National Oceanography Centre

Cruise Report No. 02

SERPENT Cruise Reports 2008 to 2010

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2011

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SERPENT Cruise Reports 2008 to 2010

.

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ABSTRACT

The SERPENT Project, Scientific & Environmental ROV Partnership using Existing iNdustrial Technology, is a collaboration between world leading scientific institutions and companies associated with the oil and gas industry. SERPENT is hosted at the National Oceanography Centre, Southampton (NOCS), one of the worlds' largest research and teaching organisations specialising in deep-sea science and oceanography. SERPENT encompasses a scientific network of academic partners across the world (USA, Canada, Brazil, Africa, Australia), linked to a network of major oil and gas operators and contractors. The project centres around the opportunistic use of ROVs (Remotely Operated Vehicles) in operational settings during periods of stand-by time. The project also aims to maximise the scientific benefit of environmental data collected as part of routine offshore operations and environmental surveys. Through access to ROVs and such environmental data scientists at NOCS and from the wider SERPENT partnership aim to improve the scientific understanding of the deep-sea's biodiversity in all its aspects. This document presents the cruise reports for SERPENT missions carried out from 2008 to 2010 and includes a history of all previous SERPENT missions.

KEYWORDS

SERPENT, ROV, Remotely Operated Vehicle, oil and gas industry, offshore drilling, diversity, Gulf of Mexico, West of Shetland, Ireland, Norway, Nigeria, Australia, *Acergy Petrel, Aker Barents, Borgsten Dolphin, Bourbon Diamond, Byford Dolphin, Discoverer Americas, Discoverer Deep Seas, Edda Fauna, Havila Harmony, Jack Ryan, Leiv Eiriksson, Mutineer 14, Ocean Bounty, Ocean Vanguard, Songa Venus, Stena Carron, Stena Clyde, Thunder Horse, Transocean Leader, Wilcraft*

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SERPENT CRUISE REPORTS

2008 – 2010

ANDREW GATES

DANIEL JONES

MARK BENFIELD

CHRISTOPHER ROTERMAN

KERSTIN KRÖGER

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COMPLETE MISSION LIST

Mission number	Rig / Vessel	Field	Location	Date	SERPENT representative	Cruise Report	Visit type
1	M.V. Regalia	Schiehallion	Faroe-Shetland Channel	20.7 – 2.8.2002	Ian Hudson	No	Science
2	Paul B Loyd Junior	Foinaven	Faroe-Shetland Channel	14 – 28.05.2003	Daniel Jones	Yes	Science
3	M.V. Nordica	Schiehallion	Faroe-Shetland Channel	25 – 28.07.2003	Daniel Jones	Yes	Science
4	Transocean Leader	Schiehallion	Faroe-Shetland Channel	27.09 – 03.10.2003	Ben Wigham	No	Science
5	Jack Bates	Laggan	Faroe-Shetland Channel	14 – 23.04.2004	Daniel Jones	Yes	Science
6	Subsea Viking	Schiehallion	Faroe-Shetland Channel	September 2004	BBC / Ben Wigham	No	BBC filming
7	Boa Deep C	TIOF	Mauritania	16 – 23.09.2004	Daniel Jones	Yes	Science
8	Jack Bates	Calister 1	Otway Basin, Australia	21.10 – 1.11.2004	Adele Pile, Gareth Andrews	Yes	Science
9	Jack Bates	Enfield 1	Australia	21.3 – 1.4.2005	Adele Pile, Gareth Andrews, Katie Robertson	Yes	Science
10	Paul B Loyd Junior	Schiehallion	Faroe-Shetland Channel	23-27.4.2005	Tania Smith	Yes	Science
11	Transocean Leader	Onyx	Norwegian Margin	May 2005	Ben Wigham	No	Science
12	Jack Bates	Enfield 2	Australia	24 – 27.5.2005	Katie Robertson	Yes	Science
13	Sedco 703	Pluto	Australia	30.7 – 3.8.2005	Adele Pile	Yes	Science
14	Jack Bates	Enfield 3	Australia	12 – 23.12.2005	Katie Robertson	Yes	Science
15	Sedco Express	Angola Block 18	Angola, West Africa	1.2006	Ian Hudson	No	Science
16	Paul B Loyd Junior	Schiehallion	Faroe-Shetland Channel	26.2 – 5.3.2006	Lis Maclaren school	Yes	Schools project
17	Jack Bates	Enfield 4	Australia	15-21.3.2006	Katie Robertson	Yes	Science
18	Eirik Raude	Uranus	Barents Sea	17 – 23.3.2006	Janne Kaariainen	Yes	Science
19	West Alpha	Morvin	Norwegian Margin	20 – 27.4.2006	Janne Kaariainen, Nina Rothe	Yes	Science
20	Eirik Raude	Edvarda	Norwegian Margin	17 - 23.5.2006	Janne Kaariainen	Yes	Science
21	Thylacine (fixed platform)	Thylacine	Otway Basin, Australia	22 – 26.5.2006	Adele Pile, Gareth Andrews	Yes	Science
22	Eirik Raude	Edvarda	Norwegian Margin	19 – 20.6.2006	Janne Kaariainen, Lis Maclaren	No	Filming

Mission number	Rig / Vessel	Field	Location	Date	SERPENT representative	Cruise Report	Visit type
23	Stena Don	Brugdan 1	Faroe-Shetland Channel	10 – 13.7.2006	Janne Kaariainen	No	Science
24	Ocean Bounty (Diamond offshore)	Mutineer	Carnarvon Basin, Western Australia	19-27.7.2006	Gareth Andrews	Yes	Science
25	Stena Don	Brugdan 2	Faroe-Shetland Channel	7 – 14.8.2006	Daniel Jones	Yes	Science
26	Polar Pioneer	Tornerose	Barents Sea	31.8 – 4.9.2006	Daniel Jones	Yes	Science
27	Stena Don	Brugdan 3	Faroe-Shetland Channel	30.8 – 4.9.2006	Janne Kaariainen	Yes	Science
28	Stena Don	Brugdan 4	Faroe-Shetland Channel	11-17.10.2006	Daniel Jones	Yes	Science
29	Polar Pioneer	Nucula	Barents Sea	29.01-3.02.2007	Janne Kaariainen	?	Science
30	Fugro Mercator	Laggan survey	Faroe-Shetland Channel	02.2007	Daniel Jones	Yes	Science
31	Transocean Rather	Rosebank 1	Faroe-Shetland Channel	04-12.04.2007	Andrew Gates	Yes	Science
32	Transocean Rather	Rosebank 2	Faroe-Shetland Channel	07-13.06.2007	Andrew Gates	Yes	Science
33	Transocean Leader	Midnattsol 1	Norwegian Margin	01-05.07.2007	Andrew Gates	Yes	Science
34	West Epsilon	Ragnarokk 1	Norwegian North Sea	26-30.07.2007	Andrew Gates	Yes	Science
35	Sovereign Explorer	Orca	Venezuela	22.07 - 03.08.2007	Daniel Jones	Yes	Science
36	Transocean Leader	Midnattsol 2	Norwegian Margin	23-29.08.2007	Andrew Gates	Yes	Science
37	West Epsilon	Ragnarokk 2	Norwegian North Sea	30.8-5.9.2007	Daniel Jones	Yes	Science
38	Transocean Rather	Rosebank 3	Faroe-Shetland Channel	26.09 - 1.10.2007	Andrew Gates	Yes	Science
39	Transocean Discoverer Enterprise	MC777	Gulf of Mexico	1-2.11.2007	Mark Benfield	Yes	Science
40	Mad Dog Spar	GC782	Gulf of Mexico	11-13.12.2007	Mark Benfield	Yes	Science
41	Thunder Horse PDG	MC778	Gulf of Mexico	15-18.01.2008	Mark Benfield	Yes	Science
42	Discoverer Deepseas	MC778	Gulf of Mexico	19-22.02.2008	Mark Benfield	No XX	Science
43	Ocean Bounty	NW Shelf	Australia	2-7.04.2008	Murray Thompson	No	Science
44	Sogna Venus	NW Shelf	Australia	13-23.05.2008	Adele Pile & Ash Fowler	No	Science
45	Ocean Vanguard	Cashel 1	NW. Ireland	18-22.05.2008	Andrew Gates	Yes	Science
46	Stena Clyde	NW Shelf	Australia	29.05-2.06.2008	Kate Swain	No	Science
47	Havila Harmony	NW Shelf	Australia	30.05-6.06.2008	Ash Fowler	No	Science

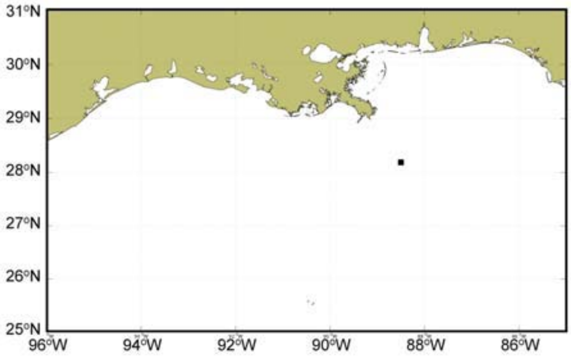
Mission number	Rig / Vessel	Field	Location	Date	SERPENT representative	Cruise Report	Visit type
48	Havila Harmony	NW Shelf	Australia	4-10.06.2008	Danielle Skropeta & David Cummings	No	Science
49	Ocean Vanguard	Cashel 2	NW. Ireland	13-18.06.2008	Andrew Gates	Yes	Science
50	Havila Harmony	NW Shelf	Australia	18-30.06.2008	David Cummings & Ash Fowler	No	Science
51	Havila Harmony	NW Shelf	Australia	20-26.06.2008	David Cummings & Ash Fowler	No	Science
52	Ocean Vanguard	Cashel 3	NW. Ireland	27.06-1.07.2008	Andrew Gates	Yes	Science
53	Ocean Bounty	NW Shelf	Australia	6-20.07.2008	Helen Smith	No	Science
54	Havila Harmony	NW Shelf	Australia	15-19.07.2008	David Cummings & Natalie Pastro	No	Science
55	Wilcraft	Bonaparte Gulf	Australia	29.07-4.08.2008	Kate Swain	No	Science
56	Mutineer 14	NW Shelf	Australia	18-26.08.2008	David Cummings	No	Science
57	Havila Harmony	NW Shelf	Australia	20-25.08.2008	Ash Fowler	No	Science
58	Stena Clyde	NW Shelf	Australia	27-31.08.2008	Adele Pile & Murray Thompson	No	Science
59	Stena Clyde	NW Shelf	Australia	9-15.09.2008	Kate Swain & Ash Fowler	No	Science
60	Transocean Leader	Haklang 1	Norwegian Sea	23.09.-8.10.2008	Andrew Gates	Yes	Science
61	Transocean Leader	Haklang 2	Norwegian Sea	15.10 - 18.10.2008	Andrew Gates	Yes	Science
62	Stena Carron	Rosebank 4	Faroe-Shetland Channel	11-14.12.2008	Daniel Jones	Yes	BBC filming
63	Transocean Discoverer Deepseas	Walker Ridge 316	Gulf of Mexico	27-29.01.2009	Mark Benfield & Marianne Alford	Yes	Science
64	Transocean Leader	Asterix	Norwegian Sea	17-24.02.2009	Andrew Gates	Yes	Science &filming
65	Stena Carron	Rosebank North 2	Faroe-Shetland Channel	20.02-12.03.2009	Daniel Jones	Yes	BBC filming
66	Leiv Eiriksson	Gro 6603	Norwegian Sea	30.4-7.05.2009	Christopher Roterman	Yes	Science
67	Jack Ryan	Akpo	Nigeria	1-6.05.2009	Daniel Jones	Yes	Science
68	Acergy Petrel	Morvin	Norwegian Sea	2-7.05.2009	Andrew Gates	Yes	Science
69	Leiv Eiriksson	Gro 6603	Norwegian Sea	6-13.06.2009	Christopher Roterman	Yes	Science
70	Stena Carron	Rosebank 5	Faroe-Shetland Channel	23.06-3.07.2009	Christopher Roterman	Yes	Science
71	Bourbon Diamond	Usan	Nigeria	9-18.07.2009	Daniel Jones	Yes	Science

Mission number	Rig / Vessel	Field	Location	Date	SERPENT representative	Cruise Report	Visit type
72	Deepwater Horizon	Tiber	Keithly Canyon 102 G.O.M	18-22.7.2009	Mark Benfield & Stuart Cook	Yes	Science &Training
73	Noble Clyde Boudreaux	Alaminos Canyon 857	Gulf of Mexico	28.7-31.7.2009	Mark Benfield, Stuart Cook	Yes	Science
74	Leiv Eiriksson	South Uist	Faroe-Shetland Channel	2-7.08.2009	Daniel Jones	Yes	Science
75	Development Driller 2	GC 743	Gulf of Mexico	3-6.08.2009	Stuart Cook	Yes	Science
76	Byford Dolphin	Lancaster 1	Faroe-Shetland Channel	21-28.08.2009	Andrew Gates	Yes	Science
77	Noble Jim Thompson	Mississippi Canyon 765	Gulf of Mexico	5-7.09.2009	Mark Benfield	Yes	Science
78	Stena Carron	Tornado 1	Faroe-Shetland Channel	19.09-2.10.2009	Daniel Jones	Yes	Science
79	Stena Carron	Tornado 2	Faroe-Shetland Channel	16-22.10.2009	Daniel Jones	Yes	Science
80	Deepwater Nautilus	Mississippi Canyon 392	Gulf of Mexico	22-25.11.09	Mark Benfield	Yes	Science
81	Edda Fauna	Morvin	Norwegian Sea	17-21.03.2010	Daniel Jones	Yes	Science
82	Borgsten Dolphin	Lancaster 2	Faroe-Shetland Channel	24.05-1.06.2010	Andrew Gates	Yes	Science
83	Borgsten Dolphin	Whirlwind 1	Faroe-Shetland Channel	10-14.09.2010	Andrew Gates	Yes	Science
84	Borgsten Dolphin	Whirlwind 2	Faroe-Shetland Channel	4-11.10.2010	Andrew Gates	Yes	Science
85	Aker Barents	Dalsnuten 1	Norwegian Sea	29.10-9.11.2010	Kerstin Kröger & Andrew Gates	Yes	Science &Training
86	Stena Carron	Lagavulin	Faroe-Shetland Channel	5-11.11.2010	Daniel Jones	Yes	Science
87	Aker Barents	Dalsnuten 2	Norwegian Sea	29.11-10.12.2010	Kerstin Kröger	Yes	Science
88	Discoverer Americas	Kiwi	Mediterranean, Egypt	14-22.12.2010	Andrew Gates	Yes	Science

MISSION 41

THUNDER HORSE PDQ, MC778, GULF OF MEXICO

MARK BENFIELD



Dates: Jan 15 – 18, 2008

Facility: Thunder Horse PDQ

Location: MC778

Latitude: 28.1899°N

Longitude: 88.4961°W

Water Depth: 5880 feet (1792 m)

SUMMARY

This was the first trip of 2008 and first visit to Thunder Horse PDQ (TH-PDQ). The purpose of the trip was to brief key personnel aboard the rig with the Gulf SERPENT Project and to familiarize the two Saipem-America ROV groups with our SERPENT survey. TH-PDQ is both a production and drilling facility. It has two ROV groups with sufficient personnel for 24-h operations. The latter factor means that regular nighttime surveys are feasible at TH-PDQ. The TH-PDQ (MC778) is in close proximity to another SERPENT site — the Discoverer Enterprise (MC777). The presence of two SERPENT sites close together will allow us to build up a very complete picture of the marine life in this area.

The two ROVs are Innovator15 and Innovator19 (Fig. 1). Innovator15 is deployed from the port side and Innovator19 is deployed from the starboard side. Innovator15 is a 150HP vehicle similar to the Innovator aboard Mad Dog but with a few important differences. The lighting configuration on Innovator15 has been modified and this change produced really excellent illumination of planktonic organisms. In addition it has a real-time multibeam sonar (MS-2000). This 200 kHz system has a very high scan rate (1 Hz) which might make target tracking easier, though its lower frequency means that it won't detect weaker and smaller targets. This vehicle can be set to operate using two or four thrusters. Two thrusters means that the vehicle can move more slowly under good control when conducting surveys. I was pleased to learn that there is a high-resolution, digital still camera system onboard for this ROV. The camera is a Kongsberg 14-208 system based on a Canon camera. The camera is owned by BP. Doug Hernandez at BP is the point of contact to discuss the use of the camera in support of SERPENT. It's not standard equipment but can be installed on the ROV in a short time. I am very interested in conducting some tests to evaluate the utility of this camera.

Innovator19 (Fig. 1) is a more powerful 250HP ROV. The vehicle is a little larger than the 150HP system. The lighting configuration is similar to that of the Innovator12. In addition to the usual video camera configuration it has a sector scan 675 kHz sonar and a DIDSON – imaging sonar. The DIDSON can be thought of as a sonar video. While the DIDSON resolution isn't as good as a video camera and it produces a monochromatic image, it doesn't need light. It can see out to about 45 feet and may be very useful for documenting organisms that are scared off by the lights of the ROV. The DIDSON is optional equipment that can be installed fairly quickly. Innovator19 is soon to undergo a substantial rebuild. It will therefore be out of operation for some weeks. When it is again available, it will be valuable to return to TH-PDQ to work with that group on SERPENT surveys and to explore the utility of the DIDSON.

Figure 1. ROVs aboard Thunderhorse-PDQ: (Top) Sonsub Innovator15 ROV (Bottom) Innovator19.

I briefed both OIMs (Thomas Hassold and Michael O'Donnell), one of the Wellsite Leaders (Ricky Trichell), a representative of the Subsea Group (Billy Sam Locke), and HSE Group on the project. I was able to give a briefing to each of the four ROV shifts on TH-PDQ: Innovator15 Day (Kris Kimmel, Paul Duncan, Rusty Thompson); Innovator15 Night (Dwaine Sampey, Chris Lasyone, Shane Westerman); Innovator19 Day (Michael Hunt, Kevin Nicottly, Cameron Mahler); and Innovator19 Night (Matt McLean, Mike Mattingly and Robert Beard)

Conditions were favorable for a dive on the evening of 01/15/08 and we deployed Innovator15 at 20h28. This was a training dive so we kept the vehicle shallow. The cursor extends down to 100 feet and given concerns about hydraulic temperatures and proximity to the rig pontoons, Dwaine Sampey decided to keep the system a bit deeper for the training dive. We did a survey at 500 feet and another at 800 feet.

During the early morning of 01/16/08, a strong weather frontal system moved through the area. High winds pushed the seas to 25 feet. Conditions were unfavorable for diving throughout the day of 01/16/08 and the following night. On the morning of 01/17/08 the frontal system had passed and the winds began to subside. By early afternoon conditions were again favorable for deployment of the ROV and we did a daytime training dive with Innovator15. The ADCP backscatter data suggested that plankton were present in layers centered around 1500 feet and deeper at about 2200 feet (Fig 2). Therefore we concentrated our efforts at these depths. A series of horizontal survey transects were conducted at 1500, 1700, 2200, 2700, and 3200 feet.

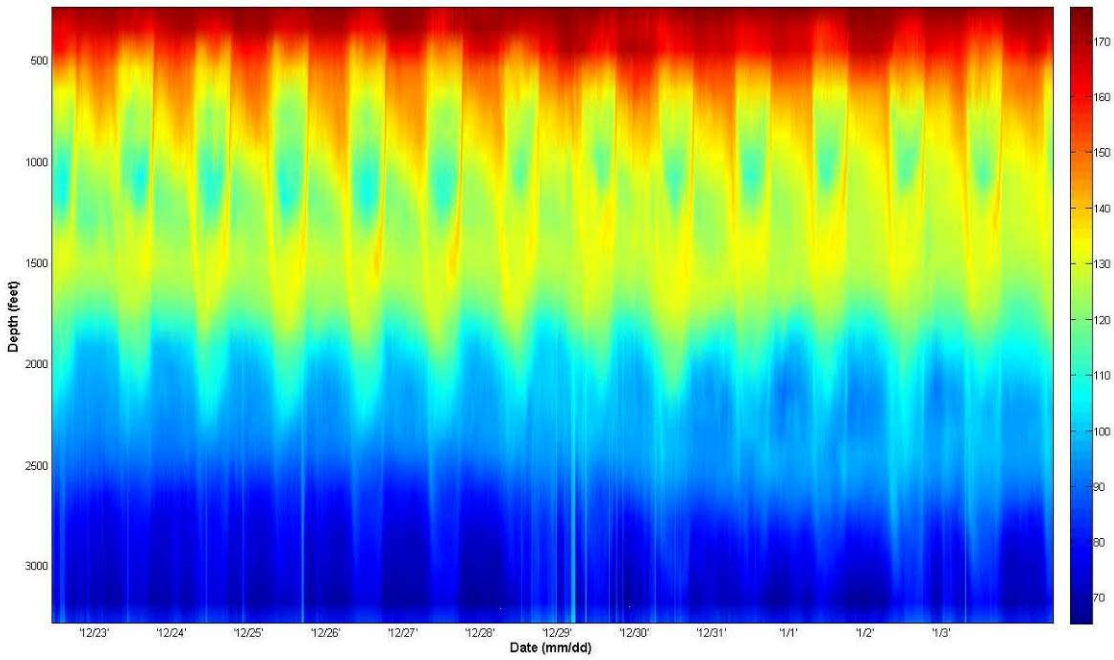


Figure 2. ADCP backscatter record from Thunder Horse PDQ from 12/23/07 – 1/4/08. Red colors represent stronger echo intensities and blue colors are weaker. Note the upward vertical migration that begins each day during the late afternoon and subsequent downward migration just before dawn. During the day there appears to be a layer at around 1500 feet and another down at about 2200 – 2400 feet. At night echo intensity is concentrated in the upper 800 feet.

SURVEY FINDINGS

The lighting system on Innovator15 provides outstanding illumination of the water out in front of the vehicle. In most cases the HID lights alone provided the best image quality. During the night dive of 01/15/08 we were able to see a lot of organisms. The water was teeming with zooplankton; however there were a lot of small targets and relatively few large ones. We documented five different organisms during our approximately 2 h dive (Fig. 3). These included a heteropod (a first for Gulf SERPENT); a large (~6 foot) apolemiid physonect siphonophore; a small lobate ctenophore; a planktonic shrimp; and the amphipod *Phronima* in its hijacked salp chamber. *Phronima* is another first-time observation and based on conversations with the ROV team here, it's very common. We weren't able to get too close to it which is unfortunate because this animal looks truly frightening. Some believe it was the inspiration for the monster in the Alien movie series and its behavior is appropriate. It finds and kills a jelly-like animal called a salp, lays its eggs in the still living shell of the salp and moves inside. By beating its back legs it creates a current that turns the hollowed-out salp into a waterjet-propelled transparent barrel. It swims around within the salp while its young hatch out and slowly eat the remains of the salp.

The dive on the afternoon of 01/17/08 was even more successful than our night dive in terms of the numbers of targets observed (Fig. 4). We began this dive at 1500 feet. This layer was dominated by the narcomedusan jellyfish *Solmissis*. We also observed a pyrosome (*Pyrosoma atlanticum*). Pyrosomes resemble a hollow cucumber with small projections on their exterior. They filter water and feed on the small organisms they ingest.

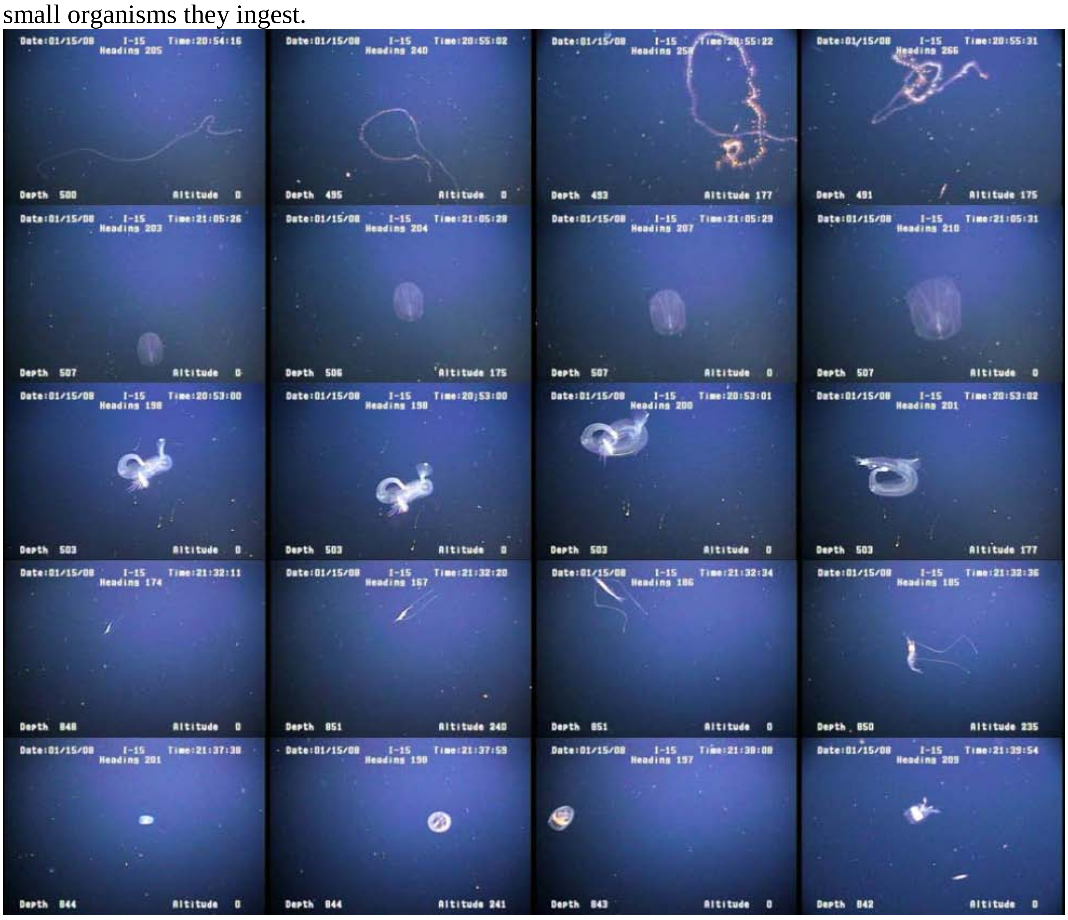


Figure 3. Organisms observed during a training dive on the night of 01/15/08 with innovator 15. From top to bottom: an Apolemiid physonnect siphonophore; a lobate ctenophore; a heteropod; a planktonic shrimp; and the amphipod *Phronima* in a salp house.

Figure 4. Examples of organisms observed during a dive on 01/17/08. From top to bottom: the jellyfish *Solmissis*, a pyrosome *Pyrosoma atlanticum*, a bristlemouth fish *Cyclothone*, a prayid calycophoran siphonophore, the ctenophore *Bathocyroe*, an unidentified ctenophore, and a planktonic shrimp.

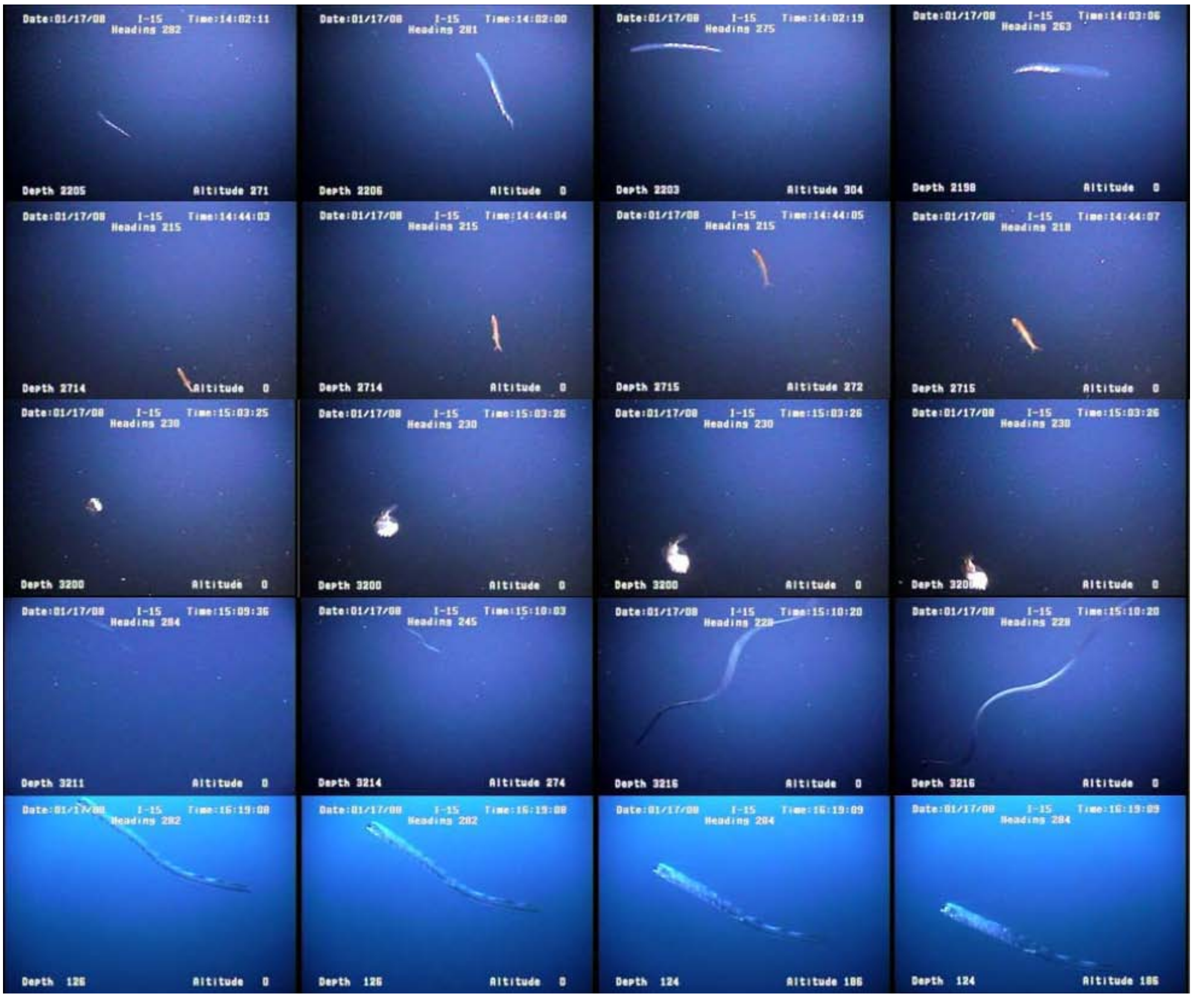


Figure 4… Further examples of organisms observed during a dive on 01/17/08. From top to bottom: a physonect siphonophore; a bristlemouth *Cyclothone*, an unidentified fish intent on attacking the ROV, a very large unidentified eel, and an oarfish observed near the surface.

LESSONS LEARNED

- The lighting configuration on Innovator15 provides excellent illumination and for most organisms, the HID lights alone are sufficient.
- The ADCP does provide a good basis for selecting survey depths for test/training dives.
- Night operations will require patience as many of the organisms that migrate to the surface waters appear to be small (at least at this time of year). There are still large organisms which are present but it takes time to see them.

SUMMARY

I am very encouraged by this initial visit to TH-PDQ. Cooperation and interest in the project were superb. When Innovator19 is operational and subsea activities permit some flexibility, I would like to return to work some more with both ROV groups. The DIDSON sonar on Innovator19 is another instrument that merits some time to evaluate. This facility has the potential to provide excellent SERPENT data. I am grateful to all personnel on the TH-PDQ who went out of their way to assist me during my stay.

MISSION 45

OCEAN VANGUARD, CASHEL 1, WEST OF IRELAND

ANDREW GATES

GENERAL INFORMATION

Client: StatoilHydro
Rig: Ocean Vanguard
Rig operator: Diamond Offshore
ROV operator: Oceaneering
SERPENT representative: Andrew Gates

Position:
Water depth: 174 m
Sea bed temperature: 9.99°C

ROV team:

	Day shift	Night shift
Supervisor	Egil Bjørheim	Rune Lindås
Pilot	Bjørn Logum Gunderson	Arild Ullenes Olsen
Trainee	Vilhelm Sunnanå	Jørgen Rolland

GEAR

SERPENT biofilm frame
SERPENT ROV push cores
SERPENT Bioturbation experimental equipment
Magnum 085 work class ROV
Kongsberg digital stills camera

NARRATIVE

Saturday 17th May 2008
1550, Leave Southampton on National Express coach to travel to Heathrow T.5
Arrive at 1830 then take bus from CBS to T.5 (30 minute wait)
Arrive Aberdeen at 2130 after no problems with baggage handling through T.5. Check into Thistle Hotel and get internet to confirm flight time.

Sunday 18th May 2008
Check in for StatoilHydro charter flight at 10am. Charter was provided by Eastern Airways. It was late in from Stavanger and the plane had to be changed at Aberdeen due to technical problems. The flight was fine and the views of Donegal were spectacular.
Check in at Donegal was slightly chaotic and it seemed very new to the staff.
Arrival on the rig at approximately 1400 after which there was lunch and then an induction for new staff on the installation.
I went to meet the ROV team who were working on the Hydraulics of the system which had gone down and had to fixed before tomorrow when spudding is due.
With Egil's help we located the SERPENT equipment in the container it had arrived in and moved it to the ROV control area.
In the evening I attended the safety meeting.

Monday 19th May 2008
I attended the morning meeting at 0645. Spudding is due today so the ROV will be needed to watch for bubbles.
The ROV had been fixed during the night shift and was tested in the morning.
I prepared some of the SERPENT equipment including putting together the core samplers and the biofilm frame.
0900, ROV off deck.
ROV observed the drill heading to the sea bed and then observed the spudding.

Tuesday 20th May 2008
0645, morning meeting. The drilling is still going, ROV is still required to observe for bubbles. After the meeting I chatted with Egil (ROV supervisor) about the possibilities of SERPENT work. He thought it would be tomorrow at the earliest.
All morning ROV was watching for bubbles.
Discussed the work with the Company man (changed on today's crew change). He suggested that there will be a window early on Wednesday morning when we could start the SERPENT survey and do some work. Best course of action is that we do a video transect survey and assess the suitability of the sea bed for core sampling, it looks like it is too rocky, more so than Laggan.

Wednesday 21st May 2008
0645, morning meeting. Still drilling so ROV still on bubble watch. The hole has more inclination that yesterday so they need to do some reaming to try and straighten it out.
Went out to ROV and watched the monitors for a bit. It became apparent that there were quite a few fish feeding on the planktonic crustaceans in the water column, presumably attached by the light of the ROV. I used the opportunity to try and do a feeding ecology study of the fish. I started noting approximate abundance of the fish/prey, the number of "bites" and the current conditions for 5 minutes every half hour.
I was informed that there would be the chance to do the video transects during the night shift at approximately 2300. I went out to the ROV at 2230 and this was possible. Transects started at approximately 2315.

Thursday 22nd May 2008

We managed to do transects in all eight headings before the ROV team went on their lunch break and I went to bed.
At the morning meeting it was explained that there would still be some time to do SERPENT work in the morning but the next section was due to be commenced in the afternoon. It was also decided that I should leave the rig that afternoon as the ROV was required for operational work for extended periods over the next week.
I took the opportunity to take some ecological highlights video data in order to get a better understanding of the species seen during the video transects taken the previous night. I did this for 2 hours before heading in to get ready to leave the rig. The helicopter was at 1330. I arrived back at Donegal at 1530 and then took the Statoil Charter flight to Aberdeen. There were no flights back down south that evening so I booked a flight to Southampton the following morning and into the airport hotel for the evening.

Friday 23rd May 2008
I took an Eastern Airways flight from Aberdeen to Southampton (via Newcastle) and arrived back at NOC at 1500.

SAMPLES:

ROV video transects were taken at the eight major headings after the drilling of the 36” section.

CODE STRUCTURE:

OV/210508/001#1

Ocean Vanguard / Date / ROV SERPENT dive log # replicate

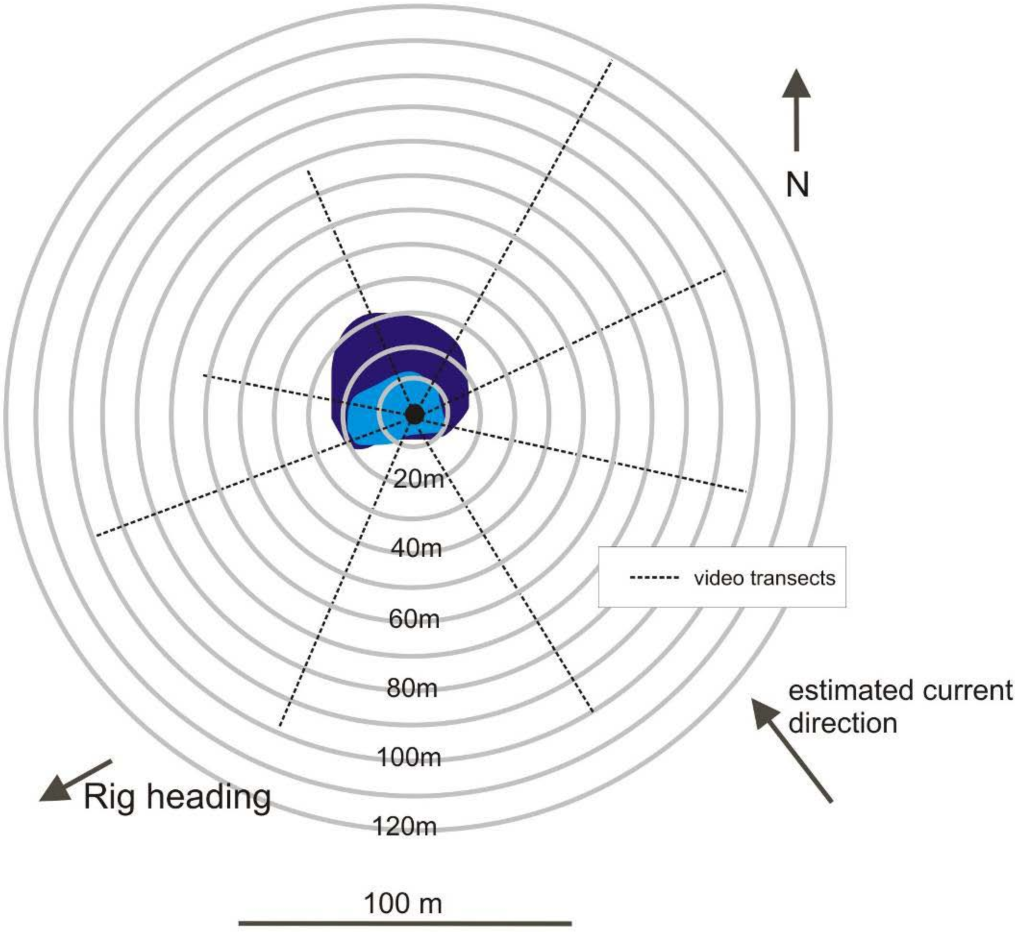
VIDEO TRANSECTS

Station	**location**	**sample type**	**details**
OV/210508/001#1	65 m at 240º from well	ROV video transect	DVD
OV/210508/002#1	100 m 285º from well	ROV video transect	DVD
OV/210508/003#1	80 m 330º from well	ROV video transect	DVD
OV/210508/004#1	120 m 015º from well	ROV video transect	DVD
OV/220508/005#1	100 m 060º from well	ROV video transect	DVD
OV/220508/006#1	100 m 105º from well	ROV video transect	DVD
OV/220508/007#1	100m 150º from well	ROV video transect	DVD
OV/220508/008#1	100m 195º from well	ROV video transect	DVD

OBSERVATIONS

VIDEO TRANSECTS:

Eight video transects were taken radiating from the well after the drilling of the 36” hole. There was some difficulty in taking the transects because as the BOP had not yet been set so there was no obvious target for navigation by Sonar, creating difficulties in accurately estimating the extent of the small amount of spoil that was created.



OPERATIONAL OBSERVATIONS

Date	time	observation	photo/video
19.05.2008	11.59	drill bit on sea bed	
	12:07	drill mud pump started	
	12:15	drill turning	
	12:30	ROV back to cage for shallow gas observation	

FAUNAL OBSERVATIONS

Observations made during the visit are recorded below. The majority of observations were made during specific surveys but there are also records made of the fish attracted to the lights while the ROV was observing for bubbles.

Date	time	observation	photo/video
19.05.2008	11:26	starfish on route to find marker buoys	
	11:28	several more asteroids observed	
	11.29	sponge	
21.05.2008	08:55-11:30 many, see book.	fish (Pollock/coalfish)	documented feeding activity
22.05.2008	08:49	Octopus	
	08:55	Spider crab	
	09:09	Asteroid	
	09:09	tiny asteroid	
	09:11	Bryozoan	

	09:13	Anemone (*Bolcera?*)	
	09:16	Asteroid (*Porania pulvillus*) feeding on an hydroid	
	09:17	Flatfish	
	09:17	The Hole	
	09:19	Norway redfish	
	09:19	Many hermit crabs	
	09:19	Small fish, possibly pout or whiting	

	09:21	Dogfish	
	09:22	Ophiuroid	
	09:23	Gastropod	
	09:25	Small spider crab, anemone & crinoid on a rock	
	09:26	Crinoid (*Antedon* sp.?)	
	09:28	Anemone & spider crab	
	09:31	Small asteroid	

	09:30	Ophiuroid under rock		
	09:31	Bryozoan		
	09:31	Henricia asteroid		
	09:34	Anemone		
	09:36	Crinoid		
	09:37	Bryozoan		

	09:37	Asteroid (*Luidia*)	
	09:47	Sunstar (*Crossaster*)	
	09:48	Anemone (Actiniaria)	
	09:49	Anemone (Bolocera)	
	09:54	Dogfish (*Scyliorhinus* sp.)	
	09:59	Yellow sponge	

	10:05	Pout (*Trisopterus luscus*)		
	10:09	anemone		
	10:10	swimming crab (*Liocarcinus*)		
	10:11	ascidian		

MISSION 49

OCEAN VANGUARD, CASHEL 2, WEST OF IRELAND

ANDREW GATES

1. GENERAL INFORMATION:

Client: StatoilHydro
Rig: Ocean Vanguard
Rig operator: Diamond Offshore
ROV operator: Oceaneering
SERPENT representative: Andrew Gates

Position: 54° 42’ 23.58” N
10° 26’ 20.37” W

Water depth: 174 m
Sea bed temperature: 9.99°C

ROV team:

	Visit 2
Supervisor	Øyvind Økland
Pilot	Bjørn Logum Gunderson

2. GEAR:

SERPENT biofilm frame
SERPENT ROV push cores
Magnum 085 work class ROV
Kongsberg digital stills camera
SERPENT experimental chambers x 4
Large geology push core for collecting animal specimens.

3. NARRATIVE:

Thursday 12th June 2008
Travel to Dublin from Southampton and then on to Donegal. Arrive 2100 and stay at the Ostann na Rosann hotel, Dungloe.

Friday 13th June 2008
Flight depart Donegal airport at approximately 1140. Arrive on Ocean Vanguard and attend the welcome meeting at 1215 then lunch.
On night shift so I then went to sleep for the rest of the day.
Night shift: Pre-tour meeting 1845, 3rd party meeting, 1930.

Out to ROV at 2000. Discussed my plans for the trip with Øyvind and Bjorn (the ROV team) and we constructed the experimental chambers before going in for lunch at 0000.

Saturday 14th June 2008
0100 back out to ROV – pre dive checks
Slight modification were made to chamber 4, to improve the weighting on it as we were concerned it would not sit flat on the seabed.
0130. The cambers were attached to the ROV with two on the 5 function arm and two on the hook below the video camera.
Successful deployment of 4 chambers. Six specimens of *Porania* collected for the “near” replicates, three were placed in each “near” chamber by 0513. All the *Porania* specimens were collected from more than 60 m from the well to ensure they had not been affected by the drilling operations to date. The unused chambers were temporarily used as lids for the chambers containing *Porania*.

Pre-tour meeting 1845, 3rd party meeting, 1930.
Design and construct some lids for the chambers to ensure the *Porania* are unable to escape. ROV out of cage at 2215 to inspect and add lids to the “near” chambers.
Locate core tube dropped from the cage on descent.

Sunday 15th June
0100 - Collection of specimens of *Porania* for the “far” replicates commenced. Part way through the collection the ROV alarm sounded to signal a fault with the vehicle. It was important to repair the fault so when the sample collection was complete (0420) they were placed in their chambers and moved approximately 75 m from the well, the location noted and then left for the duration of the experiment. It was important to repair the fault so as soon as the collection of specimens was completed and the ROV was recovered (0451).

Sunday 15th – Monday 16th June
I spent the first part of the night shift constructing a bag capable of holding 2 chambers for recovery. The rest of the shift was spent helping the ROV team with the repairs, updating the SERPENT archive with Cashel material and doing some paper work.

Monday 16th
Pre-tour meeting 1845, 3rd party meeting, 1930.
Discussion with Karl & Aiden (day and night StatoilHydro representatives) about staying out on the rig to finish the work. My scheduled departure was changed from Tuesday until Wednesday in order to give and additional shift. The first part of the shift was spent finishing the maintenance to the ROV before preparing for next dive.

Tuesday 17th June
0524 – ROV out of cage to collect experimental chambers. Intially the “near” chambers were collected. The mechanism for collection and recovery of the chambers was a success but unfortunately one animal was missing from chamber #3. It is not certain when this was lost. The ROV was back on deck at 0610 with the chambers which I then removed from the vehicle to label, sort and preserve the animals.

Pre-tour meeting 1845, 3rd party meeting, 1930.
2057 - Dive to recover the “far” chambers, deploy the biofilm frame and take the video transects.
The Biofilm frame was deployed close to the marker buoys near the BOP - 320º 10m from BOP.
The near chambers were collected and placed in the basket on the ROV by 2230 before commencing the transect survey.
Five transects were completed by 0000.

Wednesday 18th June

The remaining three transects were completed by 0040 and the ROV recovered to label, sort and preserve the *Porania* specimens, this time all animals were present when returned to the surface. We had hoped to do final dive to collect controls but Øyvind thought that the swell was too large for the ROV to dive safely, particularly as the swell was forecast to increase during the rest of the night. I therefore spent the remaining time packing up the equipment and preparing to leave the *Ocean Vanguard*.

Pre-tour meeting 1845, 3rd party meeting, 1930.

There was a StatoilHydro assessed safety drill on the Wednesday morning which involved a simulated fire in the accommodation block. We had to follow emergency procedures and muster at the aft lifeboats. My flight off the rig was at 1330. At this point I spoke to Hans Bergsland and he told me that the rig may be leaving the Cashel location much sooner than initially anticipated so might have to arrange final visit asap. I arranged to speak with him on Friday.

I returned to Donegal at 1330, stayed at the Ostann na Rosann hotel, Dungloe before travelling back to Southampton the following day.

EXPERIMENTAL PLAN:

In collaboration with StatoilHydro, SERPENT have carried out missions at 7 locations in Northern European waters with pre- and post-drilling video surveys at each site. The major observation from these studies is that there is a large physical disturbance to the sea bed caused by the drill spoil from the initial drilling operations that extends up to 100 m from the well. It is clear from the previous work that there is limited recolonization of the cuttings pile during the course of drilling a well, either in shallow (e.g. Rganarokk) or deep (e.g. Brugdan/Midnattsol) water. Work in shallow water at Ragnarokk in 2007 showed that despite a high abundance of echinoids, which had the ability to rapidly re-emerge from burial, there were very few on the cuttings pile 2 months after it had been deposited. Successful experimental work in the shallow water of Ragnarokk proved the possibility to carry out similar work at the slightly deeper Cashel, this time using the asteroid (starfish/sea star) *Porania pulvillus* as an experimental organism:

Porania pulvillus

The experiment was designed to assess the effects of the drill cuttings on the most common animal at the location. Analysis of the video transects from the first visit showed that *Poraina* was the most common (easily collectable) organism at Cashel. The plan was to place animals collected from far away from the drill cuttings in chambers exposing them to the cuttings and compare them to similar animals placed in similar chambers outside of the cuttings. In addition controls would be taken from both near and far from the cuttings pile to assess the effect of the chambers. After the experiment samples were to be taken from each animal to test for storage products (glycogen, lipids and proteins), mRNA, and histology. The storage products, to give an indication of stress as the organism level based on the theory that stressed organisms will utilize more stored resources. The mRNA, to test for the expression of stress proteins such as *hsp70* and the histology samples, to asses the gender and reproductive condition of the organisms as this can also affect levels of storage products in an organism. The experimental design and the samples taken are shown in the table below.

The experimental design and the samples to be taken from each specimen:

Diagrammatic representation	Treatment	Samples to be taken from each animal
	2 x 3 FAR *Porania* translocated to 2 FAR experimental chambers	Body sample for Storage product analysis Arm sample for histology Tissue sample for stress protein analysis
	2 x 3 FAR *Porania* translocated to 2 NEAR experimental chambers	Body sample for Storage product analysis Arm sample for histology Tissue sample for stress protein analysis
	2 x 3 randomly selected control *Porania* from undisturbed FAR sediment	Body sample for Storage product analysis Arm sample for histology Tissue sample for stress protein analysis
	2 x 3 randomly selected control *Porania* from the disturbed sediment NEAR the BOP	Body sample for Storage product analysis Arm sample for histology Tissue sample for stress protein analysis

4. SAMPLES:

Samples of different anatomical features of the *Porania pulvillus* specimens and video transects to assess the extent of the drill spoil were taken. Each individual sample is listed below.

CODE STRUCTURE:

OV/210508/001#1

Ocean Vanguard / Date / ROV SERPENT dive log # replicate

STATIONS

Station	**location**	**sample type**	**details**
OV/170608/009#1	Experimental Chamber 2	*Porania* storage products analysis	Frozen
OV/170608/009#2	Experimental Chamber 2	*Porania* Histology	In Formalin
OV/170608/009#3	Experimental Chamber 2	Stress protein analysis	In RNA later
OV/170608/010#1	Experimental Chamber 2	*Porania* storage products analysis	Frozen
OV/170608/010#2	Experimental Chamber 2	*Porania* Histology	In Formalin
OV/170608/010#3	Experimental Chamber 2	Stress protein analysis	In RNA later
OV/170608/011#1	Experimental Chamber 3	*Porania* storage products analysis	Frozen
OV/170608/011#2	Experimental Chamber 3	*Porania* Histology	In Formalin
OV/170608/011#3	Experimental Chamber 3	Stress protein analysis	In RNA later
OV/170608/012#1	Experimental Chamber 3	*Porania* storage products analysis	Frozen
OV/170608/012#2	Experimental Chamber 3	*Porania* Histology	In Formalin
OV/170608/012#3	Experimental Chamber 3	Stress protein analysis	In RNA later
OV/170608/013#1	Experimental Chamber 3	*Porania* storage products analysis	Frozen
OV/170608/013#2	Experimental Chamber 3	*Porania* Histology	In Formalin
OV/170608/013#3	Experimental Chamber 3	Stress protein analysis	In RNA later
OV/170608/014#1	100m+ 285º from BOP	Video transect	DVD
OV/170608/015#1	100m 240º from BOP	Video transect	DVD
OV/170608/016#1	100m+ 195º from BOP	Video transect	DVD
OV/170608/017#1	90m 150º from BOP	Video transect	DVD
OV/170608/018#1	100m 105º from BOP	Video transect	DVD

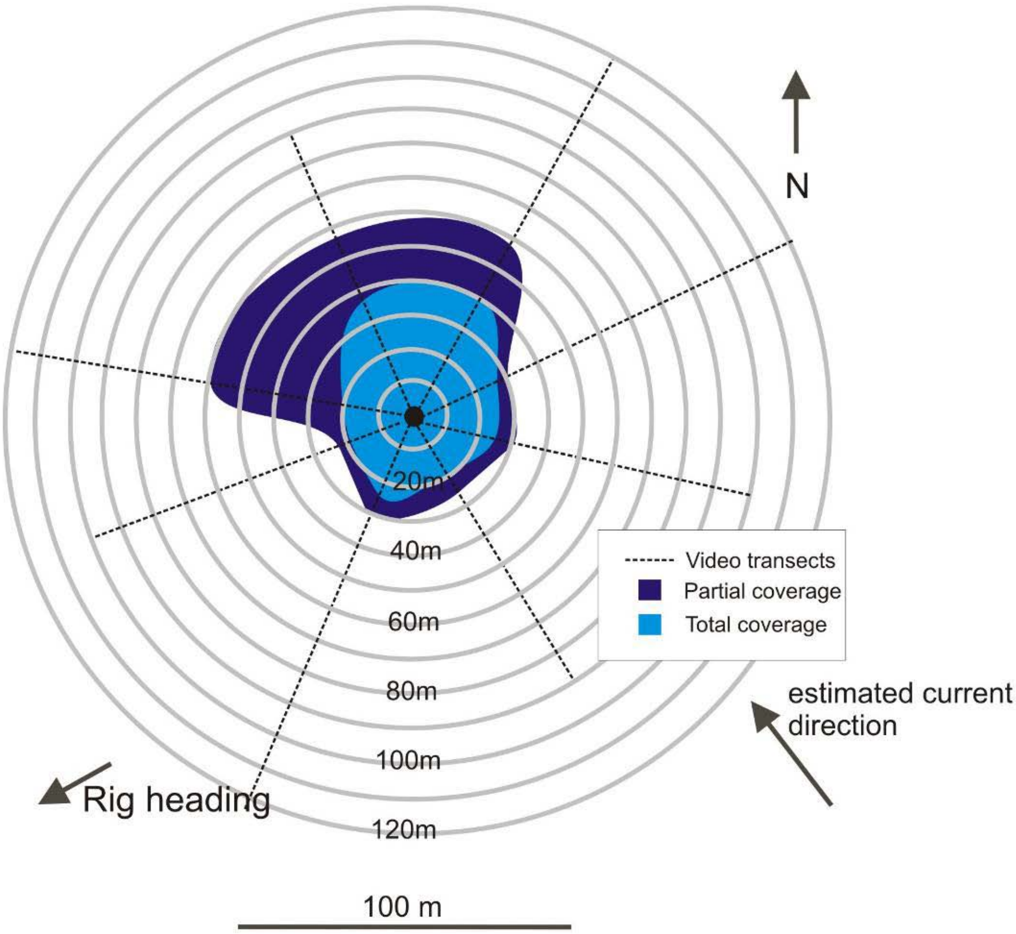
OV/180608/019#1	100m+ 60º from BOP	Video transect	DVD
OV/180608/020#1	100m+ 015º from BOP	Video transect	DVD
OV/180608/021#1	90m 330º from BOP	Video transect	DVD
OV/180608/022#1	Experimental Chamber 1	*Porania* storage products analysis	Frozen
OV/180608/022#2	Experimental Chamber 1	*Porania* Histology	In Formalin
OV/180608/022#3	Experimental Chamber 1	Stress protein analysis	In RNA later
OV/180608/023#1	Experimental Chamber 1	*Porania* storage products analysis	Frozen
OV/180608/023#2	Experimental Chamber 1	*Porania* Histology	In Formalin
OV/180608/023#3	Experimental Chamber 1	Stress protein analysis	In RNA later
OV/180608/024#1	Experimental Chamber 1	*Porania* storage products analysis	Frozen
OV/180608/024#2	Experimental Chamber 1	*Porania* Histology	In Formalin
OV/180608/024#3	Experimental Chamber 1	Stress protein analysis	In RNA later
OV/180608/025#1	Experimental Chamber 4	*Porania* storage products analysis	Frozen
OV/180608/025#2	Experimental Chamber 4	*Porania* Histology	In Formalin
OV/180608/025#3	Experimental Chamber 4	Stress protein analysis	In RNA later
OV/180608/026#1	Experimental Chamber 4	*Porania* storage products analysis	Frozen
OV/180608/026#2	Experimental Chamber 4	*Porania* Histology	In Formalin
OV/180608/026#3	Experimental Chamber 4	Stress protein analysis	In RNA later
OV/180608/027#1	Experimental Chamber 4	*Porania* storage products analysis	Frozen
OV/180608/027#2	Experimental Chamber 4	*Porania* Histology	In Formalin
OV/180608/027#3	Experimental Chamber 4	Stress protein analysis	In RNA later
OV/180608/028#1	Near experimental Chambers 2 & 3	Taxonomic specimens (x2)	In Formalin
OV/180608/029#1	Near experimental Chambers 2 & 3	spare specimen	Frozen

5. OBSERVATIONS

SEA BED ENVIRONMENT

VIDEO TRANSECTS

Eight video transects were taken radiating from the well after the BOP had been set. Estimates of the extent of the drill spoil were made based on distances from the BOP measured using the ROV's sonar navigation equipment and plotted as a drill spoil map shown below.



The drill spoil map for Cashel on the second visit. The majority of the drill spoil was to the north west of the well, to be expected based on the estimated current direction. During the first visit the currents have been strong. On the second visit the currents were minimal.

Porania experiment observations

Date	**time**	**observation**	**photo/video**
14.06.2008	0200	4 chambers placed temporarily near marker buoys at BOP	
	0300	begin collecting *Porania* specimens from SE of BOP to place in “near” chambers (2&3)	
	0445	3^{rd} *Porania* specimen collected and added to chamber 2	
	0523	6^{th} *Porania* specimen collected and added to chamber 3	
	2236	inspection of chambers 2 & 3	
15.06.2008	0230	begin collecting *Porania* for “far” chambers (1&4)	
	0325	place 3^{rd} *Porania* in chamber 2	
	0420	place final *Porania* in chamber 4	
17.06.2008	05:24	collect “near” chambers (2&3), put in basket on cage in draw-string bag for recovery	
	0610	back on deck to label and preserve samples	
	2140	Collect chamber 4	
	22:28	Collect chamber 1 and recover ROV to preserve and label *Porania* samples	

FAUNAL OBSERVATIONS

Species observations made during second visit to Cashel are recorded in the table below. There was not time to carry out an ecological highlights survey but when an organism of interest was noted it was filmed for a short period of time. It was still not possible to use the stills camera as the experimental work was time consuming.

Date	**time**	**observation**	**photo/video**
14/06/2008	03:09	*Merluccius merluccius* – European Hake	
14/06/2008	04:55	Monkfish – *Lophius* piscatorius	
14/06/08	22:34	*Molva molva* – Ling	
18/06/2008	00:31	Squat lobster *Munida sarsi*	
18/06/2008	00:32	Ophiuroid (Brittle star)	

MISSION 52

OCEAN VANGUARD, CASHEL 3, WEST OF IRELAND

ANDREW GATES

GENERAL INFORMATION

Client: StatoilHydro
Rig: Ocean Vanguard
Rig operator: Diamond Offshore
ROV operator: Oceaneering
SERPENT representative: Andrew Gates

Position:
Water depth: 174 m

ROV team:

	Night shift
Supervisor	Egil Bjørheim
Pilot	Arild Ullenes Olsen
Trainee	Johannes Lia

GEAR

SERPENT biofilm frame
SERPENT ROV push cores
Magnum 085 work class ROV
Kongsberg digital stills camera
SERPENT experimental chambers x 4
Large geology push core for collecting animal specimens.

NARRATIVE

Thursday 26th June 2008
Travel to Aberdeen from Southampton and stay overnight at Aberdeen airport.

Friday 27th June 2008
Flight depart Donegal airport at approximately 1140. Arrive on Ocean Vanguard and went to the welcome meeting at 1330.
I was on night shift so I then went to sleep for the rest of the day.
Night shift: Pre-tour meeting 1845, 3rd party meeting, 1930.

Out to ROV at 2000. Discuss my plans for the visit with Egil trip and we attempted to set up the stills camera but unfortunately one of the cables is broken so some work needed to be done on this. It was decided to fix the camera before the first dive so that ecological highlights data can be collected alongside the sample collection.

In for lunch at 0000.
Saturday 28th June 2008
Time is still required to sort out the cable so I spent the rest of the shift preparing equipment and working on other SERPENT work.

1845 – Pre-tour & 3rd party meetings. Plan to collect the control specimens for the *Porania* experiments.
2110 ROV off deck. Checked bullseyes
Initially did a survey to ensure there are enough specimens of *Porania,* both on and off the drill spoil. Use this time to take ecological highlights photographs. Take an initial trial collection of a *Porania* to ensure corer is a suitable tool. In for lunch at 0000.

Sunday 29th June
0138 ROV out of cage to collect the control specimens. 12 specimens collected from outside the drill spoil by 0230. Specimens brought to surface and labelled and preserved. Second dive at 0400 to collect control specimens from on the drill spoil, this took much longer as we were restricted to a smaller area and the animals were not as common on the spoil. Once collected and the ROV recovered I labelled, sorted and preserved the *Porania* specimens.

1845 – Morning meeting, 1930 – 3rd Party meeting.
Plan to dive to take core samples so the chemical composition of the sediments near to and far from the well can be determined; two cores to be taken from 15m at 70º from the BOP and 2 cores at 75 m on the same heading. The push cores were attached to the 5-function arm with ratchet straps.

Monday 30th June
0154 ROV off deck. Coring was difficult, near to the well there was a thin layer of drill spoil over the rocky sea bed. By 0350 two cores had been successfully retained from the near the BOP but the remaining two corers had been broken. We then recovered the biofilm frame, which I sorted, labelled and prepared for return to Southampton. At 0450 the ROV was back at depth again and we commenced coring. After many attempts to collect them the “FAR” cores they were finally successfully brought back on deck.

Monday 30th June/Tuesday 1st July
1845 – Morning meeting, 1930 – 3rd Party meeting.
There was a large, increasing swell which prevented the ROV team from putting the vehicle in the water. I spent the rest of the shift preparing the SERPENT equipment for return to Southampton, downloading the stills images and downloading/burning the SERPENT footage to DVD.

I returned to Aberdeen from the *Ocean Vanguard* on a helicopter at approximately 1330 on the 1st July, stayed in Aberdeen overnight and, and after a final successful trip to Cashel, flew back to Southampton on Wednesday morning.

SAMPLES:

Samples were collected to use as controls for the *Porania* experiment which were divided into body, arm and tissue samples for the various analyses outlined in the visit #2 Quick-look report. Sediment samples and samples from the biofilm frame were also collected, they are all listed below.

CODE STRUCTURE:

OV/210508/001#1

Ocean Vanguard / Date / ROV SERPENT dive log # replicate

Station	**location**	**sample type**	**details**
OV/290608/030#1	50-70 m from the BOP	*Porania* specimen	Frozen
OV/290608/030#2	50-70 m from the BOP	*Porania* arm	Preserved in Formalin
OV/290608/030#3	50-70 m from the BOP	Tissue sample	Preserved in RNA later
OV/290608/031#1	50-70 m from the BOP	*Porania* specimen	Frozen
OV/290608/031#2	50-70 m from the BOP	*Porania* arm	Preserved in Formalin
OV/290608/031#3	50-70 m from the BOP	Tissue sample	Preserved in RNA later
OV/290608/032#1	50-70 m from the BOP	*Porania* specimen	Frozen
OV/290608/032#2	50-70 m from the BOP	*Porania* arm	Preserved in Formalin
OV/290608/032#3	50-70 m from the BOP	Tissue sample	Preserved in RNA later
OV/290608/033#1	50-70 m from the BOP	*Porania* specimen	Frozen
OV/290608/033#2	50-70 m from the BOP	*Porania* arm	Preserved in Formalin
OV/290608/033#3	50-70 m from the BOP	Tissue sample	Preserved in RNA later
OV/290608/034#1	50-70 m from the BOP	*Porania* specimen	Frozen
OV/290608/034#2	50-70 m from the BOP	*Porania* arm	Preserved in Formalin
OV/290608/035#1	50-70 m from the BOP	*Porania* specimen	Frozen
OV/290608/035#2	50-70 m from the BOP	*Porania* arm	Preserved in Formalin
OV/290608/036#1	50-70 m from the BOP	*Porania* specimen	Frozen
OV/290608/036#2	50-70 m from the BOP	*Porania* arm	Preserved in Formalin
OV/290608/037#1	50-70 m from the BOP	*Porania* specimen	Frozen
OV/290608/037#2	50-70 m from the BOP	*Porania* arm	Preserved in Formalin
OV/290608/038#1	50-70 m from the BOP	*Porania* specimen	Frozen
OV/290608/038#2	50-70 m from the BOP	*Porania* arm	Preserved in Formalin
OV/290608/039#1	50-70 m from the BOP	*Porania* specimen	Frozen
OV/290608/039#2	50-70 m from the BOP	*Porania* arm	Preserved in Formalin
OV/290608/040#1	50-70 m from the BOP	*Porania* specimen	Frozen
OV/290608/040#2	50-70 m from the BOP	*Porania* arm	Preserved in Formalin
OV/290608/041#1	50-70 m from the BOP	*Porania* specimen	Frozen
OV/290608/041#2	50-70 m from the BOP	*Porania* arm	Preserved in Formalin
OV/290608/042#1	<20 m from the BOP	*Porania* specimen	Frozen
OV/290608/042#2	<20 m from the BOP	*Porania* arm	Preserved in Formalin
OV/290608/042#3	<20 m from the BOP	Tissue sample	Preserved in RNA later
OV/290608/043#1	<20 m from the BOP	*Porania* specimen	Frozen
OV/290608/043#2	<20 m from the BOP	*Porania* arm	Preserved in Formalin
OV/290608/043#3	<20 m from the BOP	Tissue sample	Preserved in RNA later
OV/290608/044#1	<20 m from the BOP	*Porania* specimen	Frozen
OV/290608/044#2	<20 m from the BOP	*Porania* arm	Preserved in Formalin
OV/290608/044#3	<20 m from the BOP	Tissue sample	Preserved in RNA later
OV/290608/045#1	<20 m from the BOP	*Porania* specimen	Frozen

OV/290608/045#2	<20 m from the BOP	*Porania* arm	Preserved in Formalin
OV/290608/045#3	<20 m from the BOP	Tissue sample	Preserved in RNA later
OV/290608/046#1	<20 m from the BOP	*Porania* specimen	Frozen
OV/290608/046#2	<20 m from the BOP	*Porania* arm	Preserved in Formalin
OV/290608/047#1	<20 m from the BOP	*Porania* specimen	Frozen
OV/290608/047#2	<20 m from the BOP	*Porania* arm	Preserved in Formalin
OV/290608/048#1	<20 m from the BOP	*Porania* specimen	Frozen
OV/290608/048#2	<20 m from the BOP	*Porania* arm	Preserved in Formalin
OV/290608/049#1	<20 m from the BOP	*Porania* specimen	Frozen
OV/290608/049#2	<20 m from the BOP	*Porania* arm	Preserved in Formalin
OV/290608/050#1	<20 m from the BOP	*Porania* specimen	Frozen
OV/290608/050#2	<20 m from the BOP	*Porania* arm	Preserved in Formalin
OV/290608/051#1	<20 m from the BOP	*Porania* specimen	Frozen
OV/290608/051#2	<20 m from the BOP	*Porania* arm	Preserved in Formalin
OV/290608/052#1	<20 m from the BOP	*Porania* specimen	Frozen
OV/290608/052#2	<20 m from the BOP	*Porania* arm	Preserved in Formalin
OV/290608/053#1	<20 m from the BOP	*Porania* specimen	Frozen
OV/290608/053#2	<20 m from the BOP	*Porania* arm	Preserved in Formalin
OV/290608/054#1	<20 m from the BOP	*Porania* specimen	Frozen
OV/300608/058#1	15m at 70º from BOP	ROV push core	top 3 cm frozen
OV/300608/058#2	15m at 70º from BOP	sediment subsample	subsample
OV/300608/059#1	15m at 70º from BOP	ROV push core	top 3 cm frozen
OV/300608/059#2	15m at 70º from BOP	sediment subsample	subsample
OV/300608/060#1	75m at 70º from BOP	ROV push core	top 3 cm frozen
OV/300608/060#2	75m at 70º from BOP	sediment subsample	subsample
OV/300608/060#1	75m at 70º from BOP	ROV push core	top 3 cm frozen
OV/300608/060#2	75m at 70º from BOP	sediment subsample	subsample

OBSERVATIONS

Faunal observations

Species observations made using the high quality stills camera at Cashel are recorded in the table below:

Date	**time**	**observation**	**photo/video**
		indet anemone	

		Poranina pulvillus (Starfish)	
		Eledone cirrhosa (Octopus)	
		Antedon sp. (Crinoid)	
		Trisopterus (Pout)	
		inde*t ophiuroid*	

		Gastropod mollusc	
		Stichastrella rosea (Starfish)	
		Pisidia (Porcelain crab)	
		Scyliorhynus canicula (Dogfish)	
		Ophiuroid	

		Indet cnidarian	
		Indet??	
		Actiniarian - Anemone	
		Zoanthids	
		Clavelina lepadiformis (Sea squirt)	

		Anseropoda placenta (cushion star)	
		Molva molva (Ling)	
		Luidia (Starfish)	
		Small spider crab - possibly *Macropodium* sp.	
		Cancer pagurus (Edible crab)	

		Lophius piscatorius (Monkfish)	
		Cerianthid – tube dwelling anemone	
		Scallop – *Pecten* sp	
		crinoid – *Antedon* sp?	

MISSION 60

TRANSOCEAN LEADER, HAKLANG 1, NORWEGIAN SEA

ANDREW GATES

GENERAL INFORMATION

Client: StatoilHydro
Rig Operator: Transocean
Rig: *Transocean Leader*
ROV operator: Oceaneering
SERPENT representative: Andrew Gates

Position:
Water depth: 1250m

ROV team:

	day shift
Supervisor	Tore Damdalen
Pilot	Frank Knutsen
Pilot	Erik Garatun
Pilot	Håvard Fauske
Pilot	Trond Haraldsvik

GEAR

SERPENT biofilm frame
SERPENT ROV push cores
Magnum 018 work class ROV
Kongsberg digital stills camera
SERPENT experimental chambers x 4
Bioturbation frames
Luminophores

NARRATIVE

Tuesday 23rd September 2008
Travel to Heathrow (bus broke down so had to change to a taxi at Basingstoke). Flight to Stavanger, then to Trondheim then to Brønnøysund. Stay overnight in Thon Hotel.

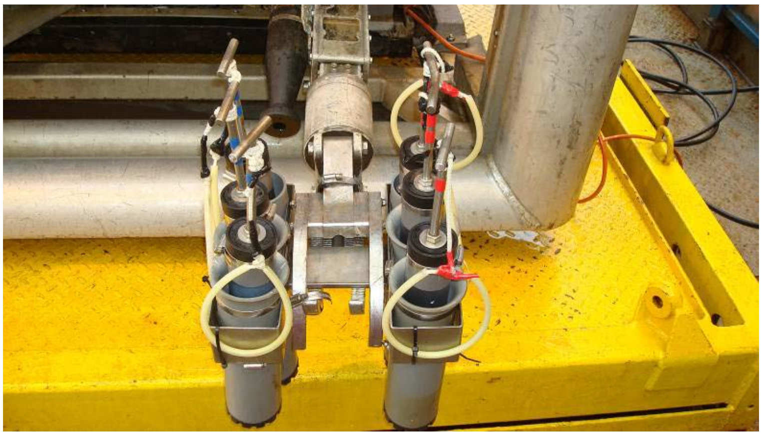
Wednesday 24th September 2008
Flight to *Transocean Leader* at 0730, check in 0630. Arrive on rig at approximately 0900. ROV supervisor was on the same flight. Out to meet the ROV team after welcome meeting. Initially the ROV required some maintenance so I spent some time viewing the pre-drilling video survey that the ROV team took to look for potential problems. These were not of high enough quality for the accurate identification of the megafauna but it looked like there were similar fauna to Midnattsol. Cerianthids appeared common and there were some asteroids. The location of the SERPENT equipment was determined but it will be collected tomorrow.

Thursday 25th September 2008
Still maintenance to complete on the ROV. I retrieved the equipment and started to put sampling equipmen together. It was also necessary to spend some time working on general SERPENT work by email.
ROV off deck at 1350.
Cage at depth of 1225 m at 1440.
Bullseyes checked by 1500.
5 video transects carried out on headings between 360 west to 180 but could not reach the other side of the rig as there was a current taking the ROV to the west of the rig. In this direction it appeared that the drill cuttings were widespread. They seemed to reach further than the 90 m that we were able to reach and still located the BOP with the Sonar.

Friday 26th September 2008
The weather has been picking up so it has not been possible to dive. It is due to get very large (50 knots and 16 m swells) over the weekend so diving is not possible.
SERPENT equipment has been moved to the Oceaneering container to ensure it remains safe in the rough weather.
I spent the day working on other SERPENT work and generally helping out around the ROV. Safety meeting in the evening.

Saturday 27th September 2008
The weather has really picked up. The swells are large and the wind is howling. It is certainly not possible to dive.
Spoke with the company man about the possibility of a return visit right at the end of the well so am contemplating setting up a some bioturbation frames.

Sunday 28th September 2008
The weather is still bad but there is the possibility of a dive later in the day.
It turns out that the dive was not possible as the weather stayed up.
Had a chat with OIM on the rig and he was very interested in SERPENT. He like the presentation I had made for the Leader and asked if it would be possible to arrange for some photos to be printed and framed and displayed in the recreation rooms on the Leader.
In the afternoon I made the final preparations for coring and attached the frame to the ROV in the hope of a dive in the morning.



ROV push cores attached to the 5 function manipulator arm prior to the first dive. The rope handles were removed after the first dive because it was easier to manipulate without them.

Monday 29th September 2008
At the morning meeting we talked about SERPENT and I agreed to give a presentation at the next safety meeting on Friday.
It was again mentioned that the rig will be here for another month so it may be possible to get a return visit in.
At the meeting it was also requested that the ROV checks the riser and BOP bulls eyes.
1040: ROV off deck.
On the way down it was requested that the ROV do a riser survey. I was not sure what this entailed but had to wait. It turned out that this involved checking every one of all the joins on the riser. This took all day and the ROV team had to work until 11pm to complete the work.

Tuesday 30th September 2008
Morning meeting. Flight home due to be on Saturday.
Spoke with Nina and explained the situation to date but had some optimism as we were about to dive.
Pre dive checks 1430, ROV off deck 1500. At depth 1550. I observed quite a few salp chains on the way down. Once I started to record them I did not see any more (300m).
On the way down it seems good. The current does not seem that strong. I plan to go east of the BOP in order to get some samples.
When we got to 700m water depth the ROV started to be taken forward of the rig. The tether was being dragged towards the BOP. We had discussions with Statoil and he advised that we stop the dive. We had been using the HPR to ensure we were aware of where the ROV was in relation to the rig because of the issues with the current that the team had experienced the day before. The ROV had ended up 80m away from the launch site and 40 m ahead of the BOP.

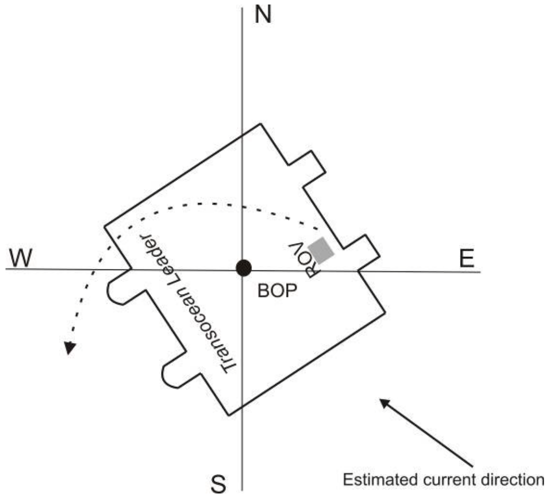


Diagram of the HPR display when the current was too strong for safe use of the ROV. The ROV followed the track shown by the dotted line and this meant that there was a high potential that the cage could have ended up the wrong side of the BOP causing serious problems on recovery.

Wednesday 1st October 2008
Morning meeting – helicopter changed until Sunday. This may give a little more time for core sampling but with the ROV crew change happening today I suspect we won't dive today.
Spoke with Nina again and she recommended staying on the rig until I had done the sampling. This is a reasonable plan but the weather does not look good in the long run and it may be a while before the sampling can be completed, if at all.

Thursday 2nd October 2008
It is confirmed at the morning meeting that I can stay on the rig for longer if needed. The weather is looking OK for the day so it should be OK to get a dive in.
The HPR has been fixed and pre dive checks are commenced at 0850 with the plan to complete the video survey and finish collect 2 sets of 3 cores from 2 locations.
ROV off deck at 0920.
The was a problem with the depth counter on the overlay as the ROV as being lowered. This caused a major panic until it was realized that the CTAG monitor was still showing the correct depth so it was a problem with the software rather than a mechanical problem.
The current again starts to move the vehicle at about 7-800 m and I am concerned that the dive will again be aborted.

