**Group 1- Log Book**

**DAY 1**

Offshore:

Date: 29/06/10 Time of Departure: 0800 GMT

Vessel: RV Callista

Weather at departure: Grey, very light shower, overcast. Low winds.

HW: 0650 GMT 6.0m LW: 1320 GMT 1.2m

Heading 125°

**Station 1:** Blackrock

Lat: 050.08.476N long: 005.01.534W

Time: 0819 GMT Weather: 8/8 cloud cover

True wind: 318°, 3.4 m/s Tide height: 4.4 m

Water temp: 15.6.C (t/s probe 15.1C)

CTD deployed at 0825 GMT, secchi disk deployed at 0839 GMT, secchi depth 7m

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  |  | SAMPLE BOTTLE NUMBER |  |
| Stn | Depth (m) | Niskin bottle No. | O | N&P | S | LI |
| A2 | 18.4 | 3 | 111 | 066 | 001 | 002 |
| A1 | 2.5 | 5 | 112 | 047 | 003 | 003 |

A3: 0954 GMT vertical plankton net 200 µm mesh, depth 10m, closing net

3 niskin bottles were fired for 2.5 m depth but only one used (bottle 5)

**Station 2:** (possibly passing the front)

Lat: 050.07.007N long: 004.59.411W

Time: 0913 GMT Weather: 8/8 cloud cover

True wind: 326°, 2.0 m/s Tide height: 3.9 m

Water temp:15.2°C

 CTD deployed at 0918 GMT

No defined features, unclear thermocline, no water samples taken here

**Station 3:** T/s probe used to find the front. 15.4°C, increase of 0.2°C in seconds at 50.06N, 004.57W. CTD dropped to 60m

Lat: 050.05.933N long: 004.57.360W

Time: 0937 GMT Weather: 8/8 cloud cover

True wind: 317°, 1.9 m/s Tide height: 3.6m

Water temp:15.3C (t/s probe 15.1C)

Clear thermocline on edge of the front 15.4- 12.3°C

**Station 4:**

CTD dropped to 60m

Lat: 050.05.040N Long: 004.55.742W

Time: 1000 GMT Weather: 8/8 cloud cover

True wind: 311°, 1.3m/s Tide height: 3.3m

Water temp: 15.8°C (t/s probe 16.6C)

Temp very stratified, chlorophyll maximum clear just below thermocline

|  |  |  |  |
| --- | --- | --- | --- |
| Niskin bottle No | Depth (m) | Salinity | Temp (°C) |
| 1 | 61 | 35 | 10.6 |
| 3 | 27 | 35 | 11.6 |
| 5 | 27 | 35 | 11.6 |
| 9 | 21 | 35 | 12.3 |
| 11 | 5 | 35 | 16.1 |

Secchi disk deployed at 1007 GMT

Secchi disk depth 10.5m

Water samples:

|  |  |  |  |
| --- | --- | --- | --- |
|  |  | SAMPLE BOTTLE NUMBER |  |
|  Niskin bottle No. | Depth (m) | O | N&P | S | LI |
| 1 | 61 | 116 | 049 | 003 | 001 |
| 5 | 27 | 114 | 054 | 004 | 004 |
| 11 | 5 | 113 | 055 | 005 | 005 |

Plankton trawl (closing net)

PP sampling between 35-40m and 0-20m, using a 200µm mesh net.

Time: 1046 GMT

Chlorophyll maximum 27m.

**Station 5:**

Lat: 050.08.017N Long: 004.55.005W

Time: 1135 GMT Weather: 8/8 cloud cover

True wind: 181.1°, 2.4m/s Tide height: 1.9m

Water temp: 15.8°C

CTD drop depth: 48m

Current: 214.9° 0.4knots

Secchi depth: 8.5m

**Station 6:**

Lat: 050.10.684N Long: 004.54.725W

Time: 1212 GMT Weather: 8/8 cloud cover

True wind: 198.3°, 3.1m/s Tide height: 1.5m

Water temp: 15.2C

CTD drop depth: 30m

Current: 203.1° 0.4knots

Secchi depth: 7.0m

**Station 7:**

Lat: 050.09.953N Long: 004.46.805W

Time: 1259GMT Weather: 5/8 cloud cover

True wind: 195.5°, 3.6m/s Tide height: 1.2m

Water temp: 15.9°C

CTD drop depth: 48m

Current: 213.0° 0.4knots

Secchi depth: 11.5m

No CTD drop.

**Station 8:** PLANKTON TRAWL (Bongo net)

Depth of trawl- 2m at 1.6knots

Time net in: 1326 GMT Time net out: 1331 GMT Total time: 5mins

Lat in: 50. 11.378N Long in: 004.47.449W

Lat out: 50.11.458 Long out: 004.47.819W

100µM net and a 200µM net. Net open area: 0.38m2

True wind: 192.6°, 3.8m/s Tide height: 1.2m (Mevagissey)

Water temp: 15.9°C

Current: 215.1° 0.4knots

CTD drop depth: 42m

**Station 9:**

Lat: 050.08.412N long: 005.01.351W

Time: 1511 GMT Weather: 5/8 cloud cover

True wind: 240.1°, 5.8m/s Tide height: 2.3m

Water temp: 15.6°C

CTD drop depth: 13m

Current: 016.0° 0.6knots

Secchi depth: 6.5m

Vertical plankton trawl 15m to surface (close net) at 15:21 GMT. Position: 15.08.401N 005.01.598W

|  |  |  |  |
| --- | --- | --- | --- |
|  |  | SAMPLE BOTTLE NUMBER |  |
|  Niskin bottle No | Depth (m) | O2 | N&P | Si | LI |
| 3 | 13.1 | 115 | 050 | 006 | 006 |
| 5 | 2.6 | 117 | 051 | 007 | 007 |

Volume filtered through filters: 50ml

**ADCP directory**

|  |  |  |
| --- | --- | --- |
| File name | Location at start | Time at start (GMT) |
|  gp1000r | 50.08.476N | 5.01.534W | 0825 |
| gp1001r | 50.08.035N | 5.01.331W | 0857 |
| gp1002r | 50.06.984N | 4.59.380W | 0914 |
| gp1003r | 50.06.837N | 4.59.060W | 0924 |
| gp1004r | 50.05.934N | 4.57.363W | 0935 |
| gp1005r | 50.05.863N | 4.57.315W | 0946 |
| gp1006r | 50.05.071N | 4.55.763W | 0957 |
| gp1007r | 50.04.685N | 4.56.013W | 1105 |
| gp1008r | 50.08.010N | 4.55.096W | 1134 |
| gp1009r | 50.07.991N | 4.55.215W | 1147 |
| gp1010r | 50.10.688N | 4.54.725W | 1208 |
| gp1011r | 50.10.759N | 4.54.817W | 1216 |
| gp1012r | 50.09.965N | 4.46.798W | 1256 |
| gp1013r | 50.09.955N | 4.46.093W | 1309 |
| gp1014r | 50.11.300N | 4.47.477W | 1324 |
| gp1015r | 50.11.377N | 4.47.801W | 1353 |
| gp1016 | 50.08.324N | 5.01.476W | 1503 |

