Update on North Pacific Right Whale Research

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ABSTRACT

Through an Inter-Agency agreement (IA) between the National Marine Mammal Laboratory (NMML) and the Minerals Management Service (MMS), NMML is conducting a dedicated multi-year study of the distribution, abundance and habitat use of North Pacific right whales in the North Aleutian Basin and southeastern Bering Sea. This report covers activities conducted during the period 15 January 2008 to 16 January 2009.

The major activities during 2008 consisted of the final planning and preparation for, and then the execution of, the PRIEST (Pacific RIght whale Evaluation Study) survey. A 150-ft crabber, the *Ocean Olympic*, was chartered for this project. A total of 25 scientists (including one observer aboard the USCGC *Healy* and an acoustician aboard the NOAA Ship *Oscar Dyson*) participated in the shipboard portion of the study and two additional observers were led by Brenda Rone for the aerial component of the project. Approximately 1200nm (vessel) and 5821nm (aerial) of on-effort track lines were covered throughout the survey. In all, 11-14 individual right whales were photographed this season, and 5 of those have been matched to whales seen in previous years. One right whale and 3 humpbacks were satellite tagged during the cruise. On Leg 1, extensive oceanographic sampling was conducted throughout the area to characterize the habitat.

Introduction and objectives

The eastern population of the North Pacific right whale (*Eubalaena japonica*) is arguably the most endangered stock of whales in the world. Although there are currently no estimates of abundance, the extreme rarity of sightings in recent decades suggests that the population numbers in the tens, the result of extensive historical whaling in the 19th century, followed by large illegal catches by the USSR in the 1960s. Little is known about the distribution, movements, migrations or habitat use of this population, but the scant existing data suggest that it now occupies a reduced range compared to historical times, when right whales were clearly widely distributed across the Gulf of Alaska and Bering Sea.

In 2007, NMML and MMS entered into an IA for NMML to conduct integrated surveys of right whales and other cetaceans (and their habitat) in the Bering Sea. This work was prompted by the need for better data to assess the potential impact of oil and gas development in the North Aleutian Basin (NAB) area.

The IA study is a multi-year project which will feature multi-disciplinary investigations of right whale occurrence, movements and feeding ecology. The 2007 portion of this work was more limited in scope due to the short period available for organization of the field work; this resulted from the relatively late finalization of the IA between the two agencies. The 2008 study's aims include a ship survey, foraging ecology studies, satellite tagging, photo-identification and biopsy sampling.

The overall goal of the IA study is to provide information relative to the development of future oil and gas-related mitigation by assessing the distribution, occurrence and habitat use of North Pacific right whales in the southeastern Bering Sea (North Aleutian Basin lease sale area and adjacent waters). The general objectives of the study are to estimate seasonal distribution, relative abundance and movement patterns of right whales in and adjacent to the lease

sale area; and to characterize right whale habitat, foraging behavior, health, and prey distribution. The proposed study will have 3 component projects: right whale biology, passive acoustics, and right whale feeding and prey. Each component project is a technological discipline and will be coordinated by a Project Leader with extensive experience in that discipline.

The specific objectives are:

1. To assess the distribution of right whales using fixed-winged aircraft and ship-based surveys (focused in the lease sale and adjacent areas);
2. To assess short- and long-term movements of whales through satellite tagging of individuals in the lease sale area and Critical Habitat;
3. To locate whales for tagging, behavioral observations and habitat studies using ship-based passive acoustic methodology;
4. To conduct acoustic tagging and concurrent oceanographic and zooplankton sampling to investigate right whale foraging ecology and assess habitat characteristics relative to this;
5. To use acoustic monitoring to assess year-round presence and relative abundance of whales in the lease sale area and Critical Habitat, as well as to identify potential migration routes from the Bering Sea;
6. To photo-identify and biopsy sample individual right whales during tagging operations for analysis of population structure, genetics, pollutants and diet. In addition, samples of copepods will be taken during oceanographic operations to establish a baseline of existing anthropogenic compounds.

Summary of work performed and overall progress made

2008 PRIEST Cruise summary

Equipment: A significant amount of scientific and safety equipment was required for this cruise. The project coordinator purchased, repaired, maintained, inventoried, set-up and broke down all the necessary gear for the shipboard survey. Small boat safety inspections and maintenance also took place, both before and after the cruise.

Personnel: There were 11 scientists aboard the *R/V Ocean Olympic* during the first leg, 12 during the second leg, and 14 during the last leg of the cruise. Four of the researchers on board during leg 1 were conducting a foraging ecology study for the Woods Hole Oceanographic Institute. Two of the scientists aboard the last leg of the cruise disembarked on day 3 after deploying and retrieving 3 moored acoustic buoys near sea lion rookeries within the study area. Additionally, researchers from the Northeast Fisheries Science Center (NEFSC), the Southwest Fisheries Science Center (SWFSC), the University of Washington, Oregon State University, the University of Alaska, Marine Acoustic Consultants, the San Diego Zoo, the Dominican Foundation for Marine Studies and others participated in this cruise. One marine mammal observer from the SWFSC was aboard the USCGC *Healy* for the month of July.

