

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 annual report covers work conducted in 2013, the second year of this study.

The major activities during 2013 consisted of planning for and conducting the Arctic Whale Ecology Study (ARCWEST) cruise from 13 August through 18 September 2013. The cruise took place on the chartered research vessel R/V *Aquila*. Seventeen scientists, technicians, and observers from eight different laboratories and institutions participated on the ARCWEST cruise.

## 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**

In 2013, the first ARCWEST vessel survey was planned and conducted. Alaska Fisheries Science Center (AFSC) and Pacific Marine Environmental Laboratory (PMEL) staff worked with the Western Acquisition Division (WAD) to charter the R/V *Aquila* for the survey and to hire survey staff through Ocean Associates (OAI). Field equipment and supplies were purchased as needed. Sampling station and mooring locations and survey plans were developed in coordination with the five component projects. A cruise track and schedule were developed but modified as needed during survey operations. Informational fliers were developed and distributed to Alaska villages describing the ARCWEST project in general and the tagging operations specifically. The 2013 ARCWEST survey was conducted from 13 August through 18 September 2013. Seventeen scientists, technicians, and observers from eight different laboratories and institutions participated on the ARCWEST cruise. Please see the 2013 ARCWEST cruise report ("[ARCWEST.CruiseReport2013.pdf](#)") for a full summary of activities and progress made during the cruise.

## Post-cruise data analysis results and planning

### Visual Observations Component:

Visual observations for marine mammals were conducted during the 2013 ARCWEST survey from 13 August through 18 September 2013. Sightings have been mapped to examine distribution. Detailed maps are available in the ARCWEST cruise report (“ARCWEST.CruiseReport2013.pdf”).

### *Photo-ID*

Preliminary analysis of photographs collected during the ARCWEST survey resulted in the following unique individuals: 36 gray whales collected in the Bering Strait and Chukchi Sea, 1 humpback whale photographed off Kodiak, and 32 killer whales photographed in the Gulf of Alaska, northern Bering Sea and Chukchi Sea. One gray whale was resighted during the survey, 24 August and 7 September, 2013. Individuals will be compared to existing catalogs.

### Satellite Tagging Component:

New satellite transmitter designs were 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. Prototypes were produced and delivered for laboratory testing on 15 April 2013. Initial tests showed that the anchoring system of the new tags is robust, and therefore, it is unlikely that deployment on whales will result in the previously observed failures. During the 2013 vessel survey, satellite tags were deployed on five gray whales: two on 24 August, two on 7 September, and one on 8 September. One of the 24 August tags did not transmit. The final tag details and positions are shown below (Table 1 and Fig. 1). Additional details are given in the cruise report (“ARCWEST.CruiseReport2013.pdf”).

Table 1. Metadata for the satellite tags deployed on gray whales in 2013.

Deployment	PTT #	Tag Type	# of days transmitted
8/24/2013	84485	Spot5	11
9/7/2013	87636	mk10a	67
9/7/2013	84484	Spot5	51
9/8/2013	84482	Spot5	41
Mean			42.5