**CTD directory**

|  |  |  |  |
| --- | --- | --- | --- |
| File Name | Bottle sample code | Location of drop | Time (GMT) |
| St 1 | A |  |  |
| St 2 | B | 50.06.984N,4.59.380W | 0917 |
| St 3 | C | 50.05934N,4.57.363W | 0943 |
| St 4 | D | 50.05071N,4.55.763W | 0957 |
| St 5 | E | 50.08017N,4.55.005W | 1136 |
|  St 6 | F | 50.10638N,4.54.725W | 1208 |
|  St 7 |  | 50.09.953N,4.46.805W | 1259 |
| St 8 | H | 50.11503N,4.48.042W | 1340 |
| St 9 | I | 50.08324N,5.01.476W | 1503 |

Summary of objectives:

To identify location of front off of Falmouth by sampling once on mixed side, crossing the front and taking samples on the stratified side, back and forth from mixed to stratified in order to identify the area it was between. Achieved using CTD vertical profiles. There were 9 stations altogether. Data was processed in order to identify front and map. Water bottle samples were taken in order to look at the bio and chem. Of either side of the front using Niskin bottles and phytoplankton trawls.

 **DAY 2**

**Bio Lab:**

Date: 30/06/10

**Objectives:** Process samples collected on offshore practical on the 29/06/10 on *Callista* offshore. Identifying and quantifying zooplankton and phytoplankton samples.

**Phytoplankton**

* Lugols iodine samples were allowed to settle overnight so that sedimentation of plankton could occur.
* Each sample was concentrated by siphoning off the excess lugols iodine with a siphon pump. 90ml was siphoned off from 100ml leaving 10ml of concentrated sample. Therefore sample was concentrated by a factor of 10x.

**Method**

* From each concentrated sub-sample of 10ml we extracted 1ml to fill a sedgewick rafter cell.
* This cell was then viewed under the microscope by an optical zoom of 10x.
* Species were identified and quantified by counting the number of phytoplankton within each square.

**Table: Phytoplankton counts from Offshore**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Station** | **Depth (m)** | **No. columns counted** | **Volume viewed (ml) (x10 dilution)** | **Species** | **Abundance** |
| 1(A) | 2.5 | 10 | 2 | Conscinodiscus | 2 |
| 1(A) | 18.4 | 10 | 2 | None | 0 |
| 4(D) | 5 | 15 | 3 | None | 0 |
| 4(D) | 27 | 20 | 4 | Chaetoceros | 1 |
| 4(D) | 61 | 15 | 3 | Conscinodiscus | 1 |
| 9(I) | 2.6 | 20 | 4 | Rhizosolenia setigera | 1 |
|   |   |   |   | Conscinodiscus | 1 |
|   |   |   |   | Leptocylindrus donicus | 1 |
| 9(I) | 13.1 | 20 | 4 | Chaetoceros | 1 |
|   |   |   |   | Rhizosolenia setigera | 1 |

**Summary**

* Very few phytoplankton, therefore impossible to do any statistics.
* Representatives: *Cosinodiscus Chaetocerus Rhizosolenia*

**Zooplankton**

* On Callista, 10ml of Formalin was added to each 1L bottle sample. This killed the zooplankton allowing us to count them today.
* The samples were concentrated from 1L down to 500ml samples.

**Method**

* From each 500ml bottle, we took either a 5ml or 2ml sub-sample depending on how concentrated with zooplankton the bottle was.
* This was transferred into a Bogorov chamber (making sure it was well mixed beforehand.
* This was viewed under a light microscope from 0 – 3.5x magnification.
* Species of zooplankton were identified and counted using, “Coastal Plankton: Photo Guide for European Seas” by Otto Larink and Wilfred Westheide, 2006.
* We filled in the sheets as shown.
* We then averaged all the data (each station/bottle was counted 4 times) for different species in a spreadsheet and worked out the flow through each net.

In order to calculate the number of copepods in the phytoplankton trawl (200µm mesh), we used the following equation:

**Number of revolutions x 0.3 x opening area of bongo net**

e.g. 789 x 0.3 x 0.38

 = 89.95 m3

As an estimation we expected about 1000 copepods per m3.

Total over 5 samples was 2190 copepods counted.

Took average = 438

Bottle samples 500ml, sampled 2ml, so multiplied 438 by 250.

This gives average per bottle: 109500 copepods.

109500 / 89.95 = 1217 copepods m-3

This was what we expected from our estimation.

**Chemistry Lab**

Date: 30/06/10

**Objectives:** To determine the average concentrations of chlorophyll, dissolved oxygen, nitrate, phosphate and silicon in our bottle samples collected during offshore practical (29/06/10)

**Chlorophyll**

**Results**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Station** | **Depth (m)** | **Filter Number** | **Reading (µg/L)** | **Adjusted Reading (µg/L)** |
| 1 | 2.5 | 73 | 7.18 | 0.86 |
| 1 | 18.4 | 74 | 7.38 | 0.89 |
| 1 | 2.5 | 75 | 2.66 | 0.32 |
| 1 | 18.4 | 76 | 6.84 | 0.82 |
| 4 | 61 | 77 | 3.17 | 0.38 |
| 4 | 61 | 78 | 2.97 | 0.36 |
| 4 | 27 | 79 | 15.10 | 1.81 |
| 4 | 27 | 80 | 14.50 | 1.74 |
| 4 | 5 | 81 | 5.03 | 0.60 |
| 4 | 5 | 82 | 4.25 | 0.51 |
| 9 | 13.1 | 83 | 4.11 | 0.49 |
| 9 | 13.1 | 84 | 4.71 | 0.57 |
| 9 | 2.6 | 85 | 9.29 | 1.11 |
| 9 | 2.6 | 86 | 9.44 | 1.13 |

**Method**

* Poured the 6ml of acetone (which had the filter in it overnight) into a cuvette.
* This was placed into the fluorometer (serial number SOES1348) and analysed.
* The reading was the adjusted for the sample size to give a reading in µg/L.

**e.g.** sample size = 6ml

filtered seawater = 50 ml

corrected reading = (reading x 6) / 50

**Silicon - method**

* Make standard to test against. Used standard B for offshore – 25x dilution.
* Made blanks with water and other chemicals to account for 0 silicon. Take this value away from final results as accounts for glass and the other chemicals.
* Added 5ml of samples into bottles and added reagent to each. Also did replicates.
* Prepared reagent:

10 parts Metol Sulphate

6parts oxalic acid

6 parts sulphuric acid

8 parts MQ water

* Added 3ml of reagent to bottles, including blanks.
* Mixed well, left to set for 2 hours.
* Put samples into 4cm long glass box (as opposed to 1cm). Used larger box as there was so little silicon.
* Placed into spectrophotometer to give absorbance value.
* Record absorbance value for each standard sample and water sample by pouring each into the 4cm cuvette one at a time.
* A single beam spectrophotometer U5625 was used (wavelength 810 nm).