Preliminary results: The first leg of the cruise was devoted to the foraging ecology study and hinged on the successful deployment of a pole mounted suction cup tag. The first right whales were spotted on 8/04 and tagging attempts were made on August 4th, 5th, 7th, 8th, and 9th. Only one suction cup tag was successfully deployed (on 8/09) and it fell off after 9 minutes, likely due to poor tag placement on the animal. No satellite tags were deployed during leg 1.

Legs 2 and 3 focused almost exclusively on satellite tag deployment. Right whales were seen on August 21st, 22nd, 23rd, and September 3rd and 4th. One satellite tag was successfully deployed transmitted accurate positions until October 18th (Figure 1). A biopsy of the tagged animal was obtained and has been archived here at the lab. In all, 7-10 individual right whales were seen from the *Ocean Olympic* during the 6 week cruise. Other species sighted include humpback whales, killer whales, Dall's porpoise, harbor porpoise, northern fur seals, Stellar sea lions, pacific white sided dolphin and several unidentified large whales. Engine problems and severe weather near the end of leg 3 required us to spend a few days at St. Paul Island, and then to return early to Dutch Harbor. Although the

ship docked earlier than expected, we were able to work with nearshore humpbacks for the last few days of the cruise. Three humpback whales were satellite tagged and two of those tags transmitted for over a month.

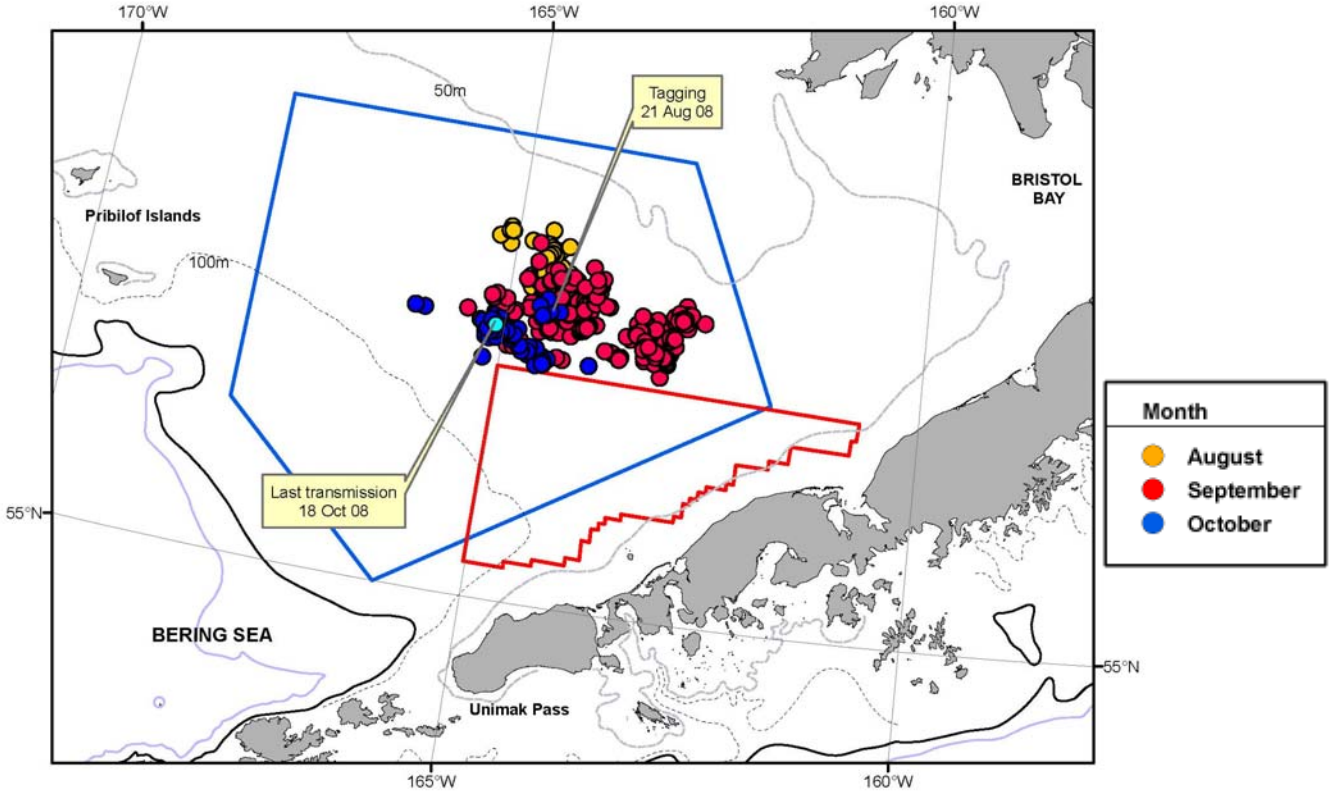

Figure 1: Locations received from the North Atlantic right whale tagged on 21 August 2008 during the PRIEST cruise.

