CNR ISMAR – Istituto di
Scienze Marine

BIOFUN010 Cruise Report

30 April– 17 May 2010

Edited by M. Borghini

	Consiglio Nazionale delle Ricerche - ISMAR	Università degli Studi di Genova
	Università di Messina	University of Plymouth

Contents

Cruise Details

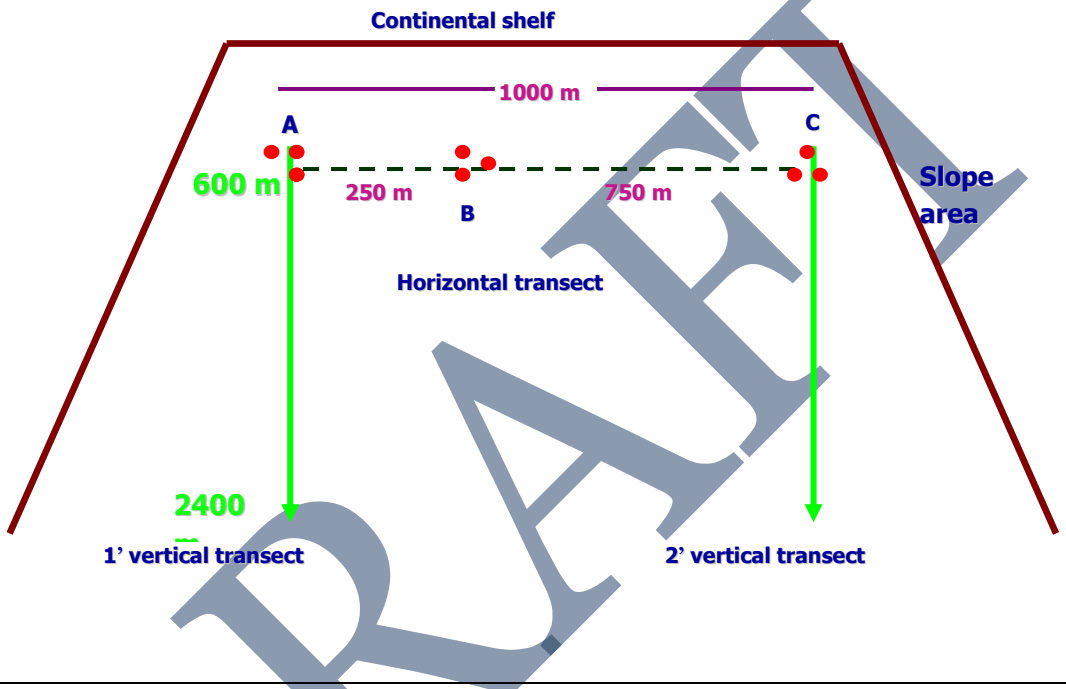
NAME	*BIOFUN010*
DATE	*30 April – 17 May 2010*
STUDY AREA	*BALEARIC SEA* *SARDINIA CHANNEL* *TYRRHENIAN SEA*
PROJECT RESPONSIBLE	*ELENA MANNINI, CNR-ISMAR*
HEAD OF MISSION	*MIRENO BORGHINI, CNR-ISMAR*
CHIEF SCIENTIST	*ELENA MANNINI-STEFANO ALIANI, CNR-ISMAR*
PARTICIPANT INSTITUTES	*CNR – ISMAR* *UNIVERSITY OF GENUA* *UNIVERSITY OF MESSINA* *UNIVERSITY OF PLYMOUTH*
RESEARCH VESSEL	*URANIA*
DEPARTURE PORT	*MESSINA*
ARRIVAL PORT	*NAPOLI*

Scientific Objectives

One of the aim of the Oceanographic cruise is to invstigate the ralationships between the biodiversity of the macrobenthic communities and the acosystem functioning un the deep Mediterranean sea by changing the spatial scale of observation.We will conduce a sampling design by taking in consideration a local scale of variations in abundance, distribution and biodiversity of the deep macrobenthos in relation to the main physical-chemical and trophic environmental cheracteristics.To achive our aim we wil choose the most homogeneous slope area. Samples will be taken from stations along a bathymetric gradient, from the broken point of the continental shelf to the abyssal plain.A distance of 300m between each stations will be fixed, for a total of 8 stations expected.This sampling design will be realized along two vertical transect on the same slope area and with a distance of few kilometers between them. In each station 4-5 deployments will be made by using an oceanographic box-corer, 3 depliyments will be sieved to collect macrofauna samples and 1 or 2 deployments will be sub-sampled to collect corers for environmental parameters.I each stations one CTD will be performed to collect data on the main deep water characteristics.

The investigation on the local scale would be completed by carryng out a hieararchical sampling design along an hypothetiacal horizontal axis between two stations at the same depth chosen along the two vertical treansect described above. Three sites along the oruizontal axis will be randomly selected. At each site three stations, randomly chosen, will be samples(4-5 deployments in each) to collect macrofauna and evironemental samples.

Sampling scheme



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Cruise Plan

The following table 1 summarizes the parameters that have been measured and the groups involved in the sampling operations, while table 2 lists the sampling equipment and the methods of analysis.

Parameters/Instruments	Working Group
Macrobenthos and parameters characterizing the deep sediments	CNR-ISMAR
CTD/O2/Fluorescence/Trasmissometer/rosette	CNR-ISMAR
Salinity - Dissolved Oxygen	CNR-ISMAR
ADCP	CNR-ISMAR
LADCP	CNR-ISMAR
Meteo station on board	CNR-ISMAR
Marine midrobic microbiology	GENUA UNIVERSITY – MESSINA UNIVERSITY

Table 1 Measured Parameters

Small-Volume Sampling	SBE Carosell 24-place rosette with 12-liter bottles
CTD System	CTD SBE 911 plus
Salinometer	GUILDLINE AUTOSAL 8400B
Dissolved Oxygen	Winkler titration
WMADCP	RDI WH 300 kHz, RDI OS 75 kHz
LADCP	RDI WH 300 kHz
NO3, P04, SiO4	Samples only, no on board analyses
Meteo station on board	AANDERAA
Sediment sampling	Oceanic Box-corer
Sediment sampling	Gravity -corer