**Results – Standards and Blanks**

|  |  |  |  |
| --- | --- | --- | --- |
| **Dilution (x)** | **Abs 1** | **Abs 2** | **[Si] (µM)** |
| 1 | 0.006 |   | (blank) |
| 1 | 0.014 |   | (blank) |
| 1 | 0.005 |   | (blank) |
| 1 | 0.585 |   | 1.4 |
| 1 | 0.037 |   | 1.4 |
| 1 | 0.087 |   | 1.4 |
| 1 | 0.146 |   | 2.8 |
| 1 | 0.145 |   | 2.8 |
| 1 | 0.162 |   | 2.8 |
| 1 | 0.33 |   | 7.1 |
| 1 | 0.262 |   | 7.1 |
| 1 | 0.298 |   | 7.1 |
| 2 | 1.343 | 0.767 | 14.2 |
| 2 |   | 0.388 | 14.2 |
| 2 |   | 0.349 | 14.2 |

**Results – Our Samples**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Station** | **Depth (m)** | **Salinity** | **Bottle Number** | **Dilution (x)** | **Abs 1** |
| 1 | 2.5 | 35 | 002 | 1 | 0.71 |
| 4 | 5 | 35 | 005 | 1 | 0.057 |
| 9 | 2.6 | 35 | 007 | 1 | 0.07 |
| 4 | 61 | 35 | 003 | 1 | 0.12 |
| 1 | 18.4 | 35 | 001 | 1 | 0.079 |
| 1 | 18.4 | 35 | 001 | 1 | 0.079 |
| 9 | 13.1 | 35 | 006 | 1 | 0.073 |
| 9 | 13.1 | 35 | 006 | 1 | 0.075 |
| 4 | 27 | 35 | 004 | 1 | 0.083 |
| 4 | 27 | 35 | 004 | 1 | 0.075 |

**Notes**

* In one of the standards of [Si] 1.4, the absorbance levels were very high (0.585). The other replicates were very much lower – 0.037 and 0.087. This high value may be ignored in calibration plots.
* In [Si] 14.2 it was found that without dilutions the absorbance levels were much higher than other results (1.343). It was necessary to dilute x2 to reach more acceptable values. [NO3-]

**Nitrate**

**Calibration Table**

|  |  |  |
| --- | --- | --- |
| **[NO3-] (µM)** | **Peak Height (mm)** | **Average (mm)** |
| 10 | 28 |   |
| 10 | 30 | 29.3 |
| 10 | 30 |   |
| 1 | 3 |   |
| 1 | 3 | 3.0 |
| 1 | 3 |   |
| 5 | 16 |   |
| 5 | 14 | 14.3 |
| 5 | 13 |   |

**Method – Flow Injection**

* Using a clean syringe, inject 2ml of sample into a steady flow of artificial seawater (seawater without nitrate)
* Sample passes through a block that contains coppensed cadmium catalyst. Nitrate in sample is reduced to nitrite.
* Sulphanilamide and NEDH reactants are added to the flow, reacting with nitrate to produce azo dye.
* Concentration of azo dye is determined by transmissometer. Blocked light is recorded as a peak below a base line of 100% of light transmitted through reagents.

**Dissolved Oxygen**

**Method**

Firstly had to standardise the sodium thiosulphate:

* Added 50ml of MQ water
* 1ml sulphuric acid
* 1ml alkaline iodine
* 10ml KIO3, mix, wait 5 mins
* Add MQ water to brim
* Add magnetic stirrer
* Repeat 3 times until difference <5%
* Divide average of burette readings by 50.

**\*Thiosulphate normality = 0.1 / V**

**(V = average titre for the standardisation procedure in ml)**

22.490 ml 1st test Average = 22.45 = 0.449. 0.1/0.449 = **0.22\***

22.500 ml 2nd test 50

22.360 ml

**Results**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Station** | **Temp (°C)** | **Salinity** | **Bottle Number** | **Thiosulphate added (ml)** | **Bottle Weight (ml)** |
| 1 | 13.8 | 35.0 | 111 | 30.080 | 119.37 |
| 1 | 15.0 | 34.9 | 112 | 29.820 | 119.79 |
| 4 | 16.1 | 35.0 | 113 | 30.100 | 118.61 |
| 4 | 11.6 | 35.1 | 114 | 30.665 | 102.81\* |
| 9 | 14.2 | 35.0 | 115 | 30.825 | 120.61 |
| 4 | 10.9 | 35.1 | 116 | 27.205 | 120.02 |
| 9 | 14.9 | 34.9 | 117 | 30.390 | 120.61 |

**Phosphate**

**Method**

* Using a clean syringe inject 10ml of sample into centrifuge tube (labelled)
* 3 random replicates included (from total sample base of 7 bottles) and 1 blank (using MQ water)
* Make up a reagent using:

20% Ammonium molybdate

50% Sulphuric Acid (2.5 M)

20% Ascorbic acid

10% Potassium Antimonyl tartrate

* Add 1ml of reagent to each 10ml sample and mix. Leave for 1 hour.
* Using a 4ml cell measure the absorbance of the standards, replicates, blanks and samples at a wavelength of 882nm in a spectrophotometer.
* Absorbance values measured twice for accuracy.

**Results – Standards Results - Samples**

Instrument: U-1800

spectrophotometer

Cell: 4cm

Wavelength (882 nm)

|  |  |  |
| --- | --- | --- |
| **[PO4] (µM)** | **Abs 1** | **Abs 2** |
| 0 - blank | 0.010 | 0.010 |
| 0 - blank | 0.016 | 0.016 |
| 0 - blank | 0.014 | 0.013 |
| 0.15 | 0.026 | 0.023 |
| 0.15 | 0.028 | 0.027 |
| 0.15 | 0.022 | 0.021 |
| 0.30 | 0.037 | 0.038 |
| 0.30 | 0.038 | 0.038 |
| 0.30 | 0.041 | 0.039 |
| 0.75 | 0.074 | 0.074 |
| 0.75 | 0.076 | 0.075 |
| 0.75 | 0.076 | 0.075 |
| 1.50 | 0.143 | 0.137 |
| 1.50 | 0.132 | 0.131 |
| 1.50 | 0.136 | 0.136 |
| 3.00 | 0.268 | 0.264 |
| 3.00 | 0.278 | 0.276 |
| 3.00 | 0.264 | 0.264 |
| **Station** | **Depth (m)** | **Bottle Number** | **Abs 1** |
| - | - | BLANK | 0.014 |
| 4 | 27 | 054 | 0.037 |
| 9 | 13.1 | 050 | 0.04 |
| 4 | 5 | 055 | 0.032 |
| 1 | 2.5 | 047 | 0.031 |
| 9 | 2.6 | 051 | 0.029 |
| 1 | 18.4 | 066 | 0.036 |
| 4 | 61 | 049 | 0.043 |
| 1 | 18.4 | 066R | 0.023 |
| 4 | 61 | 049R | 0.043 |
| 4 | 5 | 055R | 0.037 |