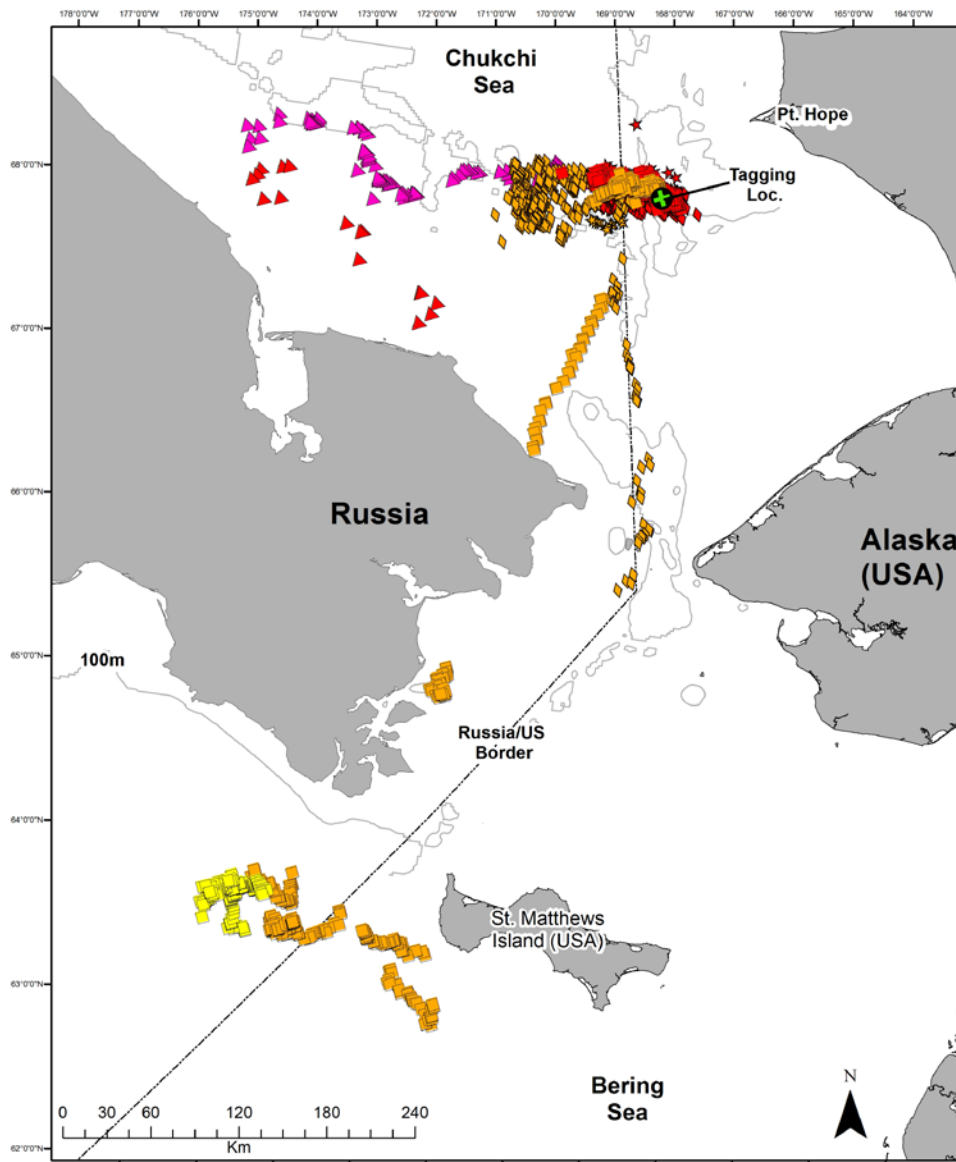


Figure 1. Final positions for the gray whales tagged this season, colored by month. 87636=square, 84484=diamond, 84485=triangle, and 84482=star. August=pink, September=red, October=orange, and November=yellow.

Passive Acoustic Component:

*NMML Long-term moorings:*

[Note: All recorders used in this study are Autonomous Underwater Recorders for Acoustic Listening (AURALS, Multi-Électronique, Rimouski, QC, Canada), sampling at a rate of 16 kHz on a duty cycle of 85 minutes of recordings made every 5 hours, for an entire year].

Locations for the 2013 moorings (Fig. 2, yellow triangles and stars) were determined in coordination with the oceanographic and lower trophic level components of ARCWEST.

In 2012, we used ship time during the final retrieval cruise of the BOEM-funded Chukchi Sea Acoustics, Oceanography, and Zooplankton (CHAOZ) project to redeploy some of our passive acoustics moorings to be retrieved and analyzed under the ARCWEST study (Table 2). These included five moorings in the Chukchi Sea (Fig. 2, KZ1, PH1, CL1, IC1, and WT1), three in the Beaufort Sea (Fig. 2, BF1-3), and five in the Bering Sea (Fig. 2, NM1 and Fig. 3 BS1-4). In addition, we placed an AURAL recorder on four non-BOEM-project oceanographic moorings (Stabeno/PMEL) in the Bering Sea (Fig. 3, M2, M4, M5, and M8). The exciting news from the 2013 retrievals is that 14 of the 15 recorders that have had their data extracted so far have recorded for the full year as planned, making this our most successful deployment ever. This success is due to a redesign of our AURAL battery packs. Unfortunately the two recorders deployed within the right whale critical habitat (Fig. 2, M2, BS3) were both fished up; EA3 in early October, and M2 in late November. These recorders were essential for monitoring the southeastern Bering Sea for the critically endangered North Pacific right whale and this leaves us with a substantial hole in our dataset.