Table 2 Sampling equipment and analysis methods

Cruise Maps

Figure 1 Box Corer map

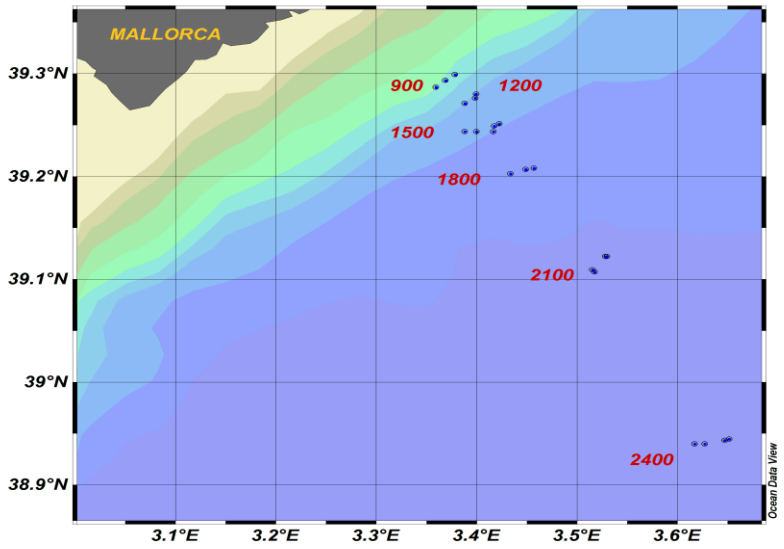


Figure 2 Gravity Corer map

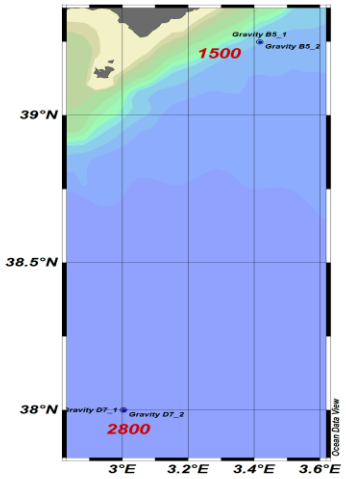


Figure 3 Bucket map

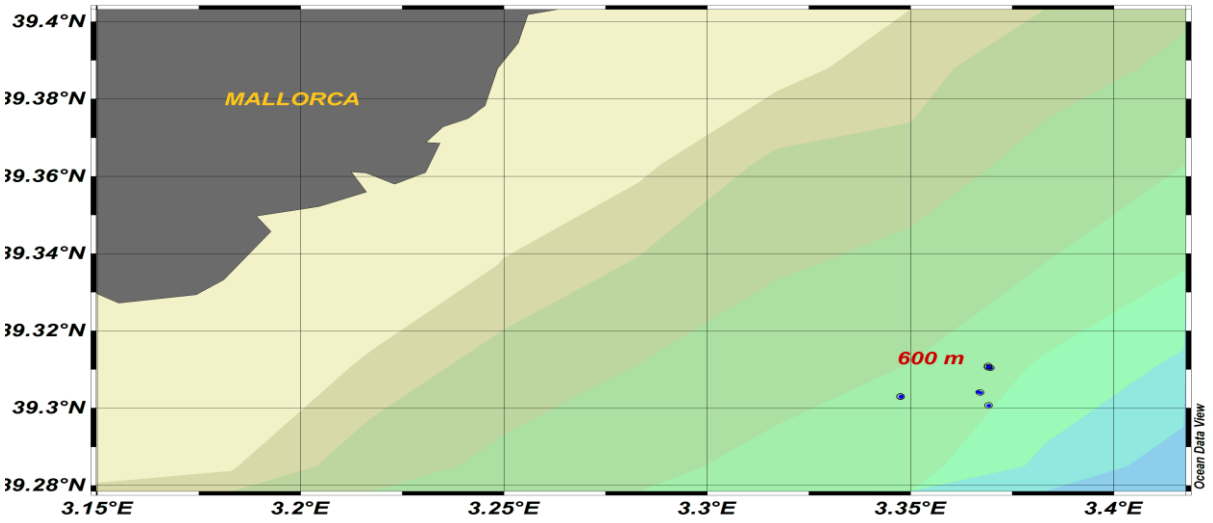
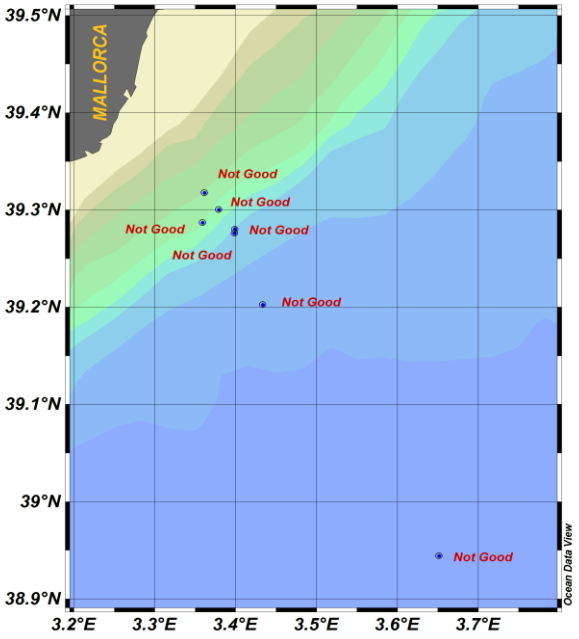