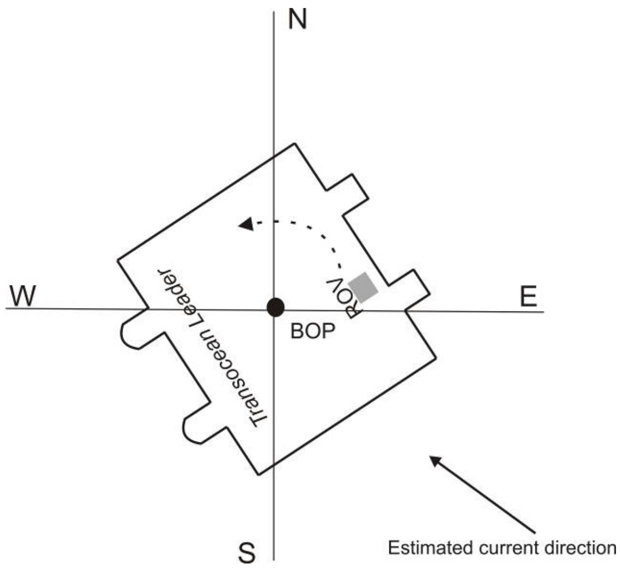


Diagram of the HPR display when the current was not a problem when diving. It can be seen clearly that the location of the cage causes no problem for the BOP.

It turns out that the current isn't as bad as I had feared and the cage remains relatively close to it's launch site.
ROV at depth at 1007 (1225m)
Out of cage at 1025
We attempt to take the East transect, facing west and reversing back at 1044.
It is difficult to keep on track at 90º because there is a problem with the port thruster.
Careproctus observed.
We eventually managed to take Transect 6 at a 200 heading in.
Back in cage at 1205 and in for lunch.
After lunch did a THINK Plan for core sampling in which I showed the ROV team video of how best to do the work.
1330 ROV out of cage, 1340 checking BOP Bulls Eye
Go to 25 m to take first sample. Struggling to take them. ROV too buoyant. Spent ages trying to settle and waiting for the sediment to clear. Was not happening so we had to abandon fist core as I am concerned that the top layer of sediment might be blown away so abandon.
Move out to 50 m on the same heading.
Managed to get 3 cores at 50 m and then back in to 25 m to get another core by 1541.
ROV team need to check the riser bullseye at 600m below the rig on the way up.
I prepared sample bags and labels during the ascent.
ROV back on deck 1800. I processed the samples and then went in for dinner at 2000.

Friday 3rd October 2008
As predicted the weather was up today. It was not possible to dive so the ROV team conducted some essential maintenance.
One of the problems with the current has been that the pump for the port thruster meant that the vehicle was underpowered. They are changing this today.
At the weekly Safety meeting I gave a presentation about SERPENT to the rig staff, audience, approx. 40-50 (the off duty staff).
This was a success and many people have showed an interest in the project since.

Saturday 4th October 2008
There is still some maintenance to do for the rest of the day. They need to test the pump that they changed yesterday and then they need to assess the problems with the winch. All in all this ROV needs some serious updating.

Sunday 5th October 2008
Still no significant progress as there are still problems with the ROV. This time there is no power to the vehicle, the winch needs mending and it is generally SHIT.
Made some amphipod traps during the day and attached the coring equipment to the ROV but it is unlikely that they will be used today. The problem with the power has to be left until tomorrow. Torre thinks that it will be sorted in time to do some good dives on Tuesday.

Monday 6th October 2008
No dives because there is still no power to the ROV. The crew work on this all day and end up concluding that it is a software problem.
Discussed the problems with the company man (glen gabrielsen)

SAMPLES:

Video transect samples were collected to assess the extent of the disturbance related to the drilling activities.

CODE STRUCTURE:

TL/250908/001#1

Transocean Leader / Date / ROV SERPENT dive log # replicate

Station	**location**	**sample type**	**details**
TL/250908/001	340º 90 m from BOP	Video transect	DVD
TL/250908/002	320º 90 m from BOP	Video transect	DVD
TL/250908/003	270º 90 m from BOP	Video transect	DVD
TL/250908/004	225º 90 m from BOP	Video transect	DVD
TL/250908/005	180º 90 m from BOP	Video transect	DVD
TL/021008/006	020º 90 m from BOP	Video transect	DVD
TL/021008/007 # 1	50 m at 060º from BOP	ROV push core top 2 cm	¾ core frozen for chemical analysis
TL/021008/007 # 2	50 m at 060º from BOP	ROV push core 2-4 cm	¾ core frozen for chemical analysis
TL/021008/007 # 3	50 m at 060º from BOP	ROV push core 4-6 cm	¾ core frozen for chemical analysis
TL/021008/007 # 4	50 m at 060º from BOP	ROV push core top 2 cm	¼ core frozen for microbial ecology
TL/021008/007 # 5	50 m at 060º from BOP	ROV push core 2-4 cm	¼ core frozen for microbial ecology
TL/021008/007 # 6	50 m at 060º from BOP	ROV push core 4-6 cm	¼ core frozen for microbial ecology
TL/021008/008 # 1	50 m at 060º from BOP	ROV push core top 3cm	¾ core frozen for chemical analysis
TL/021008/008 # 2	50 m at 060º from BOP	ROV push core top 3cm	¾ core frozen for chemical analysis
TL/021008/008 # 3	50 m at 060º from BOP	ROV push core 3-6 cm	¾ core frozen for chemical analysis
TL/021008/008 # 4	50 m at 060º from BOP	ROV push core 6-9 cm	¼ core frozen for microbial ecology
TL/021008/008 # 5	50 m at 060º from BOP	ROV push core 3-6 cm	¼ core frozen for microbial ecology
TL/021008/008 # 6	50 m at 060º from BOP	ROV push core 6-9 cm	¼ core frozen for microbial ecology
TL/021008/009 # 1	50 m at 060º from BOP	ROV push core top 3cm	¾ core frozen for chemical analysis
TL/021008/009 # 2	50 m at 060º from BOP	ROV push core top 3cm	¾ core frozen for chemical analysis
TL/021008/009 # 3	50 m at 060º from BOP	ROV push core 3-6 cm	¾ core frozen for chemical analysis
TL/021008/009 # 4	50 m at 060º from BOP	ROV push core 6-9 cm	¼ core frozen for

			microbial ecology
TL/021008/009 # 5	50 m at 060º from BOP	ROV push core 3-6 cm	¼ core frozen for microbial ecology
TL/021008/009 # 6	50 m at 060º from BOP	ROV push core 6-9 cm	¼ core frozen for microbial ecology
TL/021008/010 # 1	25 m at 060º from BOP	ROV push core top 3cm	¾ core frozen for chemical analysis
TL/021008/010 # 2	25 m at 060º from BOP	ROV push core top 3cm	¾ core frozen for chemical analysis
TL/021008/010 # 3	25 m at 060º from BOP	ROV push core 3-6 cm	¾ core frozen for chemical analysis
TL/021008/010 # 4	25 m at 060º from BOP	ROV push core 6-9 cm	¼ core frozen for microbial ecology
TL/021008/010 # 5	25 m at 060º from BOP	ROV push core 3-6 cm	¼ core frozen for microbial ecology
TL/021008/010 # 6	25 m at 060º from BOP	ROV push core 6-9 cm	¼ core frozen for microbial ecology

OBSERVATIONS

FAUNAL OBSERVATIONS

Species observations made using the high quality stills camera at Cashel are recorded in the table below:

Date	**time**	**observation**	**photo/video**
25th Sept 2008		Cirrate octopus	Observed on sit cam when travelling between locations - no video
2nd Oct 2008	11.05	Careproctus sp. at 90m from BOP at 90º	Also see video 
2nd Oct 2008	11.22	Ray (*Amblyraja hyperborea*) at 65 m from BOP at 10º - in drill spoil	Also see video 
2nd Oct 2008	11.22	Unknown plankton observed in transit Ctenophore??	

2nd Oct 2008	13:40	planktonic crustacean	
2nd Oct 2008	13:40	planktonic crustacean 2	

MISSION 61

TRANSOCEAN LEADER, HAKLANG 2, NORWEGIAN SEA

ANDREW GATES

GENERAL INFORMATION

Client: StatoilHydro
Rig: *Transocean Leader*
Rig operator: Transocean
ROV operator: Oceaneering
SERPENT representative: Andrew Gates

Position: 670248.314 N
070331.860 E
Water depth: 1250 m

ROV team:

	day shift
Supervisor	Trond Arne Nilsen
Pilot	Jan Ove Hansen
Pilot	Ron Sande

GEAR

SERPENT ROV push cores mark 2
New design ROV push core for trial
New design specimen container for trial
Magnum 018 work class ROV
Kongsberg digital stills camera

NARRATIVE

14th October 2008
Travel to Brønnøysund via London, Stavanger and Trondheim. Stay overnight in the Thon Hotel, Brønnøysund.

15th October 2008
Check-in at 0630, helicopter leaves by 0800. Arrive on rig before 1000. Straight out to the ROV to meet with ROV supervisor, Trond Nielsen (he had worked with SERPENT before, at Midnattsol). We discussed the work plans and the problems of the previous trip and he assures me that the vehicle is in working order; they had to re-terminate the tether. Glen Gabrielsen (StatoilHydro Drilling Supervisor)

explains that we need to get the work done as soon as possible as the weather is due to come up over the weekend.
We decide to dive to do the video transects immediately. They have requested a new stills camera from shore as there were so many problems with the old one. We decide to do a dive to complete the video transects after lunch.
1245 – predive checks
1315 ROV off deck
1405 ROV at depth
Carry out video surveys and stills picture photography until 21:30 before going in for the day.

16th October 2008
Plan to do two dives to get as many core samples as possible.
Run through of coring video to show the pilots the best way to take the samples
ROV off deck at 0844, at depth 0930, out of cage 0940.
Good successful core sampling during the morning. 4 out of 6 samples contain suitable sediment samples on recovery. In for lunch at 1300.
ROV off deck at 1400. At depth 1504 carrying push core equipment and amphipod trap baited with salmon from the galley.
Amphipod trap placed 5 m NW of BOP at 1520.
More samples successfully collected, on video it looked like they were all fine but on recovery to the surface 2 samples had limited material in them.
This appears to be a problem with the finer sediment nearer to the source of the disturbance. Samples processed and in for the day at 1930.

17th October 2008
Plan to do 2 dives again today with the possibility of overtime if the tasks are not completed. Again some problems with some of the samples and only 3 are successful despite all six looking good on video. ROV on deck at 1300.
Final dive, plan to test the specimen storing container and the new design of ROV push core as well as collecting some additional push cores for Holly Bik's work on nematode taxonomy.
Navigate to 100 m east of the BOP to an undisturbed area of sea bed. The new push corer and the specimen container are both very successful. There are some minor suggestions from the ROV operators which are detailed elsewhere.
The amphipod trap was collected at 1830 before taking the ROV back to the cage before dinner. Recovery of ROV commenced at 1920 and the vehicle was back on deck for starting the sample processing at 2010.

18th October 2008
All SERPENT gear packed away and arranged for backload. Helicopter off the rig at 1030. Travel from Brønnøysund to Trondheim to meet with Nina Aas from StatoilHydro and hand over the samples. Stay overnight at the Trondheim airport hotel,

19th October 2008
0500 check-in for flight to London via Oslo. Back in Southampton by 1300.

SAMPLES:

Video transect samples were collected to assess the extent of the disturbance related to the drilling activities.

CODE STRUCTURE:

TL/250908/001#1

Transocean Leader / Date / ROV SERPENT dive log # replicate

Station	location	sample type	details
TL/161008/013#1	100m at 60º from BOP	ROV push core top 2 cm	¾ core frozen for chemical analysis
TL/161008/013#2	100m at 60º from BOP	ROV push core 2-4 cm	¾ core frozen for chemical analysis
TL/161008/013#3	100m at 60º from BOP	ROV push core 4-6 cm	¾ core frozen for chemical analysis
TL/161008/013#4	100m at 60º from BOP	ROV push core top 2 cm	¼ core frozen for microbial ecology
TL/161008/013#5	100m at 60º from BOP	ROV push core 2-4 cm	¼ core frozen for microbial ecology
TL/161008/013#6	100m at 60º from BOP	ROV push core 4-6 cm	¼ core frozen for microbial ecology
TL/161008/014#1	100m at 60º from BOP	ROV push core top 2 cm	¾ core frozen for chemical analysis
TL/161008/014#2	100m at 60º from BOP	ROV push core 2-4 cm	¾ core frozen for chemical analysis
TL/161008/014#3	100m at 60º from BOP	ROV push core 4-6 cm	¾ core frozen for chemical analysis
TL/161008/014#4	100m at 60º from BOP	ROV push core top 2 cm	¼ core frozen for microbial ecology
TL/161008/014#5	100m at 60º from BOP	ROV push core 2-4 cm	¼ core frozen for microbial ecology
TL/161008/014#6	100m at 60º from BOP	ROV push core 4-6 cm	¼ core frozen for microbial ecology
TL/161008/015#1	100m at 60º from BOP	ROV push core top 2 cm	¾ core frozen for chemical analysis
TL/161008/015#2	100m at 60º from BOP	ROV push core 2-4 cm	¾ core frozen for chemical analysis
TL/161008/015#3	100m at 60º from BOP	ROV push core 4-6 cm	¾ core frozen for chemical analysis
TL/161008/015#4	100m at 60º from BOP	ROV push core top 2 cm	¼ core frozen for microbial ecology
TL/161008/015#5	100m at 60º from BOP	ROV push core 2-4 cm	¼ core frozen for microbial ecology
TL/161008/015#6	100m at 60º from BOP	ROV push core 4-6 cm	¼ core frozen for microbial ecology
TL/161008/016#1	60m at 60º from BOP	ROV push core top 2 cm	¾ core frozen for

			chemical analysis
TL/161008/016#2	60m at 60º from BOP	ROV push core 2-4 cm	¾ core frozen for chemical analysis
TL/161008/016#3	60m at 60º from BOP	ROV push core 4-6 cm	¾ core frozen for chemical analysis
TL/161008/016#4	60m at 60º from BOP	ROV push core top 2 cm	¼ core frozen for microbial ecology
TL/161008/016#5	60m at 60º from BOP	ROV push core 2-4 cm	¼ core frozen for microbial ecology
TL/161008/016#6	60m at 60º from BOP	ROV push core 4-6 cm	¼ core frozen for microbial ecology
TL/161008/017#1	60m at 60º from BOP	ROV push core top 2 cm	¾ core frozen for chemical analysis
TL/161008/017#2	60m at 60º from BOP	ROV push core 2-4 cm	¾ core frozen for chemical analysis
TL/161008/017#3	60m at 60º from BOP	ROV push core 4-6 cm	¾ core frozen for chemical analysis
TL/161008/017#4	60m at 60º from BOP	ROV push core top 2 cm	¼ core frozen for microbial ecology
TL/161008/017#5	60m at 60º from BOP	ROV push core 2-4 cm	¼ core frozen for microbial ecology
TL/161008/017#6	60m at 60º from BOP	ROV push core 4-6 cm	¼ core frozen for microbial ecology
TL/161008/018#1	60m at 60º from BOP	ROV push core top 2 cm	¾ core frozen for chemical analysis
TL/161008/018#2	60m at 60º from BOP	ROV push core 2-4 cm	¾ core frozen for chemical analysis
TL/161008/018#3	60m at 60º from BOP	ROV push core 4-6 cm	¾ core frozen for chemical analysis
TL/161008/018#4	60m at 60º from BOP	ROV push core top 2 cm	¼ core frozen for microbial ecology
TL/161008/018#5	60m at 60º from BOP	ROV push core 2-4 cm	¼ core frozen for microbial ecology
TL/161008/018#6	60m at 60º from BOP	ROV push core 4-6 cm	¼ core frozen for microbial ecology
TL/161008/019#1	25m at 60º from BOP	ROV push core top 2 cm	¾ core frozen for chemical analysis
TL/161008/019#2	25m at 60º from BOP	ROV push core 2-4 cm	¾ core frozen for chemical analysis
TL/161008/019#3	25m at 60º from BOP	ROV push core 4-6 cm	¾ core frozen for chemical analysis
TL/161008/019#4	25m at 60º from BOP	ROV push core top 2 cm	¼ core frozen for microbial ecology
TL/161008/019#5	25m at 60º from BOP	ROV push core 2-4 cm	¼ core frozen for microbial ecology
TL/161008/019#6	25m at 60º from BOP	ROV push core 4-6 cm	¼ core frozen for microbial ecology
TL/161008/020#1	25m at 60º from BOP	ROV push core top 2 cm	¾ core frozen for chemical analysis
TL/161008/020#2	25m at 60º from BOP	ROV push core 2-4 cm	¾ core frozen for chemical analysis
TL/161008/020#3	25m at 60º from BOP	ROV push core 4-6 cm	¾ core frozen for chemical analysis
TL/161008/020#4	25m at 60º from BOP	ROV push core top 2 cm	¼ core frozen for

			microbial ecology
TL/161008/020#5	25m at 60º from BOP	ROV push core 2-4 cm	¼ core frozen for microbial ecology
TL/161008/020#6	25m at 60º from BOP	ROV push core 4-6 cm	¼ core frozen for microbial ecology
TL/161008/021#1	100m at 60º from BOP	ROV push core top 2 cm	¾ core frozen for chemical analysis
TL/161008/021#2	100m at 60º from BOP	ROV push core 2-4 cm	¾ core frozen for chemical analysis
TL/161008/021#3	100m at 60º from BOP	ROV push core 4-6 cm	¾ core frozen for chemical analysis
TL/161008/021#4	100m at 60º from BOP	ROV push core top 2 cm	¼ core frozen for microbial ecology
TL/161008/021#5	100m at 60º from BOP	ROV push core 2-4 cm	¼ core frozen for microbial ecology
TL/161008/021#6	100m at 60º from BOP	ROV push core 4-6 cm	¼ core frozen for microbial ecology
TL/161008/022#1	75m at 60º from BOP	ROV push core top 2 cm	¾ core frozen for chemical analysis
TL/161008/022#4	75m at 60º from BOP	ROV push core top 2 cm	¼ core frozen for microbial ecology
TL/161008/023#1	75m at 60º from BOP	ROV push core top 2 cm	¾ core frozen for chemical analysis
TL/161008/023#2	75m at 60º from BOP	ROV push core 2-4 cm	¾ core frozen for chemical analysis
TL/161008/023#3	75m at 60º from BOP	ROV push core 4-6 cm	¾ core frozen for chemical analysis
TL/161008/023#4	75m at 60º from BOP	ROV push core top 2 cm	¼ core frozen for microbial ecology
TL/161008/023#5	75m at 60º from BOP	ROV push core 2-4 cm	¼ core frozen for microbial ecology
TL/161008/023#6	75m at 60º from BOP	ROV push core 4-6 cm	¼ core frozen for microbial ecology
TL/161008/024#1	25m at 60º from BOP	ROV push core top 2 cm	¾ core frozen for chemical analysis
TL/161008/024#4	25m at 60º from BOP	ROV push core top 2 cm	¼ core frozen for microbial ecology
TL/161008/025#1	75m at 60º from BOP	ROV push core top 2 cm	¾ core frozen for chemical analysis
TL/161008/025#2	75m at 60º from BOP	ROV push core 2-4 cm	¾ core frozen for chemical analysis
TL/161008/025#3	75m at 60º from BOP	ROV push core 4-6 cm	¾ core frozen for chemical analysis
TL/161008/025#4	75m at 60º from BOP	ROV push core top 2 cm	¼ core frozen for microbial ecology
TL/161008/025#5	75m at 60º from BOP	ROV push core 2-4 cm	¼ core frozen for microbial ecology
TL/161008/025#6	75m at 60º from BOP	ROV push core 4-6 cm	¼ core frozen for microbial ecology
TL/161008/026#1	110m at 60º from BOP	ROV push core top 2 cm	¾ core frozen for chemical analysis
TL/161008/026#2	110m at 60º from BOP	ROV push core 2-4 cm	¾ core frozen for chemical analysis
TL/161008/026#3	110m at 60º from BOP	ROV push core 4-6 cm	¾ core frozen for

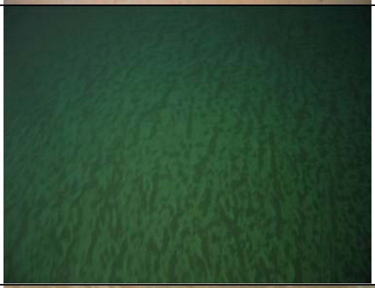
SERPENT
SCIENTIFIC AND ENVIRONMENTAL ROV PARTNERSHIP USING EXISTING INDUSTRIAL TECHNOLOGY

			chemical analysis
TL/161008/026#4	110m at 60º from BOP	ROV push core top 2 cm	¼ core frozen for microbial ecology
TL/161008/026#5	110m at 60º from BOP	ROV push core 2-4 cm	¼ core frozen for microbial ecology
TL/161008/026#6	110m at 60º from BOP	ROV push core 4-6 cm	¼ core frozen for microbial ecology
TL/161008/027#1	110m at 60º from BOP	ROV push core top 2 cm	¾ core frozen for chemical analysis
TL/161008/027#2	110m at 60º from BOP	ROV push core 2-4 cm	¾ core frozen for chemical analysis
TL/161008/027#3	110m at 60º from BOP	ROV push core 4-6 cm	¾ core frozen for chemical analysis
TL/161008/027#4	110m at 60º from BOP	ROV push core top 2 cm	¼ core frozen for microbial ecology
TL/161008/027#5	110m at 60º from BOP	ROV push core 2-4 cm	¼ core frozen for microbial ecology
TL/161008/027#6	110m at 60º from BOP	ROV push core 4-6 cm	¼ core frozen for microbial ecology
TL/171008/028#1	100 m 60º from BOP	Nematode taxonomy push core	in DESS
TL/171008/028#2	100 m 60º from BOP	Nematode taxonomy push core	in DESS
TL/171008/028#3	100 m 60º from BOP	Nematode taxonomy push core	in DESS
TL/171008/029	100 m 60º from BOP	video of new corer	DVD
TL/171008/030	100 m 60º from BOP	video of new container	DVD
TL/171008/031#1	100 m 60º from BOP	Amphipods from trap	in formalin
TL/171008/031#2	100 m 60º from BOP	Amphipods from trap	in DESS
TL/171008/032	100 m 60º from BOP	Astropecten specimen	in formalin
TL/151008/033	090º 100m from BOP	Video Transect	DVD
TL/151008/034	045º 100+m from BOP	Video Transect	DVD
TL/151008/035	135º 100+m from BOP	Video Transect	DVD
TL/151008/036	180º 100m from BOP	Video Transect	DVD
TL/151008/037	270º 100m from BOP	Video Transect	DVD

OBSERVATIONS

FAUNAL OBSERVATIONS

Species observations made during the second visit to Haklang are shown below

Date	time	observation	photo/video
		partially impacted sediment 100m from BOP	
		impacted sediment	
15.10.2008		Cerianthid anemone and pycnogonid on drill cuttings	
15.10.2008		Ophiuroid on drill cuttings	

15.10.2008	18:56	Cirrate octopus			
15:10:2008	19:53	Cerianthid anemone, *Lycodes* sp. *Lycodonus* sp.			
16.10.2008	10:03	Sabellid polychaete			
16.10.2008	10:32	*Stylocaudia borealis*			
17.10.2008	18:26	Amphipod trap with many scavenging amphipods prior to recovery			

MISSION 62

STENA CARRON, ROSEBANK 4, FAROE-SHETLAND CHANNEL

DANIEL JONES

1. GENERAL INFORMATION:

Client: Chevron
Rig operator: Stena
Rig name: Stena Carron
Rig location: Rosebank, Faroe-Shetland Channel
Rig position: 061°08.4533' N 003° 40.3403' W (WGS 84)
Seabed depth: 1100 m
Seabed temperature: -1°C
ROV operator: Oceaneering
ROV: Magnum x 2 + Small Minimum vehicle
ROV team:

Supervisor	Bruce Montgomery
	Richard Coull
	Ian Morgan

2. GEAR:

Magnum ROV x 2 & Small Minimum vehicle
SERPENT Gear
Deep-sea Systems Colour HD video camera x 2 (different models, one is large one is small)
Deep-sea Systems High Intensity Discharge (HID) lighting
Deep-sea Systems DPC8000 Stills camera
Panasonic DVCPro-HD deck on one camera and 8 x hard-disc array on the other

3. NARRATIVE:

Thursday 11st December 2008

Flew out to rig on helicopter from Aberdeen. Spent the afternoon doing safety induction and permit to work training. Finished safety inductions and courses at 18:00 as ROV team went offshift.

Friday 12th December 2008

Weather bad – swell about 5 m significant

Saturday 13th December 2008

Weather bad – swell about 11 m significant

Sunday 14th December 2008

Weather bad – swell about 5 m significant. All non-essential personnel were taken off the rig owing to problems with the drill tensioners. I got the helicopter off the vessel at 16:00 and arrived in Aberdeen at 19:00.

MISSION 63

TRANSOCEAN DISCOVERER DEEP SEAS, WALKER RIDGE 316, GULF OF MEXICO

MARK BENFIELD & MARIANNE

1. GENERAL INFORMATION:

Client: Chevron
Drillship Operator: Transocean
Drillship Name: Discoverer Deep Seas
Drillship Location: Walker Ridge 316 Lewis Well
Drillship Position: 26° 38‘ 11.277“ N, 91° 32‘ 32.153“ W
Seabed Depth: 6168 ft (1880 m)
Seabed Temperature: 4.4°C
Drillship Heading: 270 – 025°
ROV Operator: Subsea7
ROV: Hercules 8
TIME ZONE: GMT -6

ROV Team:

Shift 1	Alternate Crew
Joseph Nowak (Supervisor)	Cesar Zamorano
Terry Todd	Dennis Kelly
Dave Smith	Lorena Landa

Drillsite Leaders: Bill Thornberg and Bob Barton
HE&S Team: Chris Deyton, Trace Rhames
OIM: Reggie Hillman and Joey Davenport
Gulf SERPENT Personnel: Mark Benfield and Marianne Alford

2. GEAR

ROV Type: Centurion 8 120 Hp Electro-hydraulic
ROV Camera: Color Video Kongsberg OE-1367
Grayscale SIT: Kongsberg OE-1324
SONAR: Tritech Super SeaKing 670 kHz Sector Scan
ADCP: Sontek (Probably 250 kHz)
DVD Recording Deck: Phillips DVDR3576H DVD–R

3. VISIT NARRATIVE:

3.1 <u>Background</u>

This was the second Gulf SERPENT mission to the DDS following a trip during February 2008 when we begin our collaboration with Chevron. During that initial 2007 trip we received outstanding ROV support which produced excellent observational data; however, no subsequent observations were collected by the DDS. This was due to a combination of factors: the departure of Tony Kastropil (ROV Superintendent) who had been a keen supporter of SERPENT; heavy tasking of the ROV in support of drilling, and the vessel going off-contract from Chevron for an extended period. I am committed to rebuilding and expanding our partnership with Chevron and the DDS in order to collect regular SERPENT data over the next year and beyond. Consequently, a site visit to familiarize everyone with our protocols and program is the logical first step. This was also an opportunity to begin training our technician (Ms. Marianne Alford) in offshore procedures so that she can undertake future missions to the DDS and other partner sites.

We were initially scheduled to depart on a morning flight on Monday 1/26/09. Late on the evening of 1/25/09 I received an email that our trip was on hold pending completion of a new hold-harmless visitation agreement between LSU and Chevron. We had such an agreement in place effective July 2007, however new State regulations and a desire by Chevron to harmonize the agreements they had with various academic organizations meant that a new one had to be completed. By 15:00 on 1/26/09 with the assistance of Chevron Attorney David DuPlantier and Jim Bates (LSU Office of Sponsored Programs), we had a new agreement in place and were cleared to be manifested on a flight on the morning of 1/27/09. The new agreement requires that we fill out a Job Safety Analysis (JSA) and submit an after action report documenting activities and support provided by Chevron to our project. It also incorporates new State regulations barring employees from giving or receiving gifts to employees of corporations.

<u>Tuesday 01/27/08</u>

We left Baton Rouge at 02:30 and arrived at the Leeville Heliport by 05:15. Departed for the DDS at 06:45 on an AB139 and arrived at the DDS at 08:00. We were met by Joe Nowak (Subsea7). After receiving orientation to the facility, we met with Chris Deyton (HE&S) and I filled out a JSA form. We put our gear in our quarters, changed into our personal protective equipment (PPE) and headed to the ROV control van.

The ROV was holding at 6053 ft waiting to begin a current velocity/direction survey. We discussed our survey and planned to conduct SERPENT surveys following every current measurement. The depths for the current measurements were: 6053; 5000; 4000; 3000; 2000; 1500; 1000; 500; 300; 100; and 50 feet. We began data collection at 11:44 and completed survey transects at 6000, 5000, 4000, 3000, and 2000 ft. After the 2000 ft survey, we decided to suspend further SERPENT surveys for the day in order to ensure the ROV had time to complete the current survey. SERPENT data collection ended at 15:55 and we were escorted back to the living quarters. We planned to resume SERPENT data collection at 07:00 the next morning.

<u>Wednesday 01/28/09</u>

We met with Joe Nowak at 06:45 and went out to the ROV. It was overcast and rain was forecast for most of the morning. I modified my JSA to include weather-related hazards. The ROV team began their pre-dive checks and the ROV was deployed at 07:30. Today we’re going to conduct a dedicated SERPENT dive beginning at 500’ and descending at 500’ intervals to the bottom. Horizontal transects will be conducted out to 300 ft from the TMS. Spent the morning working down to 3500 and continued down through the afternoon. One interesting discovery was the use of the 670 kHz sector scan to locate targets. By setting the gain to 100% we could detect scattering from siphonophores and fish. Our observations of a pair of unusual midwater fishes that were vertically-oriented at 3500 ft was due to their detection on the echosounder. The Sontek ADP also provided a real-time record of the water temperature although we did not configure it to log data.

We completed all ~300 ft horizontal transects at 500 ft vertical intervals from 500 – 6000 ft. Three DVDs were collected. It's important to note that we only recorded during the horizontal transcripts and stopped recording during descents and the final ascent to the surface. Joe Nowak and I left the control van at 17:30 to attend the 3rd Party Safety Meeting while Marianne observed recovery and post-dive checks of the ROV. Tomorrow we are scheduled to depart on the last helicopter, which should give us time to conduct some surveys in the morning.

Thursday 1/29/09
After breakfast, I filled out a JSA and a Hot Work Permit to take some digital photos of the ROV, met with Bob Barton (Drillsite Leader) and Trace Rhames (HS&E Coordinator) to brief them on the project. Then Marianne and I met with the ROV team in the morning. They were working on an electrical issue in their control van. We finished burning CDs of previously-acquired data along with archived observations they'd collected in the past. They needed to complete their work on the control van power system so we finished up and returned to the living quarters to have lunch and watch the helicopter safety video. We departed DDS at 11:30 and arrived back at the Leeville Heliport at 12:45.

4. SAMPLES: Collection of physical samples is not normally part of the Gulf SERPENT Project. Our data consist of primarily of video observations and other measured data. Current velocities and directions were recorded during the first dive (Table I).

Table I. 01/27/09 Current Velocity and Direction Survey Data

Depth (ft)	Depth (m)	Velocity (cm s^{-1})	Direction (°)	Temperature (°C)
50	9.1	-	-	-
100	30.5	61.8	240	
500	152.4	20.6	240	16.8
1000	304.8	36.0	250	11.9
1500	457.2	25.7	120	9.0
2000	609.6	28.3	170	7.3
3000	914.4	46.3	200	5.5
4000	1219.2	38.6	210	4.5
5000	1524.0	15.4	200	4.4
6053	1845.0	7.7	190	4.4

5. GEAR REPORT:
ROV: All systems on the ROV were functioning properly and the surveys were conducted without any problems.

6. FAUNAL OBSERVATIONS:

Dive 1557. DVD Label: WR 316 DDS 2009 1/27/09 Dive 1557[1] Disk 1 of 2; Disk 2 of 2.

Date	Time (local)	Depth (ft)	Observation	Video Still Image	Video File Location
1/27/09	11:05	6135	Tomopterid polychaete		Disk 1 of 2 VTS_01_1.VOB
1/27/09	11:07	6133	Larvacean		Disk 1 of 2 VTS_01_1.VOB
1/27/09	11:46	5014	Larvacean		Disk 1 of 2 VTS_01_1.VOB

[1] Subsea7 DDS sequential dive number

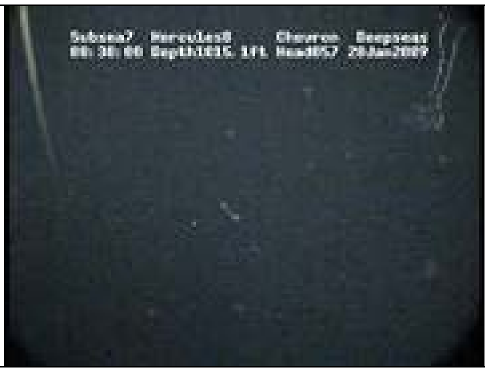
Date	Time (local)	Depth (ft)	Observation	Video Still Image	Video File Location
1/27/09	11:46	5014	Shrimp		Disk 1 of 2 VTS_01_1.VOB
1/27/09	11:56	5009	Ctenophore (*Thalassocalyce* sp.)		Disk 1 of 2 VTS_01_1.VOB
1/27/09	12:02	5022	Chaetognath		Disk 1 of 2 VTS_01_1.VOB
1/27/09	12:05	5019	Pteropods	No still image	Disk 1 of 2 VTS_01_2.VOB
1/27/09	12:16	5026	Jellyfish (*Periphyllopsis braueri*)		Disk 1 of 2 VTS_01_2.VOB

Date	Time (local)	Depth (ft)	Observation	Video Still Image	Video File Location
1/27/09	13:20	4019	Ctenophore (*Thalassocalyce* sp.)		Disk 1 of 2 VTS_01_2.VOB
1/27/09	14:08	2977	Larvacean		Disk 1 of 2 VTS_01_2.VOB
1/27/09	14:09	2991	Larvacean		Disk 1 of 2 VTS_01_3.VOB
1/27/09	14:56	1998	Fish (*Cyclothone* sp.)		Disk 1 of 2 VTS_01_2.VOB
1/27/09	14:58	2020	Ctenophore (*Eurhamphaea*)	No still image, out of focus.	Disk 1 of 2 VTS_01_3.VOB
1/27/09	14:59	2018	Physonect siphonophore	No still image, too far away before we lost visual	Disk 1 of 2 VTS_01_3.VOB

Date	Time (local)	Depth (ft)	Observation	Video Still Image	Video File Location
1/27/09	15:00	2020	Fish (*Cyclothone* sp.)		Disk 1 of 2 VTS_01_3.VOB
1/27/09	15:38	1514	Pyrosome (*Pyrosoma atlanticum*) with commensal shrimp		Disk 1 of 2 VTS_01_4.VOB

Dive 1558. DVD Label: WR316 DDS 2009 1/28/09 Dive 1558 Disk 1 of 3, Disk 2 of 3, Disk 3 of 3.

Date	Time (local)	Depth (ft)	Observation	Video Still Image	Video File Location
1/28/09	07:51	521	Physonect siphonophore		Disk 1 of 3 VTS_01_1.VOB

1/28/09	08:38	1015	Cydippid ctenophore		Disk 1 of 3 VTS_01_2.VOB

Date	Time (local)	Depth (ft)	Observation	Video Still Image	Video File Location
1/28/09	09:09	1499	Jellyfish (*Solmissus* sp.)		Disk 1 of 3 VTS_01_3.VOB
1/28/09	09:11	1499	Shrimp	Brief encounter. No still image.	Disk 1 of 3 VTS_01_3.VOB
1/28/09	09:12	1497	Unidentified jellyfish		Disk 1 of 3 VTS_01_3.VOB
1/28/09	09:13	1492	Unidentified		Disk 1 of 3 VTS_01_3.VOB
1/28/09	09:14	1489	Unidentified		Disk 1 of 3 VTS_01_3.VOB
1/28/09	09:20	1506	Lobate ctenophore	Brief observation. No still image.	Disk 1 of 3 VTS_01_3.VOB

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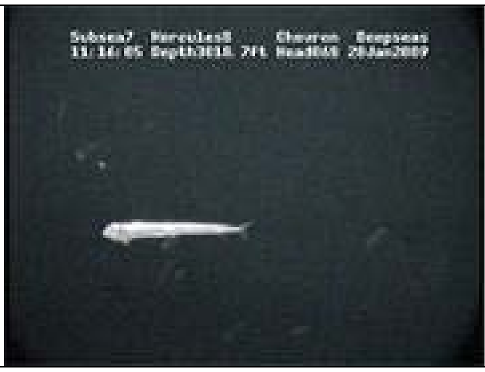
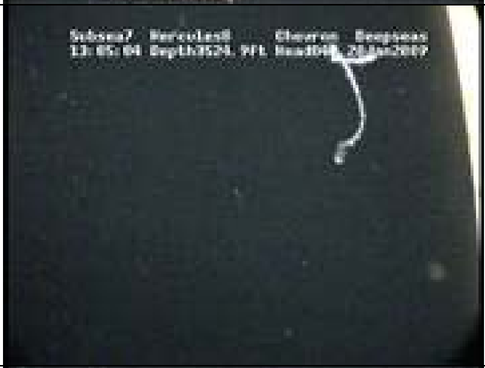
Date	Time (local)	Depth (ft)	Observation	Video Still Image	Video File Location
1/28/09	09:42	2003	Cydippid ctenophore		Disk 1 of 3 VTS_01_4.VOB
1/28/09	09:46	1996	Calycophoran siphonophore		Disk 1 of 3 VTS_01_4.VOB
1/28/09	09:58	1993	Physonect siphonophore		Disk 1 of 3 VTS_01_4.VOB
1/28/09	10:27	2495	Jellyfish (*Periphylla periphylla*)		Disk 2 of 3 VTS_01_1.VOB

Date	Time (local)	Depth (ft)	Observation	Video Still Image	Video File Location
1/28/09	10:41	2529	Physonect siphonophore		Disk 2 of 3 VTS_01_1.VOB
1/28/09	10:44	2531	Physonect Siphonophore		Disk 2 of 3 VTS_01_1.VOB
1/28/09	10:46	2531	Fish (*Cyclothone* sp.)	Very brief observation. No still image.	Disk 2 of 3 VTS_01_1.VOB
1/28/09	10:51	2546	Red cydippid ctenophore		Disk 2 of 3 VTS_01_2.VOB
1/28/09	11:10	2994	Unidentified gelatinous	Brief observation. No still image.	Disk 2 of 3 VTS_01_2.VOB
1/28/09	11:16	3018	Viperfish (*Chauliodus sloani*)		Disk 2 of 3 VTS_01_2.VOB

Date	Time (local)	Depth (ft)	Observation	Video Still Image	Video File Location
1/28/09	11:18	3038	Unidentified fish		Disk 2 of 3 VTS_01_2.VOB
1/28/09	11:26	3053	Radiolarian		Disk 2 of 3 VTS_01_2.VOB
1/28/09	11:49	3053	Physonect siphonophore		Disk 2 of 3 VTS_01_3.VOB
1/28/09	12:43	3510	Physonect siphonophore		Disk 2 of 3 VTS_01_3.VOB

1/28/09	12:49	3510	Fish (Family Paralepididae?)				Disk 2 of 3 VTS_01_3.VOB
1/28/09	12:59	3517	Physonect siphonophore				Disk 2 of 3 VTS_01_3.VOB
1/28/09	13:05	3524	Physonect siphonophore				Disk 2 of 3 VTS_01_3.VOB
1/28/09	13:12	4016	Squid ink trail				Disk 2 of 3 VTS_01_4.VOB

Date	Time (local)	Depth (ft)	Observation	Video Still Image	Video File Location
1/28/09	13:41	4021	Ctenophore (*Bathocyroe* sp.)		Disk 2 of 3 VTS_01_4.VOB
1/28/09	14:53	5007	Unidentified fish		Disk 3 of 3 VTS_01_2.VOB
1/28/09	15:00	5009	Unidentified fish		Disk 3 of 3 VTS_01_2.VOB
1/28/09	15:04	5008	Calycophoran siphonophore	Brief observation. No still image.	Disk 3 of 3 VTS_01_2.VOB
1/28/09	15:34	5533	Larvacean		Disk 3 of 3 VTS_01_2.VOB
1/28/09	15:37	5550	Fish (*Cyclothone* sp. ?)	Brief observation. No still image	Disk 3 of 3 VTS_01_3.VOB

Date	Time (local)	Depth (ft)	Observation	Video Still Image	Video File Location
1/28/09	15:46	5587	Larvacean		Disk 3 of 3 VTS_01_3.VOB
1/28/09	16:04	6052	Tomopterid Polychaete		Disk 3 of 3 VTS_01_3.VOB
1/28/09	16:14	6054	Tomopterid Polychaete		Disk 3 of 3 VTS_01_4.VOB
1/28/09	16:16	6054	Chaetognath		Disk 3 of 3 VTS_01_4.VOB

Date	Time (local)	Depth (ft)	Observation	Video Still Image	Video File Location
1/28/09	16:26	6059	Larvacean		Disk 3 of 3 VTS_01_4.VOB
1/28/09	16:31	6103	Tomopterid Polychaete		Disk 3 of 3 VTS_01_4.VOB
1/28/09	16:33	6108	Unidentified fish		Disk 3 of 3 VTS_01_4.VOB

7. VIDEO TRANSECT DATA

Date	Time (local)	Depth (feet)	Depth (m)	Heading (°)	Comments
1/27/2009	10:48:00	6168	1880.0		Doing current profile at 6168’
1/27/2009	10:52:30	6000	1828.8		Coming out of TMS
1/27/2009	11:04:10	6138	1870.9		Starting horizontal transect
1/27/2009	11:04:46	6138	1870.9		Shrimp
1/27/2009	11:06:11	6135	1869.9		Polychaete. Noted recording to HDD had not started properly, restarted recording.
1/27/2009	11:12:50	6116	1864.2		Continuing transect
1/27/2009	11:15:08	6133	1869.3		Larvacean
1/27/2009	11:16:38				End outbound transect ~150’ from TMS, returning to TMS.
1/27/2009	11:24:25	6000	1828.8		Latching to TMS, Paused Recording. Ascending to 5000’
Date	Time (local)	Depth (feet)	Depth (m)	Heading (°)	Comments
1/27/2009	11:44:36	5000	1524.0		Completed current measurements. Unlatching from TMS.
1/27/2009	11:44:55	5000	1524.0		Recording to HDD.
1/27/2009	11:45:30	5014	1528.3		Starting outbound transect
1/27/2009	11:46:16	5015	1528.6		Larvacean, shrimp
1/27/2009	11:49:05	5009	1526.7		Continuing transect
1/27/2009	11:53:00	5009	1526.7		Ctenophore (*Thalassocalyce* sp.)
1/27/2009	11:57:15	5009	1526.7		Continuing transect
1/27/2009	12:02:20	5022	1530.7		Chaetognath
1/27/2009	12:05:30	5022	1530.7		Pteropod, out of focus, overexposed
1/27/2009	12:09:05	5024	1531.3	230	End of outbound transect ~350’ from TMS, Turning back
1/27/2009	12:12:15	5088	1550.8	048	Continuing back
1/27/2009	12:15:10	5024	1531.3	056	*Periphyllopsis braueri* (Note tether is 2.5” in diameter so the animal is ~3” bell diameter)
1/27/2009	12:18:32	5007	1526.1	052	At TMS. Paused recording. Break for lunch
1/27/2009	13:04:50	3999	1218.9	122	Coming out of TMS at 4000’
1/27/2009	13:07:30	4006	1221.0	076	
1/27/2009	13:09:22	4006	1221.0	076	Starting outbound transect
1/27/2009	13:15:30	3997	1218.3	251	Continuing outbound transect
1/27/2009	13:19:12	4009	1221.9	262	Ctenophore (*Thalassocalyce*)
1/27/2009	13:22:45	4046	1233.2	247	Continuing transect
1/27/2009	13:34:15	3977	1212.2	191	End outbound transect, ~300’ out, turning to TMS
1/27/2009	13:42:23	4004	1220.4	202	At TMS, pausing recording
1/27/2009	14:05:10	3003	915.3	204	Unlatching from TMS, recording to HDD, starting 3000’ survey
1/27/2009	14:07:40	2977	907.4	217	Larvacean
1/27/2009	14:09:40	2989	911.0	234	Larvacean
1/27/2009	14:18:08	2996	913.2	247	End of outbound transect, ~300’ out, turning to TMS
1/27/2009	14:30:42	2927	892.1	244	At TMS, pausing recording
1/27/2009	14:50:00	2003	610.5	332	Unlatching from TMS, recording to HDD

1/27/2009	14:56:24	1996	608.4	291	Fish (*Cyclothone*)
1/27/2009	14:58:59	2020	615.7	296	Ctenophore (*Eurhamphaea*) Out of focus
1/27/2009	14:59:33	2018	615.1	287	Physonect siphonophore
1/27/2009	15:00:00	2020	615.7	250	Fish (*Cyclothone*)
1/27/2009	15:16:39	2018	615.1	083	Back at TMS, pausing recording
1/27/2009	15:38:03	1509	459.9	241	Starting outbound transect, recording to HDD
1/27/2009	15:38:13	1514	461.5	247	Pyrosome (*Pyrosoma atlanticum*) with small commensal shrimp
1/27/2009	14:45:52	1489	453.8	282	End of transect ~300' out, turning to TMS
1/27/2009	15:55:17	1502	457.8	070	At TMS end SERPENT data collection.

Date	Time (local)	Depth (feet)	Depth (m)	Heading (°)	Comments
1/28/2009	7:30:04	0	0.0		ROV in water
1/28/2009	7:37:30	500	152.4	320	Exit TMS turning to 320 deg
1/28/2009	7:42:28	533	162.5	319	Starting transect
1/28/2009	7:44:12	511	155.8	320	Continuing …
1/28/2009	7:45:50	508	154.8	306	Adjusting heading
1/28/2009	7:48:20	508	154.8	295	Adjusting heading
1/28/2009	7:36:27	508	154.8	295	Continuing …
1/28/2009	7:38:01	511	155.8	294	16.8°C
1/28/2009	7:52:20	528	160.9	295	Siphonophore
1/28/2009	7:40:27	528	160.9	181	turning for return 400-450' out
1/28/2009	7:42:29	560	170.7	079	on return …
1/28/2009	7:46:24	540	164.6	062	Continuing …
1/28/2009	7:50:56	541	164.9	061	Continuing …
1/28/2009	7:55:20	543	165.5	061	16.3°C
1/28/2009	7:59:33	511	155.8	060	Back at TMS stopping video, descending to 1000'
1/28/2009	8:14:08	533	162.5	190	Descending to 1000'
1/28/2009	8:15:18	673	205.1	150	16.0°C
1/28/2009	8:15:47	744	226.8	143	Continuing …
1/28/2009	8:16:24	840	256.0	152	14.0°C
1/28/2009	8:17:17	939	286.2	155	13.8°C
1/28/2009	8:18:02	1005	306.3	162	13.0°C
1/28/2009	8:18:43	1003	305.7	154	Coming out of TMS, recording DVD
1/28/2009	8:20:56	1017	310.0	056	12°C
1/28/2009	8:23:05	1015	309.4	236	Starting out on transect
1/28/2009	8:24:55	1015	309.4	235	On transect
1/28/2009	8:27:56	1017	310.0	235	11.7°C
1/28/2009	8:29:15	1017	310.0	235	At end of transect turning back

Date	Time (local)	Depth (feet)	Depth (m)	Heading (°)	Comments
1/28/2009	8:29:35	1017	310.0	064	Return transect
1/28/2009	8:35:06	1015	309.4	064	Return transect 11.7°C
1/28/2009	8:38:20	1015	309.4	057	Cydippid ctenophore (brief)
1/28/2009	8:44:52	1012	308.5	059	Moving into strong current, difficult to videotape targets
1/28/2009	8:48:58	1003	305.7	022	Latched to TMS
1/28/2009	9:02:06	1504	458.4	049	8.4°C
1/28/2009	9:03:34	1506	459.0	238	Coming out of TMS, recording DVD
1/28/2009	9:05:32	1497	456.3	236	8.8°C
1/28/2009	9:08:21	1499	456.9	237	*Solmissus* (nice footage)
1/28/2009	9:10:15	1499	456.9	237	continuing transect 8.8°C
1/28/2009	9:11:54	1502	457.8	238	shrimp (brief)
1/28/2009	9:12:30	1504	458.4	236	small medusa (great footage)
1/28/2009	9:13:50	1489	453.8	238	Unidentified (some footage)
1/28/2009	9:15:30	1499	456.9	237	Unidentified (same thing)/shrimp
1/28/2009	9:19:55	1502	457.8	237	End of outward transect turning back to TMS 300' out
1/28/2009	9:20:40	1506	459.0	040	Lobate ctenophore (brief)
1/28/2009	9:23:01	1509	459.9	057	returning … 8.9°C
1/28/2009	9:27:38	1521	463.6	060	returning …
1/28/2009	9:32:00	1500	457.2		latched to TMS, descending
1/28/2009	9:38:49	2000	609.6	229	at 2000’, 7.6°C
1/28/2009	9:39:14	2000	609.6	230	Coming out of TMS, recording DVD
1/28/2009	9:40:01	2005	611.1	230	On transect …
1/28/2009	9:42:13	2003	610.5	229	cydippid ctenophore (nice footage) 7.4°C
1/28/2009	9:45:21	1998	609.0	229	on transect
1/28/2009	9:46:00	1996	608.4	230	calycophoran siphonophore (brief)
1/28/2009	9:52:01	1996	608.4	230	End of outbound transect 300’
1/28/2009	9:52:20	1998	609.0	052	Returning to TMS 7.4°C
1/28/2009	9:58:41	1993	607.5	050	Physonect siphonophore (brief)
1/28/2009	10:00:11	2023	616.6	234	At TMS, stop recording DVD, end DVD
1/28/2009	10:05:38	2340	713.2	352	7.0°C, holding while umbilical inspected
1/28/2009	10:14:00	2340	713.2	052	Continuing descent to 2500’
1/28/2009	10:19:41	2497	761.1	254	New DVD (DVD#2)
1/28/2009	10:20:12	2497	761.1	238	Coming out of TMS
1/28/2009	10:20:43	2500	762.0	250	starting transect 6.2°C
1/28/2009	10:25:02	2504	763.2	251	continuing transect 6.2°C
1/28/2009	10:27:32	2497	761.1	251	*Periphylla periphylla* 6.2°C (nice footage)
1/28/2009	10:33:21	2482	756.5	251	End of transect, turning
1/28/2009	10:33:48	2510	765.0	093	Descending slightly for return
1/28/2009	10:34:31	2526	769.9	089	Returning …
1/28/2009	10:41:00	2529	770.8	086	Physonect siphonophore (brief)

1/28/2009	10:44:10	2529	770.8	086	Physonect siphonophore (brief)
1/28/2009	10:46:00	2529	770.8	086	6.1°C
1/28/2009	10:46:34	2531	770.8	086	*Cyclothone* (brief)
1/28/2009	10:51:16	2549	776.9	103	fast, red cydippid ctenophore (ok footage)
1/28/2009	10:52:46	2531	771.4	282	At TMS, ascending to dock, stopping DVD
1/28/2009	10:54:27	2497	761.1	240	Latched to TMS, descending to 3000'
1/28/2009	10:55:12	2544	775.4	244	6.1°C descending …
1/28/2009	10:59:21	2991	911.7	261	5.5°C descending …
1/28/2009	10:59:46	3000	914.4	268	At 3000’, 5.5°C, recording to DVD
1/28/2009	11:00:26	3000	914.4	264	Unlatching from TMS
1/28/2009	11:01:33	3006	916.2	259	Outbound transect 5.4°C
1/28/2009	11:06:10	3001	914.7	259	Continuing transect .. 5.4°C
1/28/2009	11:10:15	2994	912.6	259	Unidentified ‘cross’
1/28/2009	11:14:03	2991	911.7	259	End of outbound transect, returning to TMS

Date	Time (local)	Depth (feet)	Depth (m)	Heading (°)	Comments
1/28/2009	11:14:38	3001	914.7	067	Descending a bit for return transect
1/28/2009	11:15:11	3013	918.4	067	Returning to TMS … 5.4°C
1/28/2009	11:16:10	3013	918.4	067	Viperfish *Chauliodus sloani* (nice)
1/28/2009	11:18:40	3038	926.0	053	Fish Unidentified (brief)
1/28/2009	11:24:14	3055	931.2	072	Continuing back 5.3°C
1/28/2009	11:26:45	3050	929.6	077	Radiolarian (brief)
1/28/2009	11:30:32	3055	931.2	061	Shrimp (brief)
1/28/2009	11:32:20	3001	914.7	293	Latching to TMS
1/28/2009	11:32:44	3000	914.4	010	Latched stop DVD recording
1/28/2009	11:33:38	3033	924.5	226	5.3°C descending
1/28/2009	11:36:17	3306	1007.7	154	5.2°C descending
1/28/2009	11:36:36	3344	1019.3	143	5.1°C descending
1/28/2009	11:38:25	3485	1062.2	273	5.0°C
1/28/2009	11:38:49	3500	1066.8	242	4.9°C holding at this depth in TMS, lunch break
1/28/2009	11:49:00	3500	1066.8	317	physonect siphonophore, recorded to DVD while in TMS
1/28/2009	12:36:23	3500	1066.8	276	Back from lunch, ready to continue
1/28/2009	12:42:28	3503	1067.7	256	Coming out of TMS, recording DVD
1/28/2009	12:43:50	3510	1069.8	256	Physonect siphonophore (brief)
1/28/2009	12:49:10	3510	1074.1	200	Pair of midwater fish, saw them on the sonar. (Good video. Cool!)
1/28/2009	12:57:30	3520	1072.9	256	4.8°C at end of transect. Moving to investigate sonar target
1/28/2009	12:59:00	3520	1072.9	257	physonect siphonophore
1/28/2009	13:00:09	3522	1073.5	049	returning to TMS 4.8°C
1/28/2009	13:05:05	3529	1075.6	047	small physonect siphonophore (brief) 4.8°C
1/28/2009	13:09:54	3537	1078.1	049	continuing back
1/28/2009	13:13:45	3500	1066.8	302	Latched to TMS, stopped DVD
1/28/2009	13:14:26	3504	1068.0	142	Descending to 4000’

1/28/2009	13:16:53	3822	1164.9	200	4.7°C descending …
1/28/2009	13:17:58	3952	1204.6	203	4.6°C descending …
1/28/2009	13:18:46	4004	1220.4	212	At 4000’, 4.6°C
1/28/2009	13:19:29	4004	1220.4	215	Coming out of TMS, recording
1/28/2009	13:20:09	4028	1227.7	276	Outbound transect
1/28/2009	13:20:36	4019	1225.0	276	Continuing outward 4.6°C
1/28/2009	13:26:04	4016	1224.1	275	Squid ink train
1/28/2009	13:38:42	4024	1226.5	277	End outbound transect
1/28/2009	13:39:45	4024	1226.5	093	Turned lights down to low level, using SIT camera to see tether and watching sonar for targets.
1/28/2009	13:41:33	4024	1226.5	094	Bathocyroe (briefly)
1/28/2009	13:48:31	4043	1232.3	089	Near TMS, 4.5°C
1/28/2009	13:50:30	4000	1219.2	095	Latched to TMS, descending to 4500'
1/28/2009	13:53:16	4282	1305.2	086	4.5°C

Date	Time (local)	Depth (feet)	Depth (m)	Heading (°)	Comments
1/28/2009	13:57:56	4500	1371.6	295	Holding at 4500, while finalizing DVD. Lights off during descent. Will keep lights off and use on low setting during transect
1/28/2009	14:16:12	4508	1374.0	315	Turned lights to low on SIT camera
1/28/2009	14:17:02	4505	1373.1	312	Coming out TMS, Recording DVD#3
1/28/2009	14:18:25	4520	1377.7	275	Outbound transect, low light
1/28/2009	14:32:31	4555	1388.4	277	Continuing outbound …4.4°C
1/28/2009	14:33:18	4562	1390.5	276	End of transect, turning to TMS
1/28/2009	14:33:57	4584	1397.2	095	Returning
1/28/2009	14:36:41	4584	1397.2	093	Returning …
1/28/2009	14:45:17	4505	1373.1	065	Latched to TMS, stopped DVD
1/28/2009	14:46:53	4604	1403.3	050	Descending 4.4°C
1/28/2009	14:48:20	4778	1456.3	025	Descending 4.4°C
1/28/2009	14:50:25	5002	1524.6	338	At 5000, recording DVD, lights on
1/28/2009	14:50:54	5017	1529.2	264	Outbound transect
1/28/2009	14:53:39	5009	1526.7	265	Unidentified fish (good footage)
1/28/2009	15:00:00	5009	1526.7	264	Another uid fish same type
1/28/2009	15:02:15	5007	1526.1	265	Continuing 4.4°C
1/28/2009	15:04:31	5009	1526.7	264	Calycophoran siphonophore (brief)
1/28/2009	15:08:43	5009	1526.7	265	End of outbound transect, turning
1/28/2009	15:17:29	4002	1219.8	253	Latched to TMS, stopped recording
1/28/2009	15:18:34	4002	1219.8	244	Descending to 5500’
1/28/2009	15:18:53	5050	1539.2	247	Descending …
1/28/2009	15:21:10	5324	1622.8	242	Descending … 4.4°C
1/28/2009	15:23:07	5500	1676.4	274	Unlatching from TMS, recording
1/28/2009	15:26:18	5516	1681.3	275	Outbound … 4.4°C
1/28/2009	15:31:39	5518	1681.9	275	Recording had not started earlier, started now.

1/28/2009	15:34:45	5530	1685.5	275	Larvacean
1/28/2009	15:37:23	5550	1691.6	273	*Cyclothone* (brief)
1/28/2009	15:38:38	5558	1694.1	273	End of transect, Turning to TMS
1/28/2009	15:39:19	5555	1693.2	095	Returning …
1/28/2009	15:46:34	5587	1702.9	109	Larvacean? (brief)
1/28/2009	15:50:08	5503	1677.3	288	Latched to TMS, stopped recording
1/28/2009	15:51:38	5640	1719.1	119	Descending …
1/28/2009	15:55:22	6000	1828.8	004	At 6000
1/28/2009	15:57:43	6005	1830.3	185	Unlatching TMS, recording
1/28/2009	16:04:02	6047	1843.1	090	False start, turning to 279 heading
1/28/2009	16:04:30	6047	1843.1	270	Tomopterid polychaete (ok footage)
1/28/2009	16:08:40	6039	1840.7	247	Continuing out …4.4°C
1/28/2009	16:15:00	6054	1845.3	270	Tomopterid polychaete (nice footage)
1/28/2009	16:16:30	6057	1846.2	280	Chaetognath (nice footage)
Date	Time (local)	Depth (feet)	Depth (m)	Heading (°)	Comments
1/28/2009	16:26:43	6062	1847.7	298	Larvacean (nice footage)
1/28/2009	16:28:00	6074	1851.4	195	Unidentified (partial, brief)
1/28/2009	16:29:01	6079	1852.9	241	Turning back to TMS 4.4°C
1/28/2009	16:30:34	6101	1859.6	278	Tomopterid polychaete (nice footage)
1/28/2009	16:33:45	6108	1861.7	069	Fish? (brief)
1/28/2009	16:38:48	6047	1843.1	124	Maneuvering to TMS
1/28/2009	16:44:23	6005	1830.3	095	Latching to TMS
1/28/2009	16:45:00	6005	1830.3	098	Recovering to surface. End DVD

8. CHEVRON LOGISTICAL SUPPORT

The support and cooperation we received on this mission was outstanding. Everyone we dealt with, from the OIM, Drillsite Leaders, ROV team to the Camp Boss, made us feel extremely welcome. Their interest in the SERPENT Project made this a very successful trip.

<u>Transportation</u>:

Date	Flight	Persons	Flight Time (h)	Aircraft
01/27/09	Leeville Heliport to DDS	2	1.25	Agusta Bell 139
01/29/09	DDS to Leeville	2	1.25	Bell 430

<u>Accommodation</u>:
2 persons x 2 nights (1/27/09, 1/28/09)

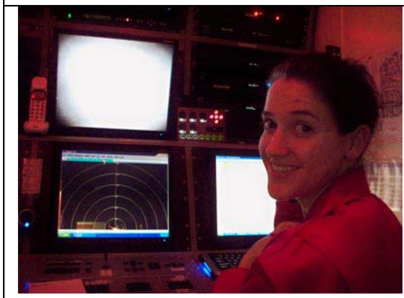
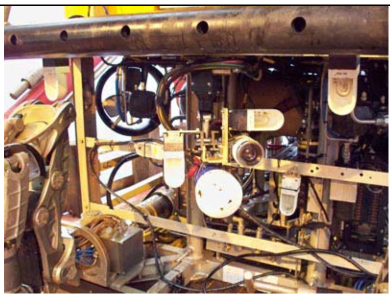
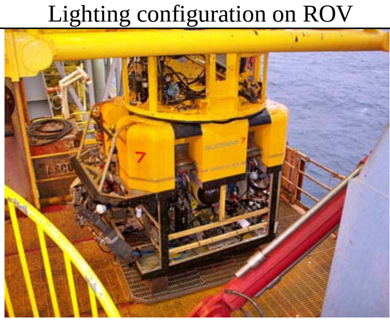
<u>Meals</u>:

Date	Breakfast	Lunch	Dinner
1/27/09	-	2	2
1/28/09	2	2	2
1/29/09	2	2	-
Total	4	6	4

<u>ROV Time</u>:

1/27/09:	4h 10min
1/28/09:	9h 15min
Total:	13h 25min

1. DIGITAL STILL IMAGES

 100_0160 Dave Smith in ROV Control Van	 100_0161 Dave Smith and Marianne Alford in ROV Control Van	 100_0164 Smith and Marianne Alford in ROV Control Van
 100_0168 Marianne Alford in ROV Control	 100_0170 Centurion ROV	 100_0171 Centurion ROV
 100_0172 Marianne Alford next to Centurion ROV	 100_0173 Lighting configuration on ROV	 100_0174 Sontek ADP on ROV
 100_0175 Marianne Alford and Mark Benfield in front of ROV	 100_0176 Centurion ROV	

MISSION 64

TRANSOCEAN LEADER, ASTERIX, NORWEGIAN SEA

ANDREW GATES

1. GENERAL INFORMATION:

Well: Asterix 6705/10-1
Project partner: StatoilHydro
Rig: *Transocean Leader*
Rig operator: Transocean
ROV operator: Oceaneering
SERPENT representative: Andrew Gates (+ Lars-Petter Myhre - StatoilHydro)

Position:05º17'25,8" E
67 01'02,2" N

Water depth: 1340 m
Water Temperature: Approximately -1ºC (reading switching between -0.84 and -1.02)

ROV team:

Supervisor	Trond Arne Nilsen
Pilot	Jan Ove Hansen
Pilot	Ron Sande

2. GEAR:

SERPENT ROV push cores
ROV operated scraper (for sampling sponges)
Specimen container
Magnum 018 work class ROV
Kongsberg OE14-208 digital stills camera

3. NARRATIVE:

Tuesday 17th February 2009
Travel from Southampton to Brønnøysund. Snow in Norway meant that the flight from London to Stavanger was delayed so I missed the Stavanger to Trondheim connection. I was therefore re-routed via Oslo to make a different connection to Trondheim. Final journey: London-Stavanger-Oslo-Trondheim-Brønnøysund. Arrival at Thon Hotel Bronnoysund at 2300.

Wednesday 18th February 2009
Arrive at helicopter check-in at 0600. At 0730 we were informed that the flight had been delayed to 1545 because 7 personnel had experienced the same problems with their flights as I had the previous day.
Check-in 1445, Flight out to Transocean Leader, arrive approximately 1730. Brief introduction. Meet with Glen Gabrielsen the StatiolHydro drilling supervisor and then meet Trond Nilsen ROV supervisor.

Thursday 19th February 2009
Morning meeting 0730. Informed of the slightly re-arranged plans for the trip. Lars-Petter will be coming out to the rig with journalists from the Norwegian newspaper VG and a cameraman from StatoilHydro.
Located equipment in container MD-790 but unable to access it because it was on the pipe-deck. This was resolved by the crane operator who moved it to the area behind the ROV control room.
The ROV team is the same as the second visit to Haklang which is good news as they were highly competent with SERPENT work and very supportive of the project.
There were some problems with the GUI for the stills camera (despite assurances before I travelled that it had been repaired since Haklang and had been tested). After some testing the camera was functional but on occasions the GUI software would crash when using the camera's zoom function.
ROV off deck 1022, At depth 1116, Leave cage 1120
The morning was spent doing an initial visual survey of the area in order to assess the nature of the sea bed and suitability for different protocols later in the visit. Some time was spent looking specifically for *Thenea* sp. sponges but this was unsuccessful.
Lars-Petter arrived on the *Transocean Leader* along with the StatoilHydro camera operator at approximately 1430, had his rig inductions and met with the staff. The VG journalists had missed their flight and would not be coming out to the rig.
Following the general survey we started to carry out a quantitative video transect survey. 5 transects of over 100m in length were completed before finishing work at 2130.
The key observation from the general survey and the video transects was that ophiuroids (brittle stars) were extremely abundant at the site. This presented the possibility for experimentation later in the visit.

Friday 20th February 2009
At the morning meeting I was asked to present a talk about SERPENT at the HSE meeting that evening.
The early part of the morning was spent loading the SERPENT coring equipment to the ROV and doing a small amount of ROV maintenance.
0950 – ROV off deck, 1050 ROV at depth.
The remaining 3 video transects were completed before lunch.
Following lunch L-P and AG were interviewed by the StatoilHydro camera operator for a StatoilHydro documentary about the work on the *Transocean Leader*. Following the interview about the SERPENT collaboration with StatoilHydro we were filmed using the ROV to carry out a mock video transect to find various species on the sea bed. L-P and AG spoke about the transect when it was in progress.
At the end of the filming some time was dedicated to searching for *Thenea* sp. sponges. Unfortunately they did not seem to be present. This was unsurprising considering the size of the undisturbed area available for investigation. Specimens of the common ophiuroids and cerianthids were collected using the push coring equipment and the new specimen container.

At the HSE meeting in the evening AG gave a well received presentation about SERPENT. This included a brief introduction to the project followed by some photos and a description of life on the sea bed under the *Transocean Leader*, finishing with some short video clips from previous missions to the *Leader.*

Saturday 21st February 2009
At the morning meeting I was told that I would be retuning to shore on the Monday (I had previously expected to stay until Wednesday or Friday). The reasons for this were reduced bed-space on the rig and the forecast for a significant wave height of greater than 4 m for the next 5 days (4 m is the maximum depth in which Oceaneering will dive the ROV.)
Plans were changed to make best use of the limited time remaining by collecting some push core samples at further distance from the BOP than has previously been possible through SERPENT and collecting further specimens of the fauna (particularly the abundant ophiuroids) using baited traps.
Off deck 0930 but there was a problem with the oil pressure on the ROV. It had to be brought back on deck and repaired. This was completed by lunchtime.
ROV off deck 1340, at depth 1429.
The baited trap was deployed at 100 m to the east of the BOP alongside a marker buoy to aid finding its location on recovery. This took longer than anticipated.
Cores were taken from sites approximately 200 m and 50 m from the BOP (East). Unfortunately one core sampler was broken in the operations.

Sunday 22nd February 2009
It was confirmed at the morning meeting that I would be returning to shore tomorrow. The weather was bad and it was not clear if we would be able to dive. Whilst the weather was bad in the morning I used the time to download the stills images and select/download/ burn the video footage from the videologger in the ROV control room.
The wave height remained high all morning but by late afternoon it looked like it was dropping for a short time. We decided to dive to collect some additional cores and recover the baited trap.
ROV off deck 1533, ROV at depth 1628
Spent some time trying to locate the baited trap but the visibility was bad. Finally located the marker buoy but he trap was not obviously nearby. There was a notable track in the sediment leading to the location of the base of the marker buoy indicating that it had moved substantially since deployment. Following a thorough search of the area it was decided that the time would be better spent collecting the remaining core samples so the search for the trap was abandoned. Samples were therefore collected at 80 m east of the BOP and the remaining samples from 50 m were taken.
The ROV was recovered by 2210.

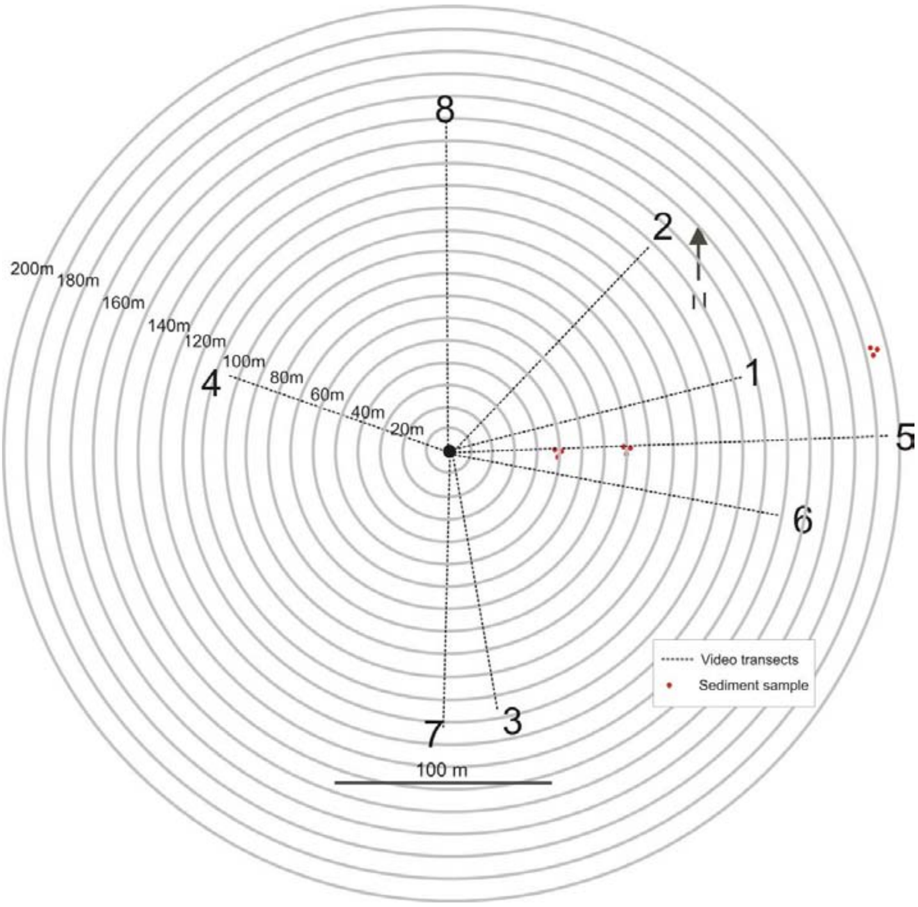
Monday 23rd February 2009
On the final day offshore the SERPENT equipment was packed and prepared for backload. Folllowing discussions with Lars-Petter one box was prepared for a possible visit to the *Leader* at a later date in the drilling programme and left in the Oceaneering container. The other box was sent back to Southampton.
The helicopter arrived at Brønnøysund at approximately 1730 and there was a flight to Trondhiem. I met Nina Aas at Trondheim airport to hand over the frozen samples for chemical analysis. I stayed overnight at the Rica Hell Hotel.

Tuesday24th February 2009
I was unable to change my flight from Oslo to London so I had to stay an extra day in Trondheim.

Wednesday 25th February 2009
Flights from Trondheim to Oslo and onwards to London. National Express from Heathrow to Southampton.

4. SAMPLES:

A detailed video survey was carried out which extended beyond 100m in eight headings. Three replicate push cores were taken from three sites 50, 80 and 200 m to the east of the BOP in. Each sample was divided into three sections of 2 cm to enable the assessment of the depth of the spoil, particularly at the more distant sites. In addition approximately ¼ of each sample was removed for analysis of microbial communities. These are to be used to add to the growing body of data SERPENT has collected on the effects of disturbance on the benthic environment. All sediment samples were frozen immediately after processing and remain frozen until analysis. Photographs were taken at the location of each of the core samples.
Specimen samples were collected for identification of an abundant species of ophiuroid at the site as well as a common cerianthid (similar to one seen at many sites visited by SERPENT in the deep waters off Norway).
Two sediment samples were taken to provide data for a project based at NOCS and the Natural History Museum, London which is working on the taxonomy of an important group of nematodes. A baited trap was also deployed but was not successfully recovered during the visit. The ROV team plan to look for the trap again when the weather is improved
The new design thermally insulated specimen capture container was successfully used throughout this mission, attached core holding frame.



The video transects and chemical analysis samples taken at Asterix

CODE STRUCTURE:

TL/250908/001#1

Transocean Leader / Date / ROV SERPENT dive log # replicate

ALL SAMPLES IN ORDER OF COLLECTION

Station	location	sample type	details
TL/190209/001	130 m 045º of BOP	Video transect	DVD
TL/190209/002	115 m 000º of BOP	Video transect	DVD
TL/190209/003	125 m 180º of BOP	Video transect	DVD
TL/190209/004	140 m 270º of BOP	Video transect	DVD
TL/190209/005	200 m 090º of BOP	Video transect	DVD
TL/200209/006	150 m 135º of BOP	Video transect	DVD
TL/200209/007	160 m 225º of BOP	Video transect	DVD
TL/200209/008	150 m 315º of BOP	Video transect	DVD
TL/200209/010	100 m 090º of BOP	Push core	Cerianthid specimen
TL/200209/011#1	100 m 090º of BOP	Specimen	Ophiuroid specimens
TL/200209/011#2	100 m 090º of BOP	Push core	Meiofauna sample HB
TL/200209/012	100 m 090º of BOP	Push core	Meiofauna sample HB
TL/210209/013#1	200 m 045 º of BOP	Push core	Top 2 cm for chemical analysis
TL/210209/013#2	200 m 045 º of BOP	Push core	2-4 cm for chemical analysis
TL/210209/013#3	200 m 045 º of BOP	Push core	4-6 cm for chemical analysis
TL/210209/013#4	200 m 045 º of BOP	Push core	Top 2 cm for microbial ecology
TL/210209/013#5	200 m 045 º of BOP	Push core	2-4 cm for microbial ecology
TL/210209/013#6	200 m 045 º of BOP	Push core	4-6 cm for microbial ecology
TL/210209/014#1	200 m 045 º of BOP	Push core	Top 2 cm for chemical analysis
TL/210209/014#2	200 m 045 º of BOP	Push core	2-4 cm for chemical analysis
TL/210209/014#3	200 m 045 º of BOP	Push core	4-6 cm for chemical analysis
TL/210209/014#4	200 m 045 º of BOP	Push core	Top 2 cm for microbial ecology
TL/210209/014#5	200 m 045 º of BOP	Push core	2-4 cm for microbial ecology
TL/210209/014#6	200 m 045 º of BOP	Push core	4-6 cm for microbial ecology
TL/210209/015#1	200 m 045 º of BOP	Push core	Top 2 cm for chemical analysis
TL/210209/015#2	200 m 045 º of BOP	Push core	2-4 cm for chemical analysis
TL/210209/015#3	200 m 045 º of BOP	Push core	4-6 cm for chemical analysis
TL/210209/015#4	200 m 045 º of BOP	Push core	Top 2 cm for microbial ecology
TL/210209/015#5	200 m 045 º of BOP	Push core	2-4 cm for microbial ecology
TL/210209/015#6	200 m 045 º of BOP	Push core	4-6 cm for microbial ecology
TL/210209/016#1	55 m 090º of BOP	Push core	Top 2 cm for chemical analysis
TL/210209/016#2	55 m 090º of BOP	Push core	2-4 cm for chemical analysis
TL/210209/016#3	55 m 090º of BOP	Push core	4-6 cm for chemical analysis
TL/210209/016#4	55 m 090º of BOP	Push core	Top 2 cm for microbial ecology
TL/210209/016#5	55 m 090º of BOP	Push core	2-4 cm for microbial ecology

TL/210209/016#6	55 m 090º of BOP	Push core	4-6 cm for microbial ecology
TL/220209/017#1	80 m 090º of BOP	Push core	Top 2 cm for chemical analysis
TL/220209/017#2	80 m 090º of BOP	Push core	2-4 cm for chemical analysis
TL/220209/017#3	80 m 090º of BOP	Push core	4-6 cm for chemical analysis
TL/220209/017#4	80 m 090º of BOP	Push core	Top 2 cm for microbial ecology
TL/220209/017#5	80 m 090º of BOP	Push core	2-4 cm for microbial ecology
TL/220209/017#6	80 m 090º of BOP	Push core	4-6 cm for microbial ecology
TL/220209/018#1	80 m 090º of BOP	Push core	Top 2 cm for chemical analysis
TL/220209/018#2	80 m 090º of BOP	Push core	2-4 cm for chemical analysis
TL/220209/018#3	80 m 090º of BOP	Push core	4-6 cm for chemical analysis
TL/220209/018#4	80 m 090º of BOP	Push core	Top 2 cm for microbial ecology
TL/220209/018#5	80 m 090º of BOP	Push core	2-4 cm for microbial ecology
TL/220209/018#6	80 m 090º of BOP	Push core	4-6 cm for microbial ecology
TL/220209/019#1	80 m 090º of BOP	Push core	Top 2 cm for chemical analysis
TL/220209/019#2	80 m 090º of BOP	Push core	2-4 cm for chemical analysis
TL/220209/019#3	80 m 090º of BOP	Push core	4-6 cm for chemical analysis
TL/220209/019#4	80 m 090º of BOP	Push core	Top 2 cm for microbial ecology
TL/220209/019#5	80 m 090º of BOP	Push core	2-4 cm for microbial ecology
TL/220209/019#6	80 m 090º of BOP	Push core	4-6 cm for microbial ecology
TL/220209/020#1*	50 m 090º of BOP	Push core	Top 2 cm for chemical analysis
TL/220209/021#1+	50 m 090º of BOP	Push core	Top 2 cm for chemical analysis
TL/220209/021#2+	50 m 090º of BOP	Push core	2-4 cm for chemical analysis
TL/220209/021#3+	50 m 090º of BOP	Push core	4-6 cm for chemical analysis
TL/220209/021#4+	50 m 090º of BOP	Push core	Top 2 cm for microbial ecology
TL/220209/021#5+	50 m 090º of BOP	Push core	2-4 cm for microbial ecology
TL/220209/021#6+	50 m 090º of BOP	Push core	4-6 cm for microbial ecology

* not enough material in core for full sectioning
\+ the core sampler broke during sampling operation, there may be additional mixing within sample.

