Offshore Practical: (26/06/2012)

PSO: Marina Tides for 26.06.12 GMT

Deck: Freddie, Michael, Carlo, Clair High tide: 0922 (4.5 m)

Computer: Gina, Julie Low tide: 1352 (1.22 m)

Chemistry: Sarah, Hazel, Ben 1 nautical mile= 1.8 km

All times in GMT 1 minute (lat) = 1 nautical mile

Plan A: Good weather Plan B: Poor weather

0800-1000 Black Rock 0800🡪 Black rock and then dependant

1000-1130 Manacle Point on weather conditions, stick to shore and

1130-1300 Black Head calmer waters.

1300-1430 Lizard Point Vessel: Calista

BE AWARE: weather changes, may take 1½ hours to get back, ROV site up to 1½ hours

Equipment: ROV, secchi disk, CTD, flurometer, light meter, transmissometer, rosette

 sampler, ADCP, vertical net.

AIM: How do vertical mixing processes in the waters of Falmouth affect, directly and indirectly, the structure and functional properties of phytoplankton?

|  |  |  |
| --- | --- | --- |
|  | Time (GMT) | Depth (m) |
| Low tide | 0434 | 1.10 |
| High tide | 1022 | 4.50 |
| Low tide | 1652 | 1.22 |
| High tide | 2246 | 4.70 |

Weather: (Metcheck) Taken at 0730 26.06.2012

0700: 12oC, 0uv, 0.1mm rain, 100% Cloud, SW wind, 3mph

0900: 12oC, 0uv, 0.3mm rain, 100% Cloud, W wind, 2mph

1200: 12oC, 0uv, 0.1mm rain, 54% Cloud, SW wind, 3mph

1500: 12oC, 0uv, 0.1mm rain, 27% Cloud, SW wind, 4mph

1800: 12oC, 4uv, 0.0mm rain, 22% Cloud, SW wind, 6mph

Timetable:

0820: Left from mooring, prepared equipment, group briefed by PSO, skipper briefed of plan.

0841: Arrive at Black Rock, station 1.

0845: CTD and rosette frame prepared- can only use bottles 2,3,4,9,10 and 11

0851: CTD switched on, computer group ready

0855: CTD deployed

0925: Net deployed 15m to 6m depth sampled

1000: TRANSAS switched on to plot route of vessel

1025: CTD deployed at Manacle point, station 2 1220: Net recovered

1035: Net deployed 25m to 10m depth sampled 1355: Arrive at Lizard Point, station 4

1045: Net recovered 1400: CTD deployed

1100: Depart from station 2 1410: CTD recovered

1156: CTD deployed at Black Head, station 3 1415: Net deployed 25m- 10m depth

1210: Net deployed 20m to 5m depth sampled 1430: Net recovered

 1440: ROV deployed

Offshore Practical Evening: (26/06/2012)

AIM: Transfer all data to seahorse and create a data storage structure

REMEMBER: Put all raw data in a folder named “raw” and always use copied file of raw data to process. Include date, time, stations in read me file to explain directory and data.

**Station 1 (Black Rock)** Latitude and longitude saved in CTD file filename = blackrock26th

Position 2: Temp: 12.547 0C Depth: 26.282 m Secchi depth: 7.50 m

 Sal: 35.235 Fluorometer: 0.126 Calculated euphotic zone: 22.50m

Position 3: Temp: 12.761 0C Depth: 6.714 m Chlorophyll: Tube 145

 Sal: 35.183 Fluorometer: 0.131 Used water from pump 1m depth

Dissolved Oxygen: Depth 2=bottle 01. Depth 3=bottle 02 Net sample in bottle 1, depth: 15-6m

ADCP: filename gp2000 Start time 0857 GMT Finish time 09.44 GMT

**Station 2 (Manacle Point)** Lat = 50 04.019N Long = 005 00.896W

Position 2: Depth: 39.201m Sal: 35.392 Net sample taken between 25-10m

 Temp: 12.494 0C Fluorometer: 0.091 Messenger didn’t send. Redo 10.45

Position 3: Depth: 16.500m Sal: 35.346 Secchi disk: 8m observed

 Temp: 12.608 0 C Flu: 0.109 calculated euphotic zone = 24m

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Depth | O2 (DO) | Silicon | Nitrate/Phosphate | Chloro |
| 2 | 003 | 1 | 75 | 157 (50) |
| 3 | 004 | 2 | 119 | 169 (50) |

