NGA-LTER

Northern Gulf of Alaska Long-Term Ecological Research

Cruise Report September 2022

Cruise ID: TGX2022-09

Funding Sources: NSF, NPRB, AOOS, EVOS/GWA

Purpose:

The NGA is a highly productive subarctic Pacific marine biome where intense environmental variability has profound impacts on lower trophic level organisms and community dynamics that, directly or indirectly, support the iconic fish, crabs, seabirds and marine mammals of Alaska. In the NGA, a pronounced spring bloom and regions of sustained summer production support a stable base of energy-rich zooplankton grazers that efficiently transfers primary production up the food chain and a substantial sinking flux of organic matter that exports carbon to the sea bottom communities. The LTER research cruises examine features, mechanisms and processes that drive this productivity and system-wide resilience to understand how short- and long-term climate variability propagates through the environment to influence organisms.

This cruise represents a continuation of sampling begun in fall 1997 under the NSF/NOAA NE Pacific GLOBEC program, and subsequently a consortium of the North Pacific Research Board (NPRB), the Alaska Ocean Observing System (AOOS), and the Exxon Valdez Oil Spill Trustee Council's (EVOSTC) Gulf Watch. This is the fourth year with expanded domain, measurements and investigators under the NSF's Northern Gulf of Alaska Long-term Ecological Program (NGA-LTER). This cruise marks the 26th fall cruise for the Seward Line in the NGA, including Prince William Sound (PWS), and the 52nd year of observations at GAK1.

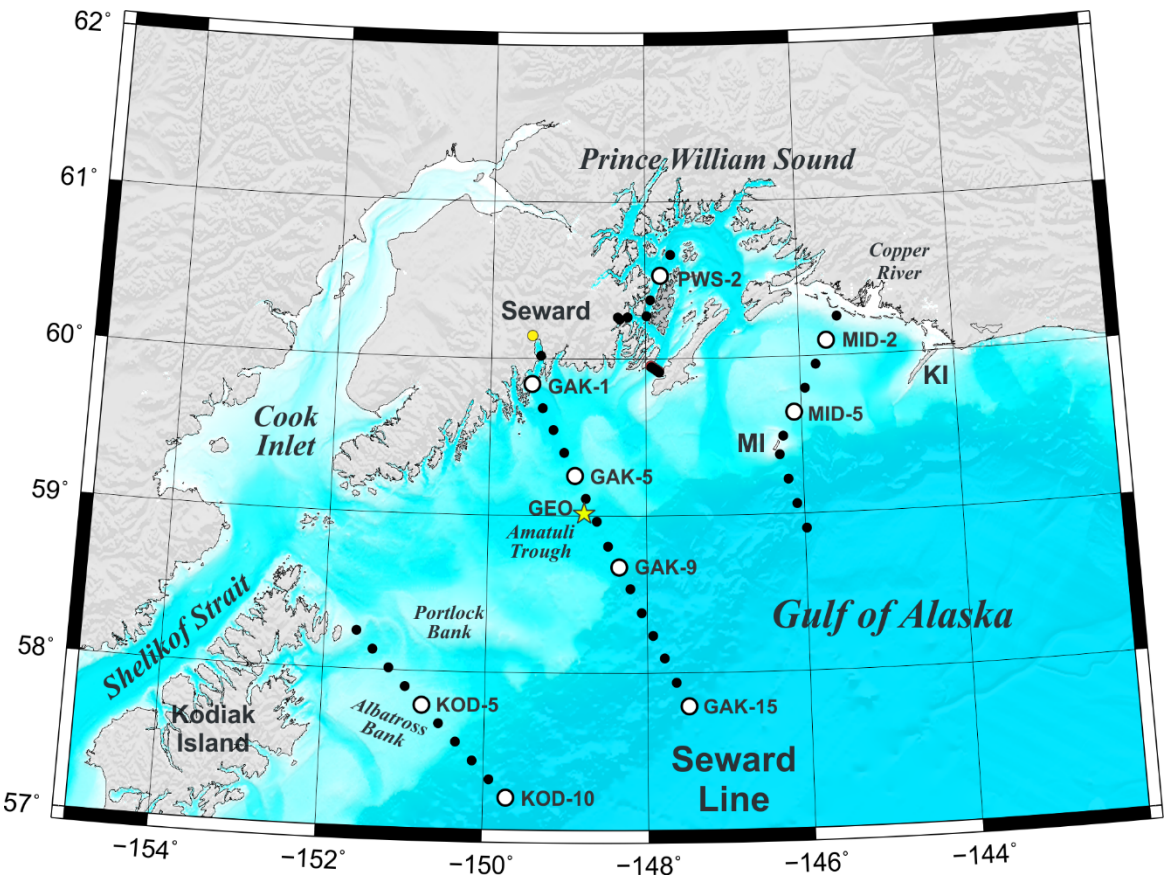

Figure 1. *The revised LTER Phase-1 sampling stations. Open circles indicate intensive stations. black circles indicate regular stations. Yellow star shows position of LTER mooring. Yellow circle indicates the location of Seward.*

Scientific Personnel:

1	Russ Hopcroft (LTER Lead PI)	Zooplankton (days), UAF, Chief Scientist
2	Alex Poje	Zooplankton (nights), UAF
3	Emily Stidham	Zooplankton (nights), UAF
4	Hannah Kepner	Zooplankton (nights), UAF
5	Alex Knobloch	Zooplankton (nights), UAF
6	Tom Kelly	Particle flux (days), UAF
7	Kerri Fredrickson	Phytoplankton/Microzoop, WWU
8	Kelley Bright	Phytoplankton/Microzoop, WWU
9	Sierra Llyod	Phytoplankton/Microzoop, UAF
10	Addie Norgaard	Chemistry (Gases), UAF
11	Sydney Wilkinson	Chemistry (Nutrients, Iron), UAF
12	Emily Ortega	Chemistry (Nutrients, Iron), UAF
13	Isaac Reister	Physics (CTD), UAF
14	Daniel Cushing	Seabirds/Mammals, FWS

TGX2021-09 was conducted in the tail of the COVID19 global pandemic. Mitigation measures were taken to reduce the risk of disease transmission following UNOLS' and USFWS recommendations.

Cruise Overview:

Station Transects: Most of the cruise was dedicated to transect station work, with 2 days planned in Prince William Sound and 5 on the Seward Line, plus transit time and weather days. This cruise was constrained by the LTER network's All Scientist meeting that would begin on Sept 19th, and the ship was not available any earlier than Sept 9th. As per standard design while occupying our transect lines, operations were generally divided into distinct day and night tasks, thus requiring each station to be occupied twice. This structure requires some back-tracking but avoids each discipline needing to supply 2 shifts of scientists and ensures all organisms – especially larger diel-migrating zooplankton – are captured with minimal time-of-day bias. During each morning we typically occupied an established "intensive" station for experimental work. Intensive stations involve a greater number and range of collections than other stations occupied that day. Stations profiles were supplemented by underway measurements. The Fe-Fish was deployed in between all stations, there were no trace-metal casts. Bird and mammal observations were conducted continuously during daylight hours while the ship was underway.

Sediment Traps: This cruise involved the deployment of drifting sediment traps at intensive stations with subsequent-day recovery. The reoccupation of stations as characteristic of our normal sampling design greatly facilitated the integration of sediment traps into the cruise logistics, but still imposes logistical challenges.

Moorings: This cruise had no mooring work.

Undulating platforms: This cruise had no towed vehicles.

Daily summary

Sept 8 – Day0 – science party all arrive in Seward and overnight on land

Sept 9 – Day1 – mobilization and loading of vessel *Tiglax*. Winch and Conex were loaded at the railway dock at ~9am, then the vessel moved to SMC by 10:30. Most of day was spent setting up labs and adding larger instruments to CTD. Hydrographic wire was not re-terminated. Issues with line counter sensor on CTD could not be resolved. Winch hydraulics needed replumbing. Marine Tech Ethan Roth helped greatly with mobilization.

Sept 10 – Day2 – Ship was underway ~6:00. RES2.5 was sampled ~7:00, and Intensive Station GAK1 began with a Prod cast at ~9:20. The prod cast was followed by a pair of Calvets, a CTD, the vertical multinet, and a final CTD, ending the station at ~12:00. We sampled southward, with Calvets and CTDs at the primary stations and waterless CTDs at the intermediate stations, ending at GAK 4i at 19:40. We transited to GAK5 to deploy a drifting sediment trap at ~20:00. We returned to GAK4 to begin night sampling at 22:00 conducting Methots and towed Multinets heading northward to GAK1. A second Multinet for genetics was completed at ~5:40, then the ship transited toward GAK5.

Sept 11 – Day 3 – Intensive Station GAK5 began with a Prod cast at ~10:00. The prod cast was followed by a pair of Calvets, a CTD, and the vertical multinet, ending the station at ~12:00. We sampled southward, with Calvets and CTDs at the primary stations and waterless CTDs at the intermediate stations, ending at GAK 8i at ~20:00. We transited to GAK9 to deploy a drifting sediment trap at ~21:00. We returned to GAK8 to begin night sampling at ~22:00 conducting Methots and towed Multinets heading northward to GAK5. The second GAK5 Multinet for genetics was completed at 05:00, the drifting trap at GAK5 was retrieved at ~06:30, then the ship transited toward GAK9.

Sept 12 – Day 4 – Intensive Station GAK9 began with a Prod cast at ~11:15. The prod cast was followed by a pair of Calvets, a CTD, and the vertical multinet, ending the station at ~13:30. We sampled southward, with Calvets and CTDs at the primary stations and a waterless CTD at intermediate station GAK9i, ending at GAK 11 at 16:15. We transited to GAK12, and deployed a drifting sediment trap at ~21:15. Night sampling began at GAK12 at ~21:30 conducting Methots and towed Multinets heading northward to GAK9. The second GAK9 Multinet for genetics was completed at 06:30. The drifting trap set at GAK9 has drifted far southward and was retrieved at 08:40, then the ship transited toward GAK12.

Sept 13 – Day 5 – We began at Station GAK12 at ~11:15 with a Calvet followed by a CTD. We sampled southward, with Calvets and CTDs at the primary stations 13 and 14 then transited to GAK15 for a sediment trap deployment that ended at 18:40. With time available, a deep vertical multinet was taken for live sorting that ended at ~20:00, then we waited for darkness. Night sampling began at GAK15 at ~21:00 conducting Methots and towed Multinets heading northward to GAK13 (2 Multinets were collected at GAK15) ending there at 03:20. The drifting trap set at GAK12 had moved southward and was retrieved at 06:30, then the ship transited toward GAK15.

Sept 14 – Day 6 – Intensive Station GAK15 began with a Prod cast at ~10:00. The prod cast was followed by a CTD, a pair of Calvets, a third CTD then a pair of vertical multinet, ending the station at ~15:30. We conducted a bird transect out GAK16 (a dead whale was found nearby), returned to retrieve the drifting trap at 18:30, then the ship transited toward PWS.

Sept 15 – Day7 – Day work began with a dry CTD cast at ~8:00 at MS4, followed by casts at MS3, MS1 and finally at MS2 where bottles were tripped and a Calvet net taken, ending the line at ~10:00. A dry CTD was taken at KIP0, then we began the Icy Bay line at ~13:00 starting at IB2

and working inward to complete IBO at ~16:30 with 2 Calvets. We repositioned at KIP2 to begin night work at 21:30, working Methots and Multinets north ending at PWS3 at ~04:30. We returned to PWS2 to set a sediment trap at ~06:30 then headed back toward PWS3.

Sept 16 – Day8 – Day work began at 08:30 with a CTD followed by a Calvet at PWS3. We began intensive sampling at PWS2 with a production cast at ~10:30. Two Calvets, 2 more CTD casts and a pair of vertical multinets followed. An extra deep cast was taken for educational material, wrapping up all PWS2 activities at ~16:30. We sampled south hitting PWS1 and KIP2, ending there at 20:30. We anchored for the night and picked up the sediment trap near PWS2 at ~6:30.

Sept 17 – Day 9 – Being ahead of schedule and with poor weather in the Gulf, we headed north into College Fjord to explore. We left for Seward late afternoon.

Sept 18 – Day 10 – We arrive in Seward ~06:00. The day was spent offloading of *Tiglax*, and organizing those items left to overwinter in the SMC warehouse. Some of the science party headed to catch flights to the LTER ASM meeting late morning.

Sept 19 – Day 11 – The remaining science party disembarked *Tiglax* after breakfast, and she moved to the Railway dock to offload the winch and Connex. Packing of UHaul was completed and most of the science party was either underway for the ASM meeting or back to Fairbanks.

General Comment: *This cruise had generally workable weather.*

Physics Report:

PI: Seth Danielson, Participant: Isaac Reister

On this cruise we conducted 45 casts for water column hydrography at 38 stations (Figure 1) using a 15 x 6 liter bottle rosette. Bottle trips were made at standard levels: 0, 10, 20, 30, 40, 50, 75, 100, 125, 150, 200, 250, 500, 750, and 1000 m depths and within 5 m of the bottom when the bottom depth was less than 1000 m. The SBE9-11 CTD was outfitted with pressure, dual temperature, dual conductivity and dual oxygen sensors. Ancillary sensors included a WetLabs fluorometer, a WetLabs C-Star transmissometer, a Biospherical PAR sensor, and a Benthos altimeter. One channel was assigned to a self-logging Sequoia LISST particle size spectra instrument; one channel provided power to a self-logging SUNA nitrate sensor. The CTD stations were occupied on one shelf transect: the Seward Line (Figure 2) plus additional stations in Prince William Sound and Resurrection Bay.

Underway data from this cruise were collected by a SBE-21 thermosalinograph (temperature, salinity and chlorophyll a fluorescence) and a portable meteorological datalogger that recorded wind speed and direction (relative to the ship), air temperature, air pressure and air humidity, and solar radiation. Underway acoustic data was collected with an uncalibrated EK60 acoustics system operating at 38 and 120 Hz.