Figure 4 Box Corer Fail map



Sediment Stations

Station	DATA	TIME	LAT	LONG	DEPTH	USE
Box C8_1	03/05/010	10.25	38°56.671	003°39.094	2344	esperimento
Box C8_2	03/05/010	11.16	38°56.671	003°39.081	2343.7	micro
Box C8_3	03/05/010	12.11	38°56.66	003°39.077	Not GOOD	
Box C8_4	03/05/010	15.10	38°56.661	003°39.078	2362	macro
Box C8_5	03/05/010	15.58	38°56.668	003°39.081	2343	macro
Box C8_6	03/05/010	16.45	38°56.665	003°39.086	2347.3	macro SI
Boxc1_1	04/05/2010	9.45	39°°19.054	003°21.691	Not GOOD 313	
Boxc3_1	04/05/2010	10.24	39°17.929	003°22.71	869	micro
Boxc3_2	04/05/2010	10.50	39°17.943	003°22.706	863	macro
Boxc3_3	04/05/2010	11.15	39°17.939°	003°22.701	866	macro
Boxc3_4	04/05/2010	11.39°	39°18.012	003°22.75	fallito	
Boxc3_5	04/05/2010	13.10	39°17.938	003°22.734	861	macro SI
Boxb3_1	04/05/2010	13.40	39°17.598	003°22.143°	902	micro
Boxb3_2	04/05/2010	14.10	39°17.59	003°22.15	909	macro
Boxb3_3	04/05/2010	14.37	39°17.579	003°22.159	913	macro
Boxb3_4	04/05/2010	15.00	39°17.602	003°22.1003°4	904	macro SI
BoxaA3_1	04/05/2010	15.34	39°17.215	003°21.555	955.3	macro
BoxaA3_2	04/05/2010	16.00	39°17.217	003°21.5003°6	Not GOOD 951	
BoxaA3_3	04/05/2010	16.39°	39°17.202	003°21.562	944.7	macro
BoxaA3_4	04/05/2010	17.05	39°17.18	003°21.57	968.2	micro
BoxaA3_5	04/05/2010	17.30	39°17.201	003°21.5600	957.4	macro SI
Boxac4_1	05/05/2010	9.54	39°16.837	003°23.952	Not GOOD 1162.1	
Boxac4_2	05/05/2010	10.21	39°16.799	003°3.931	1179.2	micro
Boxac4_3	05/05/2010	10.50	39°16.797	003°23.946	Not GOOD 1183.9	
Boxac4_4	05/05/2010	11.15	39°16.798	003°23955	1194.7	macro
Boxac4_5	05/05/2010	11.45	39°16.802	003°23.95	1187.3	macro
Boxac4_6	05/05/2010	12.18	39°16.807	003°23.96	1186	macroSI
Boxab4_1	05/05/2010	12.59	39°16.567	003°23.908	1279	micro
Boxab4_2	05/05/2010	13.30	39°16.573	003°23.912	1278.7	macro
Boxab4_3	05/05/2010	14.02	39°16.56	003°23.904	Not GOOD 1282.2	
Boxab4_4	05/05/2010	14.41	39°16.568	003°23.909	1281.6	macro
Boxab4_5	05/05/2010	15.10	39°16.564	003°23.911	Not GOOD 1282.3	
Boxab4_6	05/05/2010	15.41	39°16.563	003°23.907	12291.4	macro SI
BoxaA4_1	05/05/2010	16.25	39°16.253	003°23.301	1224.6	macro
BoxaA4_2	05/05/2010	16.59	39°16.258	003°23.295	1222.3	micro
BoxaA4_3	05/05/2010	17.30	39°16.255	003°23.296	1263.9	macro
BoxaA4_4	05/05/2010	18.00	39°16.26	003°23.293	1222.1	macro SI
BoxC5_1	05/05/2010	18.30	39°15.042	003°25.332	1507.2	macro
BoxC5_2	05/05/2010	19.30	39°15.055	003°25.333	1505	micro

BoxC5_3	05/05/2010	20.05	39°15.063	003°25.335	1503.5	macro
BoxC5_4	05/05/2010	20.40	39°15.064	003°25.345	1503.5	macro SI
Boxb5_1	05/05/2010	21.43	39°14.938	003°25.053	1515.2	macro
Boxb5_2	05/05/2010	22.17	39°14.929	003°25.053	1515.2	micro
Boxb5_3	05/05/2010	22.53	39°14.941	003°25.049	1516.5	macro
Boxb5_4	05/05/2010	23.33	39°14.94	003°25.049	1515.3	macro SI
BoxA5_1	06/05/2010	8.47	39°14.615	003°24.983	1563.6	macro
BoxA5_2	06/05/2010	9.25	39°14.607	003°23.991	1568.2	micro
BoxA5_3	06/05/2010	10.02	39°14.621	003°23.988	1566	macro
BoxA5_4	06/05/2010	10.39°	39°14.618	003°23.283	1564	macro SI
BoxC6_1	06/05/2010	11.41	39°12.467	003°27.418	1803.6	micro
BoxC6_2	06/05/2010	12.23	39°12.472	003°27.415	1803.8	macro
BoxC6_3	06/05/2010	13.05	39°12.474	003°27.426	1803.8	macro SI
BoxC6_4	06/05/2010	13.48	39°12.474	003°27.424	1801.4	macro
Boxb6_1	06/05/2010	14.36	39°12.39°3	003°26.934	1776.4	macro SI
Boxb6_2	06/05/2010	15.17	39°12.39°1	003°26.937	1778.4	macro
Boxb6_3	06/05/2010	16.00	39°12.39°1	003°26.932	1776	micro
Boxb6_4	06/05/2010	16.40	39°12.401	003°26.935	1775.9	macro SI
BoxA6_1	06/05/2010	17.29	39°12.157	003°26.016	1775.4	macro
BoxA6_2	06/05/2010	18.07	39°12.157	003°26.018	1775.3	macro
BoxA6_3	06/05/2010	18.46	39°12.158	003°26.011	Not GOOD 1776.5	
BoxA6_4	06/05/2010	19.27	39°12.152	003°26.014	Not GOOD 1776.1	
BoxA6_5	06/05/2010	20.10	39°12.162	003°26.014	1775	micro
BoxA6_6	06/05/2010	20.50	39°12.159	003°26.02	1776.3	macroSI
BoxC7_1	07/05/2010	6.44	39°07.316	003°31.764	2089.1	micro
BoxC7_2	07/05/2010	7.54	39°07.318	003°31.76	2088.6	macro
BoxC7_3	07/05/2010	8.20	39°07.325	003°31.757	2087.4	macro
BoxC7_4	07/05/2010	9.06	39°07.326	003°31.781	2089	macroSI
Boxb7_1	07/05/2010	9.54	39°07.324	003°31.686	2081	micro
Boxb7_2	07/05/2010	10.38	39°07.332	003°31.687	2081	macro
Boxb7_3	07/05/2010	11.26	39°07.325	003°31.694	2081.5	macro
Boxb7_4	07/05/2010	12.09	39°07.327	003°31.682	2080.6	macro SI
Boxa7_1	07/05/2010	13.19	39°06.42	003°31.038	2061	macro
Boxa7_2	07/05/2010	14.04	39°06.416	003°31.047	2061.6	micro
Boxa7_3	07/05/2010	14.53	39°06.415	003°31.05	2061.7	macro
Boxa7_4	07/05/2010	15.32	39°06.421	003°31.045	2061.3	macroSI
BoxB8_1	07/05/2010	17.43	38°56.6	003°38.818	2346	macro
BoxB8_2	07/05/2010	18.30	38°56.598	003°38.813	2346	micro
BoxB8_3	07/05/2010	19.18	38°56.598	003°38.812	2340	macro
BoxB8_4	07/05/2010	20.05	38°56.6	003°38.822	2346	esperimento
BoxB8_5	07/05/2010	21.00	38°56.597	003°38.816	2346	macro SI
BoxA8_1	07/05/2010	21.56	38°56.385	003°37.629	2353.4	micro

BoxA8_2	07/05/2010	22.45	38°56.387	003°37.028	2353.6	macro
BoxA8_3	07/05/2010	23.37	38°56.387	003°37.627	2353.5	macro
BoxA8_4	08/05/2010	0.26	38°56.387	003°37.63	2353.5	macro SI
BoxA7_5	09/05/2010	21.05	39°06.544	003°30.907	330.907	macro SI
BoxC2_1	09/05/2010	23.12	39°18.622	003°22.18	Not GOOD 607	
BoxC2_1	09/05/2010	23.35	39°18.622	003°22.154	Not GOOD 614	
BoxC2_1	09/05/2010	23.58	39°18.633	003°22.158	Not GOOD 646	