**Calibration Plot**

|  |  |
| --- | --- |
| **[PO4] (µM)** | **Blank Corrected Abs** |
| 0.00 | 0.000 |
| 0.15 | 0.012 |
| 0.30 | 0.025 |
| 0.75 | 0.062 |
| 1.50 | 0.123 |
| 3.00 | 0.256 |

**DAY 3 – Data Analysis and Web Design**

Date: 01/07/10

**Roles**

Cris – station

Dani – station

Fiona – station

Amy – station

Rosie – station

Jason – station

Nic – CTD data

Zak – CTD data

Danielle – Website + overseeing

Naomi – CTD data

In the morning we were shown how to use various software, including: SigmaPlot 11, Surfer and Microsoft Frontpage. After Using programmes we divided ourselves into pairs/individuals to cover the analysis of all stations.

**Nic** – I accessed Google Earth to plot the stations we visited using latitude and longitude recorded at each point. The lat and long had to be converted from the format ‘degrees minutes decimals’ which the ship used, to ‘degrees minutes seconds’ which is the format Google Earth requires. This was done taking the latitude, e.g.

 050° 08.478N (478 = decimal)

 (478 / 1000) x 60

 = 28.56 seconds

Therefore, degrees minutes decimal = 050° 08.478N
 degrees minutes seconds = 050° 08. 2856N

|  |  |  |
| --- | --- | --- |
| **Station** | **Degrees Min Decimal** | **Degrees Min Seconds** |
|  | **Lat N** | **Long W** | **Lat N** |
| 1A | 050° 08.476 | 005° 01.534 | 050°08.2856 |
| 2B | 050° 07.007 | 004° 59.411 | 050° 07.0004 |
| 3C | 050° 05.933 | 004° 57.360 | 050° 05.5598 |
| 4D | 050° 05.040 |  004° 55.742 | 050° 05.2400 |
| 5E | 050° 08.017 | 004° 55.005 | 050° 08.1020 |
| 6F | 050° 10.684 | 004° 54.725 | 050° 10.4104 |
| 7G | 050° 09.953 | 004° 46.805 | 050° 09.5718 |
| 8H | 050° 11.378 | 004° 47.449 | 050° 11.2268 |
| (Bongo trawl) | 050° 11.458 | 004° 47.819 | 050° 11.2748 |
| 9I | 050° 08.412 | 005° 01..351 | 050° 08.2472 |

**Jason - Chlorophyll – Fluorometry analysis:** Plotted a calibration curve for each station where chlorophyll filters were obtained using fluorometry data from CTD for same depth. Used calibration curve for chlorophyll concentration and put values into processed CTD data worksheets.

**Rosie:** Started transferring the logbook onto a computer file incase of a loss.

**Dani: Stations 1,4,9 -** Used sigmaplot to produce graphs of nitrate, phosphate, oxygen saturation and silicon concentrations against depth. Also a graph of temperature and chlorophyll against depth for the stations. For future reference, analysis and website.

**Naomi:** Constructed readme files after computing lectures to provide a short abstract for stations illustrating the most significant details and observations.

**DAY 4 – Geophysics**

Date: 02/07/10

Boat: R.V. Explorer

Time of departure: 0750 GMT

Weather at dock: 4/8, light breeze

HW: 0845 GMT 4.6m

LW: 1505 GMT 1.5m

Wind 12mph WSW (met office website)
Temp: 18°C

Springs – 4 (28/06/10)

Neaps + 4 (06/07/10)

OSGB details in red

**Objectives of the boat work:**

* Using the side scan sonar and sector scan sonar to map seagrass beds, also deploying video equipment to confirm its presence.
* Using ADCP to determine water characteristics at the location/transect.
* Possible use of grabs to confirm substratum at appropriate locations (i.e. NOT the seagrass beds) if required.

**On boat activities**

* Secured ADCP to pole and fitted to side of vessel.
* Team brief by P.S.O (Rosie), aims of the day and job allocation.

**Recci** – 0819 GMT – St Mawes area to determine likelihood of good data collection, due to the amount of moorings in the area. 4/8 octaves, sunny. Sea surface calm.

Outcome: Good area to do 1st transect.

**Towfish Transect (Side scan sonar)**

Start: 0840 GMT 4/8 octaves calm water

End: 0854 GMT 4/8 octaves

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  **Location** |  |  | **Time** |
| **Lat N** | **Long W** | **OSBG N** | **OSBG E** | **(GMT)** |
| 050° 09.205 | 005° 01.298 | 184249 | 032524 | 0843 |
| 050° 09.392 | 005° 00.977 | 184645 | 032855 | 0847 |
| 050° 09.403 | 005° 00.830 | 184821 | 032868 | 0849 |
| 050° 09.319 | 005° 00.554 | 185143 | 032699 | 0852 |
| 050°09.279 | 005° 00.494 | 185211 | 032622 | 0853 |

**St Mawes Harbour/Percil River Area**

* Sector scan – already deployed start of week.
* Tow fish – deployed 0836 GMT (415 kHz)
* Water depth – ave 6.7m
* Layback – boat to tow fish = 514cm

 GPS receiver to towfish = 580cm

 410cm, 312 – GPS

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  |  **Location** |  |  | **Time** | **Water** |
| **Lat N** | **Long W** | **OSBG N** | **OSBG E** | **(GMT)** | **Depth (m)** |
| 050° 09. 263 | 005° 01. 190 | 184382 | 032626 | 0845 | 6.93 |
| 050° 09. 382 | 005° 00.741 | 184925 | 032825 | 0850 | 7.12 |
| 050° 09.319 | 005° 00.547 | 185151 | 032699 | 0852 | 7.44 |
| 050° 09. 234 | 005° 00.453 | 185257 | 032537 | 0853 | 3.31 |

Unknown activities at the above locations!?

**Video Camera**

* Deployed using crane at back of vessel. Camera attached to frame, secured by ties.
* Deployed @ 0907 GMT, END @ 0911 GMT
* 4/8 octaves
* Water column – 8.5m depth
* \*Recording time on video uses BST in disk\*

**Calculating layback of towfish**

Towfish model – 159D

Serial Number – 479

x = layback

Diagonal distance from GPS (above boat) to towfish = 541cm

Height from water surface to GPS (above boat) = 212cm

Depth of towfish in the water column = 150cm

150 +212 = 362 cm

541cm2 = x2 + 362cm2

x = √(5142 – 3122)

**x = 408cm**

**Sector Scanner**

* Sweep angle = 90° (45° either side of normal)
* Start range = 0
* End range = 10
* Transmit pulse = 110 microseconds
* Mute pulse = 220 microseconds
* Sweeps back and forth across seabed.