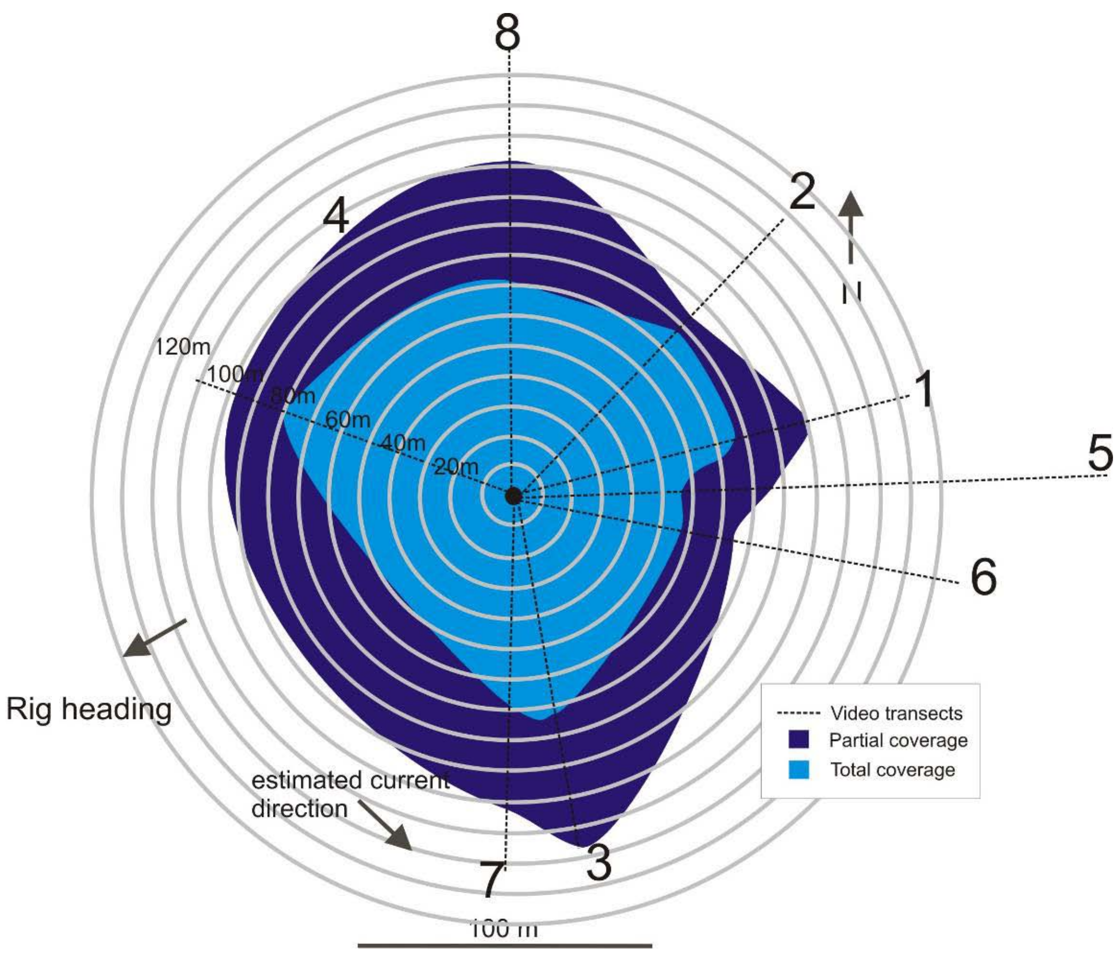
5. OBSERVATIONS

THENEA SP. SPONGES

One of the primary aims of the SERPENT operations at Asterix was to attempt to locate, map the distribution of and collect specimens of individuals of the sponge genus *Thenea*. It was thought that *T. abyssorum* and *T. muricata* were likely to be present at Asterix. Following a relatively detailed initial investigation of the undisturbed sediment it was not possible to locate any examples of either species. Data from the literature suggest that *T. abyssorum* was found in relatively high numbers in trawls which covered several nautical miles. The relatively small area available for study with the ROV suggested that they would be difficult to find. In addition these sponges are small (5 cm) and inhabit the sediment with only a limited part of their body protruding above the sediment surface, with this portion highly likely to be covered with sediment. In future operations SERPENT scientists will continue to attempt to collect *Thenea* specimens but it is suggested that this is on an opportunistic basis.

DISTURBANCE OBSERVATIONS

Eight transects were taken, each extending beyond 100 m from the BOP.
Environmental conditions resulted in fewer transects to the west of the BOP. The track of the transects intended to cover this area would often drift eastwards. Physical disturbance typically extended to 100 m from the BOP. Before these data can be properly interpreted it is important to consider the faunal abundances in the area. These data are currently in the analysis stage.



The estimated extent of physical disturbance around the BOP at Asterix.

Observations of sediment and notes on classification into Partial, Total coverage and unimpacted are shown in the table below

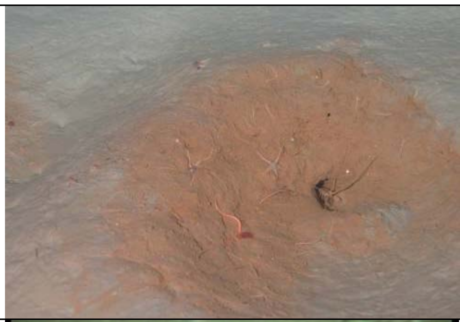
100m + from BOP Unimpacted sediment Evidence of burrows and bioturbation as well benthic megafauna	
Partially impacted sediment Areas with clear evidence of drill spoil but also signs of natural. Some motile and sessile megafauna	
Fully impacted sediment No visual evidence of the natural sea bed; characterised by limited observations of motile megafauna and complete absence of sessile megafauna	

SERPENT
SCIENTIFIC AND ENVIRONMENTAL ROV PARTNERSHIP USING EXISTING INDUSTRIAL TECHNOLOGY

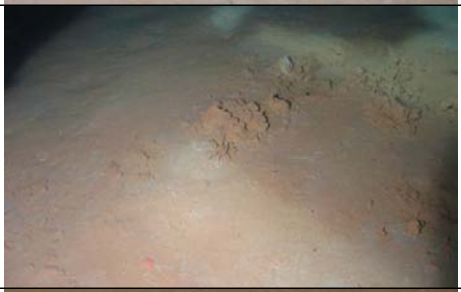
FAUNAL OBSERVATIONS

Species observations made using the colour video camera and the digital stills camera at Asterix are recorded in the table below.

Date	time	observation	photo/video
19.02.2009	12:28	*Pontaster* (Asteroid) and sabellid	
19.02.2009	12:56	Highly abundant small ophiuroids	
19.02.2009	13:01	Cerianthid in the drill spoil	
19.02.2009	13:24	Burrow in the sediment	

19.02.2009	13:38	burrow in sediment with a crustacean (probably an isopod) and ophiuroids	
19.02.2009	14:28	Unknown (possibly a priapulid)	
19.02.2009	15.22	Enteropneust	
19.02.2009	15:35	Unidentified polychaete	
19.02.2009	15:38	Asteroid buried in sediment (bioturbation)	

19.02.2009	15:45	Large burrow	
19.02.2009	15:56	Ray	
19.02.2009	16:01	*Lycodes* sp (eelpout)	
19.02.2009	16:03	Decapod shrimp (likely *Bythocaris* sp.)	

19.02.2009	18:55	Dead fish head and ophiuroids The ophiuroids were attracted by scent and were travelling in a well defined line from the downstream direction	
19:02:2009	21:11	Crinoid, soft coral and amphipod	
20.02.2009	15:09	*Gaidropsarus argentatus*	
20.02.2009	15:46	*Nymphon* sp pycnogonid (sea spider)	
20.02.2009	14:53	*Pontaster* sp. and ophiuroids	

MISSION 65

STENA CARRON, ROSEBANK NORTH, FAROE-SHETLAND CHANNEL

DANIEL JONES

1. GENERAL INFORMATION:

Client: Chevron
Rig operator: Stena
Rig name: Stena Carron
Rig location: Rosebank North, Faroe-Shetland Channel
Rig position: 061°08.4533’ N 003° 40.3403’ W (WGS 84)
Seabed depth: 1186 m
Seabed temperature: -0.75°C
ROV operator: Oceaneering
ROV: Magnum x 2 + Small Minimum vehicle
ROV team:

ROV superintendent	Bruce Montgomery
Supervisor starboard ROV days	Scot Robertson
Pilot starboard ROV days	Steven Watson
Tech starboard ROV days	Andrew May
Supervisor port ROV days	Graham Bell
Pilot port ROV days	Iain Morgan
Pilot port ROV days	Lee Alexander
Supervisor starboard ROV nights	James Campbell
Pilot starboard ROV nights	Bryson Phillips
Pilot starboard ROV nights	Andrew Angus
Supervisor port ROV nights	Adrian Ackew
Pilots port ROV nights	Terry McFadden
Pilot port ROV nights	Cameron Bannochie
Other day port supervisor	Peter Moore
Other day starboard pilot	Chris Kordas
Other day starboard pilot	Sam Arrenberg

2. GEAR:

Magnum ROV x 2 (Magnum 156 is starboard (minimum 11), Magnum 155 is port)
Small Minimum vehicle (on starboard)
Deep-sea Systems Colour HD video camera x 2 (different models, one on port ROV is large one on starboard ROV is small)
Deep-sea Systems High Intensity Discharge (HID) lighting
Deep-sea Systems DPC8000 Stills camera
Panasonic DVCPro-HD deck on port camera and 8 x hard-disc array on the starboard
SERPENT Gear:

- Hand operated pump
- 16 x Core sampler tubes
- 8 x core sampler handles
- 6 x core sampler holders
- 2 x 2.5 l 37% Formaldehyde solution (MSDS sheets included)
- 1 litre bottle of inert “Luminophore” tracers (coloured sand)
- Metal core tube holding frame
- Personal protective equipment (glasses gloves)
- SERPENT “settlement frame” (plastic frame)
- Core processing equipment (scoop, plunger, plastic rings)
- Plastic sample bags
- Stationary
- DESS solution (MSDS sheets included)
- 15 x 1 litre sample bottles
- Plastic camera tripod
- Plastic buckets
- Time-lapse camera
- SNAPS
- RNAlater 3 x 500 ml bottles
- RBR datalogger

3. NARRATIVE:

Friday 20th February 2009

Flew out to rig on helicopter from Aberdeen. Arrived on the rig at around 10:00. Port ROV was down but had large tooling skid attached rendering it unsuitable for SERPENT work. Weather deteriorating so the rig was planning to de-couple from the BOP (separate the riser from the BOP to minimise damage resulting from ships heave). The port ROV was being used for this process. The starboard ROV had problems with the HD camera resulting from a previous power spike on the vessel. SERPENT equipment verified to be on board except equipment hand carried as freight.

Saturday 21st February 2009

Weather bad – swell about 5 m significant

Sunday 22nd February 2009

Weather bad – swell about 8 m significant. I located all SERPENT equipment in a container (number 6945) on port deck 5. The container holding the SERPENT equipment was inaccessible owing to other containers blocking the entrance. Crane movements limited owing to weather so could not access equipment. Spoke to logistics and barge operator to schedule crane movements. Starboard ROV had retermination of tether, improved situation but HD camera still faulty.

Monday 23rd February 2009

Weather had improved – swell about 3-4 m significant. Starboard ROV used to check connection on top of BOP and clean mating surfaces with large rotating brush. Cirrate octopods observed around BOP. Equipment hand carried to Asco arrived although they had removed spare lithium batteries. Set up datalogger and started logging at 30 second intervals from around 15:00. Crane operations progressed although equipment not accessible until night. Starboard ROV HD camera fixed in night shift.

Tuesday 24th February 2009

Weather ok, the equipment was located and accessible. HD camera fixed and working successfully. HID lighting set up. Datalogger installed on port side of ROV above ballast weights. ROV used for SERPENT dive #1, ROV off deck at 10:15. Cage at depth 1118m 10:52. From BOP 170 m 070° to ROV cage position. 11:10 ROV out of cage for **DIVE 1**. The ships position was 61°08.50N 03°40.46W. We got some good high definition footage of some of the seabed fauna – we managed to capture footage of some of the common fish (*Careproctus* sp., *Gaidropsarus argentatus* and *Lycodonus* sp.), an ophiuroid (brittlestar), pycnogonids (the sea spiders - *Colossendeis proboscea* and a *Nymphon* sp. with juveniles attached on its back), ascidian (sea squirt), stauromedusae (highly likely to be a new species), alcyonacean (soft coral), hydroid (also possibly a new species), anemone, hexactinellid sponge and a large demosponge. The pictures are good but we need to reposition the HD camera to get some closer pictures, many of the animals are pretty small and do not fill the screen. We have not yet managed to record the most photogenic animals – the cirrate octopus and the large arctic skate. The ROV suffered a fault at 13:33. A problem with the tether resulted in no video information being transferred up the tether. The ROV was retrieved with only partial video information.

Wednesday 25th February 2009

Tether was finished around 15:00 and weather picking up all day. I spent the morning assembling the coring apparatus. I also downloaded the data from the data logger. It was not possible to dive today so I made sure as much as possible was ready. I requested a container move to the deck next to the starboard ROV but this did not happen today. I spoke to David, the Fugro rep, who was out to service a seabed mounted ADCP. He showed me some of the data obtained from the last deployment. The seabed temperature was -0.75°C at a depth of 1163m. The current velocity was up to 0.78 m/s. The currents were tidally reversing with lower velocity NE currents and higher velocity SW currents. The current velocity was greater nearer the surface (although the shallowest data from this instrument was around 600 m). The person to contact for the release of these ADCP data is A.Stagg@geos.com at Fugro.

Thursday 26th February 2009

The weather was improving. I spent some of the morning optimising the setup of the coring equipment and attaching monkey's fists to the corers. Waiting for the weather to improve. I turned the datalogger on at around 15:30 in the hope of another dive today. The ROV was launched at 17:00 and the corers were all broken almost immediately as the ROV was deployed in the incorrect direction, the cores were smashed against the side of the boat removing all the handles and loosing them to sea. I remade the cores from the spares and additional pieces from the ROV equipment.

Friday 27th February 2009

Got out to the ROV at 6:00 as it was in the cage near the seafloor for **DIVE 2**. The ships position was 61°08.73N 03°40.23W. We started dive at 8:10 and carried out two long transects as they tested the tether, I recorded these although they may have sections where the seabed is not visible. We then sampled some seabed invertebrates, at 10:30 we stopped to core an ascidian collecting it at 11:00. At 11:15 we started to sample a giant hydroid (Branchiocerianthus sp.), it was in the core at 11:31 and the core was stowed by 11:37. At 12:02 we found a stauromedusae and collected it by 12:36. We brought the samples up to deck. In the meantime Peter Wolsey had arrived and I went to meet with him, the company men (Mike and Ronan), the OIM (Ian McBain) and Bruce Montgomery (the ROV chief superintendent) to discuss the progress. We then went outside and filmed the sample processing. The datalogger was on the ROV for this dive as well. We were still holding off the well, unattached to the BOP, much of the riser was pulled up and onto the vessel.

Saturday 28th February 2009

I went out to the ROV at 06:00 but found out that it would not be possible to launch the starboard ROV as there was a supply vessel alongside. We spent the day filming around the rig including a launch and recovery sequence of the port ROV. The started to run the LMRP (lowered marine riser package – the bit that fits onto the top of the BOP when they re-latch) this evening.

Sunday 1st March 2009

We met at the ROV at 08:00 after persuading the bargemaster to keep the supply vessel off the starboard bow for 3 hours. Pete filmed the launch of the ROV. The weather was good with 5 knot winds and 2.5 m seas. The ships position was 61°08.69N 03°40.23W. The ROV was off deck at 09:30 for our **DIVE 3** (Oceaneering dive 33). The ROV was out of the cage at 09:45 and on the seabed at 09:49. Pete was filming in the ROV shack. At 09:59 we saw a cirrate octopus swimming just above the seabed and recorded it in high definition – a really good shot including possible feeding activity on the seabed. 10:05 we saw a swarm of krill swimming above the seabed (part of one was captured in one of the core samples). At 10:27 we found the common pink anemone with twelve tentacles and captured it in a core sampler, it retracted very quickly into the sediment when it was disturbed by the core. It was captured by 10:45. At 10:49 we started to sample one of the large ophiuroids, it was in a characteristic position with the disc raised above the seabed supported by the arms. It was too large to get all the creature in so we had to remove part of the arms. The core with the ophiuroid in was stowed at 10:57. At 11:03 we found a pink soft coral on a small rock and managed to scrape it off and into a core tube by 11:15. At 11:17 we returned to the cage as the supply vessel had to come along the starboard side by 12. The ROV was raised, getting some good HD footage of the water getting lighter and the exit through the splash zone, the ROV was on deck by 12:00. I processed the core samples in the afternoon and we recorded some video around the vessel.

Monday 2nd March 2009

Pete Wolsey left the Stena Carron today on the morning helicopter. I prepared the ROV for a dive with SNAPS in the morning and put the time-lapse camera together in the afternoon. As they were coupling the LMRP to the BOP from around 10:00 am until 11:00pm there was no chance of ROV dives.

Tuesday 3rd March 2009

Got to the ROV just after 6:00 but they were having troubles on the wave gauge on the heave compensating unit, because everyone was unsure as to whether they would have to decouple again we were put on standby. As there was the potential for non SERPENT dives in the afternoon I removed the SNAPS equipment from the ROV. In the late morning the wave gauge seemed to be fixed and the ROV was put in the water to deploy the Fugro current meter this was done by 15:00. At this time the weather was worsening and it was decided not to deploy the ROV for subsequent dives.

Wednesday 4th March 2009

Very rough and windy sea conditions today, a 6 m heave meant that ROV operations were not possible.

Thursday 5th March 2009

Sea conditions improving throughout the day. The ship was still sitting away from the BOP. We managed to get a short dive in after lunch and before they began to prepare to relatch the LMRP with the BOP. The ROV was off deck for **Dive 4** at 13:30. The ships position was 61°08.784'N 003°38.877'W and the ship's heading was 190°. During the descent the plastic rectangular piece that had been used to keep the seal open had fallen out at about 500 m depth. At 14:00 the ROV cage was at depth.

14:05 ROV at seabed

14:10 Found Crossaster sea star sat on seabed next to it, tried to open SNAPS but the pressure made it difficult. I think this damaged the hinge, bending it slightly and not allowing a good seal to be made. SNAPS was opened and it was attempted to put the star inside, the star was picked up directly with the manipulator, the star fell out of the jaws and was washed away by the thrusters.

14:27 Another star was found

14:29 Star sampled and placed in SNAPS

14:32 Trying to close SNAPS

14:33 Bungee deployed

14:35 Plunger depressed

14:37 Grinding by turning handle

14:39 Found another star

14:43 Star successfully cored

14:45 Core stowed and bringing ROV to the surface

14:51 ROV in cage

15:25 ROV out of water

15:30 ROV on deck

15:38 Star in core preserved in RNAlater

15:42 Star in SNAPS preserved in new RNAlater

The RNAlater samples and the rest of the stars were frozen before 16:00. The LMRP relatching stopped any further dives today.

Friday 6th March 2009

Sea conditions good, ROV was required to monitor the BOP testing until 15:00. The ship was on the drill location. SERPENT **Dive 5** began at 15:00.We achieved three video transects, one approximately west, one south and one east. The fibre optic in the ROV parted at 19:30 and the ROV was recovered with no communications to the vehicle ready for another retermination of the fibre (the 4th in 2 weeks).

Saturday 7th March 2009

ROV was already in the water when the shift started for SERPENT **Dive 6** so I used the day to do some more video transects. Did transect at 340° then managed to obtain some high definition footage of the other ROV (Magnum 155) from our system (Magnum 158) at 08:57. Did transect at 300° making an interesting observation of the euryalid ophiuroid *Gorgonocephalus caputmedusae* at the end of the transect. Did partial transect to 225° but had to abandon as the current was going in this direction and the visibility was very poor. Completed a successful transect at 045° before bringing the ROV on deck, the plan was to deploy the amphipod trap and obtain some more faunal samples but this was not possible in the time as there was a problem with the winch.

Sunday 8th March 2009

ROV was on the surface. We spent the morning preparing the time-lapse camera for operation, I has some problems communicating with the serial links to both the digisnap time-lapse unit and the camera. The digisnap eventually worked on my computer but I had to use the ROV PC to communicate successfully with the camera. Eventually got it all working after lunch and launched ROV for **Dive 7** at 14:00. The time lapse was set on a 20 minute delay and 1 minute interval – it seemed to fire a number of test shots first. I put new O rings in both the camera and flash. We had weighted the time-lapse camera down by filling the legs with old nuts and bolts and trapping a block of lead to the rear leg. We attached the tripod to the front of the ROV with tie-wraps on the feet holding them onto the cage and the 5-funciton manipulator gripping a monkey's fist on the T handle. On the first deployment the tie wraps came loose and we had to retrieve the ROV with the tripod hanging from the 5 function, fortunately it held and we successfully retrieved and attached it better (but using the same method). The secret was to hold the tripod tight against the vehicle by raising the 5-function. It successfully launched the second time (off deck 14:10) and was in the water at 14:15. We made it to depth with no mishaps by 14:35 and were on the seabed at 14:47, the tie-wraps broke easily. We headed north from the BOP and dropped the time-lapse camera off about 10m east of the current meter, there was some rearranging of the tripod – including it falling over (pushed by the tether) – before we eventually left it at 15:24. We righted the current meter, which had turned on its side (presumably by the tether) and went to the cage to collect the amphipod trap, which was difficult as the cage was moving up and down with the heave of the vessel. We eventually released the amphipod trap at 15:36 and deployed it under the cage (it was 40m and 105° from the BOP) at 15:48. We sat on the seabed and watched the trap, seeing the first evidence on an amphipod at 16:03. The ROV was retrieved and brought up at 16:20.

Monday 9th March 2009

ROV was on the surface all day as a result of bad weather.

Tuesday 10th March 2009

ROV was about to dive at 6:30 but the cursor wire got entangled on the tugger winch. The ROV team had to repair the wire. Was no chance for any SERPENT work.

Wednesday 11th March 2009

Night ROV team had recovered the time-lapse camera but had broken the cable between the flash and the camera. The ROV was working for the drillers all day – installing Transponders until there was a problem with the fibre and the ROV went down. I spent the day dismantling the equipment, cleaning it, packing away and ensuring everything was in order. I also repaired the camera cable, cutting the 4 internal wires to different lengths, splicing and soldering,, then heat-shrink then using a couple of layers of scotch coat and self-amalgamating tape to seal it. I transferred the contents of the HD hard drives to a drive for the BBC and then ensured I had everything. I was booked on the helicopter tomorrow morning.

This was the best picture obtained by the time-lapse camera but also shows that the settings were optimal. It shows two typical fish the prominent *Careproctus* sp., the fish behind is the Arctic Rockling - *Gaidropsarus argentatus*

Thursday 12th March 2009

Left the Stena Carron at 11:00.

4. SAMPLES:

CODE STRUCTURE:

SC/260209/001#1
Stena Carron / Date / station number # replicate

SAMPLE STATIONS:

Station	Location	Sample type	Preservation
SC/270209/001#1	500+ m from the BOP	ROV video transect towards BOP	DVD
SC/270209/002#1	500+ m from the BOP	ROV video transect going 260°	DVD
SC/270209/003#1	500+ m from the BOP	Push core sediment	DESS
SC/270209/003#2	500+ m from the BOP	Ascidian	Formalin
SC/270209/003#3	500+ m from the BOP	Ascidian bodywall sample	RNA later
SC/270209/003#4	500+ m from the BOP	Ascidian bodywall sample	Frozen
SC/270209/004#1	500+ m from the BOP	Push core sediment	Frozen
SC/270209/004#2	500+ m from the BOP	Branchiocerianthus	Formalin
SC/270209/004#3	500+ m from the BOP	Branchiocerianthus tentacle	RNA later
SC/270209/004#4	500+ m from the BOP	Branchiocerianthus tentacle	Frozen
SC/270209/005#1	500+ m from the BOP	Push core sediment	Frozen
SC/270209/005#2	500+ m from the BOP	Push core sediment (small subsample)	DESS
SC/270209/005#3	500+ m from the BOP	Stauromedusae	Formalin
SC/270209/005#4	500+ m from the BOP	Stauromedusae arm tissue sample	RNA later
SC/270209/005#5	500+ m from the BOP	Stauromedusae tissue sample	Frozen
SC/010309/006#1	500+ m from the BOP	Sediment from core – top 5 cm	Formalin
SC/010309/006#2	500+ m from the BOP	Soft coral	Formalin
SC/010309/006#3	500+ m from the BOP	Soft coral polyp sample	Frozen
SC/010309/006#4	500+ m from the BOP	Soft coral polyp sample	RNA later
SC/010309/006#5	500+ m from the BOP	Amphipods (in epindorph in Ali box)	Formalin
SC/010309/007#1	500+ m from the BOP	Sediment from core top 5 cm	Formalin
SC/010309/007#2	500+ m from the BOP	Ophiuroid	Formalin
SC/010309/007#3	500+ m from the BOP	Ophiuroid arm section	Frozen
SC/010309/007#4	500+ m from the BOP	Ophiuroid arm section	RNA later
SC/010309/007#5	500+ m from the BOP	Krill eyes and head	RNA later
SC/010309/008#1	500+ m from the BOP	Pink anemone with 12 tentacles (anemone 4)	Formalin
SC/010309/008#2	500+ m from the BOP	Tentacle sample of anemone	Frozen
SC/010309/008#3	500+ m from the BOP	Tentacle sample of anemone	RNA later
SC/010309/008#4	500+ m from the BOP	Small hydroid on a rock	Formalin
SC/050309/009#1	500+ m from the BOP	Crossaster section from core sample	RNA later
SC/050309/009#2	500+ m from the BOP	Crossaster section from core sample	RNA later
SC/050309/009#3	500+ m from the BOP	Crossaster section from core sample	RNA later
SC/050309/009#4	500+ m from the BOP	Crossaster from core sample	Frozen
SC/050309/009#5	500+ m from the BOP	Water from core	Frozen
SC/050309/009#6	500+ m from the BOP	Sediment from core (top 5 cm)	Frozen
SC/050309/010#1	500+ m from the BOP	Crossaster section from SNAPS	RNA later
SC/050309/010#2	500+ m from the BOP	Crossaster section from SNAPS	RNA later
SC/050309/010#3	500+ m from the BOP	Crossaster section from SNAPS	RNA later
SC/050309/010#4	500+ m from the BOP	Crossaster from SNAPS	Frozen
SC/050309/010#5	500+ m from the BOP	SNAPS liquid sample	Frozen
SC/050309/010#6	500+ m from the BOP	SNAPS liquid sample	Frozen
SC/060309/011#1	From the BOP	Video transect at 240° from BOP	HD video
SC/060309/012#1	From the BOP	Video transect at 180° from BOP	HD video
SC/060309/013#1	From the BOP	Video transect at 90° from BOP	HD video
SC/060309/014#1	From the BOP	Video transect at 340° from BOP	HD video
SC/060309/015#1	From the BOP	Video transect at 300° from BOP	HD video

SC/060309/016#1	From the BOP	Partial video transect at 225° from BOP	HD video
SC/060309/017#1	From the BOP	Video transect at 45° from BOP	HD video
SC/110309/018#1	100m from the BOP	Time-lapse camera deployment	Memory card

5. GEAR REPORT

ROV Magnum 156:

The ROV was good and highly suitable for the job. There were a number of faults with this system, the HD camera broke regularly. The tether had numerous problems requiring 4 reterminations (one of which was a replacement) during my visit.

High definition camera:

Needs lots of light – the HID lighting was very good. This lighting tended to burn out the picture in the colour camera.

Push cores:

Push cores mounted onto the 6 core holder with thick tie wraps. Thin (5mm) floating rope used to make small monkey’s fists to ease core deployment. Core holder held in 5 function manipulator arm. All the cores were broken on the initial deployment and replaced with spares, a complete set of handles was not included so me made them out of large bolts.

RBR data logger:

The datalogger was very straightforward to use. No problems programming it and retrieving data using my laptop (windows XP – RBR software). Unfortunately we need to carry the datalogger with spare batteries but these must be declared before helicopter freight (including MSDS sheet). It may be possible to carry in normal luggage to the rig.

Time-lapse camera:

The time-lapse camera frame was put together with no problems. It needed additional weight (12kg in water in original configuration) so the legs were filled with old nuts and bolts which were held in by a bolt across the base of the leg. In addition a (approx 5 kg) lead block was attached to the rear leg. The camera was set-up which had a number of problems. The digisnap would not initially work on my computer but I eventually solved the problem ensuring that the serial port settings were the same on the device manager and real-term. I tried to get it to work in hyperterminal but although it would receive messages it would not send them. I also had troubles connecting to the camera over the serial port. These were solved by using the computer in the ROV shack (running XP too) where it all worked fine. I set the camera up according to the protocols I developed.

We attached the camera to the ROV using 5mm wide tie-wraps on the feet of the tripod connecting the camera to the cage and held a monkey's fist on a rope with the 5 function arm. The arm was initially closed with a tie-wrap and then the hydraulics were turned on shortly after entering the water. The 7-function was also used to hold the semi-circular metal handle. It was difficult to position the camera where wanted because by holding the camera it obscured the ROV video. It was also more difficult to fly the ROV as a result of the extra weight on the front.

Submarine Nucleic Acid Preservation System (SNAPS):

SNAPS was mounted in the jaws of the 5-function manipulator arm, a normal coring unit was mounted next to it to allow specimen capture and retrieval of the non preserved specimen. SNAPS was cleaned and a small weak plastic freezer bag (Tesco value) was placed inside, this was filled with RNA later – on the first deployment around 600 ml was used. This was slightly too much – a 500 ml bottle of RNA later would seem to be the correct amount. The bag was knotted carefully to minimise the amount of air trapped inside and all excess plastic was cut away. The lid of SNAPS was closed for deployment and the floating plastic rectangle on the closure bungee was placed in the seal to ensure that there was no pressure build up. The bungee was used to close the system.

This figure shows SNAPS with RNA later retained in a weak plastic freezer bag (left) and SNAPS in position ready for deployment (right) note the floating plastic rectangle in position keeping the seal open for deployment. The coring unit will be used to load SNAPS with an animal and retrieve samples un preserved.

When SNAPS was deployed it had been remounted on the ROV in a similar way to shown in the photographs except the chamber was rotated so that the bungee was the furthest thing away from the ROV and the handle opened towards the ROV. The first problem was that the plastic block used to hold the seal open fell out at around 500 m depth. The resulting pressure seal made it difficult to open at depth and probably caused the hinge to bend. The hinge was always the weak link in this design and would need to be considerably strengthened for smooth operation and potentially rough handling by the ROV. This may be better replaced by a disposable pin that can be pulled out on the seabed to operate the handle.

In an ideal world the chamber would have all functions operable from one side (bungee and handle opening/closing) if it is to be mounted on the 5-function as here or it is potentially difficult to see and or operate both functions of SNAPS. It is important to see whether the animal has landed in the chamber – this was done partially blind in the deployment here so it was slightly unclear if we had got it.

The bag holding the RNAlater into SNAPS worked quite well, it seemed to successfully retain the liquid to the seafloor and we did not have problems with the bag floating out of the chamber. The bag was easily burst by deploying the handle and crushing gear. The biggest problem was that the plastic bunches up at the base of the chamber and wraps around the crusher and cushions the animal reducing its effectiveness.

The handle worked well, we had no problems pushing it down, twisting it was a little difficult as it was problematic to line the arm exactly vertical to ensure even rotation. A strong handle and a slightly open ROV grip helped this.

The core sampler was slightly in the way for this deployment. Unlike the picture, the core was mounted on the inside, it would have been better if mounted on the outside of the 5-function as in the photographs. It was not a problem in this case but could have made the task more difficult than necessary.

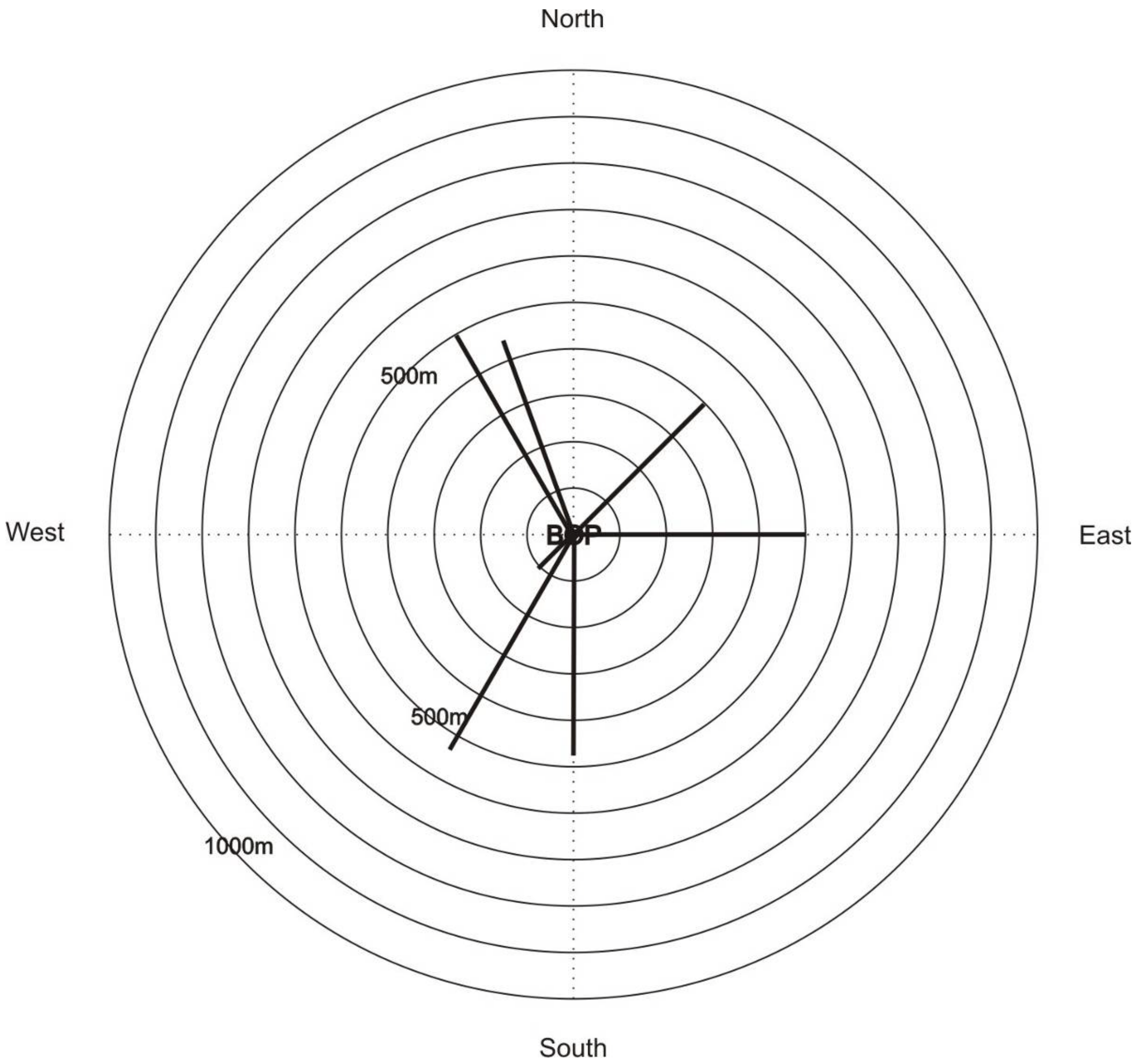
The bungee worked well, the addition by the ROV team of the bolt cable tied across the bungee to hold the loop open was very helpful. The 90 degree bolt was useful, not just for bungeeing, but also to provide another lever surface to open and close the chamber.

Freight through Asco freight management:

I had several troubles getting freight through Asco Freight Management. From what I have worked out from mine and Peter Wolsey's experiences, it is essential that you have the following printed out and with you: 1) an inventory of all the contents of the boxes – the more official it looks the better, this needs to say that the goods will not be exported. 2) MSDS sheets for everything that could possibly be dangerous – including all liquids and lithium batteries, 3) you need to ensure that Chevron logistics have sent a confirmation email to Asco that your freight will be coming – you should have a copy of this with you.

6. Transects

Video transects were carried out in high definition along the paths shown in the following diagram. Unfortunately positioning information for the ROV was not very accurate and distances were based on estimates from the amount of ROV tether paid out from the cage. We attempted to verify position with the ROV transponder, which was not accurate, and sonar, which could not pick up the BOP target at a grange greater than around 250 m.



7. Ecological highlights

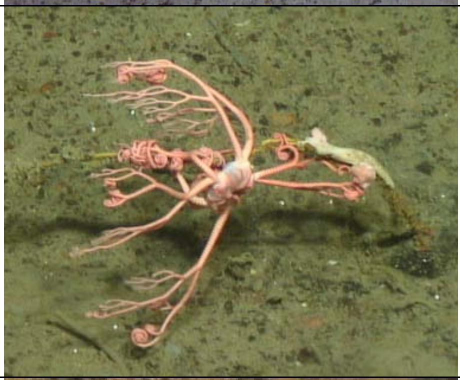
A total of 28 megafaunal taxa were observed living on or associated with the seabed at Rosebank North, with megafaunal representatives (i.e. those animals greater than 10 mm) from at least 8 phyla. There were almost certainly many additional fauna that were not possible to resolve, there was evidence for bryozoans, small hydroids, polychaetes, small or thin sponges, small asteroids and amphipods. A number of pelagic fauna were observed (but not possible to identify) near the seabed including ctenophores, chaetognaths, copepods, euphausids, pyrosomes and cephalopods (squid). The species complement was apparently very similar to that found at the nearby Rosebank site.

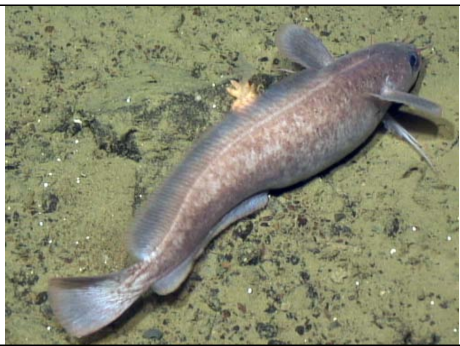
Table of all species found on this visit (only species found at Rosebank North). Note that the best picture of each taxon was used, with preference to those obtained on this visit. * indicates that better images are available from previous visits to this area. ** indicates a better image is available from the Norwegian Sea.

Phylum	Species	Notes	Picture
Porifera	Chamber sponge *Asconema setubalense*		
	Ball sponge		
	Chondrocladia gigantea	**	
	Stylocordyla borealis	*	

	Hexactinellid		
Cnidaria	12 tentacle anemone. Believed to be of the tribe Athenaria (Carlgren 1899)	*	
	Other anemone		
	Cerianthus sp. (possibly *Cerianthus voigti*)	*	
	Branchiocerianthus sp.		

	Alcyonacean	*	
	Lucernaria bathyphila		
Nemertea	*Nipponnemertes pulchra*		
Mollusca	*Colus* sp.	*	
	Benthoctopus sp.	*	
	Cirroteuthis sp.		
Arthropoda	*Colossendeis proboscea*		
	Nymphon sp.	*	

	Eurythenes gryllus	*	
Echinodermata	Large ophiuroid probably *Ophiopleura borealis*		
	Gorgonocephalus caputmedusae		
	Asteroid		
	Crossaster squamatus		

	Poliometra proxila		
Hemichordata	*Pelonaia* sp.		
Chordata	*Gaidropsarus argentatus*		
	Careproctus sp.		

	Lycodonus sp.		
	Amblyraja hyperborea, Arctic skate:	*	

Specimens Collected

Sample	Location	Organism	Preserved in RNAlater	Preserved in Formalin	Notes
SC/270209/003	500+ m from the BOP	Ascidian	Yes	Yes	Subsection frozen
SC/270209/004	500+ m from the BOP	Branchiocerianthus	Yes	Yes	Subsection frozen
SC/270209/005	500+ m from the BOP	Stauromedusae	Yes	Yes	Subsection frozen
SC/010309/006	500+ m from the BOP	Soft coral	Yes	Yes	Subsection frozen
SC/010309/006#5	500+ m from the BOP	Amphipod	No	Yes	Feeding on soft coral
SC/010309/007	500+ m from the BOP	Ophiuroid	Yes	Yes	Subsection frozen
SC/010309/007#5	500+ m from the BOP	Krill head with eyes	Yes	No	Found in water above core perhaps broken by coring
SC/010309/008	500+ m from the BOP	Pink anemone with 12 tentacles	Yes	Yes	Subsection frozen
SC/010309/008#4	500+ m from the BOP	Small hydroid on a rock	No	Yes	Found on a small 2 cm diameter rock on seabed
SC/050309/009	500+ m from the BOP	Crossaster from core	Yes	No	Frozen
SC/050309/009#5	500+ m from the BOP	Water from core	No	No	Frozen
SC/050309/009#6	500+ m from the BOP	Sediment from core (top 5 cm)	No	No	Frozen
SC/050309/010	500+ m from the BOP	Crossaster from SNAPS	Yes	No	Frozen (residual RNAlater from SNAPS)
SC/050309/010#5 & 6	500+ m from the BOP	SNAPS liquid sample	As found in SNAPS	No	Just collected extras for safety

Core Samples

Date	Time	Dive	Sample code	Sample location	Photograph	Sample notes	Sample retained
27/02/2009	10:30	2	SC/270209/003	500+ m from the BOP		Ascidian on medium pebble, removed first with seawater. All sediment preserved in DESS (top 3 cm)	Yes
27/02/2009	11:15	2	SC/270209/004	500+ m from the BOP		Hydroid on small pebble, removed first with seawater. All sediment frozen (top 3 cm)	Yes
27/02/2009	12:02	2	SC/270209/005	500+ m from the BOP		Stauromedusae either broken off sediment or had separated. It was removed. Half of top 3 cm sediment preserved in DESS other half preserved frozen	Yes
01/03/2009	11:10	3	SC/010309/006	500+ m from the BOP		Soft coral scraped off rock was on top of sediment	Yes

01/03/2009	10:54	3	SC/010309/007	500+ m from the BOP		Ophiuroid was on top of sediment surface	Yes
05/03/2009	14:45	4	SC/050309/009	500+ m from the BOP		Crossaster (undamamged) was on top of sediment – near a cobble. All sediment frozen (top 5cm)	Yes

Observations

Faunal Observations

Date	Time	Dive	location	Observation	Photo / video	Sample collected	Sample retained
24/2/2009	11:20	1	170 m 070° From BOP	Sponge	HD video	No	No
24/2/2009	11:27	1	170 m 070° From BOP	Hexactinellid sponge (1186 m depth)	HD video	No	No
24/2/2009	11:33	1	170 m 070° From BOP	anemone	Normal camera video	No	No
24/2/2009	11:42	1	170 m 070° From BOP	Arctic rockling	HD video	No	No
24/2/2009	11:44	1	170 m 070° From BOP	*Careproctus* sp	HD video	No	No
24/2/2009	11:52	1	170 m 070° From BOP	Colossendeis	HD video	No	No
24/2/2009	11:59	1	170 m 070° From BOP	Comatulid crinoid	HD video	No	No
24/2/2009	12:02	1	170 m 070° From BOP	Arctic rockling x 2	HD video	No	No
24/2/2009	13:05	1	170 m 070° From BOP	Chamber sponge	HD video	No	No
24/2/2009	13:06	1	170 m 070° From BOP	Alcyonaean and pycno	HD video	No	No
24/2/2009	13:07	1	170 m 070° From BOP	Ball sponge	Normal camera video	No	No
24/2/2009	13:12	1	170 m 070° From BOP	Sponge and *Nymphon* sp. pycnogonid with young on back	HD video and normal camera video	No	No
24/2/2009	13:18	1	170 m 070° From BOP	Ophiuroid and giant hydroid	HD video	No	No
24/2/2009	13:19	1	170 m 070° From BOP	Ophiuroid moving	HD video	No	No
24/2/2009	13:27	1	170 m 070° From BOP	Ascidian (1187m)	HD video	No	No
24/2/2009	13:31	1	170 m 070° From BOP	Lycodonus	HD video	No	No
24/2/2009	13:33	1	170 m 070° From BOP	Stauromedusae	HD video	No	No
27/02/2009	10:31	2	500+ m from BOP	Capture of ascidian	Normal camera video	Yes	Yes
27/02/2009	11:08	2	500+ m from BOP	Capture of giant hydroid	Normal camera video	Yes	Yes
27/02/2009	12:03	2	500+ m from BOP	Stauromedusae	Normal camera video	Yes	Yes
27/02/2009	12:13	2	500+ m from BOP	Capture of stauromedusae	Normal camera video	Yes	Yes

01/03/2009	09:59	3	500+ m from BOP	Cirrate octopus	HD video	No	No
01/03/2009	10:45	3	500+ m from BOP	Anemone	HD video	Yes	yes
01/03/2009	10:54	3	500+ m from BOP	Ophiuroid	HD video	Yes	yes
01/03/2009	11:10		500+ m from BOP	Soft coral	HD video	Yes	yes
01/03/2009	11:50		500+ m from BOP	Light changing from 200 m and exit through splash zone	HD video	N/A	N/A

Video Transects

VIDEO TRANSECTS

Date	Time	Dive	Sample	Notes	Observation
27/2/2009	8:15	2	SC/270209/001#1	500+ m from the BOP	ROV video transect towards BOP
27/2/2009	8:44	2	SC/270209/002#1	500+ m from the BOP start from under cage	ROV video transect going 260°
27/2/2009	8:47:00	2	SC/270209/002#1	72 m from cage	
27/2/2009	8:52:04	2	SC/270209/002#1	134 m from cage	
27/2/2009	8:53:51	2	SC/270209/002#1	168 m from cage	
27/2/2009	8:54:30	2	SC/270209/002#1	172 m from cage	
27/2/2009	8:55:19	2	SC/270209/002#1	192 m from cage	
27/2/2009	8:55:42	2	SC/270209/002#1	203 m from cage	
27/2/2009	8:56:30	2	SC/270209/002#1	221 m from cage	These distances are inaccurate an almost certainly an underestimation of true distance – the tether was 600 m long and about 20 m was left on the drum at the end of the transect so would need to make conversion factor from these distances (based on tether out meter)
06/03/2009	15:24:05	5	SC/060309/011#1	at BOP (0m)	Video transect at 240° from BOP
06/03/2009	15:24:35	5	SC/060309/011#1	Turning to 270 degrees	Ended up 240° despite start at 270°
06/03/2009	15:24:56	5	SC/060309/011#1	Start transect (0m)	
06/03/2009	15:26:26	5	SC/060309/011#1	6	
06/03/2009	15:27:05	5	SC/060309/011#1	10	
06/03/2009	15:27:44	5	SC/060309/011#1	16	
06/03/2009	15:28:58	5	SC/060309/011#1	20	
06/03/2009	15:29:33	5	SC/060309/011#1	25	
06/03/2009	15:30:07	5	SC/060309/011#1	30	
06/03/2009	15:30:40	5	SC/060309/011#1	35	
06/03/2009	15:31:36	5	SC/060309/011#1	40	
06/03/2009	15:32:29	5	SC/060309/011#1	48	
06/03/2009	15:32:47	5	SC/060309/011#1	50	

06/03/2009	15:33:22	5	SC/060309/011#1	55	
06/03/2009	15:34:12	5	SC/060309/011#1	60	
06/03/2009	15:35:03	5	SC/060309/011#1	67	
06/03/2009	15:35:45	5	SC/060309/011#1	70	
06/03/2009	15:36:03	5	SC/060309/011#1	75	
06/03/2009	15:37:26	5	SC/060309/011#1	80	
06/03/2009	15:38:22	5	SC/060309/011#1	85	
06/03/2009	15:39:49	5	SC/060309/011#1	90	
06/03/2009	15:40:48	5	SC/060309/011#1	95	
06/03/2009	15:41:50	5	SC/060309/011#1	100	
06/03/2009	15:43:17	5	SC/060309/011#1	105	
06/03/2009	15:44:05	5	SC/060309/011#1	110	
06/03/2009	15:44:42	5	SC/060309/011#1	115	
06/03/2009	15:46:28	5	SC/060309/011#1	120	
06/03/2009	15:46:31	5	SC/060309/011#1	125	
06/03/2009	15:47:42	5	SC/060309/011#1	134	
06/03/2009	15:47:55	5	SC/060309/011#1	140	
06/03/2009	15:48:02	5	SC/060309/011#1	145	
06/03/2009	15:49:25	5	SC/060309/011#1	150	
06/03/2009	15:50:18	5	SC/060309/011#1	158	
06/03/2009	15:50:30	5	SC/060309/011#1	160	
06/03/2009	15:53:53	5	SC/060309/011#1	165	
06/03/2009	15:55:06	5	SC/060309/011#1	170	
06/03/2009	15:56:09	5	SC/060309/011#1	175	
06/03/2009	15:56:56	5	SC/060309/011#1	180	
06/03/2009	15:57:16	5	SC/060309/011#1	185	
06/03/2009	15:57:48	5	SC/060309/011#1	190	
06/03/2009	15:58:27	5	SC/060309/011#1	185	
06/03/2009	15:59:23	5	SC/060309/011#1	200	Transponder interrogated and suggested 230 m at 178° from BOP probably incorrect. Tether left on the drum would suggest we were 530 m from cage. Cage is close to BOP.
06/03/2009	16:45:49	5	SC/060309/012#1	0m from BOP	Start transect going south from BOP
06/03/2009	16:46:35	5	SC/060309/012#1	5	
06/03/2009	16:47:04	5	SC/060309/012#1	10	
06/03/2009	16:48:14	5	SC/060309/012#1	17	
06/03/2009	16:48:44	5	SC/060309/012#1	20	
06/03/2009	16:49:48	5	SC/060309/012#1	25	
06/03/2009	16:50:32	5	SC/060309/012#1	30	
06/03/2009	16:51:07	5	SC/060309/012#1	35	
06/03/2009	16:51:45	5	SC/060309/012#1	40	
06/03/2009	16:52:50	5	SC/060309/012#1	45	
06/03/2009	16:53:12	5	SC/060309/012#1	50	

06/03/2009	16:53:36	5	SC/060309/012#1	55	
06/03/2009	16:54:00	5	SC/060309/012#1	60	
06/03/2009	16:54:50	5	SC/060309/012#1	65	
06/03/2009	16:55:12	5	SC/060309/012#1	70	
06/03/2009	16:55:44	5	SC/060309/012#1	75	
06/03/2009	16:56:18	5	SC/060309/012#1	80	
06/03/2009	16:56:55	5	SC/060309/012#1	85	
06/03/2009	16:57:31	5	SC/060309/012#1	90	
06/03/2009	16:58:18	5	SC/060309/012#1	95	
06/03/2009	16:58:54	5	SC/060309/012#1	100	
06/03/2009	16:59:24	5	SC/060309/012#1	105	
06/03/2009	16:59:54	5	SC/060309/012#1	110	
06/03/2009	17:00:20	5	SC/060309/012#1	115	
06/03/2009	17:00:57	5	SC/060309/012#1	120	
06/03/2009	17:01:23	5	SC/060309/012#1	125	
06/03/2009	17:01:48	5	SC/060309/012#1	130	
06/03/2009	17:02:20	5	SC/060309/012#1	135	
06/03/2009	17:02:59	5	SC/060309/012#1	140	
06/03/2009	17:03:26	5	SC/060309/012#1	145	
06/03/2009	17:04:07	5	SC/060309/012#1	150	
06/03/2009	17:04:37	5	SC/060309/012#1	155	
06/03/2009	17:05:19	5	SC/060309/012#1	160	
06/03/2009	17:05:55	5	SC/060309/012#1	165	
06/03/2009	17:06:45	5	SC/060309/012#1	170	
06/03/2009	17:07:23	5	SC/060309/012#1	175	
06/03/2009	17:07:55	5	SC/060309/012#1	180	
06/03/2009	17:08:34	5	SC/060309/012#1	185	
06/03/2009	17:09:30	5	SC/060309/012#1	190	
06/03/2009	17:09:55	5	SC/060309/012#1	195	
06/03/2009	17:10:30	5	SC/060309/012#1	200	
06/03/2009	17:11:10	5	SC/060309/012#1	205	
06/03/2009	17:11:56	5	SC/060309/012#1	210	
06/03/2009	17:12:23	5	SC/060309/012#1	215	
06/03/2009	17:13:10	5	SC/060309/012#1	220	
06/03/2009	17:13:39	5	SC/060309/012#1	225	
06/03/2009	17:14:21	5	SC/060309/012#1	230	Interrogate beacon suggests 116° 196 m from BOP. Tether on drum would indicate we are 470m away from the cage.
06/03/2009	18:38:50	5	SC/060309/013#1	0	Start transect going 90° from BOP
06/03/2009	18:40:13	5	SC/060309/013#1	5	
06/03/2009	18:42:02	5	SC/060309/013#1	10	
06/03/2009	18:44:59	5	SC/060309/013#1	21	
06/03/2009	18:46:11	5	SC/060309/013#1	26	
06/03/2009	18:47:01	5	SC/060309/013#1	30	
06/03/2009	18:48:00	5	SC/060309/013#1	35	

06/03/2009	18:48:55	5	SC/060309/013#1	40	
06/03/2009	18:49:23	5	SC/060309/013#1	45	
06/03/2009	18:50:27	5	SC/060309/013#1	51	
06/03/2009	18:51:09	5	SC/060309/013#1	55	
06/03/2009	18:52:01	5	SC/060309/013#1	60	
06/03/2009	18:52:49	5	SC/060309/013#1	65	
06/03/2009	18:53:33	5	SC/060309/013#1	70	
06/03/2009	18:55:07	5	SC/060309/013#1	75	
06/03/2009	18:56:20	5	SC/060309/013#1	80	
06/03/2009	18:58:33	5	SC/060309/013#1	85	
06/03/2009	18:59:55	5	SC/060309/013#1	90	
06/03/2009	19:00:55	5	SC/060309/013#1	100	
06/03/2009	19:02:36	5	SC/060309/013#1	112	
06/03/2009	19:02:52	5	SC/060309/013#1	115	
06/03/2009	19:03:21	5	SC/060309/013#1	120	
06/03/2009	19:04:19	5	SC/060309/013#1	125	
06/03/2009	19:05:39	5	SC/060309/013#1	130	
06/03/2009	19:08:15	5	SC/060309/013#1	135	
06/03/2009	19:08:59	5	SC/060309/013#1	140	
06/03/2009	19:09:53	5	SC/060309/013#1	145	
06/03/2009	19:11:03	5	SC/060309/013#1	154	
06/03/2009	19:11:48	5	SC/060309/013#1	160	
06/03/2009	19:13:54	5	SC/060309/013#1	170	
06/03/2009	19:15:00	5	SC/060309/013#1	175	
06/03/2009	19:15:56	5	SC/060309/013#1	180	
06/03/2009	19:16:57	5	SC/060309/013#1	185	
06/03/2009	19:17:34	5	SC/060309/013#1	190	
06/03/2009	19:18:08	5	SC/060309/013#1	195	
06/03/2009	19:20:24	5	SC/060309/013#1	200	
07/03/09	07:31:42	6	SC/070309/014#1		Start video at BOP (0m) but cage is in same direction as transect. Distance minus at first
07/03/09	07:39:08	6	SC/070309/014#1		Distance back to 0 and going up
07/03/09	07:40:35	6	SC/070309/014#1	10	
07/03/09	07:41:09	6	SC/070309/014#1	15	
07/03/09	07:41:54	6	SC/070309/014#1	20	
07/03/09	07:44:18	6	SC/070309/014#1	25	
07/03/09	07:47:28	6	SC/070309/014#1	30	
07/03/09	07:48:53	6	SC/070309/014#1	50	
07/03/09	07:48:02	6	SC/070309/014#1	55	
07/03/09	07:49:16	6	SC/070309/014#1	60	
07/03/09	07:49:36	6	SC/070309/014#1	65	
07/03/09	07:49:52	6	SC/070309/014#1	70	
07/03/09	07:50:59	6	SC/070309/014#1	75	
07/03/09	07:52:27	6	SC/070309/014#1	80	
07/03/09	07:53:32	6	SC/070309/014#1	85	
07/03/09	07:53:45	6	SC/070309/014#1	90	
07/03/09	07:54:45	6	SC/070309/014#1	95	

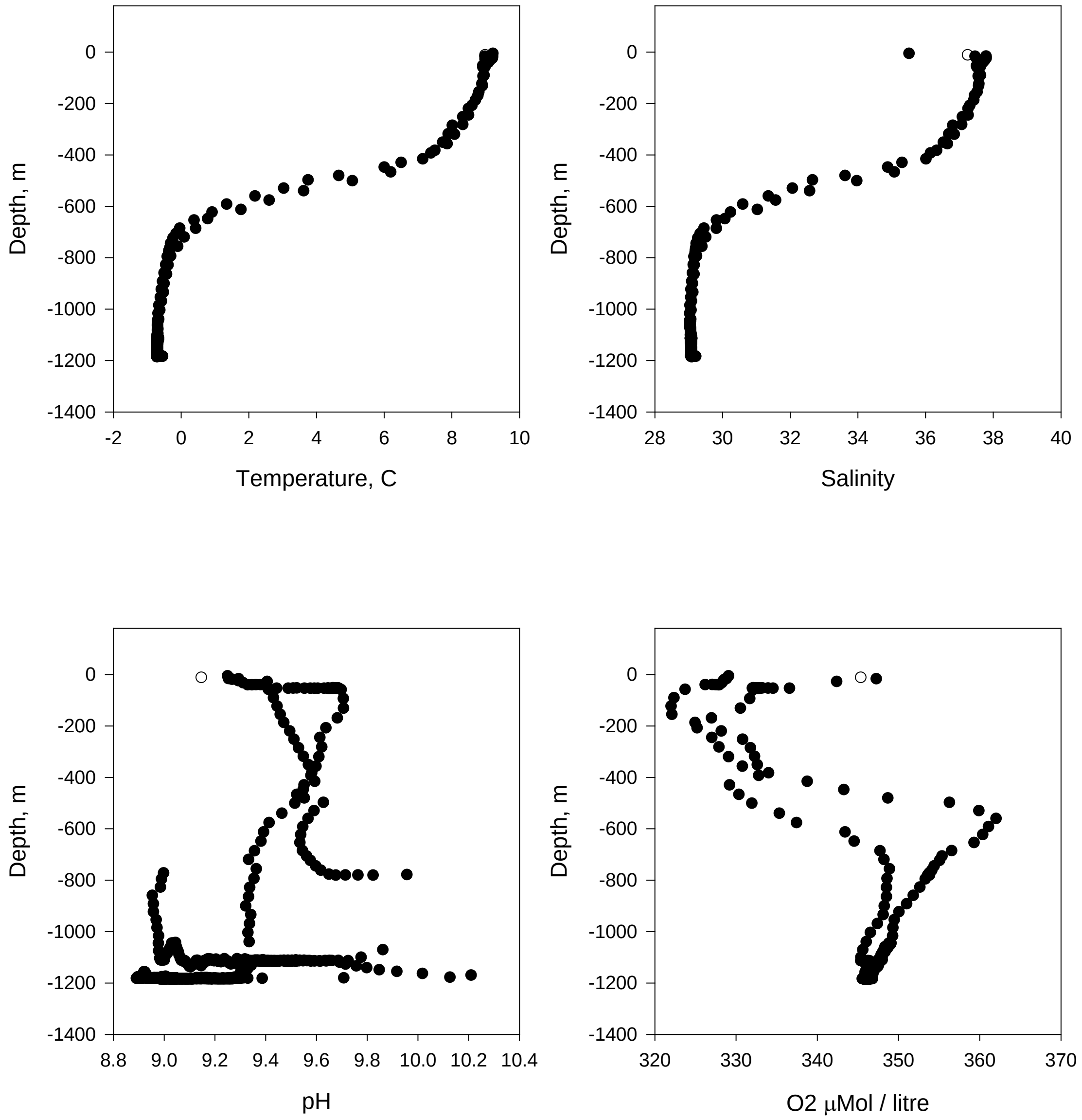
07/03/09	07:55:32	6	SC/070309/014#1	100	
07/03/09	07:55:53	6	SC/070309/014#1	105	
07/03/09	07:57:10	6	SC/070309/014#1	115	
07/03/09	07:59:04	6	SC/070309/014#1	120	
07/03/09	07:59:57	6	SC/070309/014#1	125	
07/03/09	08:00:30	6	SC/070309/014#1	130	
07/03/09	08:00:53	6	SC/070309/014#1	135	
07/03/09	08:01:07	6	SC/070309/014#1	140	
07/03/09	08:01:25	6	SC/070309/014#1	145	
07/03/09	08:01:46	6	SC/070309/014#1	150	
07/03/09	08:02:05	6	SC/070309/014#1	155	
07/03/09	08:02:27	6	SC/070309/014#1	160	
07/03/09	08:02:45	6	SC/070309/014#1	165	
07/03/09	08:03:05	6	SC/070309/014#1	170	
07/03/09	08:03:18	6	SC/070309/014#1	175	End of transect. No beacon reception. 400 m in total of tether + cage distance would suggest a 450 m long transect.
07/03/09	10:47:21	6	SC/070309/015#1	0	Starting transect 300° from BOP
07/03/09	10:48:58	6	SC/070309/015#1	-1	
07/03/09	10:50:33	6	SC/070309/015#1	-4	
07/03/09	10:53:01	6	SC/070309/015#1	-5	
07/03/09	10:57:07	6	SC/070309/015#1	-5	Starting to pay tether out now
07/03/09	11:00:32	6	SC/070309/015#1	0	
07/03/09	11:01:45	6	SC/070309/015#1	5	
07/03/09	11:02:00	6	SC/070309/015#1	10	
07/03/09	11:03:03	6	SC/070309/015#1	15	
07/03/09	11:03:58	6	SC/070309/015#1	20	
07/03/09	11:04:00	6	SC/070309/015#1	25	
07/03/09	11:05:22	6	SC/070309/015#1	30	
07/03/09	11:06:10	6	SC/070309/015#1	35	
07/03/09	11:08:07	6	SC/070309/015#1	40	
07/03/09	11:08:59	6	SC/070309/015#1	45	
07/03/09	11:09:18	6	SC/070309/015#1	50	
07/03/09	11:09:42	6	SC/070309/015#1	55	
07/03/09	11:10:07	6	SC/070309/015#1	60	
07/03/09	11:10:40	6	SC/070309/015#1	65	
07/03/09	11:11:19	6	SC/070309/015#1	70	
07/03/09	11:11:36	6	SC/070309/015#1	75	
07/03/09	11:11:59	6	SC/070309/015#1	80	
07/03/09	11:13:22	6	SC/070309/015#1	85	
07/03/09	11:13:44	6	SC/070309/015#1	90	
07/03/09	11:14:06	6	SC/070309/015#1	95	
07/03/09	11:14:26	6	SC/070309/015#1	100	
07/03/09	11:14:46	6	SC/070309/015#1	105	
07/03/09	11:15:12	6	SC/070309/015#1	110	

07/03/09	11:15:49	6	SC/070309/015#1	115	
07/03/09	11:16:08	6	SC/070309/015#1	120	
07/03/09	11:16:40	6	SC/070309/015#1	125	
07/03/09	11:17:02	6	SC/070309/015#1	130	
07/03/09	11:17:25	6	SC/070309/015#1	135	
07/03/09	11:17:47	6	SC/070309/015#1	140	
07/03/09	11:18:17	6	SC/070309/015#1	145	
07/03/09	11:18:38	6	SC/070309/015#1	150	
07/03/09	11:19:02	6	SC/070309/015#1	155	
07/03/09	13:12:32	6	SC/070309/016#1	0	
07/03/09	13:15:45	6	SC/070309/016#1	-6	
07/03/09	13:18:38	6	SC/070309/016#1	-13	
07/03/09	13:19:41	6	SC/070309/016#1	-11	
07/03/09	13:22:55	6	SC/070309/016#1	-7	
07/03/09	13:23:00	6	SC/070309/016#1	-5	
07/03/09	13:23:35	6	SC/070309/016#1	0	
07/03/09	13:24:40	6	SC/070309/016#1	5	
07/03/09	13:25:09	6	SC/070309/016#1	10	
07/03/09	13:25:52	6	SC/070309/016#1	15	
07/03/09	13:26:42	6	SC/070309/016#1	20	
07/03/09	13:27:20	6	SC/070309/016#1	25	
07/03/09	13:28:02	6	SC/070309/016#1	30	
07/03/09	13:28:37	6	SC/070309/016#1	35	Transect abandoned
07/03/09	13:56:22	6	SC/070309/017#1	0	Start transect at BOP heading 45°
07/03/09	13:57:57	6	SC/070309/017#1	5	Cage is behind so tether out should not need adjustment – apart from length conversion
07/03/09	13:59:08	6	SC/070309/017#1	10	
07/03/09	13:59:53	6	SC/070309/017#1	15	
07/03/09	14:01:02	6	SC/070309/017#1	20	
07/03/09	14:02:28	6	SC/070309/017#1	25	
07/03/09	14:03:28	6	SC/070309/017#1	30	
07/03/09	14:04:31	6	SC/070309/017#1	35	
07/03/09	14:05:20	6	SC/070309/017#1	40	
07/03/09	14:06:01	6	SC/070309/017#1	45	
07/03/09	14:07:00	6	SC/070309/017#1	50	
07/03/09	14:08:01	6	SC/070309/017#1	55	
07/03/09	14:08:34	6	SC/070309/017#1	60	
07/03/09	14:09:07	6	SC/070309/017#1	65	
07/03/09	14:09:40	6	SC/070309/017#1	70	
07/03/09	14:10:20	6	SC/070309/017#1	75	
07/03/09	14:10:59	6	SC/070309/017#1	70	
07/03/09	14:11:38	6	SC/070309/017#1	85	
07/03/09	14:12:11	6	SC/070309/017#1	90	
07/03/09	14:12:49	6	SC/070309/017#1	95	
07/03/09	14:13:23	6	SC/070309/017#1	100	

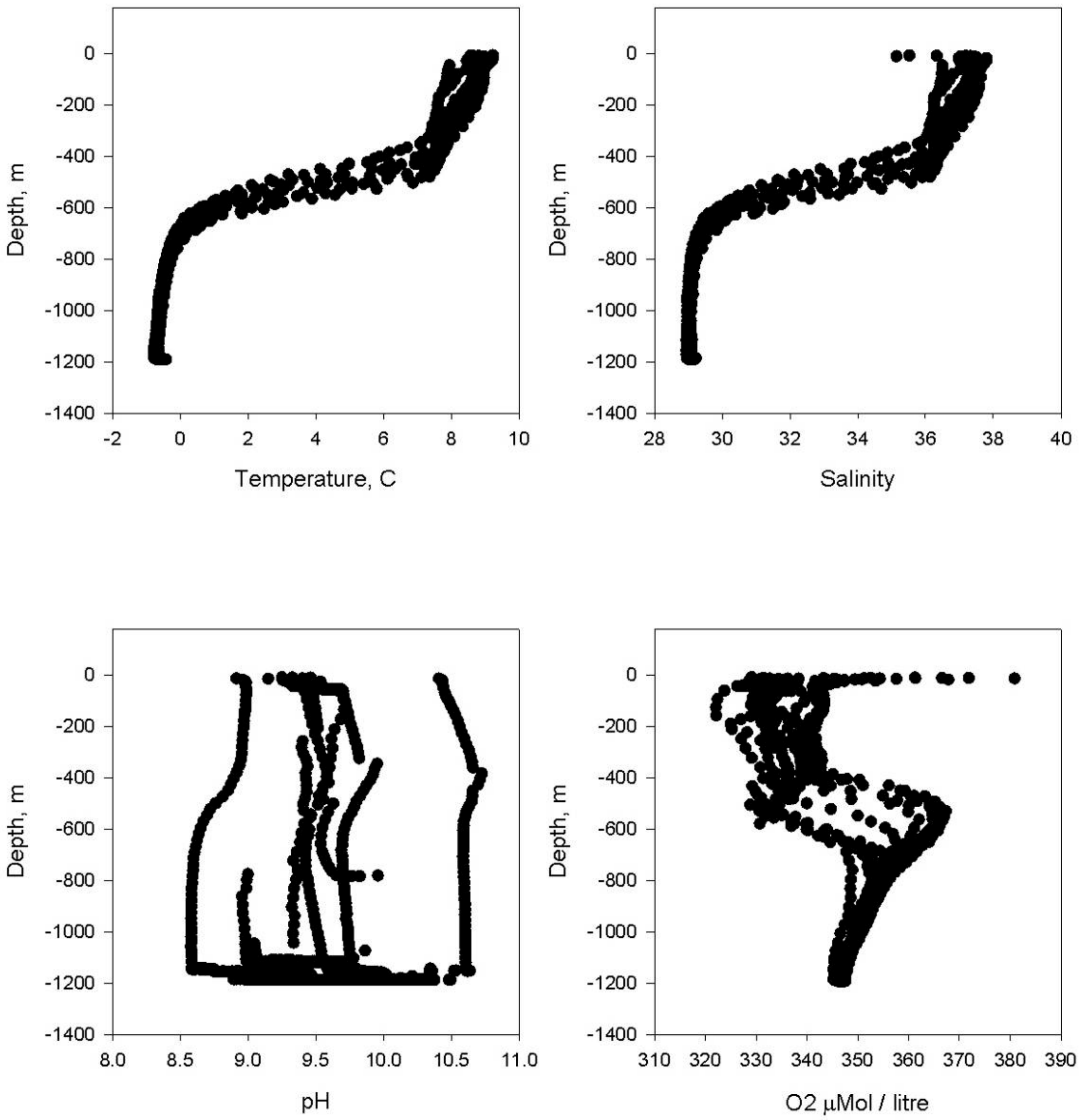
07/03/09	14:14:00	6	SC/070309/017#1	105	
07/03/09	14:14:25	6	SC/070309/017#1	110	
07/03/09	14:14:54	6	SC/070309/017#1	115	
07/03/09	14:15:29	6	SC/070309/017#1	120	
07/03/09	14:16:10	6	SC/070309/017#1	125	
07/03/09	14:16:37	6	SC/070309/017#1	130	
07/03/09	14:17:11	6	SC/070309/017#1	135	
07/03/09	14:17:34	6	SC/070309/017#1	140	
07/03/09	14:18:01	6	SC/070309/017#1	145	
07/03/09	14:18:30	6	SC/070309/017#1	150	
07/03/09	14:19:12	6	SC/070309/017#1	155	
07/03/09	14:19:59	6	SC/070309/017#1	160	
07/03/09	14:20:25	6	SC/070309/017#1	165	
07/03/09	14:21:02	6	SC/070309/017#1	170	Finish transect

Physical data

February 24th 2009



All deployments



pH data calibration is incorrect and sensor was broken so not possible to re-calibrate. There are certainly errors in the pH data but it is presented here for relative changes.

MISSIONS 66 & 69

LEIV EIRIKSSON, GRO 6603, NORWEGIAN SEA

CHRISTOPHER ROTERMAN

1. GENERAL INFORMATION:

Well: GRO 6603
Project partner: Norske Shell
Rig: *Leiv Eiriksson*
Rig operator: Ocean Rig
ROV operator: Oceaneering
SERPENT representative: Christopher Roterman

Position:03º56'24.44" E
66 08'52.92" N

Water depth: 1380 m
Water Temperature: Approximately -1ºC

ROV team:

Visit 1	Supervisor	Ronny Guttormsen
	Pilot	Odd Magne Sviland
	Pilot	Pål Althammer
Visit 2	Supervisor	Johan Ørevik, Odd Magne Sviland
	Pilot	Frank Ove stenberg
	Pilot	Thomas Vestnes

2. GEAR:

SERPENT ROV push cores
RBR Data LoggerSpecimen container
Magnum 105 work class ROV

3. NARRATIVE:

1ST VISIT

Thursday 30th April 2009 to morning of Friday 1st May 2009

Flew out to Leiv Eiriksson on helicopter from Kristiansund heliport at 1730 CET and arrived on the rig at 1915. Met the ROV crew (who were working night shifts) at 2200 after the safety induction.

Inspected both ROVs; the port ROV and the primary ROV situated next to the moon pool. Both ROVs lacked a stills camera and the only HD camera, attached to the port ROV, had a fault with its control system. It was therefore agreed in discussion with the ROV supervisor that the primary ROV would be the vehicle of choice for SERPENT operations. The 3 SERPENT equipment boxes that had been sent over a year ago were located in a storage room adjacent to the main ROV shack. All equipment within was verified as present and intact. The box containing a six-corer metal holster rack, along with a cooler box for frozen samples and some DNA preservative which had been sent 2 weeks previously, was nowhere to be seen. In the contingency that this box was delayed in arriving, a small rack of scaffolding – designed as a corral for sediment experiments was chosen as a backup for the corer rack. The rest of the shift was spent assembling the coring tubes and organising the equipment in the 3 boxes that were aboard.

1900, Friday 1st May 2009 to 0700, Saturday 2nd May

Started night shift at 1900 and was informed by the ROV supervisor (Ronny) that the significant wave height was below the 4 m operational limit and was expected to stay so for another 9 hours. It was therefore decided that we would attempt the video transect survey at 2000, after the safety meeting. There was still no sign of the missing package but the logistics coordinator was looking in to it. Commenced **Dive 1** at 2020, with the ROV cage reaching a 1349 m depth at 2100. The Bullseye report was completed at 2118 and the current at the seafloor was estimated to be around 5 kts in a SW direction.

North transect:

Commenced at 2125 at the BOP. Notable fauna seen as the ROV moved out to 100 m N of the BOP were ophiuroids, asteroids, cerianthid anemones, some amphipods, a sabellid polychaete worm and a skate. Numerous small (2-4 cm diameter) burrows were visible in the sediment and likely to be evidence of a burrowing amphipod of the genus Neohela. Interestingly, a small (< 1 cm length), pale amphipod was seen clinging to the head end of the polychaete worm. The transect ended at 2158, ~ 100 m N of BOP.

South transect:

Commenced at 2214 at the BOP. Owing to the SW moving current, the ROV did cause the suspension of some sediment when moving out from the BOP, which reduced the quality of the video footage. Never the less, mega fauna were still visible. In spite of the ROV pilot (Odd Magne) attempting to compensate for the current, the ROV was moving on heading of ~ 200° rather than 180°. Notable fauna other than the more common sabellid tube worm 110 m from the BOP. Highlight of the transect survey was the discovery of a curious polygonal pillow formation on the clay at 50 m and a bearing of 200° from the BOP. The ‘bumps’ were often hexagonal with an estimated diameter of 10-20 cm and a raised height of 2-5 cm. As the ROV passed over this region, there were also clumps over 1 m^2 of what appeared to be gelatinous organic material of unknown origin. Transect ended at 2234, 110 m from the BOP.

East transect:

Transect began at 2240 and ended at 2306, 100 m and 94° from the BOP. Notable fauna seen were a zoarcid and a sabellid tubeworm with another small amphipod attached near the head end.

West transect:

Commenced at 2313 at the BOP and ended at 2331, 110 m and 284° from the BOP. Encountered the curious polygonal patterns again about 60 m from the BOP.