ADCP transect between station 1 and 2 filename = gp2001 Start time 09.45 GMT

Finish lat = 50 03.815N long = 005 01.062W Finish time 10.23 GMT

ADCP at station 2 filename gp2002

Start lat = 50 03.880N long = 005 01.021W Start time 10.24 GMT

Finish lat = 50 04.398N long = 005 00.470W Finish time 11.05GMT

**Station 3 (Black Head)**

Depth 2: Temp: 12.5240 C Depth: 45.595m CTD deployed at 11.56

 Sal: 35.411 Flu: 0.079 CTD recovered at 12.10

Depth 3: Temp: 12.669 0C Depth: 11.391m Secchi disk depth = 7m

 Sal: 35.400 Flu: 0.214 Calculated euphotic zone = 21m

Depth 4: Temp: 13.174 0C Depth: 1.8m Net sample depth: 20-5m

 Sal: 35.372 Flu: 0.115 Deployed 1210, recovered 1220

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Position | O2 (DO) | Silicon | Nitrate/Phosphate | Chloro |
| 2 | 005 | 3 | 76 | 181 (50) |
| 3 | 006 | 4 | 82 | 193 (50) |
| 4 | 007 | 5 | 91 | 205 (50) |

ADCP transect between station 2 and 3: filename gp2003

Start time 11.06 Finish time 11.49

Start lat: 50 04.353N long: 005 00.280W Finish lat: 49 59.161N long: 005 01.577W

ADCP at station 3: filename gp2004

Start time 11.51 Finish time 13.26

Start lat: 49 59.151N long: 005 01.575W Finish lat: 49 59.115N long: 005 01.275W

**Station 4 (Lizard Point)** Arrived 13.55 Lat: 49 54.745N long 005 01.232

Depth 2: Temp: 12.439 0C Depth: 49.886m CTD deployed 14.00

 Sal: 35.391 Flu: 0.060 CTD recovered 14.10

Depth 3: Temp: 12.9020 C Depth: 21.874m Secchi depth = 7m observed

 Sal: 35.384 Flu: 0.143 Calculated euphotic zone = 21m

Depth 4: Temp: 13.8 0C Depth: 1.827 Net deployed 14.15

 Sal: 35.314 Flu: 0.065 Net recovered 14.30

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Position | O2 (DO) | Silicon | Nitrate/Phosphate | Chlor |
| 2 | 008 | 6 | 74 | 206 (50) |
| 3 | 009 | 7 | 80 | 194 (50) |
| 4 | 010 | 8 | 97 | 182 (50) |

ADCP transect from station 3-4 filename gp2005

Start time 13.28 Finish time: 13.55

 Start lat: 49 58.965N long 005 01.275W Finish lat 49 54.752N long 005 01.215W

ADCP at station 4: filename gp2006

Start time 13.56 Finish time 14.58

Start lat 49 54.751N long 005 01.253W Finish lat 49 54.958 long 005 01.067

Biology Labs Practical: (27/06/2012)

AIM: Identify phytoplankton and zooplankton species using light microscopes ( ID books and paper copies) in the ROV samples and net samples taken from offshore boat practical.

Zooplankton Analysis:

* Bogorov chamber fill with 5ml
* Measuring cylinders fill 10ml
* Start in one corner and work to other end
* Use zooplankton record sheets and tally species

Phytoplankton Analysis:

* Cedrick Rafter Chamber
* 5 transects ~ 100 squares
* Use ID sheets and books
* Use pipette to move sample

Chemistry Lab Practical: (27/06/2012)

AIM: Analysis of chlorophyll, oxygen, nitrate, phosphate and silicon from offshore practical

Chlorophyll: Flurometer

Phosphate: U1800 spectrometer, 882 wavelength

Oxygen: Winkler method

Silicon: U1800 spectrometer, 810 wavelength

Website Practical: (28/06/2012)