2008 Acoustics Summary

A combination of sonobuoys and long-term bottom-moored recorders were used to monitor for the presence of right whales in the Bering Sea during 2008. Figure 2 shows an overview of all deployments made from the *Ocean Olympic* during the PRIEST cruise as well as those deployed for our study from other research vessels. The long-term recorders were included on PMEL (Pacific Marine Environmental Laboratory/NOAA) moorings as well as dedicated NMML moorings.

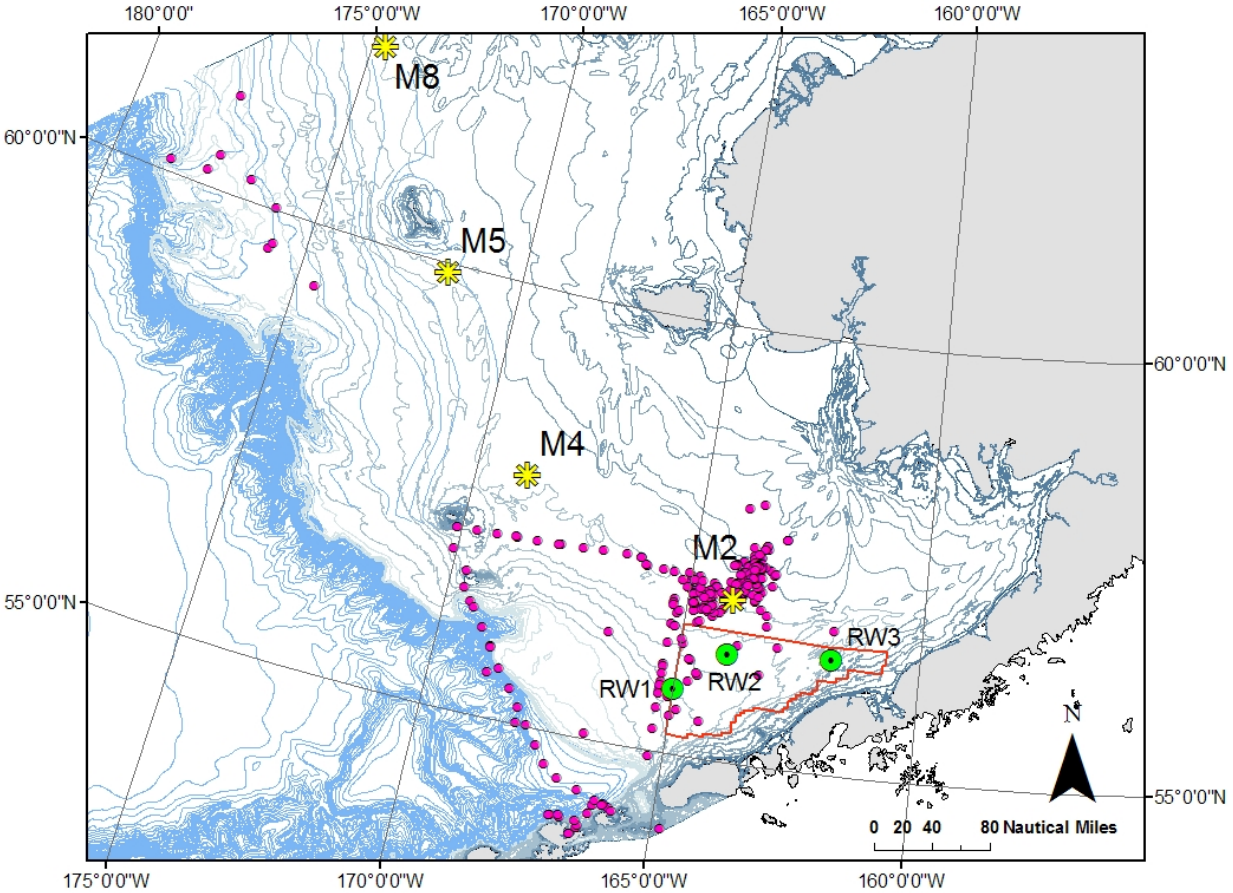

Figure 2. Passive acoustic instrument deployments in 2008 include sonobuoys (magenta circles), bottom mounted recorders on NMML moorings (green circles), and bottom mounted recorders on PMEL moorings (yellow asterisks). The NAB lease area is indicated by the red outline.

