# Collaborative Large Whale Survey 2015 (CLaWS): End-of-Leg Report: 6-27 August 2015

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*"It's very sobering to think about how many right whales were caught out here and the fact that we've yet to find a single animal" – Brenda Rone*

## Synopsis

The Collaborative Large Whale Survey 2015 (CLaWS) is a joint field effort by Southwest Fisheries Science Center and Alaska Fisheries Science Center. The 4-month survey is devoted to the assessment of several large whale species off the U.S. and Canadian west coast between northern California and Kodiak, Alaska. Major components of this effort include: (1) the first range-wide assessment of gray whales that summer south of the Aleutian Islands, (2) a dedicated visual line-transect and acoustics survey for right whales in the Gulf of Alaska, and (3) sampling (photographic and biopsy) of blue and fin whales. The work is being supported by SWFSC, AFSC, NOAA Fisheries Office of Science & Technology and Office of Protected Resources, NOAA Fisheries' Alaska Regional Office and the U.S. Marine Mammal Commission. The survey started on 9 July from San Diego amid news coverage and excitement about the large whale research and NOAA Ship *Reuben Lasker* undertaking its first scientific project. The 106-day survey will have five legs (tracklines are shown in Figure 1) and is scheduled to end in San Diego on 9 November 2015. Contact Dave.Weller@noaa.gov for additional information.

## Survey Design and Methods

*Methods*

From August 6 – 27th, a line-transect survey was conducted over a large area of the northwestern Gulf of Alaska, departing and returning to Kodiak (Figure 1); the survey area was loosely based upon locations of catches and sightings of right whales in historical and modern-era (i.e. Soviet) whaling in addition to covering shelf waters where right whales have been observed in recent years (notably Albatross Bank off Kodiak, see Figure 2).

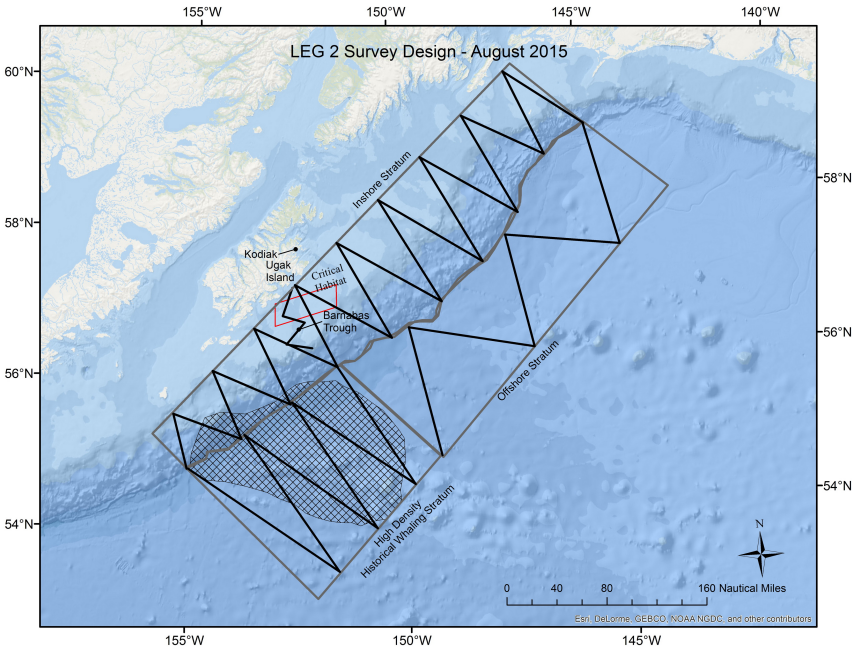


Figure 1. Survey tracklines for Leg 2, focusing on North Pacific Right Whales.