Timetable:

1. Admin discussion, health and safety brief
2. Sigma plot tutorial (refer to UoS Falmouth field course computing document)
3. Surfer tutorial
4. Web publisher tutorial

Possible order of website:

* Introduction
* Offshore
* Geophysics
* Estuary
* Conclusion
* Pictures
* References

3 second rule: to grab reader’s attention, 15 seconds to maintain it

Optimise page so loads as fast as possible: optimise images by compressing and resizing

Afternoon activity: set pieces of work for pairs to pass on to web editor (Ben), including sigma plot graphs, introduction and background information, READ ME’s, ADCP analysis and web editor basics for website for group discussion.

Geophysics Practical Boat Trip: (29/06/2012)

AIM: Sample to create habitat map of selected area based on simplified M.E.S.H system

Joint Nature Conservation Committee (JNCC) provides standards for habitat mapping.

Vessel: Xplorer (twin engine but one not working) Weather: Southerly winds 10mph

High Water: 1337 (4.4m) Low water: 0738 (1.2m)

Area of sampling: preferable 1 mile2 sheltered area up Fall estuary, avoiding moored boats

Plan A: Reference point of Carick Carlys Rock and sample to the South.

If not deep enough or too many moored boats then move to plan B

Start location: End location:

LAT: 50011”02.70 N LAT: 50011”51.10 N

LONG: 05002”29.70 W LONG: 05003”06.40 W

Start co-ordinates converted: End co-ordinates converted:

Northings: 35954 Nothings: 36888

Easting: 183200 Easting: 182324

(Marine co-ordinates converted to Ordinance Survey 1936)

RELOCATE AS CANNOT COME INTO LINE AS TOO MUCH SWELL, USE PLAN B

Plan B: Further South, moving towards shipping lane

RELOCATE AS CANNOT GET ON LINE AS TOO CLOSE TO SHORE, USE PLAN C

Plan C: Changed tow point of fish to centre from starboard side of boat for better data results

Start location: End location:

LAT: 50011”23.30 N LAT: 50012”04.20 N

LONG: 05001”78.30 W LONG: 05002”09.30 W

Start co-ordinates converted: End co-ordinates converted:

Northings: 36289 Nothings: 37825

Easting: 183921 Easting: 183519

First video drop: between transect 1 and 2 10:47:15 am AST

LAT: 50011”31.02 N LONG: 05001”58.89 W

Converted lat: 36924 Converted long: 18362

Second video drop: between transect 1 and 2 Start:10:50:35 am AST

LAT: 50011”41.98 N LONG: 05002”04.72 W

Converted lat: 37194 Converted long: 18351

Third video drop: between transect 1 and 2 Start: 11:11:30 AST

LAT: 50011”15.37 N LONG: 05001”46.87 W

Geophysical Habitat Mapping exercise (30/06/2012)

Analysing the SideScan Sonar

* Lay out the transects so they overlap along the longest edge to form a mosaic, line up using latitude & distinguishing features
* Find features, e.g. Changes in topography, anchors etc & outline
* Mark points on the outlines, which give a rough estimation of the outline
* Measure distant from points to central fish tow track in cm. Also measure fish height by measuring distance from central tow track line to the start of scan. The shadows should also be measured

Equations

Hf: Fish Height Ht: Target Height Dt: Target Depth Rs: Slant Range

Rh: Horizontal (true) range Ls: Length of shadow r: slant swath range

-Relationship between distance on paper trace & trackplot: Hf(m) = r (m)

 Hf (cm) r (cm)

-Calculate fish height (m) from paper trace (cm): Hf (m) = r (m) x Hf (cm)

 r (cm)

-Calculate slant range (m) from paper trace (cm): Rs (m) = Hf (m) x Rs (cm)

 Hf (cm)

-Calculate horizontal (true) (m) range from paper trace (cm):

 Rh (m) = [(Rs (m))^2 – (Hf (m))^2]^1/2

-Calculate r(m) using printer sweep time (s), by time stamping the surfer tracplot & sidescan trace:

 Spped on sound in water (m/s) x Printer sweep time (s)/2

* Find positions of boundary point times on trackline, change each point from m to cm, according to surfer plot scale, measure scale & measure this from trackline to boundary point & mark a point

Essentially followed sheet given during practical session

Generating the Track Plot (Used 'Guide to plotting navigation data in surfer 8')

* Imported .txt file containing time (AST), eastings, northings, depth and survey line data into surfer software package
* Create a new plot document, then create 2 new post maps: one for time, one for position
* Insert a scale bar on map and check scale agrees with map axis
* Combine all elements of plots

Species Identification of DropCam Video

Title 1 (Video 1+2)

* Biota: Rhodophyta (2 species), bivalave shells, polychaete Sabella, Crepidula fornicata (slipper limpet), scallop shells, chlorophyta, small benthic camoflagued fish
* Seabed: Sandy, with patches of rhodophyta.
* ~02:46min lower density of macroflora, less dominance of rhodophyta, greater colonisation of chlorophyta.

Part 2 of Title 1: Video 2 starts at 3:46min

* Biota: Chlorophyta, rhodophyta (2 species), bivalve shells
* Fairly high density macrofaunal coverage, up to 100%. Mainly rhodophyta.
* Less macrofloral coverage at 05:52, then varies between high macrofloral & low macrofloral coverage, before becoming steady at less macrofaunal coverage at ~07:00
* Lower diversity than part 1, title 1. Part 2 has a high dominance of macroflora, low macrofaunal component

Title 2: Video 3

* Biota: Rhodophyta (>2 species), Chlorophyta (2 species), Sabella, Bivalve shells, sand mason: Lanice conchilega, scallop shells, hermit crab, small benthic camoflagued fish (can be sen at 7:16 min), some other fish species (too fast to identify, possibly some juveniles), possible gastropod, a crab (Arthropda, Crustacea, Raptonal, possibly Carcinus maenas seen at 07:43
* >06:00 min, less dense coverage, at 06:35 two Sabella
* Species Composition varies somewhat, but composition is not drastically different & similar macroflora is found in all 3 sites. Title 2 (site 3) had greatest biodiversity, but Crepidula fornicata was absent

SideScan Interpretation

Zone 1: Dropcam evidence coarser sediment, perhaps more shell

Zone 2: Spottier Picture, higher proportion of shell?

Zone 3: Diagonal (SW) pattern, from flow pattern

Zone 4: Shadow areas, hence isolated raised section of seabed

Zone 5: Coarser Sediment (shell or gravel) in higher abundance to south, fading out to North. Dropcam evidence of more algae varied sidescan picture

Zone 6: Same as zone 7

Zone 7: Finer sediment, soft mud surrounded by shell and macroalgae

Background > Mostly fine sediment e.g. mud

Longitude and latitude conversions: (30/06/2012)

Drop cam 2 end time: 10:50 GMT Drop cam 3 end time: 11:20:54

LAT: 50O11”44.00🡪 183453 Northings LAT: 50O11”22.3566🡪 183738

LONG: 05O01”48.00 🡪 37314 LONG: 05O01”48.2228🡪 36633

Drop cam 3 start time: 11:11:30

LAT: 50O11”15.3790🡪 183756

LONG: 05O01”46.8714🡪 36416

Log book write up: (01/07/2012)

AIM: Data Day. Finish – Geo poster, Geo write up, Secchi Disk, ADCP Data, Richardson’s number, Offshore write up, Readmes, Website and Seahorse updated.

Data entry day: (02/07/2012)

AIM: Finish data entry for Seahorse and website and finish tasks in above list. Ben updates website.

Richardson Number

The Richardson number is used to establish the balance between the stabilising effect of the density gradient and the destabilising effect of the current sheer. The Richardson number uses, the effect of gravity, the changes in density through the water column, the depth of the water column and the velocity. The requirements for the Richardson number are provided by a combination of the CTD and the ADCP. Where the CTD is used to obtain the density profile and the ADCP is used to obtain the depth of the water column and the velocity throughout the water column. For these calculations the Richardson number has been derived for the water column as a whole. Whereby the densities are taken from the top and bottom of the water column using the CTD, while the velocity is an average of the water column obtained from the ADCP.

