

Dr. Sascha Flögel
IFM-GEOMAR
Wischhofstr. 1-3
24148 Kiel

Tel.: +49-431-6002317
Fax.: +49-431-6002459
Email: sfloegel@ifm-geomar.de

Short Cruise Report
RV METEOR 84/5

Vigo - Brest

May 31 – June 21 2011

Chief Scientist: Dr. Sascha Flögel

Captain: Michael Schneider



1. **TransBiscay 2011:** Cold-water coral occurrences and distribution in the Bay of Biscay in space and time; focussing on hydrography, geology, geochemistry, and biology

1.1. **Map with working areas**

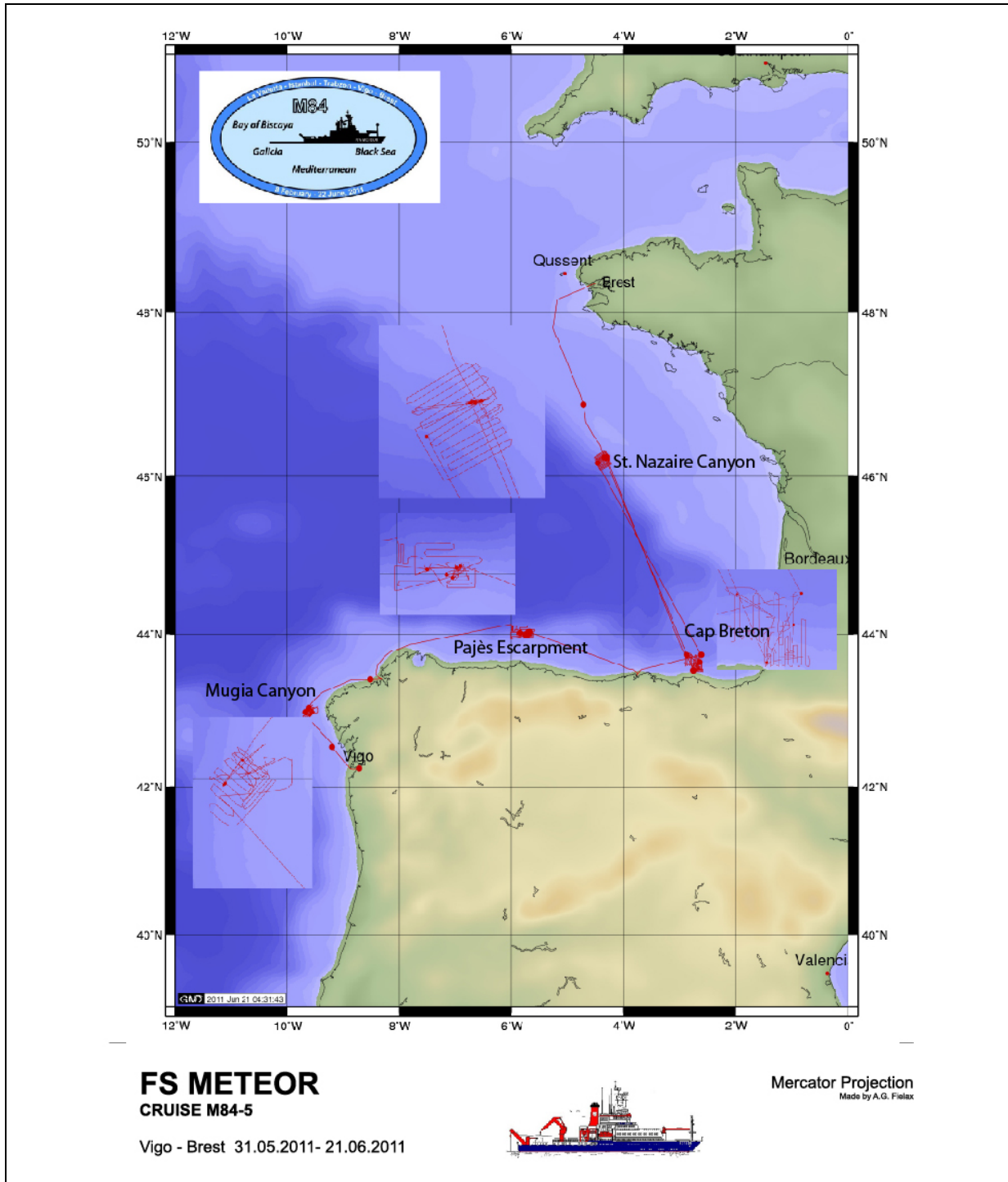


Figure 1: Map of Galician waters and the Bay of Biscay incl. working areas visited during M84/5.