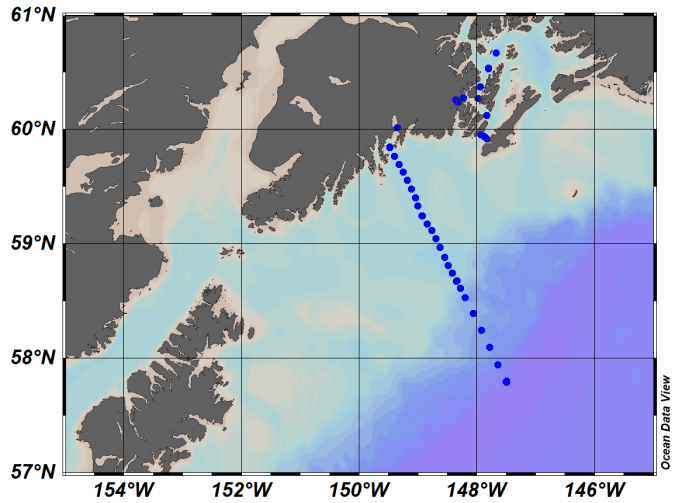

Figure 2. *TGX2022-09 CTD Stations*

Relative to the past 25 years of September Seward Line occupations, the upper 100m of the 2022 Seward Line water column was cooler by ~0.27 °C. Underway data (Fig. 3) revealed surface waters were much fresher in PWS and within the ACC (as is typical for September). The hydrographic section along the Seward Line (Fig, 4) showed a well-developed ACC with surface waters below a salinity of 32 extending across the entire line. Near-surface stratification (primarily driven by temperature) was most intense offshore and likely contributed to the subsurface chlorophyll maximum observed in offshore waters. Satellite data (Fig. 5) showed a stationary cyclonic eddy just east of the Seward Line and that chlorophyll increased during our sampling window, suggesting the presence of an NGA fall bloom.

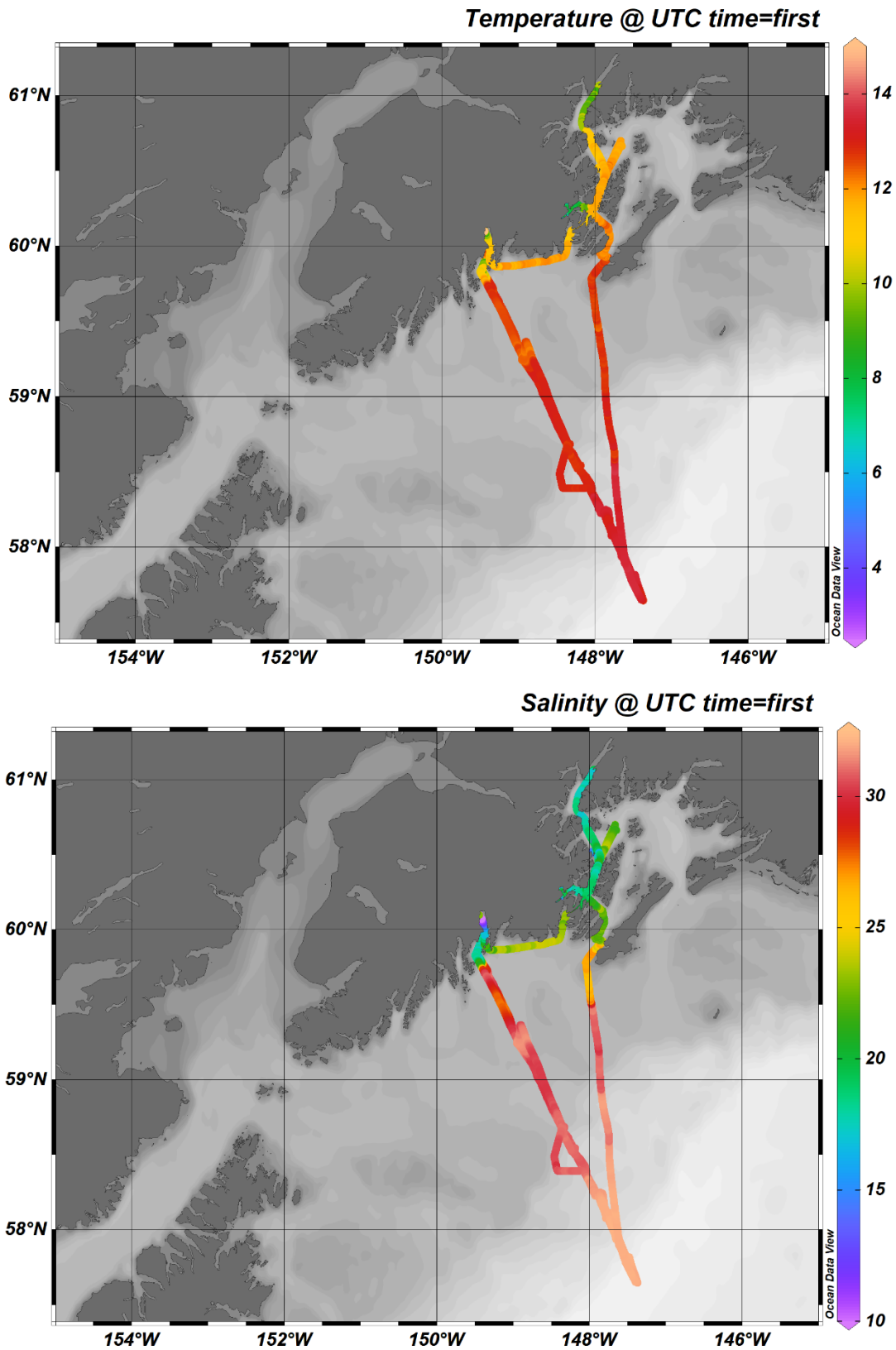

Figure 3. *Underway temperature and salinity from Fall 2022 (TGX2022-09)*

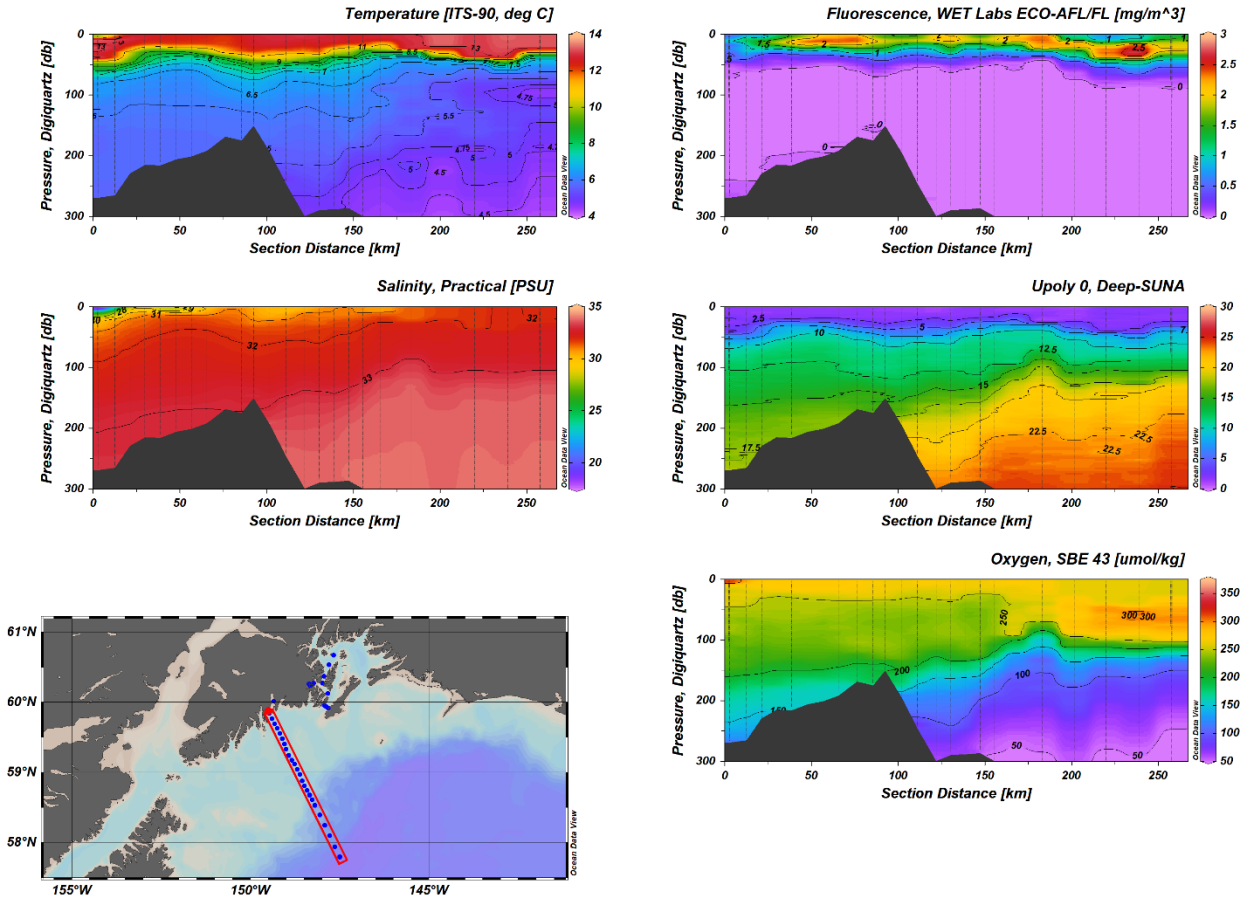

Figure 4. *Seward Line transect physical hydrography from TGX2022-09.*

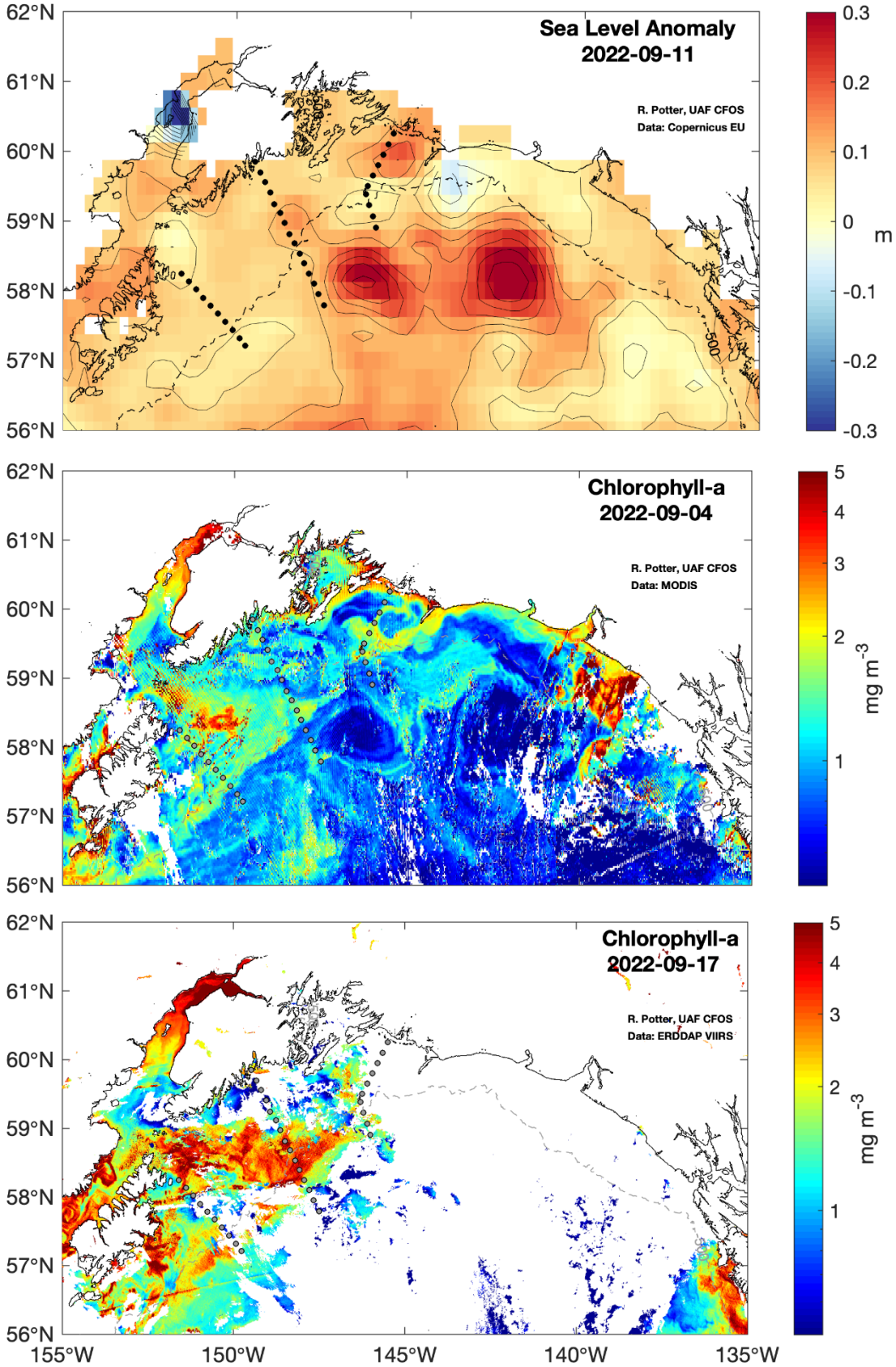

Figure 5. *Satellite images from middle, before and end of the cruise.*

Macro- and Micronutrient sample collection and processing

PI: Ana M. Aguilar-Islas
Participants: Emily Ortega, Sydney Wilkinson

Sample collection and processing for macronutrient analysis:
Filtered seawater samples were collected from 24 vertical profiles (see Table 1) from surface to 1000 m using the regular CTD rosette bottles. Samples were filtered through Whatman GF/F filter disks using a syringe, then were frozen (-80 ^{o}C) following collection. Additional samples were collected from 5 CTD cast dedicated to primary production experiments. Sydney Wilkinson was responsible for most of the sampling with some help with Emily Ortega and members of the Strom team. In total 334 samples were collected for nutrient analysis.

Sample collection for iron analysis:
Surface seawater samples were collected underway from 16 stations and in between stations (see Table 2). These samples were obtained from a custom-made surface sampler (IronFish) deployed from the starboard crane and kept at a distance of ~5 m from the hull of the ship. Emily Ortega and Sydney Wilkinson were involved in deck operations, with assistance from the *Tiglax* crew.

Sample processing for iron analysis:
Samples for the analysis of Fe parameters were collected inside a trace metal clean container secured onto the upper aft deck. The laboratory space inside the container is supplied with HEPA filtered air and maintained at positive pressure to prevent dust and other contaminants from entering the enclosure. In general samples were collected just prior to arriving at a station (2 samples were collected while departing station) and in between stations. Table 2 lists the various samples collected for Fe parameters. Filtered subsamples were filtered through 0.2 um Suppor filter cartridges (Acropak 200) using trace metal clean techniques. Emily Ortega was responsible for all sample collection.