The Richardson number can be divided into three parts whereby;

If Ri <0 = gravitationally unstable, overturning occurs

If 0<Ri<0.25 = shear flow instability develops

If Ri>1= the flow is stable and no mixing occurs between the layers.

$$Ri= \frac{g ∆ρ∆z}{ρ(∆U^{2})}$$

g = Gravity

p = density

z = depth

U = velocity

Station 1

|  |  |
| --- | --- |
| Depth (m) | Richardson’s Number |
| 1 to 10 | 15.51 |
| 10 to 20 | 256.26 |
| 20 to 30 | 0.4 |

Station 2

|  |  |
| --- | --- |
| Depth (m) | Richardson’s Number |
| 5 to 15 | 0.19 |
| 15 to 30 | 19.56 |
| 30 to 45 | 3.02 |

Station 3

|  |  |
| --- | --- |
| Depth (m) | Richardson’s Number |
| 1 to 10 | 1.28 |
| 20 to 30 | 2.12 |
| 40 to 50 | 0.38 |

Station 4

|  |  |
| --- | --- |
| Depth (m) | Richardson’s Number |
| 1 to 15 | 3.55 |
| 20 to 35 | 135.5 |
| 40 to 55 | 1.27 |

Pontoon Practical: (03/07/2012)

Arrived 9.15 BST

Equipment used: YSI probe 6600 V2, light meter, current meter

Weather: 150C, 15mph, SW, rain showers throughout

Tides: High tide-12:10 (0.06m) BST Low tide- 17:48 (5.20m)

Current meter: To start press ⱷ followed by run. Then press run again. It measures current speed in m/s and direction in degrees from North. North is towards the large yellow buoy ~200m upstream.

NOTE: current meter will only work when in water.

YSI probe: To start press ⱷ followed by

It measures temperature in degrees Celsius, salinity, depth (m), chlorophyll (µg/L) and dissolved oxygen (% saturation) NOTE: should be left in water

Light probe: To start press ON/OFF followed by to switch channel.

Measures surface irradiance and irradiance of water column. The surface meter needs to be placed facing up and It is the larger number on the console display needed.

NOTE: Turn instruments off when not using to save battery.

Estuarine Practical (04/07/2012)

AIM: Understanding how the Fal estuary acts as a transition zone between the freshwater input and the coastal seas, using the data from pontoon practical.

PSO: Mike Tide times: 12:23 Low (0.76) 17:59 High (5.62) Spring Tide

Scribe: Sarah

Deck, Clair, Carlo, Julie Weather forecast: Cloudy, 16oC, SW winds, building from 9mph at

ADCP: Hazel, Ben 1200 to 13mph at 1700. Fair.

Chemistry: Freddie, Marina

Station 1: Turnaware Bar: 50o12”186, 005o02”459 Flow rate: 242.31 m3s-1

ADCP CTD

Time of arrival: 1201 UTC Time deployed: 1203 UTC

Time of transect start: 1232 UTC (51m from shore) Time recovered: 1205 UTC

Time of transect end: 1234 UTC (219m from shore) Depth 13m, max depth 15.9m

Time of departure: 1246 UTC File name: Group2\_040712ST1.txt

Zooplankton

Location: 50o12”162, 005o02.4146 210µm net, 50cm diameter

Time of deployment: 1238 UTC Start: 49021, end: 49586

Time of recovery: 1244 UTC Bottle R

Station 2: Carick Carlys Rock: 50o12”662, 005o02.681

ADCP CTD

Time of transect start: 1254 UTC (1039m from shore) Time deployed: 1301 UTC

Time of recovery: 1322 UTC (538m from shore) Time recovered: 1303 UTC

File name: Group2001r/w Depth 8m, max depth 12m

Flow rate: 392.56 m3s-1 File name: Group2\_040712ST2.txt

Station 3: Black Rock 50o10”0043, 005o02”1835

ADCP Zooplankton: Bottle Y

Time of transect start: 1339 UTC (497m from shore) Location: 50o16”482, 005o02.074

