

GLOBEC CRUISE REPORT

Cruise HX269 March 4-13, 2003

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Scientific Purpose:

The purpose of the NE Pacific GLOBEC Program is to develop a mechanistic understanding of the response of this marine ecosystem to climate variability. Toward that end, the GLOBEC cruises on the Gulf of Alaska shelf will determine the physical-chemical structure, primary production, the distribution and abundance of zooplankton, YOY salmon, other planktivorous fishes, and marine birds and mammals. These interdisciplinary cruises will occur over a seven-year period and throughout the year so that seasonal and interannual comparisons of the oceanography of this shelf can be made. Some of the data will be compared with historical data sets, whereas, other data sets will be a product of the first systematic sampling effort from this shelf.

The March 2003 cruise was the sixth March cruise conducted as part of the Gulf of Alaska GLOBEC program Long Term Observation Program (LTOP). Cruise activities concentrated on physical oceanography (circulation and thermohaline structure), nutrient and chlorophyll concentrations, zooplankton, seabird and marine mammal distributions. Zooplankton were sampled for C-N stable isotope composition and experiments were established to estimate zooplankton growth rates and egg production and primary production.

March characterizes late winter conditions during which coastal discharge is minimum and downwelling or cyclonic wind stress is strong, and solar radiation increases. The shelf is typically weakly stratified (or unstratified) in winter. Phytoplankton production is low and zooplankters are just beginning to appear in some areas of the shelf.

Cruise Objectives:

1. Determine thermohaline, velocity, and nutrient structure of the Gulf of Alaska shelf, emphasizing Seward Line, C. Fairfield Line, Prince William Sound stations, and offshore PWS stations (Table 1). Other lines as time permits.
2. Determine primary production and phytoplankton biomass distribution.
3. Determine the distribution and abundance of zooplankton and microzooplankton.
4. Determine the distribution and abundance of seabirds and marine mammals.
5. Determine copepod and euphausiid rates of growth and egg production.
6. Characterize the carbon and nitrogen stable isotope concentrations in zooplankton.

SAMPLING

DAYTIME ACTIVITIES

1. Occupied the hydrographic transects (Table 1) and collected vertical CTD-chlorophyll-PAR profiles.
2. Collected ADCP, sea surface salinity (SSS), temperature (SST) and fluorescence (SSF) using seacrest sensors.
3. Collected discrete bottle samples at these stations for nutrients and chlorophyll pigments. Chlorophyll Size Fractionation was done at the whole numbered Seward Line stations and at every other C. Fairfield Line station.
4. Measured Primary Productivity at Stations GAK1, GAK4, GAK9, GAK13, and KIP2.
5. Observed and documented marine mammal and seabird distributions from the bridge.
6. One CalVet Net cast was done (the CalVet frame has 4 nets) on the Seward Line stations and at selected PWS stations. There were two fine mesh nets (.053mm) and two large mesh nets (.150mm) on each tow.
7. At Seward Line stations GAK1, GAK4, GAK9, GAK13 and KIP2 station Liu performed 3-6 casts with the 10-liter Niskins/Rosette to collect water (from 10-20m) for zooplankton incubations. This was accompanied by two to three ring net tows over the upper 50m.
8. We did deep MOCNESS tows (to 600 m) near the end of the Seward Line at station GAK13 and at station PWS2.

NIGHTTIME ACTIVITIES

1. Hydroacoustic samples and MOCNESS discrete samples were taken along the Seward Line, and at select PWS and Hinchinbrook Entrance Stations (see Event Log for details).

2. In addition to the normal .5mm mesh nets, fine mesh nets (.100 mm) were swapped into the MOCNESS at intermittent stations for euphausiid collection.

Cruise Log:

- | | |
|-----------|---|
| 3/3 | Science party arrives in Seward and sets up equipment. |
| 3/4 | Occupied RES2.5 and GAK1. Tested HTI. HTI found to have large noise in system. Coyle working on system. Took advantage of decent weather to begin work at outer end of Seward Line. |
| 3/5-3/9 | Working inshore from GAK13. HTI still noisy (38kHz) and not performing adequately. No HTI sampling, only MOCNESS. Completed most of Seward Line. Attempts to identify the source of the intermittent "open" in CTD system slowed pace of work. Rough weather and freezing spray forecast forced us to abandon the Seward Line and head for Prince William Sound. We completed all stations except GAK6i and GAK7 on the middle shelf. |
| 3/9 –3/12 | Very cold (0° to –5°C) and high winds (freezing spray) dictated the rest of the cruise. Completed all PWS stations. Moderate temps (2°C) during the day on 3/11 allowed us to complete hydrography on the Hinchinbrook Line. No MOCNESS work that night, however, because of freezing spray. |
| 3/12 | Completed zooplankton production casts at KIP2 in morning and returned to Seward, occupying GAK1 and Res2.5 upon return. The latter were occupied in 35 knot winds and –6°C, with freezing spray. Nearly unworkable conditions. Cruise ended that night. |
| 3/13 | Unload at SMC; science party departs. |

PHYSICAL OCEANOGRAPHY (*T. Weingartner*)

We collected CTDs along the Seward Line, Hinchinbrook Line, and Cape Fairfield Lines on the continental shelf and in Montague Strait, Knight Island Passage, and at other locations throughout western Prince William Sound. Continuous sea surface temperature, salinity, fluorescence data, ADCP data, and underway meteorological data were collected throughout the cruise. The shelf thermal structure was remarkably warm with water column temperatures 1–2°C above typical March temperatures. Indeed, temperatures approaching 7.5°C were observed at mid-depth at most of the shelf stations and in Prince William Sound. These temperatures are more typical of December rather than March, and indicate the anomalously low winter cooling that occurred in the Gulf of Alaska this past winter. The anomalously low winter cooling was due to the southerly winds that prevailed over the Gulf of Alaska and Bering Sea this past winter. The coldest winter air temperatures for the south coast of Alaska occurred on this cruise. It appears that the spring bloom will develop with anomalously high mid-depth temperatures (and possibly anomalously warm surface temperatures if this cold spell is short-lived). It also appears that cyclonic wind stress might have been

anomalously weak this winter given the prevailing southerly winds (instead of the strong easterlies typical of winter). This statement needs to be re-assessed after examining wind climatologies.

ZOOPLANKTON STABLE ISOTOPES (*Kline*)

At each MOCNESS station, samples were saved for C and N stable isotope analysis from the contents of net #1. Additionally, samples of diapausing *Neocalanus*, were saved for C and N stable isotope analysis from Dr. Hopcroft's MOCNESS sample taken at 400-600m at station PWS2 (Prince William Sound) and at GAK13 on the Gulf of Alaska continental slope. Zooplankton were saved as individuals in separate vials after identification to species level and frozen. They will be freeze-dried in the laboratory prior to isotopic analysis.