North-East transect:

Commenced at 2344 at the BOP and ended at 0019 100 m and 47° from the BOP. Notable fauna seen included two zoarcids, several scavenging amphipods and a possible hemichordate enteropneust with a head end that almost appeared to be florescent.

North-West transect:

Started at 0134 at the BOP and ended 100 m, 328° from the BOP at 0219. Notable fauna seen were sabellid tube worms, all hosting the small amphipods and many brittlestars of varying sizes.

South-West transect:

Started at 0225 at the BOP and ended at 0238, 103 m and 215° from the BOP. Curious gelatinous mats were seen about 90 m from the BOP. ROV thrusters were destabilising the sediment, which reduced visibility and therefore, a second SW transect was executed; this time moving up current toward the BOP.

2nd South-West transect, moving towards BOP:

Started at 0245, 116 m and 220° from the BOP. At around 95 m to 85 m from the BOP large (> 2 m^2) mats of gelatinous material around 1-2 cm thick was recorded. The material was distorted by the current and appeared opaque and colourless, with a light dusting of sediment on top. There was no evidence of any increased abundance of other fauna associated with this material. A suspected amphipod burrow was closed examined and a borrowing amphipod most likely of the Neohela genus was recorded partially hidden within the burrow.

South-East transect, moving towards BOP:

Started at 0326, 126 m and 145° from BOP. Notable fauna seen were 3 cerianthid anemones and an orange pycnogonid (sea spider) as well as the more common ophuiroids and asteroids.

At 0442, the ROV was back in the cage and at 0458 the ROV was back on the Leiv eiriksson, signifying the end of **Dive 1**.

1900 hrs, Saturday 2nd of May to 0700 hrs, Sunday 3rd of May

Seas were well over the 4 m operational limit, so diving was not possible for this shift. The time was used to construct the scavenger traps and to build the new rack that would house the coring tubes on the ROV. By 0300, a rack that could house 8 coring tubes was constructed that could be attached to the 5-function arm of the ROV and two traps designed to catch amphipods and ophiuroids had been assembled. The rest of the time was used for preliminary analysis of the transect footage from the previous day.

1900 hrs, Sunday 3rd of May to 0700 hrs, Monday 4th of May

Seas were still around 5 m, therefore no dive possible. Utilised the time by making adjustments to the coring rack so that it would properly fit on the 5-function arm and editing the ROV transect footage into highlights of different fauna encountered. These highlights as well as some preliminary stills taken form the video footage were given to the night shift company man.

1900 hrs, Monday 4th of May to 0700 hrs, Tuesday 5th of May

Seas were down to 3 m allowing a dive before midnight. This was the first coring dive. The rack was attached to the 5-function arm and a scavenger trap was fixed with a weakened tie wrap to the rack. **Dive 2** started at 1959 when the ROV touched the water. At 2050 the ROV left the cage at 1351 m depth. The current was now from the east and with reports from the ROV crew that the current had in the past come from the west as well, it was decided that all cores would be taken at distances north of the BOP. At 2053, the trap was laid on the seafloor next to the west marker buoy, roughly 35 m from the BOP. Coring commenced at 2101 25 m north of the BOP. At 2155, coring was aborted as the coring rack's attachments to the 5-function arm were compromised. The ROV was back on the rig at 2248. Three mud cores were successfully retrieved from the seabed, which were sectioned, sealed and frozen. After midnight the seas picked up to over 4 m and further diving was not possible. Remaining shift time was spent servicing the core tube components and examining the corer rack to make improvements.

1900 hrs, Tuesday 5th of May to 0700 hrs, Wednesday 6th of May

It was decided that the coring rack used in **Dive 2** would be more securely attached to the 5-function arm if the arm held a piece of metal that was welded to the rack. The metal that the rack was made from, however, was not suitable for welding therefore an entirely new coring rack was constructed with the rig welder. The seas, however, did not come down below the 4 m limit and a dive was not possible.

1900 hrs, Wednesday 6th of May to Thursday 7th of May

Seas were still above 4 m and remained so for the whole shift. After priming the corer rack with the push cores in case a weather window opened up, the shift time was spent reviewing the raw footage of the video transects in order to identify the types of fauna visible.
On being informed of my leaving on the evening helicopter flight, the coring equipment was disassembled and packed away. Frozen samples were stored securely in one of the galley freezer rooms and labelled, to be retrieved at a later date. Embarked on the helicopter to Kristiansund at 1930.

2ND VISIT

Saturday 6th June to 0700 hrs Sunday 7th of June

Left Brønnøysund at 1020 on the helicopter and arrived at 1150. Met the ROV crew and discussed with them the tasks ahead for the week. The Hi Def camera had been sent back to the manufacturer and now the transponder, which gave the ROV's position relative to the rig, was undergoing repairs. Started setting up the data logger and attached it to the starboard aft bottom corner of the ROV. By 0130, the coring rack had been set up with the assembled corers and attached to the 5-function arm. **Dive 3** started at 0225. The purpose of this dive was to locate the gelatinous formation encountered on the 1st visit. Jelly mats were spotted at 0337 and a full set of 6 cores was taken within one of the larger clumps of the material. This was finished at 0408 and the ROV was back in the moon pool at 0504. Cores were then processed. Some of the material was frozen, some was preserved in formalin and some was placed in niskin bottles with DNA preservative.

1900 hrs Sunday 7th June to 0700 hrs Monday 8th of June

At 1945 a general alarm was sounded at all the crew mustered at the lifeboat stations for a drill. At 2015, a safety meeting was convened in the non-smoking mess room, which ended at 2035. After this, a new corer was assembled to replace one that was damaged from the previous nights use. An amphipod trap was also constructed and baited with sardines and then attached to the coring rack. **Dive 4** started at 0116. The amphipod trap was deposited next to Marker 2, which was 10 m from the BOP. Standard sediment coring was then executed at 100 m N of the BOP and all 6 cores were completed at 0333. The old trap, which had been deposited on the 1st visit was then retrieved at the ROV was back in the moon pool at 0439. Two of the cores were found to be empty on processing. The 4 other cores were processed according to the protocol set forth by shell and the core sections were bagged and frozen in the freezer. The amphipods found in the retrieved trap were transferred to a bottle containing formalin.

1900 hrs Monday 8th June to 0700 hrs Tuesday 9th of June

Replaced a damaged corer again and serviced all the other corers by replacing the seals and adjusting other features – including the core holster configuration on the rack. The jubilee clips (hose clamps) that attached the rack to the 5-function arm were also adjusted. Monkey fists were made and be attached to the corer handles to help the ROV crew as well. Started **Dive 5** at 0117. The plan was to locate the 'jelly mats' again and retrieve more samples. 'Jelly' mats were located at 0256. A full set of cores was collected by 0353. At 0411, the trap deposited 24 hrs before was retrieved. ROV was back in the moon pool at 0529. The gelatinous material was again stored in formalin, or placed in bags for freezing. It seems that little of the material wasn't mixed into the mud in the corers on the voyage to the surface.

1900 hrs Tuesday 9th June to 0700 hrs Wednesday 10th of June

Reassembled the corers and reconfigured the monkey fists. The plan was to get sediment cores at 25 m N of the BOP and to collect one core of more gelatinous material if possible. Discussed with Christer Savio, the logistics person about arranging for the frozen sediment core samples to be sent to Kristiansund. **Dive 6** started at 2244. At 2358, there was a malfunction with the colour camera and the ROV was manoeuvred back into the cage during lunch break. At 0109, the ROV was out of the cage again. At 0134, the 'Jelly' mats were located and at 0311 a core was achieved. This was a difficult task, as the aim was to get a core full of the material without any underlying sediment. This was achieved by 'scooping' up the material with the corer held horizontally. The corer was then carefully placed in the rack, which was also held horizontally, to prevent the material from falling out of the corer. By 0418 5 sediment cores had been taken at 25 m N of the BOP. ROV was back on the moon pool at 0517. Sediment cores were again processed according to Shell protocol. One of the sediment cores was empty on inspection, so again 4 cores were processed. The gelatinous material in the 1st corer was transferred to bags and frozen. Some of the material was also placed in niskin bottles for DNA analysis. These samples were the purest yet of the material.

1900 hrs Wednesday 10th June to 0700 hrs Thursday 11th of June

Prepared all the coring equipment for a dive while the ROV crew were working at fixing the cable connections to the colour camera. At 0200, the colour camera was fixed, however, the SIT camera (black and white) was now not operating reliably and would require servicing. It was therefore decided by the ROV supervisor (Johan Orevik) that ROV operations would be suspended until all camera equipment could be seen to operate reliably. The rest of the night was spent reviewing existing footage taken from the previous dives.

1900 hrs Thursday 11th June to 0700 hrs Friday 12th of June

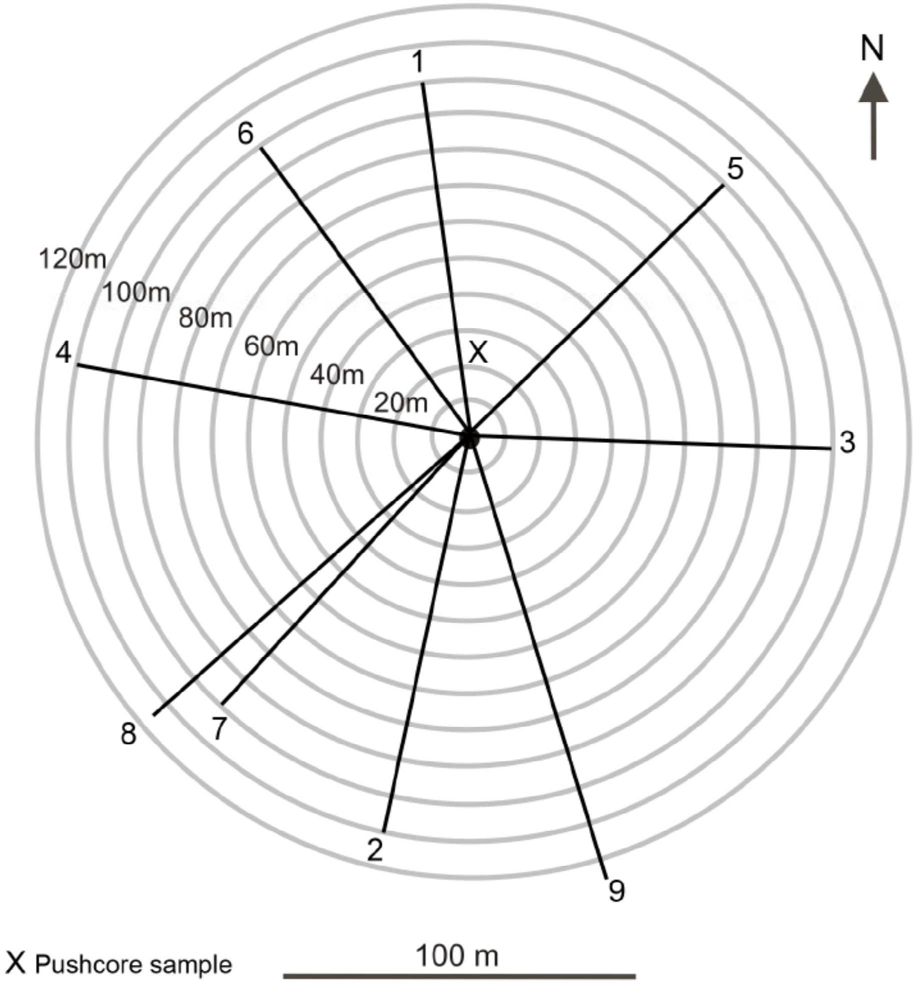
There were still some problems with the colour camera again. The cables were again checked and the problem of a flickering image on the screen persisted. It appeared that the camera connection was sensitive to the movement of the cables attached to it. Once again the crew replaced the cables to the camera and it seemed to work better. **Dive 7** began at 0138. The aim of this dive was to collect a set of sediment cores at 50 m N of the BOP and to get one more auxiliary core of the sediment under the gelatinous mats. At 0255, 5 cores had been taken at 50 m N of the BOP. At 0316, the gelatinous mats were located and a core was taken at 0325. ROV was back in the moon pool at 0502. Sediment cores were processed as per the Shell protocol, but one of the sediment corers was found to be cracked and leaking mud and was therefore discarded. Four cores were thus processed. The core containing sediment from the gelatinous mat was also processed with the top 10 cm cut into two 5 cm sections, which were frozen.

1900 hrs Friday 12th June to 0700 hrs Saturday 13th of June

Problems with the colour camera were again occurring. The decision was taken by the ROV supervisor and the pilot (Frank Ove Stenberg) to replace the entire colour camera unit with the spare. This time, the camera seemed to work perfectly and was not sensitive to cable movements. For this night, an early dive was planned, with the aim of getting sediment cores at 75 m N of the BOP. **Dive 8** began at 2004 and coring at 75 m was complete at 75 m N of the BOP by 2122. ROV was back in the moon pool at 2250. The cores were processed as per the Shell protocol. After this, the coring equipment was dismantled and the data logger was removed from the ROV, cleaned and packed away. All of the animal specimens that were stored in formalin bottles were packed into a case for shipping back to the UK. The frozen sediment cores for PSD, TOM and metal analysis were packed into a cooler box in the freezer room and labelled to be couriered to Kristiansund on the next available helicopter flight. The remaining frozen samples of the gelatinous material was packed into a cooler bag to be taken directly to the National Oceanography Centre in the UK for analysis. At 1200, I boarded the helicopter to Brønnøysund, which signalled the end of the visit.

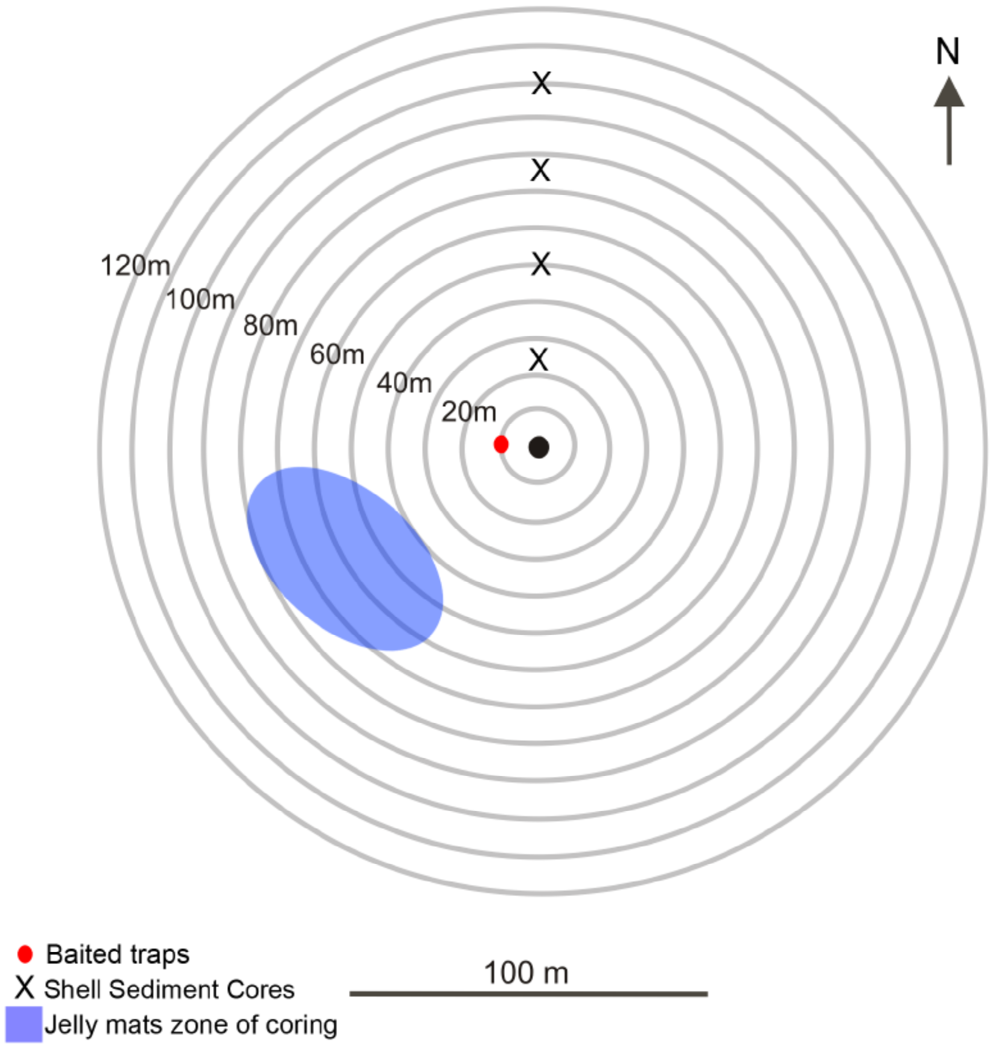
4. SAMPLES:

Visit 1: A detailed video survey was carried out which extended to roughly 100m in nine headings. Three replicate push cores were also taken 25 m N of the BOP. For each core, the top 5 cm was sliced off and these samples were frozen immediately after processing and remain frozen aboard the Leiv Eiriksson until analysis. A baited scavenger trap, for the collection of amphipods and ophiuroids, was laid 35 m W of the BOP, but wasn't retrieved.



The video transects and chemical analysis samples taken at Gro on Visit 1.

Visit 2: For this visit, no video transects we taken. Over 6 dives a series of sediment cores were taken at 4 locations N of the BOP (25 m, 50 m, 75 m, 100 m) to measure the extent of the drill-cutting disturbance around the BOP. Also, a series of cores were taken through gelatinous mats located between 50 m and 80 m SW of the BOP as the composition of this material is presently unknown and of great interest to the oceanographic community. The trap laid in the 1st visit was retrieved and another trap was deposited and retrieved 24 hours later. Any animals incidentally captured in the cores as well as the animals captured in the traps were stored as samples in formalin bottles.



Map illustrating the location of pushcore sampling and baited traps on Visit 2.

CODE STRUCTURE:

LE/010509/001#1

Leiv Eiriksson / Date / ROV SERPENT dive log # replicate or sample number

ALL SAMPLES IN ORDER OF COLLECTION

Visit 1:

Station	**location**	**sample type**	**details**
LE/010509/001#1	100 m 351º of BOP	Video transect	DVD
LE/010509/001#2	110 m 200º of BOP	Video transect	DVD
LE/010509/001#3	100 m 94º of BOP	Video transect	DVD
LE/010509/001#4	110 m 284º of BOP	Video transect	DVD
LE/010509/001#5	100 m 047º of BOP	Video transect	DVD
LE/020509/001#6	100 m 328º of BOP	Video transect	DVD
LE/020509/001#7	103 m 215º of BOP	Video transect	DVD
LE/020509/001#8	116 m 220º of BOP	Video transect	DVD
LE/020509/001#9	126 m 145º of BOP	Video transect	DVD
LE/040209/002#1	025 m 000º of BOP	Push core	Top 5 cm
LE/040209/002#2	025 m 000º of BOP	Push core	Top 5 cm
LE/040209/002#3	025 m 000º of BOP	Push core	Top 5 cm

Visit 2:

Station	**location**	**sample type**	**details**
LE/070609/003#1	50 m SW of BOP	'Jelly' Core	Top 5 cm of gelatinous mat. Frozen
LE/070609/003#2	50 m SW of BOP	Material Sample	Jelly material in formalin
LE/070609/003#3	50 m SW of BOP	DNA Sample	Jelly material in RNALater
LE/070609/003#4	50 m SW of BOP	DNA Sample	Jelly material in RNALater
LE/070609/003#5	50 m SW of BOP	DNA Sample	Jelly material in RNALater
LE/070609/003#6	50 m SW of BOP	DNA Sample	Jelly material in RNALater
LE/080609/004#1	100 m N of BOP	Sediment Core	Top 6 cm for PSD. Frozen
LE/080609/004#2	100 m N of BOP	Sediment Core	Top 6 cm in 3 sections for Metals/TOM. frozen
LE/080609/004#3	100 m N of BOP	Sediment Core	Top 6 cm in 3 sections for Metals/TOM. frozen
LE/080609/004#4	100 m N of BOP	Sediment Core	Top 6 cm in 3 sections for Metals/TOM. frozen
LE/080609/004#5	100 m N of BOP	Faunal Sample	Ophiuroids found in sediment cores. In Formalin
LE/080609/004#6	10 m W of BOP	Faunal sample	Amphipods from Visit 1 trap. In formalin
LE/090609/005#1	10 m W of BOP	Faunal Sample	Amphipods from 24hr trap. In formalin
LE/090609/005#2	50 m W of BOP	Material Sample	Top 5 cm of gelatinous mat. In Formalin

LE/090609/005#3	50 m W of BOP	Material Sample	Sample of 'Jelly'. Frozen
LE/090609/005#4	50 m W of BOP	Material Sample	Sample of 'Jelly'. Frozen
LE/090609/005#5	50 m W of BOP	Material Sample	Sample of 'Jelly'. Frozen
LE/090609/005#6	50 m W of BOP	Material Sample	Sample of underlying mud. Frozen
LE/090609/005#7	50 m W of BOP	Material Sample (DNA)	Sample of 'Jelly'. In RNALater
LE/090609/005#8	50 m W of BOP	Material Sample (DNA)	Sample of 'Jelly'. In RNALater
LE/090609/005#9	50 m W of BOP	Material Sample (DNA)	Sample of 'Jelly'. In RNALater
LE/100609/006#1	25 m N of BOP	Sediment Core	Top 6 cm for PSD. Frozen
LE/100609/006#2	25 m N of BOP	Sediment Core	Top 6 cm in 3 sections for Metals/TOM. frozen
LE/100609/006#3	25 m N of BOP	Sediment Core	Top 6 cm in 3 sections for Metals/TOM. frozen
LE/100609/006#4	25 m N of BOP	Sediment Core	Top 6 cm in 3 sections for Metals/TOM. frozen
LE/100609/006#5	70 m SW of BOP	Material Sample	'Pure' 'jelly' in Formalin Bottleg
LE/100609/006#6	70 m SW of BOP	Material Sample	'Pure' 'jelly'. Frozen
LE/100609/006#7	70 m SW of BOP	Material Sample (DNA)	'Pure' 'jelly' in RNALater
LE/100609/006#8	70 m SW of BOP	Material Sample (DNA)	'Pure' 'jelly' in RNALater
LE/100609/006#9	70 m SW of BOP	Material Sample (DNA)	'Pure' 'jelly' in RNALater
LE/100609/006#10	70 m SW of BOP	Material Sample (DNA)	'Pure' 'jelly' in RNALater
LE/120609/007#1	50 m N of BOP	Sediment Core	Top 6 cm for PSD. Frozen
LE/120609/007#2	50 m N of BOP	Sediment Core	Top 6 cm in 3 sections for Metals/TOM. frozen
LE/120609/007#3	50 m N of BOP	Sediment Core	Top 6 cm in 3 sections for Metals/TOM. frozen
LE/120609/007#4	50 m N of BOP	Sediment Core	Top 6 cm in 3 sections for Metals/TOM. frozen
LE/120609/007#5	60 m SW of BOP	Material Sample	Top 5 cm of jelly mat. Frozen
LE/120609/007#6	60 m SW of BOP	Material Sample	2nd 5 cm of jelly mat. Frozen
LE/120609/008#1	75 m N of BOP	Sediment Core	Top 6 cm for PSD. Frozen
LE/120609/008#2	75 m N of BOP	Sediment Core	Top 6 cm in 3 sections for Metals/TOM. frozen
LE/120609/008#3	75 m N of BOP	Sediment Core	Top 6 cm in 3 sections for Metals/TOM. frozen
LE/120609/008#4	75 m N of BOP	Sediment Core	Top 6 cm in 3 sections for Metals/TOM. frozen
LE/120609/008#5	75 m N of BOP	Sediment Core	Spare 6 cm top slice

5. OBSERVATIONS

GELATINOUS MATS

During the first visit to the Gro prospect, mats of a gelatinous material, several square metres each in size were observed to the west and southwest of the BOP at a distance of more than 50 m. The mats appeared to be numerous and spread over a large distance as they were encountered on both the S and SW video transects. The total area of these mats combined would be at least in excess of 50 m^2. These mats appeared to be pale, opaque, gelatinous in nature and most likely of biological origin. Few animals were observed on the mats and it did not appear to be a significant food source. Zoomed camera footage showed ripples travelling through the mats in the direction that the currents were flowing. A very light covering of sediment on top of the mats indicated that these mats were very recent features of the area. One of the priorities of the second visit was to get a pure sample of the material and to store it in various ways so as to maximize the amount of research that could be done in the laboratory. As the sample list will show, there were at least 3 attempts to get good samples of the material and the main challenge was to get some of the 'jelly' without it being significantly contaminated with the underlying sediment. Dive 6 (the 4th dive of the 2nd visit) was finally successful in the accumulation of a full core of only the jelly material. This material was then either frozen in bags (so that chemical composition could be later studied), frozen in niskin bottles with RNALater, a DNA preservative (to elucidate what the material was if it was biological in origin), or stored in bottles of formalin (so that the structure of the substance can be examined later). An initial examination of the material indicates that it may be the decomposed remnants of jellyfish that has collected in drifts on the deep-sea floor. If this is the case, it is of great interest to oceanographers. However, it is necessary to conduct tests on the material in the lab to confirm this hypothesis.

DISTURBANCE OBSERVATIONS

Eight transects were taken, each extending to or beyond 100 m from the BOP.
Owing to the strong current from the NE, there was a tendency for the ROV to drift SW, which is why there were fewer video transects that were to the east of the BOP. Physical disturbance typically extended from 75m to 100 m from the BOP. Before these data can be properly interpreted it is important to consider the faunal abundances in the area. These data are currently in the analysis stage.

Observations of sediment and notes on classification into Partial, Total coverage and unimpacted are shown in the table below

100m + from BOP Unimpacted sediment Evidence of burrows and bioturbation as well benthic megafauna	
Partially impacted sediment Areas with clear evidence of drill spoil but also signs of natural. Some motile and sessile megafauna	
Fully impacted sediment No visual evidence of the natural sea bed; characterised by limited observations of motile megafauna and complete absence of sessile megafauna	

KEY FAUNAL OBSERVATIONS

Key species observations made using the colour video camera at Gro are recorded in the table below.

Date	time	observation	photo/video
01/05/2009	2140	Lyssianasid amphipod	
01/05/2009	2155	Sabellid tubeworm	
1/05/09	2159	Possible Arctic skate.	
01/05/2009	2308	Sabellid tubeworm with an amphipod attached	

<table>
<tr><td>01/05/2009</td><td>2358</td><td>Unidentified enteropneust</td><td>
</td></tr>
<tr><td>02/05/09</td><td>0002</td><td>Lyssianasid amphipod</td><td>
</td></tr>
<tr><td>02/05/09</td><td>0141</td><td>Unidentified enteropneust</td><td>
</td></tr>
<tr><td>02/05/09</td><td>0153</td><td>Unidentifed asteroid on right and on the left is an orange asteroid, Pontaster tenuispinis.</td><td>
</td></tr>
</table>

02/05/09	0216	Hydroid with two unidentified amphipods within the crown.		
02/05/09	0308	Burrowing amphipod. Possibly a species of Neohela.		
02/05/09	0330	Cerianthid anemone.		
02/05/09	0332	Pycnogonid (sea spider). Colossendeis colossea.		

02/05/09	0344	Ceranthid anemone.		
02/05/09	0401	'Dumbo' octopus. A species of Cirroteuthis		
01/05/09	2351	Unidentified zoarcid fish (eelpout)		
09/06/09	0244	Large unidentified zoarcid (eelpout)		

MISSION 67

JACK RYAN, AKPO, NIGERIA

DANIEL JONES

INTRODUCTION

The deep-waters off Nigeria offer many interesting and valuable opportunities for novel science. SERPENT aims to carry out novel deep-water science in the area offshore Nigeria through collaboration with a variety off offshore oil and service companies. This visit to Jack Ryan was the first visit of it's type in Nigeria and the most comprehensive visit undertaken by SERPENT in Africa. Our aim for the visit was to make initial assessment of Nigerian deep-water biodiversity. To achieve this we collected both images and physical samples of the benthic fauna. As there is limited knowledge of the Nigerian deep-water fauna, a taxonomic phase will be important to reinforce detailed future ecological research and to provide a strong baseline against which to assess changes in the deep-water environment.

OVERVIEW OF ACTIVITIES

The visit to the drill ship 'Jack Ryan' was carried out by SERPENT scientist Daniel Jones from the 1st to the 6th of May. The visit was very successful, the staff of the Jack Ryan were extremely helpful and accommodating. The Oceaneering ROV team (Phil Aylwin, Jackie Stewart, Maurice Onuoha, Brett Illich, Graeme Yates and Eric Monaigha) were instrumental in the success of the visit. A total of 7 dives were made with the ROV and ROV team involved in SERPENT activities for approximately 72 hours. We were fortunate that the visit coincided with a period where there was no operational work for the ROV.

ECOLOGICAL HIGHLIGHTS

A total of 36 taxa were observed either directly or in video obtained before the visit. These are shown in the table below and have representatives from 5 phyla. Several of these taxa are likely to be rarely studied and may represent new species.

Table of all species found on this visit. Additional taxa found by the ROV team at Akpo are also included and marked with a asterix (*). Approximate sizes indicated.

Phylum	Species	Notes	Picture
Cnidaria	Actinarian 1	50 mm diameter	
	Actinarian 2	Extremely common anemone. 10-30 mm diameter.	
	Actinarian 3	50 mm diameter	

	Edwardsiia sp.	120 mm diameter	
	Cerianthus sp.	60 mm diameter	
	Umbellula sp.	300 mm stalk length	
	Pennatulid 1	600 mm stalk length	

	Pennatulid? 2	200 mm stalk length	
	Scyphomedusae 1	200 mm bell diameter	
	Scyphomedusae 2 *	150 mm bell diameter	

	Scleractinian	Possibly from surface growth on vessel. 50 mm in diameter.	
Mollusca	Opisthobranch? 1	60 mm in length on seafloor	
	Squid *	250 mm in total length	
Crustacea	Penneid	60 mm length	

	Prawn *	40 mm length	
	Plesopenneius sp.	120 mm body length (excluding antennae). Probably *Plesiopenaeus armatus* (Family: Aristaeidae) as seen off Angola.	
	Lithoides sp. 1	1000 – 1500 mm maximum dimension	
	Lithodes sp. 2 *	1000 – 1500 mm maximum dimension	

	Lithodes sp. 3 *	800 – 1500 mm maximum dimension	
Echinodermata	*Peniagone* sp.	70 mm total length	
	Enypniastes sp.	180 mm total length	
	Holothurian *	250 mm total length	

	Echinoid 1	20 – 80 mm diameter	
	Hymenaster sp. *	150 mm diameter	
Pices	Chimera 1	>1000 mm length. This is a Chimaeridae of either genus *Chimaera* or *Hydrolagus*. The distinction depends on whether or not the anal fin is divided, and that feature cannot be checked from this perspective. Ken Sulak's guess from overall shape of the body is Chimaera. There are several parasitic laernaid copepods attached to the head and tip of the dorsal fin.	
	Rhinochimera *	>1000 mm length. A Rhinochimeridae, looks like the genus *Harriotta*, but this is tentative.	

	Centroscyllium fabricii	>1000 mm length. A dogshark, family Squalidae, and looks very much like the widely distributed *Centroscyllium fabricii*, known from 200-1,600 m, including off W. Africa. Color, robustness, caudal fin, size and placement of dorsal fins are all right - need a better image to see spines on leading edges of dorsal fins.	
	Rajella sp.	>1200 mm length. Shape fits genus *Rajella*	
	Dipturus sp.	>1000 mm length. Genus *Dipturus*, very similar to *D. linteus* of W. Atlantic, and depth range is right, 400-2,200 m.	
	Bathyraja richardsoni	>1000 mm length. Very probably *Bathyraja richardsoni*	
	Pachycara sp.	500 mm length. A member of the Zoarcidae, but this is not genus *Lycodes*. More likely it is *Pachycara* (short blunt snout).	

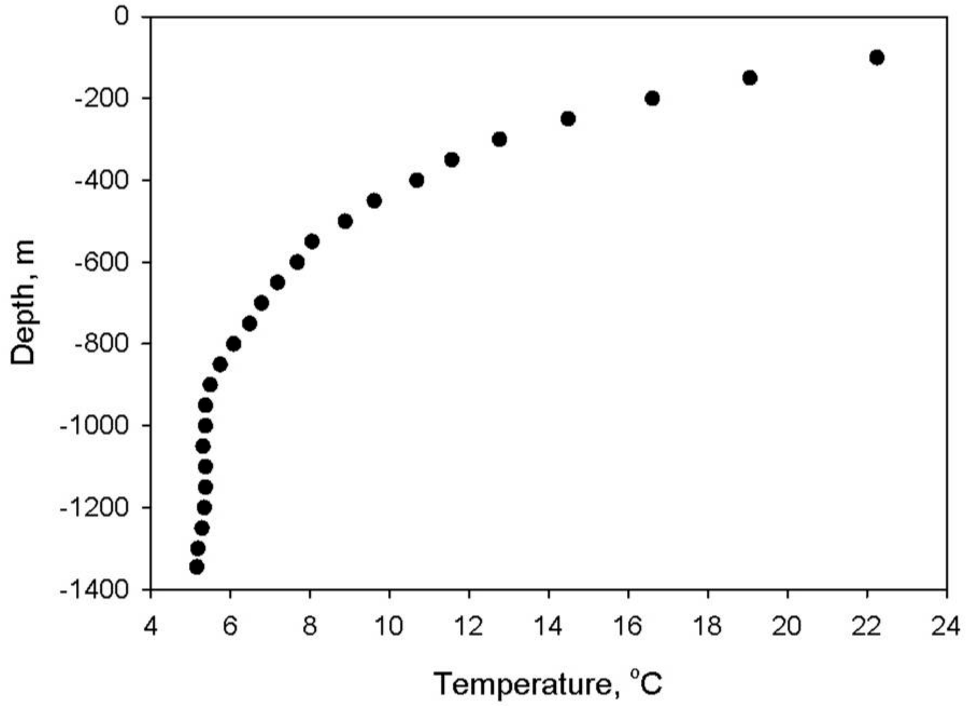
	Xyelacyba myersi	>1000 mm length. This is an the neobythitine ophidioid species *Xyelacyba myersi*. This is a definite ID. Ken Sulak has recently imaged this same species in the Bahamas. Nothing else looks like this fish.	
	Corphaenoides rupestris *	500 mm length. This is a Macrouridae, and is undoubtedly the species *Corphaenoides rupestris*, the roundhead grenadier. Colour pattern, proportions, large eye, very far forward dorsal fins are all correct.	
	Antimora rostrata	800 mm length. Distinctive.	
	Halosauridae. Probably *Aldrovandia*.sp.	600 - 1000 mm length. Not a Synaphobranchidae, but a Halosauridae, of either the genus Halosaurus or Aldrovandia. If we had a better image, I could zoom in on the top of the head to see if scales are present (*Halosaurus*) or absent (*Aldrovandia*). However, since the brain is visible through the occipital 'window', scales are probably absent.	

	Halosauridae. Probably *Halosaurus* sp.	600 - 1000 mm length. A Halosauridae. Brain not visible.	
	Simenchelys parasitica	800 - 1200 mm length. Family Synaphobranchidae. This is the species *Simenchelys parasitica*, which behaves much like a hagfish. It has a very muscular head with a small mouth, used to rip flesh from a carcass.	

PHYSICAL DATA

Seabed temperature was 5.3°C (1366 m water depth). This is thought to be consistent with other areas in the region. The temperature profile obtained by SERPENT (below) reveals a gradual transition between the warm surface waters of the Guinea Current to the colder Atlantic deep waters.

Oceanographically, this area is characterised principally by the wind-driven warm water Guinea Current flowing southward along the coast of the Gulf of Guinea almost to the equator (essentially a continuation of the Equatorial Counter-Current). A major influence on the region is the input of freshwater from the numerous rivers in this high-rainfall region, most notably the Niger (the second largest delta in the world). This results in large masses of warm (above 24°C) and low salinity (less than 35 ppt) water circulating in the Gulf of Guinea above colder water masses (as we see in this profile). These waters are permanent off Sierra Leone and Liberia and in the Gulf of Biafra (off Nigeria, Cameroon and Gabon) but seasonal along the central part of the north coast of the Gulf of Guinea (from Côte d'Ivoire to Benin). Here there are strong seasonal upwellings during the summer months. North of Sierra Leone, upwellings occur from October to April.



SPECIFIC ACTIVITIES

Friday 1st May 2009

DIVE 1 (Oceaneering dive number 391) arriving at the seabed at 15:20. The Akpo field has extensive subsea infrastructure and nearly 50 wells. We are on well 56-MG41. This was extremely obvious on the seafloor with trees, manifolds and flowlines visible. There was abundant fauna including sharks, rays, eel-like fish, liparids, lithoidid crabs, holothurians (Peniagone, Enypniastes and a benthic species), anemones and numerous indeterminate invertebrates (poss sponges/hydroids). I obtained video footage of as much as possible. We brought the ROV up at 18:00 and the night shift fabricated the biobucket for specimen collection tomorrow.

Saturday 2nd May 2009

ROV off deck 08:20 for DIVE 2. Out of cage 09:17 and on seabed by 09:20. We saw a large chimera on the seafloor. Collected some samples on the seafloor using the mark one biobucket with a sliding lid. We managed to retrieve some samples. The ROV was retrieved and back 12:00.

DIVE 3. We made a new sampling device using the zip pump to collect animals. It uses the pump to create a light sucking pressure, holding the animals in the collector and simultaneously removing sediment against a mesh. We were on seabed at 14:15 and saw a jellyfish, pennatulid, octocoral (probably umbellula). 15:22 bringing up from seabed and on deck at 16:00

DIVE 4. (Oceaneering dive 394) off deck 16:40, at seabed 17:20. We had improved the sample collector with a larger diameter hose to increase flow. Found very abundant anemones or cerianthids. Saw Enypniastes feeding at 17:49. Saw zig-zag stalked cnidarian at 18:54, it pulled itself back into the sediment on retrieval. At 19:03 we found an Edwardsiid anemone with 12 tentacles, we attempted to sample but it rapidly retracted into the sediment. 19:17 we found a large ray. 19:25 we attempted (unsuccessfully) to sample a common anemone. At 19:37 the ROV was in the cage and on the surface around 21:00. The night shift repaired the sampling equipment and carried out a temperature profile with the parascientific temperature sensor.

Sunday 3rd May 2009

DIVE 5: ROV off deck in the night and carried out temperature profile, once on the seabed we carried out sampling going in a south easterly direction (Oceaneering dive 395). At 9:51 we observed a Grenadier, 10:16 we observed an aggregation of 6 opisthobranchs some were collected. We collected a Peniagone at 10:25 and attempted to collect (unsuccessful) an Edwardsiid at 10:57. We were back on deck at 12:00

DIVE 6: ROV off deck at 13:30 armed with a bottle type amphipod trap, we were at depth at 14:05. The trap was set near the flow line at 14:15 close to manifold 56MG41. At 14:38 we observed a cucumber on the seafloor. 14:51 ctenophore, 14:53 bushy seapen in ? shape.15:03 saw Peniagone feeding. 15:47 yellow anemone on stalk. 15:54 going for anemone. 16:20 Rov coming up.

Monday 4th May 2009

DIVE 7: ROV used to deploy tuna head. On seabed in early morning. Observations made of bait for 6+ hours.

Spent the majority of the day attempting to get onto the Bourbon Diamond ROV support vessel to carry out a survey of the holes visible on the bathymetric chart of Akpo. Unfortunately this was not possible.

Tuesday 5th May 2009

It was crew change day and the ROV had a problem with the camera pod. The ROV team were busy with operational requirements and could not support any additional SERPENT operations.

Wednesday 6th May 2009

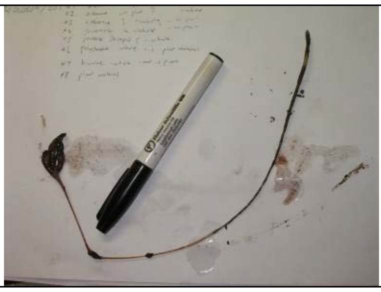
Helicopter transfer from Jack Ryan to Lagos.

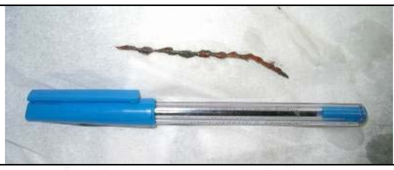
SAMPLES OBTAINED

CODE STRUCTURE:

JR/020509/001#1
Jack Ryan/ Date / station number # replicate

SAMPLE STATIONS:

Station	Location	Sample type	Preservation	Picture
JR/020509/001#1	In field	Anemone 1 on plant material – whole	RNA later	
JR/020509/001#2	In field	Anemone 2 on plant material – whole	RNA later	
JR/020509/001#3	In field	Anemone 3 on plant material – whole	RNA later	
JR/020509/001#4	In field	Anemone 4 on plant material – whole	RNA later	
JR/020509/001#5	In field	Juvenile decapod – whole	RNA later	
JR/020509/001#6	In field	Polychaete – whole	RNA later	
JR/020509/001#7	In field	Bivalve – whole	RNA later	
JR/020509/001#8	In field	Plant material (probably a yam from the surface)	RNA later	
JR/020509/002#1	In field	Pennatulid (Umbellula)	RNA later and frozen	
JR/020509/002#2	In field	Scyphozoan	RNA later and frozen	
JR/020509/002#3	In field	Macrofauna – possibly from surface	RNA later and frozen	
JR/020509/003#1	In field	Enypniastes	RNA later and frozen	

JR/020509/003#2	In field	Stalked cnidarian	RNA later and frozen	
JR/030509/004#1	In field	Opisthobranch #1 (smaller one)	RNA later and frozen	
JR/030509/004#2	In field	Opisthobranch #2	RNA later and frozen	
JR/030509/004#3	In field	Peniagone	RNA later and frozen	
JR/030509/004#4	In field	Anemone and bryozoan on rock	RNA later and frozen	
JR/030509/005#1	In field	Urchin 1 (large)	RNA later and frozen	

JR/030509/005#2	In field	Urchin 2	RNA later and frozen	
JR/030509/005#3	In field	Pennatulid (? Shaped bushy one)	RNA later and frozen	
JR/030509/005#4	In field	Anemone (Cerianthid)	RNA later and frozen	
JR/030509/005#5	In field	Hydroid	RNA later and frozen	

MISSION 68

ACERGY PETREL, MORVIN 2, NORWEGIAN SEA

ANDREW GATES

1. GENERAL INFORMATION:

Well: Morvin
Project partner: StatoilHydro
Vessel: *Acergy Petrel*
Vessel operator: Acergy
ROV: Acergy Solo Mk II
ROV operator: Acergy
SERPENT representative: Andrew Gates

Position: 7224481 N
380172 E

Water depth: 370 m
Sea bed water temperature: 7.5ºC

ROV team:

	Days	Nights
Supervisor	Magnus Hesle	Mike Blunt
Pilot	Chris Canale	John Robertson
Pilot	Edward Chuan Hock	Vegard Hansen

2. GEAR:

SERPENT ROV push cores
Acergy Sola MK II survey class ROV
Imenco Z 1051 18x zoom camera

3. SURVEY PLAN

POSITION OF MORVIN WELL:

7224481 N
380172 E

Start and end positions for the disturbance assessment video transects:

			Start Position		End Position	
	Transect length (m)	Transect direction	Northing	Easting	Northing	Easting
Transect 1	1000	North-South	7224981	380172	7223981	380172
Transect 2	1000	East-West	7224481	380672	7224481	379672
Transect 3	1000	NE-SW	7224834.55	380525.55	7224127.45	379818.45
Transect 4	1000	NW-SE	7224834.55	379818.45	7224127.45	380525.55

Start and end positions for the random Reference video transects:

	Start position		End position			
	Northing	Easting	Northing	Easting	Transect length (m)	Transect heading
R1	7225603	380239.7	7225657	380155.7	100	302.8712
R2	7224562	381928.6	7224536	381831.8	100	255.307706
R3	7224746	381119.8	7224827	381061.3	100	324.205037
R4	7224896	380709.4	7224874	380807	100	102.575375
R5	7224408	381662.5	7224506	381682.2	100	11.394293
R6	7225632	380507.9	7225675	380417.5	100	295.369727
R7	7226243	380689.3	7226184	380770.4	100	125.828598
R8	7223502	381853.4	7223417	381905.2	100	148.834815
R9	7224654	381155.4	7224572	381098.5	100	214.62429
R10	7224060	378663	7224079	378564.7	100	280.682289
R11	7225084	378506.5	7224999	378454.5	100	211.319763
R12	7224510	381760.1	7224505	381860	100	92.968597

POSITIONS FOR CORE SAMPLING ON MORVIN RECOVERY

6 samples to be taken at each site; 3 at a) and 3 at b)

6 samples can be taken on each dive

Site 1 is the priority if all the transects are carried out in 1 dive.

If more dives are used sites 2-4 should be used increasing in priority.

	Sampling position			
	Northing	Easting	distance from well (m)	Heading
site 1 a	7224506	380172	25	N
site 1 b	7224531	380172	50	N
site 2 a	7224481	380197	25	E
site 2 b	7224481	380222	50	E
site 3 a	7224463.302	380154.3022	25	SW
site 3 b	7224445.645	380136.645	50	SW
site 4 a	7224498.698	380154.3022	25	NW
site 4 b	7224516.355	380136.645	50	NW

4. NARRATIVE:

In the lead up to this visit the dates changed regularly. It was moved back and forward on an almost daily basis making it difficult to plan the travel and accommodation. See below for typical emails:

> Thanks for asking, Andrew, There is bad weather coming, which will make the operation impossible for some days (crane opt demands good weather).
> By tomorrow afternoon, I will have to make a decision what to do, but it may prove most likely that we mobilize during an early crewchange on Tuesday the 05.05.09, instead.
> Pls be prepared for anything....
> I will notify tomorrow afternoon.
> Martin
>
> Dear all, had a call from Finn-Roger Hoff, to say that the Morvin Lander installation has now been cancelled for the time being. Anyhow, we go ahead with the planned SERPENT ROV-sampling, and will use a maximum og 16 hours at Morvin for this work. We will go to Kristiansund on Sunday, May 3, morning, and mobilize equipment and one person, Andrew Gates at 0800 to 1000 hrs, local time.
> What happens after this depends on where the vessel is going to demobilize for Statoil, KSU or SVG on May 6.
> Andrew, you are therefore required to be in KSU no later than 0900 hrs on Sunday.
> Best regards
> Martin

2nd May 2009
Travel from Southampton to Kristiansund via Oslo. Arrival at the *Acergy Petrel* at 1800. Induction on board and introductions to ROV and survey team. Discuss work plans with Martin Hovland (MH). Plan is to leave Kristiansund at midnight for transit to first survey site. Contact was made with Petter Grav at StatoilHydro Vestbase to ensure the delivery of SERPENT equipment to the *Acergy Petrel*.

3rd May 2009
1400 arrival at Heidrun 500m zone to carry out a pipeline inspection. I observed the dive to familiarise myself with the fauna. Organisms were abundant attached to the pipeline, notably anemones (possible *Bolocera* sp.) and fish such a ling (*Molva molva*) and Coalfish/Saithe (*Pollachius virens*) were abundant. The fauna was principally similar to the organisms observed in the SERPENT visit to Morvin in 2006.
Transit to Morvin began at 1800 and arrival was at 2100. During this transit period SERPENT equipment was prepared for diving.
The plan was to complete all transects and then do the coring in separate dives. Following a conversation with Martin Hovland it was agreed to extend Transect 3 to 2 km to cover an additional coral reef for which a visual inspection was required.
We started the video transects began at 19:50, beginning with the extended Transect 3, Transect 2 at 22:00 and Transect 4 at 2254. For this dive the core sampling apparatus was deployed with the ROV to enable the first set of samples were taken on completion of the visual work to maximize productive ROV time.

4th May 2009
Following observation of the disturbance transects I returned to my cabin for some sleep, returning at 0330 to observe the remaining reference transects.
The reference transects were completed by 0630. Following this work we carried out a visual inspection of the AW1 coral reef. This was observed to be approximately 3 m high and supported an abundance of life, particularly *Sebastes, Molva* and *Brosme.*
On completion of the visual work core sampling commenced. Samples were taken at site 1 a and b on the same dive as the video work. The ROV was then recovered for subsequent core sampling at sites 2, 3 and 4. Core sampling for the Morvin recovery work was completed by 1530.
A useful methodological advice from Chris Canale (ROV team) was that the power of the 7 function arm on the ROV can be reduced to minimize breakage of the coring equipment.

5th May 2009

Following some additional visual coral surveys over night MH requested the use of SERPENT equipment for coring the investigation of Hydrocarbon concentrations in the sediment in the pockmarks and around the corals. These samples will be used for MH's work on coral reef distribution.
Two of these samples were close to the proposed template site. These were taken opportunistically for additional chemical analysis if future Morvin visits were not possible.
The afternoon of the 5th was spent collecting samples around the Morvin Template discharge site for the IMR Bergen analysis. These samples were divided horizontally into 0-5 cm and 5-10 cm and frozen immediately.
An attempt was made to survey a final coral reef after completion of the core sampling but with the weather due to deteriorate it was decided that the ROV should be recovered and transit made to back to Kristiansund.

6th May 2009
The vessel reached Kristiansund at 0600. The morning was spent preparing SERPENT equipment for backload, arranging delivery of the samples to Trondheim and packing away before travelling to the airport and onwards to Southampton via Oslo and London.
This was an extremely productive trip with approximately 24 hours ROV time available for SERPENT and plenty of additional SERPENT involvement in the other projects ongoing on the *Acergy Petrel.*
The crew of the vessel were fully supportive of all work, offering much useful advice. The StatoilHydro representative on the vessel, Martin Hovland, was extremely helpful and welcoming of the SERPENT Project work.

The Morvin recovery visit was extremely successful but this was based on thorough planning. StatoilHydro had been stressing the importance of reducing the scope of the recovery survey prior to the visit, notably replacing the reference transects with more core sampling. The pre-planned video survey and coring locations provided to the survey team prior to the visit ensure that it was possible to get a full data set. More time seems to be spent discussing plans than actually carrying out the surveys when planning is not complete before the visit and a well constructed plan seems to move our work up the priority list when compared to some other protocols which require further discussion.

5. MORVIN RECOVERY

SAMPLES

A video transect survey was carried out to assess the recovery from drilling in 2006. This comprised two parts. Firstly 4 transects were taken covering a minimum of 1 km over the source of the disturbance (the plugged and abandoned well). For the second part of this survey 12 reference transects were taken in previously randomly selected positions and headings.

Core samples were collected from the vicinity of the old well for comparison with samples taken prior to and immediately following drilling in 2006. 3 parallel samples were collected at 25 m and 50 m from the well on 4 headings. Where time allowed these samples were sectioned into three horizontal sections. These samples were frozen immediately following processing.

A map representing the survey of recovery of the 2006 Morvin well is shown below.

Andrew Gates and Martin Hovland processing core samples in the ROV hangar on board the *Acergy Petrel*

CODE STRUCTURE:

TL/250908/001#1

Acergy Petrel / Date / ROV SERPENT dive log # replicate

VIDEO TRANSECTS

Transect	SERPENT reference	Details	approx. distance	start position	end position	start time	end time
1	AP/030509/007	N to S over well	1000 m	380173.66 7223943.76	380171.61 7224990.29	23:52:08	00:38:50
2	AP/030509/008	E to W over well	1000 m	380698.27 7224480.53	379666.21 7224481.07	22:00:30	22:43:11
3	AP/030509/009	NE to SW over well	2000 m	379645.71 7224367.36	381691.52 7224808.45	19:50:26	21:34:01
4	AP/030509/010	NW to SE over well	1000 m	379799.39 7224855.41	380534.03 7224118.83	22:54:40	23:37:15
R1	AP/030509/011	Random (see survey plan)	100 m	380119.81 7225680.61	380247.84 7225598.63	00:58:28	01:05:51
R2		Random (see survey plan)	100 m	Transect R-2 was abandoned and replaced with R-14 because it covered the same area as the AW-1 reef survey.			
R3	AP/030509/013	Random (see survey plan)	100 m	381052.18 7224843.47	381129.23 7224734.54	02:23:12	02:29:50
R4	AP/030509/014	Random (see survey plan)	100 m	380681.97 7224902.76	380817.91 7224869.75	02:07:45	02:14:27
R5	AP/030509/015	Random (see survey plan)	100 m	381688.20 7224532.97	381659.86 7224398.80	03:04:46	03:10:34
R6	AP/030509/016	Random (see survey plan)	100 m	380400.34 7225683.98	380518.55 7225626.23	01:12:27	01:18:58
R7	AP/030509/017	Random (see survey plan)	100 m	380678.20 7226251.54	380780.46 7226178.37	01:33:00	01:38:06
R8	AP/030509/018	Random (see survey plan)	100 m	381841.47 7223524.36	381908.08 7223411.97	03:36:52	03:43:45
R9	AP/030509/019	Random (see survey plan)	100 m	381177.58 7224683.63	381094.14 7224565.23	02:35:20	02:43:26
R10	AP/030509/020	Random (see survey plan)	100 m	378703.96 7224047.27	378548.23 7224082.33	05:03:16	05:10:46
R11	AP/030509/021	Random (see survey plan)	100 m	378437.76 7224969.85	378514.01 7225094.53	05:32:31	05:40:11
R12				R12 was abandoned because it covered the same area as the extended Transect 3. It was replaced by R 13			
R13	AP/030509/022	Replacement for R12	100 m	379229.05 7225481.46	379330.87 7225398.45	05:59:07	06:06:41
R14	AP/030509/012	Replacement for R-2	100m	379628.81 7223435.34	379576.31 7223561.92	04:32:49	04:40:28
AW1	AP/030509/023	survey covering the approach to reef AW-1	n/a	380598.79 7224810.00	380667.88 7224801.02	06:40:36	07:03:40

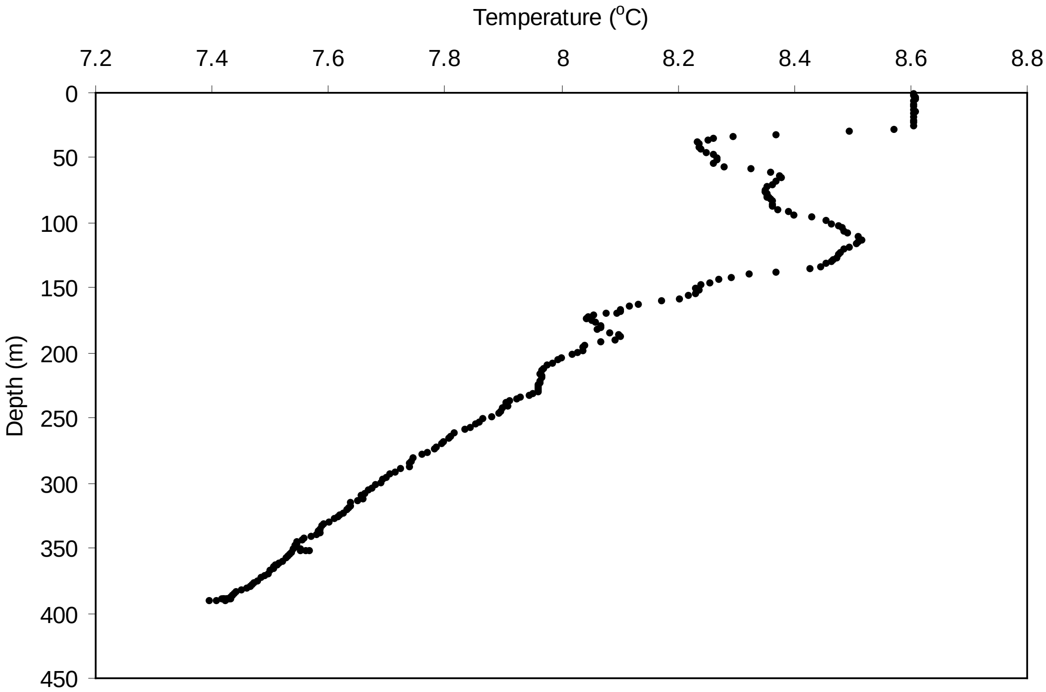
CORE SAMPLES

Site	Station	location	sample type	details	Notes
1a	AP/030509/001#1	25 m N of BOP	Push Core	top 2 cm	Evidence of barite on examination of 25 m cores
	AP/030509/001#2	25 m N of BOP	Push Core	2-4 cm	
25m North of Well	AP/030509/001#3	25 m N of BOP	Push Core	4-6 cm	
	AP/030509/002#1	25 m N of BOP	Push Core	top 2 cm	
	AP/030509/002#2	25 m N of BOP	Push Core	2-4 cm	
	AP/030509/002#3	25 m N of BOP	Push Core	4-6 cm	
	AP/030509/003#1	25 m N of BOP	Push Core	top 2 cm	
	AP/030509/003#2	25 m N of BOP	Push Core	2-4 cm	
	AP/030509/003#3	25 m N of BOP	Push Core	4-6 cm	
1 b	AP/030509/004#1	50 m N of Well	Push Core	top 2 cm	
	AP/030509/004#2	50 m N of Well	Push Core	2-4 cm	
	AP/030509/004#3	50 m N of Well	Push Core	4-6 cm	
50 m North of Well	AP/030509/005#1	50 m N of Well	Push Core	top 2 cm	
	AP/030509/005#2	50 m N of Well	Push Core	2-4 cm	
	AP/030509/005#3	50 m N of Well	Push Core	4-6 cm	
	AP/030509/006#1	50 m N of Well	Push Core	top 2 cm	
	AP/030509/006#2	50 m N of Well	Push Core	2-4 cm	
	AP/030509/006#3	50 m N of Well	Push Core	4-6 cm	
2a	AP/040509/024*	25 m E of well	Push Core	Top 5 cm	Pale sediment similar to barite from newly disturbed well
	AP/040509/025*	25 m E of well	Push Core	Top 5 cm	
	AP/040509/026*	25 m E of well	Push Core	Top 5 cm	
2b	AP/040509/027*	50 m E of well	Push Core	Top 5 cm	
	AP/040509/028*	50 m E of well	Push Core	Top 5 cm	
	AP/040509/029*	50 m E of well	Push Core	Top 5 cm	
3a	AP/040509/030#1	25 m SW of well	Push Core	top 2 cm	Pale Barite evident in all sections
	AP/040509/030#2	25 m SW of well	Push Core	2-4 cm	
	AP/040509/030#3	25 m SW of well	Push Core	4-6 cm	
	AP/040509/031#1-3 +	25 m SW of well	Push Core	all sections	CORE FAILED
	AP/040509/032#1	25 m SW of well	Push Core	top 2 cm	Barite evident in all sections
	AP/040509/032#2	25 m SW of well	Push Core	2-4 cm	
	AP/040509/032#3	25 m SW of well	Push Core	4-6 cm	
3b	AP/040509/033#1	50 m SW of well	Push Core	top 2 cm	
	AP/040509/033#2	50 m SW of well	Push Core	2-4 cm	
	AP/040509/033#3	50 m SW of well	Push Core	4-6 cm	
	AP/040509/034#1	50 m SW of well	Push Core	top 2 cm	
	AP/040509/034#2	50 m SW of well	Push Core	2-4 cm	
	AP/040509/034#3	50 m SW of well	Push Core	4-6 cm	
	AP/040509/035#1	50 m SW of well	Push Core	top 2 cm	
	AP/040509/035#2	50 m SW of well	Push Core	2-4 cm	
	AP/040509/035#3	50 m SW of well	Push Core	4-6 cm	
4a	AP/040509/036#1	25 m NW of well	Push Core	top 2 cm	
	AP/040509/036#2	25 m NW of well	Push Core	2-4 cm	
	AP/040509/036#3	25 m NW of well	Push Core	4-6 cm	
	AP/040509/037#1	25 m NW of well	Push Core	top 2 cm	
	AP/040509/037#2	25 m NW of well	Push Core	2-4 cm	
	AP/040509/037#3	25 m NW of well	Push Core	4-6 cm	
	AP/040509/038#1	25 m NW of well	Push Core	top 2 cm	
	AP/040509/038#2	25 m NW of well	Push Core	2-4 cm	
	AP/040509/038#3	25 m NW of well	Push Core	4-6 cm	
4 b	AP/040509/039#1	50 m NW of well	Push Core	top 2 cm	
	AP/040509/039#2	50 m NW of well	Push Core	2-4 cm	
	AP/040509/039#3	50 m NW of well	Push Core	4-6 cm	
	AP/040509/040#1	50 m NW of well	Push Core	top 2 cm	
	AP/040509/040#2	50 m NW of well	Push Core	2-4 cm	
	AP/040509/040#3	50 m NW of well	Push Core	4-6 cm	
	AP/040509/041#1-3 +	50 m NW of well	Push Core	All sections	CORE FAILED

* Time constraints determined that these samples were not fully sectioned. Only the top 5 cm were taken from the sample
+ The samples appeared good when taken but on examination on return to the vessel it was clear the there was no sediment in the samples

OBSERVATIONS

PHYSICAL OBSERVATIONS



The temperature profile for the water column above the Morvin well

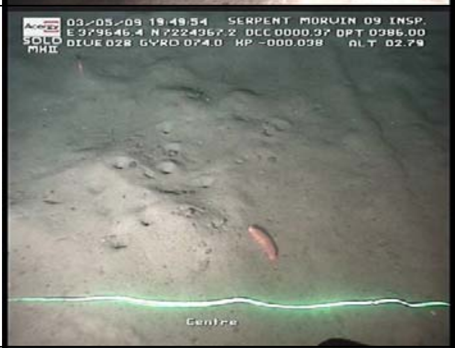
DISTURBANCE AND SEDIMENT OBSERVATIONS

<table>
<tr><td>The Morvin well that was drilled in 2006</td><td>
</td></tr>
<tr><td>Bubbles were observed rising from the abandoned well.</td><td>
</td></tr>
<tr><td>The rubble close to the well. This was also seen at Morvin in 2006</td><td>
</td></tr>
<tr><td>Sediment close to drilling</td><td>
</td></tr>
</table>

Occasional rocks provided a habitat for epifauna such as the sponges evident in this image.	
the typical natural sea bed	

FAUNAL OBSERVATIONS

Species observations made using the colour video camera during the video transect at Morvin are recorded in the table below.

Date	time	observation	photo/video
		Geryon crabs	
		Spiny sea cucumber (*Stichopus tremulus*)	
		Cushion star	
		Chimera montrosa (Rabbitfish or ratfish)	

		Anemone (*Bolocera* sp.)			
		Tall white sponge – also common in Morvin 2006			
		Cidaris cidaris – pencil spine urchin			
		sponges			
		Paralithodes??			

		Pennatulid		
		Hermit crab		
		Pennatulid		
		Asteroid		

ADDITIONAL SAMPLING

POCKMARKS CORE SAMPLING

Some core samples were taken from within unit pockmarks to analyse for hydrocarbons. Background samples were also taken from the area close to the proposed location of the Morvin template. SERPENT opportunistically took the top section of the two background samples at the template site in case no further sampling was possible of the Morvin Template prior to drilling at the site.

Sample name (MH)	SERPENT sample ref	location	sample type	details	Notes
	AP/050509/042	7226405 N 382200 E Morvin Template	Push core	Top 2 cm from Morvin Template	For SERPENT analysis
RC 4		7226405 N 382200 E Morvin Template	Push core	Lower section of sample for hydrocarbon analysis	For Martin Hovland BACKGROUND
	AP/050509/043	7226405 N 382200 E	Push core	Top 2 cm from Morvin Template	For SERPENT analysis
RC 5		7226405 N 382200 E	Push core	Lower section of sample for hydrocarbon analysis	For Martin Hovland BACKGROUND
RC 6		In Pockmarks close to Reef C18	Push core	Lower section of sample for hydrocarbon analysis	
RC 7		In Pockmarks close to Reef C18	Push core	Lower section of sample for hydrocarbon analysis	difficult to get mud to remain in sampler
RC 3		In Pockmarks close to Reef C18	Push core	Lower section of sample for hydrocarbon analysis	
RC 2		In Pockmarks close to Reef C18	Push core	Lower section of sample for hydrocarbon analysis	
RC 1		In Pockmarks close to Reef C18	Push core	Lower section of sample for hydrocarbon analysis	

MORVIN TEMPLATE PROPOSED DISCHARGE SITE SAMPLING

As the vessel was on location at the Morvin site some samples were collected close to the proposed discharge site for the Morvin Template drilling.
Three parallel samples were taken at 200m (RC-9) from the proposed discharge point. These were labelled RC-9 ‘1’ to ‘3’. The samples were sectioned to 0-5 cm (labelled ‘a’) and 5-10 cm (labelled ‘b’).
Three parallels at 100 m (RC - 8) from the proposed discharge site. These were labelled RC-9 1 to 3. These samples were sectioned to 0-5 cm (labelled ‘a’) and 5-10 cm (labelled ‘b’).
The samples were sent for analysis by IMR, Bergen.

Sample name (MH)	SERPENT sample ref	location	sample type	details	Notes
RC 8 – 1 a		100 m from Discharge point	push core	top 5 cm Frozen	
RC 8 – 1 b		100 m from Discharge point	push core	5-10 cm Frozen	
RC 8 – 2 a		100 m from Discharge point	push core	top 5 cm Frozen	
RC 8 – 2 b		100 m from Discharge point	push core	5-10 cm Frozen	
RC 8 – 3 a		100 m from Discharge point	push core	top 5 cm Frozen	
RC 8 – 3 b		100 m from Discharge point	push core	5-10 cm Frozen	
RC 9 – 1 a		200 m from Discharge point	push core	top 5 cm Frozen	
RC 9 – 1 b		200 m from Discharge point	push core	5-10 cm Frozen	
RC 9 – 2 a		200 m from Discharge point	push core	top 5 cm Frozen	
RC 9 – 2 b		200 m from Discharge point	push core	5-10 cm Frozen	
RC 9 – 3 a		200 m from Discharge point	push core	top 5 cm Frozen	
RC 9 – 3 b		200 m from Discharge point	push core	5-10 cm Frozen	

ADDITIONAL OBSERVATIONS

REEF OBSERVATIONS

Reef AW1		A Lophelia reef observed. Species include *Lophelia pertusa, Paragorgia arborea, Acesta* sp., *Sebastes viviparus, Molva molva. Lophius picatorius*	

FAUNAL OBSERVATIONS AT THE HEIDRUN PIPELINE

Indeterminate sponge (resembles *Stylocordia*)
Pennatulids – Sea pens
Bolocera sp - Anemone
Nephrops norvegicus – Norway lobster
Munida sarsi – squat lobster
Stichopus tremulus – Spiny sea cucumber
Asteria rubens – Common starfish
Chimera montrosa – Rabbitfish/ratfish
Sebastes viviparous – Redfish
Anarhichas sp.- Wolffish
Molva molva - Ling
Pollachius virens – Coalfish (Saithe)

MISSION 69 (SEE MISSION 66 ABOVE)

LEIV EIRIKSSON, GRO 6603, NORWEGIAN SEA

CHRISTOPHER ROTERMAN

MISSION 70

STENA CARRON, ROSEBANK 5

CHRISTOPHER ROTERMAN

GENERAL INFORMATION:

Client: Chevron
Rig operator: Stena
Rig name: Stena Carron
Rig location: Rosebank, Faroe-Shetland Channel
Rig position: 061°03 55.978’ N 003° 42 28.438’ W
Seabed depth: 1124 m
Seabed temperature: -0.75°C
ROV operator: Oceaneering
ROV: Magnum x 2 + Small Minimum vehicle
ROV team:

ROV superintendent	Bruce Park
Supervisor starboard ROV days	Andrew Angus
Pilot starboard ROV days	Craig Duncan, Steve Watson
Tech starboard ROV days	Scott Matheson, Brian Stringer

GEAR:

Magnum ROV x 2 (Magnum 156 is starboard, Magnum 155 is port)
Small Minimum vehicle (on starboard)
Deep-sea Systems Colour HD video camera x 2 (different models, one on port ROV is large one on starboard ROV is small)
Deep-sea Systems High Intensity Discharge (HID) lighting
Deep-sea Systems DPC8000 Stills camera
Panasonic DVCPro-HD deck on port camera and 8 x hard-disc array on the starboard

SERPENT Gear:
Hand operated pump
16 x Core sampler tubes
8 x core sampler handles
6 x core sampler holders
2 x 2.5 l 37% Formaldehyde solution (MSDS sheets included)
2 x litre bottle of inert “Luminophore” tracers (coloured sand)
Metal core tube holding frame
Personal protective equipment (glasses gloves)
SERPENT “settlement frame” (plastic frame)
Core processing equipment (scoop, plunger, plastic rings)
Plastic sample bags
Stationary
15 x 1 litre sample bottles
Plastic buckets
RNAlater 1 x 500 ml bottle
RBR datalogger

NARRATIVE

Tuesday 23rd of June:

Departed from Bristow Heliport in Aberdeen at 0800 and arrived at the Stena Carron at 0930. Safety induction to the vessel was completed at 1230, after which, I had a meeting with the ROV superintendent. It was decided that all SERPENT operations would be conducted with the starboard ROV, as the Portside ROV was not equipped to rest on the sea floor. The rig was spudding and getting ready to drill and both ROVs were being used for observing these operations. Superintendent introduced me to the daytime starboard crew and showed me where the SERPENT equipment was being stored.

Wednesday 24th June:

Retrieved coring tubes containing the CAMBO prospect sediment from the galley freezer room and proceeded to process the cores in accordance with the protocol set forth by SERPENT and Chevron. The coring holsters were then attached to the coring rack and the coring tubes were cleaned, placed in the holsters and secured with weak-link tie wraps. In preparation for the bioturbation experiment, the luminophore powder was placed into separate plastic bottles and soaked in water. The sediment corrals were prepared by cutting the bottom off six plastic buckets, labelling them and then attaching weights and monkey fists.

Thursday 25th June:

Open hole drilling was ongoing, therefore both ROVs were needed to observe operations. During this time, more adjustments were made to the bioturbation corrals and specimen bags were labelled, the datalogger was assembled, primed and some of the video footage from CAMBO was reviewed.

Friday 26th June:

Still no ROVs were available for SERPENT operations owing to cementing operations. There was an Oceaneering Superintendent crew change, with Bruce Park as the replacement. Bruce was briefed about the SERPENT work plan.

Saturday 27th June:

Attached coring rack to the ROV five-function arm and attached the plastic corrals to the steel coring rack with weak–link tie wraps for the bioturbation experiment. **Dive 1** commenced at 0812 and ended at 1135. During the dive, the 6 corrals were placed in the sediment roughly 200 m west of the well head. The ROV then collected 6 coring tubes worth of drill cuttings from the drill spoil heap at the well head and returned with the cuttings to the corrals where drill cuttings were poured onto three of the corrals (two coring tubes worth per corral). After lunch, the luminophores were poured into the coring tubes in preparation for the second phase of the bioturbation experiment setup. **Dive 2** commenced at 1444 and ended at 1715. During the dive, one coring tube's worth of luminophore powder was poured on each corral. It should be noted that the skill of the ROV pilots was crucial in the success of this phase.

Sunday 28th June:

Set up the coring tubes for the collection of routine sediment cores as per the Chevron protocol. **Dive 3** commenced at 0814 and ended at 1032. During this dive, 4 sediment cores were taken at 404m and 216 ° from the well head. Two coring tubes were used to capture a pycnogonid (sea spider) and a possible sea squirt. **Dive 4** commenced at 1357 and ended at 1558. During this dive, 3 sediment cores were collected 251 m and 196 ° from the well head. The 3 remaining corers on the rack were used to collect a Sabellid polychaete tubeworm, a pink Alcyonacean (a sessile cnidarian) and another sea spider that had at least 10 juvenile individuals on its back. The fauna were preserved in 4% formalin and a piece of the sea spider's leg was preserved in a DNA preservative, which was then frozen.

Monday 29th June:

Some of the night shift pilots were moving to day shift and therefore there were no morning ROV operations so they could sleep and acclimatize. The datalogger was attached to the ROV after lunch and the specimen bags for the bioturbation experiment were rechecked for any holes. **Dive 5** commenced at 1423 and ended at 1726. During this dive, four video transects were performed at roughly north, south, east and west headings from the BOP outwards, for a minimum of 120 m. 150 m was surveyed in the case of the south transect as the zone of disturbance appeared to extend further from the BOP. Notable fauna seen were cerianthid anemones, at least two kinds of alcyonaceans, hydroids, sabellid tubeworms, a variety of sponges, at least two kinds of pycnogonids, some brittle stars and starfish. The greatest variety of animals appeared to be in the areas that had more hard surfaces available for attachment.

Tuesday 30th June:

Dive 6 commenced at 0832 and finished at 1112. During this dive, the final four video transects were performed at roughly southwest, northwest, southeast and northeast headings from the BOP outwards for about 120 m. Similar fauna as noted for Monday were seen and again, the zone of drill cutting coverage extended to at least 50 m from the BOP. **Dive 7** commenced at 1331 and ended at 1629. During this dive coring tubes were used to collect faunal specimens; notably a white and a pink alcyonacean. After the dive, the coring equipment was cleaned and prepared for the end phase of the bioturbation experiment, to be completed on Wednesday.

Wednesday 1st July:

Dive 8 started at 0706 and ended at 0852. During this dive, 3 of the 6 bioturbation corrals were cored, each corral being cored with 2 coring tubes. These cores were then processed (top 5 cm sectioned into 5 mm slices) and frozen and the coring tubes were cleaned and prepared for the next dive. **Dive 9** started at 1319 and ended at 1517. During this dive, the other 3 bioturbation corrals were cored and the cores processed in the same manner as the cores from the previous dive.

Thursday 2nd July:

Dive 10 started at 0835 and ended at 1107. During this dive, 3 different types of sea spider were encountered, but efforts to collect them in the coring tubes failed. However a sponge, a tubeworm and an anemone were successfully collected. These specimens were preserved in 4% formalin. Some tissue from these animals were also placed in DNA preservative and frozen in niskin bottles for further analysis on land. After lunch, the coring equipment was disassembled, cleaned and packed away. The datalogger was also removed from the ROV, cleaned and packed into its hard case. Animal specimens contained in bottles of 4% formalin were stowed in the SERPENT aluminium case to remain aboard until a later date.

Friday 3rd July

Checked in luggage (including a cooler bag containing frozen sediment and animal specimens) at heli admin at 1030. Boarded helicopter for Aberdeen at 1430.

