**Draft cruise plan CMOP July-August 2010 cruise**

Leg1 = 27 July – August 2 Leg2 = August 2 – 10 August 1 = Port call Astoria

|  |  |  |  |
| --- | --- | --- | --- |
| **Person, email address** | **Leg 1** | **Leg 2** | **Institution** |
| Fred Prahl, [fprahl@coas.oregonstate.edu](mailto:fprahl@coas.oregonstate.edu) | x | x | OSU – Chief Scientist |
| Vicky Campbell, [campbelv@ebs.ogi.edu](mailto:campbelv@ebs.ogi.edu) | x | x | OHSU |
| Caroline Fortunato, [cfortunato@umces.edu](mailto:cfortunato@umces.edu) | x | x | U Maryland |
|  |  |  |  |
| Curtiss Davis, [cdavis@coas.oregonstate.edu](mailto:cdavis@coas.oregonstate.edu) | x |  | OSU |
| Alex Jaramillo, [jaramilloa@ambcs03.stccmop.org](mailto:jaramilloa@ambcs03.stccmop.org) | x |  | OHSU |
| Suzanne deLorenzo, [delorenz@ebs.ogi.edu](mailto:delorenz@ebs.ogi.edu) | x |  | OHSU |
| Basma Saadoun, [basma@pdx.edu](mailto:basma@pdx.edu) | x |  | OHSU |
| Sara Bender, [sbender@u.washington.edu](mailto:sbender@u.washington.edu) | x |  | UW |
| Colleen Durkin, [cdurkin@u.washington.edu](mailto:cdurkin@u.washington.edu) | x |  | UW |
| Laura T. Truxal, [truxal@u.washington.edu](mailto:truxal@u.washington.edu) | x |  | UW |
| David Needham, [dmneedha@gmail.com](mailto:dmneedha@gmail.com) | x |  | USC |
| Craig McNeil, [cmcneil@apl.washington.edu](mailto:cmcneil@apl.washington.edu) | x |  | UW-APL |
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| Missy Gilbert, [gilbertm@ebs.ogi.edu](mailto:gilbertm@ebs.ogi.edu) |  | x | OHSU |
| Grant Law, [lawg@stccmop.org](mailto:lawg@stccmop.org) |  | x | OHSU |
| Joe Needoba, [needobaj@ebs.ogi.edu](mailto:needobaj@ebs.ogi.edu) |  | x | OHSU |
| Michelle Maier, [maierm@ebs.ogi.edu](mailto:maierm@ebs.ogi.edu) |  | x | OHSU |
| Ezra-Mel Pasikatan, [pasikate@stccmop.org](mailto:pasikate@stccmop.org) |  | x | OHSU |
| Burke Hales,[hales@coas.oregonstate.edu](mailto:hales@coas.oregonstate.edu) |  | x | OSU |
| Dale Hubbard, [dhubbard@coas.oregonstate.edu](mailto:dhubbard@coas.oregonstate.edu) |  | x | OSU |
| Joe Jennings, [jenningj@coas.oregonstate.edu](mailto:jenningj@coas.oregonstate.edu) |  | x | OSU |
| Margaret Sparrow, [sparrowm@coas.oregonstate.edu](mailto:sparrowm@coas.oregonstate.edu) |  | x | OSU |
| Jesse Vance, [jvance@coas.oregonstate.edu](mailto:jvance@coas.oregonstate.edu) |  | x | OSU |
|  |  |  |  |
| Total Scientists | 14 | 12 |  |
| Male | 6 | 7 |  |
| Female | 8 | 5 |  |

**NOTE:** Dan Harland ([Daniel.Harlan@oregonstate.edu](mailto:Daniel.Harlan@oregonstate.edu)) will meet us loading (July 26 @1400) and unloading (August 10 @1000) day so that he can inspect the van and radioactive stock. Radioactive materials will be transported by OHSU personnel to the ship on the loading day. At the end of the cruise, OHSU personnel will also transport unused stock and samples back to their institution. So no special shipping arrangements are required of OSU Rad Safety Office.

Dan Harlan will supply booties, prepared scintillation vials for wipe test and bags/containers for solid/liquid waste.

