

NGA-LTER Seward Line CRUISE PLAN
Sept 11-20, 2023

Funding Source: NSF, NPRB, EVOS, AOOS, UAF

Vessel: R/V *Tiglax* (USFWS)

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Scientific Personnel:

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13 Isaac Reister	Physics (CTD), UAF
14 Callie Gesmundo	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 27th consecutive late-summer/fall cruise for the Seward Line in the NGA, including Prince William Sound (PWS), and the 53st year of observations at GAK1.

Cruise Objectives

1. Determine thermohaline, velocity, light, and oxygen structure of the NGA shelf.
2. Determine macro-nutrient structure of the NGA shelf.
3. Determine particle structure and flux rates of the NGA shelf (including drifting traps).
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 deep-water collections/lipid analysis for diapausing copepods at GAK15 and PWS2.
8. Determine carbonate chemistry (i.e., Ocean Acidification) at selected intensive stations.
9. ***Provide at-sea experience for students.***
10. ***Share the experience through outreach/media activities.***

SAMPLING

The overall approach of the cruise is to occupy only the Seward Line transect line across the shelf and the 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 from 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 GAK1, GAK5, GAK9, GAK15, 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. 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.
7. We will do one deep Multinet tow (to maximum 1200 m) near the end of the Seward Line (GAK15) 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.

NIGHTTIME ACTIVITIES:

1. A towed 505- μ m Multinet will be used to collect depth-stratified samples along the Seward Line, and at selected PWS Stations to 200m. A duplicate multinet is taken as intensive stations for molecular analysis.
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 #8 above).

Sampling Strategy

In general, we estimate 2 days for PWS and 4-5 days for the Seward Line. 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 Multinets 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 much 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, and trying to deploy and recover sediment traps strategically to maximize their deployment duration.

Sampling personnel requirements (and times):

CTD: winch operator, 2-3 scientists (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.

Multinet: winch operator, 2-3 scientists (launch, recovery, wash-down, re-cock) – Ship speed: 2 knots, Wire speed: ~1 m/sec down, 0.5-1m/sec up (typically 30-40min per deployment). Stern A-frame deployment. Maximum depth on tows 200m. The multinet has a depth transducer to ensure we get close to, but not on the bottom when depths are less than 200m.

Calvets: winch operator, 1-2 scientists (launch, recovery, wash-down) – Ship speed: station keeping, Wire speed: ~1 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.

Ship's Science Equipment Supplied:

- Underway sampling system (TSG, GPS) SBE21

Scientist's Equipment Needed:

- CTD (with deep-SUNA, UVP and LISST for integration)
- -40 freezer for macro-nutrient and genetic samples (in hold)
- 10 cu ft refrigerator/freezer for chemical and preserved sample storage
- Fume hood for filtration of preserved samples
- CalVet [nets, flow-meters, frames, swivels, weights, spares]
- 2 Multinet systems (coarse and fine nets, spare cod ends/nets)
- Bongo nets (backup)
- Deckboard incubators (2) connected to ship's seawater system
- Filtration systems
- Fluorometers & Centrifuge
- Laptop computers
- 14 cases (24/cs) of 16-oz & 4 cases (12/cs) of 32-oz zooplankton sample bottles

- 2-3 cases of 24 Winkler bottles
- Several coolers with nutrient and TMC bottles
- Microscopes and supplies for sorting copepods
- Incubators: 4 cu ft. required near work area
- Refrigerated Circulator
- Milk Chocolate, ice-cream (not vanilla)

Hazmat: (tentative)

Formaldehyde – 2x20L carboy

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

9/10 – Vehicles leave ONL 8-9am, arrive Seward around dinner time. WWU members are doing fly/drive with rental cars. Pizza party at SMC firepit. Motel: Breeze Inn shared rooms

9/11 – Begin setup at ~8am SMC dock, Tiglax will begin railway dock loading large items then return to SMC at ~10:00. Setup and depart sometime during evening or next morning.

9/20 – Return to Railway dock for offload by dinner time (worst case), hopefully earlier to offload all items and shuttle them to SMC. Tiglax must be underway for Homer before midnight.

9/21 – Most of the science party departs for Fairbanks/Anchorage, others will remain for end-of-season pack-up.