**Video camera** – full colour, steel frame mount

**Crane** – Type HM3.25, brand HELIA

**Grab** – Van Veen Grab

46 x 34 x 20 cm3

**Sieve stack** – 3x trays

 Coarse – 15mm

 Fine – 3mm

Finest - <3mm

**Grab – Maerl Bed**
Picture File: N° 111-1577

Depth: 6.99m

Time: 0915 GMT

Location:

050° 09.225N (184296N)

005° 01.260W (032559E)

**What was found**

* Maerl
* Hermit crab
* Green seaweed – ulva
* Gastropods – topshells, hermit crab
* Ophiuroida
* Errant polychaete
* Red seaweed
* Fine mud

Content of grab returned to roughly same location.

**Transect 2**

Towfish deployed: 0952 GMT (layback same as 1st)

Start transect: 0953 GMT, End 0957 GMT

Weather 7/8 octaves

Start Location:

050° 08.976N (184428N)

005° 01.133W (032012E)

End Location:

050° 09.144N (184787N)

005° 00.842W (032389E)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  |  **Location** |  |  | **Time** | **Water** |
| **Lat N** | **Long W** | **OSBG N** | **OSBG E** | **(GMT)** | **Depth (m)** |
| 050° 09. 014 | 005° 01.055 | 184524 | 32158 | 954 | 4.36 |
| 050° 09.076 | 005° 00.950 | 184653 | 32268 | 956 | 3.84 |

**Video Camera Deployed**

Time: 1000 GMT

Water depth: 4.29m

Cloud: 6/8 octaves

Location: 050°09.205N 184893

 005°00.757W 032498

Found

Seagrass and algae

Seagrass around 1m offshore

Dense seagrass meadow (depth 4.36m)

Location: 050°09.139N 184787

 005°00.842W 032380

Sand and seagrass ----- seagrass less abundant (depth 3.87m)

Location: 050°09.126N 185364

 005°00.856W 032332

Sand only (depth 4.32m)

Time: 1011 GMT

Location: 050°09.099N 184709

 005°00.905W 032309

Occasional 'clumps' found/seen

Time: 1024 GMT

Baran sea floor

**Video Camera OUT**

Location: 050°09.437N

 005°01.011W

**Transect 3**

**Kelp**

Towfish deployed

Time: 1035 GMT

Location: 050°08.520N 184418

 005°01.013W 031246

**Transect 3a**

**Start**

Time: 1037 GMT

Depth of water column: 9.0m

Location: 050°08.601N 184500

 005°01.049W 031393

**End**

Time: 1043 GMT

Depth of water column: 7.3m

Location: 050°08.975N 184422

 005°01.138W 032090

**Transect 3b**

**Start**

Time: 1045 GMT

Depth of water column: 9.3m

Location: 050°08.967N 184324

 005°01.220W 032079

**End**

Time: 1050 GMT

Depth of water column: 11.1m

Location: 050°08.614N 184402

 005°01.132W 031421

**Transect 3b**

**Start**

Time: 1045 GMT

Depth of water column: 9.3m

Location: 050°08.967N 184324

 005°01.220W 032079

**End**

Time: 1050 GMT

Depth of water column: 11.1m

Location: 050°08.614N 184402

 005°01.132W 031421

**Transect 3c**

**Start**

Time: 1052 GMT

Depth of water column: 14.5m

Location: 050°08.581N 184292

 005°01.222W 031364

**End**

Time: 1058 GMT

Depth of water column: 9.2m

Location: 050°08.953N 184225

 005°01.302W 032057

Note: All seen on sidescan

Possibility of kelp on rocks

Time: 1040 GMT

Depth of water column: 9.1m

Location: 050°08.751N 184467

 005°01.086W 031673

Seaweed

Time: 1046 GMT

Depth of water column: 10.0m

Location: 050°08.894N 184337

 005°01.204W 031943

Fishing marks for lobster pots and steering around

Time: 1048 GMT

Depth of water column: 11.0m

Location: 050°08.743N 184376

 005°01.162W 031661

**Video camera deployed**

Found

Crossed transects 3a,3b and 3c.

Some kelps in sandy sub, isolated fronds

Starfish also found

4/8 octinths cloud coverage

Time: 1102 GMT

Depth of water column: 11.5m

Location: 050°08.869N 184247

 005°01.278W 031901

Clear sea bed

Time: 1109 GMT

Depth of water column: 11.0m

Location: 050°08.843N 184326

 005°01.210W 031849

Patches of sea grass

Time: 1110 GMT

Depth of water column: 10.0m

Location: 050°08.841N 184363

 005°01.179W 031844

Notes:

Sector scan:

* Before seagrass the green line is thin
* Over seagrass the green line becomes thicker
* 'Whispyness' in water column (see pictures) when over seagrass

**Video camera out**

Time: 1117GMT

**Video camera deployed**

Time: 1119 GMT

Depth of water column: 8.7m

Location: 050°08.774N 184460

 005°01.093W 031716

Found

Seagrass, sand and patchy kelp

Now attempting 20-30m towards headland by previous rock area

Time: 1126 GMT

Depth of water column: 7.8m

Location: 050°08.740N 184503

 005°01.055W 031651

SKETCH OF TRANSECT LOCATIONS

NO ADCP DATA AVAILABLE – COMPUTER REQUIRED ADMINISTER PASSWORD

SUMMARY OF DAYS EVENTS

TRANSECT 1

Equipment used

* side scan sonar
* sector scan sonar
* video (on frame)
* grab

Produced a 4 leg transect of the area in St Mawes Harbour using the side scan sonar and sector scan sonar. An area of interest was identified and the video equipment deployed. Confirmation of Maerl in the vacinity and a grab sample taken.

TRANSECT 2

Some equipment used but no grab.

Different biotope identified (seagrass meadow). Able to correlate the sonar and vidoe footage to mark out a clear boundary between the edge of the seagrass meadow and the surrounding sandy area. No grab was taken due to seagrass being protected.

TRANSECT 3

Equiment as trasect 1.

Three parallel transects of side scan revealed mainly sand with kelp on margins of rocky substrate. Kelp on sector scan came up as a band of backscatter above the seabed. Grab samples unsuccessful due to rocky substrate/patchy nature of kelp. Drift videos taken corssing all three transects revealed mainly sand with dense kelp patches.

NB. Stalked kelp may give band of backscatter above substrate?