**Scientific personnel / Activity/Berth:**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Name** | **Institution** | **Activity** | **Berth** | **Leg 1** | **Leg 2** | **Comments** |
| **Fred Prahl** | **OSU** | **Chief Scientist** | **SR7-14** | **CTD-a** | **FMA-d** | **alternate** |
| **Curtiss Davis** | **OSU** | **MERIS** | **SR7-15** | **CTD-d** |  |  |
| **Vicky Campbell** | **OHSU** | **Molecular Biology** | **SR9-20** | **CTD-a** |  | **alternate** |
| **Caroline Fortunato** | **UMaryland** | **Molecular Biology** | **SR9-21** |  |  |  |
| **Alex Jaramillo** | **OHSU** | **CMOP Modeling** | **SR11-24** | **CTD-n** |  |  |
| **Suzanne deLorenzo** | **OHSU** | **Molecular Biology** | **SR12-23** | **CTD-n** |  |  |
| **Basma Sadouun** | **OHSU** | **Microarray** | **SR12-22** | **CTD-n** |  |  |
| **Sara Bender** | **UW** | **HABS** | **SR14-26** |  |  |  |
| **Colleen Durkin** | **UW** | **HABS** | **SR14-27** |  |  |  |
| **Laura Truxal** | **UW** | **Organic BioGeoChem** | **SR9-19** | **\*** |  | **7/27 – 7/31\*** |
| **David Needham** | **USC** | **Viruses** | **SR11-25** | **CTD-d** |  |  |
| **Craig McNeil** | **APL-UW** | **AUV** | **SR13-28** | **CTD-d** |  |  |
| **Trina Lichendorf** | **APL-UW** | **AUV** | **SR9-18** |  |  |  |
| **Troy Swanson** | **APL-UW** | **AUV** | **SR13-29** |  |  |  |
| **Missy Gilbert** | **OHSU** | **Nutrients** | **SR9-19** |  |  |  |
| **Grant Law** | **OHSU** | **CMOP Modeling** | **SR10-16** |  |  |  |
| **Michelle Maier** | **OHSU** | **Molecular Biology** | **SR13-29** |  |  |  |
| **Joe Needoba** | **OHSU** | **Nutrients / Methane** | **SR11-24** |  |  |  |
| **Ezra-Mel Pasikatan** | **OHSU** | **Nutrients / Methane** | **SR11-25** |  |  |  |
| **Burke Hales** | **OSU** | **SuperSucker** | **SR12-22** |  |  |  |
| **Dale Hubbard** | **OSU** | **SuperSucker** | **SR12-23** |  |  |  |
| **Joe Jennings** | **OSU** | **Nutrient Analysis** | **SR14-26** |  |  |  |
| **Margaret Sparrow** | **OSU** | **Methane Analysis** | **SR13-28** |  | **FMA-n** |  |
| **Jesse Vance** | **OSU** | **SuperSucker** | **SR14-27** |  |  |  |
|  |  |  |  |  |  |  |
| **Lydie Herfort** | **OHSU** | **Myrionecta rubra** | **SR9-19** | **\*** |  | **7/31 – 8/2\*** |
|  |  |  |  |  |  |  |
| **Black – both LEGS, Blue – LEG1, Red – LEG2** | | | | | | |

**NOTE: On this cruise, the van on the fantail will be needed almost exclusively as a storage area for tools and replacement gear required for ‘supersucker’ operations. There will be little space available for storage of empty boxes. All empty boxes for those embarking and disembarking from Newport will be stored safely in the ShipOps facility at the HMSC. For those embarking from Newport and disembarking from Astoria at the end of LEG1, empty boxes can be stored in the van but must be offloaded before LEG2 begins.**

**Detailed Outline of Sampling Plan**

***Area of Operations***: Pacific Northwest coastal ocean from South Oregon to North Washington, Columbia River plume, Columbia River and its estuary

**NOTE: all times given as Pacific Daylight Savings**

**Leg 1** Microbiology

25-26 July Loading Newport (2020 SE OSU Drive Newport, OR 97365-5275)

27 July **Depart 1000**

SH-70 (see table below for time/coordinates)

* MERIS Calibration for **Davis** (**Noon**, before station if necessary)

NOTE: The instrument used for calibration is called HyperPRO. It is deployed from a davit or small winch and then allowed to drift away from the ship.  Perhaps a snatch block on the big crane could be used to facilitate the deployment. It then does a freefall taking data on the way down.  Procedure will be repeated 3x, requiring ~30min total. The HyperPRO includes a CTD and fluorometer for chlorophyll so it may supplement CTD data at some stations.