Bucket LIST

Station	DATA	TIME	LAT	LONG	DEPTH	USE
Benna C2_1	10/05/2010	0.43	39°18.633	003°22.146	631	macro
Benna C2_2	10/05/2010	1.07	39°18.043	003°22.147	Not GOOD 598	
Benna C2_2	10/05/2010	1.23	39°18.651	003°22.15	585	macro
Benna C2_3	10/05/2010	2.00	39°18.653	003°22.142	600	macro SI
Benna b2_1	10/05/2010	2.47	39°18.253	003°21.985	582.3	macro
Benna b2_2	10/05/2010	3.12	39°18.242	003°22.025	Not GOOD 607	
Benna b2_2	10/05/2010	3.37	39°18.262	003°22.011	608.2	macro
Benna b2_3	10/05/2010	4.03	39°18.239°	003°22.025	614	macro SI
BennaA2_1	10/05/2010	4.49	39°18.184	003°20.86	608.6	macro
BennaA2_2	10/05/2010	5.11	39°18.181	003°20.85	613.1	macro
BennaA2_3	10/05/2010	5.39°	39°18.176	003°20.85	612	macro SI

GRAVITY CORER LIST

Station	DATA	TIME	LAT	LONG	DEPTH	USE
Gravity D7_1	08/05/2010	16.37	37°59.986	003°00.244	2801.5	micro-geo
Gravity D7_2	08/05/2010	18.29	37°59.992	003°00.257	2802	Frozen
Gravity B5_1	10/05/2010	8.03	39°14.942	003°25.052	1519	micro-geo
Gravity B5_2	10/05/2010	8.23	39°14.935	003°25.07	1520	Frozen

CTD Stations

Figure 5 CTD Map

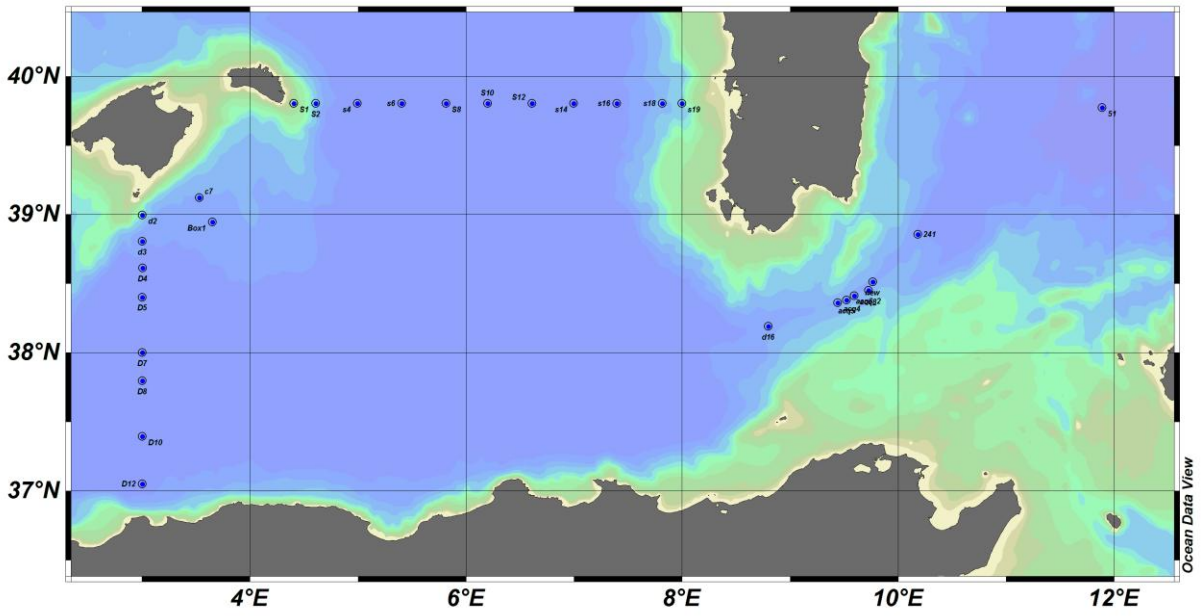


Table 3 List of CTD stations

Sampling type: N = Nutrients ; S = Salinity; O= dissolved oxygen; E = marine microbic ecology

STAZ	Start Data	LAT °	LONG°	Depth	
241	01/05/2010	38.8565	10.181	2532	O;S;E;N
51	14/05/2010	39.774	11.887667	3493	O;S;E;N
acq4	13/05/2010	38.360833	9.441	1997	O;S;E;N
acq5	13/05/2010	38.3805	9.521333	2017	O;S;E;N
acq6_2	02/05/2010	38.451167	9.725833	2050	O;S;E;N
acq8	13/05/2010	38.411667	9.592167	2037	
Box1	03/05/2010	38.9445	3.652667	2345	O;S;E;N
c7	06/05/2010	39.1215	3.529333	2092	O;S;E;N
D10	08/05/2010	37.395167	3.004333	2768	O;S;E;N
D12	09/05/2010	37.049833	3.003833	2683	O;S;E;N
d16	13/05/2010	38.190667	8.799667	2237	O;S;E;N
d2	03/05/2010	38.997	3.0045	1250	O;S;E;N
d3	06/05/2010	38.805167	3.004167	2481	O;S;E;N
D4	08/05/2010	38.6135	3.004833	2599	O;S;E;N
D5	08/05/2010	38.401667	3.0045	2702	O;S;E;N
D7	08/05/2010	37.9995	3.004167	2800	O;S;E;N
D8	08/05/2010	37.797333	3.0035	2798	O;S;E;N
new	13/05/2010	38.511833	9.766833	2063	
S1	10/05/2010	39.803833	4.4045	106	O;S;E;N
S10	11/05/2010	39.802167	6.201167	2852	O;S;E;N
S12	11/05/2010	39.803	6.61	2857	O;S;E;N
s14	10/05/2010	39.803333	6.997667	2854	O;S;E;N
s18	11/05/2010	39.8035	7.815167	1656	O;S;E;N
s19	12/05/2010	39.803167	7.9985	897	O;S;E;N
S2	10/05/2010	39.803667	4.607333	1297	O;S;E;N
s4	10/05/2010	39.803333	4.995333	2685	O;S;E;N
s6	10/05/2010	39.803667	5.404167	2825	O;S;E;N
S8	11/05/2010	39.803167	5.813333	2844	O;S;E;N
s16	11/05/2010	39.803333	7.395333	2769	O;S;E;N