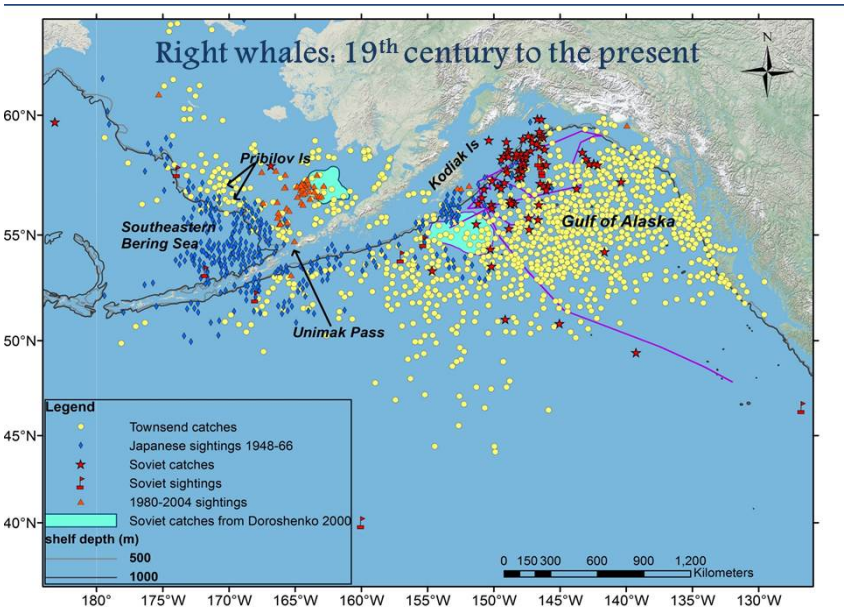


Figure 2. Right whale catches and sightings during historical and modern-era (i.e. Soviet) whaling (from Y. Ivaschenko, unpublished).

*Goals and Objectives*

The objectives for Leg 2 were as follows:

1. Survey as much of the shelf and adjacent offshore waters off Kodiak as possible, using visual and acoustic monitoring.

2. If right whales were encountered, attempt to conduct photo-identification and biopsy sampling of the animals.

3. If possible, attach satellite-monitored radio tags to right whales to determine their movements and use of key habitats.

4. When other cetacean species were documented during the survey, opportunistic photo-identification, biopsy and satellite tagging, particularly of fin and blue whales, would be conducted if possible.

*Visual Survey*

Rotating teams of three scientists collected sighting data using standard line-transect methods during on-effort mode. Operations began at 0700 Alaska Daylight Time (AKDT) and ceased at 2230 (AKDT), or as long as conditions would allow. A full observation period for each observer was 1.5 hours (30 minutes in each position) and was followed by a 2-hour rest period. All three scientists (starboard and port observers and data recorder) were stationed on the flying bridge. Observers used 25×150 'big-eye' binoculars (Fig. 3) with reticles to scan from 10 degrees past the bow on the opposite side to 90 degrees abeam.

The data recorder surveyed the trackline with 7 × 50 binoculars while scanning through the viewing areas of the two primary observers. When a sighting was made, the primary observer conveyed to the recorder the horizontal angle and number of reticles from the horizon to the initial sighting. Additional information collected included sighting cue; course and speed; species identity; and best, high, and low estimates of group size.

Figure 3. Sergio Martinez looking for whales using the "Big Eyes".

The computer program Wincruz (http://tinyurl.com/qhtakea) was used to record all sighting and environmental data (sea state, swell height, glare, precipitation, and visibility). During poor weather conditions (visibility ≤ 1 km and/or heavy rain), off-effort watches were conducted on the bridge with two observers.

*Ship-Based Passive Acoustics – DiFAR Sonobuoys*

Throughout the survey, sonobuoys were deployed continuously when in historical high density right whale areas (Fig. 4). When transiting through non-high density areas, sonobuoys were deployed approximately every 2-2.5 hours to obtain an evenly-sampled cross-survey census of marine mammal vocalizations. Four types of sonobuoys were used: SPW 77C, 53F (UND and SPW), SPW 53D, and 57B (SPW and MN). The 53D and 57B sonobuoys were very old surplus buoys from 1991 or older, and all but one failed to transmit properly. The 53F sonobuoys have either omnidirectional or DiFAR (Directional Frequency Analysis and Recording) capabilities, although all were deployed in DiFAR mode to obtain directional bearing information. The 77C sonobuoys were DiFAR only. When in DiFAR mode, the maximum frequency range is 2.5 kHz. All sonobuoys were modified by tying up portions of the buoy to prevent deployment. These modifications ensured that all hydrophones were shallower than 150 ft. Because right whales tend to vocalize near the surface, the modifications to the buoys ensured that the hydrophones were close enough to the surface layer to detect any vocalizations. In addition to shortening deployment depth, the UND 53F sonobuoys had dead display batteries that needed to be replaced. Sonobuoy crates were stored on the aft deck, and individual buoys were removed from the crates and prepped for deployment.

