

SEMI-ANNUAL PERFORMANCE REPORT

Project Title: Acoustic Monitoring of Beluga Whales and Noise in Cook Inlet

Grantee: Alaska Department of Fish & Game

Cooperators: Scientific staff from the NMFS, Alaska SeaLife Center, Hawaii Institute of Marine Biology, and Prince William Sound Science Center

Award Period: From 1 October 2007 through 30 September 2010

Period Covered by this Report: 1 April 2008 through 30 September 2008

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Summary of Progress and Expenditures to Date

Fieldwork Accomplishments

In cooperation with scientific staff from the Alaska SeaLife Center (ASLC), the Hawaii Institute of Marine Biology, and Prince William Sound Science Center (PWSSC), field work was conducted on 28-29 May 2008 to test:

- (1) the range that Ecological Acoustic Recorders (EARs) would detect a controlled noise signal of known frequency at several known distances; i.e., 'playback tests'
- (2) the amount of strumming noise from the mooring line or other noise associated with the rigging that could be recorded by the EARs
- (3) The amount of ambient noise, in particular from current flow, that could be recorded by the EARs

Playback Tests

In the afternoon of 28 May, an EAR was placed in the water over the side of a tug boat, while it was moored to the dock at the Port of Anchorage. Playback tests were conducted for ~1 hour using the transducer and amplifier from the skiff. During the morning of 29 May, playback tests were conducted in Chickaloon Bay, with the EAR over the side of the tug, while it drifted with the flooding tide, and the transducer and amplifier from the skiff. In the evening of the 29th, additional playback tests were conducted similar to those on the 28th; i.e., with the EAR over the side of the tug moored to the dock and the skiff.

The EAR recorded the playback sound during both the afternoon of the 28th and in the morning of the 29th, with the greatest distance detected about 2 miles in Chickaloon Bay. During the evening of the 29th, no playback sounds were recorded at any of the distances tested, which were from 1.65 to 2.97 miles. The propagation of sound will vary by location, and thus the playback tests during the evening of the 29th could indicate the EAR did not record the sound due to the currents/tides, bathymetry, etc. Alternatively, the battery used to power the playback sound may have been run down from being used during the previous playback tests and thus the sound signal being sent during the evening of the 29th could have been weaker than that during the previous two playback tests.

The detection range of the EAR appears to be 1-2 nautical miles, based on the limited scope of these playback tests.

Strumming Noise Tests

Tests were conducted to assess the amount of noise produced by the strumming of the line attached to the EAR. Two types of line were used (yellow and fuzzy camo), yet the sound produced by the shackle attached to the EAR in the tests of both lines was quite loud and masked any strumming noise that may have been produced by the lines. As such, no information was obtained to assess any noise that may have been produced by the strumming of either type of line.

Ambient Noise Tests

The same shackle was used during tests to record noise from dredging near Ship Creek, and thus no information was obtained relative to the sounds produced during dredging by these tests.

Work was conducted on the technical aspects of EARS, including connecting batteries, connecting the EARs' hard-drive, reformatting the hard-drive prior to deployment, downloading data from the EARs hard-drive, replacing battery in main circuit board (annually), etc.

Planning for July Deployments

Following the field work in late May, planning was initiated to deploy 3 EARs in late July for ~1 month to overlap with the NMFS aerial survey for beluga whales (i.e., the 'calf' survey). The general location of the three deployments were to be lower Knik Arm near the Port of Anchorage, Chickaloon Bay, and somewhere east of the Susitna Delta and north of Fire Island.

The line/cable purchased for the tests conducted in May were to be used for the moorings for the July deployments. One critical issue was determining the hardware for the attachment points of cable, EAR, acoustical release, etc. Jennifer Ewald, the mooring specialist under contract with the PWSSC, worked on this

issue, along with other technical aspects of the proper mooring design with other experts. Based on the results of some field testing by ASLC staff, the decision was made to have 2 EARs attached to relatively light-weight acoustical releases (the conventional EAR mooring design) and 1 EAR attached to a heavy-duty acoustical release and enclosed inside a 'SUBS' to improve hydrodynamics. Both types of releases would be deployed in the same location to examine performance and retrieval probability between the two types of releases.

July Deployments

On 23 July 2008, the three EARs were deployed using the vessel "Cosmic Wind" based out of Anchorage and operated by Cook Inlet Tug and Barge Company. Two EARs were deployed in close proximity to one another near the mouth of the Little Susitna River, and the third EAR was deployed at the south end of Knik Arm near Port Mackenzie (Figure 1). The moorings for the two 'Susitna' EARs had different types of releases; specifically, one mooring had the heavy-duty release (and SUBS) whereas the other mooring had the light-weight release (Table 1, Figure 2). The mooring for the MacKenzie EAR also had a light-weight release, and the objective was to deploy the mooring package in an area of upper Cook Inlet that has extreme environmental conditions; i.e., strong currents and large tidal fluctuations. A three week deployment period was planned for all of the mooring packages, and the dates were chosen to overlap with the early August NMFS aerial 'calf survey'. If beluga whales were observed during the aerial survey near the mooring locations it would provide an opportunity to determine if the EARs had recorded beluga calls when belugas were known to have been nearby.