Travel: TBD

Berthing:

Russ (2-man main deck)

TBD (main deck)

(old library)

(below forward),

(below aft)

Table 1. STANDARD STATIONS (intensive stations highlighted)

Latitude N (degrees, minutes)		Longitude W (degrees, minutes)		Station Name
Resurrection Bay Station				
60	1.5	149	21.5	RES2.5
Seward Line				
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
Prince William Sound Stations				
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
Icy Bay				
60	16.3	148	21.7	IB0
60	14.5	148	20.1	IB1
60	16.3	148	14	IB2
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

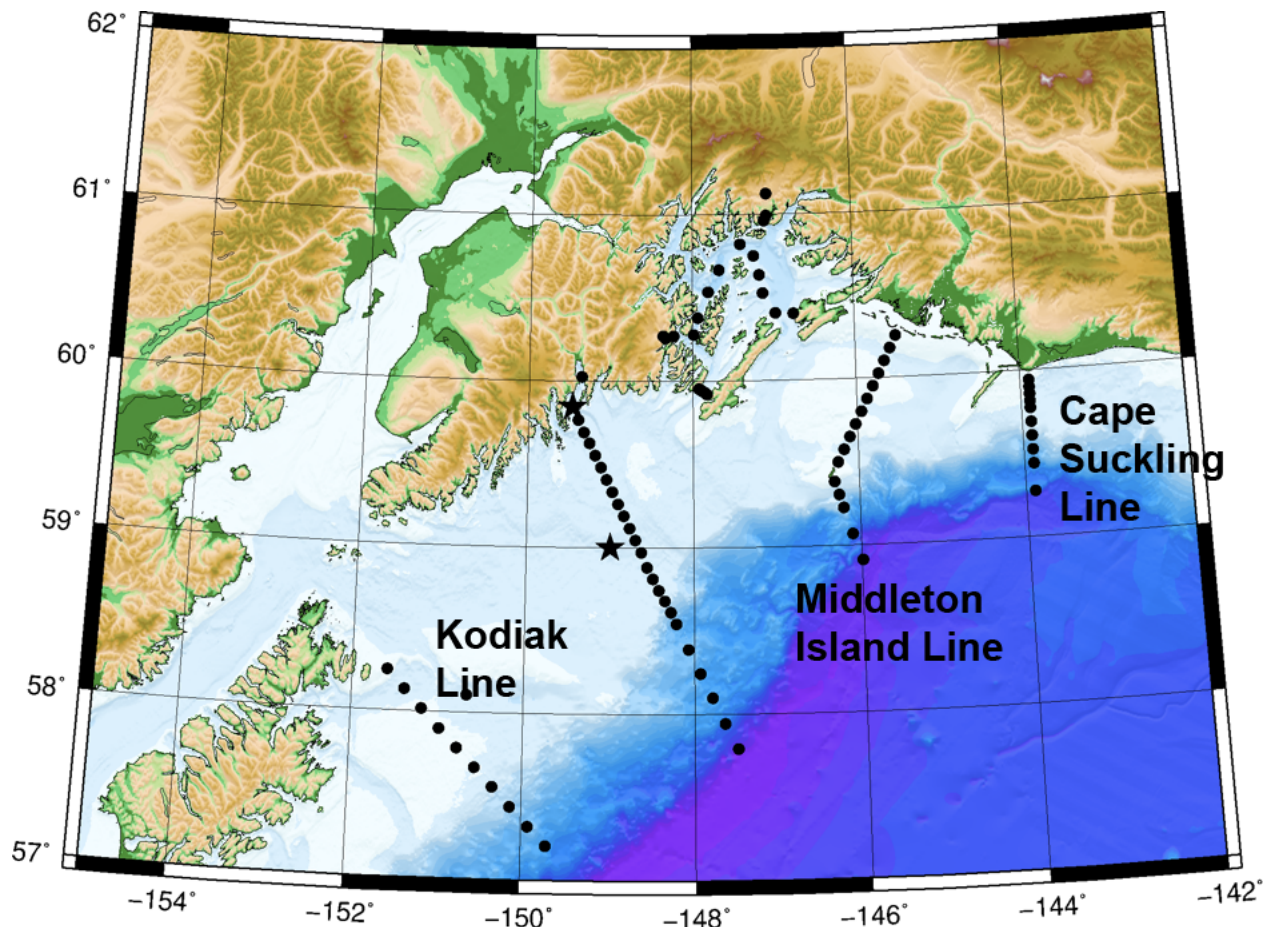


Fig. 1. NGA-LTER sampling stations highlighting new transects line near Kodiak, Middleton Island and Cape Suckling. Stars indicate GAK1 and GEO mooring locations.