* **deLorenzo:** 4 10L bottles from bottom depth
* **Truxel:** plankton tow

**Done: ~1300**

**Transit to NH line (~2.9hrs)**

NH line (NH**5** **10** 15 **20** 25 35 45 **55**) (see table below for time/coordinates)

* water collected at surface, chl max and bottom at NH5 10 20 55 (only CTD casts at other sites on this line)
* **Saadoun**: 5 liter (?surface?) sample at NH5 and NH10
* **Armburst Group**: 3 10L bottles from surface at each of NH 5, 20, 55; plus 24 10-L bottles from the surface at NH20 for setup of an incubation (may do this collection at NH5 if the diatom population looks right)
* **Truxel:** plankton tow (at NH5, 10, 20, 55 only? Or all sites?)
* **Needham:** 30L from bottom depth and 20L from the surface at NH55; bottom water at NH5 and NH10

**Sampling Time: ~14hrs**

**Done: July 28 at ~0520**

**Transit to CM-10 (~7.5hrs)**

* HICO Calibration for **Davis** (**7/28 @0944**)

28 July CM-10 (see table below for time/coordinates)

* **deLorenzo**: 4 10L bottles at bottom depth
* **Truxel**: plankton tow

**Done: ~12:50**

**Transit to LP line (~16hrs)**

* HICO Calibration for **Davis** (**7/28 @1350**)

29 July LP line (LP4 **6** 9 12 **17** 22 27 **32 52**) (see table below for time/coordinates)

* water collected at surface, chl max and bottom at LP6 17 32 52 (only CTD casts at other sites on this line)
* **Saadoun**: 5 liter (?surface?) sample at LP6 and LP17
* **Armburst Group**: LP 6, 17, 52 (3 10L bottles at each taken from surface)
* **Needham:** 1 bottle from surface & bottom at LP6, LP17, LP 32, LP52
* **deLorenzo:** 4 10L niskin bottles at bottom depth from LP6
* **Truxel:** plankton tow (at LP 6, 17, 32, 52 only? Or all sites?)
* MERIS Calibration for **Davis** (**7/29 @Noon**)

**Sampling Time: ~12.75hrs**

**Done: ~1645**

**Transit to CR line (~12.5hrs)**

30 July CR line (CR4 **7** 10 **15** 20 25 **30** 35 **40** 50) (see table below for time/coordinates)

* water collected at surface, chl max and bottom at CR7 15 30 40(only CTD casts at other sites on this line)
* **Saadoun:** 5 liter (?surface?) sample at CR15, CR7 and CR4 (only 2 of 3 sites)
* **Armburst Group:** CR 7, 15, 40 (3 10L bottles at each taken from surface)
* **Needham:** 1 bottle from surface & bottom at CR7, CR15, CR30, CR40
* **deLorenzo:** CR-15 4 10L niskin bottles at bottom depth from CR15; same done at CR-20 but ONLY IF WATER IS HYPOXIC
* **Truxel:** plankton tow (at CR 7, 15, 30, 40 only? Or all sites?)
* HICO Calibration for **Davis** (**7/30 @0902 & 1350**)

**Sampling Time: 12.25hrs**

**Done: ~1730**

Estuary Salinity Sampling (20, 15, 10, 5, 0 psu)

* five discrete water samples collected in the S. channel of the estaury at salinities: 0, 5, 10, 15, 20 PSU (whatever depths coincide with these salinities)

**Done: ~2145**

North Channel (anchored at NC11)

NOTE: Beaver Army Terminal (BAT) surface/bottom baseline sampling to be done on Leg 2

NOTE: Lydie Herfort will board / Laura Truxel will disembark via RHIB at 2000. Dropoff / pickup point will be Marina at Astoria (upriver from Maritime Museum – downriver from Sewage Treatment Plant: more specific details about location forthcoming).

For the following work: Estuary CTD System w/FLNTU and Cyclop/PE plus other MarTech backup sensors will be used for all data collection / water sampling

31 July -Aug1 North Channel Work (anchored at NC11, adjusting location as necessary)

* *Myrionecta rubra* time series monitoring (**Lydie Herfort**)
* **Saadoun:** 2 mid-salinity 5-liter estuarine samples during this time period
* HICO / MERIS Calibration for Davis (**8/1 @1306**)
* AUV deployments (**Craig McNeil**)

07/31/2010 04:58 LDT 6.7 H 11:02 LDT 0.7 L 05:23 LDT 7.7 H 11:52 LDT 1.2 L

Deployment operations for the AUV will start around 0700h on Saturday. First job is to deploy the transponders. This requires RHIB in water. We then deploy the AUV on mission at earliest possibility, probably around 1030h. Recovery of AUV around 1800h.