Sampling Strategy

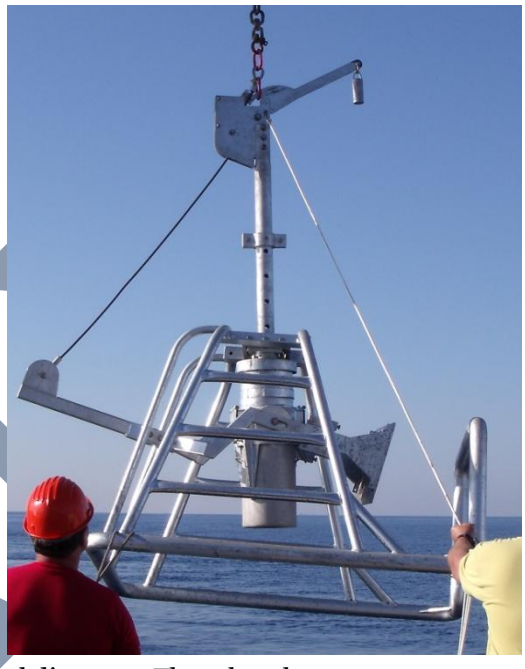
The stations have been selected mainly based on previous knowledge and available literature. The hydrological characteristics of the study area have been determined by CTD cast. In order to achieve information about the spatial variability of nutrients a high-resolution sampling has been applied, at the standard depths (table 4). For a better sampling of the biological and chemical parameters, extra sampling depths were defined in the water column by analyzing the CTD profile during the acquisition. The same standard depths have been sampled for the probe calibration against Winkler titration (for dissolved oxygen) and salinity determination.

Level	Standard depths (m)
1	0
2	25
3	50
4	75
5	100
6	200
7	300
8	400
9	500
10	750
11	1000
12	1250
13	1500
14	1750
15	2000
16	2500
17	3000
18	3250
19	3500

Table 4 Standard depths

Onboard Operations

Macrobenthos and sediment analysis



The primary purpose of the Urania cruise that took place from April 30th to May 17th was to investigate small spatial-scale variability in the distribution of macrobenthic biodiversity in Mediterranean sea along the Baleari slope.

Sediment samples were collected along tree transects from the continental shelf seaward, from 600 to 2400 meters. The distance between transect A and C was of 1000 meters, while the distances of stations of transect B were selected randomly from those of A, at same depths.

Seven different depths were selected: 600 m, 900 m, 1200 m, 1500 m, 1800 m, 2100 m, 2400 m, performing four deployments at each station. Sediment samples were collected with a box-corer (size: 32 cm diameter, 52 cm height). One deployment was used for microbial analysis: heterotrophic carbon production, organic matter, extracellular enzymatic activity, prokariotic abundance and diversity, meiofaunal abundance and granulometry. Subsamples for these analysis were collected using Plexiglass liners of 5.5 cm and 3.5 cm internal diameter. The other three deployments were used to sample macrofauna (abundance, biomass and diversity).

Since box-corer could not work successfully at 600 m, a grab (Van Veen) was used for sampling macrofauna. Microbial subsamples were not collected at these stations.

Sampling with gravity corer was performed at the depth of 1500 m and 2800 m in two replicates each, in order to provide information on much longer period of time (up to 100.000 y). One replicate was used for microbial analysis and turaniahe other one for geological investigation, carried out by Debora Nail Palmer.

Laboratory: CNR-ISMAR-Ancona

CTD Cast

At all the hydrological stations, pressure (P), salinity (S), potential temperature (θ) and dissolved oxygen concentration (DO) were measured with a CTD-rosette system consisting of a CTD SBE 911 plus, and a General Oceanics rosette with 24 12-l Niskin Bottles. Temperature measurements were performed with a SBE-3/F thermometer, with a resolution of 10^{-3} °C, and conductivity measurements were performed with a SBE-4 sensor, with a resolution of 3 x 10^{-4} S/m. In addition, salinities of water

samples were analyzed on board using a Guildline Autosal salinometer. Dissolved oxygen was measured with a SBE-13 sensor (resolution 4.3 µM), and data were checked against Winkler titration. The vertical profiles of all parameters were obtained by sampling the signals at 24 Hz, with the CTD/rosette going down at a speed of 1 m/s. The data were processed on board, and the coarse errors were corrected.

Laboratory: ISMAR-CNR -sp

LADCP

Two Lowered Acoustic Doppler Current Profilers (LADCP) were used to measure velocity profiles. We used two RDI Workhorse 300 kHz ADCP. For data post-processing we used the LDEO LADCP (versione 8.1) software.

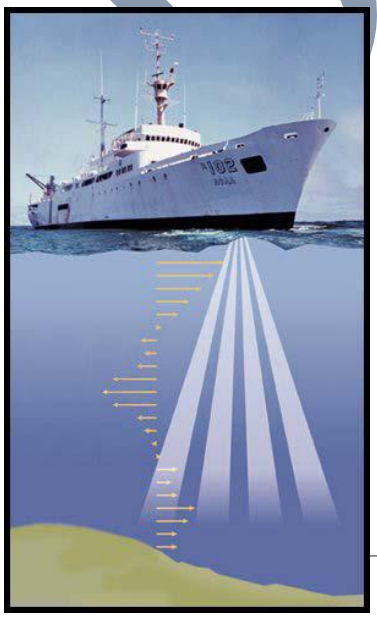
Laboratory: CNR-ISMAR -sp

Inorganic Nutrients

Seawater samples for nutrient measurements were collected at different depths, when the system CTD/rosette was going up, according to the vertical profiles of salinity, potential temperature and dissolved oxygen, recorded in real time. No filtration was employed, nutrient samples were stored at –20°C and nitrate, orthosilicate and ortophosphate concentrations will be determined later in the laboratory, using a hybrid Brän–Luebbe AutoAnalyzer following classical methods (Grasshoff et al., 1983) with slight modifications.

Laboratory: CNR-ISMAR- sp in collaboration with ENEA

Vessel-mounted ADCPs



The hydrographic data set has been integrated with direct current measurements. During the whole campaign two VM-ADCPs (RDI Ocean Surveyor, 75 KHz, and RDI Workhorse, 300 KHz) which operated during the whole campaign, along the whole ship track. The depth range of the two current profilers is about 700 m (OS75) and 150 m (WH300). Data acquisition is carried out using the RDI VMDAS software vers. 1.44. The ADCP data will be submitted to a post-processing with the CODAS3 Software System, which allows to extract data, assign coordinates, edit and correct velocity data. Data will be corrected for errors in the value of sound velocity in water, and misalignment of the instrument with respect to the axis of the ship.

