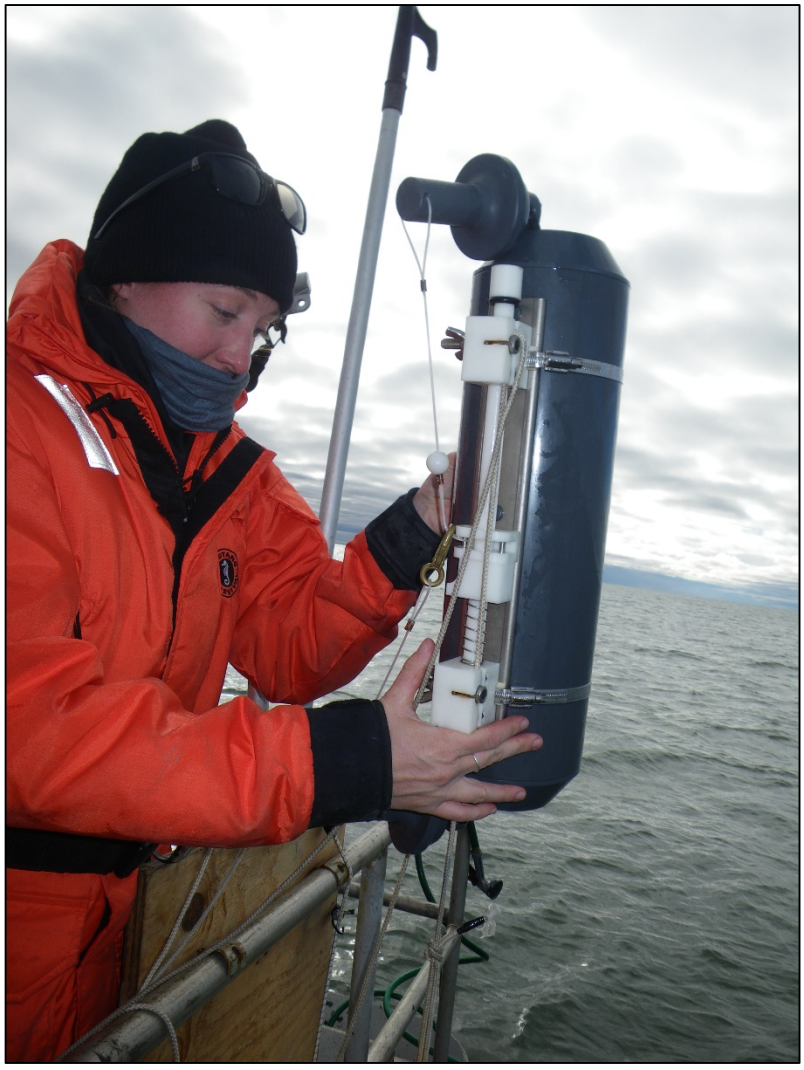
Cruise Report
Alaska Monitoring and Assessment Program

Arctic Estuaries, Chukchi and Beaufort Seas
2015 EPA National Coastal Condition Assessment

August 5 – August 25, 2015



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BOEM Disclaimer

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Cover Photo:
Rachel Pryor, NOAA, lowers a Niskin water sampler. Photo credit: Terri Lomax, ADEC.

Cruise Report
AKMAP Arctic Estuaries, National Petroleum Reserve-Alaska

The Alaska Department of Environmental Conservation (DEC), National Oceanic and Atmospheric Administration (NOAA), and the University of Alaska (UA) conducted an aquatic resource survey of estuaries within the National Petroleum Reserve – Alaska (NPR-A) in 2015 (Figure 1). This survey is part of EPA's 2015 National Coastal Condition Assessment (NCCA), a nation-wide assessment of coastal condition. AKMAP will use four NCCA indices of condition – water quality, sediment quality, benthic community condition, and fish tissue contaminants to assess the condition of estuarine aquatic resources within the National Petroleum Reserve – Alaska (NPR-A) in regards to selected water quality criteria. The survey will provide a baseline for future trend assessments, objectives are to:

