, and a box of hydrographic and plankton stations around the Barrow Arch (Peard Bay). The plan has been revised to include an additional four mooring sites that could be used for the CHAOZ extension, should this project be funded.

### **Significant technical, schedule, or cost problems encountered**

Challenges for the 2013 field season include: obtaining a contract for a research vessel, paying for increases in fuel costs that have occurred since the ARCWEST proposal was written and approved, mooring costs that have more than doubled, and obtaining the additional mooring instruments required for the 2013 field season. The last issue is a challenge because the MOU was signed so late in the last fiscal year, that no expenditures or obligations could be made using Year 1 funds. We could not use or access these funds until late in the first quarter of FY13.

Costs for a vessel charter are projected to be higher than anticipated in 2011 when the ARCWEST budget was submitted. The draft vessel schedule for 2013 has reduced the number of days dedicated to satellite tagging large whales to meet the projected vessel costs.

### **Significant meetings held or other contacts made**

3 July 2013 – Friday, Clapham, Berchok, Zerbini, and Kennedy met to discuss satellite tagging operations on the 2013 vessel survey.

9 July 2013 – Kennedy, Friday, and Berchok contacted Gay Sheffield (UAF Marine Advisory Program, Nome, AK) to solicit advice on community outreach for the Bering Strait region. Sheffield provided a list of suggested revisions to the informational fliers being developed and an expanded list of villages and their contact information. Discussions are also underway to arrange for Napp to give a presentation while in Nome, AK.

### **Presentations and Publications**

May 15-16 2013 – Napp and Logerwell led a two day Synthesis of Arctic Research workshop on fish abundance and distribution in the Chukchi and Beaufort Seas (Seattle, WA).