**Estuary Boat Work- Bill Conway**

**Date: 06/07/2010**

**HW: 23:58 GMT 4.3m**

**1143 GMT 4.2m**

**LW: 0542 GMT 1.9m**

 **18.17 GMT 2.1m**

**Wind: 5mph SW**

**Weather: Air Temp 15’C**

 **Cloud 2/8**

**Time leaving Dock- 0808 GMT**

**Tasks**

**Filtering Jason and Cris**

**ADCP Naomi**

**CTD Software Amy**

**CTD Deployment Zac and Danni**

**Light Sensor Rosie and Danielle**

**PSO Nicola Jackson**

**Logbook Fiona**

**Station 1- Black Rock**

**Lat 050’08.621 N**

**Long 005’01.46 W**

**Time: 0841 GMT**

**Weather: Cloud Cumulus, 3/8**

**Depth: 34.9**

**CTD bottle numbers: 2,5,8,10,12**

**CTD data stored on Bill Conway: Desktop- Group 1**

 **Month-Day-Time-Sec**

 **CTD computer: BST- indicate on readme file**

**Water Temp: 15.4’C**

**Salinity:34.9**

**CTD check:**

**CTD drop depth:20m**

**Time GMT: 0842 GMT**

**Lat: 050’08.631N**

**Long: 005’01.421W**

**CTD Drop 1:**

**Nb Potential problems with downcast- so better to use upcast.**

**Depth WC: 31m**

**CTD Drop Depth: 25m**

**Time: 0848 GMT**

**Lat: 50’0.682N**

**Long: 005.01.387W**

**Depth (m) Bottle Number (CTD)**

**25.0 2**

**17.35 5**

**11.56 8**

**6.05 10**

**1.37 12**

**Light meter li- cor**

**Time: 0900 GMT**

**Lat: 50’08.660**

**Long: 005’01.390**

**Plankton Net A**

**Bottle: A**

**Start Time: 0911 GMT End Time: 0916**

**Start Lat: 50’08.697 N End Long: 005’01.311W**

**End Lat: 50’08.556N End Long: 005’01.226W**

Start Rotor Number: 18156

End Rotor Number: 18926

Mesh Size: 200 µm

Net Diameter: 51cm

Wind speed: 219.6’ 4/8knts

Cloud Cover: Cumulus 4/8

Water Depth: 14.9m

Salinity: 35.2

Temp: 15.5’C

ADCP Transect 1

Data file name: group1000r

Weather: Cloud Cover 4/8 cumulus

Time: 0920 GMT

Lat Start: 50’08.458 Long Start: 005’01.059

Lat End : 50’08.630 Long End: 005’02.440

Start Distance from shore: 50m

End Dist from shore: 75m

Salinity: 35.2

Temp: 15.4’C

At 0925 GMT speed of boat increased to 4.7knts to avoid boat. At 0926 speed decreased again to 3.9knots. Note change in direction of current at the bottom of the channel, water going in reverse direction on the eastern side of the channe, possibly contraflow circulation.

TS Probe:

Checking the Niskin bottle samples at CTD drop 1

Bottle Number Salinity Depth (m)

2 35.5 25.0

5 35.5 17.35

8 35.4 11.56

10 35.4 6.05
12 34.7 1.37

There is around a 1psu salinity offset between calibration data and CTD data.

Station 2

Salinity: 34.9

Water Temp: 16.1’C

Lat: 50’10.108

Long: 005’ 02.263

Weather: 4/8 Cumulus

True Wind: 228.9’ 3.9 knots

CTD Drop 2

Water depth: 28m

CTD Drop Depth: 20m

Time: 0955 GMT

Lat: 50’10.171N

Long: 005’02.234W

Depth Niskin Bottle Number CTD Salinity CTD Temp

19.96 2 34 13.63

9.81 5 35.03 13.91

4.12 8 34.98 14.29

2.62 10 34.98 14.32

Light Li-Cor

Time GMT: 1005

Lat: 50’10.242 N

Long: 005’02.123 W

Water Depth: 26.7m

ADCP Transect 2

File Name: group1001r = WRONG

 group1002r= Correct

Time GMT: 1025

Lat Start: 50’10.227 N Long Start: 005’01.404 W

Lat End : 50’ 10.220 N Long End: 005’02.684 W

Start distance from shore: 53m

End distance from shore: 35m

Start Salinity: 34.7

Temp Start: 16.3’C

Salinity End: 34.8

Temp End: 15.4’C

Comments: Weak flow, but not uniform. Northward flow due to influx of tide, Contraflow strong on east side.

TS Probe:

To check Niskin bottles at CTD drop 2

Bottle No. Salinity Depth (m)

