

NGA-LTER Seward Line CRUISE PLAN
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Scientific Personnel:

3 Emily Stidham	Zooplankton (nights), UAF
4 Delaney Coleman	Zooplankton (nights), UAF
5 Kerri Fredrickson	Phytoplankton/Microzoop, WWU
6 Hana Buss	Phytoplankton/Microzoop, WWU
7 Emily Ortega	Chemistry (Nutrients, Iron), UAF
8 Annie Kandell	Chemistry (Nutrients, Iron), UAF
9 Mette Kaufmann	Chemistry (Nutrients, Iron), UAF
10 Isaac Reister	Physics (CTD) & LISST, UAF
11 Ben Lowin	Optics and Gases
12 Daniel Cushing	Seabirds/Mammals, FWS

Scientific Purpose:

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 third cruise of the NSF's Northern Gulf of Alaska Long-term Ecological Program (NGA-LTER). The scientific purpose of the core Seward Line project is to develop an understanding of the response and resiliency of this marine ecosystem to climate variability. This cruise marks the 24nd consecutive late-summer cruise for the Seward Line in the NGA, including Prince William Sound (PWS), and the 50th year of observations at GAK1.

Special Note: This cruise will be conducted during the COVID-19 Pandemic. Special permissions from UAF, UNOLS and NSF, and numerous other accommodations were required to sail. Among them was extreme reduction to the scientific team to avoid bringing the virus onto the Sikuliaq (which is already in quarantine), and the shortened duration and scope of the cruise. The scientific team will complete a two-week quarantine in their homes prior to driving directly to the ship.

Cruise Objectives

1. Determine thermohaline, velocity, light, and oxygen structure of the NGA shelf.
2. Determine macro- and micro-nutrient structure of the NGA shelf.
3. Determine particle structure and flux rates of the NGA shelf.
4. Determine phyto- and microzooplankton composition, biomass distribution, and productivity.
5. Determine the vertical and horizontal distribution and abundance of zooplankton species (including macro-jellies).
6. Conduct surveys of seabirds and Marine Mammals
7. Conduct shipboard experimental work on phyto- and zooplankton.
8. Determine carbonate chemistry (i.e. Ocean Acidification) at selected intensive stations
- 9. Provide at-sea experience for students within the UAF system**
- 10. Share the experience through outreach/media activities.**

SAMPLING

The overall approach of the cruise is to occupy the Seward Line transect across the shelf and a string of stations within western PWS. Operations are generally divided into distinct day and night tasks, thus requiring each station to be occupied twice. This structure 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 will typically occupy a selected “intensive” station that involves a greater number and range of collections than other stations occupied that day. Stations profiles are supplemented by underway measurements.

DAYTIME ACTIVITIES:

1. Occupy the various hydrographic stations and collect vertical CTD-fluorescence-PAR and particle profiles (see **Figures & Tables**).
2. Collect discrete bottle samples at these stations for nutrients, chlorophyll and microzooplankton. Chlorophyll Size Fractionation (20 μm) will be done at all whole numbered Seward Line and most other stations. Macronutrients samples will be pre-filtered prior to freezing. Chlorophyll will be extracted on fresh filters without freezing.
3. Measure the dissolved carbonate chemistry along the Seward Line and within Prince William Sound from bottle casts at selected intensive stations (tentatively Odd numbered GAK, KIP2, PWS2).
4. CalVet Net casts will be done (CalVet frame has 4 nets) after most the CTD casts to 100m. (NO CALVETs at the “i” stations).
5. At intensive stations an additional CTD cast will collect water to be used for primary production incubations and carbonate chemistry.
6. A trace-metal clean CTD cast will also be undertaken at all intensive stations, and other odd-numbered stations as time permits.
7. We will deploy a tow-body for sampling near-surface iron during the day (and on long transits). Sampling will occur just prior arriving to or just after departure. (It is hoped that this “fish” can simply be left in the water while on station rather than constantly retrieved and deployed).

8. At intensive stations there will be an extra Calvet collection, and along the Seward Line plus PWS2 there will be a vertical deployment of the 150 μm Multinet to 200m. Some of this material will be used for live sorting as well as post-cruise molecular analysis.
9. We will do one deep Multinet tow (to maximum 1200 m) near the end of the Seward Line and one at PWS2 (800m). This normally happens during days but may be done at night in conjunction with Multinet work at those stations if time permits.
10. If time and weather permit, we will tow the Acrobat undulating CTD along the entire Seward Line

NIGHTTIME ACTIVITIES:

1. A towed 505- μm Multinet will be used to collect depth-stratified samples along the Seward Line, and at selected PWS Stations to 200m.
2. A Methot Trawl will be deployed by forward crane for ~20 minutes while coming into or leaving stations. We are hoping to get every station with the Methot, but will reduce effort if needed.
3. Deep-multinet tows may occur during the night shift as time permits (see #9 above).