- Provide a statistically unbiased assessment to characterize the condition of aquatic resources within the NPR-A estuaries.
- Provide estimates of the NPR-A population area that meet or do not meet water quality criteria.
- Allow resource managers to more accurately evaluate data from targeted monitoring within the broader regional patterns of contamination and impact provided by the AKMAP NPR-A survey (Trowbridge and Jones, 2009).
- Integrate multiple indicators sampled at each station providing managers with a more robust comprehensive assessment of overall regional status.

The randomized survey design allows valid population estimates of the spatial distribution of environmental parameters, such as sediment trace metal concentrations, with 95% upper confidence bounds.

Field Study

The NOAA vessel Ron Brown served as the base of operations, this vessel supported two field operations during this cruise. We used a smaller launch, the Peggy D, for our estuary sampling. Our plan was to launch the Peggy D in the mornings, and return each evening to process and store samples. Field sampling operations were planned in upper Kasegaluk Lagoon east, proceeding to Wainwright Inlet, Peard Bay, Elson Lagoon and Dease Inlet, Smith and Harrison Bay's, and debarking at Barrow. A total of 40 stations were planned, of which 33 were sampled (see Figure 1).

The Ron Brown departed Kodiak August 6, 2015 and reached the first sampling locations August 12th. Poor weather prevented us from sampling for two days, instead the other project on board began their efforts early. Gale force winds, small craft advisories, and high seas along the Chukchi Sea coast delayed sampling for days or caused us to shorten field days. Sea ice caused navigational hazards in the Beaufort Sea and prevented us from reaching and sampling Harrison Bay.

Additional samples were collected for a potential oil/gas offshore pipeline corridor, Bigelow Laboratory for Ocean Sciences, NOAA National Marine Fisheries Services, and Oregon State University. At the potential oil/gas corridor stations sediment samples were collected for macroinvertebrates, physical parameters, and chemistry. Ten stations were proposed, due to weather only 7 were sampled. Additional sediment and water samples for microbial and hydrocarbon fingerprinting were collected for Bigelow, once in each estuary. Water samples were collected for

Oregon State University (OSU) as part of ocean acidification study. Additionally, in the event we caught extra fish samples in the trawl those were collected for National Marine Fisheries Service.