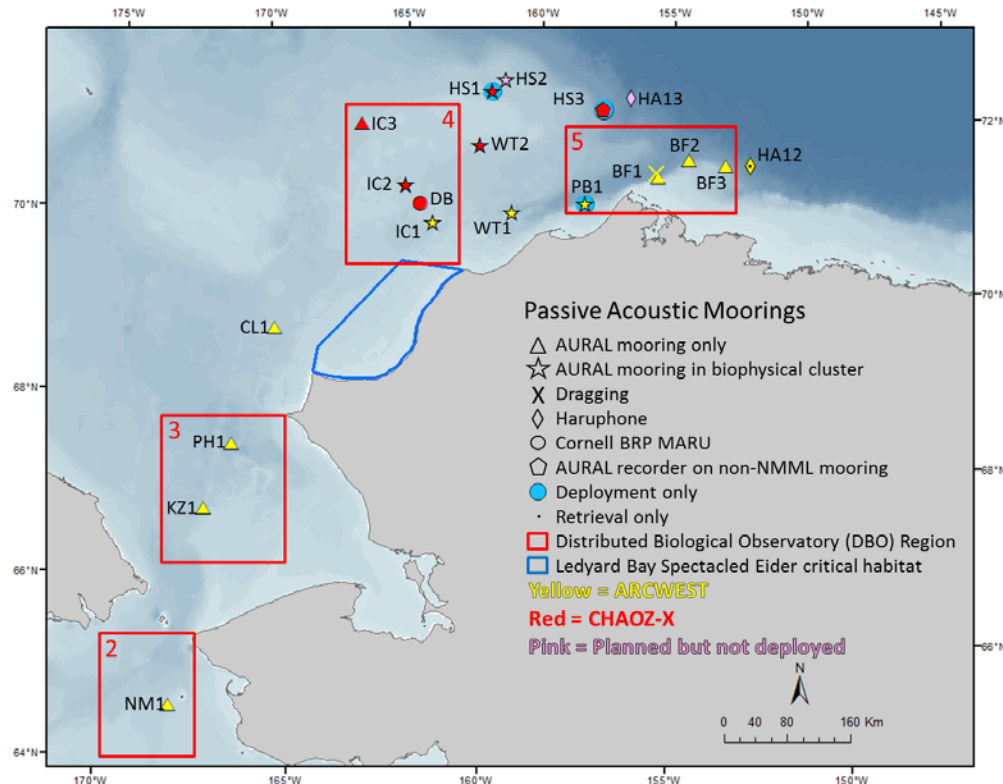


Figure 2. Passive acoustic moorings retrieved and/or deployed north of Nome, Alaska during the 2013 ARCWEST survey cruise. Yellow symbols indicate ARCWEST moorings. Red and pink symbols indicate CHAOZ-X moorings.

We also retrieved the deep-water Haruphone (Haru Matsumoto, NOAA/PMEL/CIMRS) recorder mooring (HA12) in the Beaufort Sea, which has been sent back to collaborator Holger Klinck (NOAA/PMEL/CIMRS) for his ambient noise measurement analysis. This mooring is part of an effort to map deep water ambient noise throughout the U.S. EEZ. Results from this effort will further inform the ARCWEST study.

With the exception of the Haruphone mooring, all of these moorings were redeployed in 2013, along with a sixth Chukchi recorder placed in Peard Bay (Fig. 2, PB1). A sea day was funded by a NOAA Fisheries, Office of Science and Technology, Ocean Acoustics Program (NOAA S&T) to deploy an additional recorder in Norton Sound (Fig. 3, NS1). Data from this recorder will also eventually supplement ARCWEST results.

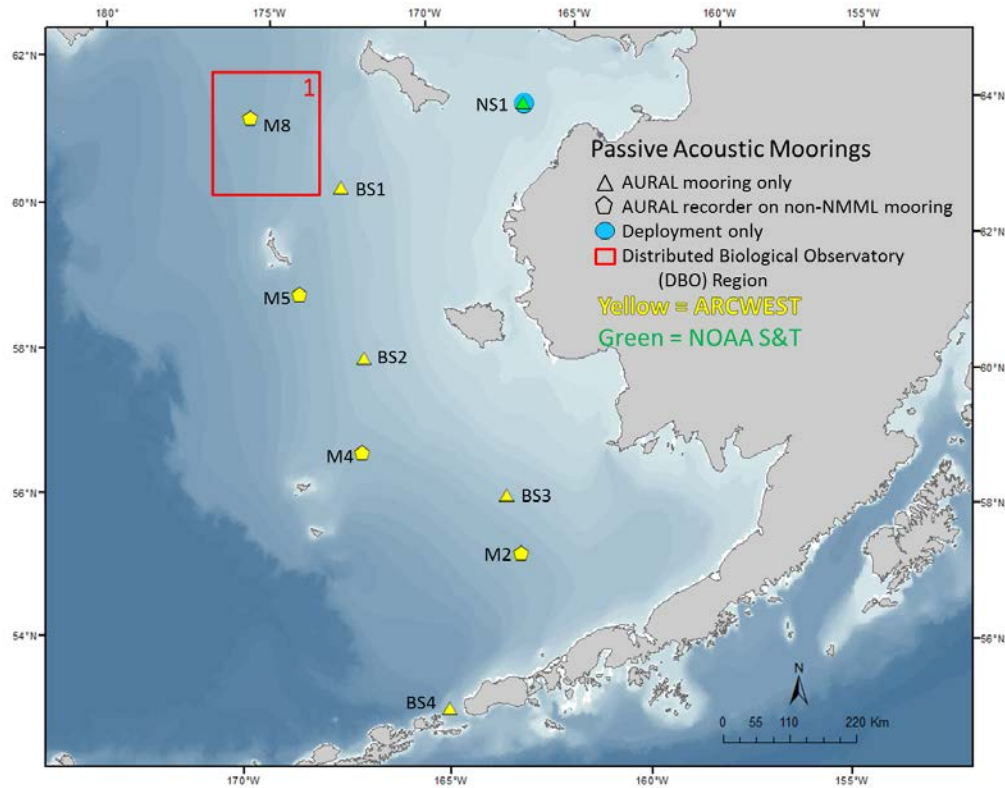


Figure 3. Passive acoustic moorings retrieved and/or deployed in the Bering Sea during the 2013 ARCWEST survey cruise. Yellow symbols indicate ARCWEST moorings. Green symbols indicate NOAA moorings.