Table 1. Region of Cook Inlet, type of acoustic release, deployment location, and water-depth of moorings with Ecological Acoustic Recordings (EARS) deployed on 23 July 2008.			
	Port Mackenzie-Knik Arm	Little Susitna River	Little Susitna River
Release Type	"Light-weight"	"Heavy-weight"	"Light-weight"
Lat	61° 16.30' N	61° 11.11' N	61° 11.09 N
Long	149° 54.88' W	150° 16.54' W	150° 16.69' W
Depth (ft)	75.5	62.3	58.0

August and September Recovery Attempts

On 15 August 2008, attempts were made to recover the three EARs using the vessel "Glacial Wind". The light-weight Susitna and MacKenzie EARs and releases were recovered, but the heavy-duty EAR was not recovered. Based on

signals received from the heavy-duty release, the EAR and release apparently did detach from the mooring but failed to rise to the water's surface. On 16 August, a second attempt was made to retrieve the heavy-weight Susitna EAR and release by dragging for the instruments using a grappling hook, but this effort was unsuccessful. The depth finder of the Glacial Wind indicated the instruments were suspended ~30 feet from the bottom, as would be expected.

On 23 September 2008, another attempt was made to retrieve the heavy-weight Susitna EAR. The instruments were located ~2.1 km southwest of the initial deployment site in ~90 feet of water at high tide. Sonar readings indicated the instruments were ~5 feet off the bottom, and thus had lost buoyancy. Several hours were spent trying to entangle the instruments without success.

Preliminary Data Analysis

The two EARs that were recovered successfully recorded acoustical information during the entire duration of the deployment period of 23 July to 15 August. Over 20,000 recordings were obtained and the acoustical data within those recordings were initially examined using automated processing software that calculates the total acoustical energy received and automatically detects beluga whale tonal sounds. Subsequently, 950 files with potential detections were examined manually and the results indicated that the dominant acoustic energy is from vessel traffic, industrial activities, and water flow noise. In addition, beluga whales were detected on 4 days from the Susitna EAR (Figure 3) and on 1 day from the MacKenzie EAR (Figure 4). All calls of belugas were detected below 10 kHz, the same frequency range of the dominant acoustic energy from anthropogenic and ambient sources of sound.

Summary to Date

A summary of the work conducted during this reporting period includes the following:

1. EARs can be deployed and recovered using conventional mooring configurations in Cook Inlet during the summer (ice free) season to successfully record beluga calls
2. Human activities near deployment sites may mask the recording of beluga calls below 10 kHz, though belugas are known to make other sounds at higher frequencies (i.e., 30-100 kHz)
3. Flow noise due to tidal currents in Cook Inlet is below 1 kHz and should not be a major limiting factor in detecting beluga calls

Approach to Future Activities

Based on the information obtained during the first year of this project, future activities will include the following:

1. Explore opportunities to test EARs and their moorings during the non-summer period when ice is present in Cook Inlet
2. Assess the feasibility and advantages of utilizing other types of acoustic devices (e.g., 'C-Pods') in addition to EARs to record higher frequency calls of belugas
3. Determine where EARs will be deployed within Cook Inlet during the spring of 2009 to meet the objectives of the second phase of the project, as originally proposed, specifically:
 - a. Monitor acoustic call data from Cook Inlet belugas to improve the understanding of their seasonal presence in the lower and mid regions of Cook Inlet as well as the occurrence of seasonal shifts in their distribution
 - b. Monitor acoustic call data from killer whales to improve the understanding of their seasonal presence in Cook Inlet
 - c. Increase the information of seasonal ambient noise levels, both natural and anthropogenic, in Cook Inlet

Figure 1. Location of EAR deployments near the mouth of the Little Susitna River (two red dots west of Fire Island) and Port MacKenzie (one red dot north of Anchorage)