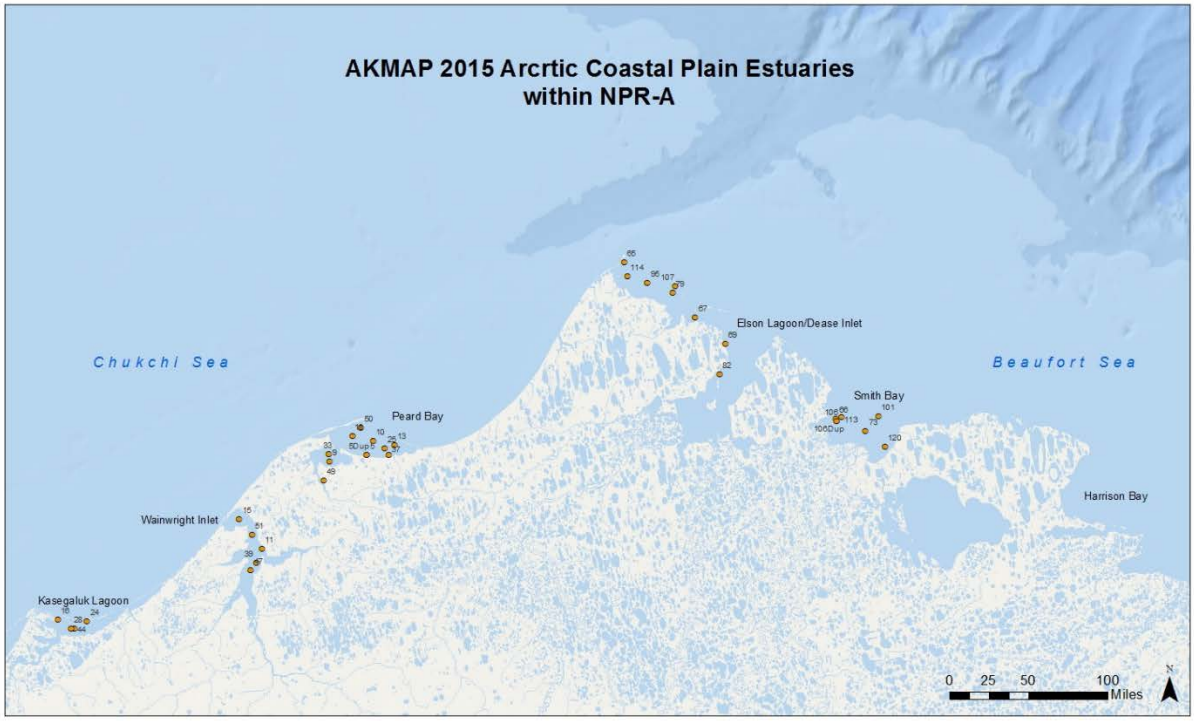

Figure 1

Planned Sampling Sequence

At each station the following sequence of sampling events occurred:

1. The station location was confirmed within ± 0.02 nm (37m) against Peggy D GPS readings. See Note 1 about utilization of oversample sites.
2. The Peggy D was anchored within the X-site sampling circle.
3. Salinity was checked to confirm ≥ 0.5 PSU.
4. If site is sampleable, e.g. ≥ 0.5 PSU depth measurements were made.
5. The underwater camera was deployed at the site location to visually assess benthic habitat.
6. Secchi disk transparency measurements were taken.
7. CTD/WQ cast.
    a. Water column was profiled with a CTD (additional measurements pH, PAR, etc.).
    b. Water samples were taken for nutrients, chlorophyll *a*, and total suspended solids.
8. Sediment sampling was conducted with a Ponar (estuaries) or Smith-Mcintyre (pipeline area) samplers for macroinvertebrates (1 mm and 0.5 mm sieves), physical parameters (grain size, color, odor, and temperature), sediment chemistry, sediment Chlorophyll a, and stable carbon and nitrogen isotopes.
    a. Depending on substrate 4 – 8 grab samples were required

One to two 1 meter beam trawls were conducted within four estuaries to collect epifauna and fish for contaminant assessment. Very little material was collected in the trawls and at times no samples were collected due to the low mass of target species. Trawling was not attempted in Elson Lagoon/Ease Inlet due to time constraints and weather delays.

Stations and Sampling Activities

Sampling activities occurred August 14th -24th and are detailed in Table 1. Station coordinates are provided in Table 2. The tables include the 33 sampled stations, including duplicates. Stations in Harrison Bay were not able to be sampled due to hazardous sea ice conditions.

Discussion

Although every effort was made to sample all sites, weather and safety concerns prevented us from sampling 7 stations. A total 33 stations were sampled out of the proposed 40 stations. The survey results will ultimately represent a smaller survey area than planned with the exclusion of Harrison Bay but will still meet overall survey objectives and provide spatial estimates of condition across a large landscape. If the Harrison Bay stations were to be sampled in 2016 it would allow for spatial estimate of conditions across the complete NPR-A estuary region.