2 35.6 19.96

5 35.5 9.81

8 35.4 4.12

**10 34.9 2.62**

**12 34.9 1.02**

**CTD Intercept with ADCP Track- Could Calculate Richardsons Number**

**Lat: 50’10.261**

**Long 005’02.247**

**Meters across track: 939**

**Station 3**

**ADCP: nb, all transects from east to west**

**ADCP Transect 3**

**File Name: group1003r**

**Start Time GMT: 1049 End Time: 1102 GMT**

**Lat Start: 50’10.979N Long Start: 005’01.614W**

**Lat End: 50’10.563N Long End: 005’02.595W**

**Start distance from shore: 49.6m**

**End Distance from shore: 125.0m**

**Salinity start 34.5 Salinity End: 31.2**

**Temp Start: 16.2’C Temp End: 16.4**

**Weather: Cloud Cover 6/8 Cumulus**

**Time GMT: 1059**

**Salinity: 34.1**

**Temp: 16.4**

**Lat: 50’10.665N**

**Long: 005’02.408W**

**Time GMT: 1100**

**Salinity: 31.1**

**Temp: 16.4**

**Lat:50’10.622**

**Long: 005’02.493W**

**Station 4- just North East of Carrick Carlys Rock**

**Time: 1117 GMT**

**Lat: 50’11.624**

**Long: 005’02.813**

**Weather: Cloud Cumulus 3/8**

**True wind: 259’ 9.2knts**

**CTD Drop 3**

**Water Depth: 17.5m**

**CTD drop depth: 15m**

**Start Time GMT: 1117 End Time GMT: 1124**

**Lat: 50’11.624N**

**Long: 005’02.813W**

**Depth (m) Niskin Bottle Number CTD Salinity CTD Temperature**

**12.16 2 34.00 13.526**

**3.66 5 33.52 14.48**

**2.32 8- did not fire 35.12 15.37**

**TS Probe Measurements:**

**Time GMT: 1124**

**Salinity: 29.2**

**Temp: 16.4**

**Location: Same as CTD Probe**

**Light Li Cor**

**Time GMT: 1127**

**Lat: 50’11.585N**

**Long: 005’02.761W**

**Cloud Cover: Cumulus, 4/8**

**Depth Water Column: 8m**

**Nb: Drifted southward to entrance of Restronguet Creek**

**Station 4**

**ADCP Transect 4**

**Start Time: 1140 GMT End Time: 1155 GMT**

**Lat Start: 50’11.867N**

**Long Start: 005’01.939W**

**Lat End: 50’11.614N**

**Long End: 005’03.318W**

**Start Distance From Shore: 96.0m**

**End Distance from shore: 219.0m**

**Wind: 207.3’ 10.3 knots**

**Cloud Cover: Cumulus 3/9**

**Start Salinity: 29.2**

**Start Temp: 16.5’C**

**Depth: 5.6m**

**Boat Speed: 4.0knts**

**End Salinity: 34.6**

**End Temp: 16.3’C**

**NB. Passed over a natural foam line at 136 GMT Salinity 34.3- possibly a front.**

**Time GMT: 1145**

**Lat: 50’11.795**

**Long: 005’02.337**

**Salinity: 34.4**

**Temp: 16.8’C**

**TS Probe:**

**Check for CTD Drop 3**

**Bottle Number Salinity Depth**

**2 35.5 12.16**

**5 35.3 3.66**

**8 NO DATA**

**Station 5**

**ADCP Track 5**

**File Name: group1005r**

**Start Time: 1208 GMT End Time: 1212 GMT**

**Lat Start: 50’12.209N**

**Long Start: 005’02.178W**

**Lat End: 50’12.279**

**Long End: 005’02.287**

**Cloud: Cumulus 4/8**

**Boat Speed: 3.7knts**

**Wing: 240’ 9.8knts**

**Start Salinity: 34.6 End salinity: 34.6**

**Start Temp: 16.4’C End Temp: 16.1**

**Start distance from shore: 32m**

**End distance from shore: 17m**

**CTD Drop 4**

**Water Depth: 18.7m**

**CTD Drop Depth: 15.0m**

**Time GMT: 12.16**

**Lat: 50'12.194**

**Long: 005'02.406**

**Temp: 16.2'C**

**Salinity: 36.4**

**Cloud: Cumulus 4/8**

**True Wind: 244' 10.5knots**

**Bottle Number Depth (m) Temp ('C) Salinity**

**2 14.88**

**8 1.8 15.76 35.12**

**10 7.25 14.25 34.81**

**Light- Li Cor**

**Time: 1227 GMT**

**Lat: 50'12.195**

**Long: 005'02.367W**

**Water Depth: 17.2m**

**Cloud: Cumulus, 6.8 Cirrus Stratus, Alto Stratus.**

**Plankton Net**

**Bottle B**

**Start Time: 1236 GMT End Time: 1242 GMT**

**Start Lat: 50'`12.225 End Lat: 50'12.369N**

**Start Long: 005'02.328 End Long: 005' 02.246W**

**Start Rotor Number:18927 End Rotor Number: 19576**

**Mesh: 200µm**

**Water Depth: 14.1**

**Cloud: 4/8 cumulus, alto cumulus**

**Salinity: 33.5**

**Temp: 16.2'C**

**Wind: 218' 3.7knots**

**TS Probe:**

**Check for Niskin bottle Drop 4**

**Ni Bottle Number Salinity Depth**

**2 35.70 14.83**

**10 35.40 7.25**

**8 34.8 1.80**

**11 34.80 Surface**

**Station 6**

**ADCP Transect 6**

**File Name: group1006r**

**Time: 1312 GMT**

**Start Lat: 50'14.451**

**Start Long: 005'00.806**

**End Lat: 50'14.429**

**End Long: 005'00.899**

**Start Distance from shore: 68m**

**End Distance from shore: 39m**

**Wind Speed: 209' 11.7knots**

**Temp:: 18.5'C**

**Salinity: 32.7**

**Depth: 8.6m**

**Boat Speed: 3.6knots**

**End Time: 1313 GMT**

**End Temp: 18.5'C**

**End Salinity: 32.5**

**CTD Drop 5**

**CTD drop depth: 6m**

**Water Depth: 9m**

**Time: 1315 GMT**

**Lat: 50'14.446**

**Long: 005'00.837**

**Cloud: 7/8 Alto Stratus, Cumulus**

**True wind: 200.33, 7.7knts**

**Depth Bottle No Salinity Temperature**

**5.98 2 32.70 18.50'C**

**Surface 5 30.75 18.10'C**

**Light- Secci Disk and Li Cor**

**Time GMT: 1321**

**Lat: 50'14.404N**

**Long: 005'00.877W**

**Water Depth: 7.2m**

**Cloud Cover: 7/8 Alto Stratus, Cumulus.