1.2. Cruise objectives

The applied cruise with RV Meteor was planned and conducted to add important information on existing data sets in adjacent waters to the North (Irish Seas and Norway) and South (Gulf of Cadiz and Mauretania) regarding living and fossil cold-water corals and the biological, chemical, and hydrographical factors controlling their distribution. During past cruises we have collected extensive information on the most important drivers of cold-water corals such as oceanographical and geological properties. Previous studies showed that parameters such as temperature, salinity, dissolved oxygen content, current intensities, and different substrates vary widely without specifically impacting the distribution of living cold-water coral reefs. Our previous data (Dullo et al., 2008) indicate that living cold-water coral reefs occur within a distinct density envelope of sigma-theta ($\sigma_{\theta} = 27.5 \pm 0.15 \text{ kg/m}^3$), thus highlighting the importance of physical boundary conditions for cold-water coral growth and distribution, thus being one of the most important controlling factors. Until now it is unclear if this density envelope is increasing the nutrient availability and/or favors the distribution and transport of larvae. This research will be conducted within the new EC-funded project Hermione. The cruise focuses on the physical, chemical, and biological boundary conditions controlling cold-water coral growth in the Gulf of Biscay – an area which will close the gap to existing data sets. It will result in a comprehensive transect spanning a large portion of NE-Atlantic, ranging from the waters off Mauretania at 16°N to data from northern Norway at 70°N. We aim to study the boundary conditions necessary for thriving cold-water coral reefs using CTDs, ADCPs, biogeochemistry, geology and sedimentology, as well as biology. Furthermore we will explore promising new areas, previously not investigated.

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The Bay of Biscay is a region critically located to investigate two climatically important phenomena: (1) the influence of the Mediterranean Outflow Water (MOW) in a far-field sense, and (2) the influence of the Fennoscandian ice sheets in a near-field sense. Therefore, another goal is to determine the far-field extent of MOW influence in the modern Bay of Biscay in three-parameter space (T, S, ϵNd). This will involve collecting water column samples. Additionally, we will test the veracity of cold-water corals as an archival source of Nd, through comparison of the isotopic signal of modern bottom water and living corals. Plus, we will sample shallow water meta-oxide nodules with accurate orientation through manned submersible collection, invaluable to radiogenic isotopic studies.

1.3. Cruise narratives

The first members of the scientific crew arrived on RV METEOR on the 29th of May to unpack most of the containers as well as technical and lab equipment. The scientific crew was completed on the 30th to finalize all necessary preparations since rough weather was expected at sea. RV METEOR left the port of Vigo at 9:00 in the morning on May 31st.

As expected 3+ meter waves were waiting for the meteor outside Vigo where we immediately began the scientific program with a calibration of the multibeam and parasound system by representatives of Kongsberg and Bremen University. After a successful calibration we started mapping our first working area – Mugia Canyon NW

of Vigo in the early morning hours of the 1st of June. The extensive mapping formed the base for all other deployments and investigations such as CTD casts and the TV/video sled. First signs of living corals were encountered in a water depth of 1800 m. Most of the area is characterized by thin sediment cover and dead coral rubble. We aimed for a deployment of our oceanographic lander system. Due to bad weather with wind gusts of up to force 9 a safe deployment was impossible. Instead we ran the TV sled until the 3rd of June when weather conditions calmed down. On the 3rd we performed two successful TV grabs with samples of *Solesnosmilia* colonies, brachiopods, mollusks, and even a Cretaceous belemnite. This was followed by box cores and repeated CTD casts. On Saturday, 4th of June we left for La Coruna to drop our multibeam calibration team.