Laboratory: CNR-ISMAR - sp

Micropaleantological Investigation

My nair reason for attending the Urania Biofun2010 cruise was to connect mediterranean sediments for micropaleantological investigation. I have successhilly connected sediment from a number of stations C8 and C5 and two gravity cores from stations C8 and C5 and two gravity cores from stations D7 and B5.

The sediments connected will be analised in a number of ways including oxygen isotope analusis and canoon dating. Micropaleantological analysis will involve studies of the benthic and planktic foraminifera, with the main focus on pteropod and neteropod remain within the sediments.

The pteropod analysis of one or both cores (gravity) will be used as a direct comparison to a carribbean core (CAR-MNO2) which I am currently analyzing for pteropod preservation linked with past climate change.

This research is part of a PhD funded by The University of Plymonth.

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5.8 Marine midrobic microbiology

Almost all stations, at depths along the water column, have been filtered with different seawater volumes to study microbial biodiversity using CARD-FISH technique. Then the sea water samples from Niskin bottles have been processed on board to perform viable counts and isolation of Heterotrophic Bacteria on Marine Agar medium (MA) and inescent Bacteria on SWC (Sea Water Complete) medium (fgure belowey will be racterized in laboratory using morpho-physiological and tassonomic approaches. Some samples are filtered on Millipore filters 0,22 μm and stored in “RNAlater” for a taxonomic study by molecular approach. As aconsequence, DNA-RNA extraction wascarried out to compare active and inactivemicrobial communities, coming from different water masses. Filters are stored at -20 °C afterincubation in “RNAlater” storage solution.

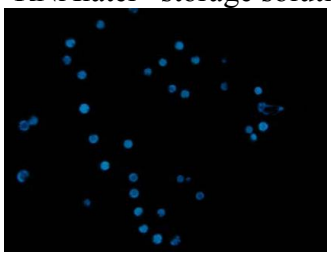

Figure 5.10.1.Luminous Bacteria Strains

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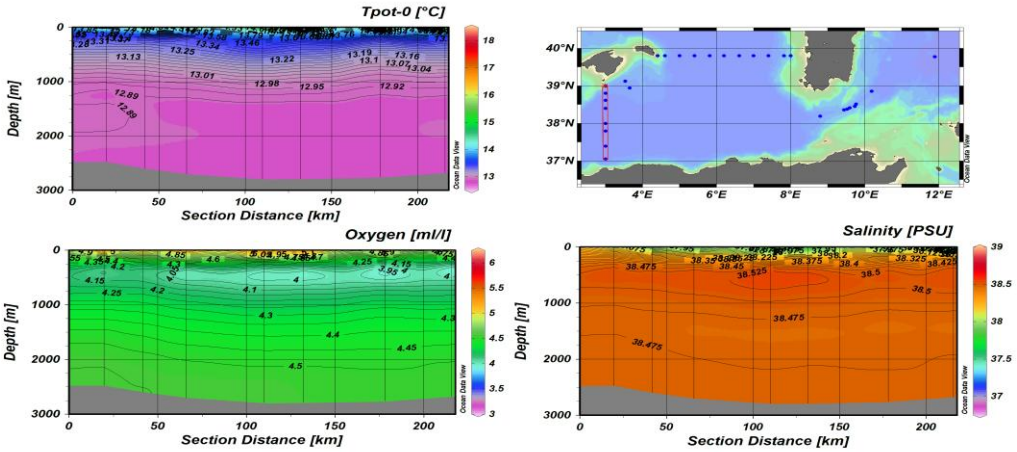
Preliminary Results

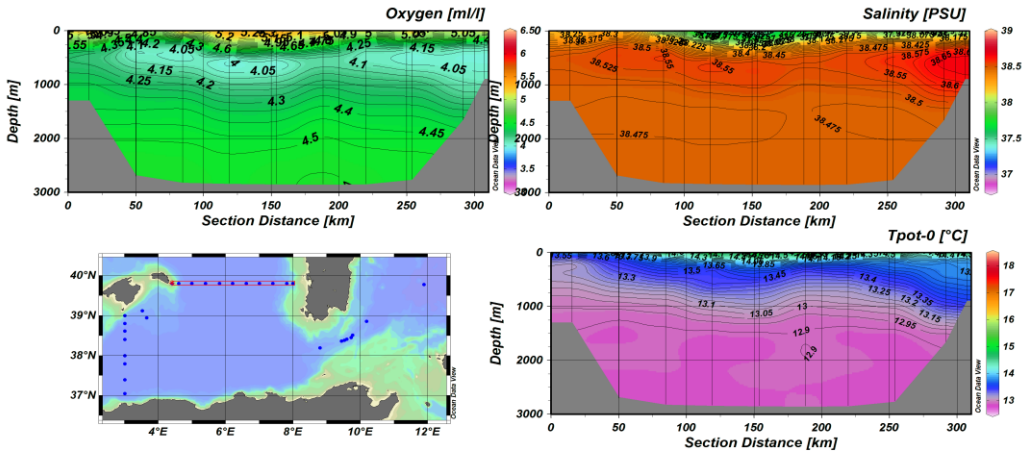
Hydrology

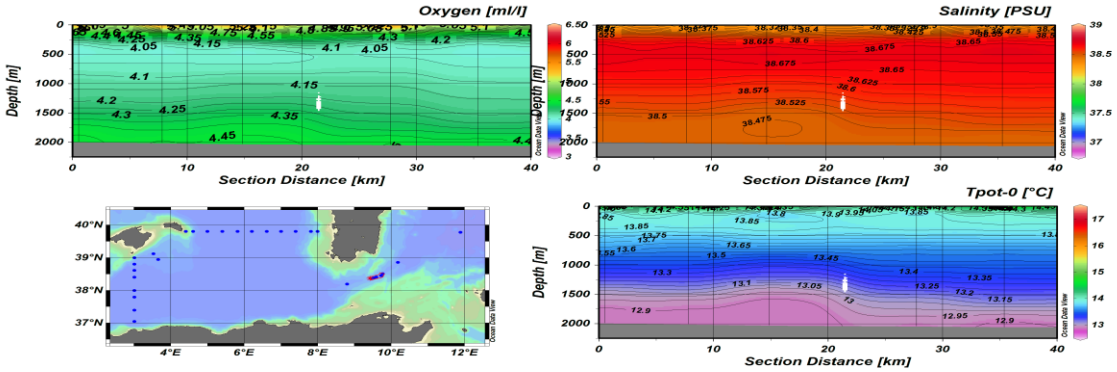
In the following some preliminary hydrological data and current measurements (LADCP data) of the work area are presented.