The WT1 mooring was located within the ARCWEST biophysical mooring cluster C4 (Fig. 4) for both the 2012 and 2013 deployments. The IC1 and PB1 moorings were located within the C1 and C5 biophysical clusters (Fig. 4), respectively. Collocating the passive acoustic moorings with the biophysical moorings will allow us to maximize our opportunities to correlate marine mammal presence with biophysical measurements.

For the upcoming analysis, we will use our in-house Matlab-based sound analysis program on data pre-processed using a low-frequency detection and classification system (LFDCS by Mark Baumgartner, Woods Hole Oceanographic Institute (WHOI)). We are beginning to populate the LFDCS with exemplars of the main call types of each species, starting with bowhead and belugas (our best studied species). The LFDCS will then be tested on two CHAOZ data sets that have already been analyzed, to see how well the system works. If successful, this system will not only reduce the amount of effort expended on each recording – and increase the number of species processed – it will allow us to obtain results for all species of interest. It will also allow us to fine-tune any auto-detection devices installed on gliders or auto-detection buoys that we may deploy in our study areas in the future.

Table 2. Recording period, position, and depth of all long-term passive acoustic recorders deployed for ARCWEST. †Retrieval date (data from mooring not extracted yet).

Mooring	Bio- Phys Cluster	Record Start	Record End	Latitude (N)	Longitude(W)	Depth (m)
AW12_AU_BS2	-	8/12/2012	8/17/2013	59.2437000	-169.4126000	53
AW12_AU_BS1	-	8/13/2012	8/19/2013	61.5877667	-171.3240333	51.5
AW12_AU_NM1	-	8/20/2012	8/23/2013	64.8473500	-168.3897667	42
AW12_AU_KZ1	-	8/21/2012	8/22/2013	67.1248000	-168.6018333	43
AW12_AU_PH1	-	8/22/2012	8/23/2013	67.9089500	-168.1946167	58
AW12_AU_CL1	-	8/23/2012	8/25/2013	69.3068000	-167.6479500	48
AW12_AU_IC1	-	8/25/2012	9/5/2013	70.8171667	-163.1364333	42.5
AW12_AU_WT1	C4	8/30/2012	8/27/2013	71.0458667	-160.5089000	48.7
AW12_AU_BF1	-	No	Data	71.5513000	155.5491000	69
AW12_AU_BF2	-	8/31/2012	9/6/2013	71.7514667	154.4712500	93
AW12_AU_BF3	-	8/31/2012	9/5/2013	71.6885833	153.1763833	103
AW12_AU_BS3	-	8/11/2012	9/13/2013	57.6699667	-164.7251833	52
AW12_AU_BS4	-	8/10/2012	9/14/2013†	54.4284000	-165.2664667	160.9
BS12_AU_05a	-	8/12/2012	8/20/2013	59.9120000	-171.7086667	71
BS12_AU_08a	-	8/14/2012	8/20/2013	62.1945000	-174.6608333	71
BS12_AU_04b	-	9/5/2012	9/12/2013†	57.8669667	-168.8724667	72
BS13_AU_02a	-	5/11/2013	9/14/2013	56.8658167	-164.0570667	72
AW13_AU_BS2	-	8/18/2013	-	59.2430833	169.4136000	55.0
AW13_AU_BS1	-	8/21/2013	-	61.5868333	171.3276500	53.7
AW13_AU_NM1	-	8/22/2013	-	64.8483667	168.3905833	44.5
AW13_AU_KZ1	-	8/24/2013	-	67.1232333	168.6047667	44.6
AW13_AU_PH1	-	8/24/2013	-	67.9074500	168.2026500	57.4
AW13_AU_CL1	-	8/26/2013	-	69.3159167	167.6324833	50.0
AW13_AU_IC1	C1	8/28/2013	-	70.8225833	163.1384833	47.5
AW13_AU_WT1	C4	8/29/2013	-	71.0464000	160.5113000	44.5
AW13_AU_PB1	C5	9/2/2013	-	71.2053000	158.0190667	51.5
AW13_AU_BF1	-	9/3/2013	-	71.5529833	155.5321667	76.5
AW13_AU_BF2	-	9/3/2013	-	71.7522667	154.4658833	102.5
AW13_AU_BF3	-	9/3/2013	-	71.6872167	153.1806167	103.5
AW13_AU_BS3	-	9/18/2013	-	57.6703167	164.7161167	51.2
AW13_AU_BS4	-	9/18/2013	-	54.4278667	165.2683333	160.9
BS13_AU_05a	-	8/20/2013	-	59.9099333	171.7053000	73.5
BS13_AU_08a	-	8/20/2013	-	62.1928833	174.6756667	73.5
BS13_AU_04b	-	9/18/2013	-	57.8708833	168.8702500	73.5
BS13_AU_02b	-	9/18/2013	-	56.8626833	164.0594167	71.0