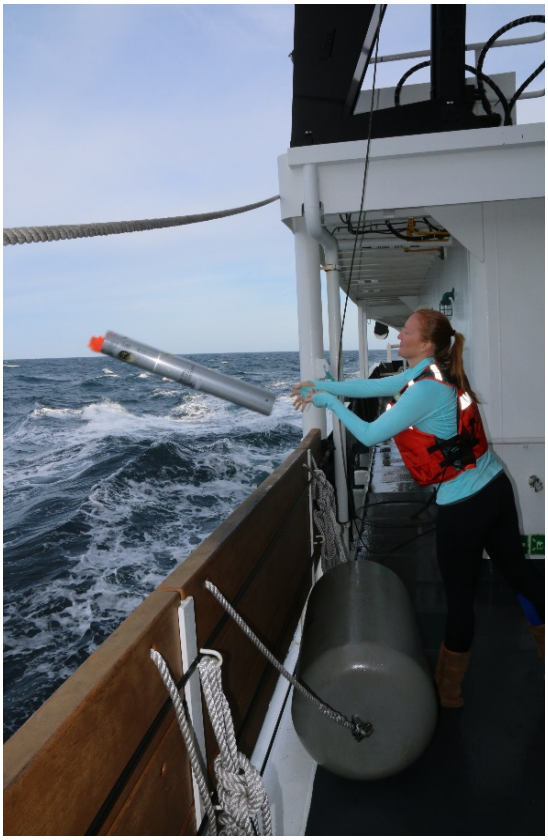

Figure 5. Sonobuoy being deployed off the starboard rail.

A preamplified omnidirectional antenna was installed on the vessel prior to the start of Leg 1. The antenna was positioned on the port side of the mast, approximately 30 m above the surface of the water. The preamp was positioned inside the bridge, with ~100 ft. of antenna cable fed from the preamp in the bridge into the Acoustics lab three decks below. The acoustics monitoring station was set up at the table in the Acoustics lab. During the survey, a problem occurred with the antenna cable from the preamp into the Acoustics lab. As a result, the monitoring station was moved into the bridge for the remainder of the survey.

## Results

*Visual Observations*

A total of 1683 nm of trackline were surveyed under full effort conditions (Fig. 6 and Table 1). Additional trackline was surveyed either on the flying bridge or bridge in off effort conditions during inclement weather.