Table 1. Nutrient Sample Collection

Station	Date	# of samples	Station	Date	# of samples
Res 2.5	9/10/22	10	GAK12	9/13/22	15
GAK1	9/10/22	12	GAK13	9/13/22	15
GAK2	9/10/22	11	GAK14	9/13/22	15
GAK3	9/10/22	12	GAK15	9/13/22	15
GAK4	9/10/22	11	MS2	9/14/22	15
GAK5	9/11/22	11	PWS1	9/16/22	13
GAK6	9/11/22	10	PWS2	9/16/22	14
GAK7	9/11/22	12	PWS3	9/16/22	14
GAK8	9/11/22	13	IB0	9/15/22	13
GAK9	9/12/22	13	IB1	9/15/22	10
GAK10	9/12/22	15	IB2	9/15/22	10
GAK11	9/12/22	15	KIP2	9/16/22	14
			Prod		**30**
				Total	**334**

Table 2. Samples for iron parameters

Station	Date	DFe	TDFe	SFe	Ligands	PFe	Notes
GAK1	9/10/22	1	1		1		
GAK1i	9/10/22	**1**	**1**				
GAK2	9/10/22	1	1		1		
GAK2i	9/10/22	**1**	**1**				
GAK3	9/10/22	1	1		1		
GAK3i	9/10/22	**1**	**1**				
GAK4	9/10/22	1	1		1		
GAK4i	9/10/22	**1**	**1**				
GAK5	9/10/22	**1**	**1**		**1**		
GAK5i	9/11/22	**1**	**1**				
GAK6	9/11/22	**1**	**1**		**1**		
GAK6i	9/11/22	**1**	**1**				
GAK7	9/11/22	**1**	**1**		**1**		
GAK7i	9/11/22	**1**	**1**				
GAK8	9/11/22	**1**	**1**		**1**		
GAK8i	9/11/22	**1**	**1**				
GAK9	9/11/22	**1**	**1**		**1**		
GAK9i	9/12/22	**1**	**1**				
GAK10	9/12/22	**1**	**1**		**1**		
GAK10-11	9/12/22	1	1				
GAK10-11	9/12/22	**1**	**1**				
GAK11	9/12/22	1	1		1		
GAK11-12	9/12/22	**1**	**1**				
GAK11-12	9/12/22	1	1				
GAK12	9/12/22	1	1		1		
GAK12-13	9/13/22	**1**	**1**				
GAK12-13	9/13/22	1	1				
GAK13	9/13/22	1	1		1		
GAK13-14	9/13/22	1	1				
GAK13-14	9/13/22	**1**	**1**				
GAK14	9/13/22	1	1		1		
GAK14-15	9/13/22	**1**	**1**				
GAK14-15	9/13/22	1	1				
GAK15	9/13/22	1	1		1		
PWS2	9/16/22	1	1		1		
Total		**35**	**35**		**16**		

DFe = dissolved iron (< 0.2 um), TDFe = total dissolvable iron (unfiltered),
SFe = soluble Fe (< 0.02 um), PFe = particulate iron (> 0.2 um)

General Notes

The deck crew provided excellent support, and their help ensured the success of our Fefish deployment and recovery activities. In general, the crew was helpful responding promptly to changes in sampling needs and/or weather conditions. Communication via handheld radio was essential to the trace metal sampling effort. We experienced no issues with ship's facilities needed for macro- and micronutrient work. The ship's deck gear was in good working condition. Meals provided by the ship's cook were delicious. We thank Ethan Roth for his essential work on the electrical wiring of the trace metal clean container prior to sailing. We also thank the Seward Marine Center, especially Brian Mullaly and Jennifer Elhard for their hard work and above-and-beyond assistance handling the container loading and unloading onto and off the *Tiglax*.

Carbonate Chemistry

PI: Claudine Hauri, Participant: Addie Norgaard

Filtered dissolved inorganic carbon, total alkalinity and pH samples were collected at specific stations along the Seward Line and in Prince William Sound. Samples were filtered with a 0.45 micron cartridge filter using a peristaltic pump to remove particulate material. Triplicates were taken at GAK1, GAK3, GAK5, GAK9, IB1, and PWS2. In total 172 samples were collected.

Station	Number of samples
GAK1	15
GAK2	9
GAK3	12
GAK4	10
GAK5	11
GAK6	9
GAK7	12
GAK9	13
GAK15	13
PWS2	15
IB0	11
IB1	11
IB2	9
RES2.5	11
MS2	11
	172

Dissolved Oxygen

Participant: Tom Kelly

A total of 14 samples were taken prioritizing waters across a range of oxygen concentrations (i.e., 19 - 302 μM). Samples where titrated on board with a replicate precision of approximately 1 μM across all concentrations. Discrete oxygen samples will be used to verify/correct the calibration of the single oxygen sensor on the CTD package after the cruise.

Particles & Biogeochemistry

PI: Thomas Kelly, UAF

Optical Instruments

A laser in situ scatterometer and transmissometer (Sequoia LISST-200x V2) was attached to the CTD rosette frame during each cast. This instrument measures particle abundance and size spectra using optical backscatter and assesses particles between 2.5 – 500 µm across 32 size classes. The LISST-DEEP was housed in a custom steel frame attached to the bottom of the rosette riser.

Surface Tethered Sediment Trap

Five (5) deployments of the surface-tethered sediment trap arrays were completed. Deployments lasted for 24-34 hours with traps released at GAK5, GAK9, GAK12, GAK15, and PWS2. Each array was outfitted with 1 cross-frame placed at 40 m and 10 pounds of ballast weight. Four collection tubes allowed for sub-sampling of sinking matter for pigments (Chl-a, phaeopigments; n = 32) and size-fractionated (i.e., >200 um and <200 um) carbon and nitrogen abundance and isotopic composition (POC, PON, PIC; n = 40). All samples were microscopically sorted for zooplankton taxa (i.e., swimmers) under a dissecting microscope.

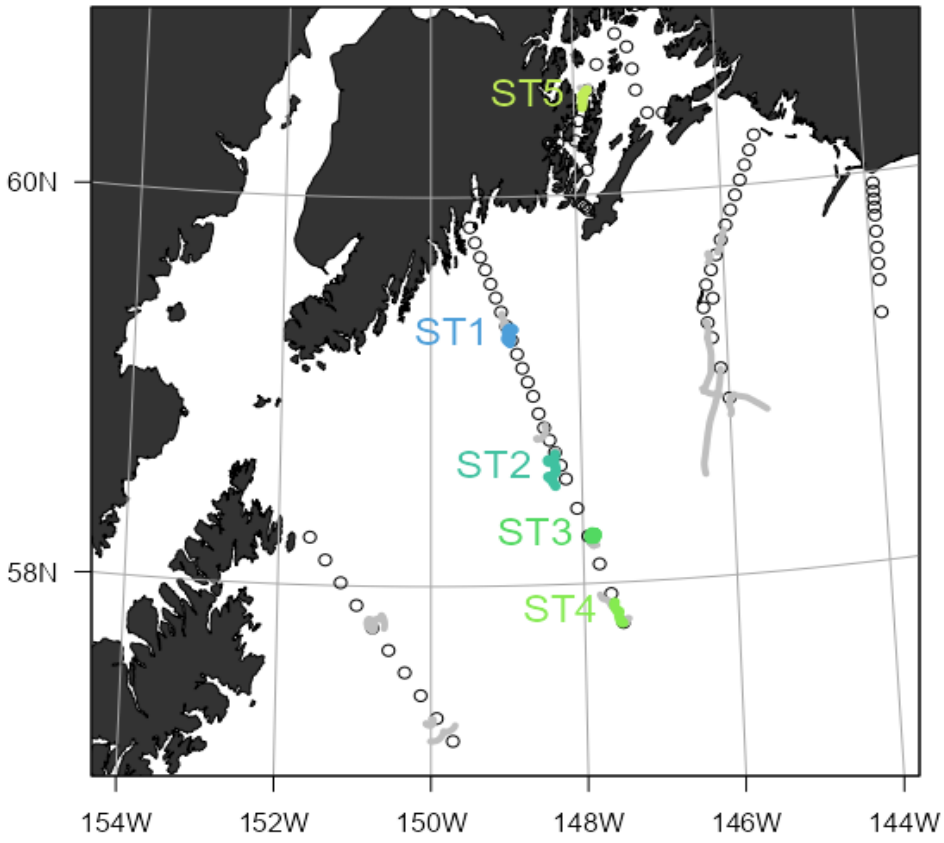

Figure 6. *Map of drifting sediment trap positions for TGX202209 (colored and labeled) and all prior deployments (grey). Note deployment in PWS.*

Phytoplankton and Microzooplankton

PI: Suzanne Strom
Participants: Kerri Fredrickson, Kelley Bright (WWU)

Rate and State Measurements:
Of the three standard LTER transect lines, only the GAK line was sampled in its entirety, as well as RES2.5 and eight stations in Prince William Sound. In total five intensive stations were sampled spanning the PWS-to-offshore gradient (gray shaded rows in sampling table).

Phytoplankton biomass and production: Phytoplankton biomass was characterized by size-fractionated (>20 µm, <20 µm) chlorophyll at all non-intermediate shelf stations, all Prince William Sound stations, and RES 2.5. Except for Icy Bay and RES2.5, additional sampling was conducted at 3 depths to determine the fraction of chl-a in the <3 µm size fraction. Samples were analyzed fluorimetrically on board. Primary production estimates were made at all intensive stations using the 13-C method and 24-h deck incubations. Six 'light depths' were sampled per station based on the attenuation coefficient as estimated from the CTD PAR profile. Total chlorophyll and nutrient samples were also taken from each light depth during experiment set-up.

Community characterization: Samples were fixed in acid Lugol's for standard microzooplankton biomass and composition estimates; these were taken from 10 m only at most stations and from 4 depths at intensive stations. Where 10m Lugol's samples were taken, samples were also fixed in borate-buffered formalin for diatom characterization. Paraformaldehyde-fixed samples were also collected at all but RES2.5 and Icy Bay stations for flow cytometric assessment of the *Synechococcus*, nano- and picoplankton communities. Samples for HPLC analysis of phytoplankton pigments (chemotaxonomy) were taken from 10 m at all intensive stations as well as additional stations to give ~20 nautical mile horizontal resolution. Also at intensive stations, samples were taken from 10 m (in duplicate) for molecular (18S rRNA) characterization of the protist community by the Rynearson laboratory at URI.

Organic carbon characterization: Samples for DOC analysis were filtered and frozen at all intensive stations (total profiles =5); depths sampled were mainly 150 m and above except in the deep intensive casts, and corresponded to nutrient sampling depths (8-11 depths per profile). At intensive stations only, 4 depths were sampled for POC and PIC (total profiles = 5).

Preliminary observations:
The cruise began immediately following a substantial storm that moved through the NGA. Weather was generally cool and cloudy with considerable swell along the GAK line, before turning calm and partly cloudy as we transited to PWS. At GAK-5 and beyond, mostly small cells were present; cells >20 µm made up 15-40% of total chl-a at the inner shelf stations and PWS (Fig. 7).

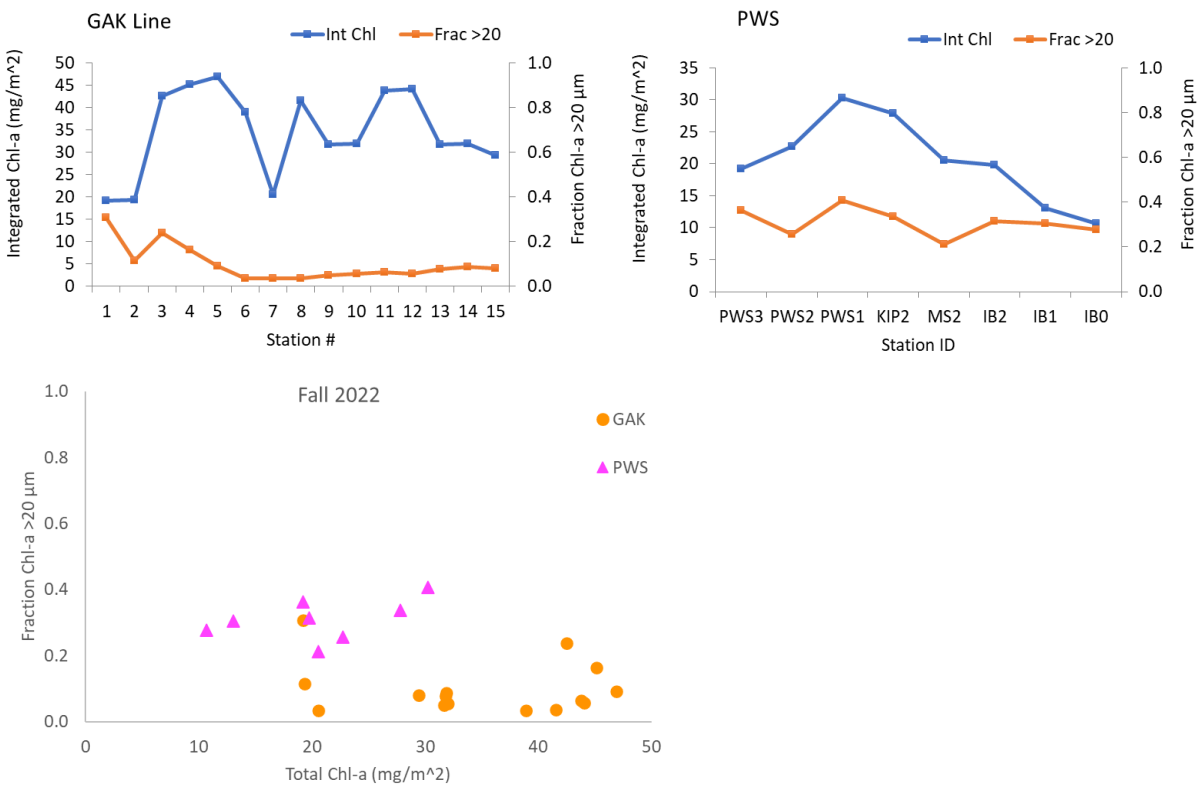

Figure 7. *Integrated chl-a biomass (blue lines, mg m^{-2}, integrated to 75 m) and fraction of total chl-a in the >20 µm size class (orange lines) for stations on the Seward (GAK) line and in PWS during September 2022. Note higher integrated chl-a on the Seward Line relative to PWS. Lower left plot shows fraction of chl-a in large (>20 µm) cells versus total integrated chl-a for all stations*.

Education and outreach, misc. sampling:
Sleeper Shark eDNA samples were collected at RES2.5 and GAK-7 for Jessica Glass, UAF. Samples were collected in triplicate at 250, 200, 150 and 100 m, plus a negative control (bottled water) from each station. Samples were collected on sterile filters and preserved in Longmire's solution for transport to UAF.

In conjunction with a series of plankton activities planned later this fall, samples were collected for Sheryl Sotelo, Chugach School District. Niskin surface and 10 m samples were collected in triplicate at PWS-1 and preserved in Lugol's solution. Near-surface samples in PWS were requested, pairing closest with what student may encounter in their local waters.

On the afternoon of September 18, Kerri provided a tour of the R/V *Tiglax* to Shana Kent and Rebeca Irigoyen, education specialists with the Alaska SeaLife Center. Future collaborations between the SeaLife Center and the NGA LTER were discussed.