SAMPLES:

CODE STRUCTURE:

SC/280609/004#1
Stena Carron / Date / Dive number # replicate (or sample number)

SAMPLE STATIONS:

Station	Location	Sample type	Preservation
SC/270609/001	NA	Video footage of dive 001	DVD
SC/270609/002	NA	Video footage of dive 002	DVD
SC/280609/003	NA	Video footage of dive 003	DVD
SC/280609/003#1	404 m, 216° from BOP	Push core sediment PSD top 6cm	Frozen
SC/280609/003#2	404 m, 216° from BOP	Push core sediment Hydrocarbon top 6cm	Frozen
SC/280609/003#3A	404 m, 216° from BOP	Push core sediment Metals top 1cm	Frozen
SC/280609/003#3B	404 m, 216° from BOP	Push core sediment Metals 1-3cm	Frozen
SC/280609/003#3C	404 m, 216° from BOP	Push core sediment Metals 3-6cm	Frozen
SC/280609/003#4	404 m, 216° from BOP	Ascidean (Sea squirt)	4% Formalin
SC/280609/003#5	404 m, 216° from BOP	Pycnogonid (Nymphon sp.)	4% Formalin
SC/280609/003#6	404 m, 216° from BOP	Ascidean (Sea squirt) tissue	RNA Later
SC/280609/004	NA	Video footage of dive 004	DVD
SC/280609/004#1	251 m, 196° from BOP	Push core sediment PSD top 6cm	Frozen
SC/280609/004#2	251 m, 196° from BOP	Push core sediment Hydrocarbon top 6cm	Frozen
SC/280609/004#3A	251 m, 196° from BOP	Push core sediment Metals top 1cm	Frozen
SC/280609/004#3B	251 m, 196° from BOP	Push core sediment Metals 1-3cm	Frozen
SC/280609/004#3C	251 m, 196° from BOP	Push core sediment Metals 3-6cm	Frozen
SC/280609/004#4	251 m, 196° from BOP	Pycnogonid (Nymphon sp.) + juveniles	4% Formalin
SC/280609/004#5	251 m, 196° from BOP	Alcyonacean (pink variety)	4% Formalin
SC/280609/004#6	251 m, 196° from BOP	Sabellid tubeworm	4% Formalin
SC/280609/004#7	251 m, 196° from BOP	Pycnogonid (Nymphon sp.) leg	RNA Later
SC/290609/005	NA	Video footage of dive 005	DVD
SC/300609/006	NA	Video footage of dive 006	DVD
SC/300609/007	NA	Video footage of dive 007	DVD
SC/300609/007#1	180 m NE of BOP	Alcyonacean (white variety)	4% Formalin
SC/300609/007#2	180 m NE of BOP	Alcyonacean (pink variety)	4% Formalin

SC/300609/007#3	180 m NE of BOP	Small Alcyonacean (white variety)	4% Formalin
SC/300609/007#4	180 m NE of BOP	Possible Tubularian	4% Formalin
SC/010709/008	NA	Video footage of dive 008	DVD
SC/010709/008#1	200 m, W of BOP	Bioturbation push core sediment (control) top 5cm (in 5mm sections)	Frozen
SC/010709/008#2	200 m, W of BOP	Bioturbation push core sediment (control) top 5cm (in 5mm sections)	Frozen
SC/010709/008#3	200 m, W of BOP	Bioturbation push core sediment (control) top 5cm (in 5mm sections)	Frozen
SC/010709/008#4	200 m, W of BOP	Bioturbation push core sediment (control) top 5cm (in 5mm sections)	Frozen
SC/010709/009	NA	Video footage of dive 009	DVD
SC/010709/009#1	200 m, W of BOP	Bioturbation push core sediment (treated) top 5cm (in 5mm sections)	Frozen
SC/010709/009#2	200 m, W of BOP	Bioturbation push core sediment (treated) top 5cm (in 5mm sections)	Frozen
SC/010709/009#3	200 m, W of BOP	Bioturbation push core sediment (treated) top 5cm (in 5mm sections)	Frozen
SC/010709/009#4	200 m, W of BOP	Bioturbation push core sediment (treated) top 5cm (in 5mm sections)	Frozen
SC/010709/009#5	200 m, W of BOP	Bioturbation push core sediment (treated) top 5cm (in 5mm sections)	Frozen
SC/010709/009#6	200 m, W of BOP	Bioturbation push core sediment (treated) top 5cm (in 5mm sections)	Frozen
SC/010709/010	NA	Video footage of dive 010	DVD
SC/010709/010#1	200 m, N of BOP	Stylocordyla sp.	4% Formalin
SC/010709/010#2	200 m, N of BOP	Sabellid tubeworm	4% Formalin
SC/010709/010#3	200 m, N of BOP	Cerianthid anemone (damaged)	4% Formalin
SC/010709/010#4	200 m, N of BOP	Stylocordyla tissue	RNA Later
SC/010709/009#7	200 m, N of BOP	Tubeworm tissue	RNA Later
SC/010709/009#7	200 m, N of BOP	Anemone tissue	RNA Later

5. GEAR REPORT

ROV Magnum 156:

The ROV was good and highly suitable for the job. No problems were encountered with vehicle.

High definition camera:

The HD camera was operating normally, but the data recording hardware was broken so no HD footage could be salvaged.

Push cores:

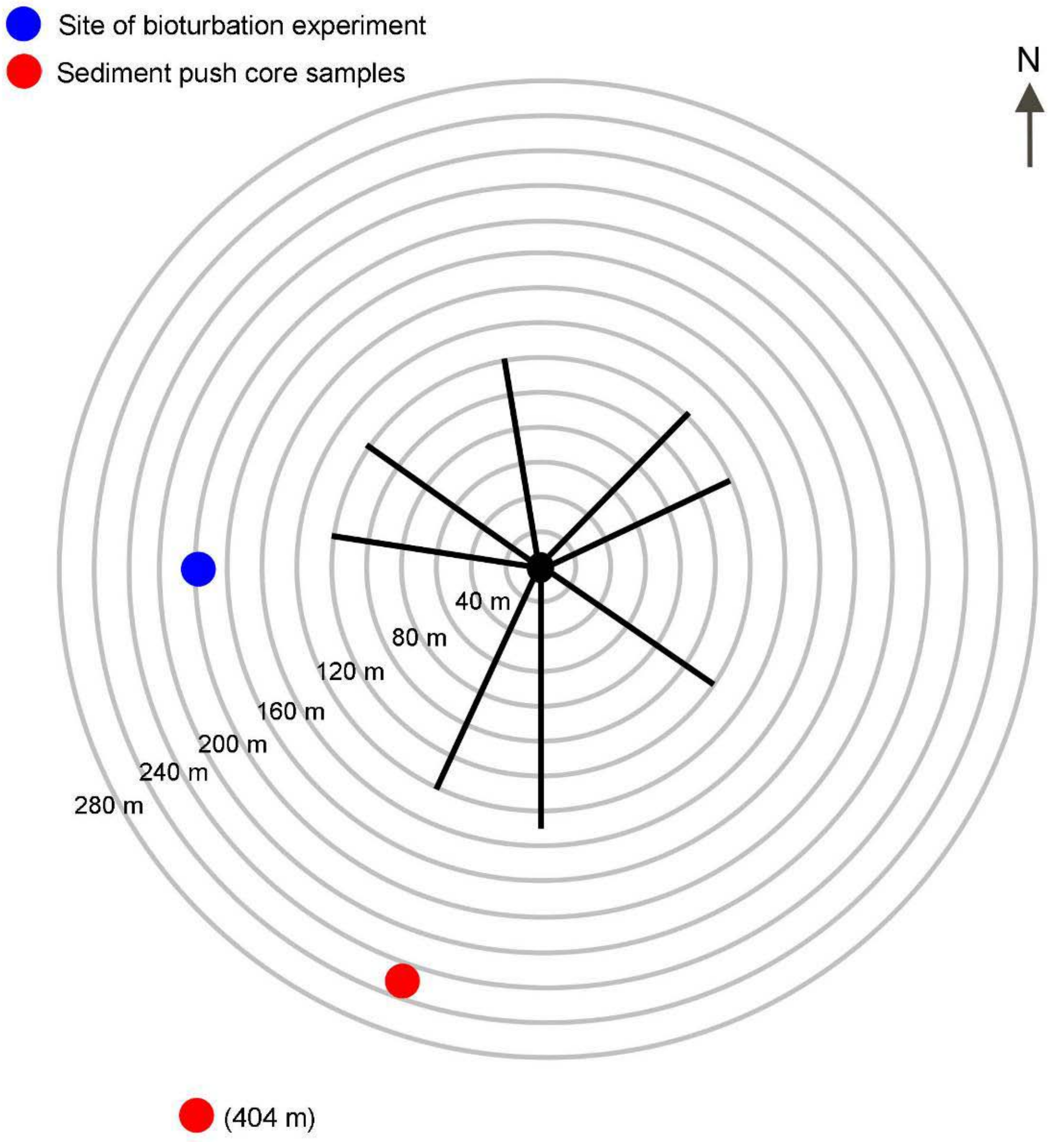
Push cores mounted onto the 6 core holder with thick tie wraps. Thin (5mm) floating rope used to make small monkey's fists to ease core deployment. Core holder held in 5 function manipulator arm. Throughout the cruise, only three plastic core tubes were broken or lost. Credit must go to the ROV crew who were working close to the operating limits of the ROV

RBR data logger:

The datalogger was placed within the ROV and secured using large plastic tie wraps. The data retrieved from the unit will prove useful in providing background environmental data.

6. Transects

Video transects were carried out using the standard video camera along the paths shown in the following diagram. Distances were estimated with the use of the ROV's SONAR as well as the ROV's transponder.



7. Bioturbation Experiment

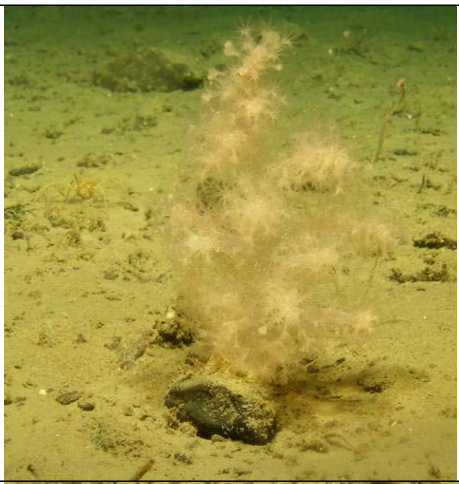
Aside from the ongoing mission of SERPENT to collect specimens and video footage of deep-sea fauna, it is also the aim of SERPENT to conduct experiments in situ on the sea floor. Bioturbation is the displacement or mixing of sediment particles by benthic fauna. An analogy on the land would be the way that earthworms work the soil. When inert tracer powder (luminophores) is placed on the surface of a patch of sediment, over time, bioturbation will result in the tracer powder being 'worked' downwards into the sediment. The distance that the powder has travelled vertically over a set period of time can provide a way of measuring the amount of faunal activity in that patch of sediment. In this case, 6 corrals were set up in a region of seafloor unaffected by the drilling and 3 corrals had a layer of drill cuttings deposited on top before the luminophores were applied to the corrals. The aim of the experiment was to see if the vertical distance travelled by the luminophores over 4 days was different for the corrals that had drill cuttings deposited on top. I.e., if the deposition of drill cuttings as is the case next to the BOP will affect the activity of the small animals in the sediment underneath. After 4 days, the corrals were cored with coring tubes, and the top 5cm of each tube was sliced into 5 mm sections. These sections were then frozen, to be later analysed for the presence of the tracer luminophores. This was the first attempt to perform such an experiment in the deep-sea realm with ROVs and although the analysis of the core slices is ongoing, this 'pilot run' was successful in showing that such an experiment is possible at such depths, and may be a useful tool in the future for quantifying the effects of drill cutting deposition.

8. Ecological highlights

A wide variety of megafunal taxa (animals greater than 10 mm in length) were observed at Rosebank, including large sponges, some sessile cnidarians, notably the alcyonaceans, pycnogonids (sea spiders), some echinoderms (brittle and sea stars) and some skates. There were almost certainly many additional fauna that were not possible to resolve, there was evidence for bryozoans, small hydroids, sabellid polychaetes, small or thin sponges, small asteroids and amphipods. A number of pelagic fauna were observed (but not possible to identify) near the seabed including ctenophores, copepods and amphipods.

Phylum	Species	Notes	Picture
Porifera	*Stylocordyla borealis*		

	Hexactinellid	Covered in Nymphon pycnogonids	
	Chondrocladia gigantea		
Cnidaria	*Cerianthus* sp. (possibly *Cerianthus voigti*)		
	Alcyonacean (Pink variety)		

	Alcyonacean (White variety)		
	Lucernaria bathyphila	Only one specimen currently exists thanks to a previous SERPENT visit to the Stena Carron	
Arthropoda	*Colossendeis proboscidea*	Note that a smaller Nymphon species of pycnogonid is on the dorsal surface of the larger Colossendeis species.	
	Nymphon sp.		

	Colossendeis colossea		
Echinodermata	Large ophiuroid		
	Crossaster squamatus		
Chordata	*Amblyraja radiata*	Note the cerianthis anemone to the right and the pycnogonid to the left	
	Possible Gaidropsaris sp.	With a skate swimming past, and an ophiuroid in the foreground	

MISSION 71

BOURBON DIAMOND, USAN, NIGERIA

DANIEL JONES

1. GENERAL INFORMATION:

Company: Total
Vessel operator: Bourbon
Vessel name: Bourbon Diamond
Location: Usan, Nigeria
Vessel position: 003°29.179 N 007°27.940 E (WGS 84: 9/7/09 18:20)
Seabed depth: 750 m
Seabed temperature: 6°C
ROV operator: Oceaneering
ROV: Millennium 73
ROV team:

ROV supervisor days	Stuart Jones
ROV pilot days	David Cox
ROV pilot days	Jayselan Naidoo
ROV tech days	Usif Abdulatif
ROV supervisor nights	Neil Purdie
ROV pilot nights	Steve Fisher
ROV pilot nights	Michael Clark

Science team:

Dr Daniel Jones	Science leader (SERPENT)
Charles Mrabure	Total E & P Nigeria
Prof. Alex Ugwumba	University of Ibadan, Department of Zoology, Ibadan, Nigeria Tel: +234 8030497460 +234 8051970791 Email: adiaha4me@yahoo.co.nz
Dr Adesina Adegbie	Institute for Oceanography and Marine Research, 3 Wilmot Point Road P.M.B. 8010 8 Victoria Island, Lagos Tel: +234 8055210651 +234 1 8750963 Email: adeadegbie@yahoo.com sadegbie@niomr.gov.ng

2. GEAR:

- Millenium 73 ROV
- Standard video camera (Insite Pegasus)
- ROV large push core as scoop
- 2 x small (57mm ID, 63mm OD) ROV push core

- Aandera Seaguard Current Meter (RCM DW rated 6000m) with salinity sensor (Serial number 100)
- CTD Datalogger Titanium body RBR Model XR-420CTDmTi+pH+DO. Includes conductivity (Marine Conductivity), temperature, pressure, pH (AMT UT-pH-EM) and Oxygen (Aanderaa AA 3830 Optode) sensors (Serial number 17023)

Unfortunately the SERPENT box that was sent to Nigeria was lost by Transocean in Port Harcourt. All the equipment that was used was hand carried by D. Jones (73kg) on the aeroplane. The equipment was temporarily exported under the UK Customs Duplicate Lists procedure and processed in a similar way in Nigeria.

Plankton sampler

We used a plankton sampler made by one of the members of crew (Diego Fernandes Torres). This simple device is shown.

3. NARRATIVE:

Tuesday 7th July 2009

Flew from London to Lagos, transferred to Millennium hotel. Had some trouble getting in through customs owing to the expensive survey equipment. Fortunately my UK customs duplicate list paperwork was sufficient to persuade the Nigerian Customs to let me fill out the equivalent paperwork for temporary import. The equipment was valued very highly £27,000 exacerbating the problem. In the future they recommended that I contact Nigerian customs in advance. I suspect that transfer of equipment may be easier under a carnet.

Wednesday 8th July 2009

Picked up from the Millennium hotel (Victoria Island) and transferred to the Total Usan offices with my equipment. I met with Charles Mrabure and Eric Mentzer. After spending some time in the Total Offices I joined the shuttle bus to the airport. I Flew on Aero jet from Lagos Local airport to the Port Harcourt International Airport. From Port Harcourt we transferred via minibus to the Novotel Hotel in Port Harcourt.

Thursday 9th July 2009

Met at Charles' room at the hotel to discuss the workplan. We were picked up from Novotel and transferred to the NAF base. We checked in all my luggage (73kg…) and I proceeded to immigration where they were concerned about my business visa. I did not work out how this problem could be resolved, perhaps with a letter from Total and by declaring that I worked for the University and not Total. We got on to a Sikorsky 76 helicopter and took the approx 1 hour journey south (100km) to Usan. We landed on West Capella (the dual derek drill ship drilling the wells at Usan) and had lunch. We transferred on Billy Pugh crane lift onto the Bourbon Diamond support vessel. We met with the ROV team and they dived on DIVE 1 at 14:37. They had to inspect a transponder then we had a chance to carry out some initial survey work. The DVD Hardrive was started at 15:54 while we were on the seabed at 740m depth.

Time	Observation
15:55:59	Phormosoma placenta
16:03:30	Ophiuroid – moving very quickly
16:04:05	Holothurian fecal cast

16:07:53	Galatheid
16:09:42	Close up of Galatheid
16:21:20	Synaphobranchid eel
16:23:24	Hole on the seafloor
16:26:09	Small monkfish like fish
16:30:24	Cerianthid ?and small crustacean in large burrow, possible symbiotic relationship
16:34:26	Synaphobranchid
16:41:31	Other eel like fish (more robust tail fin)
16:46:48	Monkfish
16:53	End Dive

The seabed temperature was measured on the parascientific sensor as 6.02°C. Seabed position was recored at 30 second intervals by the surveyor (Etien). The surveyors data was all datum WGS 84 and recorded as UTM zone 32 N (with a central meridian of 9) the first number recorded was eastings (starting 325…) and the second northings (starting 389…). The initial position of the dive was 325198.96 E 389340.75 N. There was not a huge amount of movement while we were carrying out the sampling. The West Capella was drilling well USN – 432 at the moment and just about to spud.

Friday 10th July 2009

Met the ROV team at 6:00 and spent the morning testing the CTD, carrying out pH calibrations (unsuccessful – there appeared to be no difference in pH between the buffers). The calibration used buffer solutions and went from pH 7 (7:03:42 to 07:05:30); pH 4 (07:06:30 to 07:08:30); pH 10 (07:10:00 to 07:12:10). I assembled the ROV push cores and made a crab trap out of an old oil drum. The ROV was on standby all day in the cage at depth. The ROV was brought up on deck prior to collecting transponders at around 18:00. I assembled the CTD and started logging at 18:09 logging every 30 seconds. The optode was shorting the logger (battery voltage was dropping rapidly) so I had to fill the connector with grease and deploy the logger without the optode. The battery was estimated to run out on 18th July. The ROV was launched around 19:10 and the position of the ship at 19:41 (unchanged since launch) was 3°31.538 N 7°26.392 E.

Saturday 11th July 2009

ROV was busy retrieving then deploying transponders in the morning. I designed a survey to encompass different bathymetric slopes. The methodology was as follows. Areas were identified on bathymetric charts with constant slope (a random factor for subsequent statistical analysis) and a depth between 740 and 760 m. Within each area three random survey start points and headings were identified using a random number generator in Microsoft excel. Transects were 200m long and examined by plotting onto the chart. Any transect that extended beyond the boundaries of identified areas were discarded and another picked using the same method. In the area of extreme slope, owing to bathymetric constraints, headings were constrained between 350 to 10° and 170 to 190° but otherwise random.

Waited all day for opportunities for work but none came. In the night a petal shaped survey of the proposed drill location was carried out.

Sunday 12th July 2009

ROV was busy in the morning. At 13:00 a potential opportunity for survey occurred, however the West Capella Total company man wanted permission from the office which was not granted despite Charles' intervention. I spent the afternoon refining the survey. I also assembled Diego's plankton net. ROV dived in the night (DIVE 2) while I was asleep.

The survey plan was for 12 x 200 m transects as follows (Datum UTM 32N; WGS 84):

start E	start N	heading	end E	end N	Name
329883	390569	255	329689	390517	Flat-1
329135	389240	35	329249	389403	Flat-2
328857	389538	76	329050	389585	Flat-3
325248	388398	343	325189	388589	Med-1
324864	388283	191	324826	388086	Med-2
325005	388655	196	324949	388462	Med-3
323359	386764	187	323334	386565	High-1
322799	386011	347	322754	386205	High-2
323564	386891	291	323377	386963	High-3
321285	385530	4	321298	385729	Extr-1
321333	385436	359	321329	385635	Extr-2
321319	385654	189	321287	385456	Extr-3

The headings in reality seemed to be incorrect.

Monday 13th July 2009

ROV collected one core of sediment from the seabed at 3:00 (BD/130709/001#1). We tried to section it in the morning however the sediment was very liquid and I was worried we would loose the sample. For that reason I froze the core whole for later sectioning. After the ROV team had completed a magnetograph of the umbilical we were allowed the afternoon to do some survey work. At 11:05 we commenced our **DIVE 3** and the ROV was at the seabed by 11:16:58. We carried out surveys at 1m altitude from the base of the ROV (143 cm from the centre of the camera). The camera was zoomed out to maximum extent and maximum down tilt (30 degrees calculated from measuring the camera position at the surface). The camera was a Insite Pacific Pegasus camera, the horizontal acceptance angle at full zoom out (wide angle) was 55° and the vertical acceptance angle 43°. This, at 1 m altitude (143cm camera height) gave a length of the base of the screen at 172cm.

Time	Event
11:34:29	Flat 1 survey: start
12:08:10	Flat 1 survey: end
12:30	ROV back on deck
13:00	ROV launch for **DIVE 4**
13:32:10	Start Flat 2 survey
13:57:10	End Flat 2 survey

	Transit in cage to next site
14:49:29	Start Flat 3 survey
15:09:04	End Flat 3 Survey
	Bring ROV up to surface
15:30	ROV on deck
16:12	ROV off deck for **DIVE 5**
16:25	ROV at depth
16:37:27	Start Med 1 survey
17:00:10	End Med 1 survey
	Transit in cage underwater
18:09:41	Start Med 2 survey
18:37:29	End Med 2 survey
	Transit in cage
19:27:45	Start Med 3 survey
19:55:46	End Med 3 survey
	Bring ROV to surface
20:25	ROV on deck
20:52	ROV off deck for **DIVE 6**
21:09:49	Start High 3 survey
21:35:03	End high 3 survey
21:38	Return to cage
21:50	ROV on deck
	Handover to surveyor to carry out marker buoy checks

NOTE – The High 3 survey was incorrectly referred to as High 1 in the audio of the survey please ignore the audio

Tuesday 14th July 2009

ROV had to position the marker buoy for the next well over night. At 6:00 am the ROV became free for a few hours. I also finished the plankton sampler.

07:49	ROV off deck for **DIVE 7**
08:11:45	Start High 1 survey
08:35:21	End high 1 survey
08:39:32	Return to cage
08:50	ROV on deck
09:15	ROV off deck for **DIVE 8**
09:44:37	Start High 2 survey
10:08:35	End high 2 survey
10:10	Return to cage
10:27	ROV on deck
	Had to stop survey as West Capella requested cargo transfer

In the afternoon the ROV team were doing beacons so there was no possibility for our work.

Wednesday 15th July 2009

ROV was doing beacon work all day. I attached the plankton sampler for our **DIVE 9** which was predominantly for their work. We got some sample which was preserved in formalin. The cameraperson, Brendan Butcher (HardHat Media) was due on the Bourbon Diamond today to film our work but he was delayed on the Capella.

DIVE 10, which was a operations dive, also collected plankton sample 2.

Thursday 16th July 2009

ROV was busy for the morning although on **DIVE 11** we collected some plankton samples (P3). We spent the morning doing filming of short documentary for Total E&P Nigeria with Brendan Butcher (HardHat Media) who arrived on the Diamond (via basket transfer from West Capella) at around 07:00.

20:44	ROV off deck for **DIVE 12**
21:13:41	Start Extreme 1 survey
21:45:	End Extreme 1 survey
21:51:25	Observe lithodid crab
	Return to cage
22:13	Leave cage
	Observed Brisingid asteroid
22:19:39	Start Extreme 3 survey
22:49:26	End Extreme 3 survey
	Change DVD
	In cage for transit
23:09	Out of cage
	Community video
23:23:30	Start Extreme 2 survey
23:53:45	End Extreme 2 survey
23:59	Collect rock sample
00:26	ROV on deck

Plankton sample 4 was also collected on dive 12. When examined the rocks appeared to be igneous, possibly basalts with volcanic ash.

Friday 17th July 2009

I retrieved the CTD from the ROV at around 12:00 midday and downloaded the data. On **DIVE 13** we collected the amphipod trap. There were two components of the trap, an old oil barrel with a larger entrance and a smaller bottle type trap attached (made from a 2 litre water bottle). The smaller bottle trap had tiger prawns as bait, the larger trap had two fish as bait. Unfortunately the bait had been left outside for approximately 30 hours and had started to smell bad… The bait had been wrapped in 1mm mesh, this was fortunate as it retained many more amphipods than would have been retained without. Amphipods and isopods were caught in both traps and preserved separately. I preserved one of each apparent species in RNAlater for subsequent genetic analysis. The rest were preserved in 4% formaldehyde. The amphipods were all apparently dead on the surface, presumably owing to the large temperature differences between the seabed and surface waters.

At 20:00 the ROV was off deck for DIVE 14 at the proposed site of well 454 (approximately 385330 N 322870 E). The ROV was at the seabed at 20:20. We took two core samples. Core one (rotating top design) was started 20:36:28 and completed 20:44:59. We moved to a new location, the well marker was 11m due south of the ROV. The second core was stowed 21:13:24. The ROV was in cage 21:21:46

and returned to the surface at around 21:50. We suffered an unlikely double failure, the base of the one core holder had come out (first one taken) and the material had washed out. The other core had somehow been dislodged from the holster during return to the surface and was missing.

In the evening we had a large science wash up meeting to discuss the visit.

Saturday 18th July 2009

We left the Bourbon Diamond on the Billy Pugh crane operated basket at around 07:00 and transferred onto the West Capella Drill ship. We got onto the Skorsky S76 helicopter and returned to Port Harcourt. I stayed overnight at the Novotel hotel (3 Stadium Road, Rumuomasi).

Sunday 19th July 2009

We left Novotel at 14:00. Flew from Port Harcourt International Airport to Lagos on Aero at 18:10. Arrived in Lagos Muhammed Murtala Airport at 19:30 and got Total armed convoy to Total Offices in Lagos. From there I got transported to Eko Hotel.

Monday 20th July 2009

Went to Total offices and visited the Nigerian Institute for Oceanography and Marine Research.

Tuesday 21st July 2009

Went to Total offices and gave a talk on our work at Usan.

4. SAMPLES:

CODE STRUCTURE:

BD/020509/001#1
Bourbon Diamond/ Date / station number # replicate

SAMPLE STATIONS:

Station	Location	Sample type	Preservation	Picture
BD/130709/001#1	390352 N 325354 E depth 732.5m	Core sample	Frozen	
BD/150709/002#1	3°N 7°E	Plankton sample 1	Formalin	
BD/150709/003#1	3°N 7°E	Plankton sample 1	Formalin	
BD/160709/004#1	3°N 7°E	Plankton sample 3	Formalin	
BD/160709/005#1	3°N 7°E	Plankton sample 4	Formalin	
BD/160709/006#1	321329 E 385635 N	Rock sample from 7-function manipulator	cold	

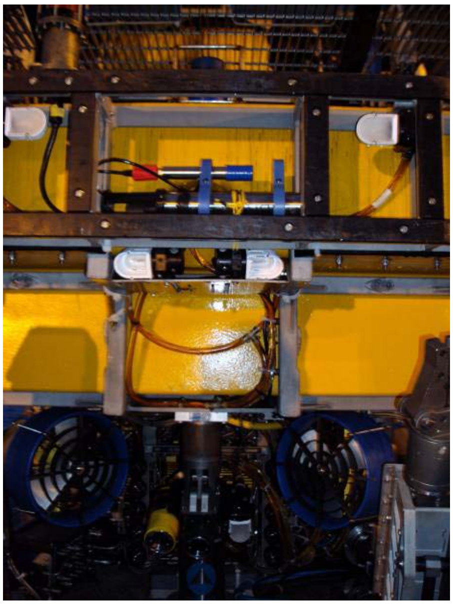
BD/160709/006#2	321329 E 385635 N	Rock sample from 5-function manipulator	Cold	
BD/160709/006#3	321329 E 385635 N	Epifauna from rock sample	Formalin	
BD/170709/007#1	3°N 7°E	Prawn baited trap scavenger sample	Formalin	
BD/170709/007#2	3°N 7°E	Isopod from prawn baited trap	RNAlater	
BD/170709/007#3	3°N 7°E	Amphipod from prawn baited trap	RNAlater	
BD/170709/008#1	3°N 7°E	Scavenger sample from fish baited trap	Formalin	
BD/170709/008#2	3°N 7°E	Isopod from fish baited trap	RNAlater	
BD/170709/008#3	3°N 7°E	Amphipod 1 from fish baited trap	RNAlater	
BD/170709/008#4	3°N 7°E	Amphipod 2 from fish baited trap	RNAlater	

5. GEAR REPORT

ROV Millennium 73

The ROV was good and highly suitable for the job. We had very few problems with the vehicle during my visit. It was equipped with a video camera, 5- and 7-function manipulator.

RBR CTD



The CTD was problematic during this trip. The core components C,T, D and the logger worked very well. Unfortunately the optode was broken, when attached it quickly drew down the voltage on the logger, presumably as a result of a short circuit or ground fault. In the end I had to fill the connector with white lithium based grease (as per manufacturers recommendation) and put a pierced plastic cap on it. This seemed to pose no problems. The pH sensor was attached throughout but during calibration (before any work) there were no changes in voltage output from the sensor despite using standard pH of 4,7 and 10. No pH data were obtained during the visit.

The CTD was mounted on the upper bar of the front of the ROV. This area was also used to mount the acoustic transponder used to navigate the vehicle with high accuracy and precision.

Current meter

The current meter needs a stable and locatable place for it to be deployed. As this was essentially unexploited there was nowhere to deploy the current meter. The only option was to use the ROV to deploy and monitor the meter to ensure that we did not loose it. There was not time for this.

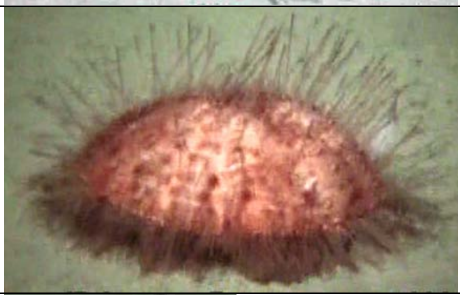
6. Ecological highlights

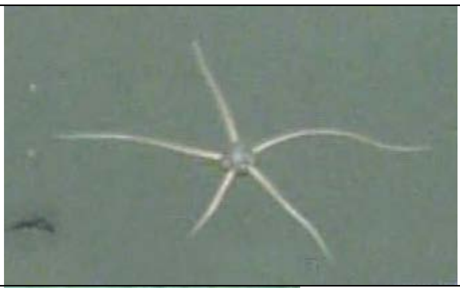
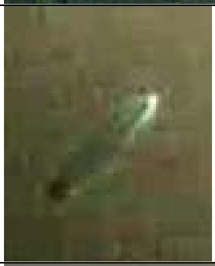
A total of 38 taxa were observed directly. These are shown in the table below and have representatives from 7 phyla. Several of these taxa are likely to be rarely studied. In addition at least 4 species of scavengers were obtained in traps. The scavengers (1 isopod and 3 amphipods) are not shown in this table.

Table of all species found on this visit. The pictures for species marked with an asterix (*) are from elsewhere but were chosen as they are significantly higher quality than those available from Usan.

Phylum	Species	Notes	Picture
Porifera	Hexactinellid	Around 200 mm in diameter. This sponge is probably *Farrea* sp.	
Cnidaria	White antipatharian	Around 200mm in height	
	Gorgonian sea whip	Found living on rocks only. Up to 700 mm in height.	

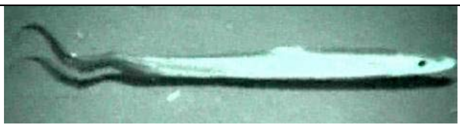
	Gorgonian sea whip	This is either a gorgonian or a pennatulid. It is only found on soft sediment. Up to 500 mm in height.	
	Pennatulea	Large pennatulid resembling *Pennatulea phosphorea*. Up to 500mm in height.	
	Gorgonian seafan	Gorgonian seafan probably exceeding 1000 mm in height. Likely very old as growth rate is mm per year.	 
	Actinoscypha	Anemone around 200 mm in length.	
	Edwardsid	12 tentacled anemone found on soft sediment. Burrows rapidly if touched. Around 100 mm in	

		diameter.	
	Striped african anemone	This is most likely another edwardsiid anemone. Also has 12 tentacles. Around 150mm in diameter.	
	Ceranthid	Possibly a cerianthid anemone. Only seen once in apparent symbiotic relationship with decapod. Could not see tube to confirm that it was a cerianthid. Approximately 150 mm in diameter.	
Echinodermata	*Phormosoma placenta*	This is the most abundant megafaunal organism at Usan. It is from 50 to 120 mm in diameter.	
	Red urchin not phormosoma	This urchin is distinct from *Phormosoma*. It never has fluid filled sacs on dorsal surface. It has many more rows of spines. It is up to 150 mm in diameter although usually smaller.	
	White echinoid	Bright white echinoid. Spherical. Spines not exceeding radius. Around 80 mm in diameter.	
	white diadema	Long spined white urchin. Total diameter (including spines) around 150 mm.	

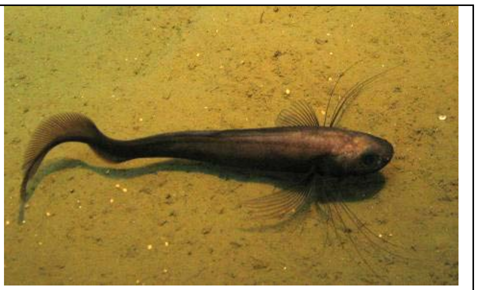
	Ophiuroid	Large ophiuroid. Can swim quickly when approached by the ROV. It is approximately 150 mm in total diameter (arm tip to arm tip)	
	Euryalid ophiuroid	Probable euraylid ophiuroid. Only seen once associated with hard substrata. Diameter 200 mm.	
	Brisingid	Large brisingid asteroids. Seen throughout rocky area. Arm length is approximately 300-400 mm.	
	Aphrodite like holothurian	Probable holothurian seen on soft sediment. The other possibility is that it is a polychaete of the genus *Aphrodite*. Approximate length 150 mm.	
	Mesothuria	Large white holothurian. Probably mesothuria. Possibly *Paeloriza pallens*. Seen pairing. Length up to 400 mm.	

	Benthothuria*	Possibly *Benthothuria funebris*. It is around 400 mm in total length.	
	Comatulid crinoid	Comatulid crinoid observed once on gorgonian (sea whip) in rocky area. Approximate diameter 100 mm.	
Crustacea	Galatheid	This squat lobster is probably in the genus Munnidopsis. It is very common. Up to 100 mm in length.	
	Prawn	Common small prawn. Up to 60 mm in total length.	
	Large Prawn	Large prawns, potentially of several species. The swimming Plesiopennaeus was not included. This species was up to 150 mm in length.	
	Nephrops	Large decapod most likely in the genus Nephrops. Up to 120 mm in length.	

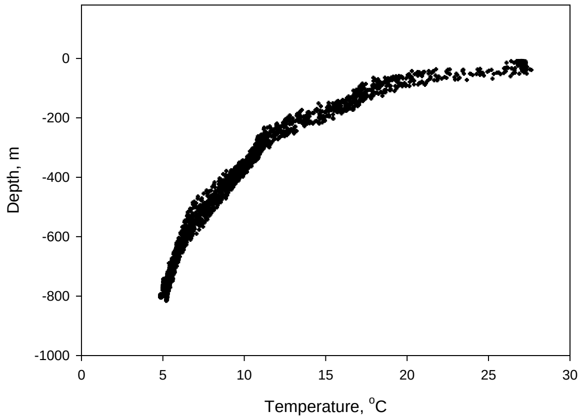
	Paralomis cristulata	Large lithodid crab seen in the rocky areas only. Up to 500 mm in total width. Has the body shape and gait you would expect from local species *Paralomis cristulata* and *africana*. It doesn't look exactly like either of them, although it is probably closely related. For now, it is most like *Paralomis cristulata* – previously known from the Ivory Coast and Guinea-Bissau.	
Mollusca	Opisthobranch*	One opisthobranch observed. This species is much more common in the deeper waters of Akpo. Around 60 mm in total length.	
Enteropneusta	Enteropneust	One potential enteropneust observed. Several spoke traces seen on soft sediment areas. Enteropneust up to 400 mm in length.	
Pices	Ray	Large ray around 900 mm in total length (including tail). Image is not of good enough quality to do much identification. There are multiple spine rows on the tail and dorsal midline. The thorns are large and the disc is rather deeply indented marginally (spade-shaped). Need a count of thorns and other details for ID.	

	Nettastoma melanura	Up to 1000 mm in total length. not a synaphobranchid, but a Nettastomidae (sharp elongate snout, dorsal fin is very high, and tapers unlike a synaphobranchid, pectoral fins may be absent or very small (usually these are prominent in synaphos and held out laterally). My initial guess is Nettastoma, maybe N. melanura, which is known from the Gulf of Guinea, depth range overall 300-900 m.	
	Halosaurus sp.	Halosauridae, or genus Halosaurus (single median dorsal fin, anal fin tapering to a fine tip). The snout tip is rounded and a bit inflated, consistent with genus Halosaurus, as opposed to the otherwise similar genus Aldrovandia.	
	Dibranchus sp.	Common monkfish. Usually around 200 mm in total length. Has walking anal fins. Ocgocephalidae, probable genus either Dibranchus or Halieutichthys. The fundamental shape is that of Dibranchus, but I cannot see the details necessary in this low-res image. The close resemblance to Dibranchus would suggest this is the correct genus, if so the species found commonly in the Gulf of Guinea from 45-1300 m depth is *Dibranchus atlanticus*. One other species *Dibranchus tremendous* is found in the region but typically deeper than this survey (750-2300 m). The details necessary to resolve the species are not visible in the photograph.	
	black fish	Common dark coloured fish. Possibly represents a number of species. Up to 100 mm in total length. My guess is that this in not a demersal fish, but a midwater fish swimming over the bottom. Gonostomatids and other midwater fishes often associate with the bottom as large adults.	
	stripey fish	Possibly zoarchid fish. Up to 300	

		mm in total length.	
	grenadier	Up to 600 mm in total length. A Macrouridae The picture is the best view. Without lateral view it is impossible to identify with any accuracy. It is tough to do much more with an overhead image. However, the snout is short and not very pointed, pectoral fins large, body tapers gradually. My guess is the genus *Corphaenoides*, which has a large number of species.	
	Laenomena laureysi ?	Up to 500 mm in total length. not a *Bathypterois*, but is a Gadidae or Moridae, both of which families have species of this general body form with multiple dorsal fins, a fan-like caudal, but most prominently - elongate, barbel-like pelvic fin-rays. The genus here is probably the Moridae genus *Laenomena*. This looks *like L. laureysi*, the Guinean codling, except known only down to 500 m. There are other choices from this area, but the taxonomy of these fishes in not so good. The other option is the genus *Urophycis* in the Gadidae. Nearly all *Laemonema* and *Urophycis* species have a small terminal chin barbel at the tip of the lower jaw (this extends forward and might be visible in a higher quality image). Many species also have the leading ray of the first dorsal fin elongated into a projecting filament. Most species of both genera have the pelvic rays elongated and conjoined for about 1/2 of their length, then they split apart at the distal end.	

	Dicrolene intronigra *	Around 300 mm in total length. This fish was also observed in Mauritania. This is definitely the ophidioid *Dicrolene*. The elongate free pelvic rays directed forward are characteristic of this taxon, and the large eye and white lateral line pores help. The full ID is probably *D. intronigra*, common between 800-1800 m both sides of the Atlantic at tropical latitudes. There are about 10 nominal species, but probably only about 4-5 are valid. A key characteristic is the short sharp preopercular spine. In *D. intronigra*, it is short, straight, and not visible in photos. In the next most likely possibility, *D. kanazawai*, the spine is longer, curved upward, white, and would be visible in a photo of the present quality.	
	Scorpionfish	Potential scorpion fish observed hiding under rock in rocky areas. Total length 200 mm.	

Physical data



MISSION 72

TRANSOCEAN DEEPWATER HORIZON, KEITHLY CANYON 102

MARK BENFIELD & STUART COOK

1. GENERAL INFORMATION:

Client:	BP
Drillship Operator:	Transocean
Drillship Name:	Deepwater Horizon
Drillship Location:	Keithly Canyon 102, Tiber Well
Drillship Position:	26° 52‘ 41.919“ N, 93° 16‘ 07.925“ W
Seabed Depth:	4135 ft (1257 m)
Seabed Temperature:	40° F (4.4°C)
ROV Operator:	Oceaneering
ROV:	Electric Magnum 1 (EMAG1)
TIME ZONE:	GMT -6

ROV Team:

Shift 1	Alternate Crew
Darren Costello (Senior Supervisor)	Terry Stafford
Troy Monceaux	James Hayfield
Christopher Gentry	Justin Conell

Wellsite Leaders: Rory McNeill, Teddy Reed, Ronny Sepulvado, Murray Sepulvado
HSE Team: Dalton ‘Mitch’ Gill
OIM:
RIG TELEPHONE NUMBER: 281 – 366 - 2241
Gulf SERPENT Personnel: Mark Benfield (LSU) and Stuart Cook (MATE Intern)

2. GEAR

ROV Type:	Electric Magnum 1 (100 Hp)
ROV Camera:	Kongsberg Color Video
	Deep Sea Systems DPC-8000 8 megapixel digital stills camera
SONAR:	Mesotech 9000 Digital 676 kHz
ADCP:	Valport
DVD Recording Deck:	Panasonic DMR-T3040, Panasonic DMR-T3030 DVD -R

3. VISIT NARRATIVE

3.1 Background

This is our first visit to the Deepwater Horizon since last summer. In March, the DPC-8000 still camera that BP funded, was installed on the EMAG ROV on Deepwater Horizon. After some initial issues related to integrating the camera within the relatively tight-fit of EMAG, the system began to collect images in May of this year. This trip has three primary goals: (1) to familiarize the ROV team with our survey protocols; (2) train Stuart Cook (our new MATE summer student intern) on how to perform SERPENT offshore survey missions; and (3) determine the optimum exposure settings for the still camera.

This is Stuart Cook's first trip offshore. He arrived on June 27th and has completed all his safety training and has been familiarized with our surveys and data analysis. Once he's confident that he can conduct the missions by himself, I'll try to get him offshore as often as possible over the rest of his internship.

Friday 07/17/09

Stuart and I drove down to Houma last night and stayed in a hotel. We checked into the PHI Heliport at 04:45. I was selected for random drug screening (passed) and we both had to go through swine flu screening, which is something new. Our flight left at 06:30 and we arrived on the Deepwater Horizon at 08:10. There is a potential H_2S hazard on this rig so much of the morning was spent conducting H_2S safety training. The ROV Supervisor (Darren Costello) met us after the training had been completed and we'd had lunch. Darren showed us some recent images they'd taken with the DPC-8000, which included some very nice shots of a squid and salp chains.

We took a look at the ROV and the camera configuration. It's definitely a tight fit. The connectors at the rear of the housing have very little room when the camera is aimed forward. The camera had condensation on the inside of the glass so that was cleaned and the dessicant was replaced. After some additional maintenance, we planned to dive at 3:30. Our initial dive will be conducted at 1500 feet. Based on examination of ADCP data from the Horizon, I determined that a daytime layer is centered at about 1500' (Fig. 1).

Conducted pre-dive checks at 03:20 and tested the camera. The DPC-8000 works fine although there was some noise on the video linkage that showed the remote desktop connection. The DPC-8000 is mounted on the pan and tilt with the color video camera located next to, and above it. We attempted to route the video from the DPC-8000 camera through the Oceaneering interface so that it provides the video feed for the ROV as well as being the stills camera. If this works, we will be able to more accurately frame our targets for still shots since the video feed will be coming from the camera. This did not work very well because the video feed from the camera viewfinder is of limited resolution and doesn't have very good low light sensitivity. We had to judge where the animals were in each of the monitors (video or stills camera) and after some trial and error managed to get animals centered in the stills camera monitor.

We descended to 1600' and started to look around. There was a moderate current that made it difficult to keep animals in our field of view for very long when moving into the current. We decided to turn the ROV so that we were working with the current. Layer contains larvaceans, cydippid ctenophores, quite a few salps – mostly solitaries, and one very interesting animal, which appeared to me to be a siphonophore. We managed to take a lot of images of this organism. I sent images to Steve Haddock at MBARI who identified it as a salp chain rather than a siphonophore. Larry Madin at Woods Hole Oceanographic Institution, identified it as *Helicosalpa virgula*. We began to ascend toward the surface at 17:56 and the ROV was on deck at 18:12. Examination of the images shows that there were some focus problems. Darren had indicated that the focus needed to be at, or close to infinity. I had moved it to a closer focus setting and we need to return to the infinity setting tomorrow. We had some great shots of the *H. virgula* chain.

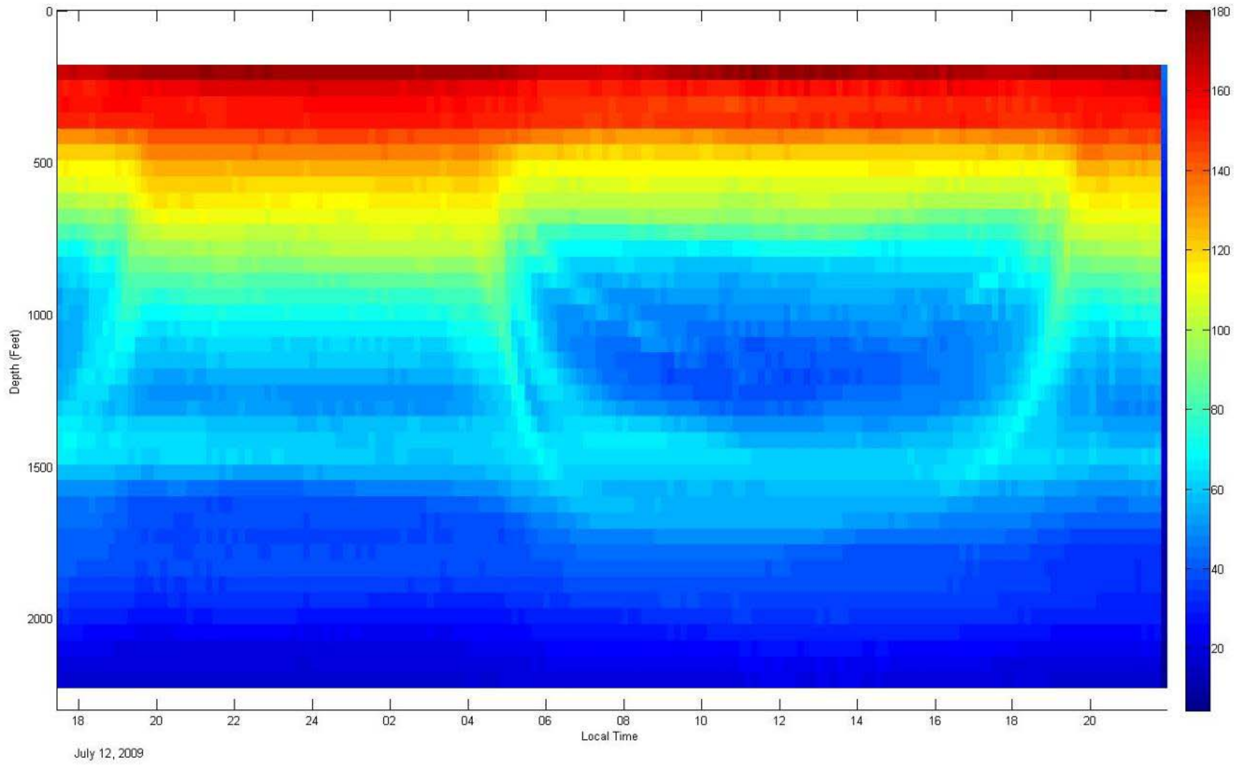


Figure 1. ADCP backscatter from July 12 – 13, 2009 from the Deepwater Horizon. Average echo intensity color coded with red indicating stronger echoes than blue. Note the diel vertical migration and daytime layer at 1400 – 1600 feet.

<u>Saturday 07/18/09</u>
Overnight the rig achieved a record by drilling the deepest well in the Gulf of Mexico. When I got up this morning the hole depth was 34,250 feet (10,439 m)!

Deployed ROV at 09:40. Descended to bottom to check bullseye’s and then began SERPENT surveys. During the descent the ROV measured the current at 500’, 1000’, 2000’, 3000’ and on the bottom. On bottom at 10:18. Completed shooting the bullseye’s at 10:55. Stuart practiced flying the ROV for 20 minutes. Began SERPENT survey above bottom at 11:17. Finished bottom survey at 12:15 and will conduct the first 500 feet of riser inspection. We broke off the riser inspection at 3500 feet to do a SERPENT survey. At 3500 feet there were few large organisms. We observed the ctenophore *Bathocyroe*, some larvaceans, *Cyclothone*, and a physonect siphonophore (family Apolimiidae). After this we continued the riser inspection up to 3000 feet then at 13:52 we conducted another SERPENT survey. At 14:36 we continued the riser inspection to 2500 feet. Our SERPENT survey at 2500 feet began at 14:39.

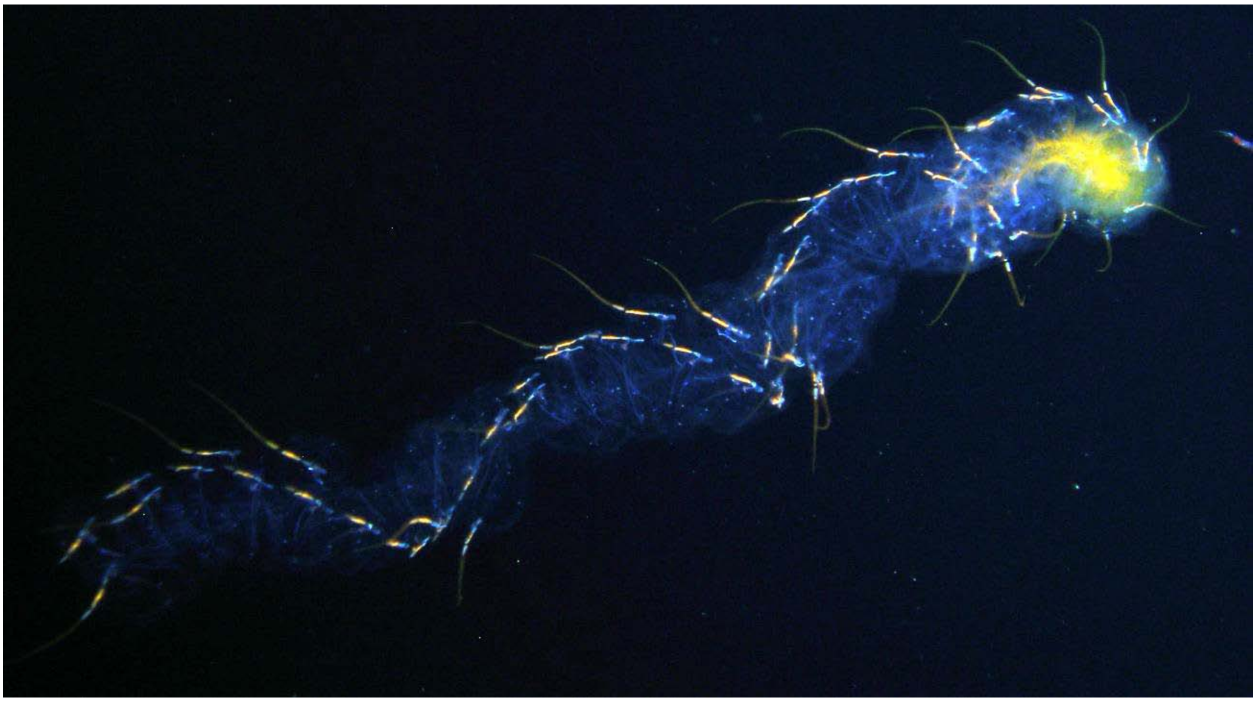


Figure 2. A salp chain (*Helicosalpa virgula*) that we imaged towards the end of our dive on 07/17/09.

The survey at 3000 feet started at 14:39 and was followed by inspection of the riser to 2000 feet. At 15:35 we ended the riser inspection and started a SERPENT survey at 15:38 at 2000 feet. A large physonect siphonophore was observed in a fishing posture at 1960 feet. Steve Haddock (MBARI) and Phil Pugh (NOC) confirmed that it is a new undescribed species that they have nicknamed the 'Galaxy Siphonophore). One notable observation was a swordfish (*Xiphias gladius*) that flashed past the ROV at 1953 feet. After our survey at 2000 feet, we ended our surveys and finished inspecting the riser to the surface. The ROV was at the surface at 16:57. In the evening, Stuart and I processed the video files we had collected during the day and updated the mission log.

Table I. Water temperatures recorded by the ROV

Depth (feet)	Temperature (°F)
500	58
1000	49
2000	42
2500	42
3000	41
3500	40
4134	40

<u>Sunday 07/19/09</u>

In the morning we continued to update the mission log with images from our dive on Saturday. A fire and boat/H2S drill was scheduled for 10:30 so we didn't attempt any dives in the morning. I spoke to the dispatcher and was able to schedule a flight back for myself on Monday. Stuart can stay aboard until Thursday or Friday, which works well for everyone since the ROV team is shorthanded and this will give them some extra hands, while we'll get more surveys done. I will pick Stuart up when he flies back to Houma.

I put together a powerpoint slide show of some of our 'greatest hits' and gave it to the RSTC. He set it up to show on the galley big screen TV and it created a lot of interest. It's a great way to showcase the

SERPENT Project and with MMS coming out on Tuesday for a site visit, it will also highlight the work that we're all doing here to the people whose agency funds our work.

After the drill had been completed and we'd had lunch, we were ready to dive; however, some problems with the ROV video feeds delayed our deployment until almost 14:00. There were intermittent failures of the video and sonar feeds from the ROV that required replacement of a daughter board in the telemetry system. The issues continued and the van lost the telemetry feed from the vehicle and control of a thruster. The ROV team kept at it and managed to repair everything. The loss of telemetry was traced to software and the thruster had to be reprogrammed. The repairs took all afternoon and our dive was cancelled for the day. The plan is for the dive to occur in the morning.

<u>Monday 07/20/09</u>
Stuart arrived at the control van at 8:00. During pre-dive check the ROV failed to receive telemetry. The ROV team adjusted the winch and full ROV control was achieved. The ROV was deployed ROV at 09:38 and it descended to bottom to check the bulls eye's. After finishing this task the ROV lost all telemetry. Intermittent communications permitted the ROV to dock with the cage and Stuart operated the winch while the ROV was recovered. During the afternoon Stuart transferred all the images collected on 07/18/09 from the camera to the surface laptop. After that he assisted the ROV team with their trouble shooting. Work ended at 17:30 without resolution to the ROV issues.

<u>Tuesday 07/21/09</u>
Stuart arrived at the ROV control van at 07:30 and the ROV team continued troubleshooting the intermittent loss of telemetry from the system. Given a new task to recover and replace an ADCP, completing the repairs became even more imperative. By noon the ROV appeared ready to dive; however, during pre-dive checks there were thruster control issues and the dive was cancelled until they could be resolved. Problems continued on an intermittent basis and a tether re-termination was required. Stuart worked with the ROV team until 22:30 when the re-termination was completed.

<u>Wednesday 07/22/09</u>
In the morning the ROV team found a problem with motor control for the ROV arms. Repairs were finished and preparations were made for a dive at 12:16. The first task was to check the bull's eyes followed by retrieval of the ADCP. The ROV was deployed at 12:20 and shooting the bulls eye's was completed at 13:09. During ADCP retrieval the camera was knocked out of alignment by the ROV arm. Consequently, the test photos were darker than normal due to the relative orientation of the strobe. Heavy depostion of gas hydrates required some removal A riser inspection from the bottom to 2000' began at 14:01 and was completed at 14:20. During the riser inspection we encountered a large *Apolemia* siphonophore. A SERPENT survey was conducted from 14:26 – 15:12 at 2000'. In this layer we encountered salp chains and pyrosomes. Following a riser inspection to 1500' during which time a medusa was observed, another SERPENT survey was conducted at 1500' from 15:21 – 16:05. The 1500' survey encountered ctenophores, salps, and medusae. The riser inspection continued to 1200' followed by a SERPENT survey from 16:11 – 16:30. No animals other than a lobate ctenophore were observed. The ROV was required on deck by drilling so the riser inspection continued to 500' followed by a brief (10 min) SERPENT survey that neded at 17:00.

Table 2. Water temperatures recorded by the ROV

Depth (feet)	Temperature (°F)	Current
500	58	.60
1000	49	.85
2000	42	.30
3000	41	.04
4000	41	.06

<u>Wednesday 07/22/09</u>
Stuart departed the Deepwater Horizon in the morning and was picked up at the Houma airport by Mark Benfield The ROV team began a SERPENT dive above the bottom mid-morning and called Mark Benfield on his mobile to report a large cephalopod that may have been a cirrate octopod.

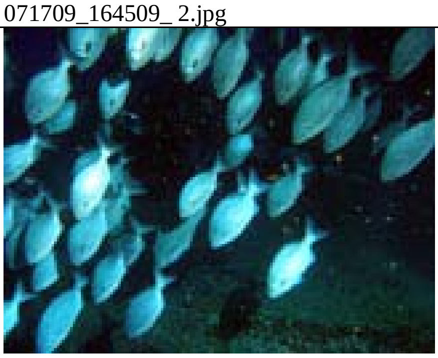
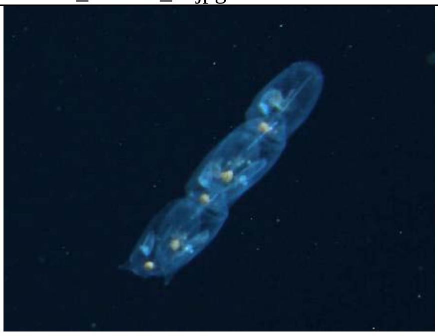
4. SAMPLES

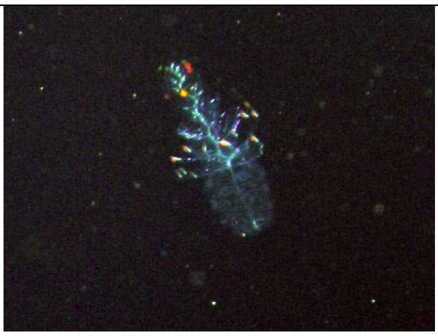
Collection of physical samples is not normally part of the Gulf SERPENT Project. Our data consist of primarily of video observations and other measured data.

5. GEAR REPORT

ROV: All systems on the ROV were functioning properly and the surveys were conducted without any problems.

Dive 07/17/09. DVD Label: Deepwater Horizon KC102 07/17/09 Disk 1 of 1.

Date	Time (local)	Depth (ft)	Observation	Video Still Image	Video File Location
07/17/09			Carangids near surface	 071709_164509_ 2.jpg	VTS_01_1.mpg
07/17/09			Kyphosids near surface	 071709_164539_ 3.jpg	VTS_01_1.mpg
07/17/09			Salp chain (*Iasis zonaria*)	 071709_172128_ 16.jpg	VTS_01_2.mpg

07/17/09			Physonect siphonophore	 071709_173537_ 27.jpg	VTS_01_2.mpg
07/17/09			Salp (*Helicosalpa virgula*)	 071709_182429_ 60.jpg	VTS_01_4.mpg

Dive 07/18/09. DVD Label: Deepwater Horizon KC102 07/18/09 Disk # of 3.

Date	Time (local)	Depth (ft)	Observation	Video/Still Image	Video File Location
07/18/09	11:19	4125	At bottom starting SERPENT survey above bottom. T=40°F		VTS_01_1.mpg
07/18/09	11:20	4131	Shrimp and hexactinellid		Disk 1 VTS_01_1.mpg

07/18/09	11:22	4133	Swimming shrimp		Disk 1 VTS_01_1.mpg
07/18/09	11:23	4133	Swimming shrimp		Disk 1 VTS_01_1.mpg
07/18/09	11:24	4130	Fish		Disk 1 VTS_01_1.mpg
07/18/09	11:25	4131	Swimming shrimp		Disk 1 VTS_01_1.mpg

07/18/09	11:28	4133	Fish		Disk 1 VTS_01_1.mpg
07/18/09	11:32	4134	Fish		Disk 1 VTS_01_1.mpg
07/18/09	11:38	4138	Fish (Halosauridae)		Disk 1 VTS_01_1.mpg
07/18/09	11:42	4127	Swimming holothuroidean		Disk 1 VTS_01_1.mpg

07/18/09	11:48	4141	Shrimp		Disk 1 VTS_01_2.mpg
07/18/09	11:51	4140	Crab (*Chaceon*)		Disk 1 VTS_01_2.mpg
07/18/09	12:03	4137	Crab (*Chaceon*)		Disk 1 VTS_01_2.mpg
07/18/09	12:08	4057	ROV Cage Creature		Disk 1 VTS_01_2.mpg

07/18/09	12:31	3496	Siphonophore		Disk 1 VTS_01_3.mpg
07/18/09	12:33		Calanoid copepod		Disk 1 VTS_01_3.mpg
07/18/09	12:39		Ctenophore (*Bathocyroe*)		Disk 1 VTS_01_3.mpg
07/18/09	12:46	3440	Larvacean		Disk 1 VTS_01_3.mpg

07/18/09	12:49	3420	Unidentified		Disk 1 VTS_01_3.mpg
07/18/09	12:53	3530	Ctenophore (*Bathocyroe*)		Disk 1 VTS_01_3.mpg
07/18/09	13:02	3487	Fish (*Cyclothone*)		VTS_01_4.mpg
07/18/09	13:37	3546	Physonect siphonophore (Apolimiidae)		Disk 2 VTS_01_1.mpg

07/18/09	14:08	3018	Chaetognath		Disk 2 VTS_01_1.mpg
07/18/09	14:13	3053	Salp		Disk 2 VTS_01_1.mpg
07/18/09	14:16	3041	Chaetognath		Disk 2 VTS_01_1.mpg
07/18/09	14:19	3036	Lobate Ctenophore		Disk 2 VTS_01_2.mpg

07/18/09	14:19	3035	Chaetognath		Disk 2 VTS_01_2.mpg
07/18/09	14:42	2509	Salps		Disk 2 VTS_01_3.mpg
07/18/09	14:48	2514	Physonect siphonophore		Disk 2 VTS_01_3.mpg
07/18/09	14:54	2506	Larvacean		Disk 2 VTS_01_3.mpg

SERPENT
SCIENTIFIC AND ENVIRONMENTAL ROV PARTNERSHIP
USING EXISTING INDUSTRIAL TECHNOLOGY

07/18/09	14:59	2494	Unidentified medusa		Disk 2 VTS_01_3.mpg
07/18/09	15:03	2482	Physonect siphonophore		Disk 2 VTS_01_3.mpg
07/18/09	15:10	2540	Unidentified siphonophore		Disk 2 VTS_01_4.mpg
07/18/09	15:15	2558	Unidentified lobate ctenophore		Disk 2 VTS_01_4.mpg

07/18/09	15:23	2502	Unidentified cydippid ctenophore		Disk 2 VTS_01_4.mpg
07/18/09	16:03	1952	*Xiphias gladius*		Disk 3 VTS_02_1.mpg

Dive 07/22/09. DVD Label: Deepwater Horizon KC102 07/22/09 Disk # of 1.

Date	Time (local)	Depth (ft)	Observation	Video/Still Image	Video File Location
07/22/09					VTS_01_1.mpg

7. BP LOGISTICAL SUPPORT

Transportation:

Date	Flight	Persons	Flight Time (h)	Aircraft
07/17/09	Houma Heliport to Deepwater Horizon	2	1:40	S92
07/20/09	Deepwater Horizon to Houma	1	1:40	S92
07/23/09	Deepwater Horizon to Houma	1	1:40	S92

Accommodation:

07/17/09	2 persons
07/18/09	2 persons
07/19/09	2 persons
07/20/09	1 person
07/21/09	1 person
07/22/09	1 person

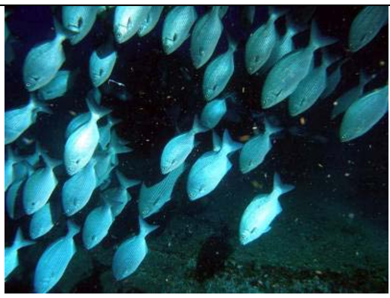
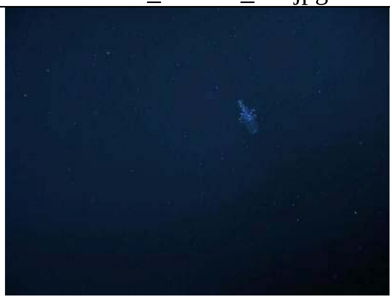
Meals:

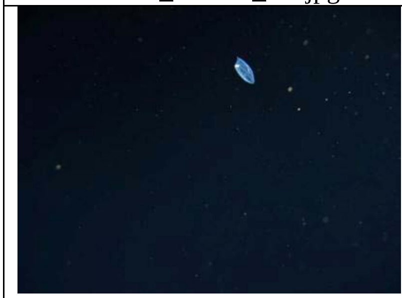
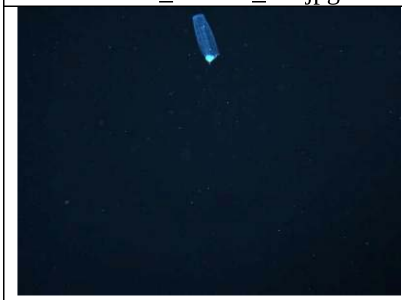
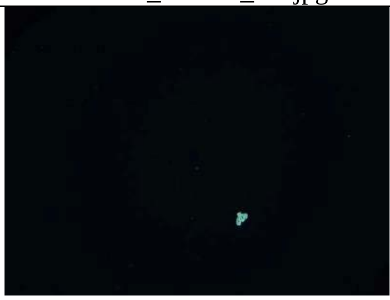
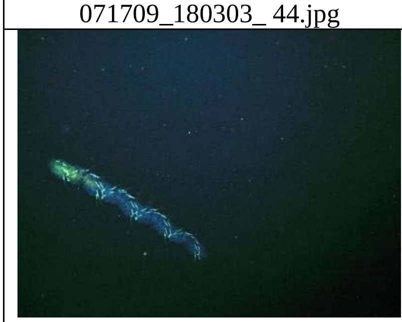
Date	Breakfast	Lunch	Dinner
07/17/09	-	2	2
07/18/09	2	2	2
07/19/09	2	2	2
07/20/09	2	1	1
07/21/09	1	1	1
07/22/09	1	1	1
07/23/09	1		
Total			

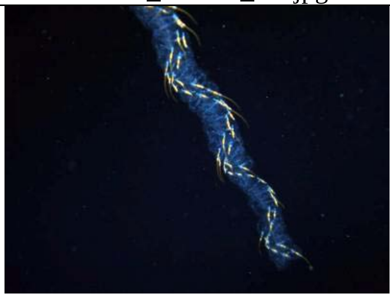
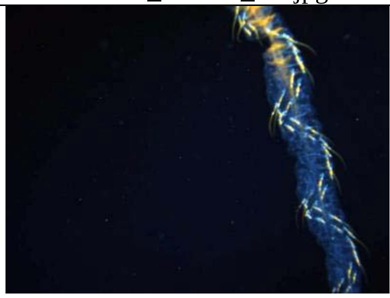
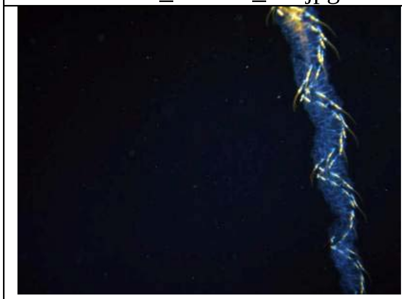
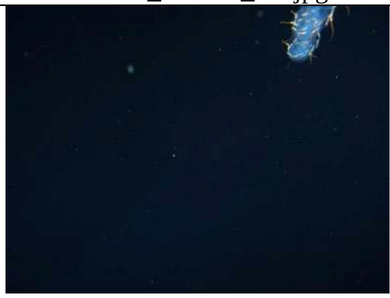
ROV Time:

07/17/09:	02:00:35 (16:00:34 – 18:01:09)
07/18/09:	04:13:51 (11:17:50 – 15:31:41)
07/22/09:	02:59:00 (14:01:00 – 17:00:00)
Total:	09:13:26

8. DPC-8000 DIGITAL STILLS

 Carangids near surface 071709_164509_ 2.jpg	 Kyphosids near surface 071709_164539_ 3.jpg	 Salp chain (*Iasis zonaria*) 071709_171732_ 10.jpg
 Salp chain (*Iasis zonaria*) 071709_171748_ 11.jpg	 Salp chain (*Iasis zonaria*) 071709_171941_ 13.jpg	 Salp chain (*Iasis zonaria*) 071709_172128_ 16.jpg
 Physonect siphonophore 071709_173400_ 23.jpg	 Physonect siphonophore 071709_173454_ 26.jpg	 Physonect siphonophore 071709_173537_ 27.jpg
 Physonect siphonophore 071709_173644_ 29.jpg	 Physonect siphonophore 071709_173729_ 30.jpg	 Salp (*Iasis zonaria*) 071709_174438_ 33.jpg

 Salps (*Iasis zonaria*) 071709_174501_ 35.jpg	 Fish (*Cyclothone*) 071709_174952_ 36.jpg	 Salp (*Iasis zonaria*) 071709_175600_ 39.jpg
 Salp (*Iasis zonaria*) 071709_175638_ 40.jpg	 Salp (*Iasis zonaria*) 071709_175711_ 41.jpg	 Salp (*Iasis zonaria*) 071709_180236_ 43.jpg
 Salp (*Iasis zonaria*) 071709_180303_ 44.jpg	 Marine snow 071709_180403_ 47.jpg	 Marine snow 071709_182044_ 56.jpg
 Salp chain (*Helicosalpa virgula*) 071709_182409_ 58.jpg	 Salp chain (*Helicosalpa virgula*) 071709_182413_ 59.jpg	 Salp chain (*Helicosalpa virgula*) 071709_182429_ 60.jpg
		

Salp chain (*Helicosalpa virgula*) 071709_182437_ 61.jpg	Salp chain (*Helicosalpa virgula*) 071709_182507_ 63.jpg	Salp chain (*Helicosalpa virgula*) 071709_182529_ 66.jpg
		
Salp chain (*Helicosalpa virgula*) 071709_182550_ 67.jpg	Salp chain (*Helicosalpa virgula*) 071709_182629_ 68.jpg	Salp chain (*Helicosalpa virgula*) 071709_182634_ 69.jpg
		
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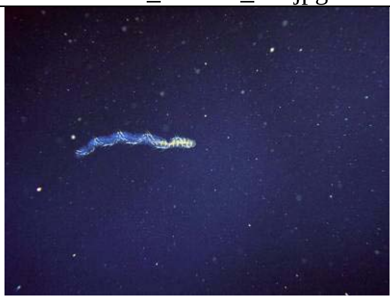
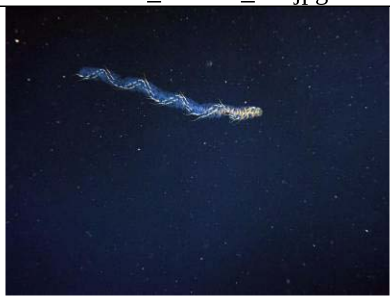
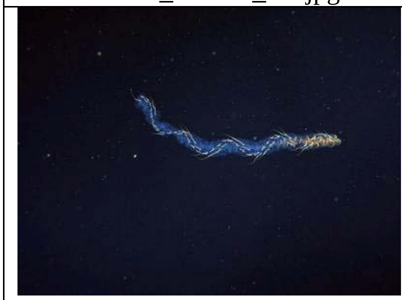
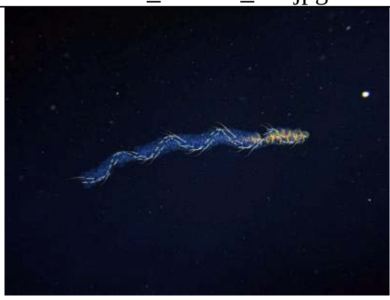
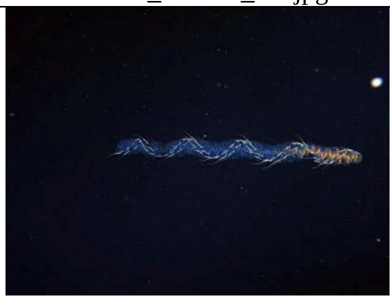
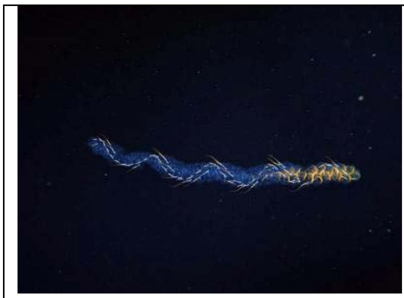
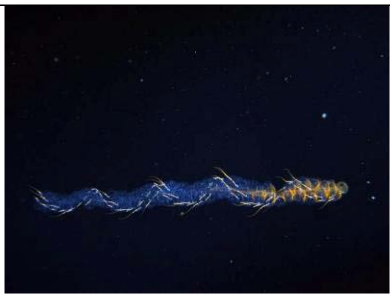
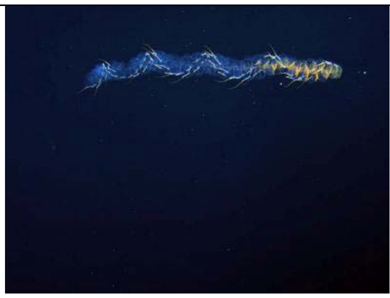
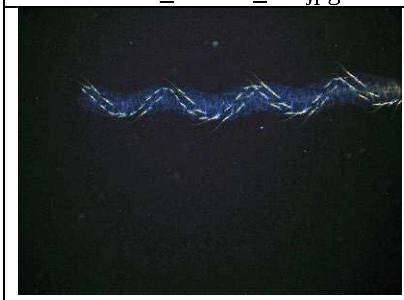
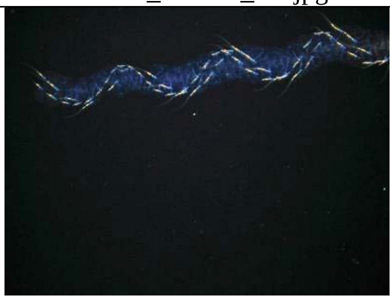
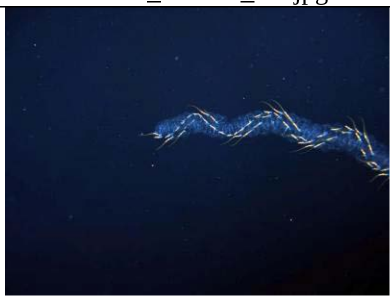
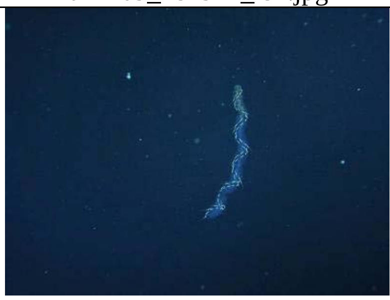
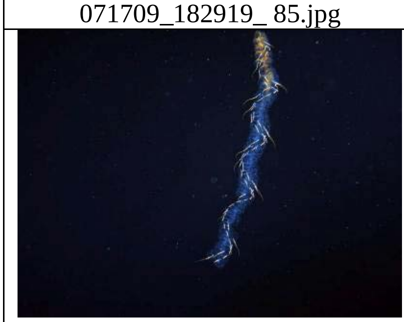
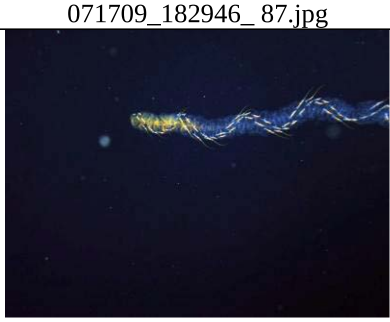
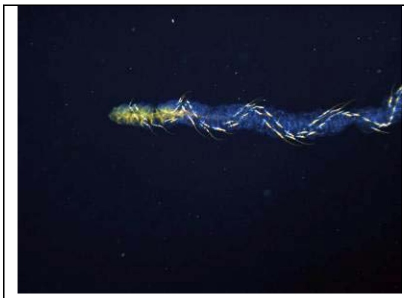
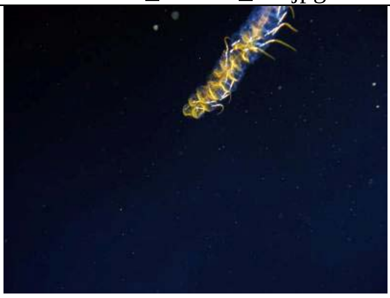
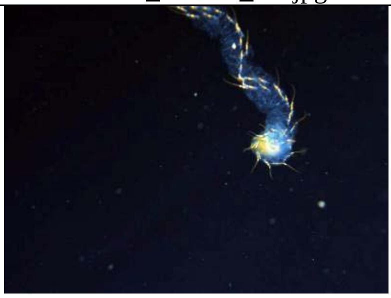
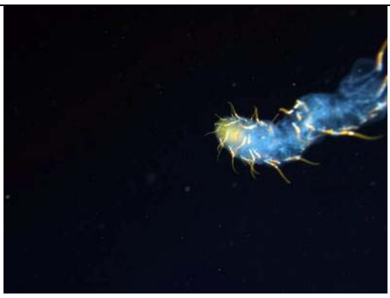
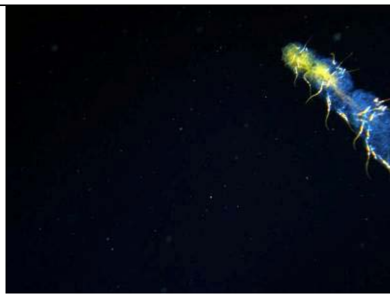
		
Salp chain (*Helicosalpa virgula*) 071709_182728_ 73.jpg	Salp chain (*Helicosalpa virgula*) 071709_182755_ 74.jpg	Salp chain (*Helicosalpa virgula*) 071709_182804_ 75.jpg
		