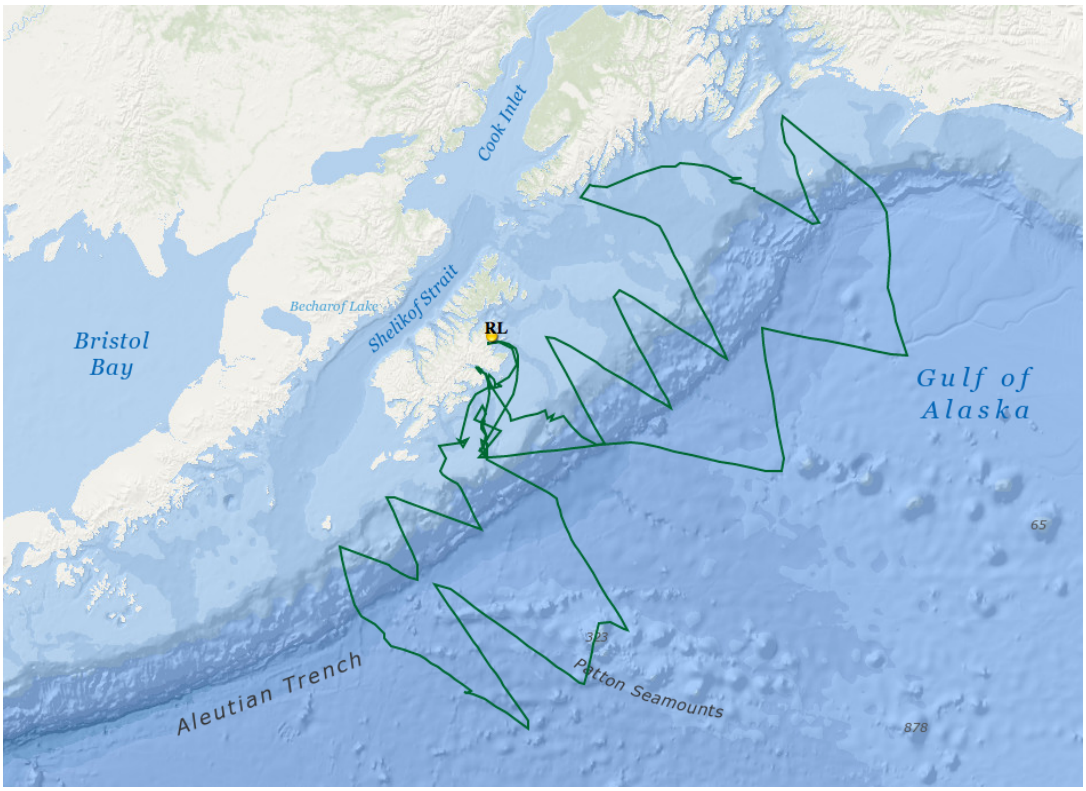


Figure 6. Trackline of the Reuben Lasker during Leg 2.

There were a total of 409 sightings (1277 individuals) from 10 confirmed species (Table 2). There were an additional 207 sightings (327 individuals) of unidentified large whales, dolphins, and porpoise.

Table 1. Search effort by day and species sightings**.** Survey distance reflects "on-effort" status and does not include bridge watch effort (during inclement weather).

| Date | Time Start/ Time End | Latitude | Longitude | Survey Distance | Average Beaufort |
|---|---|---|---|---|---|
| 80615 | 1629 | N57:37.61 | W152:01.60 | 15.8 nmi | 3.2 |
| | 2004 | N57:16.65 | W152:17.32 | | |
| 80715 | 0702 | N57:23.32 | W152:29.03 | 37.8 nmi | 3.3 |
| | 1839 | N57:09.17 | W153:21.35 | | |
| 80815 | 0659 | N56:54.61 | W153:24.62 | 56.7 nmi | 4.0 |
| | 2100 | N57:04.03 | W152:42.20 | | |
| 80915 | 0701 | N46:51.65 | W152:29.30 | 57.4 nmi | 5.3 |
| | 2154 | N56:34.04 | W152:20.68 | | |
| 81015 | 0700 | N56:38.48 | W152:48.61 | 54.9 nmi | 5.3 |
| | 2149 | N56:22.47 | W153:26.46 | | |
| 81115 | 0701 | N55:59.14 | W152:51.53 | 114.5 nmi | 4.2 |
| | 2147 | N55:13.05 | W153:46.28 | | |