Table 3. Sampling effort for Strom component, by station. Intensive stations are highlighted

Station	SF Chl	Lugols µzoo	Diatom	FC	HPLC	Euk Mol	DOC	POC/ PIC	13C prod	Shark eDNA
RES2.5	x									x
PWS1	xx			x						
PWS2	xx	x	x	x	x	x	x	x	x	
PWS3	xx			x						
KIP2	xx			x	x					
IB0	x									
IB1	x									
IB2	x									
MS2	xx	x	x	x						
GAK1	x	x	x	x	x	x	x	x	x	
GAK2	x			x						
GAK3	x	x	x	x	x					
GAK4	x			x						
GAK5	x	x	x	x	x	x	x	x	x	
GAK6	x			x						
GAK7	x	x	x	x	x					x
GAK8	x			x						
GAK9	x	x	x	x	x	x	x	x	x	
GAK10	x			x						
GAK11	x	x	x	x	x					
GAK12	x			x						
GAK13	x	x	x	x	x					
GAK14	x			x						
GAK15	x	x	x	x	x	x	x	x	x	
Total #	**24**	**10**	**10**	**20**	**10**	**5**	**5**	**5**	**5**	**2**

Table Key:

SF Chl: size-fractionated chlorophyll-a; water sample filtered in series through a 20 µm pre-size filter followed by a glass fiber filter (effective pore size 0.7 µm). For stations marked 'xx', additional size fractionation was done at 0, 10 and 20 m to determine the picophytoplankton (<3 µm) size fraction using in series filtration through a 3 µm pore-size filter followed by a glass fiber filter.

Lugol's µzoo: water sample preserved in acid Lugol's iodine solution (final concentration 5%) for microscopy analysis of size and composition of ciliate and dinoflagellate microzooplankton (cells ≥15 µm). Samples collected from 10 m except at intensive stations, where a depth profile (10, 20, 30, 50 m) was collected.

Diatom: water sample preserved in borate-buffered formalin (final concentration 2%) for microscopy analysis of diatom community. Sample collected from 10 m.

Nano/Pico: water samples fixed in glutaraldehyde (final concentration 0.5%), filtered onto a 0.8 µm polycarbonate filter, slide mounted and frozen for later analysis. Three depths sampled (0 and 10m, chl max or 30 m).

FC: flow cytometer samples preserved with paraformaldehyde, flash frozen in liquid nitrogen and then stored frozen for analysis. 4 depths sampled per station: 0, 10, 20 and 30 m. Flow cytometry of live samples was also conducted on board in nearly every case.

DOC: water sample filtered directly from Niskin through in-line pre-combusted glass fiber filter and filtrate stored frozen for analysis of dissolved organic carbon concentration.

HPLC: water sample filtered (glass fiber, 0.7 µm) and frozen in liquid N2 for HPLC analysis of phytoplankton pigments (chemotaxonomy). All samples from 10 m. Samples for HPLC pigment analysis were also obtained from several sediment trap deployments.

Euk Mol: water sample filtered (0.2 µm), placed into 0.8 ml Zymo DNA/RNA shield, and frozen (-80°C) for molecular analysis of eukaryotic microbial community composition. All samples from 10 m, in duplicate..

POC/PIC: Paired samples from a single Niskin filtered through pre-combusted glass fiber filters and filters stored frozen for analysis of particulate organic and particulate inorganic carbon. Filtered volume was increased on this cruise to 2.3 L per sample for all but high chlorophyll depths/stations.

13C Prod: water column primary productivity measured via 24-h incubation of samples from 6 different depths with 13C-labeled sodium bicarbonate. For this cruise, all primary productivity assays were conducted in duplicate. The first set of 6 bottles was filtered directly onto a GFF filter. The second set of 6 bottles was filtered through a 3 µm, 47 mm polycarbonate filter before capture on a GFF for determination of primary production in the picoplankton size class.

Shark eDNA: water samples collected in triplicate sterile 1L Whirl-Pak bags at 100, 150, 200 and 250 m. Samples were filtered onto 0.47 µm nitrocellulose filters and preserved in Longmire's solution for analysis of sleeper shark eDNA.

Microbes & Genetics

PI: Hennon, Participant: Sierra Llyod

On the Fall 2021 *Tiglax* cruise, sampling was conducted for flow cytometry and microbial genetics at each sampled station. This consisted of the Middleton and Seward Lines, as well as within Prince William Sound. The Kodiak Line was not sampled due to weather limitations. At each station sampled, with the exception of intermediate "i" stations and Montague Strait, water samples were taken at the surface, 10 meters, and the bottom. One milliliter of seawater was taken from each container and fixed with glutaraldehyde for flow cytometry. This will allow for counts of small cells in the water column to be conducted, with samples gated for picoeukaryotes, nanoeukaryotes, heterotrophic bacteria, *Synechococcus* and cryptophytes. Each water sample was also run through a 0.22 µm Sterivex filter in order for DNA analysis to be conducted. Each Sterivex filter had between one and five liters of water run through it. All DNA obtained will be extracted, PCR amplified for both 16S and 18S, and sequenced at the CORE lab at UAF. In total, 110 samples were collected over the course of the Fall cruise for both flow cytometry and DNA analysis. This data, combined with that collected on other years, will allow for a better understanding of how phytoplankton community structure responds to environmental variability.

<u>Sample collection at the NGA-LTER stations:</u>

At all regular and intensive stations, four depths were sampled for DNA and flow cytometry (Table 4). We used a quasi-adaptive sampling scheme for the four depths at which DNA and FCM samples were collected, with two fixed depths and two depths that were chosen based on downcast CTD features. We sampled the surface and 10 m for the fixed depths. We sampled the deep chlorophyll max (DCM) when present or a depth corresponding to the pycnocline if the DCM was absent. The DCM varied in depth, sitting at ~10- 25 m depending on the station. For the final depth, we sampled the bottom (~5 m above the seafloor) or oxygen minimum if it did not coincide

with the bottom of the profile. Typically, the oxygen minimum of the profile coincided with the bottom depth over the shelf, but was found at approximately 800-1000m for the deeper stations.

Whole water for DNA samples was collected in 4L acid-clean brown plastic bottles, prefiltered with a 200 μm mesh screen to remove mesozooplankton, filtered on a 0.2 μm sterivex filter, and stored at -80°C. The volumes filtered for each DNA sample were variable according to the biomass present in the water and were recorded for each filter, ranging from 0.5 – 4 L.

Flow cytometry (FCM) samples were collected from the same 4L bottles as the DNA samples, 1mL of whole seawater was removed and fixed with 20 μL of 25% glutaraldehyde and incubated for 10 min in the dark. The FCM samples were then flash frozen in liquid nitrogen and stored at -80°C.

Table 4: Summary of Genetic and FCM samples.

Station	DNA	FCM
Res2.5	4	4
GAK1	4	4
GAK2	4	4
GAK3	4	4
GAK4	4	4
GAK5	4	4
GAK6	4	4
GAK7	4	4
GAK8	4	4
GAK9	4	4
GAK10	4	4
GAK11	4	4
GAK12	4	4

Station	DNA	FCM
GAK13	4	4
GAK14	4	4
GAK15	4	4
MS2	4	4
IB2	4	4
IB1	4	4
IB0	4	4
PWS1	4	4
PWS2	4	4
PWS3	4	4
KIP2	4	4
Totals:	96	96

Meso/Macro Zooplankton

PI: Russ Hopcroft, Participants: Emily Stidham, Hannah Kepner, Alex Poje, Alex Knobloch

Zooplankton sampling operations were divided into distinct day and night activities. During daytime, Quadnets/Calvets (Quad frame has 4 nets, 2 of 150 µm mesh and 2 of 53 µm mesh) casts were conducted with the underwire winch on the starboard crane at all stations (except "i" stations) to 100 m depth. At intensive stations, an additional Quadnet cast was taken, with the 150 µm net preserved in ethanol for molecular studies and the 53µm nets used for live sorting to note general community composition. Additionally, at intensive stations along the Seward Line and at PWS2, a Multinet equipped with 150 µm mesh nets was deployed vertically to 200 m (shelf) with a second cast deployed to 750 m (PWS2) dividing strata at 600, 400, 300, 200,100, 60, 40, and 20 m. A Deep Multinet was also deployed at GAK15 to 1200 m dividing strata at 600, 400, 300, 200,100, 60, 40, and 20 m, with a second net run for live sorting.

During night-time, a Multinet equipped with 505 µm-mesh nets was towed obliquely to 200 m depth (or 5 m above the bottom) dividing strata at 100, 60, 40, and 20 m. A second collection was made at Intensive stations and preserved in Ethanol for molecular analysis.

Overall, day live samples were typical of fall: *Pseudocalanus* and a mixture of *Calanus* species. Notes: *Oikopleura dioica* was present at GAK1, *Neocalanus cristatus* C5 was still present in surface waters at GAK15. Many *Pseudocalanus* were present at GAK15 suggesting stronger offshelf transport. PWS surface waters had relatively low zooplankton abundances.

Table 5. Sampling effort for Zooplankton. Intensive stations highlighted. *samples taken for bulk genetics, sorting or imaging.

Station	Calvet-Quad	Multi Vert.	Multi Tow
RES2.5	x		
GAK1	X*	x	x
GAK2	x		x
GAK3	x		x
GAK4	x		x
GAK5	X*	x	x
GAK6	x		x
GAK7	x		x
GAK8	x		x
GAK9	X*	x	x
GAK10	x		x
GAK11	x		x
GAK12	x		x
GAK13	x		x
GAK14	x		x
GAK15	x	X*	x
MS2	x		
KIP2	x		x
PWS1	x		x
PWS2	X*	X*	X
PWS3	x		x
IB0	X*		
IB1	x		
IB2	x		
TOTAL	**24**	**5**	**19**

PI: Petra H. Lenz & Russ Hopcroft. Participant: (Hopcroft)

Project Goals: *Neocalanus* emergence from diapause, *Neocalanus* preparation for diapause (NSF project - UHM & UAF; PIs: Lenz, Hopcroft, and Hartline) – transcriptional profiling of individuals in the genus *Neocalanus* in the CV and adult stage. 2022 marks the 8th year of collection of *Neocalanus flemingeri* from our PWS2 station.

Research Activities:

- *N. flemingeri* were sorted from 400-600 m at PWS2 for transcriptomics.
- Diapausing *N. plumchrus* from Gak15 and *N. flemingeri* from PWS2 were imaged for size and lipid sac volume.

Marine bird and marine mammal surveys (USFWS)

PIs: Elizabeth Labunski and Robert Kaler, U.S. Fish and Wildlife Service, principal investigators
Observer: Dan Cushing, Pole Star Ecological Research LLC, onboard observer and report author

Background

We conducted marine bird and marine mammal surveys in the Northern Gulf of Alaska (NGA), September 9 to 18, 2022, aboard the 37-m R/V *Tiglax*, as a component of the NGA Long-term Ecological Research / Seward Line (NGA-LTER) cruise lead by chief scientist Russell Hopcroft of the University of Alaska Fairbanks. The seabird component is primarily funded by the North Pacific Research Board (Project L37) and the *Exxon Valdez* Trustee Council (Project 20120114-M). Station-based sampling was conducted along the Seward Line and in Prince William Sound (PWS). Seabird and marine mammal surveys were conducted when the vessel was underway, including transits between sampling stations and sampling lines.

Methods

Observer D. Cushing conducted visual surveys during daylight hours while the vessel was underway. Surveys were conducted from the flying bridge, using a modified line-transect protocol. The observer searched an area within a 300m, 90° arc from the bow to the beam, using hand-held 10x binoculars when necessary. Observations were recorded using four distance bins: 0–50m, 51–100m, 101–200m, and 201–300m. Observations of rare birds or large flocks, or marine mammals observed outside of the sampling window were recorded as “off-transect”. Observations were recorded directly into a laptop computer using software Dlogv3 (R.G. Ford Consulting, Portland, OR) which logged the geographic coordinates of each sighting, as well as the track line and environmental conditions (Beaufort Sea state, weather, glare, ice coverage) at 20 sec intervals. Data were processed by subdividing survey transects into 3-km segments to calculate density (birds km^{-2}) for each taxon in each transect segment.

Preliminary Results

We conducted a total of 702 linear km of surveys during the September 2022 cruise (Fig. 8). On-transect, we observed a total of 674 individuals of 27 species of birds, with an additional 19 species observed off-transect (Table 1). Averaged across all 3-km transect segments, the mean density of total birds (all bird species combined) was 3.5 birds km^{-2}. Densities of birds along the Seward Line were variable, with areas of higher and lower density. In PWS, densities were low in most surveyed locations, with areas of higher density in Montague Strait and Icy Bay (Fig. 9).

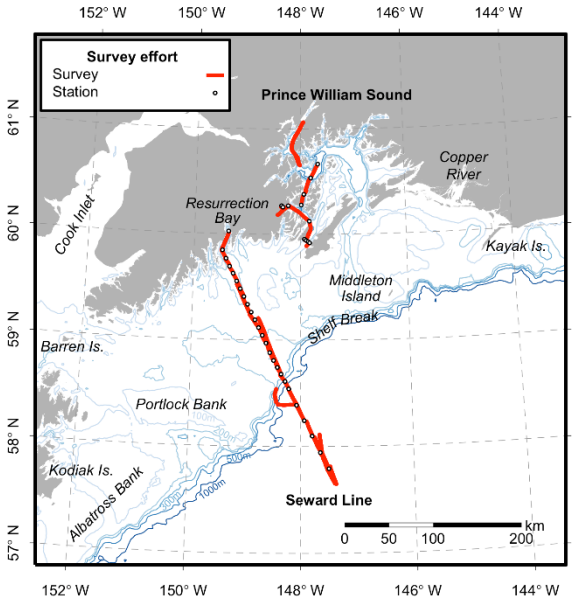

Figure 8. Location of seabird and marine mammal surveys (red).

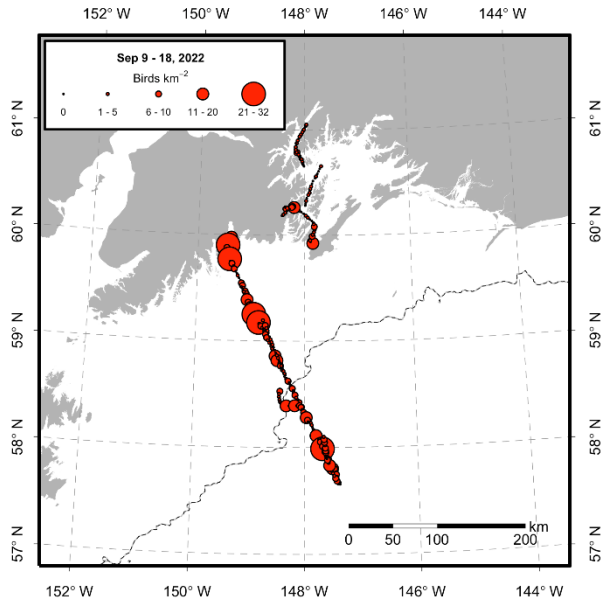

Figure 9. Densities (birds km^{-2}) of total seabirds (all species combined).