Hydrographic sections

Figure 6 Distribution of potential temperature, salinity and oxygen along the transect D2-D12, transect S1-S18 and transect Acq4-New




Oxygen [ml/l]
Salinity [PSU]
Tpot-0 [°C]
Depth [m]
Section Distance [km]
40°N
39°N
38°N
37°N
4°E
6°E
8°E
10°E
12°E


Oxygen [ml/l]
Salinity [PSU]
Tpot-0 [°C]
Depth [m]
Section Distance [km]
40°N
39°N
38°N
37°N
4°E
6°E
8°E
10°E
12°E

Potential Temperature vs Salinity Diagrams

Figure 6 Theta-S diagram of the whole water column along the D2-D12, transect S1-S18 and transect Acq4-New

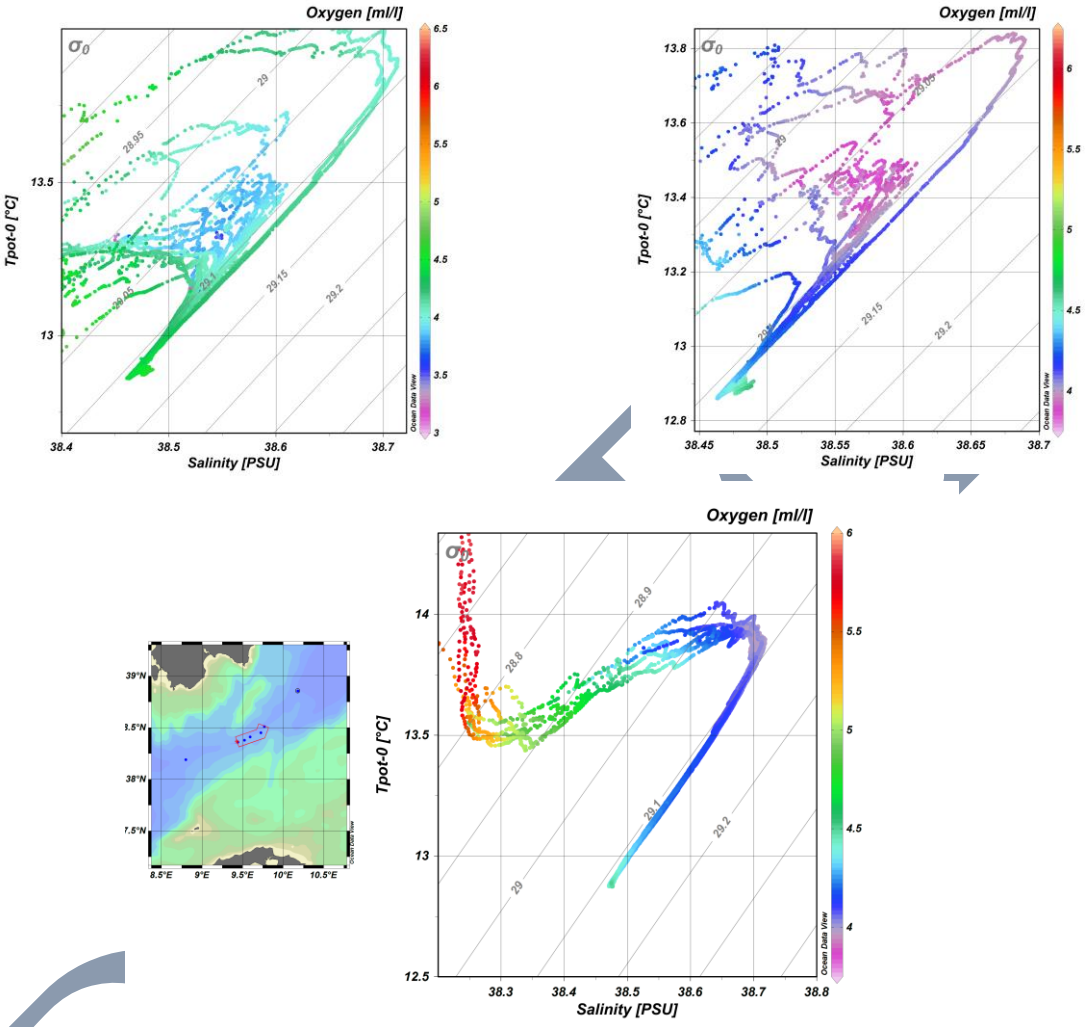
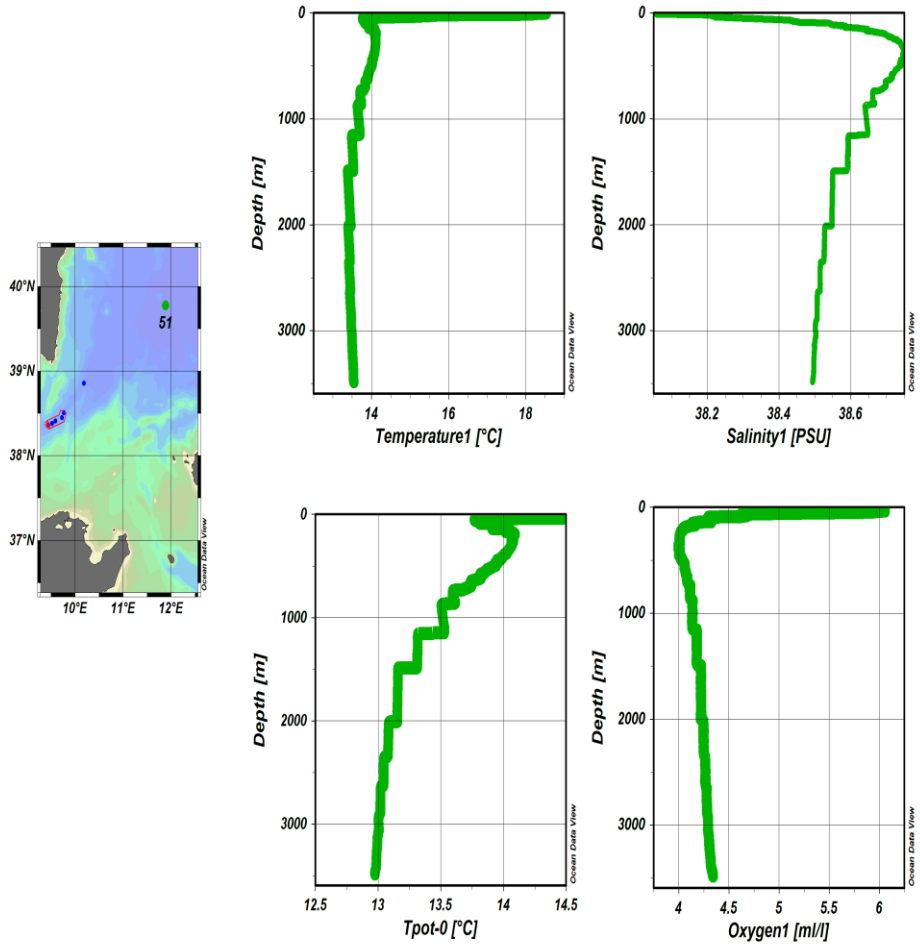
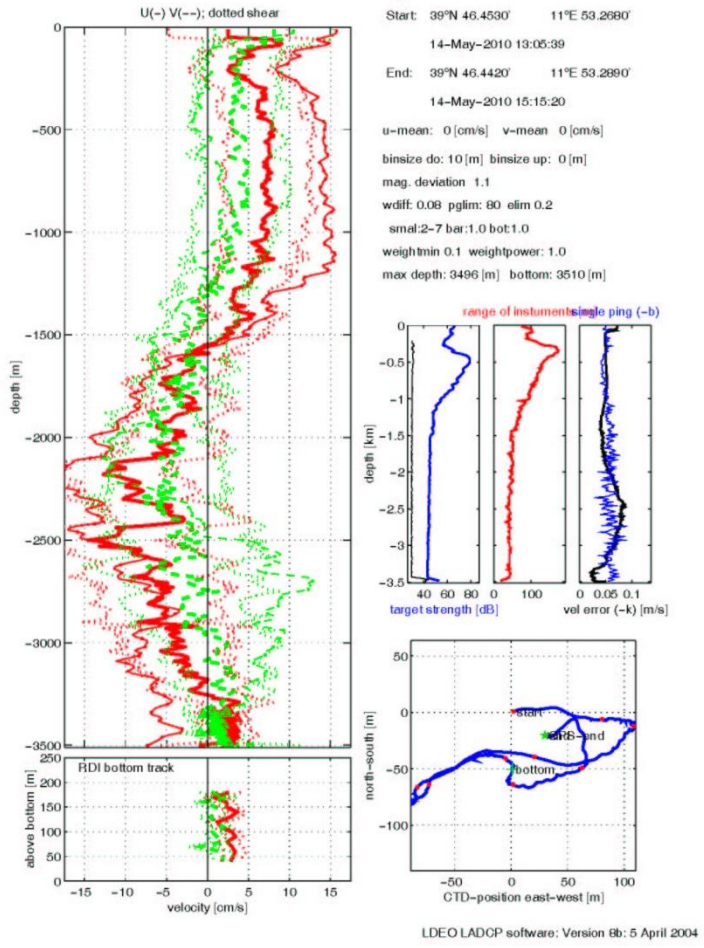