Sonobuoys: Throughout the entire cruise, 24 hour acoustic monitoring occurred. A total of 302 sonobuoys were deployed, including 290 DiFAR (Directional Fixing and Ranging), and 12 omni-directional buoys. The omni-directional buoys were all of the 57B variety, while 53E (206) and 77B (84) DiFAR buoy types were used (Figure 2). A modified, redeployable 53B (DiFAR) sonobuoy was also hung off the side of the Ocean Olympic at 15 different stations (Figure 3). If a right whale call was detected (Figure 4), the acousticians would direct the vessel toward the animal until it was within a range where the big-eye observers were likely to see a surfacing. After some fine-tuning, the acoustics were often accurate enough to put the vessel "on" whales within a half a mile. Out of 33 days with recordings, 19 had right whale gunshot calls (Figure 5a) and 14 had some variation of right whale

upsweeps (Figure 5b). In addition, humpback, fin, and orca whale sounds were detected on 11, 15, and 5 days of the cruise respectively. Fourteen sonobuoys (thirteen 53E and one 57B) were also deployed opportunistically (Figure 3 (NW corner around 60°N latitude)) by a marine mammal observer onboard the NOAA ship *Oscar Dyson*, with fin and orca but no right whale sounds detected. The sonobuoy recordings are currently being processed to detect and extract all gunshot calls.

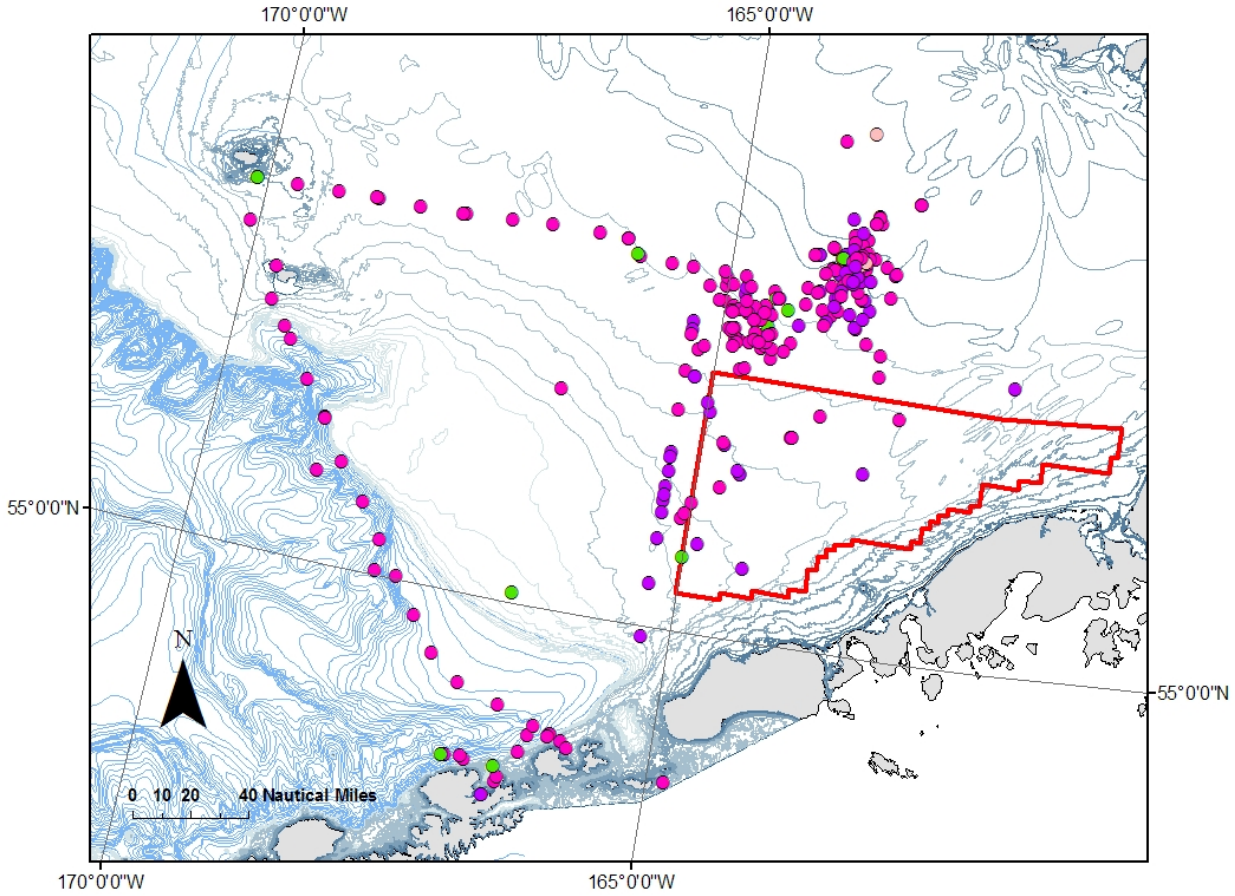

Figure 3. Sonobuoy deployments from the 2008 right whale cruise on the Ocean Olympic. Sonobuoys deployed were of the 57B (green), 53E (magenta), and 77B (purple) varieties. A redeployable 53B sonobuoy (pink) was also used. The NAB lease area is indicated by the red outline.