*Sonobuoys:*

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 had a sufficient supply of sonobuoys for the 2013 ARCWEST field season. We deployed these buoys a minimum of every three hours along the entire cruise track. All 2013 sonobuoy results can be found in the cruise report (“ARCWEST.CruiseReport2013.pdf”).

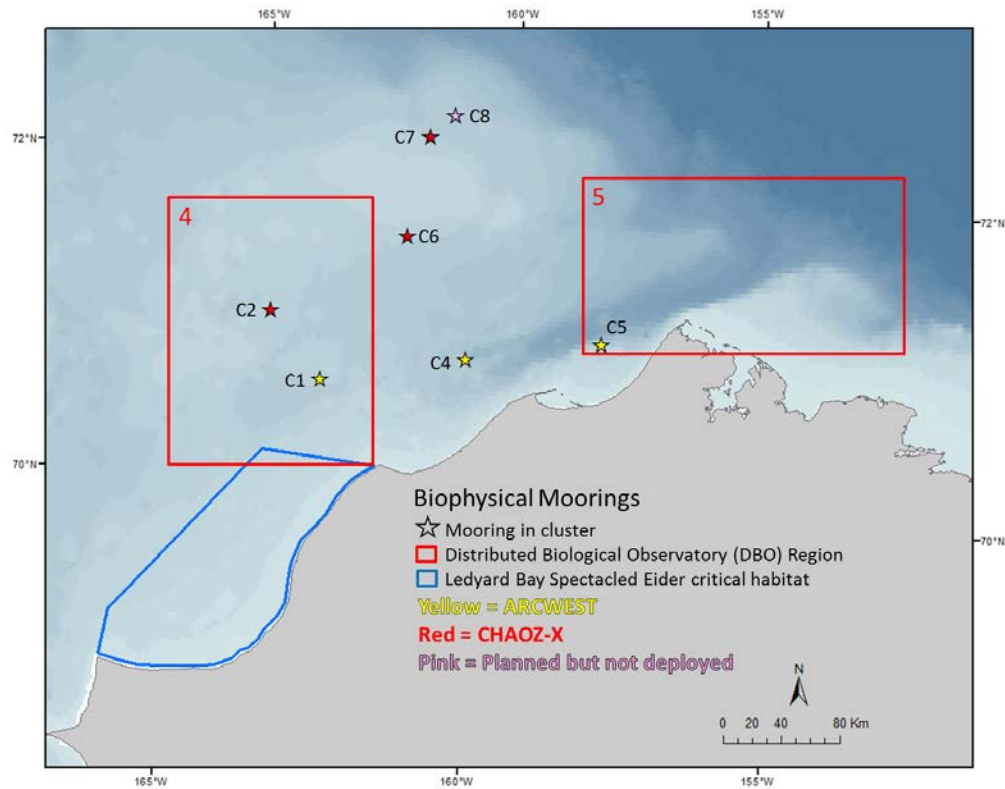
Oceanographic and Lower Trophic Level Component:*Moorings:*

Figure 4. Biophysical mooring clusters retrieved and/or deployed during the 2013 ARCWEST survey cruise. Yellow symbols indicate ARCWEST moorings. Red and pink symbols indicate CHAOZ-X moorings.

In 2012, we used ship time during the final retrieval cruise of the BOEM-funded CHAOZ project to redeploy some of our oceanographic moorings to be retrieved and analyzed under the ARCWEST study. All moorings deployed in 2012 were successfully retrieved. Locations for the 2013 oceanographic and active acoustic moorings (Fig. 4, yellow stars) were determined in coordination with the passive acoustic component of ARCWEST and based upon preliminary findings from the CHAOZ project as well as results reported by other researchers (e.g., Tom Weingartner, University of Alaska Fairbanks (UAF); Robert Pickart, WHOI). See the PMEL mooring website

([http://www.pmel.noaa.gov/foci/operations/mooring\\_plans/2013/jun2013\\_contVes\\_moorings.html](http://www.pmel.noaa.gov/foci/operations/mooring_plans/2013/jun2013_contVes_moorings.html)<sup>1</sup>) for information on the other instruments placed on each mooring.