Figure Diagram of the whole water column Station 51



Currents from LADCP

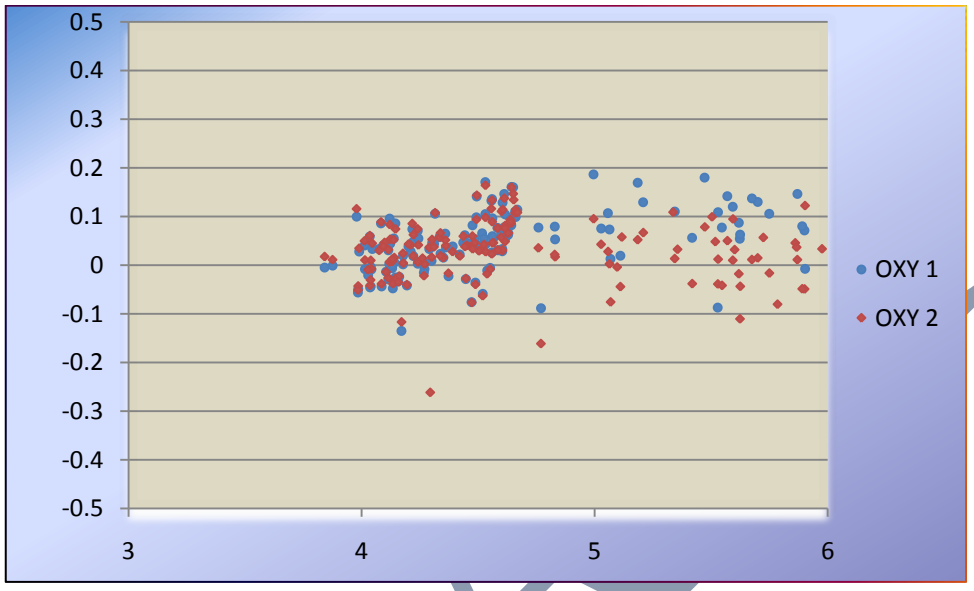
Figure 9 LADCP Profile station 51.



ON BOARD DATA CONTROLL

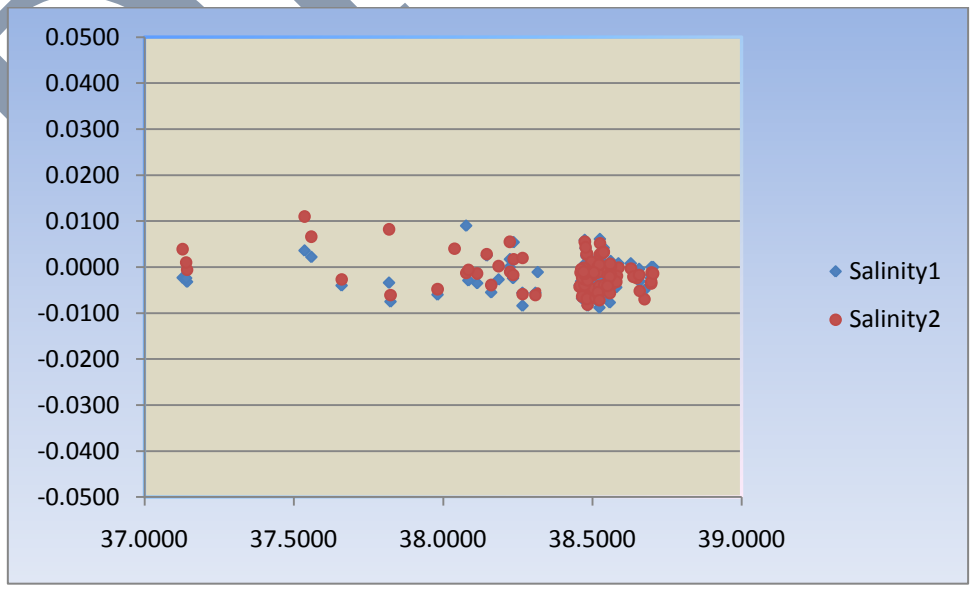
OXYGEN ERROR

WINKLER – OXYGEN SENSOR (1 and 2)



SALINITY ERROR

SALINOMETER– SALINITY SENSOR (1 and 2)



Acknowledgements

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