Sampling Strategy

In general, we estimate 1.5 days for PWS and 4-5 days for the Seward Line, and a day for the Acrobat transect. It is important that all Multinet collections (with the exception of those to 600m) be completed during darkness to allow comparison to prior years. We anticipate that 4-5 Multinet can be conducted per night: sampling starts just after dusk and stops just before dawn, and can be extended slightly when overcast. There is always a typically a greater period of light available than of darkness, so execution of daytime stations and activities are designed around being in position to commence night sampling as soon as it is sufficiently dark.

Sampling personnel requirements (and times):

CTD: winch operator, 1 scientist (launch and recovery), 30m/min in upper 100m, 60m/min below 100m. Depending on schedule, casts may be limited to 1000m at deep-sea stations.

TMC towfish: 1 Deck person and 1 scientist for launch and recovery (~15-20 min), A deck person (or martec) to watch towfish during towing and communicate with the bridge/science.

Multinet: winch operator, 2-3 scientists (launch, recovery, wash-down, re-cock) – Ship speed: 2 knots (night) or stationart (day), Wire speed: ~1 m/sec down, 0.5-1m/sec up (typically 30-40min per deployment). Stern A-frame deployment. Maximum depth on most tows 200m.

Calvets: winch operator, 1-2 scientists (launch, recovery, wash-down) – Ship speed: station keeping, Wire speed: ~0.5 m/sec for Calvet, 0.5m/sec for Ring net (10 min/cast).

Methot Trawl: winch operator, 3-4 scientists, launch, recovery, wash-down) – Ship speed: ~2.5 knots, surface trawl only.

Hazmat: (tentative)

Formaldehyde – 20L carboy
 Rose Bengal Stain 50g
 Ethanol – 40L
 Acetone – 16L
 Lugol's solution (1L)
 Oxygen Fixation (Sodium hydroxide).
 Sulphuric acid, Manganous Chloride)

Mercuric Chloride (for DIC fixation)
 3N HCl (25% v/v) (500 ml)
 Glutaraldehyde (10%) – 500 ml
 DAPI stain solution – 100 ml
 Liquid N₂ – one 30-L dewar

CRUISE ACTIVITY SCHEDULE

- 8/29 – Nutrient team leaves for Seward and TMC setup
- 8/30 – Main Van leaves UAF, ~8am, arrives ship ~5pm – we will sleep onboard
- 8/31 – Begin setup at ~8am SMC dock. Setup and depart sometime during afternoon.
- 9/1 – Sikuliaq sails by 8am
- 9/9 – Sikuliaq returns to dock by late afternoon – pickup and demob begin.
- 9/10 – Science party departs for Fairbanks around noon using vans and UHaul.

Transport:

Russ' Van: Russ, Caitlin, Emily-S, Delaney,
Ben, Isaac, (Emily-O, SWD-FAI?).

Rental car: Kerri, Hana

Rental car (ANC-SWD): Mette, Annie, Emily-O

UHaul (SWD-FAI): Mette, Annie, (Emily-O?).

Personal transport: Dan

Table 1. STANDARD STATIONS (intensive stations highlighted)

Latitude N (degrees, minutes)		Longitude W (degrees, minutes)		Station Name
<i>Resurrection Bay Station</i>				
60	1.5	149	21.5	RES2.5
<i>Seward Line</i>				
59	50.7	149	28	GAK1
59	46	149	23.8	GAK1I
59	41.5	149	19.6	GAK2
59	37.6	149	15.5	GAK2I
59	33.2	149	11.3	GAK3
59	28.9	149	7.1	GAK3I
59	24.5	149	2.9	GAK4
59	20.1	148	58.7	GAK4I
59	15.7	148	54.5	GAK5
59	11.4	148	50.3	GAK5I
59	7	148	46.2	GAK6
59	2.7	148	42	GAK6I
58	58.3	148	37.8	GAK7
58	52.9	148	33.6	GAK7I
58	48.5	148	29.4	GAK8
58	44.6	148	25.2	GAK8I
58	40.8	148	21	GAK9
58	36.7	148	16.7	GAK9I
58	32.5	148	12.7	GAK10
58	23.3	148	4.3	GAK11
58	14.6	147	56	GAK12
58	5.9	147	47.6	GAK13
57	56.6	147	39	GAK14
57	47.5	147	30	GAK15
<i>Prince William Sound Stations</i>				
60	7.5	147	50	KIP0
60	16.7	147	59.2	KIP2
60	22.78	147	56.17	PWS1
60	32.1	147	48.2	PWS2
60	40	147	40	PWS3
60	49.25	147	24	PWSA
60	45	147	14	PWSB
60	38.1	147	10	PWSC
60	31.5	147	7.6	PWSD
60	24.3	147	58.3	PWSE
60	24	146	45	PWSF
<i>Columbia Glacier</i>				
61	7.4	147	3.8	CG0
60	59.5	147	4.2	CG1
60	57.6	147	5.9	CG2