### *Hydrography & Plankton Sampling:*

Locations for lower trophic level and physical/chemical oceanographic sampling (Fig. 5, yellow dots) were also determined in coordination with the passive acoustic component and based upon previous research and our conceptual model of current flow. Analysis of the biophysical data began during the fall of 2013. First order processing has been done on the recent 2013 cruise CTD samples, and once the remaining salinity samples are run, the final processing of the temperature and salinity data will be completed. Nutrient samples were collected and frozen. These samples will be run in November. Final hydrographic data from the cruise will be uploaded to the database by 31 January 2014. Chlorophyll samples (> 200) were completed by the first week in January 2014, but data uploading is dependent upon completion of our new EcoDAAT database.

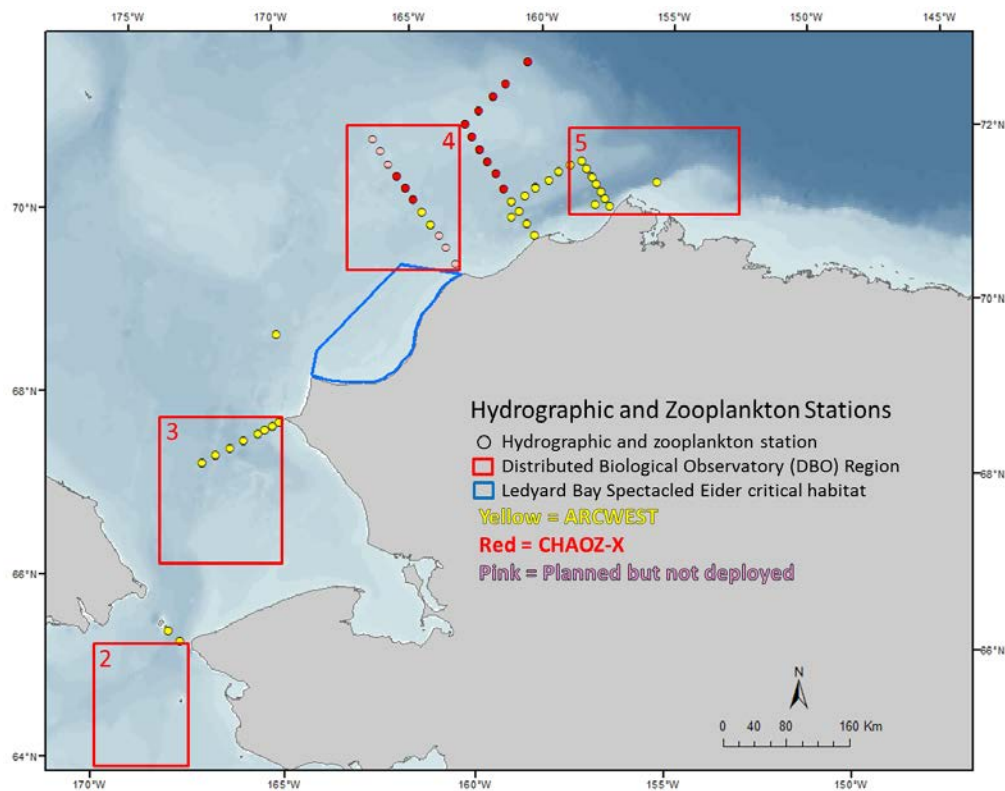


Figure 5. Biophysical stations sampled during the 2013 ARCWEST survey cruise. Yellow symbols indicate ARCWEST stations. Pink inshore symbols indicate ARCWEST stations which were not occupied. Red symbols and pink offshore symbols indicate CHAOZ-X stations.

Because of ice and rough seas, three of the ARCWEST sampling stations were not occupied (Fig. 5, first three pink inshore stations on Icy Cape line).

<sup>1</sup> On this webpage subsurface moorings relevant to this project are titled 13CK (i.e., Chukchi Sea 2013) and 13BS (i.e., Bering Sea 2013). The number on the end corresponds to the mooring clusters shown in Fig. 4 for the Chukchi Sea (e.g., 13CKT-2A corresponds to C2) or Fig. 3 for the Bering Sea (e.g., 13BS-2C corresponds to M2).

### Satellite Tracked Drifters:

Twelve drifters were deployed during the 2012 field season (Fig. 6). Those drifters still transmitting in 2013 were tracked. During the first quarter, their movement indicated the speed and direction of the ice rather than the currents. Tracks of the 2012 drifters can be viewed here:

<http://www.pmel.noaa.gov/foci/visualizations/drifter/chuk2013.html>.