Compared to other fall surveys of Seward Line from GAK1–GAK13 during 2006–2021 (the longest available time-series), the average density of total birds was 4.1 birds km^{-2}, which was 21% below the long-term mean. The average density of total alcids (murres, puffins, murrelets, auklets; 1.1 birds km^{-2}) was close to the 2006–2022 mean, while the average density of total larids (gulls and terns; 0.2 birds km^{-2}) and total tubenoses (albatrosses, storm-petrels, fulmars, shearwaters; 2.2 birds km^{-2}) were both below average. Three dead birds were observed during the cruise; a rhinoceros auklet, an unidentified alcid, and an unidentified short-tailed or sooty shearwater. One fork-tailed storm-petrel was found on the deck of ship during night operations, and was released.

Fork-tailed storm petrels were the most abundant avian species observed on transect (14.1% of total; Table 6). Storm-petrels were widely distributed, with the largest aggregations occurring over the middle shelf and the continental slope (Fig. 10). The second most abundant bird was the tufted puffin (13.9% of total). This continues a pattern of relatively high abundance of tufted puffins along the Seward Line during September in most years since 2018, which contrasts with low abundance of puffins during recent spring cruises. The highest densities of tufted puffins occurred in in the oceanic domain and on the middle shelf, and the lowest densities on the inner shelf and in PWS (Fig. 11).

Black-legged kittiwakes composed 13.5% of sightings. Kittiwakes were primarily concentrated in PWS and in Resurrection Bay, with small numbers also occurring at the offshore end of the Seward Line (Fig. 12). Northern fulmars composed 12.5% of sightings. Fulmars were widely distributed from the middle shelf to the oceanic domain, with few observations on the inner shelf (Fig. 13).

Short-tailed shearwaters composed 9.1% of sightings, while sooty shearwaters composed 5%, and an additional 1.2% of sightings were unidentified short-tailed or sooty shearwaters. In addition, Buller's shearwaters composed 2.1% of sightings. The distributions of the three species of shearwater were interspersed along most of the Seward Line, except that Buller's shearwaters were not observed on the inner shelf (Fig. 14).

Table 6. Marine birds observed during the September 2021 NGA-LTER cruise. Numbers include on-transect observations only. Species only observed off-transect are indicated by an asterisk.

Common Name	Scientific Name	Number	% of total
Canada goose	*Branta canadensis*	*	0.0%
Gadwall	*Mareca strepera*	4	0.6%
American wigeon	*Mareca americana*	*	0.0%
Northern pintail	*Anas acuta*	*	0.0%
Unid. scaup	*Aythya* spp.	*	0.0%
Harlequin duck	*Histrionicus histrionicus*	2	0.3%
Surf scoter	*Melanitta perspicillata*	*	0.0%
White-winged scoter	*Melanitta deglandi*	*	0.0%
Barrow's goldeneye	*Bucephala islandica*	*	0.0%
Red-breasted merganser	*Mergus serrator*	*	0.0%
Horned grebe	*Podiceps auritus*	*	0.0%
Red-necked phalarope	*Phalaropus lobatus*	34	5.0%
Sandhill crane	*Antigone canadensis*	*	0.0%
Pomarine jaeger	*Stercorarius pomarinus*	3	0.4%
Parasitic jaeger	*Stercorarius parasiticus*	3	0.4%
Long-tailed jaeger	*Stercprarois longicaudus*	*	0.0%
Common murre	*Uria aalge*	9	1.3%
Marbled murrelet	*Brachyramphus marmoratus*	2	0.3%
Unid. Brachyramphus murrelet	*Brachyramphus* spp.	1	0.1%
Cassin's auklet	*Ptychoramphus aleuticus*	11	1.6%
Parakeet auklet	*Aethia psittacula*	3	0.4%
Unid. auklet	*Ptychoramphus or Aethia* spp.	1	0.1%
Rhinoceros auklet	*Cerorhinca monocerata*	12	1.8%
Horned puffin	*Fratercula corniculata*	4	0.6%
Tufted puffin	*Fratercula cirrhata*	94	13.9%
Unid. alcid	*Alcidae spp.*	2	0.3%
Black-legged kittiwake	*Rissa tridactyla*	91	13.5%
Short-billed gull	*Larus brachyrhynchus*	13	1.9%
Herring gull	*Larus argentatus*	4	0.6%
Glaucous-winged gull	*Larus glaucescens*	16	2.4%
Red-throated loon	*Gavia stellata*	*	0.0%
Pacific loon	*Gavia pacifica*	1	0.1%
Common loon	*Gavia immer*	*	0.0%
Laysan albatross	*Phoebastria immutabilis*	14	2.1%
Black-footed albatross	*Phoebastria nigripes*	41	6.1%
Short-tailed albatross	*Phoebastria albatrus*	*	0.0%
Fork-tailed storm-petrel	*Oceanodroma furcata*	95	14.1%
Leach's storm-petrel	*Oceanodroma leucorhoa*	9	1.3%
Northern fulmar	*Fulmarus glacialis*	84	12.5%
Buller's shearwater	*Ardenna bulleri*	14	2.1%
Short-tailed shearwater	*Ardenna tenuirostris*	61	9.1%

Sooty shearwater	*Ardenna grisea*	34	5.0%
Short-tailed or sooty shearwater	*Ardenna tenuirostris* or *grisea*	8	1.2%
Pelagic cormorant	*Urile pelagicus*	3	0.4%
Double-crested cormorant	*Nannopterum aurium*	1	0.1%
Northern harrier	*Circus hudsonius*	*	0.0%
Bald eagle	*Haliaeetus leucocephalus*	*	0.0%
American crow	*Corvus brachyrhynchos*	*	0.0%
Black-billed magpie	*Pica hudsonia*	*	0.0%
Unid. passerine	*Passeriformes* spp.	*	0.0%
Total		**674**	**100.0%**

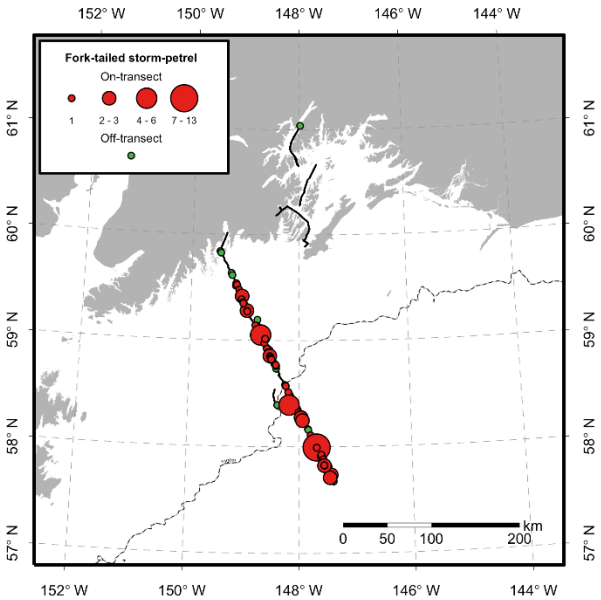

Figure 10. Fork-tailed storm-petrel.

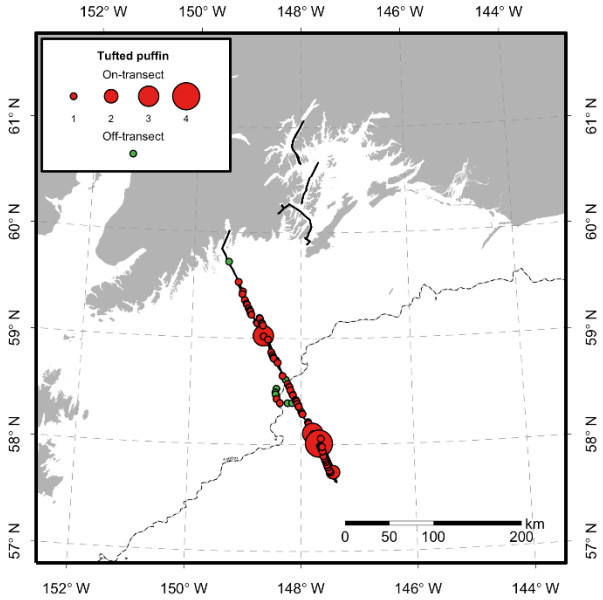

Figure 11. Tufted puffin.

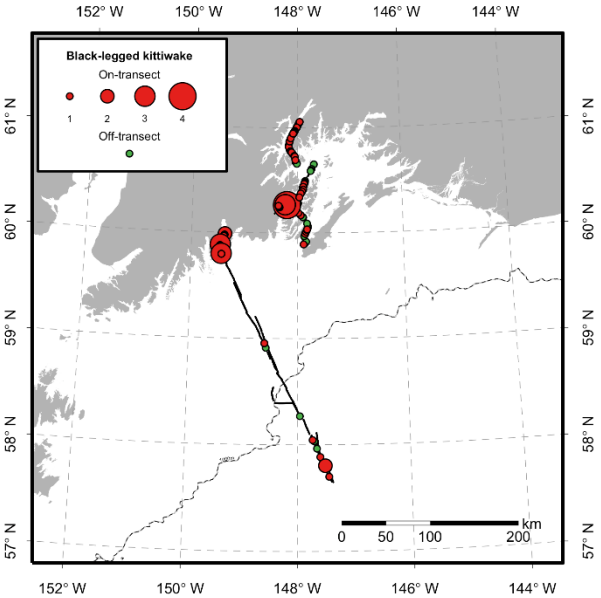

Figure 12. Black-legged kittiwake.

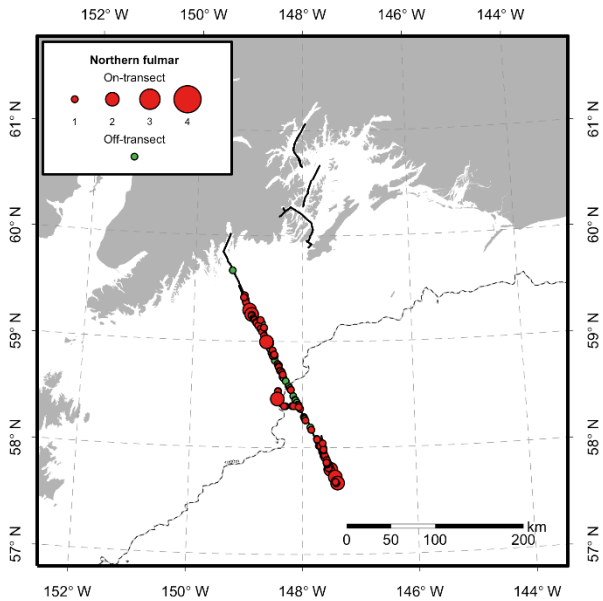

Figure 13. Northern fulmar.

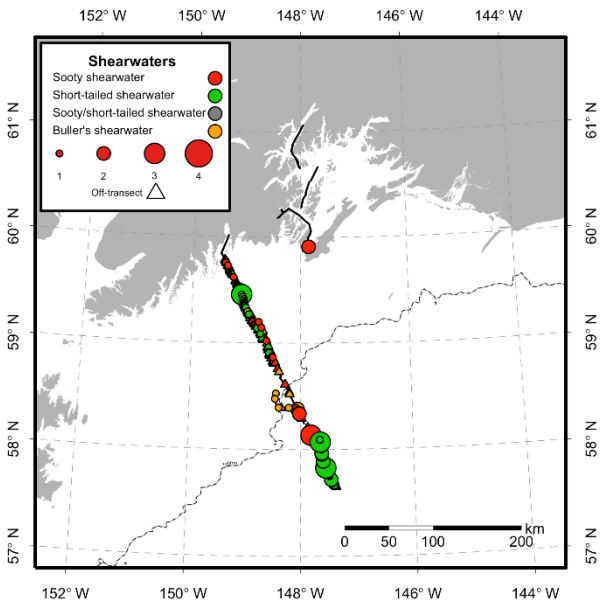

Figure 14. Shearwaters.

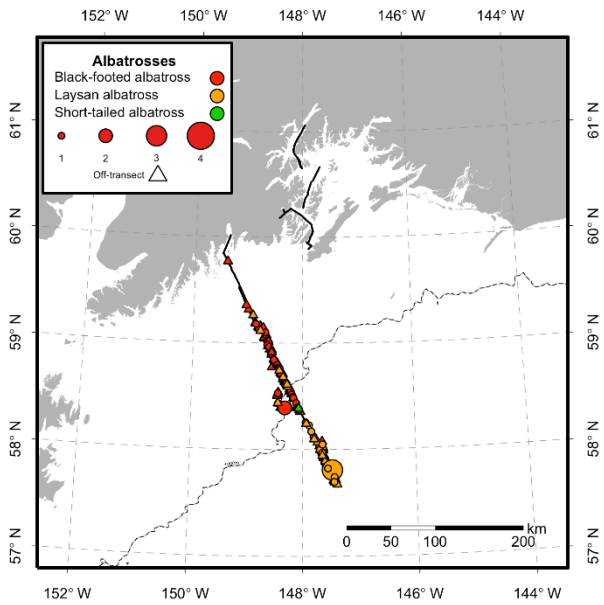

Figure 15. Albatrosses.

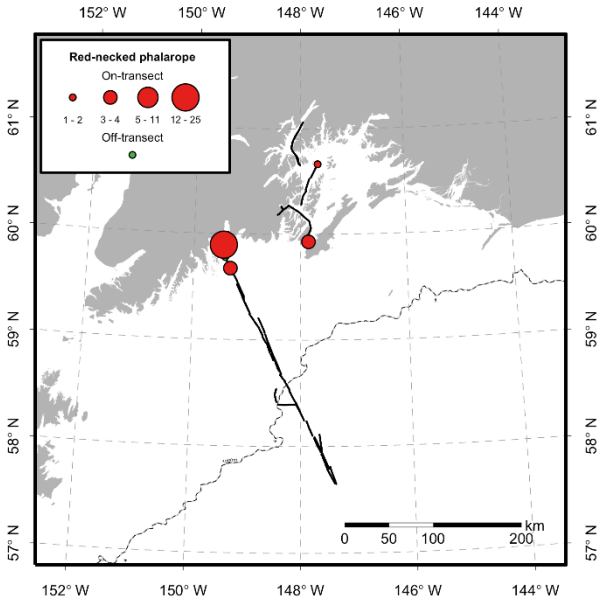

Figure 16. Red-necked phalarope.

Black-footed albatrosses composed 6.1% of sightings, while Laysan albatrosses composed 2.1%. The distributions of the two species differed, with black-footed albatrosses most abundant near the shelf break, while Laysan albatrosses were most abundant farther offshore (Fig. 15). A black-footed albatross with a yellow auxiliary leg band #580 was observed near the ship at both GAK8 and GAK9 on successive days; sighting details were shared with colleagues with the Marine National Monuments of the Pacific. A single immature short-tailed albatross was observed near the shelf-break.