**08/01/2010 05:46 LDT 6.1 H 11:33 LDT 1.2 L 05:53 LDT 7.8 H**

Deployment operations for the AUV will start around 0800h on Sunday. High tide is 1753h. We will recover the AUV around this time and aim to recover the transponders at slack, say 1830-1900h? It should take us about an hour to recover the transponders. So we should be all aboard with gear on R/V Wecoma (RHI stowed) by 2030h. If we dock on Sunday night we would go get our van at MERTS, bring back to ship the empty containers for loading that night, and offloading Monday morning. So it would be preferable that we go into Astoria on Sunday night because we can get our empty boxes in advance of unloading the ship.

2 Aug Astoria Port Call (dock – ~2030 1 Aug, personnel switch-over @ 0700 following morning, departure time 1400 or earlier depending upon progress with switch-over)

422 Gateway Ave. Astoria, Oregon 97103, Pier 2

Astoria port-call is not 100% confirmed because exact pier number might

change (but Wecoma is easy to spot even if it would be at another pier).

|  |  |  |  |
| --- | --- | --- | --- |
| Time Schedule for HyperPRO Sampling to match HICO / MODIS / MERIS satellite pass-overs (see text / next table / text for more information) | | | |
| Purpose | Date | Time | Location |
| HICO | 7/27 | 9:27 | ~Newport |
| MODIS |  | 13:30 |  |
| HICO | 7/28 | 9:55 | see Table below |
| MERIS |  | 11:30 |  |
| MODIS |  | 13:30 |  |
| HICO | 7/29 | 8:47 | see Table below |
| MERIS |  | 11:30 |  |
| HICO | 7/30 | 9:14 | see Table below |
| HICO | 8/1 |  | see Table below |