Salp chain (*Helicosalpa virgula*) 071709_182809_ 76.jpg	Salp chain (*Helicosalpa virgula*) 071709_182816_ 77.jpg	Salp chain (*Helicosalpa virgula*) 071709_182822_ 78.jpg

 Salp chain (*Helicosalpa virgula*) 071709_182827_ 79.jpg	 Salp chain (*Helicosalpa virgula*) 071709_182833_ 80.jpg	 Salp chain (*Helicosalpa virgula*) 071709_182841_ 81.jpg
 Salp chain (*Helicosalpa virgula*) 071709_182856_ 82.jpg	 Salp chain (*Helicosalpa virgula*) 071709_182900_ 83.jpg	 Salp chain (*Helicosalpa virgula*) 071709_182911_ 84.jpg
 Salp chain (*Helicosalpa virgula*) 071709_182919_ 85.jpg	 Salp chain (*Helicosalpa virgula*) 071709_182941_ 86.jpg	 Salp chain (*Helicosalpa virgula*) 071709_182946_ 87.jpg
 Salp chain (*Helicosalpa virgula*) 071709_182953_ 88.jpg	 Salp chain (*Helicosalpa virgula*) 071709_182958_ 89.jpg	 Salp chain (*Helicosalpa virgula*) 071709_183033_ 92.jpg

 Salp chain (*Helicosalpa virgula*) 071709_183039_ 93.jpg	 Salp chain (*Helicosalpa virgula*) 071709_183047_ 94.jpg	 Salp chain (*Helicosalpa virgula*) 071709_183054_ 95.jpg
 Salp chain (*Helicosalpa virgula*) 071709_183104_ 96.jpg	 Salp chain (*Helicosalpa virgula*) 071709_183142_ 98.jpg	 Salp chain (*Helicosalpa virgula*) 071709_183147_ 99.jpg
 Fish (*Cyclothone*) and Salp chain (*Helicosalpa virgula*) 071709_183253_ 101.jpg	 Salp chain (*Helicosalpa virgula*) 071709_183451_ 105.jpg	 Salp chain (*Helicosalpa virgula*) 071709_183457_ 106.jpg
 Salp chain (*Helicosalpa virgula*) 071709_183506_ 107.jpg	 Salp chain (*Helicosalpa virgula*) 071709_183512_ 108.jpg	 Salp chain (*Helicosalpa virgula*) 071709_183544_ 109.jpg


Salp chain (*Helicosalpa virgula*) 071709_183549_ 110.jpg


Salp chain (*Helicosalpa virgula*) 071709_183603_ 111.jpg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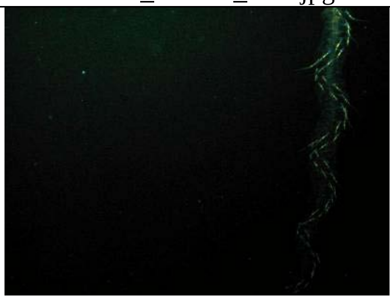
Salp chain (*Helicosalpa virgula*) 071709_183706_ 114.jpg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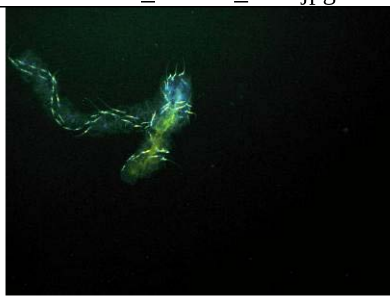
Salp chain (*Helicosalpa virgula*) 071709_183909_ 119.jpg


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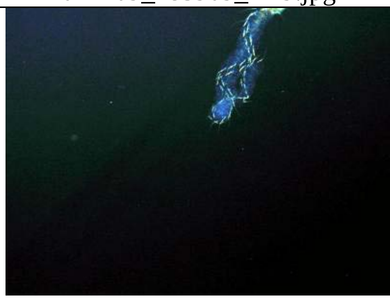
Salp chain (*Helicosalpa virgula*) 071709_184011_ 122.jpg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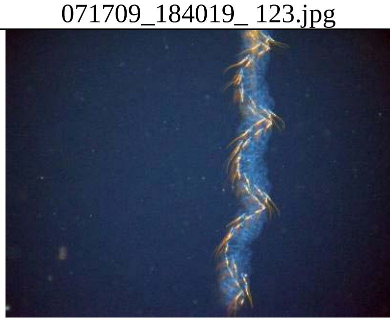
Salp chain (*Helicosalpa virgula*) 071709_184035_ 126.jpg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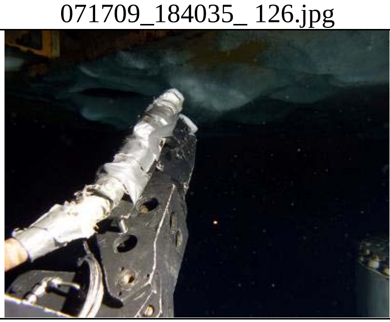
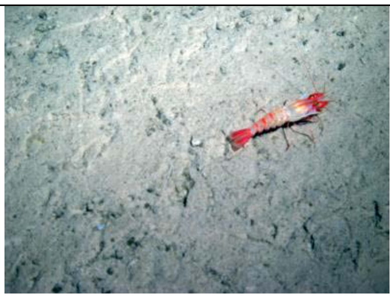
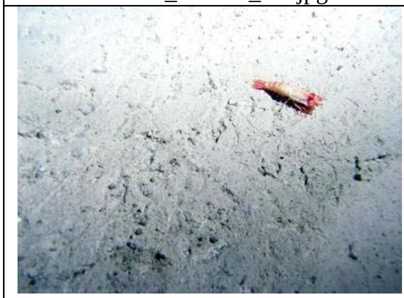
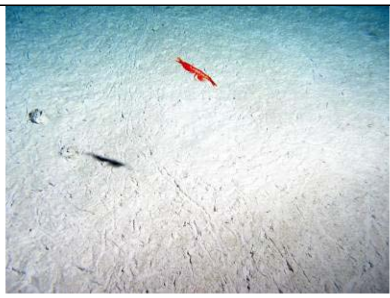
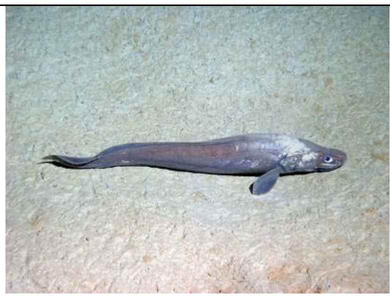
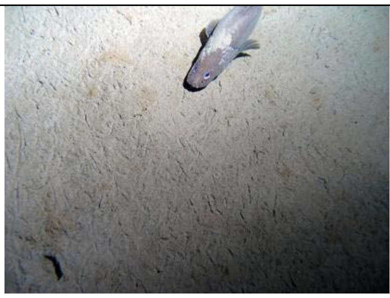


Shrimp on sight glass 071809_112910_ 7.jpg	Removing gas hydrates 071809_115704_ 8.jpg	Shrimp and hexactinellid with anemones 071809_122042_ 9.jpg
		
Shrimp and hexactinellid with anemones 071809_122053_ 10.jpg	Shrimp 071809_122110_ 11.jpg	Shrimp 071809_122137_ 13.jpg
		
Shrimp 071809_122144_ 14.jpg	Shrimp and hexactinellid with anemones 071809_122207_ 15.jpg	Shrimp swimming 071809_122422_ 18.jpg
		
Shrimp swimming 071809_122428_ 19.jpg	Unidentified fish 071809_122701_ 23.jpg	Unidentified fish 071809_122706_ 24.jpg
		
Unidentified fish 071809_122716_ 25.jpg	Unidentified fish 071809_122724_ 26.jpg	Unidentified fish 071809_122737_ 27.jpg


Unidentified fish
071809_122743_ 28.jpg


Unidentified fish
071809_122753_ 29.jpg


Unidentified fish
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Unidentified fish
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071809_122828_ 32.jpg


071809_122847_ 33.jpg


071809_122859_ 34.jpg


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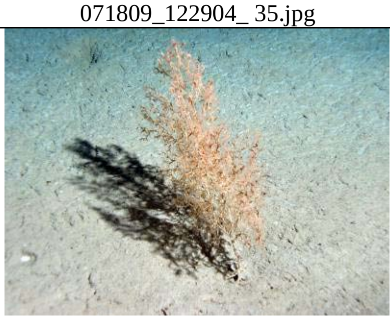
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071809_124255_ 56.jpg


071809_124330_ 59.jpg


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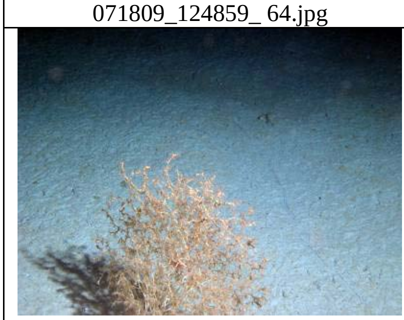
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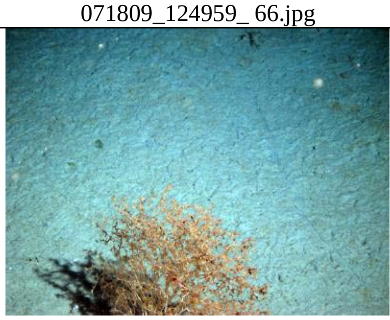
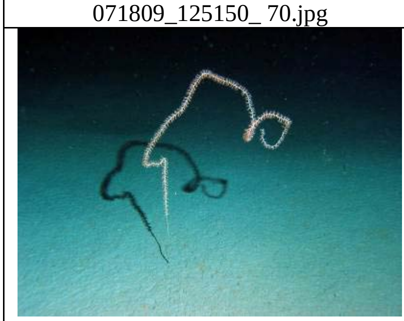
071809_125041_ 68.jpg


071809_125053_ 69.jpg


071809_125150_ 70.jpg


071809_125200_ 71.jpg


071809_125718_ 72.jpg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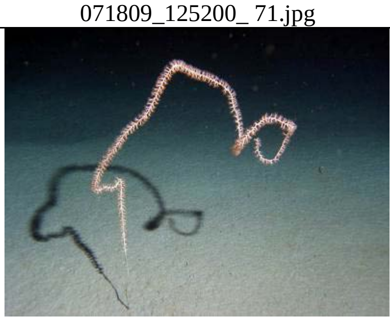

071809_125734_ 74.jpg


071809_133237_ 85.jpg

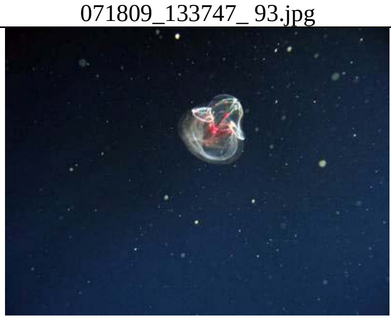

071809_133259_ 87.jpg

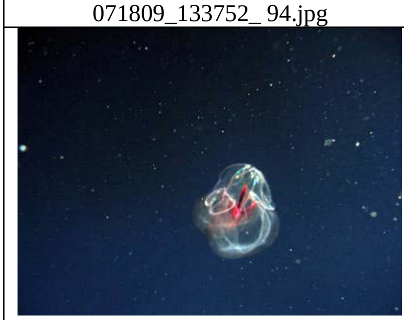

071809_133426_ 90.jpg


Ctenophore (*Bathocyroe*)
071809_133747_ 93.jpg


Ctenophore (*Bathocyroe*)
071809_133752_ 94.jpg


Ctenophore (*Bathocyroe*)
071809_134057_ 102.jpg


Ctenophore (*Bathocyroe*)
071809_134102_ 103.jpg


Ctenophore (*Bathocyroe*)
071809_134109_ 104.jpg


Ctenophore (*Bathocyroe*)
071809_134201_ 107.jpg

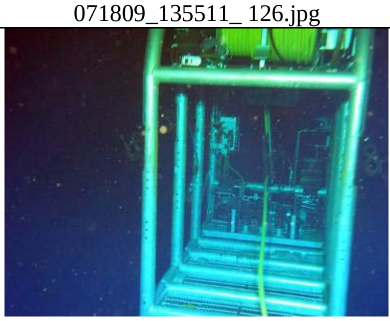

Ctenophore (*Bathocyroe*)
071809_134313_ 113.jpg

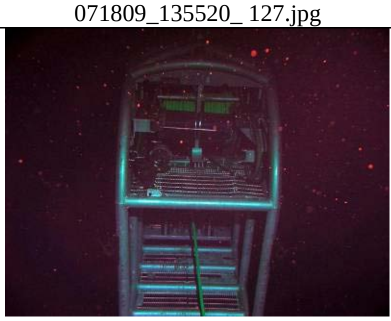

Radiolarian
071809_135506_ 125.jpg


Radiolarian
071809_135511_ 126.jpg


Radiolarian
071809_135520_ 127.jpg


Fish (*Cyclothone*)


ROV cage


ROV Cage

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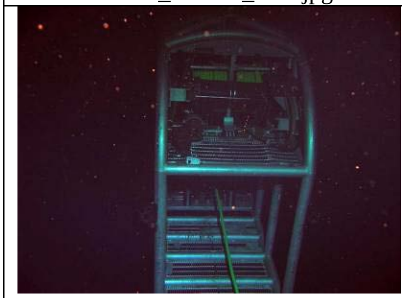
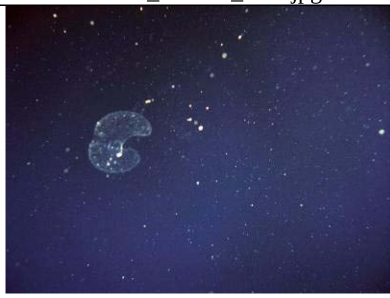
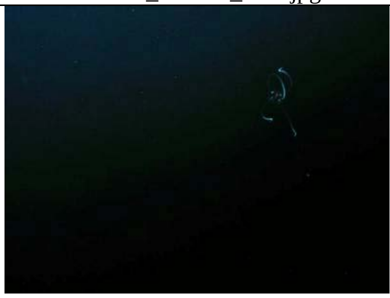
		
ROV Cage	Larvacean	Larvacean
071809_141332_ 151.jpg	071809_141557_ 154.jpg	071809_141616_ 157.jpg
		
Marine snow	Marine snow	Lobate ctenophore
071809_143122_ 163.jpg	071809_143129_ 164.jpg	071809_143320_ 170.jpg
		
Physonect siphonophore (*Apolemia*)	Physonect siphonophore (*Apolemia*)	Physonect siphonophore (*Apolemia*)
071809_143455_ 173.jpg	071809_143507_ 175.jpg	071809_143525_ 176.jpg
		
Physonect siphonophore (*Apolemia*)	Physonect siphonophore (*Apolemia*)	Unidentified physonect siphonophore
071809_143533_ 177.jpg	071809_143629_ 179.jpg	071809_155101_ 226.jpg
		

Unidentified physonect siphonophore 071809_155109_ 227.jpg	Unidentified medusa 071809_155728_ 230.jpg	Unidentified medusa 071809_155806_ 232.jpg
		
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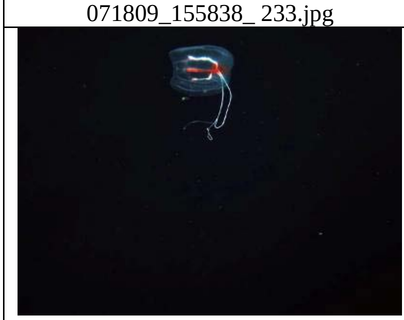		
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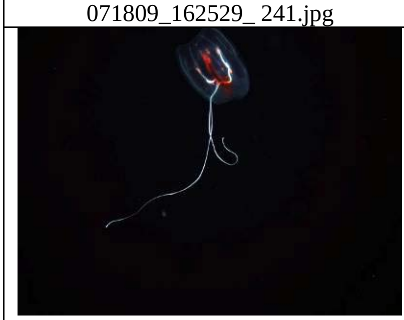		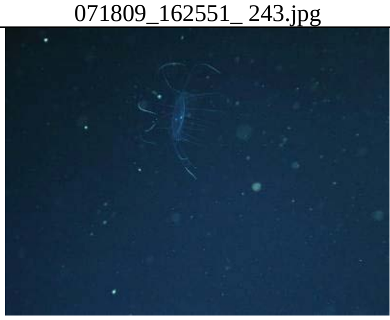
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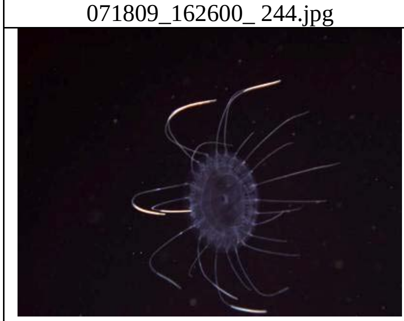
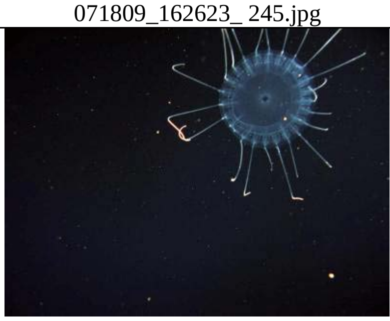
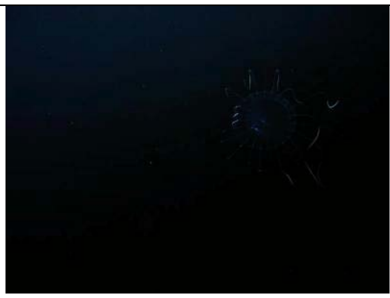
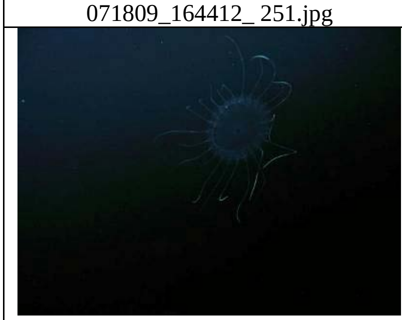
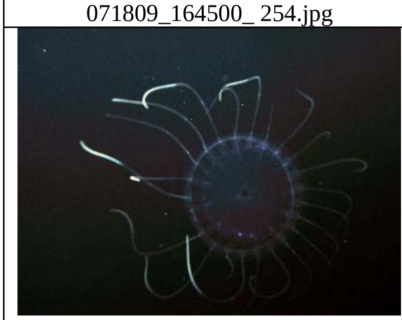
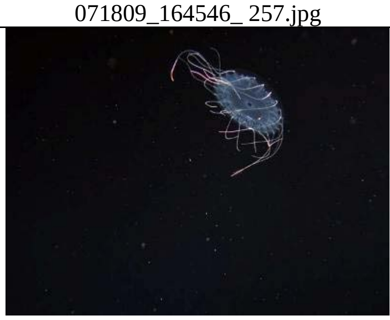
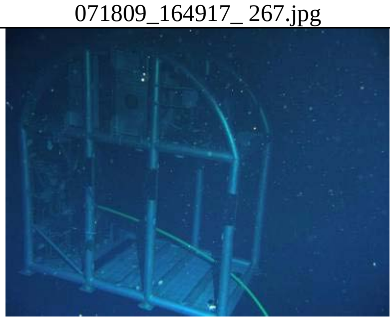
		
Medusa (*Solmissus*) 071809_164250_ 248.jpg	Medusa (*Solmissus*) 071809_164258_ 249.jpg	Medusa (*Solmissus*) 071809_164306_ 250.jpg

 Medusa (*Solmissus*) 071809_164412_ 251.jpg	 Medusa (*Solmissus*) 071809_164436_ 252.jpg	 Medusa (*Solmissus*) 071809_164451_ 253.jpg
 Medusa (*Solmissus*) 071809_164500_ 254.jpg	 Medusa (*Solmissus*) 071809_164517_ 255.jpg	 Medusa (*Solmissus*) 071809_164546_ 257.jpg
 Medusa (*Solmissus*) 071809_164622_ 258_th.jpg	 Medusa (*Solmissus*) 071809_164622_ 258_th.jpg	 Medusa (*Solmissus*) 071809_164733_ 261.jpg
 Medusa (*Solmissus*) 071809_164843_ 264.jpg	 Medusa (*Solmissus*) 071809_164857_ 265.jpg	 Medusa (*Solmissus*) 071809_164917_ 267.jpg
 Physonect siphonophore	 Physonect siphonophore next to tether	 ROV cage

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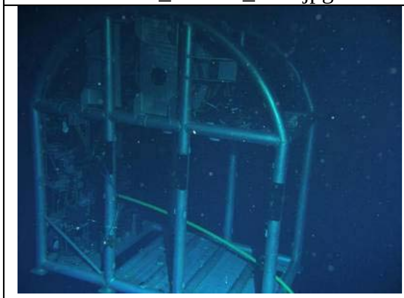
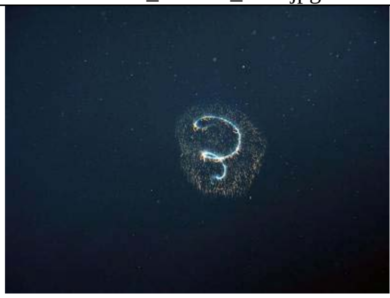
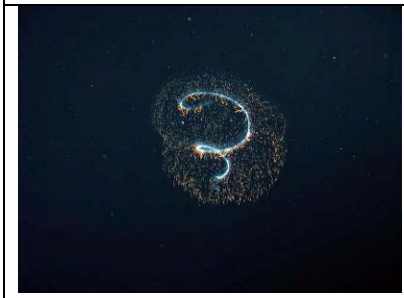
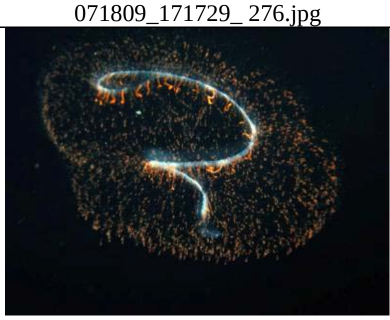
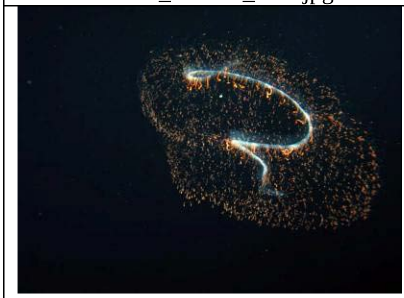
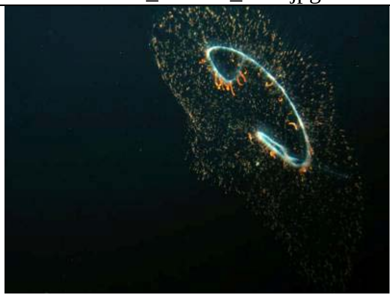
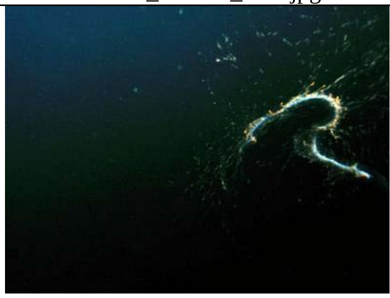
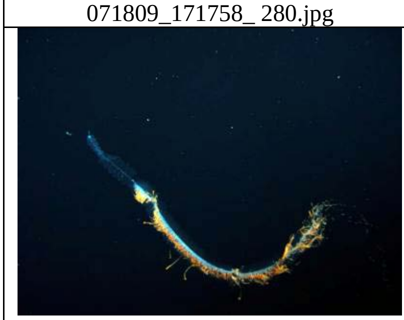
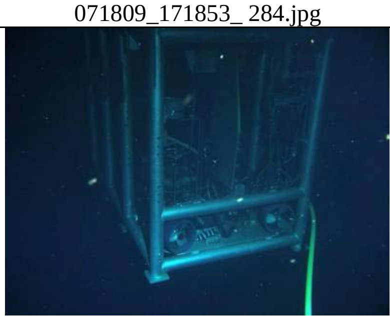
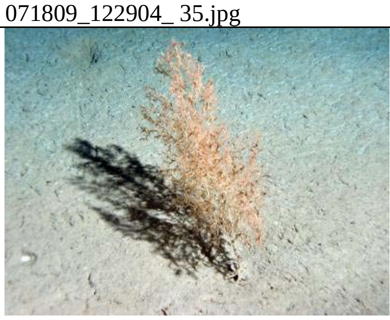
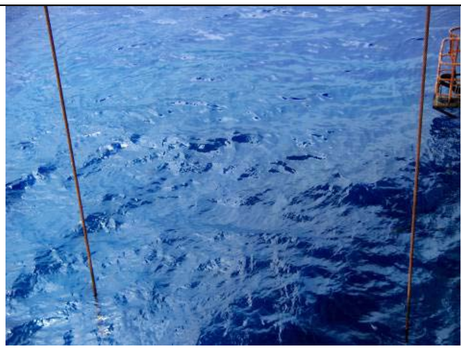
071809_170927_ 269.jpg	071809_170932_ 270.jpg	071809_171505_ 273.jpg
 ROV cage 071809_171512_ 274.jpg	 Galaxy physonect siphonophore ‘fishing’ 071809_171723_ 275.jpg	 Galaxy physonect siphonophore ‘fishing’ 071809_171729_ 276.jpg
 Galaxy physonect siphonophore ‘fishing’ 071809_171736_ 277.jpg	 Galaxy physonect siphonophore ‘fishing’ 071809_171744_ 278.jpg	 Galaxy physonect siphonophore ‘fishing’ 071809_171751_ 279.jpg
 Galaxy physonect siphonophore ‘fishing’ 071809_171758_ 280.jpg	 Galaxy physonect siphonophore ‘fishing’ 071809_171810_ 281.jpg	 Galaxy physonect siphonophore ‘fishing’ 071809_171853_ 284.jpg
 Galaxy physonect siphonophore after retracting tentacles 071809_171946_ 286.jpg	 Galaxy physonect siphonophore after retracting tentacles 071809_172052_ 287.jpg	 ROV cage 071809_174843_ 291.jpg

 071809_122859_ 34.jpg	 071809_122904_ 35.jpg	 071809_122912_ 36.jpg
 071809_123243_ 39.jpg	 071809_123434_ 42.jpg	 071809_123953_ 49.jpg

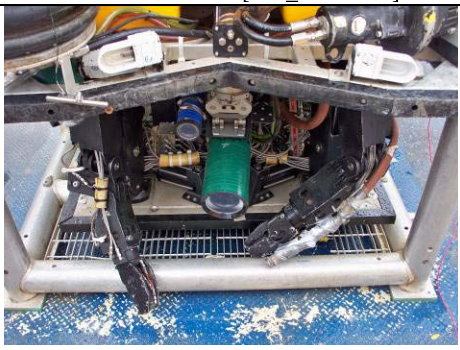
9. DIGITAL STILL IMAGES

 Stuart Cook in ROV control van [100_1180.JPG]	 Stuart Cook in ROV control van [S100_1180.JPG]
 Darren Costello teaching Stuart Cook to fly the ROV [100_1182.JPG]	 Stuart Cook flying the ROV next to Darren Costello [100_1183.JPG]
 Stuart Cook flying the ROV [100_1184.JPG]	 Stuart Cook flying the ROV [100_1185.JPG]
 Fire and boat drill [100_1186.JPG]	 Fire and boat drill [100_1187.JPG]

Mark Benfield with his self-contained breathing apparatus after the H2S drill [100_1188.JPG]



ROV guide cables [100_1189.JPG]



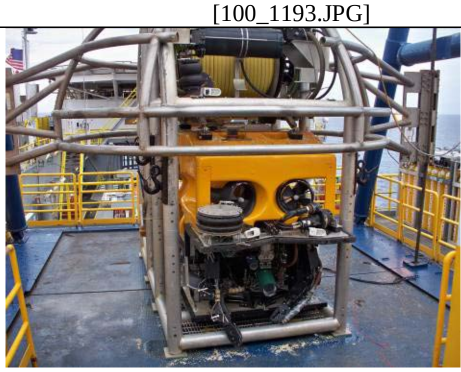
DPC-8000 (large green can) on EMAG1 [100_1190.JPG]

DPC-8000 (large green can) and strobe (upper left) on EMAG1 [100_1191.JPG]

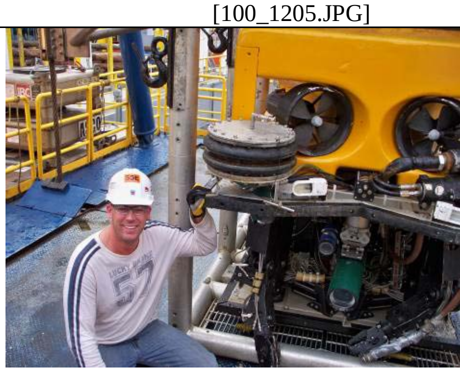
EMAG 1 Port view [100_1192.JPG]

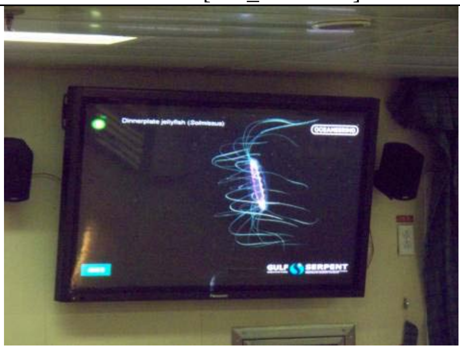
EMAG 1 [100_1193.JPG]

Stuart Cook and Mark Benfield [100_1194.JPG]

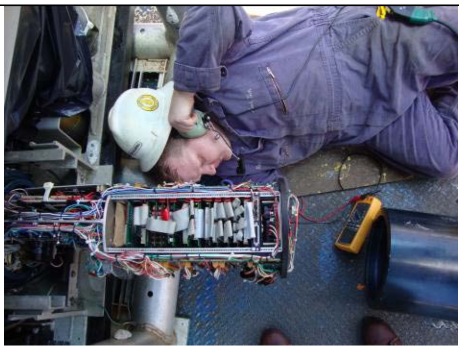
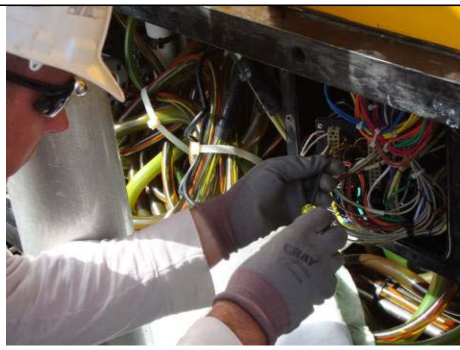


EMAG 1 [100_1195.JPG]

 EMAG 1 (Starboard view) [100_1196.JPG]	 EMAG 1 (Starboard view) 100_1197.JPG
 EMAG 1 (Aft view) [100_1198.JPG]	 Strobe (upper left), DPC-8000 camera (green can) and video camera (blue can) [100_1199.JPG]
 Mark Benfield with EMAG 1 [100_1201.JPG]	 Stuart Cook with EMAG 1 [100_1205.JPG]
 Stuart Cook with EMAG 1 [100_1206.JPG]	 Stuart Cook with EMAG 1 [100_1208.JPG]

 Christopher Gentry (left) and Troy Monceaux (right) with EMAG 1 [100_1209.JPG]	 SERPENT slideshow in galley 100_1214.JPG
 SERPENT slideshow in galley 100_1215.JPG	 SERPENT slideshow in galley 100_1216.JPG
 Stuart Cook undergoing SCBA fit test Photo_0020.jpg	 Darren, Mark and Chris in the ROV control van DSC00141.JPG
 Mark Benfield working in the ROV control van DSC00143.JPG	 EMAG 1 ROV DSC00145.JPG

 ROV Control Van DSC00152.JPG	 S92 at Deepwater Horizon DSC00158.JPG
 Deepwater Horizon [DSC00159.JPG]	 ROV Winch [DSC00153.JPG]
 Mark Benfield waiting for helicopter DSC00161.JPG	 Chris and Darren opening the telemetry can DSC00164.JPG

 Chris working on the telemetry can DSC00166.JPG	 Darren, Chris and Justin beginning retermination DSC00170.JPG
 Stuart working on the ROV DSC00176.JPG	 Stuart working on the ROV DSC00177.JPG
 S92 leaving Deepwater Horizon DSC00179.JPG	 S92 leaving Deepwater Horizon DSC00182.JPG
 Darren flying the ROV DSC00188.JPG	 Chris testing Justin DSC00185.JPG

MISSION 73

NOBLE CLYDE BOUDREAUX, ALAMINOS CANYON 857

MARK BENFIELD & STUART COOK

1. GENERAL INFORMATION:

Client: Shell
Rig Operator: Noble
Rig Name: Noble Clyde Boudreaux
Rig Location: Alaminos Canyon 857, Southwest Cluster Well
Rig Position: 26° 5‘ 31.821“ N, 94° 54‘ 15.510“ W
Seabed Depth: 8125 ft (2476 m)
Seabed Temperature: 41.6° F (5.3°C)
ROV Operator: Oceaneering
ROV: Millennium 33
TIME ZONE: GMT -6

ROV Team:

Shift 1	Alternate Crew
Stan Jeter (Superintendent)	Stephen DePino (Supervisor)
Jorge Fernandez Martinez	Saul Gonzales
Alvarado Gonzales	Crystal Houde

Drilling Forman: Buster Stewart, Bob Batson
HSE:
ROV Telephone Number: 504 – 728 – 0446
RIG Telephone Number: 504 – 728 - 0703
Gulf SERPENT Personnel: Mark Benfield (LSU), Stuart Cook (MATE Intern), John Ruhlman (Oceaneering)

2. GEAR

ROV Type: Millennium Plus (150 Hp)
ROV Camera: Kongsberg Color Video
SONAR: Mesotech 1000 Digital 676 kHz
DVD Recording Deck: Panasonic DMR-T3040, Panasonic DMR-T3030 DVD -R

3. VISIT NARRATIVE

3.1 Background

This trip marks the beginning of our partnership with Shell in the Gulf of Mexico. We plan to extend GULF SERPENT operations to five Shell deepwater facilities by the end of 2009. The Noble Clyde Boudreaux is located at the far west end of our observation network, near the Perdido Spar and Mexican waters. This site is particularly interesting because of its water depth (2467 m) and proximity to the east coast of Mexico.

John Ruhlman from Oceaneering is our project liaison with Shell. John came out on this first site visit to observe the SERPENT surveys and assist with establishing SERPENT surveys as part of the routine aboard the Noble Clyde Boudreaux.

Tuesday 07/28/09

Stuart, John, and I drove over to Galveston the previous night and were on the first helicopter of the day 06:00 to the rig. The flight was approximately 2 h and after arrival, we were given a security and safety orientation that lasted about an hour. After that I gave Stan Jeter (ROV Superintendent) and John Ruhlman an overview of the project and showed them a powerpoint about the Gulf SERPENT Project and the new Annual Report. The ROV was scheduled to dive at about 13:30. The rig is currently not drilling. All the riser and BOP was stacked on the deck. We took a break after lunch and then met at the ROV van for our afternoon dive.

The ROV was in the water at 13:36. We descended to 800 feet and began a survey at 13:54. There wasn't much in the water and we needed to find targets to train with, so we descended to 1800 feet and began another survey at 14:08. After the survey we descended to 2500 feet. Stan adjusted the thrusters so that they were at lower power and worked on the trim to make the ROV more controllable. At 15:52 we started a survey. Targets included a physonect siphonophore we haven't seen before, with some excellent close-up footage. We continued our surveys until 17:00 when the ROV was recovered.

<u>Wednesday 07/29/09</u>
Mark left the rig at Noon on Wednesday while Stuart remained with John Ruhlman. The ROV was in the water at 08:26. We descended to 8112 feet and began a survey at 08:57. At 9:30 Buster Stewart was given a PowerPoint presentation about the Gulf SERPENT Project after which we resumed our survey until 10:53. We surveyed at 7500 feet for only thirty minutes and ended the survey due to the absence of any targets. After lunch we started a survey at 12:19. There were no targets at 7000, 6500 and 6000 feet. We ascended to 5000 feet and started a survey at 13:50. At this depth the targets were diverse including a lobate ctenophore. We ascended to 4000 feet and began a survey at 15:10, though few targets were observed at this depth. We ascended to 3000 feet and started a survey at 16:05 where four targets were observed including an unusual jelly. We were back on deck by 17:00.

<u>Thursday 07/30/09</u>
Stuart was informed at 08:00 that the ROV is being tasked for the BOP and he was invited to sit in on a night dive for the BOP and rig positioning between 19:00 and 24:00. Few targets were observed due to the commitment of the ROV to support drilling.

<u>Friday 07/31/09</u>
Stuart and John left the rig on the morning flight and returned to Galveston.

4. SAMPLES

Collection of physical samples is not normally part of the Gulf SERPENT Project. Our data consist of primarily of video observations and other measured data.

Table I. Water Temperature Profile

Depth	Temperature (°F)
1800	50.0
8112	41.6
7500	41.0
7000	41.0
6500	40.6
6000	40.1
5000	41.0
4000	41.1
3000	43.6

5. GEAR REPORT

ROV: All systems on the ROV were functioning properly and the surveys were conducted without any problems.

5. FAUNAL OBSERVATIONS

Dive 07/28/09. DVD Label: Noble Clyde Boudreaux AC857 07/28/09 Disk # of 2.

Date	Time (local)	Depth (ft)	Observation	Video Still Image	Video File Location
07/28/09	14:10	1809	Solitary salp		VTS_01_1.mpg
07/28/09	14:15	1797	Solitary salp		VTS_01_1.mpg
07/28/09	14:18		Solitary salp		VTS_01_1.mpg
07/28/09	14:21	1819	Salp chain		VTS_01_1.mpg

07/28/09	14:24	1773	Solitary salp		VTS_01_1.mpg
07/28/09	14:28	1762	Medusa		VTS_01_1.mpg VTS_01_2.mpg
07/28/09	14:33	1804	Fish (*Cyclothone*)		VTS_01_2.mpg
07/28/09	14:54	1840	Medusa (*Solmissus*)		VTS_01_2.mpg

07/28/09	14:57	1829	Salps		VTS_01_3.mpg
07/28/09	15:02	1818	Chaetognath		VTS_01_3.mpg
07/28/09	15:07	1811	Pyrosome (*Pyrosoma atlanticum*)		VTS_01_3.mpg
07/28/09	15:14	1797	Hatchetfish		VTS_01_3.mpg

07/28/09	15_17	1793	Solitary salp		VTS_01_3.mpg
07/28/09	15:26	1879	Salp chain		VTS_01_3.mpg
07/28/09	15:27	1875	Unidentified		VTS_01_4.mpg
07/28/09	15:27	1874	Solitary salp		VTS_01_4.mpg

07/28/09	16:08	2513	Siphonophore		VTS_01_4.mpg
07/28/09	16:24	2510	Copepod		Disc 2 VTS_01_1.mpg
07/28/09	16:25	2509	Unidentified Medusa		Disc 2 VTS_01_1.mpg
07/28/09	16:33	2502	Siphonophore		Disc 2 VTS_01_1.mpg

07/28/09	16:35	2487	Larvacean		Disc 2 VTS_01_1.mpg
07/28/09	16:42	2532	Medusa *(Halicrea?s)*		Disc 2 VTS_01_1.mpg
07/28/09	16:50	2527	UID (*Medusa)*		Disc 2 VTS_01_2.mpg
07/28/09	16:54	2530	Siphonophore		Disc 2 VTS_01_2.mpg

07/28/09	16:57	2531	Unidentified medusa		Disc 2 VTS_01_2.mpg

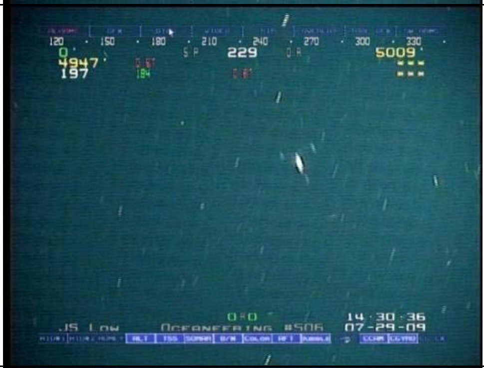
Dive 07/29/09. DVD Label: Noble Clyde Boudreaux AC857 07/29/09 Disk # of 3

Date	Time (local)	Depth (ft)	Observation	Video/Still Image	Video File Location
07/29/09	09:07	8103	Sea whip?		Disc 1 VTS_01_1.mpg
07/29/09	09:11	8091	Holothuroidean		Disc 1 VTS_01_1.mpg
07/29/09	09:15	8081	Shrimp		Disc 1 VTS_01_1.mpg

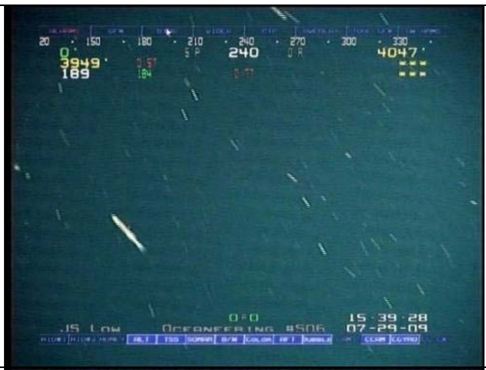
07/29/09	09:16	8071	Holothuroidean		Disc 1 VTS_01_1.mpg
07/29/09	09:16	8080	Sea Whip		Disc 1 VTS_01_1.mpg
07/29/09	11:11	7049	Tomopterid polychaete		Disc 1 VTS_01_2.mpg
07/29/09	12:20	6991	Medusa		Disc 1 VTS_01_3.mpg

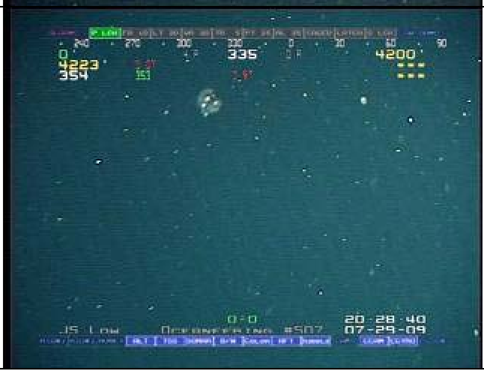
07/29/09	12:28	6970	Abandoned Larvacean House		Disc 1 VTS_01_3.mpg
07/29/09	12:31	6979	Unidentified fish		Disc 1 VTS_01_3.mpg
07/29/09	13:12	5990	Larvacean		Disc 1 VTS_01_4.mpg
07/29/09	13:16	5998	Prayid calycophoran siphonophore		Disc 1 VTS_01_4.mpg

07/29/09	13:55	5001	Lobate ctenophore (*Bathocyroe*)		Disc 2 VTS_01_1.mpg
07/29/09	13:58	4990	Physonect Siphonophore		Disc 2 VTS_01_1.mpg
07/29/09	14:01	4981	Chaetognath		Disc 2 VTS_01_1.mpg
07/29/09	14:07	4978	Unidentified cydippid ctenophore		Disc 2 VTS_01_1.mpg

07/29/09	14:18	4998	Larvacean house		Disc 2 VTS_01_1.mpg
07/29/09	14:30	5009	Copepod		Disc 2 VTS_01_2.mpg
07/29/09	15:15	3995	Chaetognath		Disc 2 VTS_01_3.mpg
07/29/09	15:18	3989	Unidentified. (Squid ink?)		Disc 2 VTS_01_3.mpg

07/29/09	15:20	3989	Copepod		Disc 2 VTS_01_3.mpg
0729/09	15:24	3998	Marine snow		Disc 2 VTS_01_3.mpg
07/29/09	15:34	4013	Unidentified salps or siphonophore		Disc 2 VTS_01_3.mpg
07/29/09	15:37	4044	Unidentified medusa		Disc 2 VTS_01_4.mpg

07/29/09	15:39	4047	Fish (*Cyclothone*)		Disc 2 VTS_01_4.mpg
07/29/09	15:47	4042	Chaetognath		Disc 2 VTS_01_4.mpg
07/29/09	15:50	4038	Unidentified		Disc 2 VTS_01_4.mpg
07/29/09	16:12	2996	Medusa		Disc 2 VTS_01_4.mpg

07/29/09	16:13	2978	Chaetognath		Disc 2 VTS_01_4.mpg
07/29/09	16:22	3052	Larvacean		Disc 3 VTS_01_1.mpg
07/29/09	16:33	3004	Medusa		Disc 3 VTS_01_1.mpg
07/29/09	20:28	4200	Larvacean house		Disc 3 VTS_02_1.mpg

07/29/09	20:29	4195	Unidentified medusa		Disc 3 VTS_02_1.mpg
07/29/09	20:33	4194	Fish (*Cyclothone*)		Disc 3 VTS_02_1.mpg
07/29/09	20:34	4189	Lobate ctenophore (*Lampocteis cruentiventer*)		Disc 3 VTS_02_1.mpg

Dive 07/29/09. DVD Label: Noble Clyde Boudreaux AC857 07/29/09 Disk # of 3

Date	Time (local)	Depth (ft)	Observation	Video/Still Image	Video File Location
07/30/09	20:45	8013	Chaetognath		VTS_01_1.mpg

07/30/09	22:15	8059	Chaetognath		VTS_01_1.mpg
07/30/09	22:44	8074	Unidentified fish		VTS_01_2.mpg
07/30/09	22:53	8101	Shrimp		VTS_01_2.mpg
07/31/09	01:30	8099	Holothuroidean (*Enypniastes*)		VTS_01_2.mpg

7. SHELL LOGISTICAL SUPPORT

We received outstanding support from all personnel while aboard the Noble Clyde Boudreaux. The enthusiastic response from both the ROV team and Drilling were much appreciated. We look forward to a productive relationship with this facility.

Transportation:

Date	Flight	Persons	Flight Time (h)	Aircraft
07/28/09	Galveston Heliport to Noble Clyde Boudreaux	2	1:40	S92
07/29/09	Noble Clyde Boudreaux to Galveston Heliport	1	1:40	S92
07/31/09	Noble Clyde Boudreaux to Galveston Heliport	1	1:40	S92

<u>Accommodation</u>:

07/28/09 2 persons
07/29/09 1 persons
07/30/09 1 persons

<u>Meals</u>:

Date	Breakfast	Lunch	Dinner
07/28/09	-	2	2
07/29/09	2	2	1
07/30/09	1	1	1
07/31/09	1	-	-
Total	4	5	4

<u>ROV Time</u>:

07/28/09: 03:11 (13:52 – 17:03)
07/29/09: 11:25 (09:00 – 20:25)
07/30/09: 02:14 (20:43 – 22:57)
Total: 16:50

8. DIGITAL STILL IMAGES

Stuart Cook in Quarters
DSC00191.JPG

Stan Jeter and Stuart Cook
DSC00194.JPG

Stan Jeter flying ROV

S92 at PHI Heliport, Galveston Tx

DSC00195.JPG	DSC00197.JPG
 Stan Jeter flying ROV 100_1227.JPG	 ROV Control Screens 100_1229.JPG
 Alvarado Gonzales 100_1230.JPG	 John Ruhlman, Buster Stewart, Mark Benfield, Stan Jeter 100_1231.JPG

MISSION 74

LEIV EIRIKSSON, SOUTH UIST, FAROE-SHETLAND CHANNEL

DANIEL JONES

1. GENERAL INFORMATION:

Company: Shell
Vessel operator: Ocean Rig
Vessel name: Leiv Eiriksson
Location: South Uist, West of Shetland
Rig position: 6792512 N 500169 E (UTM Zone 30N)
61.26686° N 2.9968488° W
Seabed depth: 1157 m
ROV operator: Oceaneering
ROV: Magnum 105 and Magnum 146
ROV team:

ROV supervisor nights	Jan-Cato Langvassli
ROV pilot nights	Odd Magne Sviland
ROV pilot nights	Joar Ottosen
ROV pilot nights	Ståle Nilsen

2. GEAR:

- Magnum 146 and Magnum 105 ROV
- Standard video camera (Kongsberg OE14-366/367)
- Small (57mm ID, 63mm OD) ROV push core
- Bottle type amphipod trap
- Bottle type light trap (using glowstick)

3. NARRATIVE:

Sunday 2nd August 2009

Flew from Southampton to Aberdeen.

Monday 3rd August 2009

Flew from Aberdeen to Scatsta (near Sullom Voe), Shetland on a fixed wing Eastern Airways flight. Got a Sikorski S92 helicopter from there to the Leiv Eiriksson. I had the safety induction and the tour of the rig and waited until the night shift started at 19:00. I put the equipment together and had a tool-box talk with the ROV team on the SERPENT work.

Tuesday 4th August 2009

Started **DIVE 1**, the ROV was in the water at 02:04 and out of the cage at 02:18.

Time	Notes
02:28:15	Start survey going north from BOP
02:29:31	10 m from BOP
02:30:26	20 m
02:30:56	30 m
02:31:56	40 m
02:32:26	50 m
02:33:06	60 m
02:34:10	70 m
02:35:07	80 m
02:37:57	90 m
02:39:35	100 m and stop transect
02:52:30	Start survey going north east from BOP
02:33:41	10 m from BOP
02:54:27	20 m
02:55:50	30 m
02:56:10	40 m
02:56:41	50 m
02:57:29	60 m
02:58:16	70 m
03:00:13	80 m
03:03:05	90 m
03:03:40	100 m and stop transect
03:21:57	Start survey going east from BOP
03:23:05	10 m from BOP
03:23:40	20 m
03:24:32	30 m

03:26:50	40 m
03:27:48	50 m
03:30:14	60 m
03:32:17	70 m
03:33:56	80 m
03:35:00	90 m
03:37:14	100 m and stop transect
04:32:35	Start survey going south east from BOP
04:35:13	10 m from BOP
04:35:56	20 m
04:36:59	30 m
04:38:00	40 m
04:38:33	50 m
04:39:23	60 m
04:40:45	70 m
04:42:34	80 m
04:43:34	90 m
04:46:18	100 m and stop transect
04:53:00	Transect heading south from BOP
04:54:13	10 m from BOP
04:54:35	20 m
04:55:09	30 m
04:56:10	40 m
04:57:34	50 m
04:58:25	60 m
05:00:00	70 m
05:02:12	80 m
05:03:42	90 m
05:05:10	100 m and stop transect
05:19:51	Transect going NE TO the BOP 100m from BOP
05:21:38	90 m from BOP
05:22:10	80 m from BOP
05:23:15	70 m from BOP
05:23:54	60 m from BOP
05:25:28	50 m from BOP
05:26:40	40 m from BOP
05:27:15	30 m from BOP
05:28:08	20 m from BOP
05:29:30	10 m from BOP
05:30:25	At BOP

05:35:43	Transect going East TO the BOP 100m from BOP
05:38:51	90 m from BOP
05:40:04	80 m from BOP
05:40:48	70 m from BOP
05:43:00	60 m from BOP
05:44:09	50 m from BOP
05:46:36	40 m from BOP
05:48:35	30 m from BOP
05:50:00	20 m from BOP
05:50:37	10 m from BOP
05:51:00	At BOP
05:53:13	Transect heading north west from BOP
05:53:50	10 m from BOP
05:54:40	20 m
05:55:18	30 m
05:56:11	40 m
05:57:15	50 m
05:57:55	60 m
05:59:08	70 m
06:00:40	80 m
06:01:36	90 m
06:03:26	100 m and stop transect

After the transects and on the same dive we carried out a set of core samples at 100 m north of the BOP.

Tuesday 4th August 2009 (night)

Start **DIVE 2,** ROV off deck 20:37 and in water 20:40. We went 75m north of the BOP and obtained a full set of 6 cores. We carried out the entire coring operation using the floating rope attached to the core handle which proved effective and did not put strain on the corers. There were no cuttings visible in the cores.

Start **DIVE 3,** ROV off deck 23:00, out of cage at 23:22 and on seabed at 23:23. We went 50 m north of the BOP and obtained a full set of 6 core samples.

Wednesday 5th August 2009 (morning)

Start **DIVE 4,** ROV off deck 02:00. Unfortunately two cores were lost on descent as they drifted out of the holsters, I think the cores were not deployed vertically and this made the floating rope act as a sail and drag the cores out of the holsters. In future we should use the thin (~5mm diameter) floating rope so that it does not have too much buoyancy. We collected 3 samples at 100 m North of the BOP completing the samples for the 100 m site.

Start **DIVE 5,** ROV off deck 04:25 and on seabed 25m North of the BOP at 05:02:57. We collected a full set of 6 cores despite difficulties getting a good core in the drill cuttings. The drill cuttings were fizzing on retrieval (this can be seen around the orange core extractor on the picture although there was also fizzing in the water above the core) and had large pore spaces. The bulk of the core material was very white in colour. Above this there was a 10-20 mm thick layer of darker finer material and then a very thin <5mm white layer on top of that (seabed surface). Only one core was retrieved where any normal sediment was visible and this was core LE/050809/005#6 which had >180 mm in cuttings depth. A typical core (LE/050809/005#2) can be seen in the picture to the left. Compare the colour with the normal sediment below the soft coral in the picture below.

Wednesday 5th August 2009 (night)

There was a supply boat loading up at the starboard side so we were not able to use Magnum 146 (that we had been using) so we transferred equipment to the moonpool launched Magnum 105. We had the corers and amphipod trap mounted on the vehicle.

ROV off deck at 21:30 for **DIVE 6**. Amphipod trap deployed near their marker buoy (to the west of the BOP 70m) at 22:28. We spent the rest of the dive making faunal collections using the core samplers. On retrieval it proved that only three of these were successful. A soft coral, amphipod found associated with soft coral and a sabellid were collected. The picture shows the soft coral on top of normal sediment.

Thursday 6th August 2009 (night)

ROV team had to collect transponders at the start of the shift. This took until 01:10.

Friday 7th August 2009 (morning)

DIVE 7 commenced (using Magnum 105) at 01:10. The ROV was equipped with five core samplers (as all the spare handles had been lost).

Time	Notes
01:58	Probable leech (subclass Hirudinea)
02:12	Tube dwelling amphipods commonly seen on seafloor. Likely *Siphonocetes* sp. These were commonly observed in Jones et al. 2007 DSR I 54:1111-1128.
02:22	Hydroid observed (collected)
02:50	Sea star observed almost certainly *Pontaster tenuispinus*
02:51	*Colossendeis proboscea* observed
03:03	Two soft corals observed next to each other – one apparently yellow and the other white. The yellow one was collected. We had already collected a sample of the white sort.
03:15	We attempted to collect another white soft coral – the collection failed
03:53	Stalked sponge observed (collected)
04:29	Located trap
05:!4	Trap retrieved

We collected a small hydroid, yellow soft coral and the stalked sponge (*Stylocordyla borealis*) using the ROV cores. We also retrieved the baited and light traps. Once the ROV was recovered to the surface and the samples processed I packed up all the SERPENT gear and sent this with the samples in formalin back to the National Oceanography Centre (under shipment RAM no 45262). Frozen samples were hand carried back to the National Oceanography Centre Southampton for further analysis. I left the rig at 17:00 on an EC225 helicopter to Aberdeen. From Aberdeen I then flew to London.

4. SAMPLES:

CODE STRUCTURE:

LE/020509/001#1
Leiv Eiriksson/ Date / station number # replicate

SAMPLE STATIONS:

Station	Location	Time	Sample type	Preservation	Subsections	Notes
LE/040809/001#1	100m N of BOP	06:19	Push core	frozen	0-6cm	No cuttings visible
LE/040809/001#2	100m N of BOP	06:12	Push core	frozen	0-1cm, 1-3cm & 3-6cm	No cuttings visible
LE/040809/001#3	100m N of BOP	06:29	Push core	frozen	0-1cm, 1-3cm & 3-6cm	No cuttings visible
LE/040809/002#1	75m N of BOP	21:07	Push core	frozen	0-1cm, 1-3cm & 3-6cm	No cuttings visible
LE/040809/002#2	75m N of BOP	21:09	Push core	frozen	0-1cm, 1-3cm & 3-6cm	No cuttings visible
LE/040809/002#3	75m N of BOP	21:12	Push core	frozen	0-1cm, 1-3cm & 3-6cm	No cuttings visible
LE/040809/002#4	75m N of BOP	21:17	Push core	frozen	0-6cm	No cuttings visible
LE/040809/002#5	75m N of BOP	21:20	Push core	frozen	0-6cm	No cuttings visible
LE/040809/002#6	75m N of BOP	21:25	Push core	frozen	0-6cm	No cuttings visible
LE/040809/003#1	50m N of BOP	23:26	Push core	frozen	0-1cm, 1-3cm & 3-6cm	10mm cuttings depth
LE/040809/003#2	50m N of BOP	23:28	Push core	frozen	0-1cm, 1-3cm & 3-6cm	29mm cuttings depth
LE/040809/003#3	50m N of BOP	23:32	Push core	frozen	0-1cm, 1-3cm & 3-6cm	24mm cuttings depth
LE/040809/003#4	50m N of BOP	23:34	Push core	frozen	0-6cm	12mm cuttings depth
LE/040809/003#5	50m N of BOP	23:36	Push core	frozen	0-6cm	11mm cuttings depth
LE/040809/003#6	50m N of BOP	23:38	Push core	frozen	0-6cm	10mm cuttings depth
LE/050809/004#1	100m N of BOP	02:29	Push core	frozen	0-1cm, 1-3cm & 3-6cm	No cuttings visible
LE/050809/004#2	100m N of BOP	02:34	Push core	frozen	0-6cm	No cuttings visible
LE/050809/004#3	100m N of BOP	02:36	Push core	frozen	0-6cm	No cuttings visible
LE/050809/005#1	25m N of BOP	05:16	Push core	frozen	0-1cm, 1-3cm & 3-6cm	All cuttings
LE/050809/005#2	25m N of BOP	05:07	Push core	frozen	0-1cm, 1-3cm & 3-6cm	All cuttings
LE/050809/005#3	25m N of BOP	05:23	Push core	frozen	0-1cm, 1-3cm & 3-6cm	All cuttings
LE/050809/005#4	25m N of BOP	05:28	Push core	frozen	0-6cm	All cuttings
LE/050809/005#5	25m N of BOP	05:33	Push core	frozen	0-6cm	All cuttings
LE/050809/005#6	25m N of BOP	05:37	Push core	frozen	0-6cm	Cuttings depth >180 mm
LE/040809/006#1	going N from BOP	02:28	100m video transect	.avi		
LE/040809/007#1	Going NE from BOP	02:52	100m video transect	.avi		
LE/040809/008#1	Going E from BOP	03:21	100m video transect	.avi		

LE/040809/009#1	Going SE from BOP	04:32	100m video transect	.avi		
LE/040809/010#1	Going S from BOP	04:53	100m video transect	.avi		
LE/040809/011#1	Going NE TO BOP	05:19	100m video transect	.avi		
LE/040809/012#1	Going E TO BOP	05:33	100m video transect	.avi		
LE/040809/013#1	Going NW from BOP	05:43	100m video transect	.avi		
LE/060809/014#1	50+ m N of BOP	22:41	Soft coral	Formalin		
LE/060809/014#2	50+ m N of BOP	22:41	Soft coral tissue sample	RNAlater		
LE/060809/015#1	50+ m N of BOP	23:41	Amphipod associated with soft coral	Formalin		
LE/060809/016#1	50+ m N of BOP	00:10	Sabellid	Formalin		
LE/070809/017#1	50+ m N of BOP	03:03	Yellow soft coral	Formalin		
LE/070809/017#2	50+ m N of BOP	03:03	Yellow soft coral tissue sample	RNAlater		
LE/070809/018#1	50+ m N of BOP	02:43	Hydroid	Formalin		
LE/070809/018#2	50+ m N of BOP	02:43	Hydroid tentacle	RNAlater		
LE/070809/019#1	50+ m N of BOP	03:57	Stylorordyla	Formalin		
LE/070809/019#2	50+ m N of BOP	03:57	Stylorordyla tissue sample	RNAlater		
LE/070809/020#1	70 m W of BOP	05:14	Light trap amphipods	Formalin		
LE/070809/021#1	70 m W of BOP	05:14	Sardine baited trap amphipods	Formalin		

5. GEAR REPORT

ROV Magnum 105 and Magnum 146

Both ROVs were good and highly suitable for the job. We had very few problems with the vehicle during my visit. It was equipped with a video camera, 5- and 7-function manipulator. The Magnum 105 was operated from a moonpool in the centre of the rig. Magnum 146 was launched over the starboard side of Leiv Eiriksson.

New corer rack

This system worked well. The increased spacing between tubes was beneficial as was the easy attachment of the tubes onto the rack. This rack fits assembled into a standard SERPENT aluminium box. The furthest core form the jaws i.e. on the back left (as looking from the ROV camera at the rack mounted on the left-hand five-function manipulator) is difficult to reach with the 7-function arm.

6. Ecological highlights

A total of 25 taxa were observed directly. These are shown in the table below and have representatives from 7 phyla.

Table of all species found on this visit.

Phylum	Species	Notes	Picture
Porifera	Ball sponge	Small, common and attached to rocks. 50 mm max diameter	
	Yellow spherical sponge	Small and brightly coloured. Not common. <40 mm diameter	
	Stylocordyla borealis	Small cup-shaped stalked sponge. Approx 60 mm in total height.	

	Stalked sponge	Rarely seen. Presumably a hexactinellid as external spicules are observed. Around 50 mm tall.	
	Asconema setubalense	Large hexactinellid. Identified from a specimen collected at Rosebank.	
Cnidaria	White soft coral	Small white soft coral with pink polyps. Specimen collected. 60 mm tall and larger.	

	Yellow soft coral	Yellow soft coral. Only one colony observed which was around 100 mm in height.	
	Hydroid (*Corymorpha groenlandica*)	Rarely seen here. Small stalked athecate hydroid. Around 80mm in height.	
	Hydroid 2	Probably a different species. Small hydroid < 30 mm in total length.	
	Tubularia?	Large stalked hydroid. >200 mm in height.	

	Edwardsiid anemone	Around 60 mm in total diameter.	
Annelid	Hirudinea sp 1	Strange striped leech. Has distinctive pacman shaped mouth. Approx 200 mm in length.	
	Hirudinea sp 2	Leech found attached to sabellid tube. Approximately 80 mm in length.	

	Sabellid	Sabellids are common at this site. There appear to be several similar species. The crown of tentacles varies in colour from white to green. The tentacles retract when directly disturbed. Up to 150 mm in tube length.	
Nemertea	*Nipponnemertes pulchra*	This nemertean was infrequently observed. It is identified by comparison with other photographs from Norwegian fjords and so identification is not certain. Up to 100 mm in length.	
Echinodermata	*Ophioscolex glacialis*	Ophiuroid commonly seen at this depth. Identified from a specimen collected at a nearby site (Rosebank North). Up to 250 mm from arm-tip to arm-tip.	
	Pontaster tenuispinus	Asteroid observed at Faroe-Shetland Channel sites. Up to 100 mm from arm-tip to arm-tip.	

	Poliometra proxila	Comatulid crinoid. Identification based on image comparisons so uncertain. Diameter up to 200 mm.	
Arthropoda	*Boreonymphon abyssorum*	Very common small pycnogonid. Up to 100 mm in diameter.	
	Colossendeis proboscidea	Large pycnogonid. Relatively common at South Uist for this species. Up to 200 mm diameter. Distinctive colouration and large proboscis visible on this photograph.	
	Siphonocetes sp.	Tube dwelling amphipod. Tubes were common on the seafloor. Tubes up to 50 mm in length.	
Chordata -Pisces	*Lycodonus* sp.	Elongate eelpout. Up to 250 mm in length.	

	Lycodes sp.	Eelpout. Up to 300mm in length.	
	Gaidropsarus argentatus	Arctic Rockling up to 350mm in length.	
	Amblyraja radiata	Large ray. Only observed once. Up to 700 mm in length.	

MISSION 75

DEVELOPMENT DRILLER 2, GC 743, GULF OF MEXICO

MARK BENFIELD

Left: A scyphomedusan jellyfish (*Periphyllopsis braueri*) imaged by Innovator 8. Right: A Cirroteuthid octopod (possibly *Cirrothauma* sp.) imaged by Innovator 14.

1. GENERAL INFORMATION:

Client: BP
Rig Operator: Transocean
Rig Name: Development Driller 2
Rig Location: GC 743
Rig Position: 27° 13.131” N, 90° 02.717” W
Seabed Depth: 6900’
Seabed Temperature: ?° F
ROV Operator: Saipem America (Sonsub)
ROV: Innovator 150: Innovator08 and Innovator14
TIME ZONE: GMT -6

ROV Team:

Team 1	Team 2
Alan Gordon(12pm-12am supervisor)	Mike Sylve (12am-12pm supervisor)
Julian Sfichi	Blake Ellison
Gary Washington	Jake Shoemaker
David Krueger(12am-12pm supervisor)	Mike Washington (Senior Supervisor) 12pm-12am
Dean Miller	Ronnie Block
Rodrigo Cueto	Brian Seamone

Wellsite Leaders: Richard Speyrer
HSE Team: Christopher Bryant
OIM: Ian Hillier
Rig Telephone Number: 713-336-7624
Gulf SERPENT Personnel: Stuart Cook (MATE Intern)

2. GEAR

ROV Type: Innovator 150
ROV Camera: Kongsberg

SONAR:	Mesotech 1000 Digital 676 kHz
DVD Recording Deck:	Pioneer DVD-R

3. VISIT NARRATIVE

3.1 Background

This is the first visit to the DD2 since last summer and Stuart Cook's third trip offshore.

Monday 08/03/09
Stuart drove down to Houma last night and stayed in a hotel. He checked into the PHI Heliport at 04:45. His flight left at 06:30 and he arrived on the DD2 at 08:00. He went through rig orientation until 10:00. The ROV Supervisor Mike Washington informed him that the ROV's were being tasked to move the BOP today. He met with the Well Site Leader. No SERPENT surveys were performed.

Tuesday 08/04/09
Stuart spoke with Mike Washington (ROV Senior Supervisor) at 10:00 who informed him that one of the ROVs would be available this evening. Stuart arrived at the ROV control room for Innovator 14 at 18:00 and they began a survey at 6900 feet just off bottom from 18:50 until 20:00. The ROV was tasked by drilling from 20:00 until 24:00.

Wednesday 08/05/09
Stuart arrived at Innovator 8 control van at 24:00. We prepared for a survey numerous times throughout the morning, however, the ROV developed a hydraulic hose leak at 3000 feet and repairs occupied most of the morning. SERPENT surveys were performed at 800, 1600, 2600, 4000, and 5000 feet between 06:20 and 10:40.

Thursday 08/06/09
Stuart arrived for pre-flight video at 9:30, departed the DD2 at 11:15 arriving in Houma at 12:45. He then drove back to LSU.

4. SAMPLES

Collection of physical samples is not normally part of the Gulf SERPENT Project. Our data consist of primarily of video observations and other measured data.

5. GEAR REPORT

ROV: All systems on the ROV were functioning properly with the exception of the temperature sensors, which apparently require recalibration. Most surveys were conducted without any problems, although a hydraulic failure occurred during one dive. The video quality is not as good as we have received from the DD2 in the past. It appears to be due to the use of a lower bitrate encoding of the video as it is written to DVD. This is likely due to the use of a high compression setting such as extended play (EP) rather than standard play (SP). The video is written to DVD at a low bitrate in order to fit more video on to a single DVD (4h) instead of the normal 2h at SP. When Stuart asked about this he was told that it couldn’t be changed. It is unfortunate that the excellent piloting and videography were degraded by the noisier video. We will work with Saipem to find a solution to this issue.

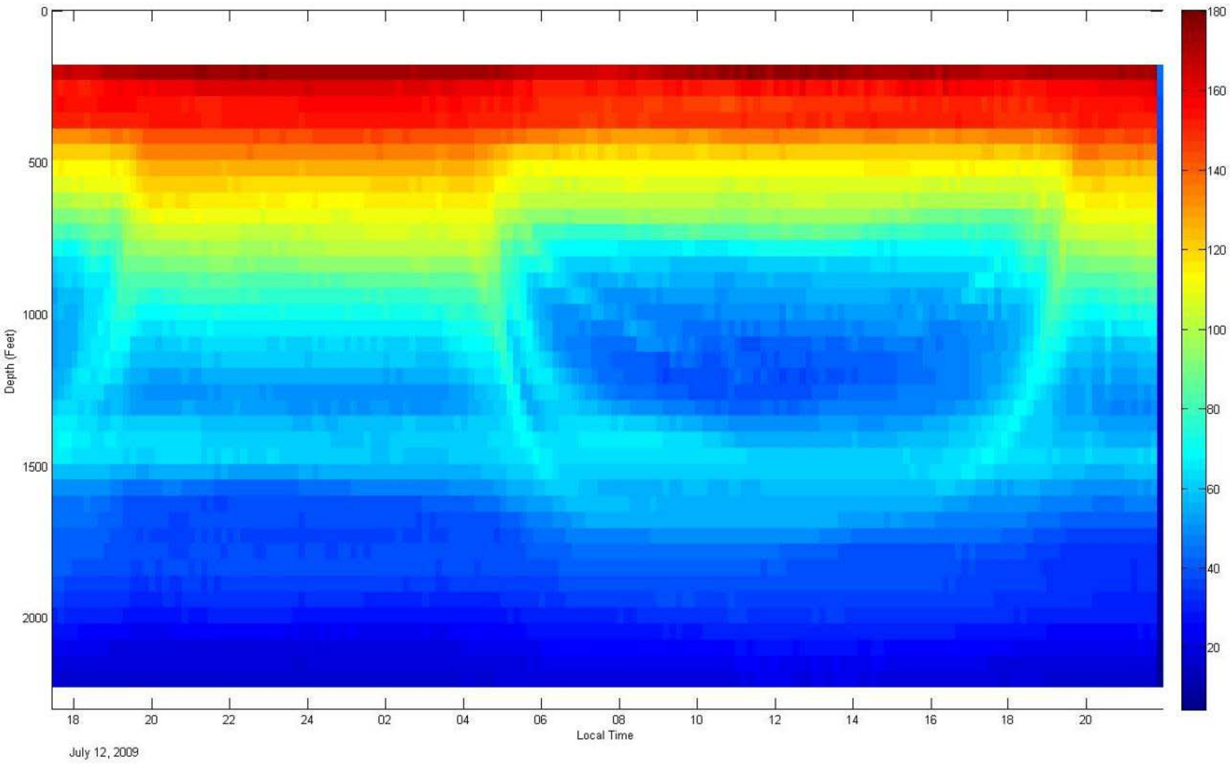


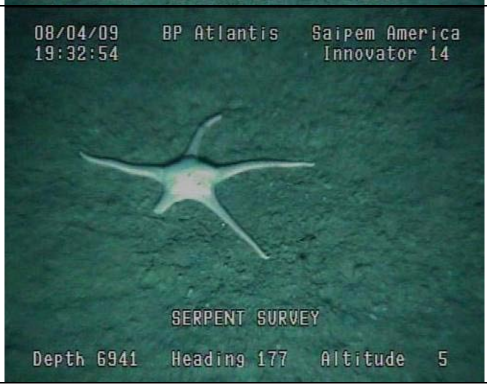
Figure 1. An ADCP backscatter intensity plot indicating that there is a layer of organisms at 1200 – 1600 feet during the day and above 1000 feet at night.

6. FAUNAL OBSERVATIONS

One notable observation was the frequent presence of tuna in the images. This is of great interest to the Gulf SERPENT Project as it may be possible to assemble a record of diving records by tuna from the video observations and to link it to our other observations to determine what they are foraging on at depth.

Dive 08/04/09. DVD Label: DD2 GC743 08/04/09 Disk 1 of 1.

Date	Time (local)	Depth (ft)	Observation	Video Still Image	Video File Location
08/04/09	19:03	6861	Cirroteuthid octopod (*Cirrothauma* sp?)		DISK 1 VTS_01_1.mpg
08/04/09	19:09	6909	Holothuroidean		DISK 1 VTS_01_1.mpg
08/04/09	19:15	6920	eel		DISK 1 VTS_01_1.mpg

08/04/09	19:20	6925	Sea pen		DISK 1 VTS_01_1.mpg
08/04/09	19:32	6941	Brittlestar		DISK 1 VTS_01_2.mpg

Dive 08/05/09. DVD Label: DD2 GC743 08/05/09 Disk 1 of 2.

08/05/09	06:19	806	Tuna		DISK 1 VTS_01_1.mpg
08/05/09	06:20	806	Squid		DISK 1 VTS_01_1.mpg

08/05/09	06:45	1631	Unidentified medusa		DISK 1 VTS_01_1.mpg
08/05/09	06:46	1619	Physonect siphonophore		DISK 1 VTS_01_1.mpg
08/05/09	06:50	1601	fish		DISK 1 VTS_01_1.mpg
08/05/09	06:54	1621	Lobate ctenophore (*Beroe*?)		DISK 1 VTS_01_1.mpg

08/05/09	06:58	1619	Shrimp		DISK 1 VTS_01_1.mpg
08/05/09	07:03	1666	Tunas		DISK 1 VTS_01_1.mpg
08/05/09	07:04	1659	Medusa (*Solmissus*)		DISK 1 VTS_01_1.mpg
08/05/09	07:12	1638	Lobate ctenophore		DISK 1 VTS_01_1.mpg

08/05/09	07:12	1631	Tunas		DISK 1 VTS_01_2.mpg
08/05/09	07:14	1664	Squid		DISK 1 VTS_01_2.mpg
08/05/09	07:15	1686	Tunas		DISK 1 VTS_01_2.mpg
08/05/09	07:19	1648	Tunas		DISK 1 VTS_01_2.mpg

08/05/09	07:20	1642	Siphonophore		DISK 1 VTS_01_2.mpg
08/05/09	07:21	1592	Tuna		DISK 1 VTS_01_2.mpg
08/05/09	07:24	1648	Physonect siphonophore		DISK 1 VTS_01_2.mpg
08/05/09	07:27	1648	Unidentified		DISK 1 VTS_01_2.mpg

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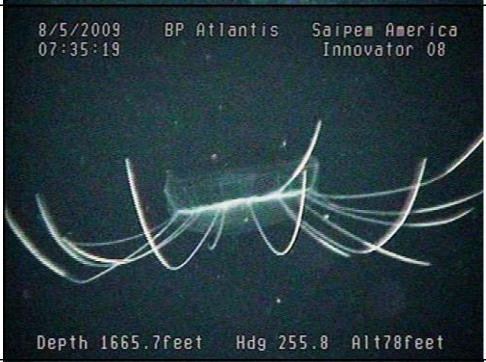
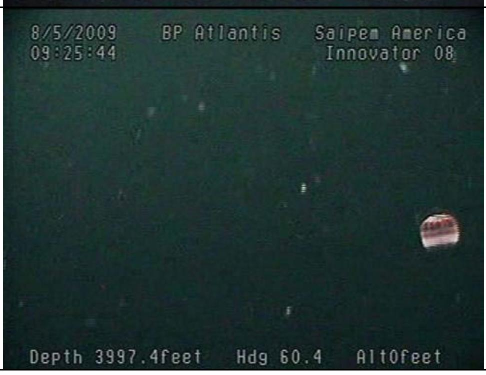
08/05/09	07:34	1665	Ctenophore (*Kiyohimea*)		DISK 1 VTS_01_2.mpg
08/05/09	07:35	16:35	Medusa (*Solmissus*)		DISK 1 VTS_01_2.mpg
08/05/09	08:15	2660	Larvacean house?		DISK 1 VTS_01_2.mpg
08/05/09	08:18	2652	Squid inking		DISK 1 VTS_01_2.mpg

08/05/09	08:20	2657	Physonect siphonophore		DISK 1 VTS_01_2.mpg
08/05/09	08:22	2651	Larvacean house		DISK 1 VTS_01_2.mpg
08/05/09	08:23	2644	Physonect siphonophore		DISK 1 VTS_01_2.mpg
08/05/09	08:26	2629	Physonect siphonophore		DISK 1 VTS_01_2.mpg

08/05/09	08:28	2664	Shrimp?		DISK 1 VTS_01_2.mpg
08/05/09	08:29	2669	Calycophoran siphonophore		DISK 1 VTS_01_2.mpg
08/05/09	08:32	2666	Chaetognath		DISK 1 VTS_01_2.mpg
08/05/09	08:32	2666	Cydippid ctenophore		DISK 1 VTS_01_3.mpg

08/05/09	08;43	2719	Larvacean		DISK 1 VTS_01_3.mpg
08/05/09	08:46	2723	Larvacean		DISK 1 VTS_01_3.mpg
08/05/09	09:04	3809	Physonect siphonophore		DISK 1 VTS_01_3.mpg
08/05/09	09:06	2834	Shrimp		DISK 1 VTS_01_3.mpg

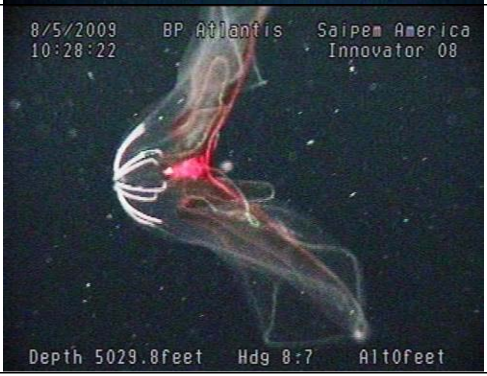
08/05/09	09:14	3910	Squid		DISK 1 VTS_01_3.mpg
08/05/09	09:19	3922	Medusa (*Atolla?*)		DISK 1 VTS_01_3.mpg
08/05/09	09:21	3931	Physonect siphonophore (*Apolemia*)		DISK 1 VTS_01_3.mpg
08/05/09	09:25	3997	Medusa		DISK 1 VTS_01_3.mpg

08/05/09	09:15	3909	Chaetognath		DISK 1 VTS_01_3.mpg
08/05/09	09:29	3976	Shrimp		DISK 1 VTS_01_4.mpg
08/05/09	09:31	4001	Physonect siphonophore (*Apolemia*)		DISK 1 VTS_01_4.mpg
08/05/09	09:32	4000	Medusa		DISK 1 VTS_01_4.mpg

08/05/09	09:32	4001	Medusa (*Periphyllopsis braueri*)		DISK 1 VTS_01_4.mpg

Dive 08/05/09. DVD Label: DD2 GC743 08/05/09 Disk 2 of 2.