Red-necked phalaropes composed 5% of sightings. They were observed at fronts in Resurrection Bay, PWS, and the inner shelf (Fig. 16).

We observed a total of 6 species of marine mammal (Table 7), with 41 individuals on-transect and 146 off-transect. An unidentified dead cetacean was observed near GAK15. The whale was highly decomposed and was not identifiable, but was a large species such as a sperm or fin whale. The carcass had attracted a foraging aggregation of approximately 300 seabirds, primarily northern fulmars, black-footed and Laysan albatrosses, and fork-tailed storm-petrels.

The most abundant toothed whale (odontocete) species observed during the cruise was the Dall's porpoise, which occurred in PWS, Resurrection Bay, and on the continental slope (Fig. 17). A group of 5 Killer whales were observed in PWS and a single male was observed near the shelf break. The only baleen whale (mysticete) observation during the cruise was a single humpback whale in PWS (Fig. 18). Harbor Seals were the only pinniped observed; most were hauled out on rocks or glacial ice in PWS (Fig. 19). Sea otters and river otters were observed in PWS.

Table 7. Marine mammal species observed during the September 2021 NGA-LTER cruise.

Common name	Scientific name	Number on-transect	Number off-transect
Humpback whale	*Megaptera novaeangliae*	0	1
Killer whale	*Orcinus orca*	1	5
Dall's porpoise	*Phocoenoides dalli*	25	15
Harbor seal	*Phoca vitulina*	1	100
Sea otter	*Enhydra lutris*	12	26
River otter	*Lontra canadensis*	2	0
Total		**41**	**147**

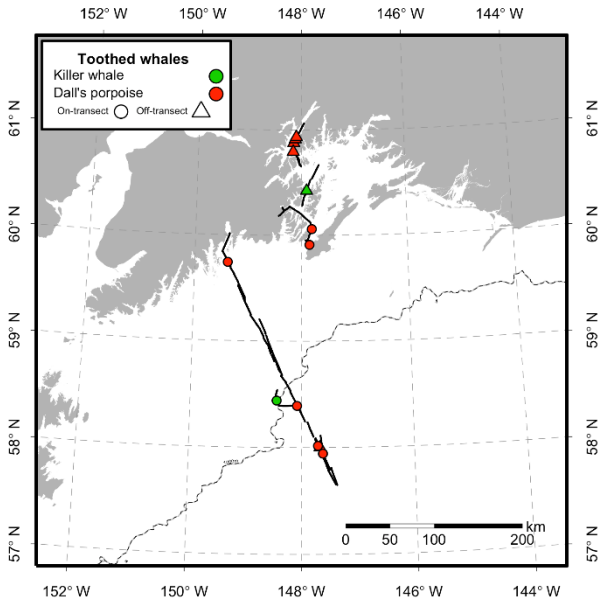

Figure 17. Toothed whales.

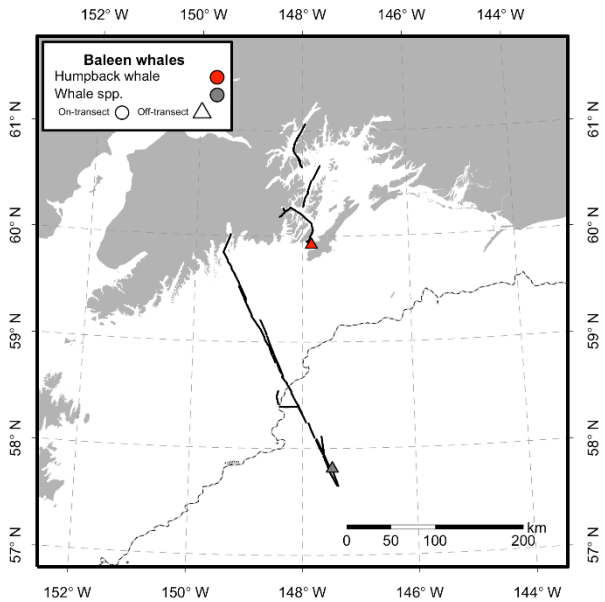

Figure 18. Baleen whales and unidentified whales. The unidentified whale at the offshore end of the Seward Line was dead.

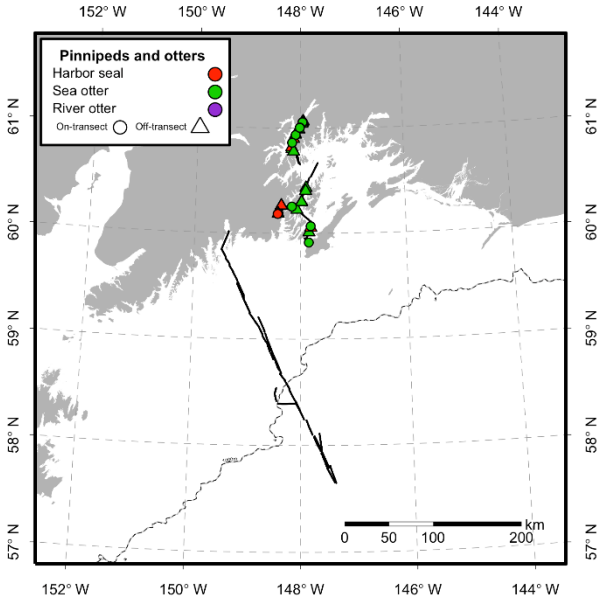

Figure 19. Pinnipeds and otters.

Appendix. STANDARD STATIONS (intensive stations highlighted)

Latitude N (degrees, minutes)		Longitude W (degrees, minutes)		Station Name	Depth
Resurrection Bay Station					
60	1.5	149	21.5	RES2.5	298
Seward Line					
59	50.7	149	28	GAK1	269
59	46	149	23.8	GAK1I	
59	41.5	149	19.6	GAK2	228
59	37.6	149	15.5	GAK2I	
59	33.2	149	11.3	GAK3	213
59	28.9	149	7.1	GAK3I	
59	24.5	149	2.9	GAK4	201
59	20.1	148	58.7	GAK4I	
59	15.7	148	54.5	GAK5	167
59	11.4	148	50.3	GAK5I	
59	7	148	46.2	GAK6	151
59	2.7	148	42	GAK6I	
58	58.3	148	37.8	GAK7	243
58	52.9	148	33.6	GAK7I	
58	48.5	148	29.4	GAK8	288
58	44.6	148	25.2	GAK8I	
58	40.8	148	21	GAK9	276
58	36.7	148	16.7	GAK9I	
58	32.5	148	12.7	GAK10	1459
58	23.3	148	4.3	GAK11	1410
58	14.6	147	56	GAK12	2134
58	5.9	147	47.6	GAK13	2058
57	*56.6*	*147*	*39*	*GAK14*	*3518*
57	*47.5*	*147*	*30*	*GAK15*	*4543*
Prince William Sound Stations					
60	7.5	147	50	KIP0	
60	16.7	147	59.2	KIP2	588
60	22.78	147	56.17	PWS1	248
60	32.1	147	48.2	PWS2	798
60	40	147	40	PWS3	742
60	49..25	147	24	PWSA	472
60	45	147	14	PWSB	
60	38.1	147	10	PWSC	245
60	31.5	147	7.6	PWSD	
60	24.3	147	58.3	PWSE	291
60	24	146	45	PWSF	
Columbia Glacier					
61	7.4	147	3.8	CG0	
60	59.5	147	4.2	CG1	192
60	57.6	147	5.9	CG2	
Icy Bay					
60	16.3	148	21.7	IB0	
60	15.5	148	20.1	IB1	172
60	16.3	148	14	IB2	157
Montague Strait Line					
59	57.257	147	55.602	MS1	
59	56.6	147	53.7	MS2	194
59	55.9	147	51.4	MS3	169
59	55.2	147	49.7	MS4	119

Event #	Description	Station	Date/Time Local	Time GMT	Latitude	Longitude	Depth	Scientist	Comments
3	CTD 1 Start	RES2.5	9/10/2022 6:57	2:57:50 PM	60.0172	149.3549	293	Danielson	note time comes from laptop:
4	CTD 1 End	RES2.5	9/10/2022 7:28	3:28:44 PM	60.0105	149.3524	293	Danielson	slow by 55 sec compared to GPS
6	CalVet Start	RES2.5	9/10/2022 7:39	3:39:19 PM	60.0200	149.3582	293	Hopcroft	
7	CalVet End	RES2.5	9/10/2022 7:46	3:46:57 PM	60.0185	149.3581	293	Hopcroft	
8	CTD 2 Start	GAK01	9/10/2022 9:22	5:22:01 PM	59.8460	149.4831	293	Danielson	
9	CTD 2 End	GAK01	9/10/2022 9:46	5:46:44 PM	59.8445	149.4852	268	Danielson	
10	CalVet Start	GAK01	9/10/2022 9:54	5:54:18 PM	59.8442	149.4859	268	Hopcroft	
11	CalVet End	GAK01	9/10/2022 10:05	6:05:04 PM	59.8451	149.4824	268	Hopcroft	
12	CalVet Start	GAK01	9/10/2022 10:15	6:15:24 PM	59.8450	149.4825	268	Hopcroft	genetics
13	CalVet End	GAK01	9/10/2022 10:20	6:20:03 PM	59.8445	149.4826	268	Hopcroft	
14	CTD 3 Start	GAK01	9/10/2022 10:26	6:26:48 PM	59.8438	149.4829	268	Danielson	
15	CTD 3 End	GAK01	9/10/2022 10:52	6:52:19 PM	59.8422	149.4845	268	Danielson	
16	Vert Multinet Start	GAK01	9/10/2022 11:09	7:09:08 PM	59.8474	149.4832	268	Hopcroft	
17	Vert Multinet End	GAK01	9/10/2022 11:22	7:22:06 PM	59.8466	149.4835	268	Hopcroft	
18	CTD 4 Start	GAK1	9/10/2022 11:43	7:43:24 PM	59.8452	149.4843	265	Danielson	
19	CTD 4 End	GAK1	9/10/2022 11:57	7:57:22 PM	59.8450	149.4845	265	Danielson	
20	CTD 5 Start	GAK1i	9/10/2022 12:47	8:47:13 PM	59.7635	149.4048	264	Danielson	
21	CTD 5 End	GAK1i	9/10/2022 12:53	8:53:03 PM	59.7623	149.4077	264	Danielson	
22	CalVet Start	GAK2	9/10/2022 13:37	9:37:05 PM	59.6941	149.3268	228	Hopcroft	
23	CalVet End	GAK2	9/10/2022 13:42	9:42:16 PM	59.6938	149.3280	228	Hopcroft	
24	CTD 6 Start	GAK2	9/10/2022 13:47	9:47:58 PM	59.6935	149.3295	228	Danielson	
24.2	CTD 6 End	GAK2	9/10/2022 14:16	10:16:00 PM	59.6600	149.3300	228	Danielson	
24.4	CTD 7 Start	GAK2i	9/10/2022 15:00	11:00:00 PM	59.6000	149.2500	214	Danielson	
24.6	CTD 7 End	GAK2i	9/10/2022 15:10	11:10:00 PM	59.6000	149.2500	214	Danielson	
25	CalVet Start	GAK3	9/10/2022 15:54	11:54:08 PM	59.5558	149.1827	215	Hopcroft	
26	CalVet End	GAK3	9/10/2022 15:59	11:59:51 PM	59.5564	149.1827	215	Hopcroft	
27	CTD 8 Start	GAK3	9/10/2022 16:08	12:08:59 AM	59.5574	149.1826	215	Danielson	
28	CTD 8 End	GAK3	9/10/2022 16:34	12:34:58 AM	59.5596	149.1817	215	Danielson	
29	CTD 9 Start	GAK3i	9/10/2022 17:25	1:31:25 AM	59.4817	149.1159	205	Danielson	
30	CTD 9 End	GAK3i	9/10/2022 17:33	1:33:13 AM	59.4817	149.1157	205	Danielson	
31	CalVet Start	GAK4	9/10/2022 18:17	2:17:15 AM	59.4075	149.0472	205	Hopcroft	
32	CalVet End	GAK4	9/10/2022 18:22	2:22:38 AM	59.4068	149.0484	200	Hopcroft	
33	CTD 10 Start	GAK4	9/10/2022 18:27	2:27:53 AM	59.4061	149.0492	200	Danielson	
34	CTD 10 End	GAK4	9/10/2022 18:50	2:50:59 AM	59.4034	149.0546	200	Danielson	
35	CTD 11 Start	GAK4i	9/10/2022 19:32	3:32:28 AM	59.3316	149.0054	191	Danielson	
36	CTD 11 End	GAK4i	9/10/2022 19:40	3:40:57 AM	59.3313	149.0060	191	Danielson	
37	Sediment Trap Start	GAK5	9/10/2022 20:30	4:30:00 AM	59.2442	148.9306	168	Kelly	ST1