Three long term acoustic recorder moorings were deployed inside of the NAB oil and gas lease area during the first leg of the cruise as indicated in Figure 2 (green circles). These moorings contain EAR (Ecological Acoustic Recorder) instruments from the Oceanwide Science Institute (Marc Lammers, Honolulu, HI) programmed to record frequencies up to 2 kHz, 6.6 minutes every hour, for a full year. In addition, four of our long-term recorders were placed on PMEL moorings (Figure 2, yellow asterisks). Haruphones (Haru Matusumoto, CIMRS/NOAA, Newport, OR), programmed to record frequencies up to 1 kHz continuously for a year were installed on the M2 and M4 moorings from the NOAA ship *Oscar Dyson*, while AURAL (Autonomous Underwater Recorder for Acoustic Listening) instruments (Multi-Électronique, QC, Canada) programmed to record up to 4096 Hz for 9 minutes every half-hour were installed on the M5 and M8 moorings from the NOAA ship *Miller Freeman* and R/V Melville respectively. All recorders will be redeployed in 2009 after refurbishment and data extraction.

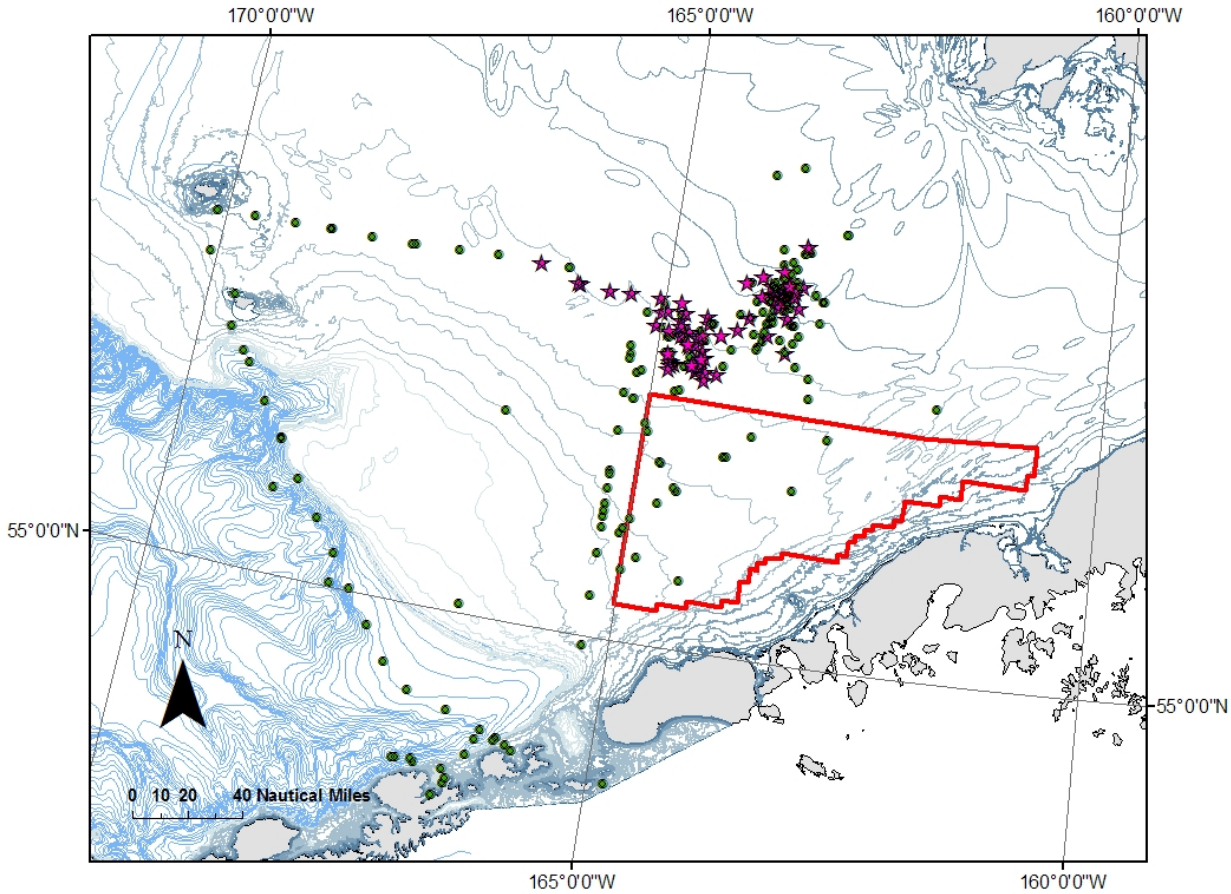

Figure 4. Sonobuoy stations (green circles) with passive acoustic detections of right whale gunshot and upsweep calls (magenta stars). Only sonobuoys deployed from the Ocean Olympic are shown. The NAB lease area is indicated by the red outline