08/05/09	10:01	5077	Squid		Disk 1 VTS_01_1.mpg
08/05/09	10:08	5061	Medusa		Disk 1 VTS_01_1.mpg
08/05/09	10:11	5073	Larvacean		Disk 1 VTS_01_1.mpg

08/05/09	10:36	5062	Larvacean		Disk 1 VTS_01_1.mpg
08/05/09	10:28	5029	Lobate ctenophore (*Bathocyroe*)		Disk 1 VTS_01_1.mpg

8. BP LOGISTICAL SUPPORT

<u>Transportation</u>:

Date	Flight	Persons	Flight Time (h)	Aircraft
08/03/09	Houma Heliport to DD2		1	1:30
S92				
08/06/09	DD2 to Houma Heliport	1	1:30	S76

<u>Accommodation</u>:
08/03/091 person
08/04/091 person
08/05/091 person

<u>Meals</u>:

Date	Breakfast	Lunch	Dinner
08/03/09	-	1	1
08/04/09	1	1	1
08/05/09	1	1	1
08/06/09	1	-	-
Total	3	3	3

<u>ROV Time</u>:
08/04/09: 00:53 (18:50 – 19:43) Innovator 14
08/05/09: 04:21 (06:19 – 10:40) Innovator 8
Total: 05:14

9. DIGITAL STILL IMAGES

 DSC00198.JPG Mike Silva, Ronny Block and Brian Seamone	 DSC00199.JPG Mike Silva, Ronny Block and Brian Seamone	 DSC00200.JPG Brian Seamone flying Innovator 14
 DSC00201.JPG Mike Silva, Ronny Block and Brian Seamone	 DSC00207.JPG Stuart Cook in the S76	 DSC00209.JPG Stuart Cook in the S76

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SCIENTIFIC AND ENVIRONMENTAL ROV PARTNERSHIP USING EXISTING INDUSTRIAL TECHNOLOGY

MISSION 76

BYFORD DOLPHIN, LANCASTER 1, WEST OF SHETLAND

ANDREW GATES

GENERAL INFORMATION:

Well name: Well 205/21a-C (Lancaster)
Rig Name: *Byford Dolphin*
Rig Operator: Dolphin/Senergy
Client: Hurricane Exploration (HEX)
Position: 60^{0} 11' 13.738 N, 003^{0}51'18.497 W
Depth: 155m
Seabed temperature: $10.2^{0}C$
ROV operator: Fugro
SERPENT Representative: Dr. Andrew Gates
Dates of visit: Friday 21st to Friday 28th August 2009

ROV team:

Supervisor	Charlie Blake
Pilot	Sean Benzie
Pilot	Steve Miller

GEAR:

The Fugro Spartan ROV was equipped with suitable video camera systems and good manipulator arm functions. There was some maintenance that was required during the visit but generally when the weather was suitable and when not required for operational tasks, the ROV was available for doing SERPENT work.

The Kongsberg OE-14 digital stills camera produced some very good images although there were some problems setting up the camera. This was related to integration with the system in place on the Spartan because the camera worked during testing in the control room. In addition there were some problems in which the camera software would crash when repeatedly using the zoom function.

Marker buoys constructed from weighted traffic cones marked with at 10cm intervals were sent to the *Byford Dolphin* for use as indicators of the vertical accumulation of drill cuttings. These were supposed to be deployed in 2 rings at 7 and 15 m from the proposed drilling site. The cone type marker buoys had not been deployed as planned but similar devices were put in the correct locations before the start of drilling by the ROV team. These had been measured and dimensions were available for accurate estimation of drill cuttings accumulation. The alternative marker buoys were perfectly suitable.

Current meter: The work at Lancaster included the first deployment of a new current meter. The current meter was mounted in the base of a weighted traffic cone and had sonar reflector attached to ensure ease of location. The sonar reflector was designed to float above the current meter. An improved mounting system is required for future deployments of the current meter. The current meter was deployed for a period of 48 hours and was simple to programme.

CTD: The CTD logged Conductivity (salinity), temperature, depth, pH and oxygen on all dives during the visit to Lancaster. The device was simple to use although instead of downloading data at the end of each day it is likely to be possible to leave the device logging for the whole trip as battery life was unaffected over the 7 dives. Reliable data were acquired from the conductivity, temperature, depth and oxygen sensors but the pH probe did not seem to work once the ROV was in the water (pH readings taken during calibration on land were precise, we think that there is too much interference with the ROV electronics for this probe to work in conjunction with an ROV). Synchronization of wrist watch, PC and CTD time, also note time difference to video log on ROV

NARRATIVE:

20th August 2009 – Travel to Aberdeen on the 1905 flight from Southampton. Stay overnight at the Speedbird Inn.

Friday 21st August 2009 – Check-in 0800 at Bristows. Arrival on *Byford Dolphin* at approximately 1030. Safety briefing straight away on arrival before lunch. After lunch meet with Hurricane CEO Robert Trice and geologist Clare Slightham. ROV supervisor Charlie Blake had also arrived today so it wasn't possible to dive. Went out to the ROV to meet the team and discuss the work. The team gave me a tour of the system and explained that the stills camera was still on the supply ship and would be delivered tomorrow. The SERPENT equipment that I had sent out was all present within the ROV workshop. I showed Clare Slightam around the SERPENT equipment and talked through the work that we will do. The plan was to try and get the ROV in the water at the first possible opportunity, with the current weather forecast it was looking like it will be tomorrow after 1400. During my time on board we will carry out a video survey, some baited trap work (for this, the Drilling Supervisor had asked the welder to construct a tube for attracting fish). During the afternoon I spent some time running some trial "dry" deployments of the current meter and CTD to ensure these were ready for diving as soon as the opportunity arose.

Saturday 22nd August 2009 - Start shift at 0600. Speak with ROV supervisor and he informs me that the weather forecast has improved and that we should be able to dive both Saturday and Sunday, however there are some perationalr tasks to complete as well. I fitted the O_2 and pH sensors to the CTD before going in for the morning meeting at 0730. SERPENT work was mentioned - stills camera still on the boat and the fish trap is nearly finished.
The datalogger time was synchronized with my PC and time difference with the ROV monitors was noted. The logger was started at 0802 and set to run until 1800, logging every 5 seconds. The values for the datalogger readings when it was started were as follows:
Optode: 302, Temp: 15, Pressure 11.4, Conductivity: 0, pH: 6.5
ROV launched at 0837 (moonpool L&R system in which the moonpool trapdoor is manually lifted). At depth 0850 to do an initial bulls eye check. Bulls eyes all OK but there were some bubbles evident around the guide base, Drilling supervisor suggested these likely to be from the newly laid cement. Following routine checks a visual exploration was made. This involved flying out on a heading (N) to determine which animals were present at the site and whether there were sufficient of any particular species for experimental work. Many observations were made but there were few species in high abundance, apart from hermit crabs, which are probably too active and therefore difficult to catch to be used as useful experimental organisms. Video footage of the observations were collected for ecological highlights data.
ROV video transect survey was started at 10:35 and 8 transects were completed before lunch at 1230. The navigation for the transects was by means of reversing out to the start points keeping the BOP in sight on the sonar. The 100m limit of the sonar meant that transects were typically about 90 m in

length. The ROV team were extremely proficient and had no problems with the navigation, flying and recording tasks needed to complete good quantitative visual surveys. "Real-time" observations of the surveys suggested that complete cuttings areas were relatively obvious whereas intermediate were less clear on first viewing and require additional analysis of the video data. "Complete coverage" of the seabed certainly extended less than the extent of the 100m transects.
After lunch the marker buoys were examined. There were not actually the cones that had been sent out to the rig but were some marker buoys that had been made on board. Using the diagrams left by the previous ROV crew it was simple to locate the markers and interpret depth of sediment
Once the marker buoys had been checked we brought the ROV on deck to fit the stills camera. This was done in the afternoon and I also checked through the pre-drill video survey carried out by the ROV team. The quality of the data was poor and the low light camera had been used meaning that the brightness of the ROV lights made it impossible to distinguish anything on the seabed. It also looked like the survey had been carried out after drilling as there was evidence of drill cuttings.

Sunday 23rd August 2009 - During the morning the swell was well over the 3m significant wave height limit for the diving with the ROV. I spent the morning preparing a frame to mount the current meter in. This was constructed from one of the remaining traffic cones and weighted with additional dive weights. A small baited trap designed for amphipod collection was mounted on the base of the cone. I successfully tested the current meter in the workshop.
Charlie coordinated the fitting of the stills camera during the poor weather. This proved challenging because despite the camera working on testing in the workshop it was not communicating when attached to the ROV. The error message "camera failed to initialize" was shown on the GUI, however the problem was later resolved and the camera was working when attached to the ROV on deck.
I spent the late afternoon in the ROV control room preparing the previous days video footage for copying onto DVD. There was a safety meeting at 1900 in the galley.

Monday 24th August 2009 - Start shift 0630, I went out to the ROV and set the current meter to record at 5 minute intervals for 48 hours from 0845. The time difference between current meter and wrist watch was noted. The CTD datalogger was synchronized with my PC and started logging at 0830. The CTD was mounted inside the back of the ROV to protect it from physical damage. The current meter was held in the 5 function manipulator arm and secured with weakened cable ties to prevent damage during launching. The fish trap was alsodeployed, baited with previously frozen herring.
ROV off deck 0850, at seabed 0857. The monkey fist from the fish trap had become tangled in the ROV frame, presumably by being drawn in towards the thrusters. The current meter was deployed and the vehicle was brought back to on deck to recover the situation. The problem was easily fixed. ROV off deck 09:22, ROV off deck 09:33. The baited traps were placed on the seabed close to a marker buoy and the current meter taken to a location 60 due north of the BOP and put in place. On return to the marker buoy to pick up the baited trap large *Cancer pagurus* (edible crabs) had arrived at the bait. The baits were in place next to the current meter by 0942. The bait was monitored with the ROV camera until 1430 at which time it was necessary to recover the ROV to investigate a fault with the pan and tilt unit. In this time several species had visited the bait, notably *Molva molva* (ling) and several *Cancer pagurus*. First arrival times and species identifications were recorded for all visits to the bait. ROV team were required to carry out an additional operation which was likely to take place that evening so we took the opportunity for an additional dive. ROV off deck 1717, at depth 1725. Back at the baits 1749 to record further observations. Back inside by 2000 after the deployment of the Expro Cat system was abandoned because of concerns by the crane operator.

Tuesday 25th August 2009 - Out to ROV 0645. Downloaded the stills images from the previous day and started preparing the CTD for deployment. At the morning meeting, 0730 we were informed that there had been a problem operationally. All non-essential personnel were required to stay inside all day. I spent the day working on the CTD data from the previous dives.

Wednesday 26th August 2009 - ROV off deck 0830, at seabed 0841. All is back on track with operations after the problems of the previous day and it is OK to start working with the ROV again.

A second bait was taken out to the trap, which was difficult to locate because the current was taking us off course. During transit there were some good opportunities to collect photographic data including flatfish and anemones. The ROV team had to spend some time carrying out the Expo job from 1030 so I observed this.

A monkfish was observed at 1330 and the manipulator arm used to estimate its size. The current meter was recovered at 1400 along with the amphipod trap. The amphipod trap had very few specimens in, only a small number of isopods, no amphipods.

ROV launched again at 1645 to deploy experimental chambers, on transit to the sampling location an unknown fish was observed, 3 of them were seen by marker buoy 7, 15m from the BOP. We watched the fish for approximately an hour recording video footage and attempting to get good photographs of with the stills camera which required manoeuvring the ROV to gain profile images of the fish without disturbing them. Some good piloting skills ensured some good footage and pictures of the fish were obtained. During launch and recovery on this dive the ROV was taken to and from the seabed at half speed to investigate a lag in the temperature and oxygen profiles apparent in the data from the CTD.

Thursday 27th August 2009 - Out to ROV 0630. Team are still trying to sort out the zoom on the stills camera because it was crashing when using the zoom function. The weather is predicted to come up over night but the ROV supervisor thinks that it will be OK for diving for the rest of the day. The chambers previously deployed were moved. Initially I attempted to use the holothurian (sea cucumber) *Stichopus* tremulus as an experimental subject for investigating the effects of sedimentation disturbance on the megafauna but unfortunately we were unable to find enough specimens. I decided to us *Porania pulvillus*, a species of sea star that had been observed in higher numbers. Some specimens were collected and used for experimental work. Again there were not very many specimens to be found but an experiment was carried out. This involved the simulation of a sediment disturbance event, similar to the effect of the deposition of cuttings during drilling. The experiment was successfully completed by 1800 and the specimens were recovered and various tissue samples were taken to assess stress responses. The tissues were preserved in formalin, RNA later or by freezing in the galley freezer, depending on the procedural requirements for subsequent analysis of the tissue.

Friday 28th August 2009

Return on chopper to Aberdeen and then onward travel to Southampton, samples returned to NOCS before travelling home.

SAMPLES:

A number of difference types of sample were collected at Lancaster. Individual video surveys were classed as samples and the DVD footage is stored at NOCS in the SERPENT archive. Eight video transect surveys were completed and the eight marker buoys were examined during the visit. Additional video data are being processed for inclusion in the SERPENT archive database of species observations and are not included in this list. Data from the SERPENT sensors were also collected and listed here. Smaples from the experimental work are shown below and have been preserved, awaiting analysis in the DEEPSEAS labs at NOCS.

CODE STRUCTURE:

BD/250809/001#1
Byford Dolphin / Date / ROV SERPENT dive log # replicate

Sample reference	Location	Sample type	Details
BD/220809/001	90m at 315^0 from BOP	Video transect	DVD (10:34:22)
BD/220809/002	88m at 000^0 from BOP	Video transect	DVD (10:50:19)
BD/220809/003	95m at 45^0 from BOP	Video transect	DVD (11:03:30)
BD/220809/004	90m at 90^0 from BOP	Video transect	DVD (11:15:44)
BD/220809/005	95m at 135^0 from BOP	Video transect	DVD (11:28:25)
BD/220809/006	95m at 180^0 from BOP	Video transect	DVD (11:44:15)
BD/220809/007	90m at 225^0 from BOP	Video transect	DVD (11:58:54)
BD/220809/008	90m at 270^0 from BOP	Video transect	DVD (12:20:45)
BD/280809/009	60m N of BOP	Scavenger trap	Preserved in Formalin
BD/280809/010#1	Experimental station at Marker buoy 7, 15m N of BOP	*Porania* experiment – Biochemistry sample	Frozen
BD/280809/010#2	Experimental station at Marker buoy 7, 15m N of BOP	*Porania* experiment – Molecular sample	Preserved in RNA Later and frozen
BD/280809/010#3	Experimental station at Marker buoy 7, 15m N of BOP	*Porania* experiment – Ecology sample	Preserved in Formalin
BD/280809/011#1	Experimental station at Marker buoy 7, 15m N of BOP	*Porania* control – Biochemistry sample	Frozen
BD/280809/011#2	Experimental station at Marker buoy 7, 15m N of BOP	*Porania* control – Molecular sample	Preserved in RNA Later and frozen
BD/280809/011#3	Experimental station at Marker buoy 7, 15m N of BOP	*Porania* control – Ecology sample	Preserved in Formalin
BD/280809/012#1	Experimental station at Marker buoy 7, 15m N of BOP	*Porania* control – Biochemistry sample	Frozen
BD/280809/012#2	Experimental station at Marker buoy 7, 15m N of BOP	*Porania* control – Molecular sample	Preserved in RNA Later and frozen
BD/280809/012#3	Experimental station at Marker buoy 7, 15m N of BOP	*Porania* control – Ecology sample	Preserved in Formalin
BD/280809/013#1	Experimental station at Marker buoy 7, 15m N of	*Porania* experiment – Biochemistry sample	Frozen

	BOP		
BD/280809/013#2	Experimental station at Marker buoy 7, 15m N of BOP	*Porania* experiment – Molecular sample	Preserved in RNA Later and frozen
BD/280809/013#3	Experimental station at Marker buoy 7, 15m N of BOP	*Porania* experiment – Ecology sample	Preserved in Formalin
BD/220809/014	Water column	CTD data dive 1	.dat file
BD/240809/015	Water column	CTD data dives 2-4	.dat file
BD/240809/016	Water column	CTD data dives 4-6	.dat file
BD/240809/017	Water column	CTD data dive 7	.dat file
BD/220809/018	Marker buoy 7, 15m N of BOP	Visual assessment of marker buoys	DVD (13:32)
BD/220809/019	Marker buoy 1, 6.8m E of BOP	Visual assessment of marker buoys	DVD
BD/220809/020	Marker buoy 3, 7m W of BOP	Visual assessment of marker buoys	DVD (13:39)
BD/220809/021	Marker buoy 5, 14.5m W of BOP	Visual assessment of marker buoys	DVD (13:53:00)
BD/220809/022	Marker buoy 6, 15.7m S of BOP	Visual assessment of marker buoys	DVD
BD/220809/023	Marker buoy 4, 4m S of BOP	Visual assessment of marker buoys	DVD
BD/220809/024	Marker buoy 8, 15m N of BOP	Visual assessment of marker buoys	DVD
BD/220809/025	Marker buoy 2, 7 m E of BOP	Visual assessment of marker buoys	DVD (13:58:30)
BD/280809/026	60m N BOP	Current meter	.dat file

OBSERVATIONS

DISTURBANCE OBSERVATIONS

Eight video transects carried out, each extending to approximately 100 m from the BOP in each of the main headings.
Observations of sediment and notes on classification into Partial, Total coverage and unimpacted seabed are shown in the table below:

Unimpacted sediment. Natural background environment, Motile and sessile megafaunal organisms present	
Partial coverage Areas with clear evidence of drill cuttings but also signs of natural sediment. Some motile and sessile megafauna.	
Total coverage No visual evidence of the natural sea bed; characterised by the complete absence of sessile megafauna but perhaps some motile organisms.	

VERTICAL DRILL CUTTINGS

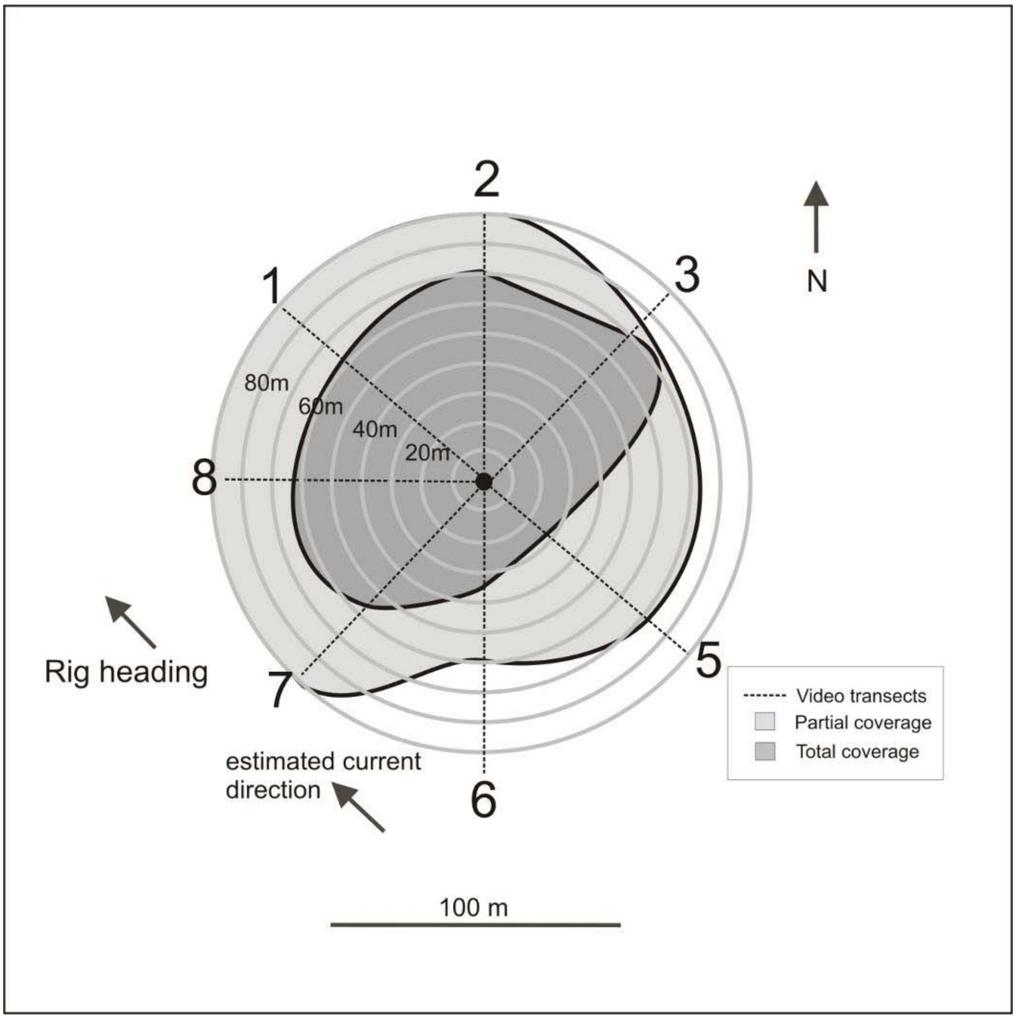
The 8 sediment marker buoys were deployed in 2 rings around the BOP at distance of approximately 7 and 15m in four headings. The depth of cuttings accumulation are shown in the table below:

Marker Buoy	Distance from BOP (m)	Heading	Depth of coverage (mm)
1	6.8	N	400
2	16	E	150
3	7	W	400
4	4	S	600
5	14.5	W	50
6	15.7	S	150
7	15	N	300
8	7	E	50
BOP	<1	All headings	2000

SERPENT
SCIENTIFIC AND ENVIRONMENTAL ROV PARTNERSHIP USING EXISTING INDUSTRIAL TECHNOLOGY

HORIZONTAL EXTENT OF DRILL CUTTINGS

The impact to the sediment was classified into 3 categories,Unimpacted, partial coverage (5-90% coverage) and Full coverage of the seabed. At Lancaster the physical disturbance typically extended beyond 100 m from the BOP in the North and West headings but to the south and east the transects reached unimpacted, natural sediment. Before these data can be properly interpreted it is important to consider the faunal abundances in the area. These data are currently in the analysis stage.



FAUNAL OBSERVATIONS

Species observations made using the colour video camera and the digital stills camera at Lancaster are recorded in the table below.

Date	Time	Observation	Photo/video grab
22.08.09	1146	BOP and cuttings mound	
22.08.09	0920	Hermit crab 30m from BOP	
22.08.09	0924	Flatfish – Megrim?	
22.08.09	0928	Ascidian - Sea squirt	
22.08.09	0925	Sabellid polychaete	

22.08.09	0929	Squat lobster	
22.08.09	0931	Unknown cnidarians	
22.08.09	0931	Serpulid polychaete	
22.08.09	0934	Indeterminate anemone	
22.08.09	0934	Asteroid (Seastar)	
22.08.09	0946	Squat lobster	

22.08.09	0939	Sponge	
22.08.09	0948	Anemone	
22.08.09	0949	Small gadoid fish	
22.08.09	0950	Octopus – *Eledone cirrhosa*	
22.08.09	0959	Flatfish	
22.08.09	1001	Monkfish	

22.08.09	1406	Seastar – *Porania pulvillus*	
22.08.09	14:15	Cuttlefish – *Sepiola atlantica?*	
22.08.09	1417	Indeterminate fish, likely a goby e.g. *Pomatoschistus* sp.	
22.08.09	1432	Edible crab – *Cancer pagurus*	
22.08.09	1454	Indeterminate ophiuroid	
22.08.09	1006	Goosefoot seastar – *Anseropoda placenta*	

22.08.09	1006	Norway redfish – *Helicolenus dactylopterus*	
22.08.09	1459	Common seastar – *Asterias rubens*	
22.08.09	1500	Unknown hydroid	
24.08.09	1020	European Ling (*Molva molva*)	
26.08.09	1755	Boarfish feeding on epifauna from marker buoy	

MISSION 77

NOBLE JIM THOMPSON, MISSISSIPPI CANYON 765, GULF OF MEXICO

MARK BENFIELD

1. GENERAL INFORMATION:

Client: Shell
Rig Operator: Noble
Rig Name: Noble Jim Thompson
Rig Location: Mississippi Canyon 765
Rig Position: 28° 7‘ 5“ N, 89° 7‘ 55“ W
Seabed Depth: 3545 ft (1080.5 m)
Seabed Temperature: 40.3° F (4.6°C)
ROV Operator: Oceaneering
ROV: Millennium 12
TIME ZONE: GMT -6

ROV Team:

Shift 1	Alternate Crew
Frank Coppock (Supervisor)	Brian Mickolashek (Superintendent)
Dale Morris	Ed Miller (MT)
Ron Hodgins	Jonathan McGriff (ET)

Drilling Forman: James Coston
HSE: Steve Hataway
Rig Clerk: Danny Derouen
ROV Telephone Number: 504 – 728 – 0729
RIG Telephone Number: 504 – 728 - 0734
Gulf SERPENT Personnel: Mark Benfield (LSU)

2. GEAR

ROV Type: Millennium Plus (150 Hp)
ROV Camera: Kongsberg Color Video
SONAR: Simrad Mesotech MS 900
DVD Recording Deck: Panasonic DMR-T6070, Panasonic DMR-EH50 DVD –R,+R

3. VISIT NARRATIVE

3.1 Background

This is the second visit to a Shell facility in the Gulf of Mexico. We plan to extend GULF SERPENT operations to five Shell deepwater facilities by the end of 2009. The Noble Jim Thompson is located in Mississippi Canyon, a region which prior SERPENT observations suggest is a very biologically-diverse area.

Saturday 09/05/09

I drove from Baton Rouge to the Boothville PHI heliport and arrived at 04:30. It turned out that my flight didn't leave until 9:30. I was fortunate to meet several Oceaneering employees who were going to the Mars TLP to service the ROV. I discussed SERPENT with them and they gave me some contact info at Oceaneering (Doug Daigle) in the event that we extend SERPENT to that facility.

Upon arrival I was met by Steve Hataway (Shell HSE) who briefed me on the safety procedures at the rig. I met the ROV team in the galley, had lunch, and then we moved to the control van. The ROV was in the water at 11:57. Our plan was to dive to the bottom, take a look at the seafloor and then begin some surveys through the water column. We set the DVD recorder to XP (1h/DVD).

The bottom was populated largely by shrimp and rattails. We also saw a large cloud of sediment that was kicked up by something big. I stopped recording at 12:58 due to poor visibility while we maneuvered back to the cage. At 13:13 we began our survey at 3000'. Few targets but saw a large siphonophore (*Apolemia*), a sergestiid shrimp, and a chaetognath. Transect distance outbound was over 450'.

Ascended to 2500' and began a survey at 14:05. Saw two larvaceans initially but nothing else except one salp close to the cage. Transect distance was 350'. Latched to cage at 14:33. Ascending to 2000'.

At 2000' we saw a lot of large marine aggregates ('sea snot'), which had some very symmetrical circular, funnel shapes, larvaceans, some small medusae, and two siphonophores. Started DVD 2 at 14:48 but it may not have been recording for the first few minutes. Our outbound transect distance was 300'. Back at the cage at 15:16. Stopped recording. Next transect at 1500'.

At 1500' we observed several ctenophores, the dinnerplate jellyfish *Solmissus*, and a calycophoran siphonophore. We had difficulty closing in these targets as the current was carrying them towards the vehicle. Most observations were brief.

Sunday 09/06/09

This morning's dive began with a riser inspection and shooting the bullseyes on the BOP. The ROV was deployed at 07:20. Finished shooting bullseyes at 08:10. Saw some benthic fish and a nice ctenophore between 08:10 and 08:22. Returned to cage and ascended to 1400' for a survey. Reached 1400 feet at 08:54. We conducted surveys at 1400, 1200 and 600 feet. Few targets were seen other than a few larvaceans, a ctenophore and a small siphonophore. I'm surprised that this water column appears to have so few larger planktonic organisms.

We stopped for the afternoon and planned to continue with a night dive near the surface. Based on the ADCP backscatter intensity plot (Fig. 1), we will investigate the animals at 500, 450, 400, and 350 feet.

During the afternoon I finished processing the video tapes and extracting thumbnail images. I also put together a survey update for the Mil12 ROV crew, particularly the guys on the other shift. That summary is included in Appendix A.

After dinner Dale and Ron did a pre-dive on the ROV and the ROV was deployed at 09:38. We descended to 500 feet and did a survey. There were amphipods and a lot of small plankton but very few obvious targets. Interestingly, there were several large aggregates that we typically only see down deep. It would be useful to know what forms them. We did another survey at 400 and again, saw very little. I decided to try a little deeper and we went down to 1000 feet. Right after arriving we saw a squid flash by. Hyperiid amphipods were common. We also saw a large ctenophore, which looked like *Thalassocalyce* but it floated by rapidly it was hard to tell. Near the cage there was a large physonect siphonophore that we recorded very nice footage of. After this we did a survey at 750 but there were few targets other than a small siphonophore and a larvacean. The dive ended at 23:35.

4. SAMPLES

Collection of physical samples is not normally part of the Gulf SERPENT Project. Our data consist of primarily of video observations and other measured data.

Table I. Water Temperature Profile on 09/05/09

Depth (feet)	Temperature (°F)
98	86.1
585	57.7
1000	50.4
1500	47.4
2000	44.2
2500	42.2
3000	41.0
3545	40.3

Table II. Current profile from National Data Buoy Center, MMS ADCP database collected at 09/06/09 04:03 CDT.

Depth (ft)	**Direction (°)**	**Velocity (kts)**	**Depth (ft)**	**Direction (°)**	**Velocity (kts)**
207.0	257	0.64	1991.8	236	0.18
259.5	257	0.50	2044.3	251	0.19
312.0	249	0.53	2096.8	223	0.18
364.5	247	0.38	2149.3	232	0.15
417.0	237	0.28	2201.7	237	0.18
469.5	256	0.30	2254.2	216	0.16
522.0	246	0.33	2306.7	231	0.14
574.5	233	0.29	2359.2	211	0.13
627.0	221	0.30	2411.7	214	0.13
679.5	212	0.28	2464.2	222	0.12
731.9	216	0.32	2516.7	221	0.13
784.4	230	0.32	2569.2	254	0.10
836.9	228	0.33	2621.7	233	0.13
889.4	237	0.31	2674.2	230	0.12
941.9	218	0.25	2726.7	219	0.14
994.4	203	0.19	2779.2	239	0.16
1046.9	220	0.24	2831.7	226	0.15
1099.4	227	0.16	2884.2	213	0.11
1151.9	253	0.14	2936.6	223	0.07
1204.4	253	0.11	2989.1	192	0.13
1256.9	255	0.10	3041.6	211	0.08
1309.4	250	0.13	3094.1	196	0.06
1361.9	245	0.07	3146.6	261	0.06
1414.4	202	0.01	3199.1	220	0.06
1466.8	259	0.06	3251.6	249	0.05
1519.3	262	0.08	3304.1	138	0.09
1571.8	270	0.06	3356.6	194	0.17
1624.3	271	0.08	3409.1	274	0.18
1676.8	261	0.06	3461.6	240	0.07
1729.3	277	0.12	3566.6	183	0.40
1781.8	258	0.12			
1834.3	245	0.14			
1886.8	241	0.16			
1939.3	250	0.17			

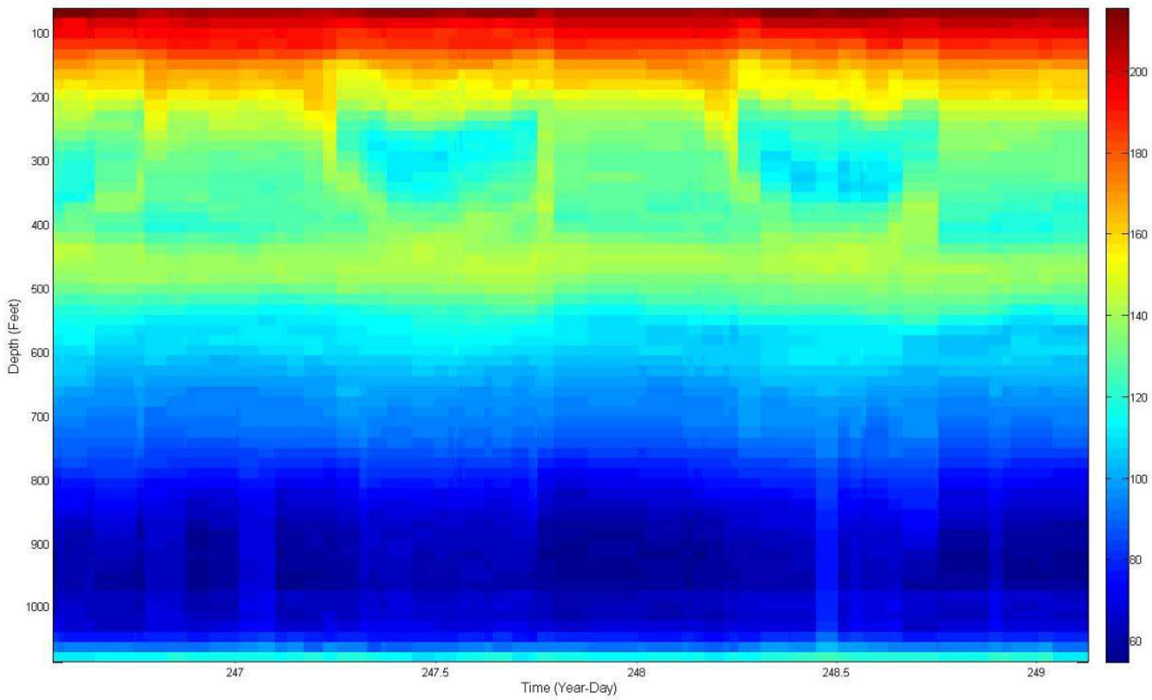


Figure 1. ADCP backscatter intensity (RSSI) beneath the Noble Jim Thompson from Sep 3 – 6, 2009. The pattern indicates that a layer persists during the day and night between 400 – 500 feet. At night organisms are concentrated in the upper 200 feet. Another deeper layer appears to begin at 1050 feet.

5. GEAR REPORT

ROV: All systems on the ROV were functioning properly and the surveys were conducted without any problems.

6. FAUNAL OBSERVATIONS

Dive 09/05/09. DVD Label: Noble Jim Thompson 09/05/09 Disk # of 3.

Date	Time (local)	Depth (ft)	Observation	Video Still Image	Video File Location
09/05/09	12:40	3547	Rattail		Disk 1 VTS_01_1.mpg
	12:41	3547	Rattail		Disk 1 VTS_01_1.mpg
	12:44	3549	Rattail		Disk 1 VTS_01_1.mpg
	12:46	3549	Crab (*Chaceon*)		Disk 1 VTS_01_1.mpg
	12:49	3549	Rattail	No still image taken	Disk 1

					VTS_01_1.mpg
	12:52	3549	Shrimp	No still image taken	Disk 1 VTS_01_1.mpg
	13:33	3015	Chaetognath		Disk 1 VTS_02_2.mpg
	13:41	2984	Physonect siphonophore (*Apolemia*)		Disk 1 VTS_03_1.mpg
	13:45	3003	Shrimp	No still image taken	Disk 1 VTS_03_1.mpg
	14:09	2492	Larvacean		Disk 1 VTS_06_1.mpg
	14:10	2492	Larvacean		Disk 1 VTS_06_1.mpg

	14:43	1991	Jellyfish		Disk 1 VTS_08_1.mpg
	14:45	1991	Chaetognath		Disk 1 VTS_08_1.mpg
	15:13	1501	Calycophoran siphonophore	No still image taken	Disk 2 VTS_01_1.mpg
	15:13	1503	Large marine aggregate		Disk 2 VTS_01_1.mpg
	15:13	2008	Physonect siphonophore		Disk 2 VTS_01_2.mpg
	15:26	1496	Unidentified ctenophore	No still image taken	Disk 2 VTS_02_1.mpg

	15:31	1483	Unidentified siphonophore (detached nectosome?)		Disk 2 VTS_02_1.mpg
	15:36	1401	Jellyfish (*Solmissus*)		Disk 2 VTS_02_1.mpg
	15:42	1479	Chaetognath		Disk 2 VTS_02_1.mpg
	16:16	994	Chaetognath		Disk 3 VTS_01_1.mpg

Dive 09/06/09 Morning. DVD Label: Noble Jim Thompson 09/06/09 Day Disk 1 of 1.

Date	Time (local)	Depth (ft)	Observation	Video Still Image	Video File Location
09/06/09	08:17	3544	Unidentified fish		Disk 1 VTS_01_1.mpg
	08:20	3548	Unidentified fish		Disk 1 VTS_01_1.mpg
	08:21	3540	Unidentified lobate ctenophore		Disk 1 VTS_01_1.mpg
	09:09	1392	Larvacean		Disk 1 VTS_02_1.mpg

	09:13	1364	Larvacean		Disk 1 VTS_02_2.mpg

Dive 09/06/09 Morning. DVD Label: Noble Jim Thompson 09/06/09 Night Disk 1,2 or 3 of 3.

Date	Time (local)	Depth (ft)	Observation	Video Still Image	Video File Location
09/06/09	21:46	496	Unidentified fish or squid	No still image taken	Disk 2 VTS_01_1.mpg
09/06/09	22:32	1000	Hyperiid amphipod		Disk 2 VTS_01_4.mpg
09/06/09	22:34	988	Hyperiid amphipod		Disk 2 VTS_01_4.mpg

09/06/09	22:38	983	Larvacean and hyperiid amphipod		Disk 2 VTS_01_4.mpg
09/06/09	22:46	990	Hyperiid amphipod		Disk 2 VTS_01_4.mpg
09/06/09	22:43	985	Unidentified		Disk 2 VTS_01_4.mpg
09/06/09	22:43	982	Chaetognath		Disk 2 VTS_01_4.mpg

09/06/09	22:57	986	Physonect siphonophore		Disk 3 VTS 01_1.mpg

9. SHELL LOGISTICAL SUPPORT

We received outstanding support from all personnel while aboard the Noble Jim Thompson. The enthusiastic response from both the ROV team and Drilling were much appreciated. Millennium 12 has a very professional ROV group who were supportive of the SERPENT project. I look forward to a productive relationship with this facility.

<u>Transportation</u>:

Date	Flight	Persons	Flight Time	Aircraft
09/05/09	Boothville Heliport to Noble Jim Thompson	1	0:45	S76
09/07/09	Noble Jim Thompson to Boothville Heliport	1	0:45	S76

<u>Accommodation</u>:

09/05/09	1 person
09/06/09	1 person

<u>Meals</u>:

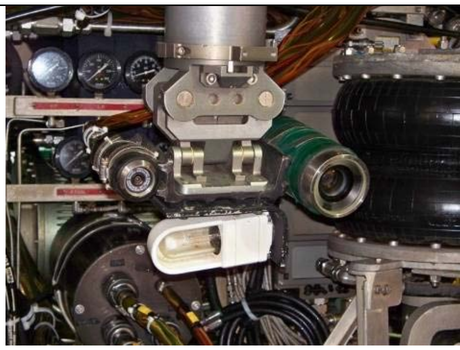
Date	Breakfast	Lunch	Dinner
09/05/09	-	1	1
09/06/09	1	1	1
09/07/09	1	-	-
Total	2	2	2

<u>ROV Time</u>:

09/05/09:	04:46 (11:56 – 16:42)
09/06/09:	01:00 (08:00 – 10:00)
09/06/09:	01:57 (21:38 – 23:35)
Total:	08:03

10. DIGITAL STILL IMAGES


100_1293.JPG
Ron Hodgins working on the ROV


100_1294.JPG
Cameras (b&w on left and color on right) on Millennium 12


100_1295.JPG
Front of Millennium 12


100_1296.JPG
Front of Millennium 12


100_1297.JPG
Dale Morris with Millennium 12


100_1298.JPG
Millennium 12


100_1299.JPG
Millennium 12

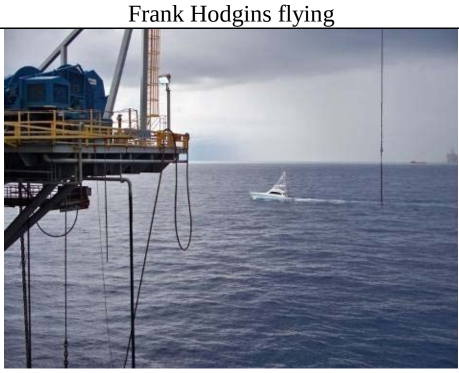

100_1300.JPG
Dawn with MARS platform flaring

100_1306.JPG
Millennium 12


100_1313.JPG
Millennium 12


100_1316.JPG
Frank Hodgins flying


100_1328.JPG
Charter boat fishing for tuna around Noble Jim Thompson


100_1329.JPG
Charter boat fishing for tuna around Noble Jim Thompson


100_1336.JPG
Millennium 12


100_1337.JPG
Frank Coppock next to Millennium 12


100_1338.JPG
Frank Coppock next to Millennium 12

MISSION 78 & 79

STENA CARRON, TORNADO, FAROE-SHETLAND CHANNEL

DANIEL JONES

1. GENERAL INFORMATION:

Client: OMV
Rig operator: Stena
Rig name: Stena Carron
Rig location: Tornado, Faroe-Shetland Channel
Rig position: 60° 33’43.79” N 04° 27’22.95” W (WGS 84)
Seabed depth: 1050 m
Seabed temperature: -0.75°C
ROV operator: Oceaneering
ROV: Magnum x 2 + Small Minimum vehicle
ROV team:

Visit 1:

ROV superintendent	Bruce Montgomery
Supervisor starboard ROV days	Andrew Angus
Pilot starboard ROV days	Daniel Simpson
Tech starboard ROV days	Andrew Waggot
Supervisor port ROV days	Peter Moore
Pilot port ROV days	Cameron Bannochie
Pilot port ROV days	Chris Blackmoore (Canadian)
Supervisor starboard ROV nights	Scott Forrest
Pilot starboard ROV nights	Sam Arrenberg
Pilot starboard ROV nights	Mark O’Shea
Supervisor port ROV nights	Bruce Park
Pilots port ROV nights	Graham Bell
Pilot port ROV nights	Iain Morgan
Other day port supervisor	Lee Alexander
Other day starboard pilot	Steven Watson

Visit 2:

ROV superintendent	Steve Johns
Supervisor starboard ROV days	Scot Robertson
Pilot starboard ROV days	Mike Reid
Pilot starboard ROV days	Steven Watson
Supervisor port ROV nights	Lee Alexander
Pilots port ROV nights	Andy Lawson
Pilot port ROV days	Iain Morgan
Other supervisor starboard ROV days	Andrew Angus

2. GEAR:

Magnum ROV x 2 (Magnum 156 is starboard (minimum 11), Magnum 155 is port)
Small Minimum vehicle (on starboard)
Deep-sea Systems Colour HD video camera (on starboard ROV Deep-sea Systems High Intensity Discharge (HID) lighting
Deep-sea Systems DPC8000 Stills camera
8 x hard-disc array for HD video storage on the starboard ROV)

SERPENT Gear
Box 1
Sent to Rosebank and left on ship
15 x 1 litre sample bottles
Plastic buckets
2 x 2.5 l 37% Formaldehyde solution (MSDS sheets included)
2 x box nitrile gloves
1 x plastic quadrat
Box 2
Sent to Rosebank and left on ship
Hand operated pump
17 x Core sampler tubes
8 x core sampler handles
8 x grey core sampler holders (with black bases & bungs)
2 litre bottle of inert "Luminophore" tracers (coloured sand)
Metal core tube holding frame
Personal protective equipment (glasses gloves)
Core processing equipment (scoop, plunger, plastic rings)
Plastic sample bags
Stationary
1 x core spares kit (washers, bolts, rubber seals)
1 x pack 5 x spare hose clamps
Plastic buckets
1 x wooden core extractor
1 x wash bottle
1 x mesh bag
1x bag epindorph tubes
Box 3
Hand Carried via ASCO
RBR datalogger
Helifreight
8 x marker cones

2 x cool box + icepack
Acetone cleaned foil and metal core extractor

Extra gear visit 2:

5 choice amphipod trap – constructed on the rig
Fluorescein disodium dye
Squeeze plastic bottle for dye deployment

3. NARRATIVE:

Saturday 19th September 2009

Flew out to rig on helicopter from Aberdeen. Arrived on the rig at around 10:00. Ship was still on contract to Chevron. Handover delayed owing to weather.

Sunday 20th September 2009

Found all SERPENT equipment on rig from previous Chevron work. Serviced and prepared this equipment for OMV work.

Monday 21st September 2009

Found cones on helideck. Found cool boxes in AGR container on pipedeck. Marked cones and gave them to the cementer to fill with cement.

Tuesday 22nd September 2009

WOW

Wednesday 23rd September 2009

WOW

Thursday 24th September 2009

Collected epifauna from approximately 20 x 20 cm patch of riser that had been in the splash zone. The bulk of the sample was preserved in formalin and a small sample preserved in RNAlater. The fauna was composed (exclusively - from what I could see without a microscope) of the hydroid *Tubularia indivisa*.

Friday 25th September 2009

We were planning on diving for the survey but this was delayed. I set up the CTD, the time was synced at 08:54:21, the sampling period was 20 seconds. Logging was enabled at 08:58:00. I proceeded with pH calibration, immersing the sensor in pH buffers of known concentration for 3 minutes (taking around 9 readings):

pH	Start time	End time
7	09:11:10	09:14:10
4	09:16:00	09:19:00
7	09:20:00	09:23:00
10	09:24:00	09:28:00

Saturday 26th September 2009

Was woken at 03:00 to start survey. ROV was in the water for SERPENT **Dive 1** at 03:49:00 and it was out of the cage at depth at 04:25. The still camera clock was fast reading 13:36 at real time of 04:35.

Transect	**Orient-ation**	**Distance (m)**	**Time**	**Cover of cobbles and boulders**		**Cover of visible epifauna**	
				Description	**Cover (%)**	**Descripton**	**Cover (%)**
1	**SW**	**0**	**04:40:05**		0		5
1	**SW**	**10**	**04:42:17**		0		1
1	**SW**	**20**	**04:44:02**		5		5
1	**SW**	**30**	**04:46:45**	one cobble	10	alcyonacean	5
1	**SW**	**40**	**04:49:12**		0	asteroid	2
1	**SW**	**50**	**04:51:10**	two cobbles	5	hydroid, sponge, alcyonacean	5
1	**SW**	**60**	**04:55:36**	one cobble	5	crinoid	5
1	**SW**	**70**	**04:56:51**	one large cobble	10	crinoid	5
1	**SW**	**80**	**05:00:11**	cobble, possible boulder	10	crinoid	5
1	**SW**	**90**	**05:02:10**	cobble	5	alcyonacean	5
1	**SW**	**100**	**05:04:42**		0	alcyonacean, hydroid, sabellid	3

Depth was 1050 m. With the transects, it is basically impossible to do everything all at once while the ROV is flying so I have been landing on the seafloor every 10 m, waiting for the sediment to clear (<2mins), recording the information in the spreadsheet and taking the photos. I have been using the HD video screen for recording the information in the spreadsheet as it is the clearest image source. The stills camera viewer is really low res (although the stills are good). I have been recording HD video, standard def video (another camera view – it is a closer view than the HD video) and the digital stills. They are all linked through the time code. They are taking around 25 mins a transect which I think is entirely reasonable and what we predicted.

The seabed is really interesting – we don't often get a chance to see it without any disturbance. There is loads of life, soft corals (*Gersemia* sp.), sea stars (at least 2 species, probably including *Hymenaster pellucidus* which we have not seen with an ROV before), hydroids (*Corymorpha groenlandica* and the large arctic *Tubularia regalis*), crinoids (probably *Poliometra prolixa*) and sponges (several small species) are all common. It is not hugely dense so percentage covers are low, at a guess there is about 1 animal per m2. I have been edging on the side of overestimating percentage cover if I am unsure although clearly I am trying to be as accurate as possible.

Dive 2: The ROV was off deck for Dive 2 at 15:30 and at depth by 16:00. We located the well site at 16:23 and dropped off the two cones that had been deployed in the 5-function manipulator. We went back to the cage at 16:24 and picked up one marker buoy at 16:29 (the other had been lost on deployment as it was quite rough – 5 m seas) and put this on the seabed to mark the well position. We then proceeded to carry out the transects.

Transect	Orient-ation	Distance (m)	Time	Cover of cobbles and boulders		Cover of visible epifauna	
				Description	Cover (%)	Description	Cover (%)
		0	**16:36:59**		0	alcyonacean	3
2	**NE**	**10**	**16:38:39**		0		0
2	**NE**	**20**	**16:40:29**	2 boulders, cobbles	20	chondrocladia, crossaster, hydroid, edwardsid, crinoid, arctic rockling	3
2	**NE**	**30**	**16:43:18**		0	gersemia, commatulid crinoid	2
2	**NE**	**40**	**16:44:59**	2 large cobbles	10	hydroid, alcyonacean	2
2	**NE**	**50**	**16:47:43**	1 boulder, 1 cobble	5	edwardsid, alcyonacean	2
2	**NE**	**60**	**16:51:13**	3 large cobbles	10	4 crinoid, alcyonancean, edwardsid	4
2	**NE**	**70**	**16:54:04**	1 large cobble	5	crinoid, hydroid	2
2	**NE**	**80**	**16:56:17**		0	lycodes	1
2	**NE**	**90**	**16:58:37**	1 large boulder, 1 smaller boulder	15	sponge, alcyonacean	5
2	**NE**	**100**	**17:02:34**		0		0
		0	**17:13:59**		0	alcyonacean, stauromedusa	2
3	**SE**	**10**	**17:16:30**		0	sabellid, alcyonacean	2
3	**SE**	**20**	**17:19:15**	1 large boulder	30	sabellid, porania	5
3	**SE**	**30**	**17:22:24**	1 small cobble	5	crinoids x 9	5
3	**SE**	**40**	**17:25:08**	6 small cobbles	10	crinoid, 11 x arctic rockling	5
3	**SE**	**50**	**17:28:10**	very small cobbles	5	crinoid, colus	5
3	**SE**	**60**	**17:30:34**	1 small boulder	5	crinoid	5
3	**SE**	**70**	**17:32:45**		0		0

3	**SE**	**80**	**17:35:41**	1 small boulder	5	crinoids x 4	5
3	**SE**	**90**	**17:38**	fire alarm - transect cancelled			
3	**SE**	**100**					
		0	**18:41:16**		0	alcyonacean, crinoid	5
3	**SE**	**10**	**18:43:06**	1 cobble	5	crinoid	2
3	**SE**	**20**	**18:45:18**		0	edwardsid	2
3	**SE**	**30**	**18:47:47**	1 cobble	5	crinoid	3
3	**SE**	**40**	**18:49:50**	1 boulder	10	lycodes. Crinoid, sabellid	5
3	**SE**	**50**	**18:51:47**	1 cobble	5	crinoid x 3	3
3	**SE**	**60**	**18:54:22**	1 boulder, 2 cobbles	5	alcyonacean, crinoid	5
3	**SE**	**70**	**18:56:41**		0	alcyonacean, crinoid	3
3	**SE**	**80**	**19:00:04**	cobbles	3	edwardsid, crinoids	4
3	**SE**	**90**	**19:02:35**		0	crinoids	5
3	**SE**	**100**	**19:05:21**	1 cobble	5	crinoids	5
4	**NW**	**0**	**19:21:22**	1 boulder	5	sabellid, crinoid	2
4	**NW**	**10**	**19:23:10**	cobbles	5	edwardsid, colus, alcyonacean	5
4	**NW**	**20**	**19:26:52**	cobbles	5	alcyonacean, asteroid, hydroid	2
4	**NW**	**30**	**19:30:03**	cobble x 2, small boulder	5	alcyonacean, edwardsid, crinoid	5
4	**NW**	**40**	**19:32:20**	small cobbles	4	crinoid	2
4	**NW**	**50**	**19:34:32**	cobble, boulder	5	alcyonacean, crinoid	5
4	**NW**	**60**	**19:38:10**		0	alcyonacean, crinoid	2
4	**NW**	**70**	**19:40:09**		0	alcyonacean	4
4	**NW**	**80**	**19:42:02**	cobble x 2, small boulder	5		0
4	**NW**	**90**	**19:44:37**		0	sabellid	1
4	**NW**	**100**	**19:46:30**	cobble x 1	3	crinoid	3

At 19:55 we moved back to the well location and set out the cones both in a sw direction from the well site, one at 5 m and one (with thick red tape on the handle) at 10 m from the well centre. The direction of the cones was assessed using the navigation system and the ROV compass and the distance from the well measured with the ROV sonar. At 20:05 the cores were in position. In cage at 20:17 and on deck at 20:50.

We set up the cores and the rest of the cones ready to carry out another dive and finish the pre-spud work. The wave height was 6.5 m on average and there were some very large waves coming through, it

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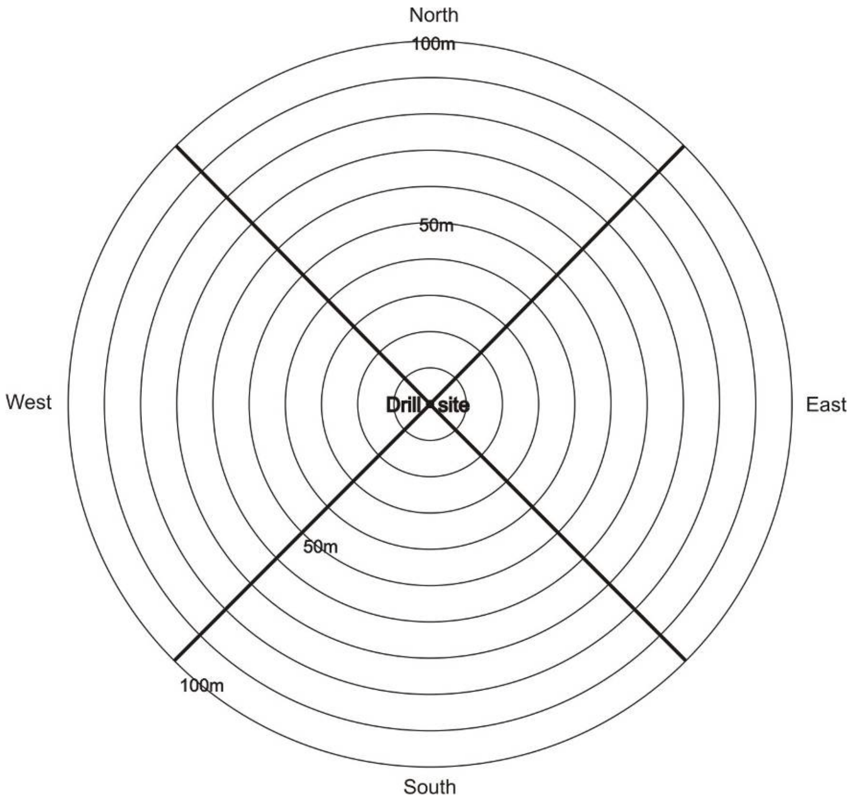
was 55 kn winds too so the dive was abandoned. We stood down at 23:30 as Ronan (junior drilling site manager) informed us they had started drilling the hole.



Sunday 27th September 2009

Dive 3 off deck at 12:45.

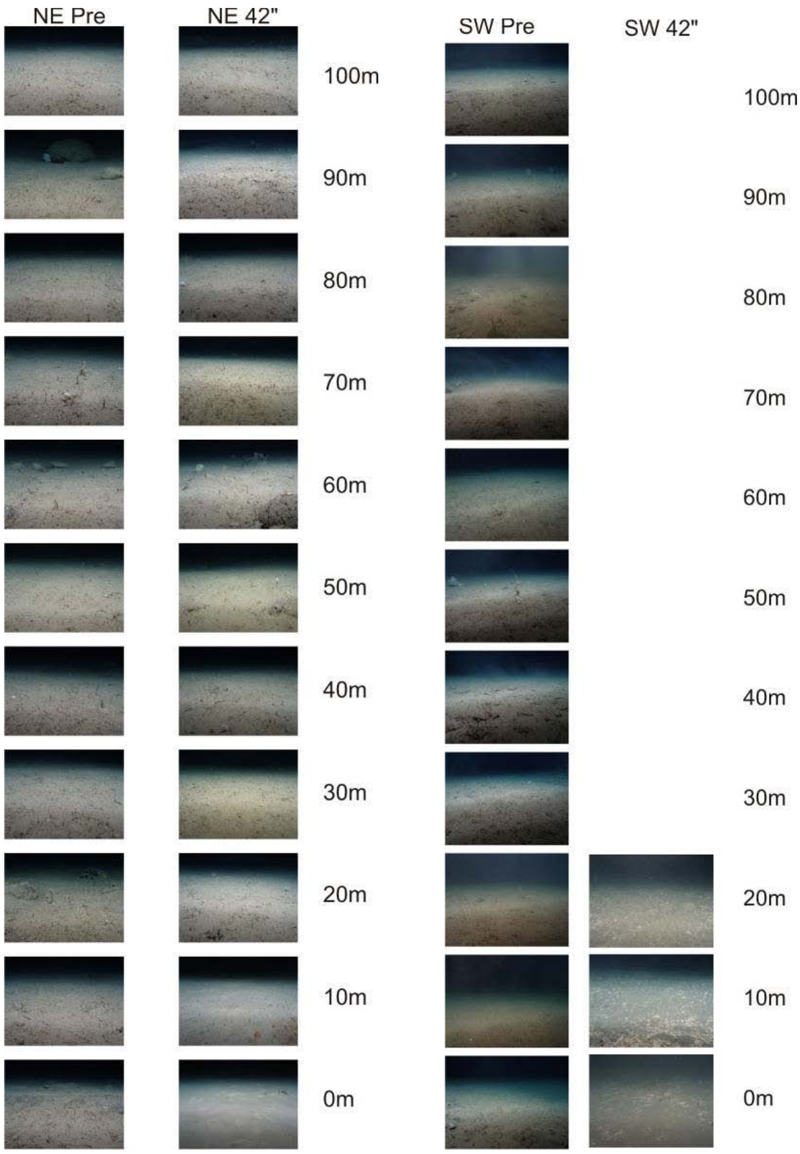
Put cone at 15 m SW from drilling activity

Repeated transects after the 42" hole had been drilled.

Transect	Orient-ation	Distance (m)	Time	Cover of cobbles and boulders		Cover of visible epifauna	
				Description	Cover (%)	Description	Cover (%)
1	**SW**	**0**	**15:54:00**	cuttings			
1	**SW**	**10**	**15:55:27**	more cuttings			
1	**SW**	**20**	**16:05:59**	more cuttings			
1	**SW**	**30**	**16:14:00**	transect abandoned			
1	**SW**	**40**					
1	**SW**	**50**					
1	**SW**	**60**					
1	**SW**	**70**					
1	**SW**	**80**					
1	**SW**	**90**					
1	**SW**	**100**					

		0	**15:19:07**				
2	**NE**	**10**	**15:21:24**			edwardsid, hydroid in background	
2	**NE**	**20**	**15:24:46**			crinoid back right	
2	**NE**	**30**	**15:26:49**			little in foreground line ef crinoids in background	
2	**NE**	**40**	**15:28:41**			alcyonacean back left	
2	**NE**	**50**	**15:30:18**			stauromedusa in foreground	
2	**NE**	**60**	**15:33:26**	note chondrocladia not on transect		boulder right hand side	
2	**NE**	**70**	**15:35:53**			crinoid back centre	
2	**NE**	**80**	**15:37:27**			crinoid back left	
2	**NE**	**90**	**15:39:30**			alcyonacean mid back, hydroid left back	
2	**NE**	**100**	**15:41:31**			boulder back left	

Once abandoned transect we picked up the clump weight (we left 4 cones in a pile on the seafloor) and returned the ROV to the cage at 16:42. Before bringing back to surface.



Monday 28th September 2009

The cement job was completed last night, all the cones were completely covered in cement (including 15 m cone) and even the sonar buoy was covered (around 2 m tall).

Tuesday 29th September 2009

On standby

Wednesday 30th September 2009

On standby for the day shift waiting for the 17.5' cement job to happen, there was to be an opportunity for SERPENT work after the cement had been pumped, jetted by the port ROV (to clear the bullseye) and was setting.

The opportunity eventually arose at 22:50 where the ROV was taken out of the cage (it was already at depth) at 22:50 for Dive 4. We arrived at the seabed at 22:55.

Started with seabed photographic and video transects.

Transect	Orient-ation	Distance (m)	Time	Cover of cobbles and boulders		Cover of visible epifauna	
				Description	Cover (%)	Description	Cover (%)
1	SW	0	23:50:31	complete cover of cement			
1	SW	10	23:51:20	complete cover of cement			
1	SW	20	00:03:35	complete cover of cement			
1	SW	30		abandoned as sedimentation too high			
1	SW	40					
1	SW	50					
1	SW	60					
1	SW	70					
1	SW	80					
1	SW	90					
1	SW	100	00:19:00	at 100m and no cuttings			
		0	23:06:41	complete cover of cement			
2	NE	10	23:13:23	very white cement			
2	NE	20	23:15:45			anemone on cement	
2	NE	30	23:17:59			chondrocladia on left	
2	NE	40	23:20:10			patch on seabed of hydroids	
2	NE	50	23:22:36				
2	NE	60	23:23:33			alcyonacean left and right	
2	NE	70	23:26:08			crinoid mid left and alcyonancean centre	
2	NE	80	23:28:07			alcyonaceans back left	
2	NE	90	23:30:25			boulder with life in centre	
2	NE	100	23:33:08			relatively barren	

1	**SW**	**100**	**00:39:24**	started recording prematurely black frame marks start of the transect properly		sabellid	
1	**SW**	**90**	**00:42:20**			chondrocladia back right	
1	**SW**	**80**	**00:44:49**			possible alcyonacean just right of centre	
1	**SW**	**70**	**00:47:33**	cuttings full			
1	**SW**	**60**	**00:49:59**	cuttings full		chondrocladia	
1	**SW**	**50**	**00:52:35**	full cuttings			
1	**SW**	**40**	**00:54:49**	full cuttings			
1	**SW**	**30**	**00:57:04**	full cuttings with ridge down centre			
1	**SW**	**20**	**00:59:59**				
1	**SW**	**10**	**01:01:45**	full cuttings on edge of mound			
1	**SW**	**0**	**01:04:17**	at well			
		0	**01:15:10**	at well			
3	**SE**	**10**	**01:16:34**	ripples			
3	**SE**	**20**	**01:21:47**	ripples and 2 photos before completely sediment out one is this site			
3	**SE**	**30**	**01:24:33**			colossendeis	
3	**SE**	**40**	**01:26:47**	very loose sediment			
3	**SE**	**50**	**01:29:40**	boulder in background		hydroid	
3	**SE**	**60**	**01:31:52**			crinoids	
3	**SE**	**70**	**01:34:18**	strange brown mixed sediment		tubularia on boulder on right	
3	**SE**	**80**	**01:36:29**	triangular boulder			
3	**SE**	**90**	**01:38:34**	picture with black spot in centre is start			
3	**SE**	**100**	**01:44:21**			crinoid at mid left	
4	**NW**	**0**	**02:05:50**	in cement crater next to well			
4	**NW**	**10**	**02:08:30**	full cuttings			
4	**NW**	**20**	**02:10:20**	cloudy			
4	**NW**	**30**	**02:21:57**	normal seabed			
4	**NW**	**40**	**02:25:47**	2 pics second has crinoid in			
4	**NW**	**50**	**02:26:55**	2 pics second is			

				cloudy			
4	**NW**	**60**	**02:27:36**	2 pics second has crinoid in			
4	**NW**	**70**	**02:29:33**				
4	**NW**	**80**	**02:31:39**	rockling community by rock			
4	**NW**	**90**	**02:32:41**	2 pics			
4	**NW**	**100**	**02:34:09**	2 pics			

On the SW transect still partial cuttings at 150m, not surveyed onwards. Full cuttings start at 120m out from well centre.

Thursday 1st October

Packed up gear and left in a red half sized container number 7334 on the starboard back deck near the stb ROV. Inside the container were: SERPENT aluminium box 1: containing formaldehyde, core rack, 6 complete cores, preserved specimens from this and the Rosebank trip. SERPENT aluminium box 2: containing core spares, all other SERPENT equipment, the foil and equipment from ERT. There is a cardboard box which contained the imploded pressure test sphere. There is a plastic peli case with the datalogger (with KCl solution and lithium batteries x4 but with no pH buffers) There is an ERT cool box and a bottle rack for freezing the cores. In the freezer for the galley there is an ERT cool box empty except for icepacks.

Friday 2nd October

Left the Stena Carron at around 09:00 on EC225 helicopter to Bristows, Aberdeen.

VISIT 2

Friday 16th October

Arrived at the Stena Carron at around 09:30. Spent the morning with inductions and distributing MSDS sheets. I built an advanced amphipod trap with five choices of bait (light, seaweed (Porphyra tenera), control (no bait), mackerel and crab) within 2 litre water bottle traps. We were planning to deploy the traps today but a supply vessel was alongside preventing ROV operations.

Saturday 17th October

Attached the data logger to the ROV. It was started at 06:09 and, logging every 10 seconds, was set to finish on 19th October (Monday) at 17:30. We attached the baited trap and started on:

Dive 1: Left the deck at 07:15. Out of cage at 07:39.We deployed the 5 choice amphipod trap at 07:48. It was deployed next to the Fugro ADCP current meter (approx 100m south of the BOP). The current meter was located but was found to be on its side, it was righted at 07:50:59. After this the BOP survey was completed. On the way back to the cage we attempted to sample a comatulid crinoid directly with the manipulator arm – this was not successful, the arms were extremely brittle. At 8:41 the ROV was in the cage and being brought back up.

The baited trap presented five choices. From the top these were (in order): 1) a glowstick (Divex lightstick green cyalume), 2) seaweed (*Porphyra tenera*), 3) control, 4) mackerel (tinned in brine), 5)

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crab (John West white crab tinned in brine). The traps were space 200 mm apart on a steel beam. Each trap had a 400 x 50 mm strip of pure cotton cloth to retain the bait, the light and control traps also contained cotton.

Dive 2: The ROV was off deck at 10:32 for Dive 2. We had fitted the coring equipment to the 5 function manipulator. The ROV had a problem coming out of the cage as the tether was allowed to go slack and a loop developed that got stuck in the cage. We made it to the seabed at 11:23.

Time	Distance from BOP, m	Bearing from BOP, °	Activity
11:37	100	45	Collect core 1
11:39	100	45	Collect core 2 with comatulid crinoid
11:50	100	315	Collect core 3
12:19	100	225	Collect core 4 (this is the downstream direction and cuttings were covering the seafloor). It was extremely difficult to get a core here owing to the fine cuttings cover. The only way we could get this was pushing the core deeper into the sediment loosing some of the very surface material.
12:37	100	135	Collect core 5
12:47	100+	135	Collect core 6 with *Hymenaster* seastar

On deck the cores were retrieved and the sediment frozen. The animals were processed with the addition of two ‘bonus’ ophiuroids collected by mistake.

The rest of the day was spent constructing experimental chambers.

Sunday 18th October

Attached experimental chambers and single core to the ROV.

Dive 3: ROV off deck 08:10. We deployed the bucket chambers close to the current meter at 08:43. The chambers (plastic buckets) were deployed on the ROV using a stiffened rope attached from the base of the 7-function arm to a stiffened loop held by the 5-function arm, this produced a ‘washing line’ to which all the buckets hung from. After deploying the buckets they carried out some BOP checks. Once this was done we went back to the chambers. We attempted to use the starfish Crossaster for the experiments, while we could have probably found enough it was not possible to scrape these off the rocks they inhabit with the ROV without causing bodily damage and probable high levels of stress. Instead we focussed on the soft coral Gersemia which was extremely abundant and attached to rocks which could be picked up easily without damaging the animal. The rocks could then be transferred into the chambers with minimal disturbance to the animal.

Time	Activity
10:31:15	Located soft coral #1 and picked up
	Put in C1 – it was not clear that this animal went in the bucket (it curled up on the transit – this was the only specimen that did this)

10:47:33	Collected soft coral #2
10:51:15	Put in D3
11:04:55	Collected soft coral #3
11:08:25	Put in C3
11:16:38	Collected soft coral #4
11:20:23	Put in D1
11:26:47	Collected soft coral #5
11:29:03	Put in D2
11:40	Collected soft coral #6
11:44	Put in C1 – in case the other one didn't get in
11:53:36	Collected soft coral #7
11:58:11	Put in C2
12:10	Amphipod trap retrieved after being on the seabed around 29 hours
12:45	ROV on deck

The amphipod trap was recovered and the contents proved interesting. The mackerel trap had the most amphipods by far. All traps contained some amphipods. The light trap had an amphipod with very large irregular eyes. The crab trap had a buccinid gastropod (possibly *Colus*) but not many amphipods. The gastropod was preserved with the amphipods in formalin, two tissue samples were preserved separately one in RNAlater and the other just frozen. The control trap had amphipods of several different species. The seaweed didn't have many amphipods although a few were observed.

After the amphipods were preserved I downloaded the CTD, changed the batteries and started logging at 14:30 approx (end of logging 20 Oct 23:59; sampling interval 10 seconds).

We attached the CTD logger to the 5-function arm with the optode attached to the jaw. A squeezy bottle of fluorescein dye was attached in the jaws of the 7-function.

Dive 4: Off deck at 15:30. At depth and out of cage at 16:00. The time of the HD video, the standard def video and the logger were all different. The logger was ahead in time, the SD video was 1:15 behind the logger time and the HD video was 2:00 behind logger time.

Time	Time source	Logger time (within 5 seconds)	Activity
16:20:07	SD	16:21:22	1st squeeze of bottle (dye release)
16:21:54	SD	16:23:09	Squeeze 2
16:23:08	HD	16:25:08	Squeeze 3
16:25:30	HD	16:27:30	No more dye
16:33:48	SD	16:35:03	Optode by sponge
16:37:38	SD	16:38:53	Move
16:37:56	HD	16:39:56	Further in sponge
16:42:50	HD	16:44:50	Pushed further in
16:46:00	HD	16:48:00	Move
16:46:55	HD	16:48:55	New position
16:51:00	HD	16:53:00	Move away

Bring ROV up to surface.

Monday 19th October

Attached corers to ROV in the morning. It was crew change day so Scot Robertson was off and Andrew Angus was on. For this reason the morning was not available for ROV work.

Dive 5: At 12:55 the ROV was lifted off deck and launched. It was on the seabed at 13:20. We went straight to the chambers and filled up the disturbed experimental chambers.

Time	Activity
13:33:18	Filled D2 with a core tube full of surficial (top 5cm) sediment
13:40:50	Filled D1 with a core tube full of surficial (top 5cm) sediment
13:42:16	Filled D3 with a core tube full of surficial (top 5cm) sediment

After working at the chamber site we went in the northern sector to try and find some interesting organisms for taxonomic evaluation.

Time	Activity
14:04	Found octopus (probably *Benthoctopus* as has two rows of suckers but female so not definitative)
14:20	Found large hydroid (possibly *Branchocerianthus*), tried to obtain a sample but the core broke. We managed to retrieve the plastic tube with most of the animal inside. Core 1
	2 x *Henricia* (purple coloured) were observed not together.
	Large Poranid starfish observed. We tried to collect but the star was bigger than the core tube, we only successfully obtained one arm. Core 2
	White star seen on seabed, attempted to core unsuccessfully.
	Red starfish seen partially buried, we uncovered it with the ROV jetter, took some pictures and successfully cored (although lost arms). Core 3
	Large hydroid seen and cored, we could not get the entire body so just captured the head region. Core 4.
16:20	*Pteraster miliaris*? Seen with young. Captured core 5.

The ROV was brought up at 16:30.

I spent the evening processing the samples. They were all successfully retrieved and preserved in Formalin (most of it), tissue samples were preserved in RNAlater and frozen.

Tuesday 20th October

ROV with pole attached to 5-function arm and held in 7-function.

ROV off deck at 7:20. After a BOP Bullseye inspection we carried out some stills photography for 1.5 hours, trying to get representative pictures of all megafaunal organisms. At 09:20 we went to the current meter site to try and pick up the experimental chambers. Unfortunately they were too light and two had drifted off.

Time	Activity
09:25:30	Picked up C1
09:27:25	Picked up D2
09:32:23	Picked up D3
09:34:43	Picked up D1
09:59:50	Eventually located and picked up C2
10:37:48	Eventually located C3 found that C2 had fallen off spike previously
13:05	Found C2 again (it was lost at around 10:30)
13:18	All 6 buckets collected
13:26	Bringing up ROV
14:00	ROV on deck – 2 buckets lost in splash zone. 1 bucket C2 came up empty

Upon retrieval the D buckets had around 10mm sediment depth, fine to large pebble in grain size (typical of the area).

Preserved samples and cleaned equipment.

Wednesday 21st October

Weather conditions too bad for ROV launch so spent the day packing up the gear.

Thursday 22nd October

Helicopter (EC225) left the rig to go to Aberdeen, strong wind meant re-fuel in Kirkwall and long flight to Aberdeen.