Event #	Description	Station	Date/Time Local	Time GMT	Latitude	Longitude	Depth	Scientist	Comments
38	Methot Start	GAK4	9/10/2022 21:53	5:53:31 AM	59.3888	149.0344	200	Hopcroft	
39	Methot End	GAK4	9/10/2022 22:13	6:13:30 AM	59.3992	149.0402	200	Hopcroft	
40	MultiNet Start	GAK4	9/10/2022 22:25	6:25:17 AM	59.4068	149.0463	200	Hopcroft	
41	MultiNet End	GAK4	9/10/2022 22:47	6:47:36 AM	59.4219	149.0577	200	Hopcroft	
42	Methot Start	GAK3	9/10/2022 23:45	7:45:52 AM	59.5378	149.1696	215	Hopcroft	
43	Methot End	GAK3	9/11/2022 0:17	8:17:35 AM	59.5562	149.1944	215	Hopcroft	
44	MultiNet Start	GAK3	9/11/2022 0:21	8:21:55 AM	59.5587	149.1970	215	Hopcroft	
45	MultiNet End	GAK3	9/11/2022 0:52	8:52:40 AM	59.5762	149.2164	215	Hopcroft	
46	Methot Start	GAK2	9/11/2022 1:45	9:45:29 AM	59.6816	149.3142	231	Hopcroft	
47	Methot End	GAK2	9/11/2022 2:09	10:09:02 AM	59.6965	149.3271	231	Hopcroft	
48	MultiNet Start	GAK2	9/11/2022 2:17	10:17:01 AM	59.7019	149.3287	231	Hopcroft	
49	MultiNet End	GAK2	9/11/2022 2:44	10:44:43 AM	59.7179	149.3331	231	Hopcroft	
51	Methot Start	GAK1	9/11/2022 3:47	11:47:07 AM	59.8265	149.4585	273	Hopcroft	
52	Methot End	GAK1	9/11/2022 4:09	12:09:12 PM	59.8385	149.4720	273	Hopcroft	
53	MultiNet Start	GAK1	9/11/2022 4:16	12:16:57 PM	59.8414	149.4879	273	Hopcroft	ETHANOL
54	MultiNet End	GAK1	9/11/2022 4:48	12:48:27 PM	59.8571	149.4583	273	Hopcroft	
55	MultiNet Start	GAK1	9/11/2022 5:12	1:12:58 PM	59.8510	149.4736	273	Hopcroft	2nd tow
56	MultiNet End	GAK1	9/11/2022 5:42	1:42:59 PM	59.8349	149.4957	273	Hopcroft	
57	CTD 12 Start	GAK5	9/11/2022 10:08	6:08:04 PM	59.2446	148.9321	168	Danielson	
58	CTD 12 End	GAK5	9/11/2022 10:34	6:34:58 PM	59.2471	148.9357	168	Danielson	
59	CalVet Start	GAK5	9/11/2022 10:41	6:41:00 PM	59.2418	148.9316	168	Hopcroft	
60	CalVet End	GAK5	9/11/2022 10:46	6:46:10 PM	59.2424	148.9329	168	Hopcroft	
61	CalVet Start	GAK5	9/11/2022 11:03	7:03:56 PM	59.2418	148.9322	168	Hopcroft	genetics
62	CalVet End	GAK5	9/11/2022 11:08	7:08:58 PM	59.2423	148.9330	168	Hopcroft	
63	CTD 13 Start	GAK5	9/11/2022 11:14	7:14:12 PM	59.2431	148.9337	168	Danielson	
64	CTD 13 End	GAK5	9/11/2022 11:36	7:36:16 PM	59.2454	148.9401	168	Danielson	
65	Vert Multinet End	GAK5	9/11/2022 11:52	7:52:35 PM	59.2418	148.9297	168	Hopcroft	
66	Vert Multinet End	GAK5	9/11/2022 12:08	8:08:32 PM	59.2430	148.9345	168	Hopcroft	
67	CTD 14 Start	GAK5i	9/11/2022 13:01	9:01:42 PM	59.1725	148.8456	174	Danielson	
68	CTD 14 End	GAK5i	9/11/2022 13:10	9:10:21 PM	59.1740	148.8443	174	Danielson	
69	CalVet Start	GAK6	9/11/2022 13:53	9:53:00 PM	59.1191	148.7696	174	Hopcroft	
70	CalVet End	GAK6	9/11/2022 13:58	9:58:16 PM	59.1206	148.7697	174	Hopcroft	
71	CTD 15 Start	GAK6	9/11/2022 14:03	10:03:24 PM	59.1198	148.7720	150	Danielson	
72	CTD 15 End	GAK6	9/11/2022 14:34	10:34:13 PM	59.1197	148.7688	150	Danielson	
73	CTD 16 Start	GAK6i	9/11/2022 15:15	11:15:30 PM	59.0453	148.7001	1193	Danielson	
74	CTD 16 End	GAK6i	9/11/2022 15:24	11:24:00 PM	59.0456	148.6990	1193	Danielson	
75	CalVet Start	GAK7	9/11/2022 16:08	12:08:34 AM	58.9714	148.6304	245	Hopcroft	dipped back under

Event #	Description	Station	Date/Time Local	Time GMT	Latitude	Longitude	Depth	Scientist	Comments
76	CalVet End	GAK7	9/11/2022 16:14	12:14:04 AM	58.9710	148.6279	245	Hopcroft	
77	CTD 17 Start	GAK7	9/11/2022 16:20	12:20:10 AM	58.9707	148.6251	245	Danielson	
78	CTD 17 End	GAK7	9/11/2022 16:43	12:43:29 AM	58.9693	148.6136	245	Danielson	
79	CTD 18 Start	GAK7i	9/11/2022 17:39	1:39:37 AM	58.8809	148.5550	303	Danielson	
80	CTD 18 End	GAK7i	9/11/2022 17:51	1:51:11 AM	58.8787	148.5495	303	Danielson	
81	CalVet Start	GAK8	9/11/2022 18:29	2:29:30 AM	58.8100	148.4938	290	Hopcroft	
82	CalVet End	GAK8	9/11/2022 18:34	2:34:48 AM	58.8105	148.4912	290	Hopcroft	
82.5	CTD 19 Start	GAK8	9/11/2022 18:43	2:43:00 AM	58.8076	148.4704	288	Danielson	
83	CTD 19 End	GAK8	9/11/2022 19:10	3:10:44 AM	58.8076	148.4704	288	Danielson	
84	CTD 20 Start	GAK8i	9/11/2022 19:45	3:45:50 AM	58.7439	148.4212	280	Danielson	
85	CTD 20 End	GAK8i	9/11/2022 19:56	3:56:29 AM	58.7417	148.4181	280	Danielson	
86	Sediment Trap Start	GAK9	9/11/2022 20:56	4:56:53 AM	58.6736	148.3533	280	Kelly	ST2
87	Methot Start	GAK8	9/11/2022 21:59	5:59:50 AM	58.7962	148.4830	280	Hopcroft	
88	Methot End	GAK8	9/11/2022 22:21	6:21:23 AM	58.8060	148.4939	280	Hopcroft	
89	MultiNet Start	GAK8	9/11/2022 22:31	6:31:49 AM	58.8136	148.4967	280	Hopcroft	
90	MultiNet End	GAK8	9/11/2022 23:00	7:00:15 AM	58.8338	148.5151	280	Hopcroft	
91	Methot Start	GAK7	9/11/2022 23:55	7:55:18 AM	58.9498	148.6149	245	Hopcroft	
92	Methot End	GAK7	9/12/2022 0:19	8:19:04 AM	58.9684	148.6297	245	Hopcroft	
93	MultiNet Start	GAK7	9/12/2022 0:24	8:24:36 AM	58.9726	148.6331	245	Hopcroft	
94	MultiNet End	GAK7	9/12/2022 0:51	8:51:49 AM	58.9938	148.6494	245	Hopcroft	
95	Methot Start	GAK6	9/12/2022 1:40	9:40:59 AM	59.1016	148.7468	150	Hopcroft	
96	Methot End	GAK6	9/12/2022 2:02	10:02:51 AM	59.1173	148.7669	150	Hopcroft	
97	MultiNet Start	GAK6	9/12/2022 2:08	10:08:37 AM	59.1210	148.7683	146	Hopcroft	
98	MultiNet End	GAK6	9/12/2022 2:36	10:36:07 AM	59.1407	148.7737	146	Hopcroft	
99	Methot Start	GAK5	9/12/2022 3:27	11:27:58 AM	59.2236	148.8974	168	Hopcroft	
100	Methot End	GAK5	9/12/2022 3:49	11:49:27 AM	59.2361	148.9177	168	Hopcroft	
101	MultiNet Start	GAK5	9/12/2022 3:55	11:55:50 AM	59.2387	148.9233	168	Hopcroft	
102	MultiNet End	GAK5	9/12/2022 4:19	12:19:53 PM	59.2527	148.9433	168	Hopcroft	
103	MultiNet Start	GAK5	9/12/2022 4:41	12:41:44 PM	59.2411	148.9485	168	Hopcroft	ETHANOL
104	MultiNet End	GAK5	9/12/2022 5:06	1:06:00 PM	59.2536	148.9258	168	Hopcroft	
105	Sediment Trap End	GAK5	9/12/2022 6:27	2:27:32 PM	59.3429	148.8798	168	Kelly	ST1
106	CTD 21 Start	GAK9	9/12/2022 11:15	7:15:09 PM	58.6756	148.3487		Danielson	
107	CTD 21 End	GAK9	9/12/2022 11:41	7:41:32 PM	58.6739	148.3631		Danielson	
108	CalVet Start	GAK9	9/12/2022 11:45	7:45:32 PM	58.6730	148.3660	276	Hopcroft	
109	CalVet End	GAK9	9/12/2022 11:50	7:50:32 PM	58.6734	148.3683	276	Hopcroft	
110	CalVet Start	GAK9	9/12/2022 12:06	8:06:51 PM	58.6808	148.3344	276	Hopcroft	genetics
111	CalVet End	GAK9	9/12/2022 12:11	8:11:48 PM	58.6802	148.3360	276	Hopcroft	

Event #	Description	Station	Date/Time Local	Time GMT	Latitude	Longitude	Depth	Scientist	Comments
112	CTD 22 Start	GAK9	9/12/2022 12:16	8:16:59 PM	58.6800	148.3380		Danielson	
113	CTD 22 End	GAK9	9/12/2022 12:48	8:48:10 PM	58.6802	148.3528		Danielson	
114	Vert Multinet Start	GAK9	9/12/2022 13:06	9:06:25 PM	58.6823	148.3600	276	Hopcroft	
115	Vert Multinet End	GAK9	9/12/2022 13:19	9:19:37 PM	58.6818	148.3642	276	Hopcroft	
116	CTD 23 Start	GAK9i	9/12/2022 14:20	10:20:56 PM	58.6112	148.2784	686	Danielson	
117	CTD 23 End	GAK9i	9/12/2022 14:41	10:41:14 PM	58.6127	148.2862	686	Danielson	
118	CalVet Start	GAK10	9/12/2022 15:33	11:33:25 PM	58.5310	148.2003	1456	Hopcroft	
119	CalVet Start	GAK10	9/12/2022 15:38	11:38:23 PM	58.5313	148.2016	1456	Hopcroft	
120	CTD 24 Start	GAK10	9/12/2022 15:45	11:45:21 PM	58.5316	148.2026	1456	Danielson	
121	CTD 24 End	GAK10	9/12/2022 16:40	12:40:13 AM	58.5313	148.2060	1456	Danielson	
122	CalVet Start	GAK11	9/12/2022 18:13	2:13:24 AM	58.3913	148.0667	1417	Hopcroft	
123	CalVet End	GAK11	9/12/2022 18:18	2:18:36 AM	58.3916	148.0659	1417	Hopcroft	
124	CTD 25 Start	GAK11	9/12/2022 18:25	2:25:27 AM	58.3932	148.0663	1430	Danielson	
125	CTD 25 End	GAK11	9/12/2022 19:17	3:17:43 AM	58.3977	148.0698	1430	Danielson	
126	Sediment Trap Start	GAK12	9/12/2022 21:16	5:16:22 AM	58.2470	147.9276	1430	Kelly	ST3
127	Methot Start	GAK12	9/12/2022 21:35	5:35:50 AM	58.2312	147.9291	1430	Hopcroft	
128	Methot End	GAK12	9/12/2022 21:57	5:57:49 AM	58.2429	147.9383	1430	Hopcroft	
129	MultiNet Start	GAK12	9/12/2022 22:04	6:04:31 AM	58.2450	147.9417	1500	Hopcroft	
130	MultiNet End	GAK12	9/12/2022 22:38	6:38:24 AM	58.2714	147.9372	1500	Hopcroft	
131	Methot Start	GAK11	9/12/2022 23:35	7:35:34 AM	58.3678	148.0449	1500	Hopcroft	
132	Methot End	GAK11	9/12/2022 23:57	7:57:17 AM	58.3821	148.0410	1500	Hopcroft	
133	MultiNet Start	GAK11	9/13/2022 0:04	8:04:10 AM	58.3874	148.0408	1454	Hopcroft	
134	MultiNet End	GAK11	9/13/2022 0:40	8:40:19 AM			1454	Hopcroft	Entry delayed and correct, no pos
135	Methot Start	GAK10	9/13/2022 1:32	9:32:31 AM	58.5068	148.1964	1454	Hopcroft	
136	Methot End	GAK10	9/13/2022 1:55	9:55:03 AM	58.5238	148.2019	1454	Hopcroft	
137	MultiNet Start	GAK10	9/13/2022 2:03	10:03:33 AM	58.5306	148.2032	1569	Hopcroft	
138	MultiNet End	GAK10	9/13/2022 2:19	10:19:36 AM	58.5420	148.2056	1569	Hopcroft	ABORTED
139	MultiNet Start	GAK10	9/13/2022 3:10	11:10:01 AM	58.5365	148.1976	1569	Hopcroft	RECAST
140	MultiNet End	GAK10	9/13/2022 3:45	11:45:28 AM	58.5215	148.2237	1569	Hopcroft	
141	Methot Start	GAK09	9/13/2022 4:44	12:44:15 PM	58.6298	148.3432	276	Hopcroft	
142	Methot End	GAK09	9/13/2022 5:05	1:05:13 PM	58.6446	148.3402	276	Hopcroft	
143	MultiNet Start	GAK09	9/13/2022 5:13	1:13:27 PM	58.6537	148.3430	276	Hopcroft	
144	MultiNet End	GAK09	9/13/2022 5:42	1:42:40 PM	58.6769	148.3459	276	Hopcroft	
145	MultiNet Start	GAK09	9/13/2022 6:06	2:06:18 PM	58.6810	148.3334	276	Hopcroft	ETHANOL
146	MultiNet End	GAK09	9/13/2022 6:33	2:33:14 PM	58.6756	148.3617	276	Hopcroft	
147	Sediment Trap End	GAK9	9/13/2022 8:37	4:37:57 PM	58.3975	148.4254	276	Kelly	ST2
148	CalVet Start	GAK12	9/13/2022 10:58	6:58:22 PM	58.2427	147.9335	2179	Hopcroft	