| | | | | | |
|---|---|---|---|---|---|
| 81215 | 0703 | N55:22.26 | W154:26.67 | 103.2 nmi | 3.0 |
| | 2120 | N54:26.03 | W154:13.91 | | |
| 81315 | 0700 | N54:02.49 | W152:59.26 | 57.5 nmi | 1.2 |
| | 2158 | N54:01.71 | W152:13.74 | | |
| 81415 | 0701 | N54:41.87 | W152:59.78 | 134.4 nmi | 2.4 |
| | 2118 | N54:25.27 | W151:36.12 | | |
| 81515 | 0701 | N54:41.87 | W152:59.78 | 101.9 nmi | 4.5 |
| | 2118 | N54:25.27 | W151:36.12 | | |
| 81615 | 0659 | N56:06.13 | W151:12.35 | 84.3 nmi | 3.1 |
| | 2143 | N56:53.61 | W152:29.22 | | |
| 81715 | 0659 | N56:54.70 | W152:36.44 | 0 nmi | 5.2 |
| | 1659 | N57:27.49 | W152:42.01 | | |
| 81815 | 1862 | N57:25.14 | W152:36.35 | 29.7 nmi | 3.5 |
| | 2130 | N56:59.78 | W152:07.67 | | |
| 81915 | 0659 | N56:56.12 | W151:04.16 | 115.9 nmi | 2.5 |
| | 2130 | N57:31.68 | W150:28.38 | | |
| 82015 | 0700 | N57:02.18 | W148:58.28 | 108.0 nmi | 3.3 |
| | 2123 | N57:43.53 | W148:24.87 | | |
| 82115 | 0700 | N58:04.35 | W148:24.36 | 84.6 nmi | 3.0 |
| | 2131 | N59:19.85 | W150:00.26 | | |
| 82215 | 1200 | N59:30.54 | W149:47.55 | 60.7 nmi | 4.2 |
| | 2118 | N59:23.09 | W147:51.28 | | |
| 82315 | 0659 | N59:13.89 | W147:21.07 | 118.1 nmi | 2.9 |
| | 2121 | N59:42.45 | W146:12.10 | | |
| 82415 | 0700 | N58:33.93 | W144:45.63 | 125.9 nmi | 3.8 |
| | 2111 | N57:51.05 | W147:05.26 | | |
| 82515 | 0700 | N56:22.44 | W146:57.69 | 130.6 nmi | 3.0 |
| | 2117 | N56:36.87 | W151:02.95 | | |
| 82615 | 0659 | N56:58.14 | W152:45.81 | 91.2 nmi | 4.6 |
| | 1935 | N57:34.62 | W151:57.05 | | |

| Code | Species | Sighting(individual) |
|---|---|---|
| 022 | *Lagenorhynchus obliquidens* | 6(140) |
| 037 | *Orcinus orca* | 20(114) |
| 040 | *Phocoena phocoena* | 2(3) |
| 044 | *Phocoenoides dalli* | 96(397) |
| 046 | *Physeter macrocephalus* | 28(46) |
| 069 | *Eschrichtius robustus* | 5(16) |
| 070 | *Balaenoptera sp.* | 5(5) |
| 073 | *Balaenoptera borealis* | 2(2) |
| 074 | *Balaenoptera physalus* | 66(102) |

| Code | Species | Sighting(individual) |
|---|---|---|
| 075 | *Balaenoptera musculus* | 13(13) |
| 076 | *Megaptera novaeangliae* | 171(444) |
| 077 | unid. dolphin | 4(54) |
| 079 | unid. large whale | 190(240) |
| 477 | unid. porpoise | 8(28) |
| | **Total** | **616(1604)** |

*Biopsy Sampling*

A total of six biopsy samples were collected during Leg 2 (Table 3). Biopsy samples of gray whales were collected in Ugak Bay. Blue whale samples were collected in the 'High Density Historical Whaling' stratum.

Table 3. Tissue samples collected.

| Species | Common Name | No. of samples collected | Comments |
|---|---|---|---|
| *Eschrichtius robustus* | Gray whale | 4 | One sample is a duplicate. |
| *Balaenoptera musculus* | Blue whale | 2 | One sample is skin only. |

*Photo-identification*

Photographs were collected of gray (Figure 4), blue, fin, humpback, sperm and killer whales, and Pacific white-sided dolphins (Table 4). Catalogs were compiled for: gray, blue, fin, humpback and killer whales. The gray whale catalog now has 18 individuals, 12 from Leg 1 and 6 from Leg 2. Three additional individuals documented during Leg 2 were duplicates from Leg 1. The killer whale catalog now has 98 individuals; 8 were photographed during Leg 2. Additional individuals photographed during Leg 2 were: 3 blue whales, 4 fin whales, 8 humpback whales and 1 sperm whale. These photographs will be compared to the existing photo-identification catalogues maintained at SWFSC and AFSC and by other groups.


Figure 4. Gray whale photographed in Ugak Bay, Alaska.