While the majority of sample collections were uneventful, ponar depths and trawl abundance were routinely insufficient. The sample area appeared to have a compacted sediments making ponar penetration difficult. Several ponar drops per stations had to be composited to collect enough material for sediment chemistry samples, benthic samples collected using the ponar did not reach the target depth. While adding additional weight to the ponar did allow for greater penetration, the winch on board the Peggy D was already maxed out on its capacity and pulling the ponar out of the compacted layer was difficult. Inadequate depths for the benthic samples will have be considered when analyzing the results. Trawling in four estuaries was attempted, but samples were only collected in two. Very little sample biota mass was collected each time, and samples that were collected typically were too small for analysis. Although the trawling results were disappointing, our results were comparable with historical surveys in the area.

These relatively shallow estuaries experience harsh conditions throughout the year. The average depths of the stations sampled is 3.3 m. Variable salinity, high winds that can in effect drain the estuary, landfast ice scouring the sea floor, repeated freeze thaw cycles, and a short summer season may account for the biotic scarcity we experienced in the trawls and benthic samples. Very little is known about arctic estuaries and we hope that our work will contribute to the overall understanding of these important environments. Although the biota sample collections were not as diverse or abundant we would of liked it was noted that several of the estuaries did appear to contain many juvenile species. Once the taxonomic work is complete it will be interesting to see if some of the estuaries are possible nursery grounds for some species.

Sampling Team

The field crew was comprised of individuals from three agencies: NOAA, DEC, and UAF. Ian Hartwell, NOAA, served as the Chief Scientist for this project. Terri Lomax, DEC, was responsible for quality assurance and ensuring field protocols followed NCCA methodology. The success of this cruise was attributed to the following personal:

Field Scientific Team (Figure 2)	NOAA Ron Brown/Peggy D
Ian Hartwell, NOAA (Chief Scientist)	Capt. Robert Kamphaus, Ron Brown
Terri Lomax, DEC	Lt. Adrianne Hooper, Ron Brown
Brian Stillie, DEC	Capt. Patrick Kreigh, Peggy D
Max Hoberg, UAF	BGL Mike Lastinger, Peggy D
Rachel Pryor, NOAA	
Katie Beaumont, NOAA Volunteer	

Figure 2 - AKMAP Field Sampling Team.
From left to right– (back row) Rachel Pryor, Terri Lomax, Brian Stillie, Katie Beaumont; (front row) Ian Hartwell, and Max Hoberg

Doug Dasher, UAF, while unable to assist with field sampling did provide support through the study design, implementation and coordination of logistics. Bad weather continued to plague us even after field work was completed. Expected rough seas hastened our departure from Barrow, Alaska. We had planned to debark on August 27th, instead we departed on August 25th. Heavy fog then delayed our return flights, we arrived home August 26th.