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Table summarizing all sites to be occupied during LEG1 including data on travel time and length of stay for sampling at each site. Information presented in this table is used to derive the times indicated in **RED** above. All time estimates assume 10knot ship speed, 0.5m/s CTD cast speed with 20% overhead in time calculation for both. | | | | | | | | | |
| **Station** | **Lat** | **Lon** | **Distance nMiles** | **Travel time hours** | **Depth m** | **Cast time hours** | **Total hr** | **PST Time** | **Date** |
| **Newport** | 44.625 | 124.043 | 0.00 | 0.00 | 0 | 0.00 | 0.00 | 10:00 | July 27 |
| **sh-70** | 44.252 | 124.252 | 24.1 | 2.61 | 70 | 0.28 | 2.89 | 12:503 | HyperPRORO |
| **nh-3**  **h-3**  **h-3** | 44.652 | 124.130 | 24.6 | 2.66 | 48 | 0.25 | 2.91 | 15:48 |  |
| **nh-5** | 44.652 | 124.177 | 1.99 | 0.40 | 60 | 0.27 | 0.67 | 16:28 |  |
| **nh-10** | 44.652 | 124.295 | 5.05 | 0.71 | 80 | 0.29 | 0.99 | 17:28 |  |
| nh-15 | 44.652 | 124.412 | 4.98 | 0.70 | 90 | 0.30 | 1.00 | 18:27 |  |
| **nh-20** | 44.652 | 124.528 | 4.98 | 0.70 | 140 | 0.36 | 1.05 | 19:31 |  |
| nh-25 | 44.652 | 124.650 | 5.19 | 0.72 | 296 | 0.53 | 1.25 | 20:46 |  |
| nh-35 | 44.652 | 124.883 | 9.96 | 1.20 | 435 | 0.68 | 1.88 | 22:38 |  |
| nh-45 | 44.652 | 125.117 | 9.96 | 1.20 | 700 | 0.98 | 2.17 | 0:49 | July 28 |
| **nh-55** | 44.652 | 125.367 | 10.7 | 1.27 | 2885 | 3.41 | 5.17 | 5:59 |  |
| **cm-10** | 45.483 | 124.208 | 69.7 | 7.17 | 135 | 0.35 | 7.52 | 13:31 | HyperPRO |
| lp-4 | 47.917 | 124.742 | 147.6 | 15.0 | 35 | 0.24 | 15.20 | 4:42 | July 29 |
| **lp-6** | 47.917 | 124.792 | 2.01 | 0.40 | 55 | 0.26 | 0.66 | 5:22 |  |
| lp-9 | 47.917 | 124.875 | 3.35 | 0.54 | 82 | 0.29 | 0.83 | 6:12 |  |
| lp-12 | 47.917 | 124.958 | 3.35 | 0.54 | 110 | 0.32 | 0.86 | 7:03 |  |
| **lp-17** | 47.917 | 125.083 | 5.03 | 0.70 | 137 | 0.35 | 1.05 | 8:06 |  |
| lp-22 | 47.917 | 125.192 | 4.36 | 0.64 | 183 | 0.40 | 1.04 | 9:09 |  |
| lp-27 | 47.917 | 125.308 | 4.69 | 0.67 | 494 | 0.75 | 1.42 | 10:34 | HyperPRO |
| **lp-32** | 47.917 | 125.432 | 4.99 | 0.70 | 790 | 1.08 | 2.28 | 12:50 |  |
| **lp-52** | 47.917 | 125.928 | 19.95 | 2.19 | 1500 | 1.87 | 4.56 | 17:24 |  |
| cr-50 | 46.167 | 125.030 | 111.4 | 11.3 | 1000 | 1.31 | 12.65 | 6:03 | July 30 |
| **cr-40** | 46.167 | 124.910 | 4.99 | 0.70 | 969 | 1.28 | 2.48 | 8:32 |  |
| cr-35 | 46.167 | 124.792 | 4.92 | 0.69 | 1097 | 1.42 | 2.11 | 10:39 | HyperPRO |
| **cr-30** | 46.167 | 124.670 | 5.06 | 0.71 | 591 | 0.86 | 2.06 | 12:42 |  |
| cr-25 | 46.167 | 124.557 | 4.71 | 0.67 | 146 | 0.36 | 1.03 | 13:44 |  |
| cr-20 | 46.167 | 124.452 | 4.36 | 0.64 | 132 | 0.35 | 0.98 | 14:43 |  |
| **cr-15** | 46.167 | 124.333 | 4.92 | 0.69 | 110 | 0.32 | 1.01 | 15:44 |  |
| cr-10 | 46.167 | 124.218 | 4.78 | 0.68 | 82 | 0.29 | 0.97 | 16:42 |  |
| **cr-7** | 46.167 | 124.158 | 2.49 | 0.45 | 55 | 0.26 | 0.71 | 17:25 |  |
| cr-4 | 46.167 | 124.077 | 3.39 | 0.54 | 27 | 0.23 | 0.77 | 18:11 |  |
| NSConfluence | 46.235 | 123.880 | 9.14 | 1.11 | 15 | 0.22 | 1.33 | 19:31 |  |
| Upriver#1 | 46.239 | 123.720 | 6.65 | 0.87 | 15 | 0.22 | 1.08 | 20:36 | HyperPRO |
| NSConfluence | 46.235 | 123.880 | 6.65 | 0.87 | 15 | 0.22 | 1.08 | 21:41 |  |
| NC11 | 46.241 | 123.972 | 3.82 | 0.58 | 15 | 0.22 | 0.80 | 22:29 | thru 8/ 2 |



Map showing the sites to be occupied during LEG1 (see table above for details about the schedule). Work scheduled to be done at each of these sites is outline in the written materials above.

**Leg 2** Microbiology/CO2/Methane/Nutrients

NOTE: All ship transit during this Leg is done at ≤5 knots so that the boom-mounted ADCP can be deployed continuously

2 Aug: **Methane outwash experiment Catalamet Bay (Neap Tides)**

* RM17 (46.210oN, 123.776oW) by 1500, anchored overnight
  + Setup for continuous profiling with supersucker
  + Discrete samples taken for [CH4] determination, on-deck methane oxidation experiments, and molecular biological measures of methanotrophic community and, ideally, activity
  + Michelle: sample the following 3 time points: Max major flood, mid major ebb, max major ebb; 4 L of surface water for each

3 Aug: **Hydrographic River Survey with Supersucker (T, S, transmissometry, backscatter, chla, phytoerythrin, pO2, altimetry: in situ; pCO2, methane, nutrients: shipboard)**