From La Coruna we steamed to our second working area, Pajès escarpment west of the Le Danois bank. Here we initiated our investigations with a thorough bathymetric survey followed by promising observations with the TV sled (OFOS). These indicated potential coral sites in water depths of 820-900 m. Additional OFOS transects showed only few living corals on various substrates while dead coral rubble was abundant. TV grabs verified these observations with samples of dead and sub-fossil calcareous organisms, brachiopods, stony corals as well as pieces of *Desmophyllum*, a solitary coral. In the afternoon of June 9th we recovered our benthic lander system after 3.5 days in 776 m of water depths. Preliminary data show a strong tidal signal while bottom currents were rather slow. This was followed by multiple gravity cores with a length of up to 2,70 m – rather long if one takes the thin sediment cover into account.

Early on the 10th of June we left for our third working area, Cap Breton Canyon in the SE most corner of the Bay of Biscay. We began our work with a sound velocity profile for the multibeam mapping survey. On June 11, this was followed by intense OFOS tracks which revealed a rather monotonous sea-floor with dominating fine and soft sediments. This was confirmed by multiple TV grabs. These findings resulted in the decision to leave for our final working area, St. Nazaire Canyon on the French shelf/slope. After sailing 160 nm to the North we arrived at our first CTD station on the 13th. Our plan was to focus on St. Nazaire Canyon (46°13,9'N und 004°20,5'W) and its tributaries. Our schedule of mapping and video observations (6/13 and 6/14) was kept and thus we found very promising coral bearing sites (dead and living) on various ridges in the area. On the 15th we deployed our lander system for the last time during this cruise, this time in a water depth of 804 m. Additional TV grabs and box cores (up to 400 cm) on the ridges were very successful, delivering abundant living corals and associated fauna.

Unfortunately, we had to leave the area because of low pressure system (985 hPa) coming our way. Instead of waiting we sailed back to the Cap Breton area to investigate open questions such as 'pockmarks'. But these didn't show any active venting. Instead we sampled some shallow corals for genetic studies in water depth of 200 m. Improving weather conditions allowed us to return to St. Nazaire Canyon on the 18th. Here, we finished our work a successful lander recovery and final mapping efforts before we sailed to Brest. We arrived at Brest in the early morning hours of June 21.

1.4. Participants of M84/5

1.	Sascha Flögel	Chief Scientist	IFM-GEOMAR
2.	Wolf-Christian Dullo	Marine Geology/Hydrography	IFM-GEOMAR
3.	Andres Rüggeberg	Marine Geology/Hydrography	Gent University
4.	Lelia Matos	Geologist/Sedimentologist	Bremen University
5.	Luciana Genio	Biology/Macrofauna	Aveiro University
6.	Ronan Becheler	Coral genetics	Ifremer
7.	Volker Liebetrau	Isotope chemistry	IFM-GEOMAR
8.	Claudio Stalder	Sedimentology/Foraminifera	Fribourg University
9.	Marina da Cunha	Benthic biology	Aveiro University
10.	Martin Frank	Sediment-/Hydrochemistry	IFM-GEOMAR
11.	Moritz Zieringer	Sediment-/Hydrochemistry	IFM-GEOMAR
12.	Yannick Frank	Student	IFM-GEOMAR
13.	Christian Fietzke	Student	IFM-GEOMAR
14.	Covadonga Orejas	Marine biology	IEO
15.	Andrea Gori	Marine biology	IEO
16.	Thorsten Garlich	Hydrochemistry	IFM-GEOMAR
17.	Gerrit Obermüller	Multibeam	Bonn University
18.	Matthias Lopez-Correa	Benthic ecology/Geology	Erlangen University
19.	An De Cleyn	Pore water chemistry	Leuven University
20.	Aurore Movellan	Foraminifera	Angers University
21.	Asmus Petersen	Technician	IFM-GEOMAR
22.	Thorsten Schott	Technician	Oktopus

1.5. Acknowledgements

We like to thank captain Michael Schneider, his officers and crew of RV METEOR for their support of our sampling and measurement programme and for creating a very friendly atmosphere on board.