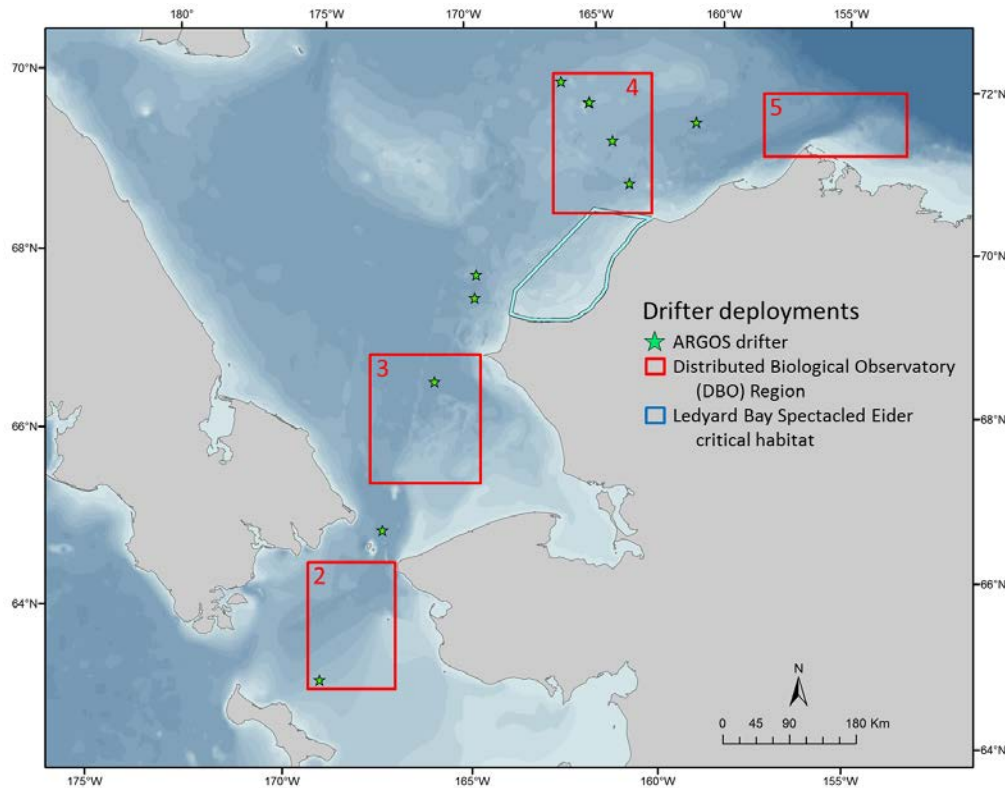


Figure 6. Deployment locations (★) of ARGOS drifters in 2012.

Twelve drifters were deployed during 2013 (Fig. 7) and are being tracked. The ice is arriving in the region late this year, and so we are able to measure current speed and direction for a longer fall period this year than last. A movie showing drifter tracks and ice extent can be viewed at the following website under the heading *Chukchi drifters, ice*: [http://www.ecofoci.noaa.gov/efoci\\_drifters.shtml](http://www.ecofoci.noaa.gov/efoci_drifters.shtml).

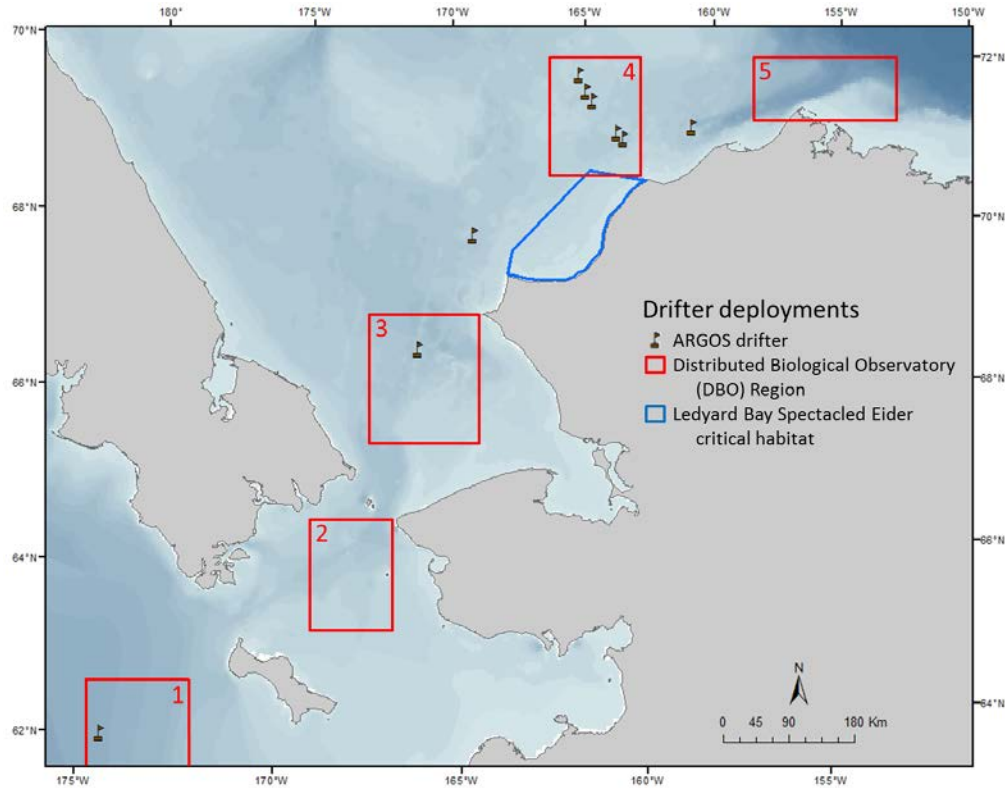


Figure 7. Deployment locations of ARGOS drifters in 2013.