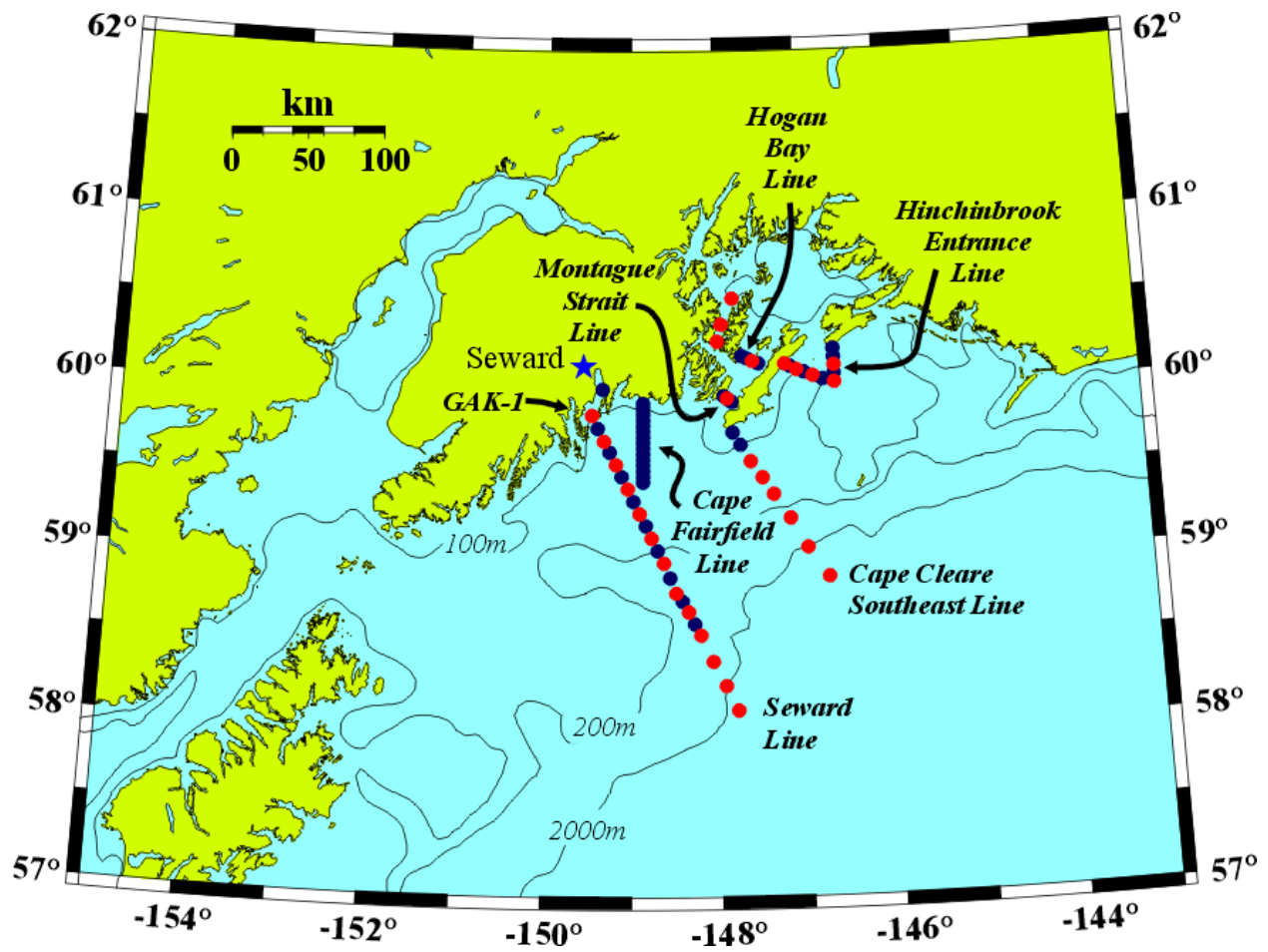
Table 1.

NEP GLOBEC LTOP STANDARD STATIONS				
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	47.5	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
<i>Cape Fairfield Line</i>				

59	54.5	148	52	CF1
59	53	148	52	CF2
59	51	148	52	CF3
59	49	148	52	CF4
59	47	148	52	CF5
59	45	148	52	CF6
59	43	148	52	CF7
59	41	148	52	CF8
59	39	148	52	CF9
59	37	148	52	CF10
59	35	148	52	CF11
59	33	148	52	CF12
59	31	148	52	CF13
59	29	148	52	CF14
59	27	148	52	CF15
<i>Prince William Sound Stations</i>				
60	22.78	147	56.17	PWS1
60	32.1	147	48.2	PWS2
<i>Knight Island Passage Station</i>				
60	16.7	147	59.2	KIP2
<i>Hogan Bay Line</i>				
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
<i>Montague Strait Line</i>				
59	57.465	147	56.225	MS0i
59	57.257	147	55.602	MS1
59	56.982	147	54.761	MS1i
59	56.6	147	53.7	MS2
59	56.282	147	52.633	MS2i
59	55.9	147	51.4	MS3
59	55.56	147	50.611	MS3i
59	55.2	147	49.7	MS4
<i>Hinchinbrook Entrance Line</i>				
60	13	146	36.5	HE1
60	10.8	146	36.5	HE2
60	7.8	146	36.5	HE3
60	4.8	146	36.5	HE4
60	3.126	146	44.19	HE6.5
60	5.6	146	57.7	HE8
60	6.6	147	3	HE9
60	7.8	147	8	HE10

60	8.6	147	11.5	HE11
<i>Cape Cleare Southeast</i>				
59	44.5	147	49	CCSE1
59	40	147	43.6	CCSE2
59	34.25	147	36.5	CCSE3
59	28.5	147	28.5	CCSE4
59	22.5	147	21	CCSE5
59	14	147	9.5	CCSE6
59	3.5	146	58	CCSE7
58	53	146	44	CCSE8

NEP GLOBEC Standard Station Map



Note: The Cape Cleare Southeast Line is a standard line only in select cruises during the Process Study sampling years.

hx269 Cruise Track