The ship time on METEOR was provided by the Deutsche Forschungsgemeinschaft within the core program METEOR/MERIAN. Financial support for the different projects carried out during the cruise was provided through the EU-Projects HERMIONE. We also benefited from financial contributions by the research institutes involved. We gratefully acknowledge all this support.

1.6. Station list M84/5

no.	Meteor no.	Area detail	Gear	Gear Depth	Date	Time (UTC)	Depth	Lat	Long
1	556	6nm from Cabo Corubedo	Sound velocity		5/31/11	11:42	97	42.53	9.20
2	557	Mugia Canyon	Sound velocity		5/31/11	22:24	1603	42.96	9.69
3	558	Mugia Canyon	Multibeam/Parasound	-	6/2/11	5:11	812	42.95	9.62
4	559	Mugia Canyon	CTD-Ro	2300	6/2/11	8:45	2344	43.00	9.72
5	560	Mugia Canyon	CTD-Ro	1100	6/2/11	10:31	2350	43.01	9.72
6	561	Mugia Canyon	OFOS	1800	6/3/11	4:34	1835	42.99	9.67
7	562	Mugia Canyon	TVG	1833			1835	42.99	9.67
8	563	Mugia Canyon	TVG	1905	6/3/11	12:00	1902	42.98	9.68
9	564	Mugia Canyon	Box Coring	1848	6/3/11	16:40	1792	42.99	9.67
10	565	Mugia Canyon	Box Coring	1848	6/3/11	18:20	1788	42.99	9.67
11	566	Mugia Canyon	Plankton Net	50	6/3/11	19:00	1853	42.99	9.68
12	567	Mugia Canyon	Plankton Net	100	6/3/11	19:30	1852	42.99	9.68
13	568	Mugia Canyon	CTD-Ro	1869	6/3/11	21:35	1846	42.99	9.68
14	569	Mugia Canyon	CTD-Ro	1000	6/3/11	23:05	1851	42.99	9.68
15	570	Mugia Canyon	CTD-Ro	1000	6/4/11	0:00	1851	42.99	9.68
16	571	Mugia Canyon	CTD-Ro	1000	6/4/11	0:55	1854	42.99	9.68
17	572	Mugia Canyon	CTD-Ro	1000	6/4/11	1:47	1851	42.99	9.68
18	573	Mugia Canyon	CTD-Ro	1000	6/4/11	2:43	1852	42.99	9.68
19	574	Mugia Canyon	CTD-Ro	1000	6/4/11	3:42	1845	42.99	9.68
20	575	Mugia Canyon	CTD-Ro	1000	6/4/11	4:42	1849	42.99	9.68
21	576	W´ Le Danois Bank Abyssal Plain	CTD-Ro	3250	6/5/11	4:05	3295	44.13	6.00
22	577	W´ Le Danois Bank Abyssal Plain	CTD-Ro	1000	6/5/11	5:51	3326	44.13	6.00
23	578	W´ Le Danois Bank	Multibeam/Parasound		6/5/11	12:44	2837	44.11	5.99