Icy Bay				
60	16.3	148	21.7	IB0
60	14.5	148	20.1	IB1
60	16.3	148	14	IB2
Hogan Bay Line				
60	11.57	147	42	HB1
60	10.754	147	38.5	HB2
60	9.855	147	34.508	HB3
60	8.807	147	30.04	HB4
Montague Strait Line				
59	57.257	147	55.602	MS1
59	56.6	147	53.7	MS2
59	55.9	147	51.4	MS3
59	55.2	147	49.7	MS4

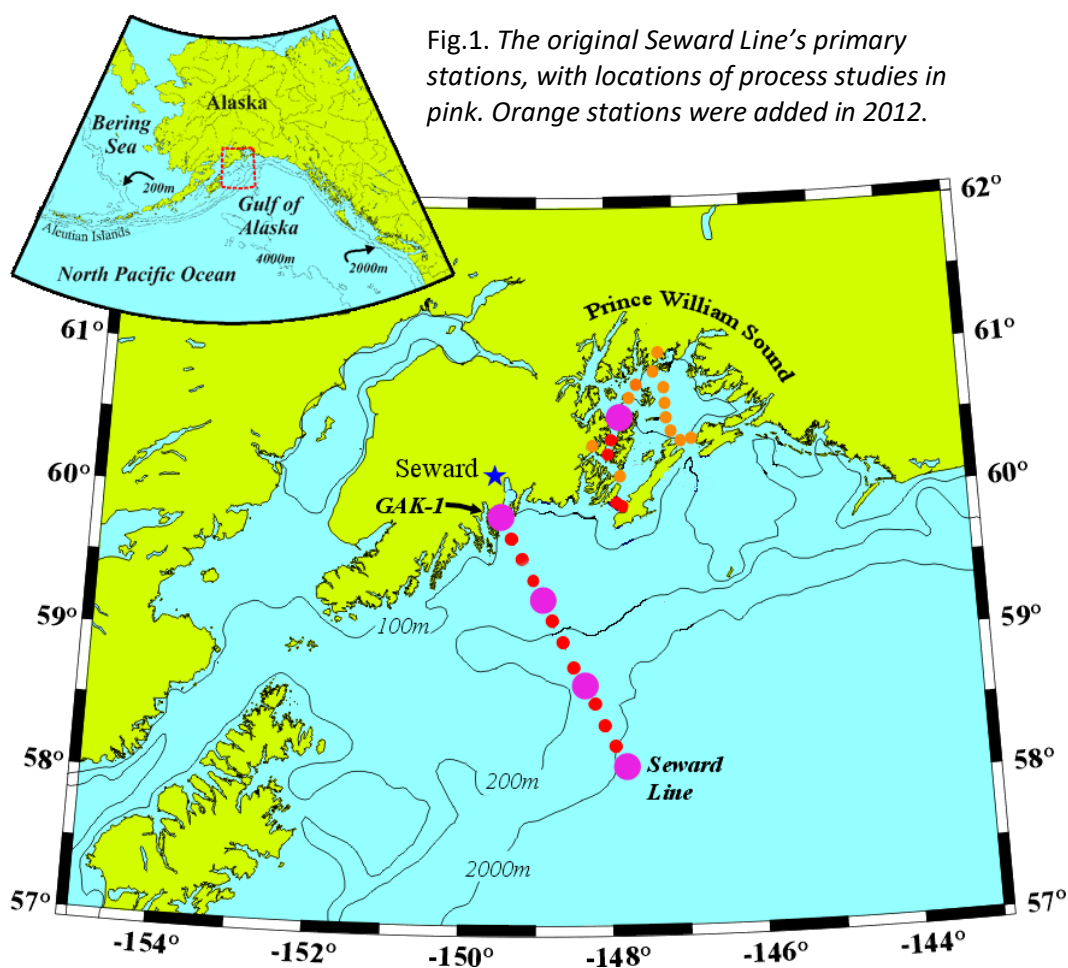


Fig.1. The original Seward Line's primary stations, with locations of process studies in pink. Orange stations were added in 2012.