Event #	Description	Station	Date/Time Local	Time GMT	Latitude	Longitude	Depth	Scientist	Comments
149	CalVet End	GAK12	9/13/2022 11:03	7:03:56 PM	58.2429	147.9308	2179	Hopcroft	
150	CTD 26 Start	GAK12	9/13/2022 11:10	7:10:09 PM	58.2438	147.9278	2179	Danielson	
151	CTD 26 End	GAK12	9/13/2022 12:02	8:02:22 PM	58.2411	147.8997	2179	Danielson	
152	CalVet Start	GAK13	9/13/2022 13:25	9:25:06 PM	58.0995	147.7838	2059	Hopcroft	
153	CalVet End	GAK13	9/13/2022 13:30	9:30:14 PM	58.0997	147.7823	2059	Hopcroft	
154	CTD 27 Start	GAK13	9/13/2022 13:35	9:35:22 PM	58.0961	147.7852	2059	Danielson	
155	CTD 27 End	GAK13	9/13/2022 14:35	10:35:52 PM	58.0846	147.7654	2059	Danielson	
156	CalVet Start	GAK14	9/13/2022 15:54	11:54:26 PM	57.9429	147.6467	3040	Hopcroft	
157	CalVet End	GAK14	9/13/2022 15:59	11:59:53 PM	57.9424	147.6456	3040	Hopcroft	
158	CTD 28 Start	GAK14	9/13/2022 16:06	12:06:24 AM	57.9418	147.6446	3040	Danielson	
159	CTD 28 End	GAK14	9/13/2022 17:05	1:05:56 AM	57.9312	147.6346	3040	Danielson	
160	Sediment Trap Start	GAK15	9/13/2022 18:40	2:40:35 AM	57.7909	147.5037	3040	Kelly	ST4
161	Vert Multinet Start	GAK15	9/13/2022 18:57	2:57:00 AM	57.7963	147.4871	4600	Hopcroft	genetics & sort
162	Vert Multinet End	GAK15	9/13/2022 20:07	4:07:44 AM	57.7942	147.4886	4600	Hopcroft	
163	Methot Start	GAK15	9/13/2022 20:59	4:59:51 AM	57.7774	147.4933	4600	Hopcroft	
164	Methot End	GAK15	9/13/2022 21:25	5:25:36 AM	57.7957	147.5070	4600	Hopcroft	
165	MultiNet Start	GAK15	9/13/2022 21:30	5:30:50 AM	57.7994	147.5107	4600	Hopcroft	
166	MultiNet End	GAK15	9/13/2022 22:03	6:03:32 AM	57.8222	147.5320	4600	Hopcroft	
167	MultiNet Start	GAK15	9/13/2022 22:32	6:32:12 AM	57.8145	147.5263	4600	Hopcroft	ETHANOL
168	MultiNet End	GAK15	9/13/2022 23:02	7:02:11 AM	57.7972	147.5125	4600	Hopcroft	
169	Methot Start	GAK14	9/14/2022 0:09	8:09:20 AM	57.9302	147.6322	3040		
169	Methot End	GAK14	9/14/2022 0:24	8:24:00 AM			3040		no position
170	MultiNet Start	GAK14	9/14/2022 0:35	8:35:32 AM	57.9468	147.6246	3040	Hopcroft	
171	MultiNet End	GAK14	9/14/2022 1:04	9:04:24 AM	57.9381	147.6513	3040	Hopcroft	
172	Methot Start	GAK13	9/14/2022 2:19	10:19:33 AM	58.1118	147.7380	2059	Hopcroft	
173	Methot End	GAK13	9/14/2022 2:45	10:45:55 AM	58.1015	147.7597	2059	Hopcroft	
174	MultiNet Start	GAK13	9/14/2022 2:51	10:51:40 AM	58.0974	147.7626	2059	Hopcroft	
175	MultiNet End	GAK13	9/14/2022 3:19	11:19:42 AM	58.0769	147.7817	2059	Hopcroft	
176	Sediment Trap End	GAK12	9/14/2022 6:26	2:26:30 PM	58.2365	147.8721	3040	Kelly	ST3
177	CTD 29 Start	GAK15	9/14/2022 9:49	5:49:49 PM	57.7908	147.5022	4607	Danielson	
178	CTD 29 End	GAK15	9/14/2022 10:12	6:12:15 PM	57.7921	147.5060	4607	Danielson	
179	CTD 30 Start	GAK15	9/14/2022 10:41	6:41:58 PM	57.7932	147.5024	4607	Danielson	
180	CTD 30 End	GAK15	9/14/2022 11:32	7:32:12 PM	57.7960	147.5045	4607	Danielson	
181	CalVet Start	GAK15	9/14/2022 11:35	7:35:54 PM	57.7961	147.5045	4607	Hopcroft	
182	CalVet End	GAK15	9/14/2022 11:41	7:41:46 PM	57.7960	147.5039	4607	Hopcroft	
183	CalVet Start	GAK15	9/14/2022 11:58	7:58:09 PM	57.7971	147.5025	4607	Hopcroft	genetics
185	CalVet End	GAK15	9/14/2022 12:04	8:04:19 PM	57.7977	147.5015	4607	Hopcroft	

Event #	Description	Station	Date/Time Local	Time GMT	Latitude	Longitude	Depth	Scientist	Comments
186	CTD 31 Start	GAK15	9/14/2022 12:11	8:11:39 PM	57.7985	147.5014	4607	Danielson	
187	CTD 31 End	GAK15	9/14/2022 12:29	8:29:21 PM	57.8009	147.4995	4607	Danielson	
188	Vert Multinet Start	GAK15	9/14/2022 12:49	8:49:35 PM	57.8035	147.4984	4607	Hopcroft	shallow
189	Vert Multinet End	GAK15	9/14/2022 13:01	9:01:29 PM	57.8054	147.4975	4607	Hopcroft	
190	Vert Multinet Start	GAK15	9/14/2022 13:38	9:38:08 PM	57.7913	147.5041	4607	Hopcroft	deep
191	Vert Multinet End	GAK15	9/14/2022 15:01	11:01:58 PM			4607	Hopcroft	no position
192	Bird transect End	GAK16	9/14/2022 16:34	12:34:46 AM	57.6483	147.3728	4607	Hopcroft	
193	Sediment Trap End	GAK15	9/14/2022 18:43	2:43:19 AM	57.9045	147.6163	4607	Kelly	ST4
194	CTD 32 Start	MS4	9/15/2022 7:53	3:53:16 PM	59.9208	147.8313	113	Danielson	
195	CTD 32 End	MS4	9/15/2022 8:00	4:00:37 PM	59.9194	147.8360	113	Danielson	
196	CTD 33 Start	MS3	9/15/2022 8:11	4:11:17 PM	59.9316	147.8573	166	Danielson	
197	CTD 33 End	MS3	9/15/2022 8:19	4:19:57 PM	59.9297	147.8656	166	Danielson	
198	CTD 34 Start	MS1	9/15/2022 8:41	4:41:23 PM	59.9545	147.9300	164	Danielson	
199	CTD 34 End	MS1	9/15/2022 8:48	4:48:20 PM	59.9537	147.9340	164	Danielson	
200	CalVet Start	MS2	9/15/2022 9:04	5:04:02 PM	59.9450	147.8960	190	Hennon	
201	CalVet End	MS2	9/15/2022 9:09	5:09:28 PM	59.9450	147.9007	190	Hennon	
202	CTD 35 Start	MS2	9/15/2022 9:19	5:19:48 PM	59.9443	147.8966	190	Danielson	
203	CTD 35 End	MS2	9/15/2022 9:47	5:47:30 PM	59.9379	147.9178	190	Danielson	
204	CTD 36 Start	KIP0	9/15/2022 11:27	7:27:28 PM	60.1252	147.8343	292	Danielson	
205	CTD 36 End	KIP0	9/15/2022 11:38	7:38:58 PM	60.1251	147.8301	292	Danielson	
206	CalVet Start	IB2	9/15/2022 13:27	9:27:06 PM	60.2753	148.2314	155	Hopcroft	
207	CalVet End	IB2	9/15/2022 13:32	9:32:40 PM	60.2751	148.2309	155	Hopcroft	
208	CTD 37 Start	IB2	9/15/2022 13:36	9:36:30 PM	60.2751	148.2301	158	Danielson	
209	CTD 37 End	IB2	9/15/2022 14:00	10:00:12 PM	60.2761	148.2244	158	Danielson	
210	CalVet Start	IB1	9/15/2022 14:35	10:35:15 PM	60.2417	148.3347	165	Hopcroft	
211	CalVet End	IB1	9/15/2022 14:41	10:41:11 PM	60.2419	148.3353	165	Hopcroft	
212	CTD 38 Start	IB1	9/15/2022 14:45	10:45:15 PM	60.2419	148.3352	143	Danielson	
213	CTD 38 End	IB1	9/15/2022 15:09	11:09:24 PM	60.2416	148.3335	154	Danielson	
214	CalVet Start	IB0	9/15/2022 15:33	11:33:32 PM	60.2640	148.3647	322	Hopcroft	
215	CalVet End	IB0	9/15/2022 15:39	11:39:02 PM	60.2640	148.3643	322	Hopcroft	
216	CTD 39 Start	IB0	9/15/2022 15:46	11:46:25 PM	60.2640	148.3641	332	Danielson	
217	CTD 39 End	IB0	9/15/2022 16:19	12:19:52 AM	60.2638	148.3617	332	Danielson	
218	CalVet Start	IB0	9/15/2022 16:23	12:23:50 AM	60.2637	148.3614	332	Hopcroft	genetics
219	CalVet End	IB0	9/15/2022 16:29	12:29:15 AM	60.2635	148.3611	332	Hopcroft	
220	Methot Start	KIP2	9/15/2022 21:25	5:25:40 AM	60.2692	148.0135	577	Hopcroft	
221	Methot End	KIP2	9/15/2022 21:47	5:47:33 AM	60.2763	147.9906	577	Hopcroft	
222	MultiNet Start	KIP2	9/15/2022 21:54	5:54:37 AM	60.2775	147.9868	577	Hopcroft	

Event #	Description	Station	Date/Time Local	Time GMT	Latitude	Longitude	Depth	Scientist	Comments
223	MultiNet End	KIP2	9/15/2022 22:25	6:25:15 AM	60.2990	147.9789	577	Hopcroft	
224	Methot Start	PWS1	9/15/2022 23:00	7:00:42 AM	60.3569	147.9513	364	Hopcroft	
225	Methot End	PWS1	9/15/2022 23:23	7:23:14 AM	60.3687	147.9481	364	Hopcroft	
226	MultiNet Start	PWS1	9/15/2022 23:28	7:28:20 AM	60.3729	147.9459	365	Hopcroft	
227	MultiNet End	PWS1	9/15/2022 23:56	7:56:13 AM	60.3956	147.9300	365	Hopcroft	
228	Methot Start	PWS2	9/16/2022 0:55	8:55:53 AM	60.5142	147.8242	736	Hopcroft	
229	Methot End	PWS2	9/16/2022 1:17	9:17:11 AM	60.5287	147.8110	736	Hopcroft	
230	MultiNet Start	PWS2	9/16/2022 1:22	9:22:09 AM	60.5323	147.8069	736	Hopcroft	
231	MultiNet End	PWS2	9/16/2022 1:51	9:51:08 AM	60.5496	147.7863	736	Hopcroft	
232	MultiNet Start	PWS2	9/16/2022 2:15	10:15:16 AM	60.5346	147.8046	736	Hopcroft	ETHANOL
233	MultiNet End	PWS2	9/16/2022 2:45	10:45:01 AM	60.5526	147.7842	736	Hopcroft	
234	Methot Start	PWS3	9/16/2022 3:37	11:37:33 AM	60.6526	147.6804	743	Hopcroft	
235	Methot End	PWS3	9/16/2022 3:59	11:59:54 AM	60.6668	147.6661	743	Hopcroft	
236	MultiNet Start	PWS3	9/16/2022 4:07	12:07:59 PM	60.6724	147.6619	743	Hopcroft	
237	MultiNet End	PWS3	9/16/2022 4:38	12:38:54 PM	60.6968	147.6653	743	Hopcroft	
238	Sediment Trap Start	PWS2	9/16/2022 6:17	2:17:53 PM	60.5382	147.8069		Kelly	ST5
239	CTD 40 Start	PWS3	9/16/2022 8:03	4:03:01 PM	60.6716	147.6718	750	Danielson	
240	CTD 40 End	PWS3	9/16/2022 8:54	4:54:33 PM	60.6622	147.6496	750	Danielson	
241	CalVet Start	PWS3	9/16/2022 9:06	5:06:17 PM	60.6706	147.6671	750	Hopcroft	
242	CalVet End	PWS3	9/16/2022 9:11	5:11:27 PM	60.6698	147.6656	750	Hopcroft	
243	CTD 41 Start	PWS2	9/16/2022 10:21	6:21:33 PM	60.5363	147.8039	736	Danielson	
244	CTD 41 End	PWS2	9/16/2022 10:55	6:55:20 PM	60.5308	147.8040	736	Danielson	
245	CalVet Start	PWS2	9/16/2022 10:57	6:57:41 PM	60.5304	147.8043	736	Hopcroft	
246	CalVet End	PWS2	9/16/2022 11:02	7:02:52 PM	60.5295	147.8047	736	Hopcroft	
247	CalVet Start	PWS2	9/16/2022 11:17	7:17:49 PM	60.5270	147.8060	736	Hopcroft	genetics
248	CalVet End	PWS2	9/16/2022 11:23	7:23:19 PM	60.5263	147.8067	736	Hopcroft	
249	CTD 42 Start	PWS2	9/16/2022 11:33	7:33:58 PM	60.5367	147.8040	736	Danielson	
250	CTD 42 End	PWS2	9/16/2022 12:14	8:14:28 PM	60.5340	147.8080	736	Danielson	
251	Vert Multinet Start	PWS2	9/16/2022 12:26	8:26:41 PM	60.5327	147.8096	736	Hopcroft	shallow
252	Vert Multinet End	PWS2	9/16/2022 12:41	8:41:41 PM	60.5313	147.8117	736	Hopcroft	
253	Vert Multinet Start	PWS2	9/16/2022 13:12	9:12:54 PM	60.5338	147.8044	736	Hopcroft	deep
254	Vert Multinet End	PWS2	9/16/2022 13:59	9:59:05 PM	60.5293	147.8122	736	Hopcroft	
255	CTD 43 Start	PWS2	9/16/2022 14:27	10:27:05 PM	60.5341	147.8055	736	Danielson	
255.5	CTD 43 End	PWS2	9/16/2022 15:07	11:07:50 PM					no position
256	Vert Multinet End	PWS2	9/16/2022 15:35	11:35:44 PM	60.5345	147.8082	736	Hopcroft	Katie: live deep
257	Vert Multinet Start	PWS2	9/16/2022 16:17	12:17:59 AM	60.5312	147.8210	736	Hopcroft	
258	CalVet Start	PWS1	9/16/2022 18:06	2:06:46 AM	60.3732	147.9431	350	Hopcroft	

Event #	Description	Station	Date/Time Local	Time GMT	Latitude	Longitude	Depth	Scientist	Comments
259	CalVet End	PWS1	9/16/2022 18:11	2:11:41 AM	60.3726	147.9437	350	Hopcroft	
260	CTD 44 Start	PWS1	9/16/2022 18:16	2:16:04 AM	60.3720	147.9443	364	Danielson	
261	CTD 44 End	PWS1	9/16/2022 18:47	2:47:53 AM	60.3675	147.9486	364	Danielson	
262	CalVet Start	KIP2	9/16/2022 19:29	3:29:15 AM	60.2769	147.9862	577	Hopcroft	
263	CalVet End	KIP2	9/16/2022 19:34	3:34:40 AM	60.2753	147.9862	577	Hopcroft	
264	CTD 45 Start	KIP2	9/16/2022 19:41	3:41:07 AM	60.2734	147.9856	591	Danielson	
265	CTD 45 End	KIP2	9/16/2022 20:21	4:21:56 AM	60.2626	147.9883	591	Danielson	
266	Sediment Trap End	PWS2	9/17/2022 6:20	2:20:01 PM	60.4627	147.8786	591	Kelly	ST5