24	579	W´ Le Danois Bank	OFOS	1031	6/5/11	19:29	1069	44.04	5.68
25	580	W´ Le Danois Bank	POZ Lander	776			762	44.02	5.71
26	581	W´ Le Danois Bank	Multibeam/Parasound		6/6/11	6:00	1320	44.04	5.75
27	582	W´ Le Danois Bank/ Pajes Escarpment	CTD-Ro	766	6/6/11	8:08	763	44.02	5.70
28	583	W´ Le Danois Bank/ Pajes Escarpment	CTD-Ro	766	6/6/11	9:03	763	44.02	5.70
29	584	W´ Le Danois Bank/ Pajes Escarpment	CTD-Ro	762	6/6/11	9:50	763	44.02	5.70
30	585	W´ Le Danois Bank/ Pajes Escarpment	CTD-Ro	760	6/6/11	10:41	764	44.02	5.70
31	586	W´ Le Danois Bank/ Pajes Escarpment	CTD-Ro	760	6/6/11	11:30	764	44.02	5.70
32	587	W´ Le Danois Bank/ Pajes Escarpment	CTD-Ro	759	6/6/11	12:25	763	44.02	5.70
33	588	W´ Le Danois Bank/ Pajes Escarpment	CTD-Ro	760	6/6/11	13:06	763	44.02	5.70
34	589	W´ Le Danois Bank/ Pajes Escarpment	CTD-Ro	760	6/6/11	14:00	764	44.02	5.70
35	590	W´ Le Danois Bank/ Pajes Escarpment	OFOS	304	6/6/11	23:01	354	44.00	5.69
36	591	W´ Le Danois Bank/ Pajes Escarpment	CTD-Ro	759	6/7/11	0:52	762	44.02	5.70
37	592	W´ Le Danois Bank/ Pajes Escarpment	CTD-Ro	760	6/7/11	1:35	761	44.02	5.70
38	593	W´ Le Danois Bank/ Pajes Escarpment	CTD-Ro	759	6/7/11	2:18	763	44.02	5.70
39	594	W´ Le Danois Bank/ Pajes	CTD-Ro	759	6/7/11	2:57	761	44.02	5.70

		Escarpment								
40	595	W´ Le Danois Bank/ Pajes Escarpment	CTD-Ro	759	6/7/11	3:54	761	44.02	5.70	
41	596	W´ Le Danois Bank/ Pajes Escarpment	CTD-Ro	600	6/7/11	4:42	764	44.02	5.70	
42	597	W´ Le Danois Bank/ Pajes Escarpment	CTD-Ro	761	6/7/11	5:40	763	44.02	5.70	
43	598	W´ Le Danois Bank/ Pajes Escarpment	CTD-Ro	761	6/7/11	6:25	764	44.02	5.70	
44	599	W´ Le Danois Bank/ Pajes Escarpment	Plankton Net	100	6/7/11	8:11	667	43.98	5.72	
45	600	Pajes Escarpment	Box Coring	665	6/7/11	9:45	666	43.98	5.72	
46	601	Pajes Escarpment	Box Coring	666	6/7/11	10:54	668	43.98	5.72	
47	602	Pajes Escarpment	Box Coring	595	6/7/11	12:15	594	43.99	5.72	
48	603	Pajes Escarpment	Box Coring	583	6/7/11	13:28	582	43.99	5.72	
49	604	Pajes Escarpment	Box Coring	638	6/7/11	14:43	634	43.99	5.73	
50	605	Pajes Escarpment	Box Coring	350	6/7/11	15:45	348	43.99	5.71	
51	606	Pajes Escarpment	Box Coring	350	6/7/11	16:24	350	43.99	5.71	
52	607	Pajes Escarpment	Box Coring	354	6/7/11		353	44.00	5.69	
53	608	Pajes Escarpment	Multibeam/Parasound		6/8/11	5:22	2257	44.06	5.62	
54	609	Pajes Escarpment	Plankton Net		6/8/11	5:45	565	43.96	5.77	
55	610	Pajes Escarpment	OFOS	1252	6/8/11	15:45	1251	44.02	5.84	
56	611	Pajes Escarpment	CTD-Ro	1992	6/8/11	18:20	1996	44.00	5.90	
57	612	Pajes Escarpment	CTD-Ro	1248	6/8/11	20:28	1252	44.02	5.84	