* **Upriver to Beaver Army Terminal (BAT)**

**Campbell**: baseline survey samples - 5L from surface and bottom waters at BAT; also 5L sample from freshwater on the way to or from BA (best in early morning or evening)

NOTE: all sampling from here onwards will be done using the ship’s flow-thru system or the ‘supersucker’

* **Downriver to North Channel**
  + pCO2, FMA, nutrient monitoring done with ship’s flow-thru system while in transit (at ≤5 knots)
  + Depth profiles with supersucker at discrete stations along the down river transect (see map below):
  + BAT: 46.170oN, 123.212oW
  + Upriver#4: 46.144oN, 123.321oW
  + Upriver#3: 46.210oN, 123.424oW
  + Upriver#2: 46.255oN, 123.553oW
  + Upriver#1: 46.239oN, 123.720oW
  + Tongue Point: 46.220oN, 123.771oW
  + Astoria off Youngs Bay: 46.189oN, 123.885oW
  + At each station, discrete samples taken for [CH4] determination, on-deck methane oxidation experiments (BAT, Upriver#2, Astoria off Youngs Bay), and molecular biological measures of methanotrophic community and, ideally, activity
  + **Michelle**: sample at BAT (ideally, 4L from surface and bottom); as well as at the Upriver 1-4 sites (4L each, surface)

**Anchor overnight (RM-17: 46.210oN, 123.776oW)**

**2nd Occupation - Methane outwash experiment Catalamet Bay (Neap Tides)**

* RM17 (46.210oN, 123.776oW) by 2100, anchored overnight
  + Continuous profiling with supersucker
  + Discrete samples taken for [CH4] determination, on-deck methane oxidation experiments, and molecular biological measures of methanotrophic community and, ideally, activity
  + **Michelle**: sample at 4 time points: mid major flood, max major flood, mid major ebb, max major ebb (4L each. surface)

4 Aug: **Hydrographic Survey with Supersucker (Neap-to-Spring Transition)**

NOTE: we can take large-volume discrete samples from the vehicle, but this operation will comes at the expense of the shipboard analyses that depend on the sample supply stream.  The best way to do such sampling is to periodically stop the ship, dedicate our efforts to pumping large volumes from fixed  depths, and then resume surveying.  This operation will come at the expense of continuous plume surveys, so we need to define an optimal plan!

* **Plume (begin at 0600)**
  + Continuous depth profiles taken over 4.5d with supersucker along the same transect line perpendicular to the Columbia River plume. Transect line defined with guidance from CMOP model (Joe Cho). Ultimate objective is to quantify biogeochemical signals that are exported from the CRE to the coastal ocean during a neap-to-spring transition. Ideally would need to perform this exercise over a complete neap-spring-neap period.
  + Discrete samples for [CH4] and pCO2/TCO2 will be taken from supersucker pump at prescribed times to calibrate continuous FMA and LICOR measurements
  + **Michelle:** sample for FlowCAM at all discrete sampling points, plus samples for POC (1L) where possible; collect water across the plume transect – one sample north of the plume (10L), one mid-plume (10L), and one south of the plume (10L) (all surface water)

5 Aug: **Hydrographic Survey with Supersucker**

* **Plume (continued)**

6 Aug: **Hydrographic Survey with Supersucker**

* **Plume (continued)**

7 Aug: **Hydrographic Survey with Supersucker**

* **Plume (continued)**

8 Aug: **Hydrographic Survey with Supersucker**

* **Plume (end at 1800)**
* **Methane outwash experiment Catalamet Bay (Spring Tides) – anchored at RM17**
  + Continuous profiling with supersucker
  + Discrete samples taken for [CH4] determination, on-deck methane oxidation experiments, and molecular biological measures of methanotrophic community and, ideally, activity
  + **Michelle:** sample at 5 time points: max minor ebb, mid major flood, max major flood, mid major ebb, max major ebb (4L each, surface)

9 Aug: **Survey of South Channel (46.200oN 123.936oW to 46.210oN 123.776oW return)**

* **Profiles with supersucker** at discrete locations proximate to Youngs Bay during this flood / ebb tide period. Aimed to evaluate ‘outwash’ biogeochemical signals from this major, non-vegetated mudflat system in the CRE
* **Michelle:** sample at 4 time points - mid minor flood, max minor flood, mid minor ebb, max minor ebb (4L each, surface)
* **End operations at 2100 and sail back to Newport (**~**11hrs travelling)**

10 Aug: **arrive in Newport (0800) and unload**