#### *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. Both instruments were recovered and recorded data until the spring of 2013. These instruments used the old NiCad battery packs that were replaced in 2013 with higher amp hr lithium battery packs. We are currently examining the quality of the collected data. We accomplished > 40 tows of the Tucker sled with associated hydrographic and zooplankton acoustic data (TAPS-6). First order data processing on the 2013 TAPS-6 data has been accomplished. Final processing of the data will take place after the first of the year, when the TAPS-6 has a post cruise calibration.

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

Preserved zooplankton samples from the Tucker sled were inventoried and sent to Poland in November 2013 for processing. It is anticipated that the resulting data will be returned by 30 May, 2014. After applying our standard QC/QA procedures those data will be ready for uploading in a database.

#### *2013 Field Season Planning:*

Locations for the 2013 oceanographic and active acoustic mooring (Fig. 4, yellow stars) 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 were determined (Fig. 5, yellow dots). The 2013 survey

included three moorings sites, fewer onshore/offshore transects, and a box of hydrographic and plankton stations around the Barrow Arch (Peard Bay). The survey included an additional three mooring sites for the CHAOZ-X project. Five new sets of TAPS-6NG transducers were purchased, but only 4 new instruments were constructed. We were able to deploy active acoustics at a total of 5 sites between the ARCWEST and CHAOZ-X projects by using the TAPS-6NG instrument retrieved in 2012.

The first quarter of 2013 was spent placing orders for new floats, pressure canisters, batteries, electronic components, etc. with the plan of constructing new TAPS-6NG units. 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 occurred early in the third quarter before the cruise

#### *2014 Field Season Planning:*

Field season planning for 2014 will begin this year with a review of last year's field season and an identification of needs for the coming year.

#### **Contribution of data to the Distributed Biological Observatory (DBO)**

The ARCWEST program has agreed to contribute data to the DBO Workspace, supported by AOOS/AXIOM. ARCWEST principal investigators were invited to join the password-protected workspace in December 2013, and are in the process of contributing data and data products (maps and figures) as are other DBO contributors. The development of the Workspace is an activity of the DBO Implementation Team ([http://www.arctic.noaa.gov/dbo/about.html#DBO\\_Implementation\\_Team](http://www.arctic.noaa.gov/dbo/about.html#DBO_Implementation_Team)) and is in its early stages. The contribution of information from the ARCWEST program is considered foundational to the development of the workspace, especially for the visual and acoustic data provided on marine mammals. To date, the 2013 sonobuoy data have been uploaded.

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

Challenges for the 2013 field season included: obtaining a contract for a research vessel, paying for increases in fuel and vessel 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 had reduced the number of days dedicated to satellite tagging large whales to meet the projected vessel costs. It is anticipated that this will be the case in 2014 as well.

Due to the 8 September incident in which the satellite tagging team was flipped overboard during satellite tagging operations involving gray whales, additional expenses have been incurred due to lost gear and skiff repairs. Details of the incident, NMML's investigation of the incident, and future recommendations are contained in Appendix 7 of the ARCWEST 2013 Cruise Report ("ARCWEST.CruiseReport2013.pdf").

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

23 January 2013 – Napp presented the ARCWEST draft field season plan at the 2013 Arctic Field Season Coordination Briefing convened by Sheyna Wisdom of Olgoonik Fairweather during AMSS.

24 January 2013 – Friday, Clapham, Berchok, Crance, Napp, Stephanie Grassia, Ellen Garland, Kim Shelden, and Julie Mocklin who met with Jeff Denton (BOEM) to discuss ARCWEST.

27 February, 2013 – Friday, Kennedy, and Crance met with Steff and Fowler (Western Acquisition Division) to discuss the ARCWEST vessel charter planning.

29 March, 2013 – Friday met with Steff and Fowler (Western Acquisition Division) to discuss the ARCWEST vessel charter.

29 March, 2013 – Clapham, Berchok, Stabeno, Napp, Kennedy, and Friday met to discuss the timing of the ARCWEST vessel survey.

3 April, 2013 – Rone, Kennedy, Berchok, and Crance had a conference call with Dave Steckler to discuss the potential use of a new survey program, *Mysticetus*.

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**

6 March, 2013 – Friday presented a summary of the ARCWEST project at the U.S./Russia Marine Mammal Working Group Meeting.

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).

20 August 2013 – Napp radio interview with KNOM (Nome, AK).

16 August 2013 – Clapham interview for The Nome Nugget.