Table 4. Photo-identification data collected during Leg 2.

| Species Code | Scientific Name | Common Name | No. Sightings | No. Photos |
|---|---|---|---|---|
| 69 | Eschrichtius robustus | Gray whale | 5 | 870 |
| 46 | Physeter macrocephalus | Sperm whale | 1 | 14 |
| 37 | Orcinus orca | Killer whale | 1 | 390 |
| 76 | Megaptera novaeangliae | Humpback whale | 2 | 459 |
| 75 | Balaenoptera musculus | Blue whale | 4 | 853 |
| 74 | Balaenoptera physalus | Fin whale | 5 | 99 |
| 22 | Lagenorhynchus obliquidens | Pacific white-sided dolphin | 1 | 797 |

*Acoustics*

A total of 219 sonobuoys were deployed (Figure 5) of which 191 were successful deployments. Of these, 95 were modified (taped and tied) SPW 77C's, 29 were SPW 53F's, 84 were modified (new battery and tied up) USS 53F's, 9 were older (1991-92) SPW 53D's and 2 were older (1991) MN 57B omnidirectional buoys. The overall sonobuoy success rate was 86%; however, when the old 53D and 57B sonobuoys were excluded, success rate increased to 91%.

Average reception range during the entire survey was 8.4 nm (range 3.4 – 20.4 nm). However, it is important to note that this average includes those ranges received when the antenna cable and preamp failed. Reception range at the start of the survey averaged 9.3 nm (range: 7.3-11.4 nm), until the technical issues arose. After moving the monitoring station into the bridge, bypassing the faulty cable, and switching pre-amps, reception range averaged 8.9 nm (6.7 – 20.4 nm) for the remainder of the survey.

A total of over 330 hours of acoustic monitoring occurred. North Pacific right whale vocalizations (gunshots and up calls, Figure 6) were detected on a total of 6 sonobuoys (3%); on two buoys on 10 August, and four buoys on 16 August.

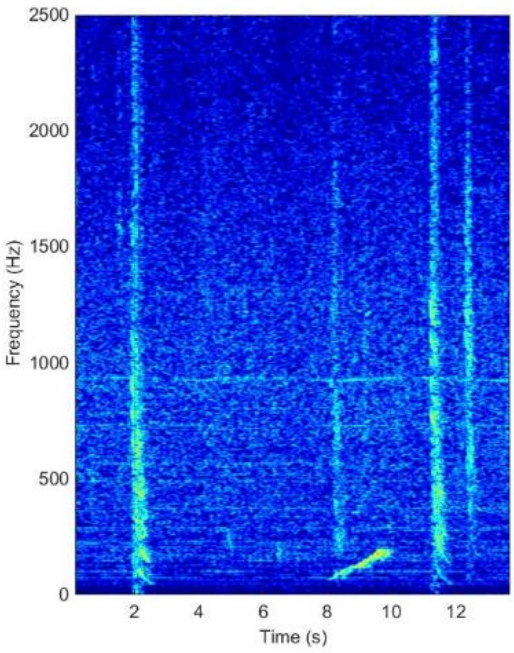


Figure 6. Spectrogram of the two common call types of the North Pacific right whale: the gunshot call (at 2s, 8s, 11.5s, and 12.5 s) and the upsweep (at 8-10 s).

The two most commonly detected species were sperm whales and blue whales, detected on 107 and 100 sonobuoys (56% and 52%), respectively. Humpback whales and killer whales were the next most commonly detected, on 55 and 41 sonobuoys (28.7% and 21%), respectively. Fin whales were detected on 28 sonobuoys (14.6%), and both gray whales and sei whales were detected on 9 sonobuoys (4.7%). There was one possible detection of a Dall's porpoise whistle (14 August), though species confirmation is still needed. It is important to note that the results presented here are preliminary; some post-processing confirmation of species attribution is needed.

**Acknowledgments**

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*Leg 2 Scientific party. Front: S. Martínez. Second Row: L to R: R. Pitman, N. Tucker, J. Crance, A. Burke, M. Slack, K. Miller, K. Beach, B. Rone, A. Martínez. Third Row: L to R: B. Alps, K. Cates, T. Johnson*