58	Pajes 613	Escarpment	OFOS	766	6/8/11	23:18	767	44.02	5.71
59	Pajes 614	Escarpment	OFOS	812	6/9/11	1:45	813	44.03	5.70
60	Pajes 615	Escarpment	CTD-Ro	609	6/9/11	5:57	620	43.99	5.73
61	Pajes 616	Escarpment	Multibeam/Parasound		6/9/11	5:09	922	43.94	6.01
62	Pajes 617	Escarpment	TVG	1234	6/9/11	8:28	1234	44.02	5.84
63	Pajes 618	Escarpment	TVG	813	6/9/11	11:16	811	44.03	5.68
64	Pajes 619	Escarpment	TVG	812	6/9/11	13:35	813	44.03	5.68
65	Pajes 620	Escarpment	POZ Lander		6/9/11	15:00	780	44.02	5.71
66	Pajes 621	Escarpment	Gravity Coring	967	6/9/11	17:58	899	44.03	5.68
67	Pajes 622	Escarpment	Gravity Coring	953	6/9/11	19:33	898	44.03	5.68
68	Pajes 623	Escarpment	Gravity Coring	975	6/9/11	20:56	899	44.03	5.68
69	624	Cap Breton	CTD-Ro	2365	6/10/11	13:15	2384	43.73	2.62
70	625	Cap Breton	CTD-Ro	980	6/10/11	15:00	2365	43.73	2.62
71	626	Cap Breton	Multibeam/Parasound		6/11/11	7:49	2061	43.74	2.65
72	627	Cap Breton	OFOS	726	6/11/11	12:03	717	43.64	2.63
73	628	Cap Breton	OFOS	478	6/11/11	16:47	476	43.62	2.71
74	629	Cap Breton	Multibeam/Parasound		6/12/11	5:11	306	43.58	2.77
75	630	Cap Breton							
76	631	Cap Breton	TVG	235	6/12/11	10:35	238	43.53	2.76
77	632	Cap Breton	TVG	244	6/12/11	11:02	240	43.53	2.76
78	633	Cap Breton	TVG	235	6/12/11	12:12	221	43.53	2.76
79	634	Cap Breton	TVG	233	6/12/11	13:13	238	43.53	2.76
80	635	Cap Breton	CTD-Ro	223	6/12/11	14:07	230	43.53	2.76
81	636	Cap Breton	TVG	2365	6/12/11	18:15	2366	43.73	2.62
82	637	Cap Breton	Plankton Net	100	6/12/11	18:45	2366	43.73	2.62

83	638	St. Nazaire Canyon	CTD-Ro	2063	6/13/11	12:23	2057	46.17	4.47
84	639	St. Nazaire Canyon	CTD-Ro	900	6/13/11	13:40	2060	46.17	4.47
85	640	St. Nazaire Canyon	Multibeam/Parasound		6/13/11	21:00	2070	46.17	4.47
86	641	St. Nazaire Canyon	OFOS	387	6/14/11	3:46	440	46.24	4.30
87	642	St. Nazaire Canyon	POZ Lander	809	6/14/11	7:08	814	46.23	4.33
88	643	St. Nazaire Canyon	TVG	884	6/14/11	10:05	825	46.23	4.33
89	644	St. Nazaire Canyon	TVG	823	6/14/11	13:52	820	46.23	4.33
90	645	St. Nazaire Canyon	Multibeam/Parasound		6/15/11	1:30	1510	46.22	4.51
91	646	St. Nazaire Canyon	OFOS	614	6/15/11	7:30	660	46.23	4.32
92	647	St. Nazaire Canyon	Plankton Net	100	6/15/11	8:11	1348	46.23	4.35
93	648	St. Nazaire Canyon	Box Coring	1107	6/15/11	10:52	1099	46.23	4.34
94	649	St. Nazaire Canyon	Box Coring	1110	6/15/11	12:11	1105	46.23	4.34
95	650	St. Nazaire Canyon	Box Coring	988	6/15/11	13:35	990	46.23	4.34
96	651	St. Nazaire Canyon	Box Coring	985	6/15/11	14:36	982	46.24	4.34
97	652	St. Nazaire Canyon	Box Coring	788	6/15/11	15:55	781	46.24	4.33
98	653	St. Nazaire Canyon	Box Coring	756	6/15/11	16:49	753	46.24	4.33
99	654	St. Nazaire Canyon	Box Coring	679	6/15/11	17:50	669	46.24	4.32
100	655	St. Nazaire Canyon	Box Coring	527	6/15/11	19:30	530	46.24	4.31
101	656	St. Nazaire Canyon	CTD-Ro	1364	6/15/11	21:15	1357	46.23	4.35
102	657	St. Nazaire Canyon	CTD-Ro	1107	6/15/11	22:32	1121	46.23	4.34