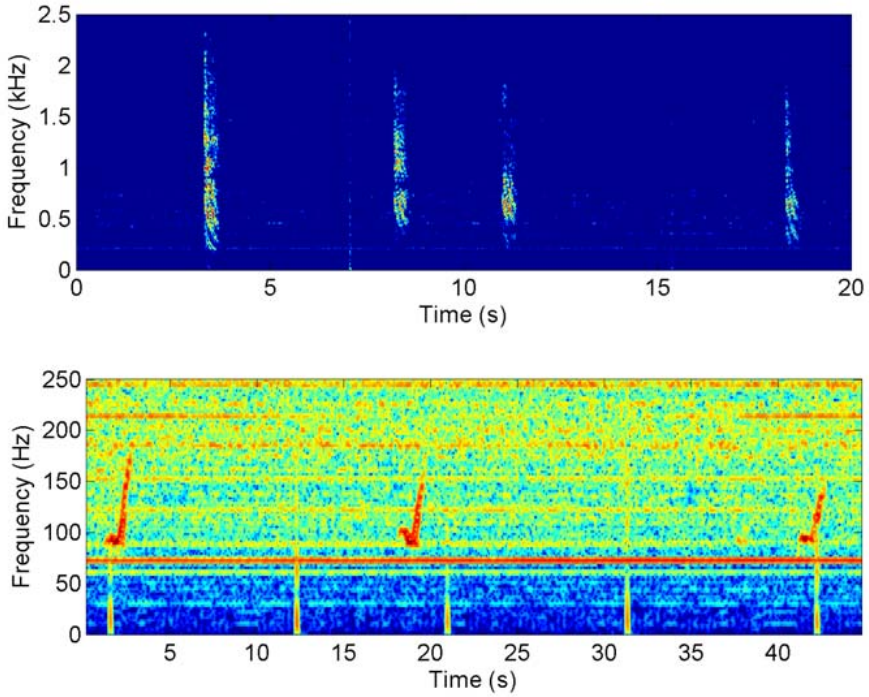

Figure 5. Spectrograms of the gunshot (top) and down-up upsweep (bottom) right whale calls recorded on sonobuoys deployed from the *Ocean Olympic*.

2008 Aerial survey summary

The first flight of the season was on 22 July 2008. The aerial team flew (weather permitting) along tracklines designed to maximize coverage of regions used by right whales in the recent past as well as evaluate use of the lease area. The aerial and shipboard teams coordinated their efforts to assist each other with finding right whales and following individuals during the often protracted tagging process.

A total of 163 flight hours were flown, including transits and maintenance. The survey covered a total of 5821 nautical miles (10,782 km) on effort. Cross legs and transits totaled 471 n. miles (872 km) and off effort accounted for an additional 837 n. miles (1551 km).

There were 10 sightings (13 individuals) of right whales, all observed in August. Of the 13 individual sightings, 6 unique animals were photographed. Two individuals were sighted on 2 separate days. Four of the 6 right whales were matched to animals photographed by the shipboard survey. A survey total of 263 sightings (755 individuals) of 11 confirmed marine mammal species were recorded. Additional species sighted from the plane included humpback, fin and sei whales as well as killer whales, Dall's and harbor porpoise, Pacific white-sided dolphins, fur seals, sea lions, walrus and sea otters.