Time of transect end: 1346 UTC (132m from shore) Time of deployment: 1420 UTC

Flow rate: 982.94 m3s-1 Time of recovery: 1225 UTC

File name: Group2002r/w 210µm net, 50cm diameter

CTD (1) CTD (2)

Time deployed: 1352 UTC Time deployed: 1358 UTC

Time recovered: 1355 UTC Time recovered: 1401 UTC

Depth 21m, max depth 27m Depth 21m, max depth 27m

File name: Group2\_040712ST3.txt File name: Group2\_040712ST3a.txt

Determination of the water volume passing through the plankton net:

Number of revolutions x pitch of impeller x 0.3 x area of opening (πr2). [Plankton net diameter 50cm]

Station 1: Revs: 49586- 49021= 565 🡪 565 x 0.3 x (π x 0.252) = 33.28 m3

Station 3: Revs: 50377- 49586 = 791 🡪 791 x 0.3 x (π x 0.252) = 46.59 m3

Estuarine Lab Session (05/07/2012)

AIM: To create mixing diagrams for nutrients and create profile of Fal estuary by prep and analysis of data collected by group 2 and 6. Restricted to 10 samples unless more time available.

Nitrate, dissolved oxygen, phosphate, silicon and chlorophyll will be analysised with the references methods below:

Manual chlorophyll, dissolved Phosphate and Silicon:

Parsons T. R. Maita Y. and Lalli C. (1984) “ A manual of chemical and biological methods for seawater analysis” 173 p. Pergamon.

Dissolved oxygen

Grasshoff, K., K. Kremling, and M. Ehrhardt. (1999). Methods of seawater analysis. 3rd ed. Wiley-VCH.

Nitrate by Flow injection analysis

 Johnson K. and Petty R.L.(1983) “Determination of nitrate and nitrite in seawater by flow injection analysis”. Limnology and Oceanography **28** 1260-1266.

|  |  |
| --- | --- |
| **Bottle 89: Station 2** | **Tally** |
| Guinardia delicatula | 1 |
| Prorocentrum micans | 1 |
| Alexandrium | 5 |
| Rhizosolenia setigera | 1 |
| Guinardia flaccida | 11 |
| Thallasiosira | 3 |
| Pseudo-nitzschia | 3 |
| Rhizosolenia imbricata | 3 |
| Coscinodiscus | 10 |

Phytoplankton results:

|  |  |
| --- | --- |
| **Bottle 37: Station 1** | **Tally** |
| Alexandrium | 16 |
| Coscinodiscus | 24 |
| Chaetoceros | 1 |
| Karenia mikimotoi | 2 |

Taken from 10ml sample at 2 stations:

|  |  |
| --- | --- |
| **Bottle 13: Station 2** | **Tally** |
| Guinardia flaccida | 2 |
| Alexandrium | 14 |
| Coscinodiscus | 7 |

Station 1 and 2, none at 3 as no more bottles were available.

Estuary Richardson

To calculate the Richardson number for the Estuary the density was calculated from an online convertor from the depth, temperature and salinity. The CTD did not provide density and so it had to be calculated. The website[*http://www.csgnetwork.com/water\_density\_calculator.html*](http://www.csgnetwork.com/water_density_calculator.html) was used. This website refrenced the calculation from, Millero, F, C. Chen, A Bradshaw, and K. Schleicher, 1980: *A new high pressure equation of state for seawate*r, Deep Sea Research, Part A, 27, 255-264. The calculated density could then be used to provide a Richardson number using the data from the ADCP. For station 3 the ADCP was not consistent enough for the Richardson number to be calculated confidently for the channel

Station 1

|  |  |
| --- | --- |
| Depth (m) | Richardson’s Number |
| 0 to 4 | 11.39 |
| 4 to 8 | 4.46 |
| 8 to 12 | 38.22 |

Station 2

|  |  |
| --- | --- |
| Depth (m) | Richardson’s Number |
| 0 to 2.5 | 9.57 |
| 2.5 to 5 | 0.29 |
| 5 to 8 | 5.51 |