103	658	St. Nazaire Canyon	CTD-Ro	846	6/15/11	23:35	837	46.24	4.34
104	659	St. Nazaire Canyon	CTD-Ro	647	6/16/11	0:36	650	46.24	4.32
105	660	St. Nazaire Canyon	CTD-Ro	483	6/16/11	1:18	486	46.24	4.31
106	661	St. Nazaire Canyon	CTD-Ro	351	6/16/11	2:00	355	46.24	4.29
107	662	St. Nazaire Canyon	CTD-Ro	1145	6/16/11	3:22	1132	46.23	4.34
108	663	St. Nazaire Canyon	CTD-Ro	829	6/16/11	4:26	837	46.24	4.34
109	664	St. Nazaire Canyon	CTD-Ro	649	6/16/11	5:20	646	46.24	4.32
110	665	St. Nazaire Canyon	CTD-Ro	473	6/16/11	6:05	483	46.24	4.31
111	666	St. Nazaire Canyon	CTD-Ro	798	6/16/11	7:07	808	46.23	4.32
112	667	St. Nazaire Canyon	Plankton Net	100	6/16/11	7:23	845	46.23	4.33
113	668	St. Nazaire Canyon	Gravity Coring	538	6/16/11	8:30	535	46.24	4.31
114	669	St. Nazaire Canyon	Gravity Coring	669	6/16/11	9:28	674	46.24	4.32
115	670	St. Nazaire Canyon	Gravity Coring	746	6/16/11	10:20	750	46.24	4.33
116	671	St. Nazaire Canyon	Gravity Coring	749	6/16/11	11:15	752	46.24	4.33
117	672	St. Nazaire Canyon	Gravity Coring	978	6/16/11	12:28	980	46.24	4.34
118	673	St. Nazaire Canyon	Gravity Coring	1116	6/16/11	13:45	1098	46.23	4.34
119	674	St. Nazaire Canyon	Gravity Coring	515	6/16/11	14:53	499	46.24	4.31
120	675	St. Nazaire Canyon	Gravity Coring	536	6/16/11	16:16	530	46.24	4.31
121	676	St. Nazaire Canyon	Gravity Coring	979	6/16/11	17:30	988	46.24	4.34
122	677	Cap Breton	TVG	225	6/17/11	11:15	214	43.53	2.76
123	678	Cap Breton	TVG	227	6/17/11	12:08	215	43.53	2.76

124	679	Cap Breton	TVG	228	6/17/11	14:18	216	43.53	2.76
125	680	Cap Breton	TVG	187	6/17/11	15:56	173	43.53	2.76
126	681	Cap Breton	OFOS	839	6/17/11	22:00	880	43.67	2.73
127	682	Cap Breton	Multibeam/Parasound		6/18/11	4:43	1137	43.67	2.75
128	683	Cap Breton	Plankton Net	100	6/18/11	6:06	912	43.66	2.72
129	684	Cap Breton	CTD-Ro	918	6/18/11	7:18	909	43.66	2.72
130	685	Cap Breton	CTD-Ro	553	6/18/11	8:10	911	43.66	2.72
131	686	Cap Breton	OFOS	1503	6/18/11	15:19	1491	43.73	2.87
132	687	St. Nazaire Canyon	TVG	519	6/19/11	12:14	537	46.24	4.31
133	688	St. Nazaire Canyon	TVG	662	6/19/11	14:03	667	46.24	4.32
134	689	St. Nazaire Canyon	TVG	751	6/19/11	16:00	752	46.24	4.33
135	690	St. Nazaire Canyon	TVG	753	6/19/11	17:40	755	46.24	4.33
136	691	St. Nazaire Canyon	Multibeam/Parasound		6/20/11	5:26	313	46.23	4.28
137	692	St. Nazaire Canyon	POZ Lander		6/20/11	6:55	760	46.23	4.32