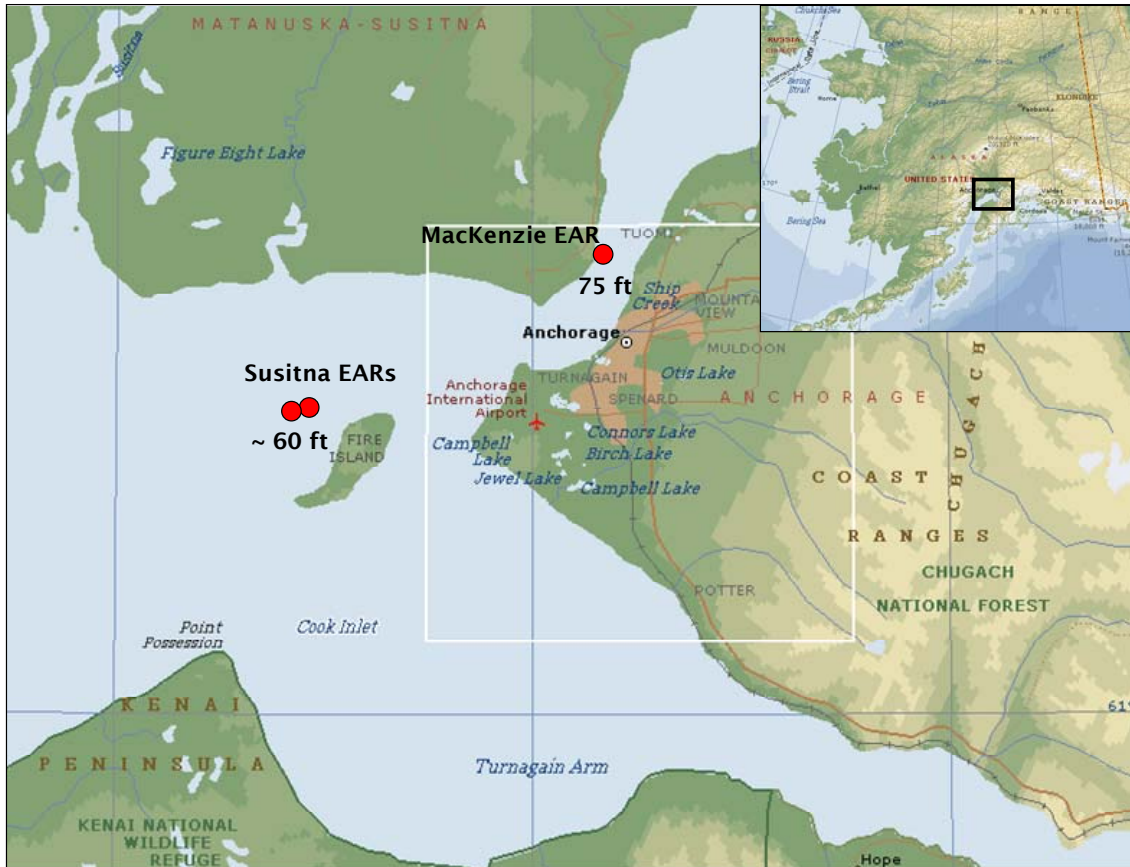
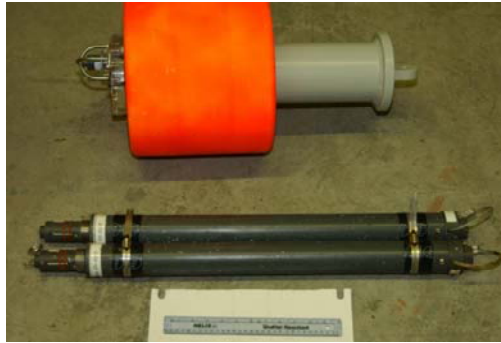


Figure 2. Acoustical releases used in deployment of EARS in Cook Inlet.

**EAR with foam collar and
'light-weight' release**



**EAR inside
SUBS with
'heavy-weight'
acoustic
release**

'Light-weight' release sitting on top of 'heavy-weight' release



Figure 3. Dates and times for detections of beluga whales recorded from the Susitna EAR.

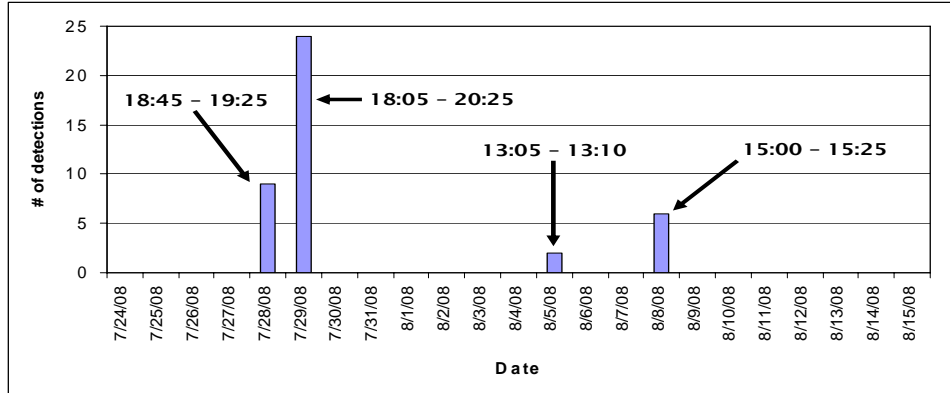


Figure 4. Date and time for detections of beluga whales recorded from the Mackenzie EAR.