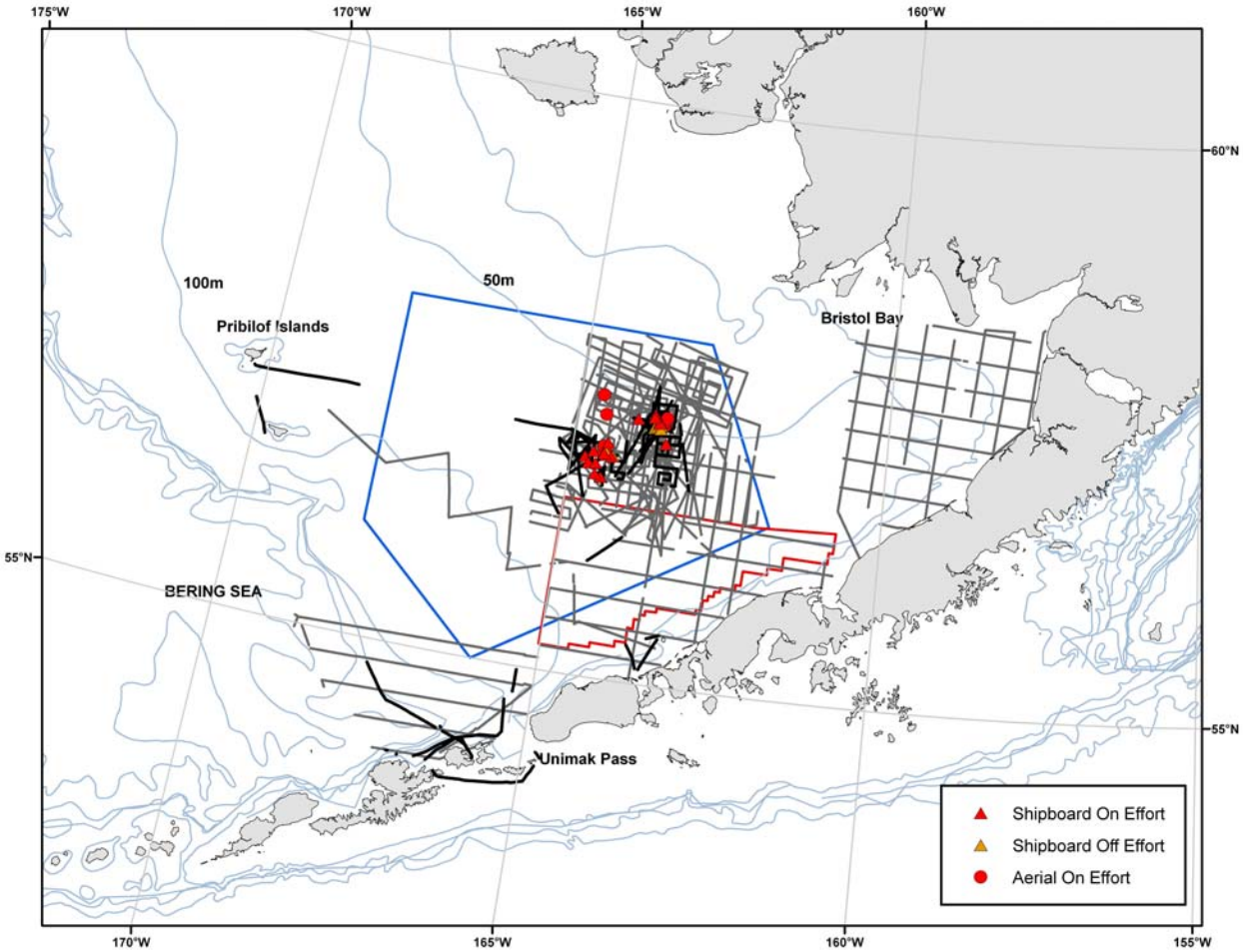

Figure 6: North Pacific right whale sighting and survey effort from the aerial and shipboard components of PRIEST '09. (aerial survey effort – grey lines, shipboard survey effort – black lines)

Right whale photo-identification summary

The number of whales identified from ship and aerial surveys were 7-9 and 6, respectively, resulting in the identification of 9-11 individuals in total. Four whales were seen by both survey platforms, indicating that a small number of individuals occurred in the survey area. Five whales seen in 2008 were also previously photographed in the BS in 1996-2002, and in 2004. Photo-identification is still ongoing, and more matches are likely to be found within the next few months.

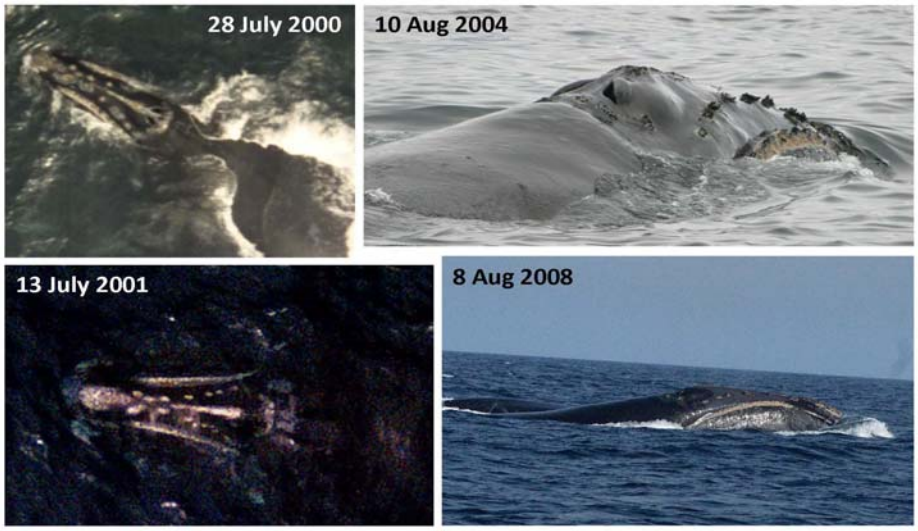

Figure 7: Whale "Match 27" was first identified in 1996 and was resighted in 1998, 2000, 2001, 2004, and 2008. Additionally, a satellite transmitter was deployed on this individual in 2004.