Terri Lomax, Alaska Monitoring and Assessment Program Manager
October 5, 2015

Table 1

		NCCA Parameters										Supplemental Samples Collected						
Site ID	Date	Secchi Depth (m)	CTD profile	Nutrient Sample	TSS Sample	Chlorophyll Sample	Underwater Video Recording	Benthic Collection	Sediment Collection	Trawl Conducted	Fish Collected	Bigelow Water	Bigelow Sed	Sed Chlorophyll A	Sed Trace Metals	Air PAH	POC Water	NOAA Fish
AK-NCCA15-024	08/14/15	X	X	X	X	X	X							X	X			
AK-NCCA15-044	08/14/15	X	X	X	X	X	X							X	X			
AK-NCCA15-028	08/14/15	X	X	X	X	X	X							X	X			
AK-NCCA15-016	08/14/15	X	X	X	X	X	X			X		X	X	X	X	X	X	
AK-NCCA15-011	08/15/15	X	X	X	X	X		X	X					X	X		X	
AK-NCCA15-039	08/15/15	X	X	X	X	X		X	X					X	X		X	
AK-NCCA15-047	08/15/15	X	X	X	X	X								X	X		X	
AK-NCCA15-051	08/15/15	X	X	X	X	X		X		X		X	X	X	X	X	X	
AK-NCCA15-015	08/15/15	X	X	X	X	X			X									
AK-NCCA15-013	08/18/15	X	X	X	X	X	X	X	X					X	X			
AK-NCCA15-037	08/18/15	X	X	X	X	X	X							X	X			
AK-NCCA15-005	08/18/15	X	X	X	X	X	X	X	X				X	X	X	X	X	
AK-NCCA15-005Dup	08/18/15			X	X	X		X	X					X	X			
AK-NCCA15-025	08/18/15	X	X	X	X	X	X							X	X		X	
AK-NCCA15-033	08/19/15	X	X	X	X	X	X	X	X					X	X		X	
AK-NCCA15-009	08/19/15	X	X	X	X	X	X	X	X					X	X		X	
AK-NCCA15-049	08/19/15	X	X	X	X	X	X	X	X					X	X		X	
AK-NCCA15-018	08/19/15	X	X	X	X	X			X	X	X			X	X		X	X
AK-NCCA15-050	08/19/15	X	X	X	X	X	X	X	X					X	X		X	
AK-NCCA15-010	08/19/15	X	X	X	X	X	X	X	X					X	X		X	
AK-NCCA15-065	08/20/15	X	X	X	X	X	X	X	X					X	X		X	
AK-NCCA15-114	08/20/15	X	X	X	X	X	X	X	X				X	X	X		X	
AK-NCCA15-095	08/20/15	X	X	X	X	X	X	X	X			X		X	X	X	X	
AK-NCCA15-107	08/20/15	X	X	X	X	X	X	X	X					X	X		X	
AK-NCCA15-079	08/20/15	X	X	X	X	X	X	X	X					X	X		X	
AK-NCCA15-067	08/20/15	X	X	X	X	X	X	X	X					X	X		X	
AK-NCCA15-069	08/21/15	X	X	X	X	X	X		X					X	X		X	
AK-NCCA15-082	08/21/15	X	X	X	X	X	X	X	X					X	X		X	
AK-NCCA15-066	08/23/15	X	X	X	X	X	X	X	X					X	X		X	
AK-NCCA15-106	08/23/15	X	X	X	X	X	X	X	X			X	X	X	X	X	X	
AK-NCCA15-106Dup	08/23/15		X	X	X	X		X	X					X	X		X	
AK-NCCA15-113	08/23/15	X	X	X	X	X	X		X					X	X		X	
AK-NCCA15-101	08/24/15	X	X	X	X	X	X							X	X		X	
AK-NCCA15-073	08/24/15	X	X	X	X	X	X		X					X	X		X	
AK-NCCA15-120	08/24/15	X	X	X	X	X	X		X	X	X			X	X		X	X
D1B	08/15/15											X	X					
D2B	08/15/15							X	X			X	X					
D4B	08/15/15							X	X			X	X	X				
D3B	08/15/15							X	X			X	X					
D5B	08/15/15							X	X									
S10B	08/16/15							X	X			X	X	x				
S9B	08/16/15								LS									

LS= limited samples.

Table 2 – Sampled Stations Coordinates (NAD 83)