**

**Wind: Light, picking up**

**Plankton Net;**

**Along Pontoon**

**Time: 1327 GMT**

**Lat: 50'14.404N**

**Long: 005'00.877W**

**Start Rotor: 19577**

**End Rotor: 19656**

**Mesh: 200µm**

**Cloud: 5/8**

**TS Probe:**

**Niskin Bottle Number Salinity Depth (m)**

**2 34.8 5.98**

**5 32.9 1.26**

**- 32.6 Surface**

**CTD Serial Number F58A1**

**Transmissometer: F58A4**

**Niskin Bottles: F52; B,A, C,G,D**

**Li-Cor Meter: LI 1000 Data Logger**

 **Serial Number: Q21147**

 **Calibration date 25/03/02**

 **Units: µm s-1 m-2**

**CTD Rosette: Serial Number: E10/12945/1231**

**Length of Niskin Bottle: 45.8cm long**

**CTD Frame to Bottom of Nikin Bottle Length: 46.1cm**

**YSI Probe: F2020**

**Station 7**

**ADCP Transect 7**

**File Name: group1007r**

**Time GMT: 1350**

**Lat Start: 50'13.383N**

**Long Start: 005'01.396W**

**Lat End: 50'13.313N**

**Long End: 005' 01.707W**

**Start Distance from shore: 52m**

**End Distance from Shore: 60m**

**Start Temp: 17.3'C**

**Start Salinity: 33.8**

**Boat Speed: 3.2knots**

**Depth: 4.0m**

**End Temp: 18.1'C**

**End Salinity: 33.0**

**Cloud 6/8 Cumulus**

**Wind Speed: 143.9 0.5knots**

**Station 7**

**CTD Drop 6**

**Time GMT: 13:59**

**Lat: 50'13.342N**

**Long: 005' 01.525W**

**CTD drop depth: 10m**

**Water Depth: 13m**

**Cloud:**

**True Wind: 116.2' 5.6knts**

**Salinity: 32.2**

**Temp: 17.3**

**Bottle Number Depth (m) Salinity Temperature ('C)**

**2 8.87 32.94 14.273**

**5 4.09 34.58 14.99**

**8 2.10 33.95 15.05**

**Light- Li Cor and Secchi Disk**

**Time GMT: 1405**

**Lat: 50'13.370N**

**Long: 005'01.525W**

**Cloud: 6/8, cumulus and cirrus stratus**

**Water Depth: 14.1m**

**Plankton Net- NO**

**TS Probe:**

**Niskin Depth Salinity**

**2 9.87 35.3**

**5 4.09 35.1**

**8 2.10 34.4**

**Surface 0 34.0**

**Chemical Samples- Taken from Niskin Bottles**

**Nb:**

**Oxygen samples were not shaken at the time, samples were taken but later.**

**Pump system- underway and propella**

**Riverine end members for nitrate and phosphate taken at Truro**

**Lugol iodine= 100ml sample**

**Chlorophyll filter= 50ml go through**

**Station Depth Niskin O2 N&P Si LI CF**

**1 25 2 004 130 54 – 1,2**

**1 17.35 5 - 129 49 - 3.4**

**1 11.56 8 - 119 43 - 5,6**

**1 6.05 10 - 109 35 - 7,8**

**1 1.37 12 101 121 51 095 9,10**

**2 19.96 2 076 115 55 - 12,13**

**2 9.81 5 - 102 56 - 14,15**

**2 4.12 8 - 103 41 - 16,17**

**2 2.62 10 111 108 40 - 18,19**

**2 Surface - - 120 34 - 20,21**

**3 12.16 2 114 128 47 - 24/25**

**3 3.66 5 - 122 37 - 26/27**

**3 0.5m 8 - 134 38 82 22,23**

**3 0.5m Bucket - 112 64 - 28/29**

**5 14.83 2 113 106 48 - 30/31**

**5 1.8 10 105 123 58 87 32/33**

**3 Surface - - 113 66 - 36/37**

**3 7.25 105 - 127 50 - 34/35**

**6 5.98 2 010 117 53 - 38/39**

**6 1.26 5 108 114 39 94 40/41**

**6 Surface - - 113 46 - 42/43**

**7 9.87 2 116 132 52 - 44/45**

**7 4.09 5 - 110 45 - 46/47**

**7 2.10 8 006 `107 59 40 48/49**

**7 Surface - - 111 36 - 50/51**

**Light Sensor Data:**

**Station 1**

|  |  |  |
| --- | --- | --- |
| Station 1DEPTH  | SURFACE LIGHT IRRADIANCE | UNDERWATER LIGHT IRRADIANCE |
| (m) | (I1) (µmol m-2 s-1) | (I2) (µmol m-2 s-1) |
| 0 | 1423 | 724 |
| 1 | 1499 | 450 |
| 2 | 1411 | 404 |
| 3 | 1400 | 309 |
| 4 | 1365 | 138 |
| 5 | 1317 | 215 |
| 7 | 1348 | 155 |
| 9 | 1319 | 118 |
| 11 | 1350 | 86 |
| 13 | 1353 | 65 |
| 15 | 1379 | 46 |

**Light Sensor Data: Station 2**

|  |  |  |
| --- | --- | --- |
| DEPTH | SURFACE LIGHT IRRADIANCE  | UNDERWATER LIGHT IRRADIANCE (I2) |
| (m) | (I1) (µmol m-2 s-1) | (I2) (µmol m-2 s-1) |
| 0 | 1369 | 809 |
| 1 | 1702 | 773 |
| 2 | 1251 | 351 |
| 3 | 613 | 106 |
| 4 | 1739 | 260 |
| 5 | 1715 | 177 |
| 6 | 1662 | 128 |
| 9 | 1642 | 78 |
| 11 | 854 | 45 |
| 13 | 1013 | 35 |
| 15 | 1789 | 32 |

**Light Sensor Data: Station 4**

|  |  |  |
| --- | --- | --- |
| DEPTH | SURFACE LIGHT IRRADIANCE  | UNDERWATER LIGHT IRRADIANCE (I2) |
| (m) | (I1) (µmol m-2 s-1) | (I2) (µmol m-2 s-1) |
| 0 | 1462 | 234 |
| 1 | 556 | 219 |
| 2 | 1292 | 278 |
| 3 | 1246 | 419 |
| 4 | 2039 | 417 |
| 5 | 1980 | 315 |
| 6 | 1920 | 143 |
| 7 | 1901 | 151 |

**Light Sensor Data: Station 5**

|  |  |  |
| --- | --- | --- |
| DEPTH | SURFACE LIGHT IRRADIANCE  | UNDERWATER LIGHT IRRADIANCE (I2) |
| (m) | (I1) (µmol m-2 s-1) | (I2) (µmol m-2 s-1) |
| 0 | 1769 | 923 |
| 1 | 1873 | 708 |
| 2 | 893 | 179 |
| 3 | 664 | 108 |
| 4 | 650 | 72 |
| 5 | 643 | 52 |
| 7 | 700 | 37 |
| 9 | 703 | 19 |
| 11 | 910 | 16 |
| 13 | 1930 | 20 |
| 15 | 1684 | 11 |

**Light Sensor Data: Station 6**

|  |  |  |
| --- | --- | --- |
| DEPTH  | SURFACE LIGHT IRRADIANCE  | UNDERWATER LIGHT IRRADIANCE (I2) |
| (m) | (I1) (µmol m-2 s-1) | (I2) (µmol m-2 s-1) |
| 0 | 965 | 457 |
| 1 | 1027 | 164 |
| 2 | 1129 | 109 |
| 3 | 1359 | 133 |
| 4 | 1579 | 96 |
| 5 | 1484 | 65 |
| 6 | 1580 | 43 |

**Light Sensor Data: Station 7**

|  |  |  |
| --- | --- | --- |
| DEPTH  | SURFACE LIGHT IRRADIANCE  | UNDERWATER LIGHT IRRADIANCE (I2) |
| (m) | (I1) (µmol m-2 s-1) | (I2) (µmol m-2 s-1) |
| 0 | 1676 | 956 |
| 1 | 1770 | 698 |
| 2 | 1775 | 375 |
| 3 | 524 | 66 |
| 4 | 1300 | 60 |
| 5 | 513 | 31 |
| 7 | 490 | 15 |
| 9 | 490 | 8 |
| 11 | 507 | 5 |

**Phytoplankton**

**1ml cedric raster cell with 1µm squares.**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Station No. | Bottle No. | Depth (m) | Columns Counted | Species | Total | Total overall |
| 1 | 95 | 0.5 (bucket) | 15 | Ceratium | 1 | 1 |
| 4 | 82 | 0.5 (bucket) | 10 | Rhizosolenia | 4 |   |
|   |   |   |   | Alexandrium | 1 |   |
|   |   |   |   | Chaetoceros | 6 |   |
|   |   |   |   | Odontella | 2 | 13 |
| 5 | 87 | 1.8 | 10 | Alexandrium | 1 |   |
|   |   |   |   | Chaetoceros | 2 |   |
|   |   |   |   | Leptocylindrus | 1 | 4 |
| 6 | 94 | 1.26 | 10 | Alexandrium | 38 |   |
|   |   |   |   | Rhizosolenia | 8 |   |
|   |   |   |   | Chaetoceros | 68 |   |
|   |   |   |   | Thallasiosira | 1 |   |
|   |   |   |   | Nitzschia | 2 |   |
|   |   |   |   | Leptocylindrus | 4 |   |
|   |   |   |   | Coscinodiscus | 29 |   |
|   |   |   |   | Guinardia | 22 | 172 |
| 7 | 40 | 2.1 | 10 | Guinardia | 4 |   |
|   |   |   |   | Chaetoceros | 16 |   |
|   |   |   |   | Leptocylindrus | 7 |   |
|   |   |   |   | Pterosperma | 1 |   |
|   |   |   |   | Alexandrium | 1 | 29 |