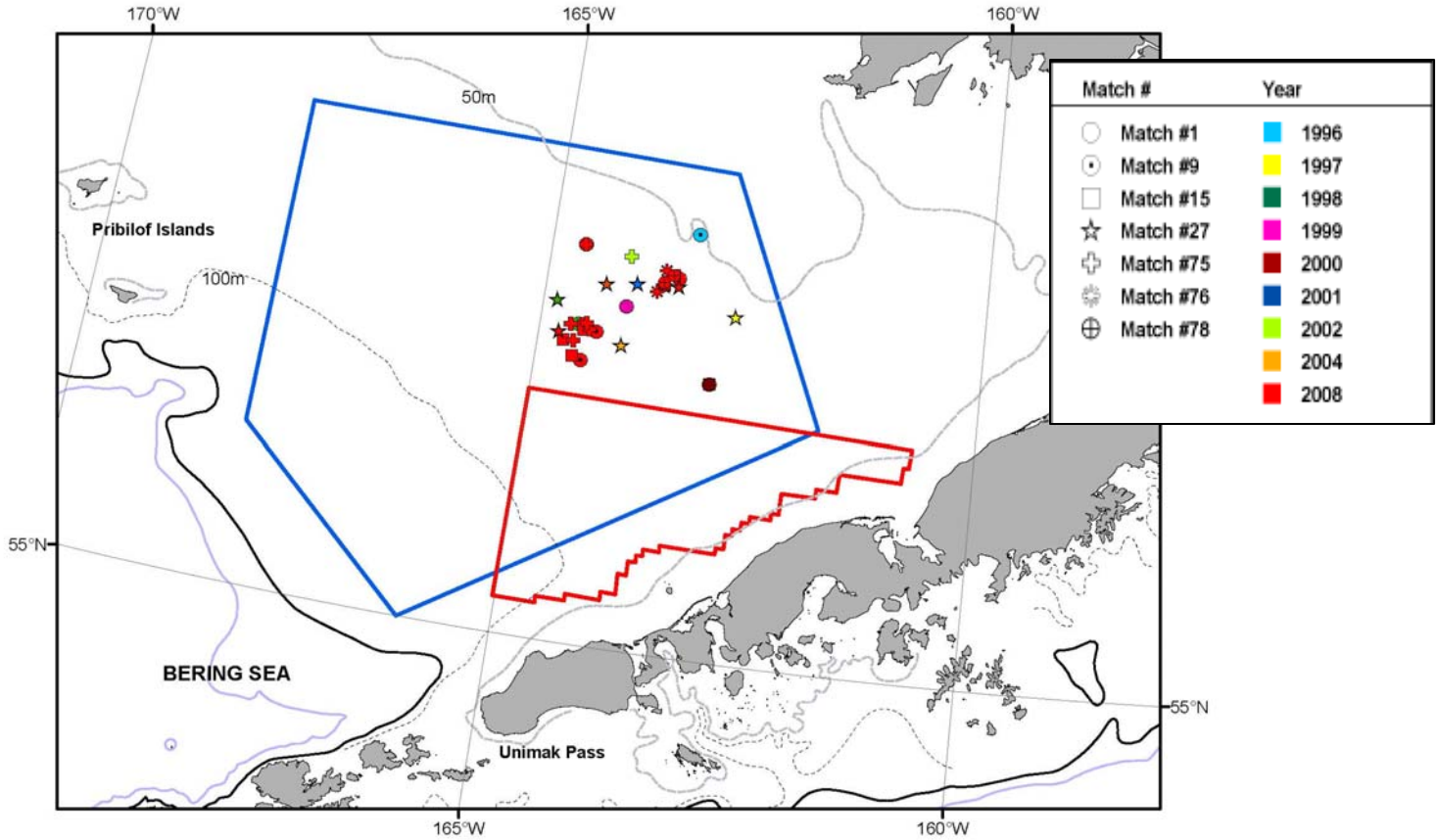

Figure 8: Positions of within-year and between-year resightings of North Pacific right whales in the Bering Sea from 1996-2008.

List of Presentations and Publications:

Berchok, C.L., L.J. Morse, P. J. Clapham, H. Klinck, K. Klinck, D.K. Mellinger, D. K. Ljungblad, S.E. Moore, F. Scattorin, and J. L. Keating . 2009. Right whale gunshot calls in the southeastern Bering Sea. *Acoustical Society of America, 157th Meeting*, Portland, Oregon, 18-22 May 2009.

Friday, Nancy A., A.N. Zerbini, J.M. Waite, A.S. Kennedy, B.K. Rone, P.J. Clapham, and S.E. Moore. 2008. Baleen whale broad-scale distribution. BSIERP Project B-66. *BEST-BSIERP PI meeting*; 10/14-10/16/2008. Girdwood, AK.

Stafford, K.M., D.K. Mellinger, P. Stabeno, S.L. Nieukirk, S. Heimlich and S.E. Moore. 2008. Analysis of acoustic and oceanographic data from the Bering Sea June 2006-May 2007. *Alaska Mar. Sci. Symposium*, Anchorage, Jan. 2009.

Zerbini, A.N., P.J. Clapham, C.L. Berchok, A.S. Kennedy, B. Rone, D. K. Mellinger, and S.L. Nieukirk, and S.E. Moore. 2009. Occurrence of the Endangered North Pacific Right Whale (Eubalaena japonica) in the Bering Sea in 2008. *Alaska Mar. Sci. Symposium*. Anchorage, Jan 2009.

Zerbini, A.N., P.J. Clapham, C.L. Berchok, A.S. Kennedy, B.K. Rone, and M. Baumgartner. 2008. North Pacific right whale (Eubalaena japonica) research in the Bering Sea. Book of Abstracts and Biographies, p. 3. MMS 11th Information Transfer Meeting and US and Canada Oil and Gas Research Forum: Current Status and Future Directions in the Beaufort Sea, Northern Slope and Mackenzie Delta; 10/28-10/30/2008. Anchorage, AK.