Station ID	Date	Site Name	Depth (ft.)	Depth (m)	Latitude	Longitude
AK-NCCA15-024	8/14/2015	Kasegaluk Lagoon	10	3.0	70.28793	-161.3814
AK-NCCA15-044	8/14/2015	Kasegaluk Lagoon	8	2.4	70.26598	-161.4981
AK-NCCA15-028	8/14/2015	Kasegaluk Lagoon	10.5	3.2	70.26575	-161.5266
AK-NCCA15-016	8/14/2015	Kasegaluk Lagoon	7	2.1	70.29276	-161.6485
AK-NCCA15-011	8/15/2015	Wainwright Inlet	10.5	3.2	70.51008	-159.7809
AK-NCCA15-039	8/15/2015	Wainwright Inlet	10	3.0	70.46702	-159.8293
AK-NCCA15-047	8/15/2015	Wainwright Inlet	9	2.7	70.44557	-159.8809
AK-NCCA15-051	8/15/2015	Wainwright Inlet	11.3	3.4	70.55376	-159.8718
AK-NCCA15-015	8/15/2015	Wainwright Inlet	13.3	4.1	70.60010	-159.9874
AK-NCCA15-013	8/18/2015	Peard Bay	15.7	4.8	70.82645	-158.5646
AK-NCCA15-037	8/18/2015	Peard Bay	11.8	3.6	70.79523	-158.6182
AK-NCCA15-005	8/18/2015	Peard Bay	8.2	2.5	70.79668	-158.8176
AK-NCCA15-005Dup	8/18/2015	Peard Bay	8.2	2.5	70.79668	-158.8176
AK-NCCA15-025	8/18/2015	Peard Bay	19.7	6.0	70.81623	-158.656
AK-NCCA15-033	8/19/2015	Peard Bay	11.5	3.5	70.79699	-159.1691
AK-NCCA15-009	8/19/2015	Peard Bay	11	3.4	70.77606	-159.1602
AK-NCCA15-049	8/19/2015	Peard Bay	13.5	4.1	70.71915	-159.2127
AK-NCCA15-018	8/19/2015	Peard Bay	22.5	6.9	70.85295	-158.9502
AK-NCCA15-050	8/19/2015	Peard Bay	22	6.7	70.87621	-158.8707
AK-NCCA15-010	8/19/2015	Peard Bay	22	6.7	70.83772	-158.7633
AK-NCCA15-065	8/20/2015	Elson Lagoon	9.2	2.8	71.36658	-156.4656
AK-NCCA15-114	8/20/2015	Elson Lagoon	10.2	3.1	71.32653	-156.4286
AK-NCCA15-095	8/20/2015	Elson Lagoon	12	3.7	71.30807	-156.2501
AK-NCCA15-107	8/20/2015	Elson Lagoon	7	2.1	71.29836	-155.992
AK-NCCA15-079	8/20/2015	Elson Lagoon	7.5	2.3	71.27721	-156.0189
AK-NCCA15-067	8/20/2015	Elson Lagoon	10.5	3.2	71.20421	-155.8128
AK-NCCA15-069	8/21/2015	Elson Lagoon/Dease Inlet	8	2.4	71.12628	-155.5366
AK-NCCA15-082	8/21/2015	Elson Lagoon/Dease Inlet	6	1.8	71.03730	-155.5879
AK-NCCA15-066	8/23/2015	Smith Bay	8	2.4	70.90526	-154.5248
AK-NCCA15-106	8/23/2015	Smith Bay	8	2.4	70.89648	-154.5171
AK-NCCA15-106Dup	8/23/2015	Smith Bay	8	2.4	70.89648	-154.5171
AK-NCCA15-113	8/23/2015	Smith Bay	7.5	2.3	70.90934	-154.4716
AK-NCCA15-101	8/24/2015	Smith Bay	13	4.0	70.91140	-154.1342
AK-NCCA15-073	8/24/2015	Smith Bay	6	1.8	70.86619	-154.2514
AK-NCCA15-120	8/24/2015	Smith Bay	8	2.4	70.81970	-154.0758
D1B	8/15/2015	Wainwright Offshore Deep	60.4	18.4	70.7097	-160.0194
D2B	8/15/2015	Wainwright Offshore Deep	NR	NR	70.71285	-159.9725
D4B	8/15/2015	Wainwright Offshore Deep	NR	NR	70.74202	-159.8639
D3B	8/15/2015	Wainwright Offshore Deep	NR	NR	70.77156	-159.8515
D5B	8/15/2015	Wainwright Offshore Deep	NR	NR	70.79037	-159.7532
S10B	8/16/2015	Wainwright Offshore Shallow	28.0	8.5	70.7753	-159.7083
S9B	8/16/2015	Wainwright Offshore Shallow	32.0	9.8	70.75851	-159.7584

NR=not recorded.