4. SAMPLES:

CODE STRUCTURE:

SC/260909/001#1
Stena Carron / Date / station number # replicate

SAMPLE STATIONS:

Station	Location	Sample type	Preservation
SC/260909/001#1	Drill site	Predrill ROV video transect going SW from drill location for 100m	Standard definition Video, High definition video and digital stills every 10 m
SC/260909/002#1	Drill site	Predrill ROV video transect going NE from drill location for 100m	Standard definition Video, High definition video and digital stills every 10 m
SC/260909/003#1	Drill site	Predrill ROV video transect going SE from drill location for 100m	Standard definition Video, High definition video and digital stills every 10 m
SC/260909/004#1	Drill site	Predrill ROV video transect going NW from drill location for 100m	Standard definition Video, High definition video and digital stills every 10 m
SC/270909/005#1	Drill site	42” pre cement job ROV video transect going NE from drill location for 100m	Standard definition Video, High definition video and digital stills every 10 m
SC/270909/006#1	Drill site	42” pre cement job ROV video transect going SW from drill location for 20m	Standard definition Video, High definition video and digital stills every 10 m
SC/300909/007#1	Drill site	17.5” post cement job ROV video transect going SW from drill location for 100m	Standard definition Video, High

			definition video and digital stills every 10 m
SC/310909/008#1	Drill site	17.5" post cement job ROV video transect going NE from drill location for 100m	Standard definition Video, High definition video and digital stills every 10 m
SC/310909/009#1	Drill site	17.5" post cement job ROV video transect going SE from drill location for 100m	Standard definition Video, High definition video and digital stills every 10 m
SC/310909/010#1	Drill site	17.5" post cement job ROV video transect going NW from drill location for 100m	Standard definition Video, High definition video and digital stills every 10 m
SC/171009/001#1	SE BOP 100m	Hymenaster arm tissue	RNA later in green eppendorph
SC/171009/001#2	SE BOP 100m	Hymenaster arm tissue	frozen in green eppendorph
SC/171009/001#3	SE BOP 100m	Hymenaster body	formalin (all formalin specimens for this dive were preserved together)
SC/171009/001#4	SE BOP 100m	Sediment in core	Frozen whole
SC/171009/002#1	NE BOP 100m	Crinoid arm tissue	RNA later in pink eppendorph
SC/171009/002#2	NE BOP 100m	Crinoid arm tissue	Frozen in pink eppendorph
SC/171009/002#3	NE BOP 100m	Large ophiuroid arm tissue	RNA later in blue eppendorph
SC/171009/002#4	NE BOP 100m	Large ophiuroid arm tissue	Frozen in blue eppendorph
SC/171009/002#5	NE BOP 100m	Ophiuroid and crinoid	Formalin
SC/171009/002#6	NE BOP 100m	Sediment in core	Frozen whole
SC/171009/003#1	NE BOP 100m	Sediment in core	Frozen whole

SC/171009/004#1	NW BOP 100m	Sediment in core	Frozen whole
SC/171009/004#2	NW BOP 100m	Small ophiuroid	Formalin
SC/171009/005#1	SW BOP 100m	Sediment in core	Frozen whole
SC/171009/006#1	SE BOP 100m	Sediment in core	Frozen whole
SC/181009/007#1	S of BOP 100m	Amphipods from light trap	Formalin
SC/181009/007#2	S of BOP 100m	Amphipods from seaweed trap	Formalin
SC/181009/007#3	S of BOP 100m	Amphipods from control (no bait) trap	Formalin
SC/181009/007#4	S of BOP 100m	Amphipods from mackerel trap	Formalin
SC/181009/007#5	S of BOP 100m	Amphipods from crab trap	Formalin
SC/181009/007#6	S of BOP 100m	Gastropod tissue sample (collected in crab trap)	RNAlater
SC/181009/007#7	S of BOP 100m	Gastropod tissue sample (collected in crab trap)	Frozen
SC/191009/008#1	Approx NW of BOP around 100m	Large hydroid from core 1	Formalin
SC/191009/008#2	Approx NW of BOP around 100m	Tissue sample (basal stalk) from large hydroid from core 1	RNAlater (orange tube)
SC/191009/008#3	Approx NW of BOP around 100m	Tissue sample (basal stalk) from large hydroid from core 1	Frozen (orange tube)
SC/191009/009#1	Approx NW of BOP around 100m	Poranid from core 2	Formalin
SC/191009/009#2	Approx NW of BOP around 100m	Tissue sample (arm) from Poranid from core 2	RNAlater (green tube)
SC/191009/009#3	Approx NW of BOP around 100m	Tissue sample (arm) from Poranid from core 2	Frozen (green tube)
SC/191009/010#1	Approx NW of BOP around 100m	Red starfish from core 3	Formalin
SC/191009/010#2	Approx NW of BOP around 100m	Tissue sample (arm) from red starfish for core 3	RNAlater (purple tube)
SC/191009/010#3	Approx NW of BOP around 100m	Tissue sample (arm) from red starfish for core 3	Frozen (purple tube)
SC/191009/011#1	Approx NW of BOP around 100m	Large hydroid from core 1	Formalin
SC/191009/011#2	Approx NW of BOP around 100m	Tissue sample (tentacle outer whorl) from large hydroid from core 1	RNAlater (yellow tube)
SC/191009/011#3	Approx NW of BOP around 100m	Tissue sample (tentacle outer whorl) from large hydroid from core 1	Frozen (yellow tube)
SC/191009/012#1	Approx NW of BOP around 100m	Pteraster from core 5	Formalin
SC/191009/012#2	Approx NW of BOP around 100m	Tissue sample (arm) from Pteraster from core 5	RNAlater (blue? Tube)
SC/191009/012#3	Approx NW of BOP around 100m	Tissue sample (arm) from Pteraster from core 5	Frozen (blue? Tube)
SC/201009/013#1	100m South of BOP	D1 soft coral body	Formalin
SC/201009/013#2	100m South of BOP	D1 soft coral tissue sample	RNAlater
SC/201009/013#3	100m South of BOP	D1 soft coral tissue sample	Frozen
SC/201009/014#1	100m South of BOP	D3 soft coral body	Formalin
SC/201009/014#2	100m South of BOP	D3 soft coral tissue sample	RNAlater
SC/201009/014#3	100m South of BOP	D3 soft coral tissue sample	Frozen
SC/201009/015#1	100m South of BOP	C3 soft coral body	Formalin

SC/201009/015#2	100m South of BOP	C3 soft coral tissue sample	RNAlater
SC/201009/015#3	100m South of BOP	C3 soft coral tissue sample	Frozen
SC/201009/016#1	100m South of BOP	Crinoid (and small amphipod) body	Formalin
SC/201009/016#2	100m South of BOP	Crinoid arm tissue sample	RNAlater
SC/201009/016#3	100m South of BOP	Crinoid arm tissue sample	Frozen

5. GEAR REPORT

ROV Magnum 156:

The ROV was good and highly suitable for the job. There were a number of faults with this system, the HD camera broke regularly. The tether had numerous problems requiring 4 reterminations (one of which was a replacement) during my visit.

High definition camera:

Needs lots of light – the HID lighting was very good. This lighting tended to burn out the picture in the colour camera.

Push cores:

Push cores mounted onto the 6 core holder with thick tie wraps. Thin (5mm) floating rope used to make small monkey's fists to ease core deployment. Core holder held in 5 function manipulator arm. All the cores were broken on the initial deployment and replaced with spares, a complete set of handles was not included so me made them out of large bolts.

RBR data logger:

The datalogger was very straightforward to use. No problems programming it and retrieving data using my laptop (windows XP – RBR software). Unfortunately we need to carry the datalogger with spare batteries but these must be declared before helicopter freight (including MSDS sheet). It may be possible to carry in normal luggage to the rig.

For some reason the oxygen sensor stopped working towards the end of the visit, including its most useful dive with the sponge assessment.

Freight through Asco freight management:

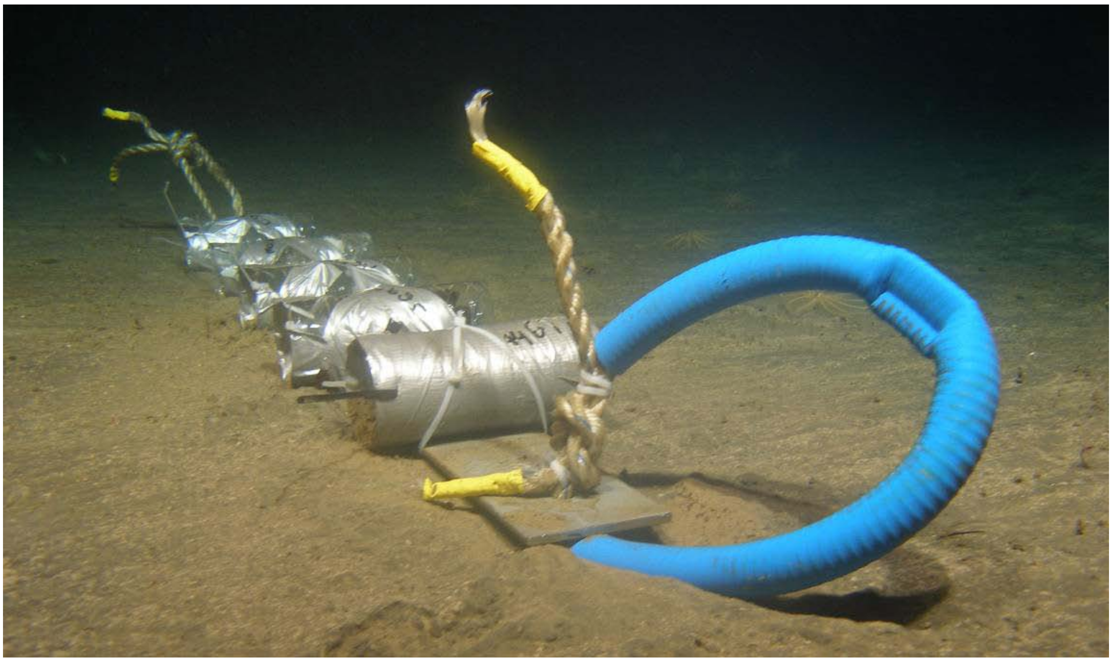
I tested our freight protocols for Asco Freight Management and they were successful. It is essential that you have the following printed out and with you: 1) an inventory of all the contents of the boxes – the more official it looks the better, this needs to say that the goods will not be exported. 2) MSDS sheets for everything that could possibly be dangerous – including all liquids and lithium batteries, 3) you need to ensure that Chevron logistics have sent a confirmation email to Asco that your freight will be coming – you should have a copy of this with you.

Amphipod trapping

A trapping choice experiment was performed using five bait choices in one trap. The baited trap presented five choices. From the top these were (in order): 1) a glowstick (Divex lightstick green cyalume), 2) seaweed (*Porphyra tenera*), 3) control, 4) mackerel (tinned in brine), 5) crab (John West white crab tinned in brine). The traps were space 200 mm apart on a steel beam. Each trap had a 400 x 50 mm strip of pure cotton cloth to retain the bait, the light and control traps also contained cotton.

The traps were 2 litre water bottles attached to a steel bar. It was deployed by holding the ropes at either end of the trap with the two manipulator arms. By holding it out straight little movement occurred and the trap was deployed and recovered safely.

The trap on the seabed is shown below:



The amphipod trap was recovered and the contents evaluated. The mackerel trap had the most amphipods by far. All traps contained some amphipods. The light trap had an amphipod with very large irregular eyes. The crab trap had a buccinid gastropod (possibly *Colus*) but not many amphipods. The gastropod was preserved with the amphipods in formalin, two tissue samples were preserved separately one in RNAlater and the other just frozen. The control trap had amphipods of several different species. The seaweed didn't have many amphipods although a few were observed.

Sponge experiment

The aim of this experiment was to investigate the pumping rates and metabolism of deepwater hexactinellid sponges (here the hexactinellid *Asconema setubalese*).

To estimate pumping rate a dye tracer (fluorescein) and photogrammetry (to calculate sizes from photographs) is used. It is necessary to calculate: time for dye to pass through sponge, the area of the sponge osculum (opening), also to work out pumping rate as body volumes per unit time it is necessary to calculate the body volume.

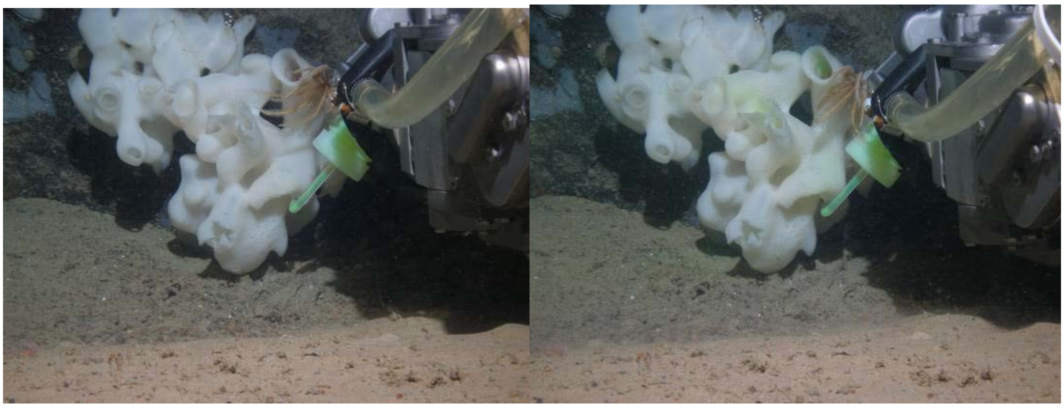
To estimate metabolic rate it is necessary to assess the pumping rate and the oxygen concentration in the water and within the osculum.

ROV setup:

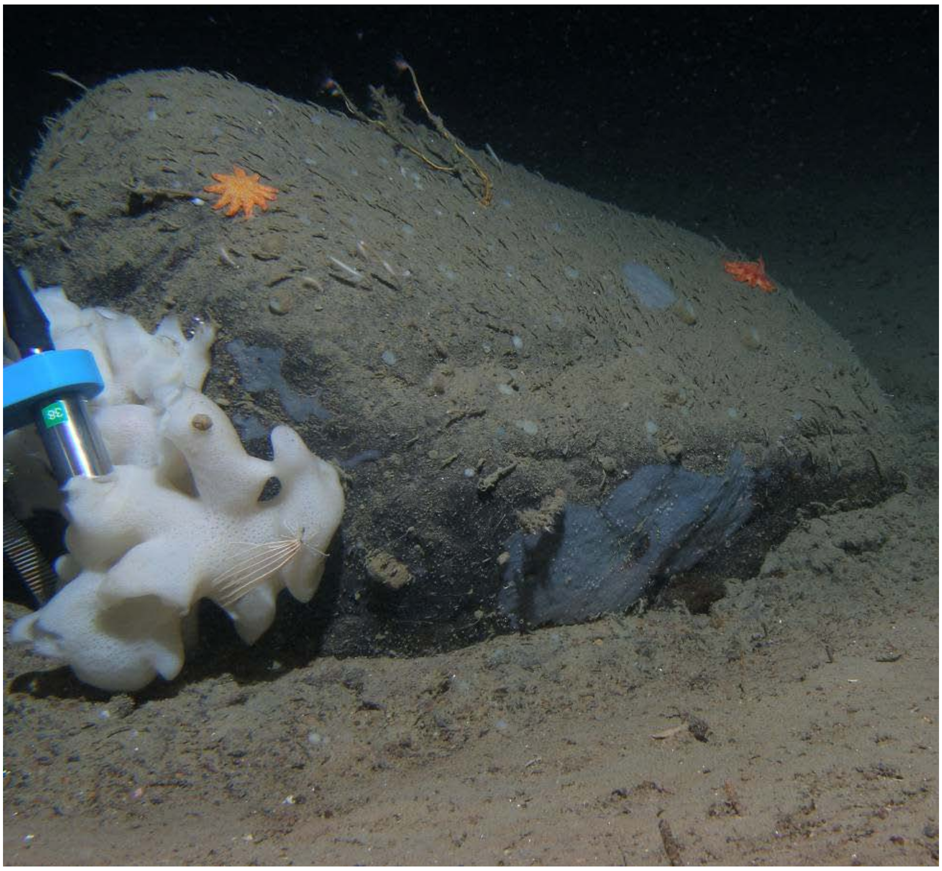
The 7- function manipulator arm held a squeezy bottle of fluorescein dissolved in seawater (it is important to use seawater and minimal fluorescein to minimise osmotic and chemical shock to the sponge). This bottle was held in place with plastic tie wraps, when the claws of the arm were closed this released dye into the water.

The 5- function arm had the data logger attached to the arm with the oxygen sensor attached to the claw – the claw offered some protection to the valuable and sensitive optode.

On the seabed the dye release worked well. It was only possible to get around 4 attempts at dye release before there was insufficient dye to be imaged. The squeezes of the ROV claw should be around 1 second in duration. We had a problem with coordinating it all, there are a lot of orders/observations to make in a very short space of time. It is probably easier if the scientist presses the close manipulator button at a set time. As it is possible to see from the figure below the dye release was successful with rapid (<5 second) transfer of the dye from outside to the osculum.



The sponge was a bit small to insert the optode into the oculum, it might be best to use a smaller micro optode or electrode to ensure insertion is possible. In the end the optode failed to record data and did not fully enter the osculum but the experiment was a successful proof of concept.



Disturbance experiment

A disturbance experiment was performed using plastic buckets as experimental chambers.

Chamber construction:

Chambers were constructed from 5 litre plastic buckets. 8 x 50mm diameter stainless steel washers were attached to the base of the bucket with plastic cable ties. This was not enough weight (~100g). I think at least 500 grams is necessary. The buckets had 8 x 8mm holes drilled into them (4 holes on each quadrant of the bucket on two levels) for ventilation. The lid had a circular hole cut in it 10 mm larger in radius than the core. The buckets were labelled clearly on the top and sides with marker pen which worked well.

Deployment

The chambers (plastic buckets) were deployed on the ROV using a stiffened rope attached from the base of the 7-function arm to a stiffened loop held by the 5-function arm, this produced a ‘washing line’ to which all the buckets hung from.

The bucket chambers were deployed close to the current meter at 08:43 on 18th October. It is very important to deploy the experiments at a site that can easily and consistently be found with the ROV sonar.

Filling the chambers with animals:

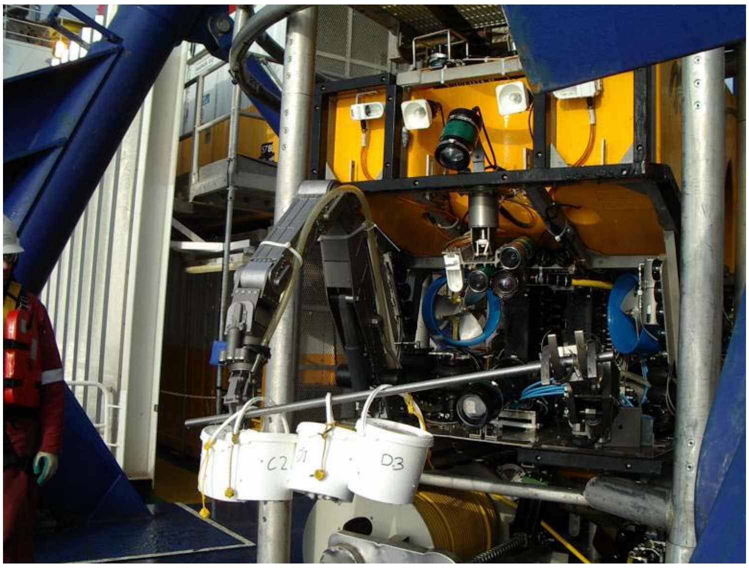
We attempted to use the starfish *Crossaster* for the experiments, while we could have probably found enough it was not possible to scrape these off the rocks they inhabit with the ROV without causing bodily damage and probable high levels of stress. Instead we focussed on the soft coral *Gersemia* which was extremely abundant and attached to rocks which could be picked up easily without damaging the animal. The rocks could then be transferred into the chambers with minimal disturbance to the animal.

Disturbing the experimental chambers:

On 19th October starting 13:33 sediment was added to the 3 experimental buckets. Surficial sediment was scraped off using the cores. It was possible to get a consistent fill of sediment material. When recovered, the experimental chambers had approximately consistent levels of sediment around 10mm in height. The sediment introduction worked well although the sediment moved out of the cores in lumps rather than a fine sprinkling of material which is perhaps more like the drilling disturbance. The alcyonaceans in the recovered buckets were covered in sediment.

Recovery

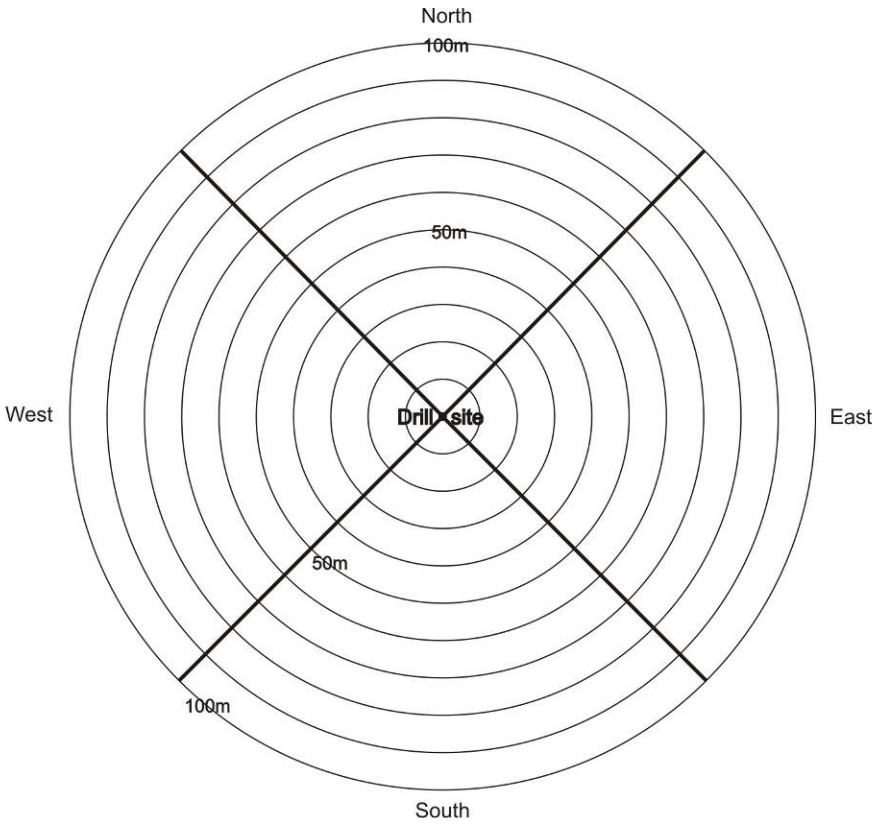
The chambers were recovered using a steel pole in the ROV arms. It took us a long time to find the chambers as they had drifted. Some had also partially turned over. The recovery did not go well. It took several hours of frustrating searching. In the splash zone two buckets broke off and one that was recovered had a partially cracked handle. It is likely that the cold temperatures on the seabed make the plastic brittle and unsuited to the rough handling that occurs on the sea surface in the splash zone.



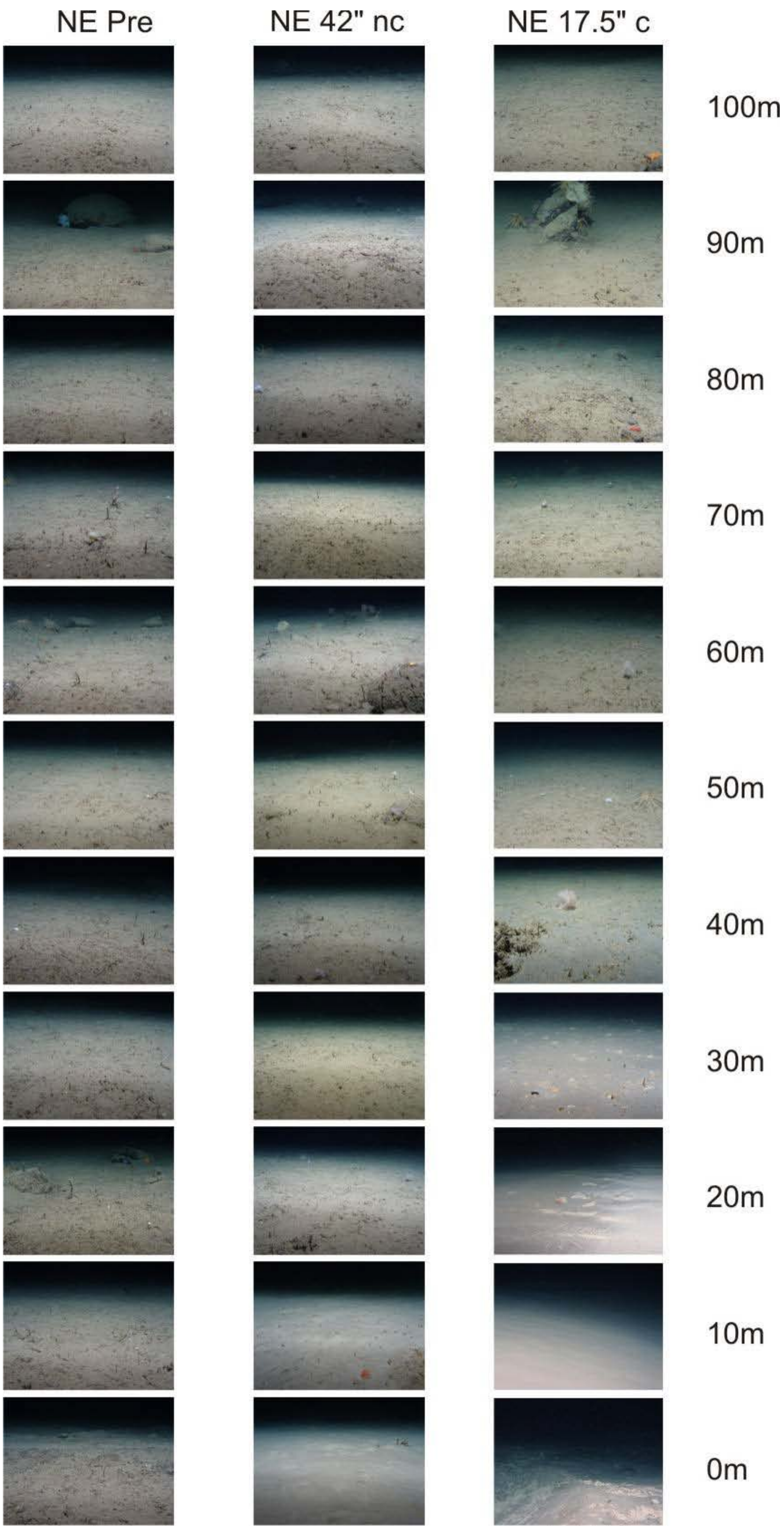
The photographs show recovery of the 4 chambers on the steel pole. This was a better solution to the rope used for deployment.

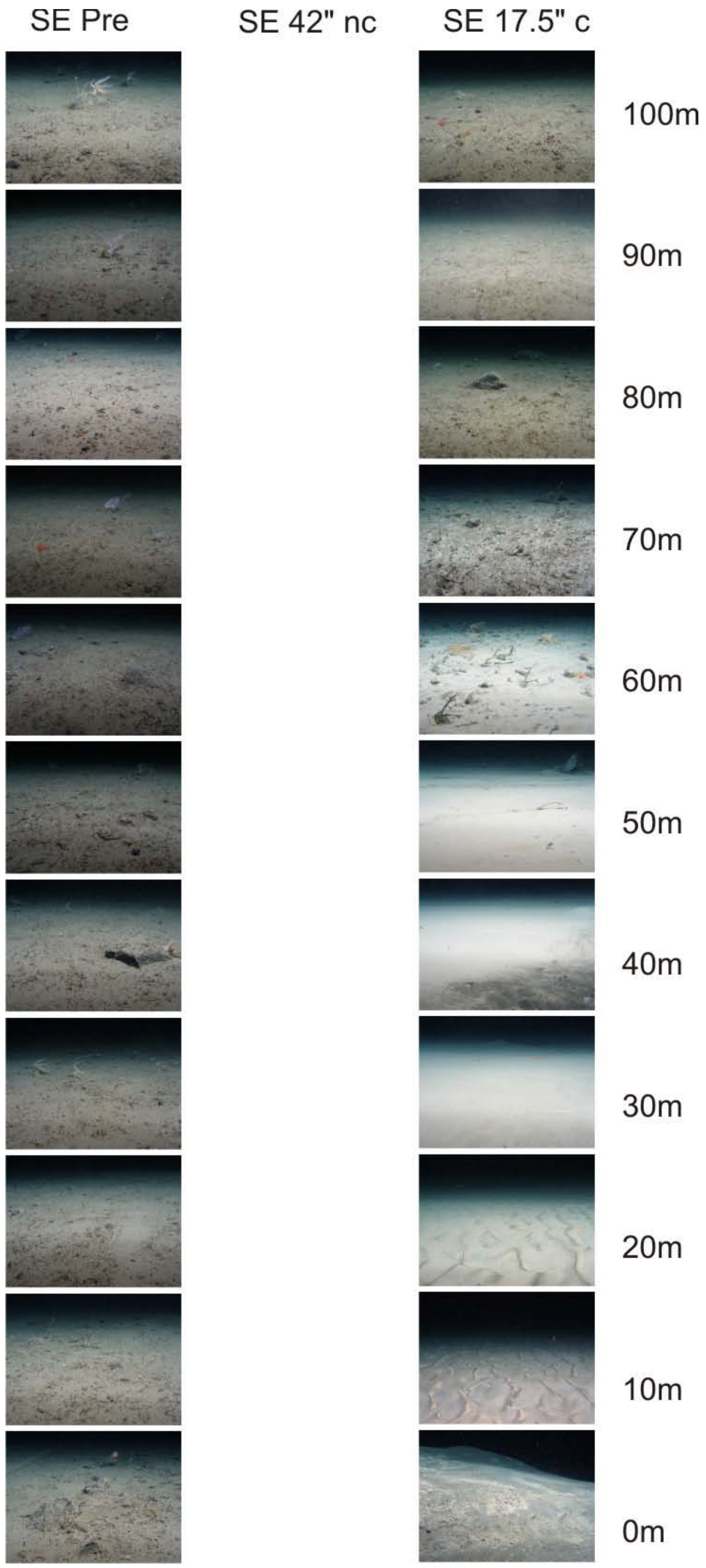
6. Transects

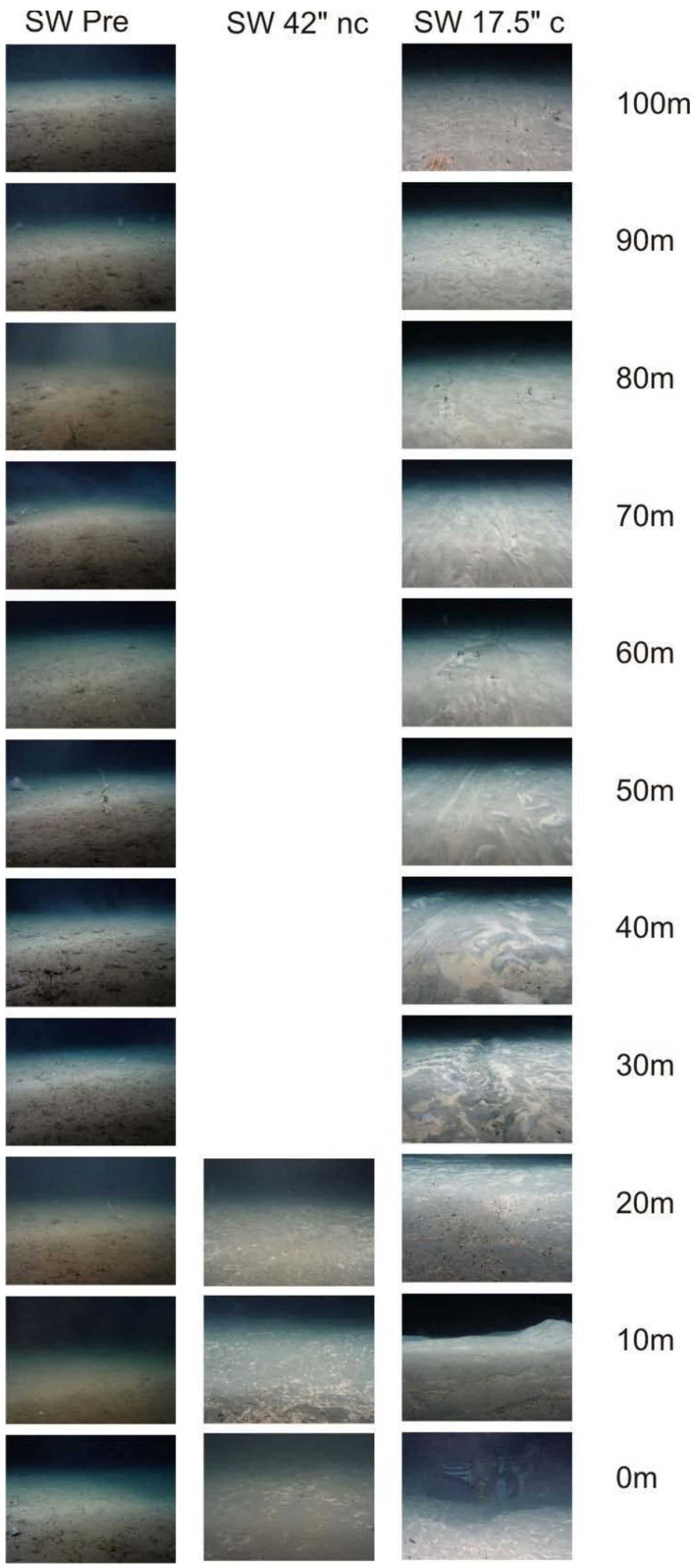
Video transects were carried out in high definition along the paths shown in the following diagram.

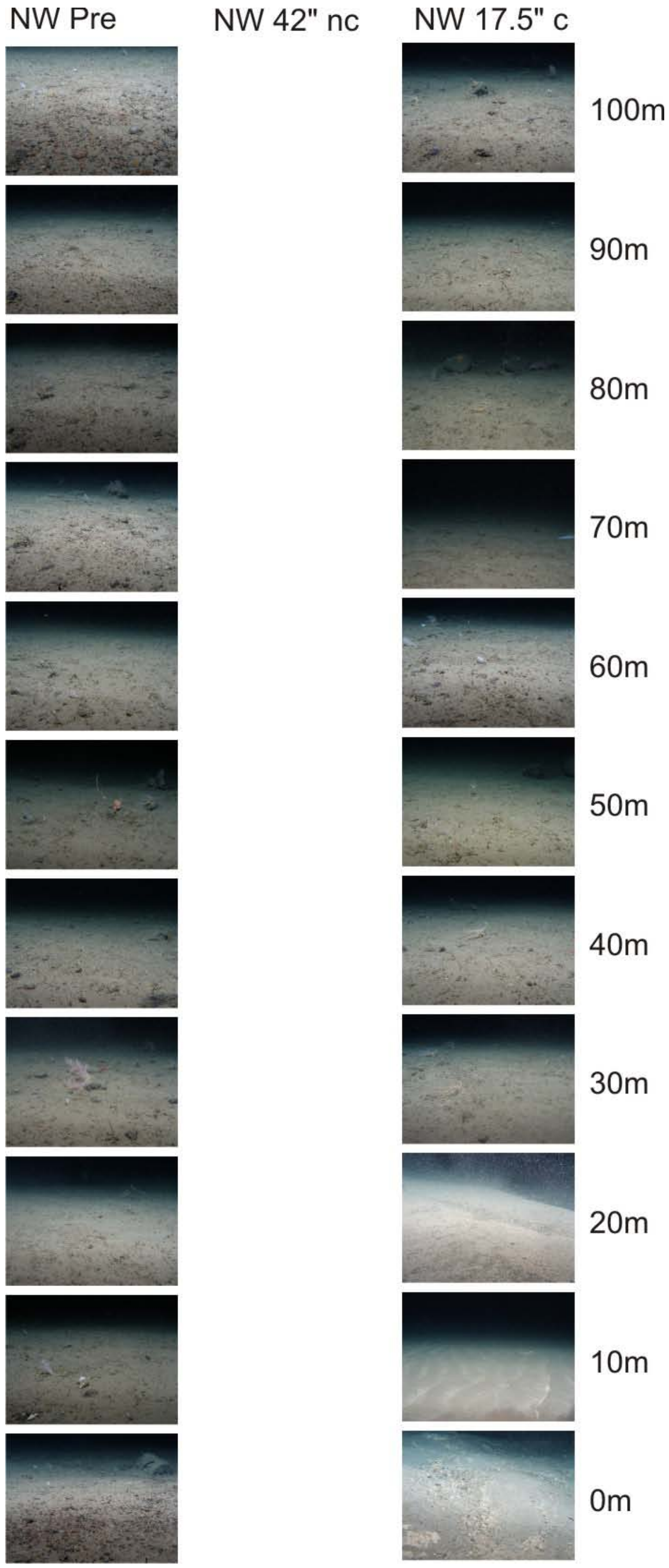


Transect still photographs (nc = drilled only (no cement); c = drilled and cemented)




SE Pre
SE 42" nc
SE 17.5" c
100m
90m
80m
70m
60m
50m
40m
30m
20m
10m
0m


SW Pre
SW 42" nc
SW 17.5" c
100m
90m
80m
70m
60m
50m
40m
30m
20m
10m
0m

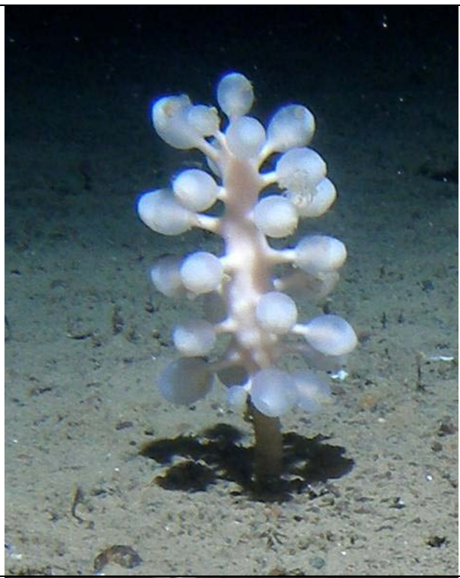

NW Pre
NW 42" nc
NW 17.5" c
100m
90m
80m
70m
60m
50m
40m
30m
20m
10m
0m

7. Ecological highlights

A total of 33 megafaunal taxa were observed living on or associated with the seabed at Tornado, with megafaunal representatives (i.e. those animals greater than 10 mm) from at least 8 phyla. There were almost certainly many additional fauna that were not possible to resolve, there was evidence for bryozoans, small hydroids, polychaetes, small or thin sponges, small asteroids and amphipods. A number of pelagic fauna were observed (but not possible to identify) near the seabed including ctenophores, chaetognaths, copepods, euphausids, pyrosomes and cephalopods (squid). The species complement was apparently very similar to that found at the nearby Rosebank site. Crinoids were considerably more common at this site than elsewhere we have seen in the FSC.

Table of all 34 species found on this visit . Note that the best picture of each taxon was used, with preference to those obtained on this visit. Some photos (marked with *) were taken from previous visits to this area (Rosebank, Cambo and Rosebank North).

Phylum	Species	Notes	Picture
Porifera	Chamber sponge *Asconema setubalense*		
	Unknown sponge		

	Chondrocladia gigantea	Carniverous sponge.	
	Cladorhiza gelida.	A specimen has earlier been taken at about 60°N, 5°E, about 1140 m. Elsewise, the species is distributed at large depths in the Norwegian-Greenland Sea. Carniverous.	

	Asbestopluma bihamatifera	Another carnivorous sponge from cold water	
	Stylocordyla borealis	*	
Cnidaria	12 tentacle anemone. Believed to be of the tribe Athenaria (Carlgren 1899). Edwardsid anemone.		

	Corymorpha gronlandica sp.		
	Tubularia regalis		
	Branchocerianthus?		

	Alcyonacean		
	Lucernaria bathyphila		
Nemertea	*Nipponnemertes pulchra*	*	
Polychaeta	Sabellid		

Mollusca	*Colus* sp.		
	Colus sp. 2		
	Benthoctopus sp.		
	Cirroteuthis sp.	*	
Arthropoda	*Colossendeis proboscea*		
	Nymphon sp.	This photo shows juveniles on dorsal surface	
	Eurythenes gryllus	*	

Echinodermata	Red asteroid		
	Crossaster squamatus		
	Henricia sp.		
	Poranid		
	Poranid 2		

	Pteraster miliaris		
	Hymenaster		
	Poliometra proxila		
Chordata	*Gaidropsarus argentatus*		
	Lycodonus sp.	*	
	Lycodes sp.		

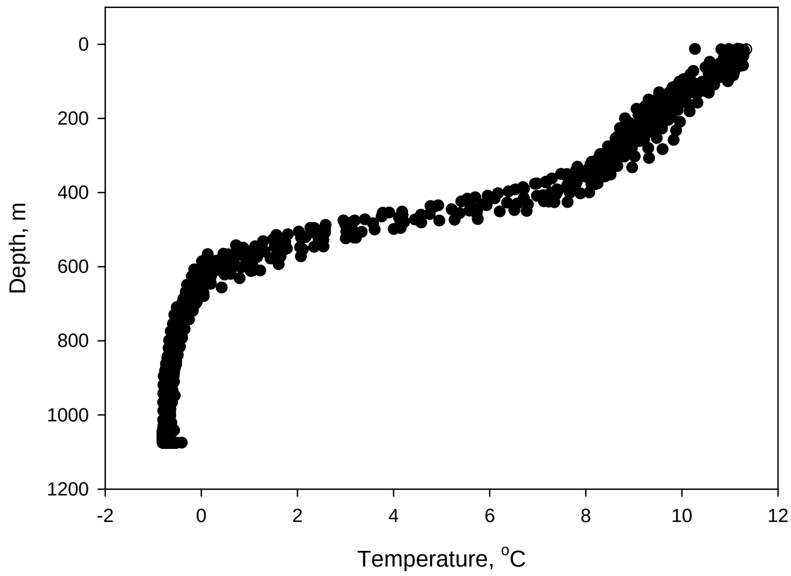
	Lycodes esmarkii		
	Cottunculus microps		
	Amblyraja hyperborea, Arctic skate?		

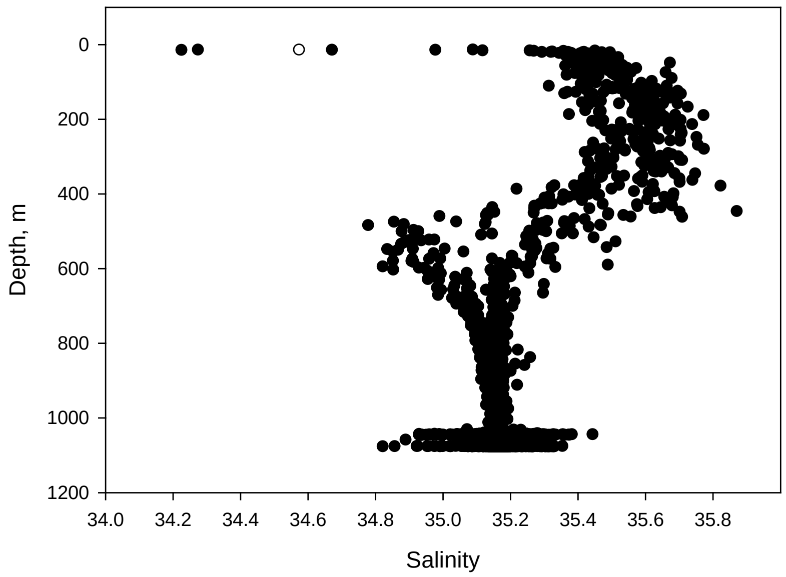
Physical data

Visit 1:

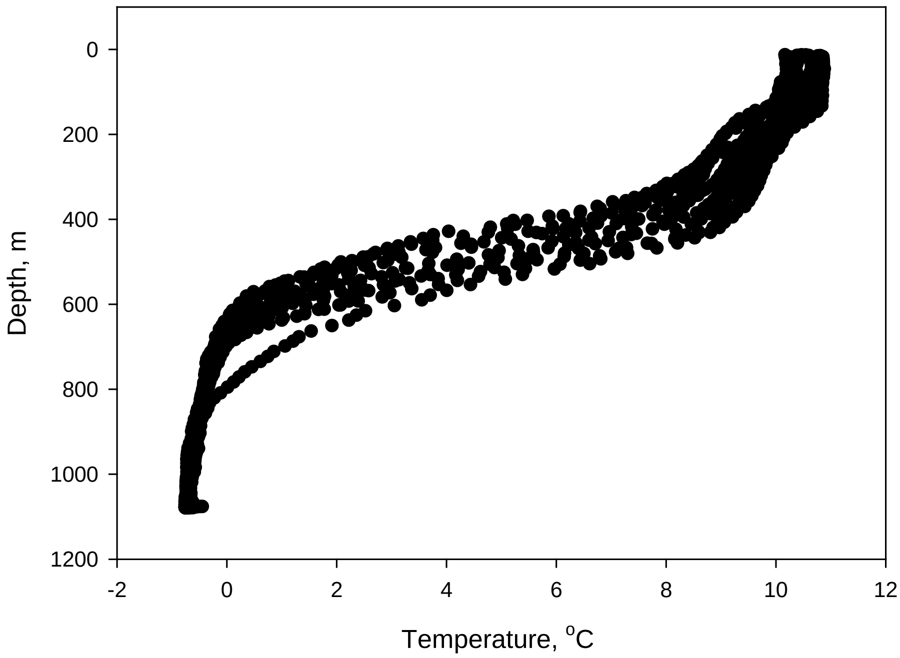
pH calibration:

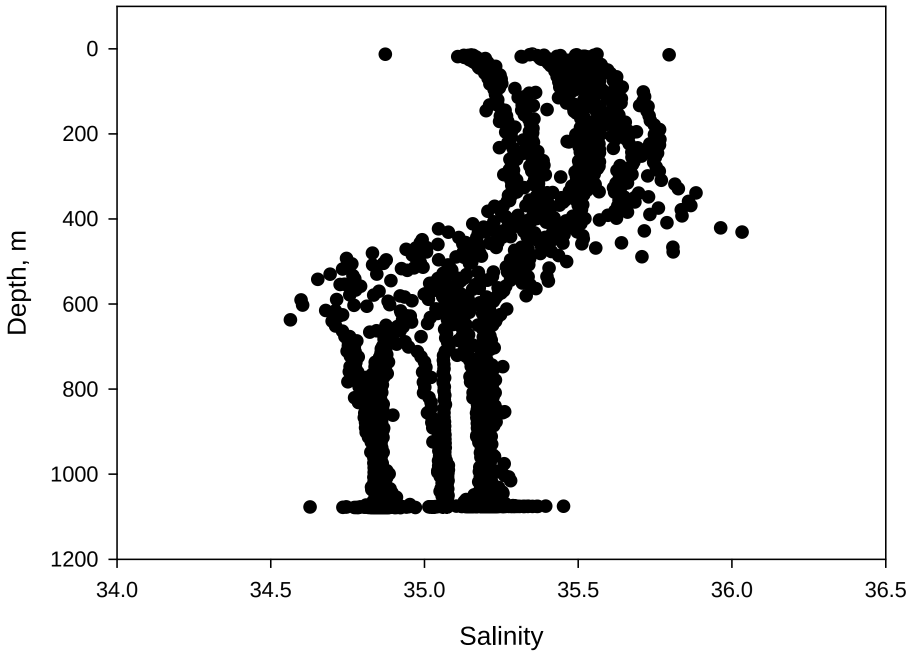
pH	Start time	End time	Average reading	Reading STD
7	09:11:10	09:14:10	8.16162	0.348108
4	09:16:00	09:19:00	5.386383	0.044959
7	09:20:00	09:23:00	8.0597	0.085634
10	09:24:00	09:28:00	10.40134	0.034554





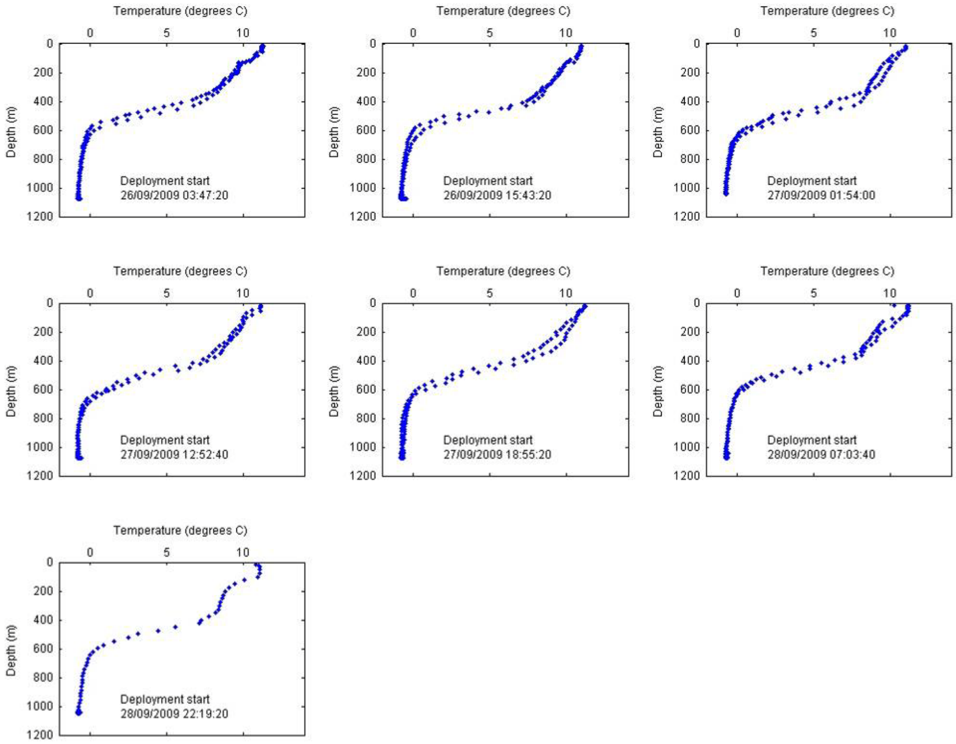
Visit 2:


Depth, m
0
200
400
600
800
1000
1200
-2
0
2
4
6
8
10
12
Temperature, ^{o}C

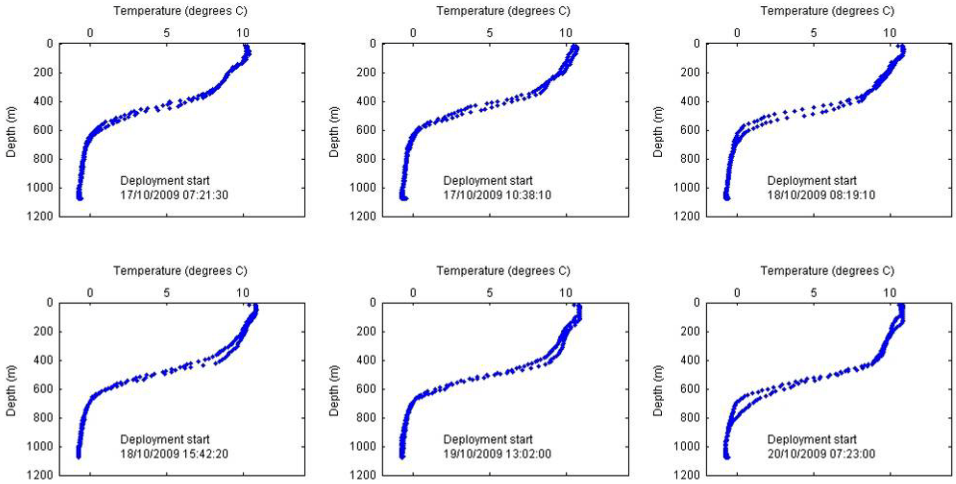

Depth, m
0
200
400
600
800
1000
1200
34.0
34.5
35.0
35.5
36.0
36.5
Salinity

Temperature profiles for individual dives

Visit 1

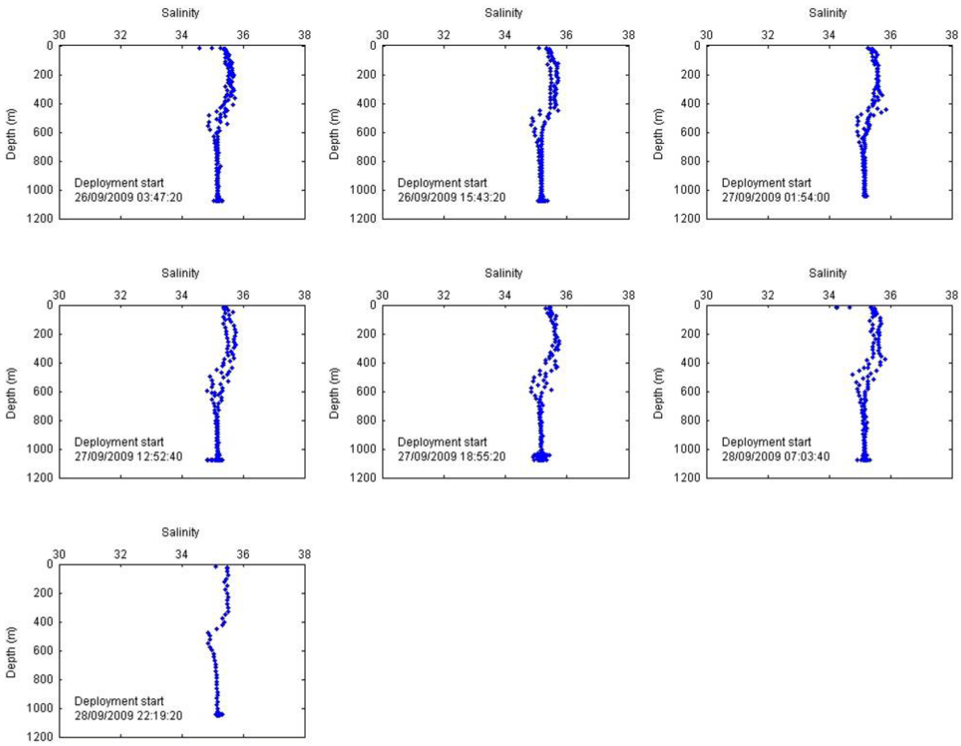


Visit 2

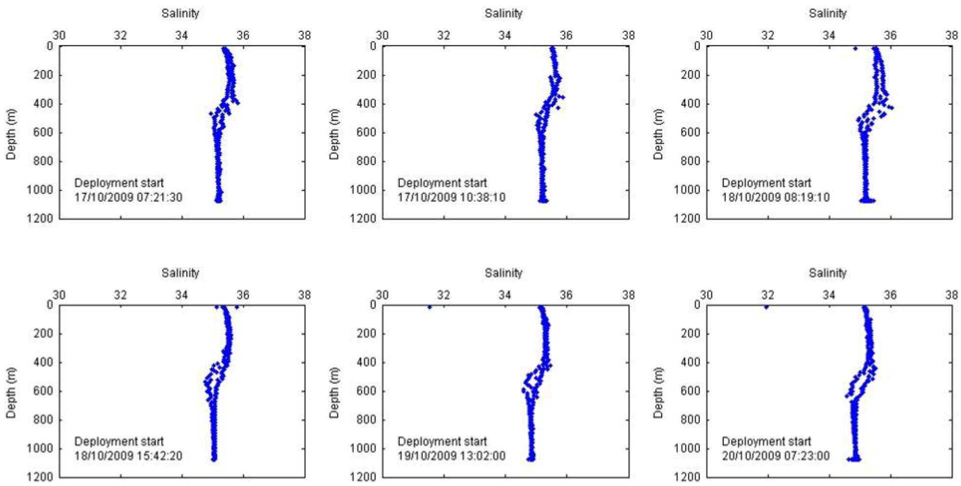


Salinity profiles for individual dives

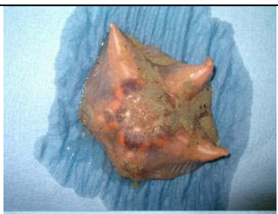
Visit 1

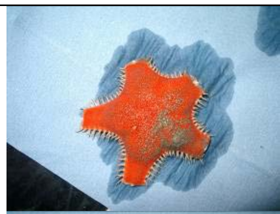


Visit 2



Specimens Collected

Sample	Location	Organism	Preservation	Photo
SC/171009/001#1	SE BOP 100m	Hymenaster arm tissue	Formalin, RNAlater and frozen	 
SC/171009/002#5	NE BOP 100m	Ophiuroid and crinoid	Formalin, RNAlater and frozen	 
SC/171009/004#2	NW BOP 100m	Small ophiuroid	Formalin	
SC/181009/007#1	S of BOP 100m	Amphipods from light trap	Formalin	
SC/181009/007#2	S of BOP 100m	Amphipods from seaweed trap	Formalin	
SC/181009/007#3	S of BOP 100m	Amphipods from control (no bait) trap	Formalin	
SC/181009/007#4	S of BOP 100m	Amphipods from mackerel trap	Formalin	
SC/181009/007#5	S of BOP 100m	Amphipods from crab trap	Formalin	
SC/191009/008#1	Approx NW of BOP around 100m	Large hydroid from core 1	Formalin, RNAlater and frozen	
SC/191009/009#1	Approx	Poranid from core	Formalin, RNAlater	

	NW of BOP around 100m	2	and frozen	
SC/191009/010#1	Approx NW of BOP around 100m	Red starfish from core 3	Formalin, RNAlater and frozen	 
SC/191009/011#1	Approx NW of BOP around 100m	Large hydroid from core 1	Formalin, RNAlater and frozen	
SC/191009/012#1	Approx NW of BOP around 100m	Pteraster from core 5	Formalin, RNAlater and frozen	 
SC/201009/013#1	100m South of BOP	D1 soft coral body	Formalin, RNAlater and frozen	
SC/201009/014#1	100m South of BOP	D3 soft coral body	Formalin, RNAlater and frozen	
SC/201009/015#1	100m South of BOP	C3 soft coral body	Formalin, RNAlater and frozen	
SC/201009/016#1	100m South of BOP	Crinoid (and small amphipod) body	Formalin, RNAlater and frozen	

MISSION 80

DEEPWATER NAUTILUS, MISSISSIPPI CANYON 392, GULF OF MEXICO

MARK BENFIELD

1. GENERAL INFORMATION:

Client: Shell
Rig Operator: Transocean
Rig Name: Deepwater Horizon
Rig Location: Mississippi Canyon 392
Rig Position: 28° 39‘ 07.657“ N, 87° 59‘ 59.015“ W
Seabed Depth: 7242 ft (2207.3 m)
Seabed Temperature: 39.7° F (4.3°C)
ROV Operator: Oceaneering
ROV: Millennium 14
TIME ZONE: GMT -6

ROV Team:

Shift 1	Alternate Crew
Dave Workman (Supervisor)	Todd Hebert (Supervisor)
Rodney Williams	Denny Companion
Shea McDonald	Eric Marsjanik

Company Man: Bobby Ougel/Jim Enlow
OIM: Doug Cox, John Hamilton
HSE: Orrin Battle (Transocean), Scott Samuel (Shell)
Rig Scheduler/Planner: Frank Moser, Gerald Fruge
ROV Telephone Number: 504 – 728 – 8048
RIG Telephone Number: 504 – 728 - 8041
Gulf SERPENT Personnel: Mark Benfield (LSU)

2. GEAR

ROV Type: Millennium (150 Hp)
ROV Camera: Kongsberg Color Video
SONAR: Simrad Mesotech MS 900
DVD Recording Deck: Panasonic DMR-T6070, Panasonic DMR-EH67 DVD –R

3. VISIT NARRATIVE

3.1 Background

This is the first visit to the Deepwater Nautilus although they have been sending video survey data to us since the summer. It's a great opportunity to work directly with the ROV team aboard.

Sunday 11/22/09
I drove over in the evening from Baton Rouge to stay in a hotel in Belle Chasse since I had to be at the heliport for 05:00.

Monday 11/23/09
I arrived at the heliport at 05:00 and checked in. I met Dave Workman (ROV Supervisor) who was on my flight. My flight left at 06:30 and arrived at the Nautilus at 07:10. After a safety orientation given by the RSTC, I met Dave Workman who took me around the rig for an orientation. We then proceeded to the ROV, which was prepping for a pre-dive and a riser inspection. I met the ROV team and waited for them to deploy Mil-14.

ADCP backscatter data was not available from the Nautilus on NDBC website so I obtained recent data from two nearby sites (Ocean Confidence and Horn Mountain). These plots (Fig. 1-2) suggest that there is a layer during the day from about 1200 – 1800 feet and also shallower than 1000 feet.

In the water at 09:55:52 for the riser inspection. At 11:30 they were finished with the inspection and began a survey over the bottom. We did see an interesting cydippid ctenophore that was completely black and had its two tentacles extended. Did the first water column survey at 7000' and saw a few swimming sea cucumbers. After that we did a survey at 6500' and 6000'. I opted to cut the 6000' survey short when the ROV was about 270' out from the cage. We returned to the cage and ascended to 1500' to take a quick look at a depth that potentially had more targets for training. By the time we got to 1500' it was already almost dark so likely most animals had migrated upwards into shallower water. We did see a physonect siphonophore and a *Solmissus* jellyfish. Tomorrow we'll resume our survey at 5500'.

After dinner Shea and I went fishing. There were about six people fishing and only a couple of small blackfin tunas were landed. There had been some yellowfin tuna around but a large supply boat scared them away and the fishing (catching) stopped. We kept one of the carcasses to take down to the bottom tomorrow. We'll place it on the bottom and check it after an interval to see what benthic organisms it attracts.

Tuesday 11/24/09
After breakfast I met the ROV team at their van for their morning meeting. After that Dave Workman and I went back inside for a morning supervisor's meeting. I had an opportunity to meet the senior team on the Deepwater Nautilus and give them a quick overview of the Gulf SERPENT Project. Everyone was very supportive and interested. I left three copies of the SERPENT 2008 Annual Report for them. Afterwards two individuals – a geologist and geophysicist indicated an interest in visiting the ROV van to observe during our SERPENT dive. The Transocean HSE Coordinator – Orrin Battle is going to write an article on the visit for an in-house newsletter and said he'd drop by to discuss it further. I also need to put together some powerpoint slides for the TV in the galley.

While Dave and I were inside, Shea and Rodney prepped the ROV and put the tuna carcass on board. We also deployed a bag of Styrofoam cups we decorated for Buchanan elementary school in Baton Rouge and for the LSU Child Care Center. When we returned I took some pictures of the activities around the ROV.

We deployed the ROV at 08:42 and conducted a riser inspection followed by an examination of the BOP. Immediately following deployment I began logging ADCP data from the 300 kHz workhorse unit attached to the ROV cage. Using this data I was able to obtain a temperature profile of the water column (Fig. 3). After that we moved 500’ away from the BOP on a heading of 20° to place the tuna carcass on the seafloor at 10:49. On the way we observed a large fish *Acanthonus armatus* (family Ophidiidae). The common name for this species is the bony-eared assfish (I am not kidding!). Interestingly, it is reported to have the smallest brain of any living bony fish and possibly of any vertebrate. This appears to be the first time that it has ever been imaged in situ.

We set the ROV down on the seafloor about 8 feet back from the carcass and observed it for about 2h. During this period the carcass was investigated by quite a few small shrimp and subsequently by some very large red penaeid shrimp. At 12:05 we departed the carcass, returned to the cage, and ascended to 3000’ to begin a survey. Surveys were conducted at 3000, 2500, 2000, and 1500 feet. We observed some siphonophores, *Solmissus* and other jellyfish, and a large siphonophore that appeared to be the galaxy siphonophore. The latter was fishing with all its tentacles extended and after videoing it for a while we moved closer, whereupon it retracted its tentacles and unwound revealing what appeared to be a hatchetfish that it had captured. We ended the dive at 17:15 and recovered the ROV to the surface.

We finished finalizing the DVDs and I packed up my gear. After dinner I observed some fishing. There were several schools of large yellowfin tuna circling the rig and one individual had landed a tuna weighing approximately 100 lbs. Small blackfin tunas were caught and released but these, and the carcass of the yellowfin attracted sharks that likely scared the tunas away.

Wednesday 11/25/09
I was scheduled to depart on the second flight at 10:00. Prior to this I visited the ROV van to download ADCP data from yesterday’s dive and to say thanks and goodbye to the ROV team. I met with Orrin Battle (RSTC) again and answered some questions he had for an article that he was writing for Transocean and Shell on the SERPENT project. I left the rig at 10:40h, arrived at the Boothville heliport at 11:25, and drove back to Baton Rouge.

4. SAMPLES

Collection of physical samples is not normally part of the Gulf SERPENT Project. Our data consist of primarily of video observations and other measured data.

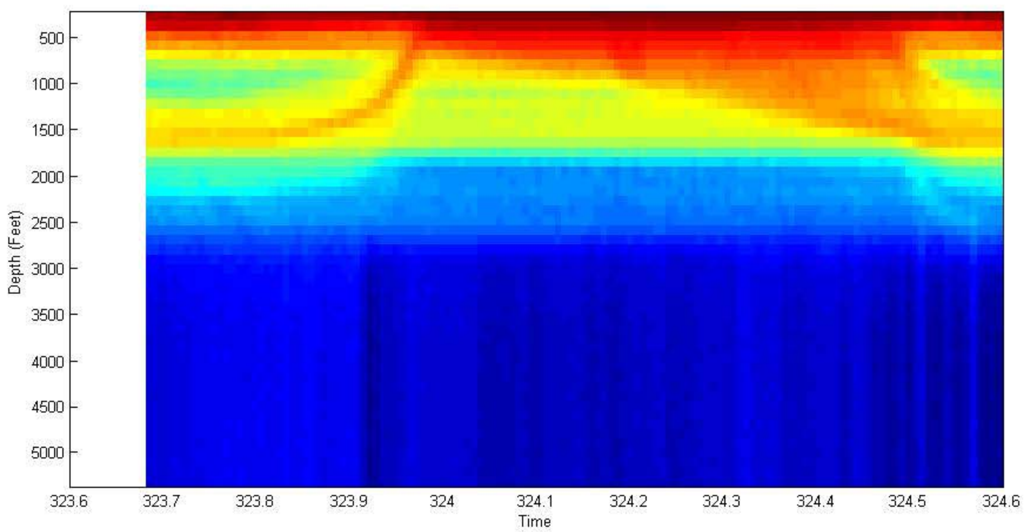


Figure 1. ADCP backscatter intensity ($\log_{10}$(RSSI)) at 76 kHz beneath the Ocean Confidence from Nov 18 (16:48) – 19 (14:24), 2009. ADCP data from the Nautilus were not available and the Ocean

Confidence is located nearby. The pattern indicates a layer persists during the day from ~1200 – 1800 feet and at night it is above 1000 feet.

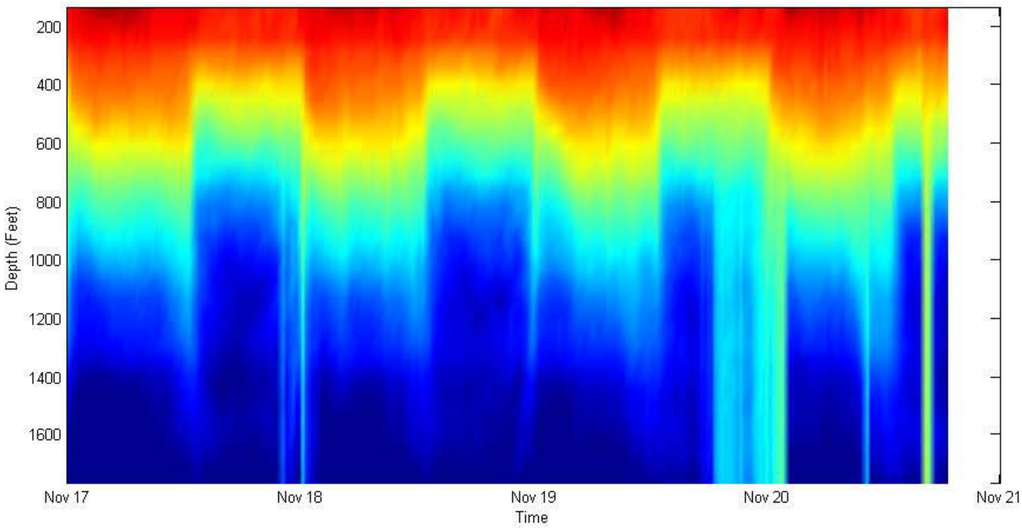


Figure 2. ADCP backscatter intensity ($\log_{10}$(RSSI)) at 38 kHz beneath Horn Mountain from Nov 17 – 20, 2009. ADCP data from the Nautilus were not available and Horn Mountain is located nearby. The pattern indicates a low intensity layer persists during the day from 1200 – 1300 feet and also shallower than 1000 feet. At night it is above 700 feet. This frequency will record fish more strongly than invertebrates.

5. GEAR REPORT

ROV: All systems on the ROV were functioning properly and the surveys were conducted without any problems. There is only one functional DVD recorder in the ROV van. The other one is broken. This makes it impossible to keep a second SERPENT DVD ready to record observations that occur occasionally during routine work.

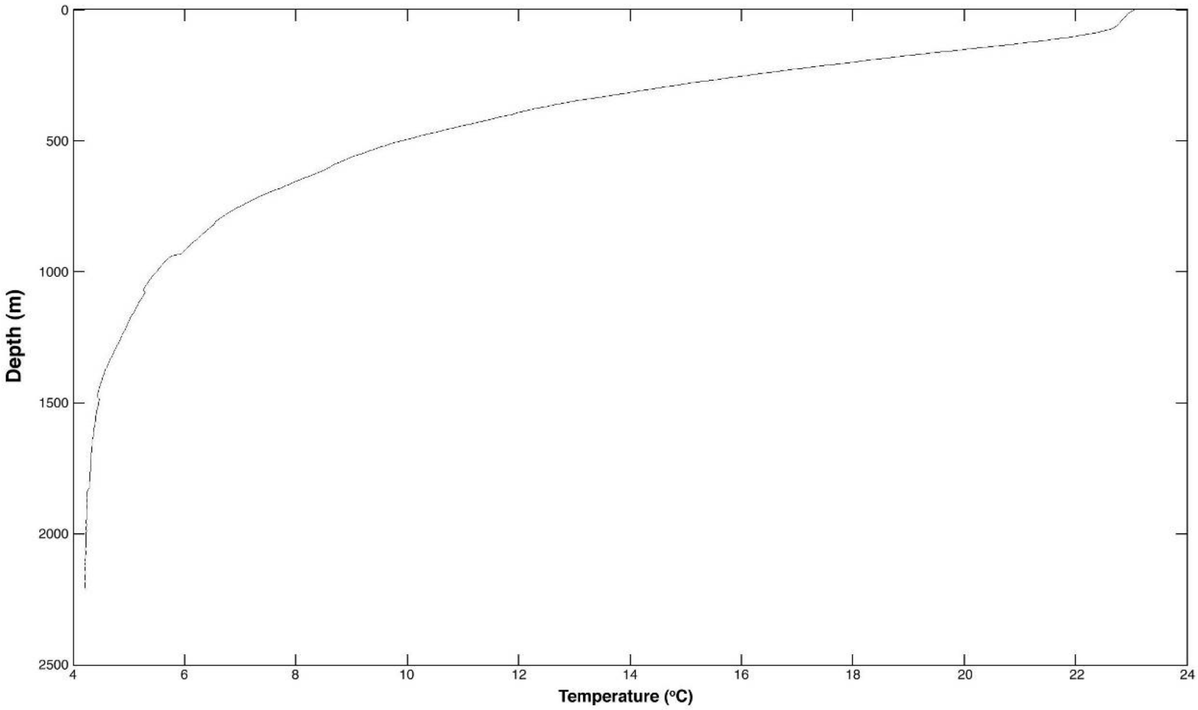


Figure 3. Temperature profile from ADCP temperature sensor during dive on 11/24/09

6. FAUNAL OBSERVATIONS

Dive 11/23/09. DVD Label: Deepwater 11/23/09 MC 392 Disk 1, 2

Date	Time (local)	Depth (ft)	Observation	Video Still Image	Video File Location
11/23/09	13:16	7186	Halosaurid fish (*Aldrovandia affinis*)		Disk 1 VTS_01_1.mpg
11/23/09	13:25	7243	Halosaurid fish (*Aldrovandia affinis*)		Disk 2 VTS_03_1.mpg

11/23/09	13:37	7242	Halosaurid fish (*Aldrovandia affinis*)		Disk 2 VTS_04_1.mpg
11/23/09	13:38	7240	Holothuroidean (sea cucumber) drifting above bottom.		Disk 2 VTS_04_1.mpg
11/23/09	13:45	7234	Unidentified cydippid ctenophore (comb jelly) with both tentacles extended		Disk 2 VTS_06_1.mpg
11/23/09	14:08	7010	Holothuroidean (sea cucumber) swimming		Disk 2 VTS_07_1.mpg

11/23/09	14:13	7005	Holothuroidean (sea cucumber) swimming		Disk 2 VTS_08_1.mpg
11/23/09	14:22	7003	Holothuroidean (sea cucumber) swimming		Disk 2 VTS_10_1.mpg
11/23/09	14:50	6501	Lobate ctenophore (comb jelly) similar to *Bathocyroe* but red gut not apparent		Disk 2 VTS_11_1.mpg
11/23/09	17:01	1504	Chaetognath (arrow worm)		Disk 2 VTS_14_1.mpg

11/23/09	17:11	1528	Unidentified physonect siphonophore		Disk 2 VTS_15_1.mpg
11/23/09	17:12	1527	Dinnerplate jellyfish (*Solmissus*)		Disk 2 VTS_15_1.mpg
11/23/09	17:14	1528	Dinnerplate jellyfish (*Solmissus*)		Disk 2 VTS_16_1.mpg

Dive 11/24/09 DVD Label: Deepwater Nautilus 11/24/09 MC 392 Disk 1 - 5

Date	Time (local)	Depth (ft)	Observation	Video Still Image	Video File Location
11/24/09	10:37	7233	Bony-eared assfish swimming above bottom (*Acanthonus armatus*). This is probably the first time that an adult of this species has been imaged in the ocean.		Disk 1 VTS_02_1.mpg

11/24/09	10:42	7241	Halosaurid fish (*Aldrovandia affinis*)		Disk 1 VTS_02_1.mpg
11/24/09	10:51	7242	Tuna carcass on bottom		Disk 1 VTS_02_1.mpg
11/24/09	11:14	7242	Royal red shrimp (*Pleoticus robustus*) feeding on tuna carcass		Disk 1 VTS_02_1.mpg
11/24/09	11:31	7242	Royal red shrimp (*Pleoticus robustus*) feeding on tuna carcass		Disk 2 VTS_01_1.mpg

11/24/09	11:51	7241	Holothuroidean drifting over bottom (arrow) with royal red shrimp (*Pleoticus robustus*) feeding on tuna carcass		Disk 2 VTS_02_1.mpg
11/24/09	12:05	7242	Royal red shrimp (*Pleoticus robustus*) feeding on tuna carcass		Disk 2 VTS_03_1.mpg
11/24/09	12:15	7241	Holothuroidean drifting over bottom		Disk 2 VTS_04_1.mpg
11/24/09	12:36	7241	Holothuroidean drifting over bottom		Disk 3 VTS_01_1.mpg

11/24/09	15:00	2500	Shrimp		Disk 4 VTS_01_2.mpg
11/24/09	15:22	2507	Physonect siphonophore (Galaxy siphonophore) in fishing posture		Disk 4 VTS_01_3.mpg
11/24/09	15:23	2511	Physonect siphonophore (Galaxy siphonophore) leaving fishing posture		Disk 4 VTS_01_3.mpg
11/24/09	15:25	2512	Galaxy siphonophore close up of nectosome		Disk 4 VTS_01_3.mpg

11/24/09	15:26	2514	Galaxy siphonophore close up of siphonostome		Disk 4 VTS_01_3.mpg
11/24/09	15:27	2513	Fish (probably a hatchetfish) captured by the siphonophore		Disk 4 VTS_01_3.mpg

11. SHELL LOGISTICAL SUPPORT

We received outstanding support and cooperation from all personnel while aboard the Deepwater Horizon. The enthusiastic response from both the ROV team and Drilling were much appreciated. Millennium 14 has a very professional ROV group who were supportive of the SERPENT project. The piloting skills of all three members of the group are very good. The next well is going to be in much deeper water and I look forward to a productive relationship with this facility.

Transportation:

Date	Flight	Persons	Flight Time (h)	Aircraft
11/23/09	Boothville Heliport to Deepwater Horizon	1	0:45	S92
11/25/09	Deepwater Horizon to Boothville Heliport	1	0:45	S92

Accommodation:

11/23/09 1 person
11/24/09 1 person

Meals:

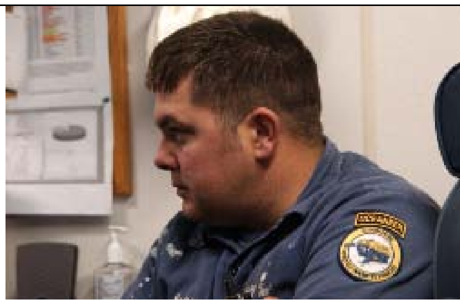
Date	Breakfast	Lunch	Dinner
11/23/09	-	1	1
11/24/09	1	1	1
11/25/09	1	-	-
Total	2	2	2

ROV Time:

11/23/09: 04:10 (13:15 – 17:25)
11/24/09: 06:54 (10:21 – 17:15)
Total: 11:04

12. DIGITAL STILL IMAGES

Styrofoam cups prior to being deployed
DSC_0438.jpg



Rodney Williams in the ROV control van
DSC_0440.jpg

Millennium 14
DSC_0441.jpg

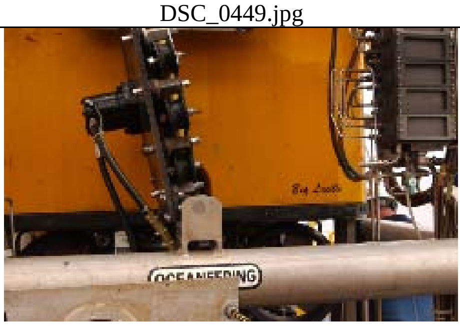
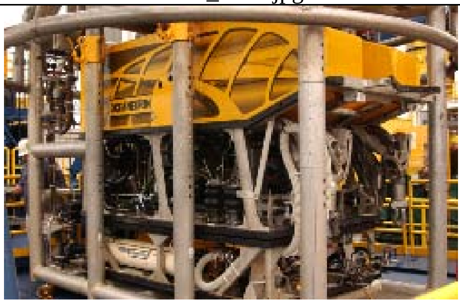
ADCP mounted on port side of ROV cage
DSC_0442.jpg

Dave Workman and Rodney Williams in front of ROV
DSC_0444.jpg

Dave Workman
DSC_0445.jpg

ADCP mounted on port side of ROV cage
DSC_0448.jpg

Deepwater Nautilus Rig
DSC_0457.jpg

 Millennium 14 DSC_0449.jpg	 ROV Control Van DSC_0453.jpg
 ROV Name DSC_0454.jpg	 Camera Configuration DSC_0455.jpg
 Front of ROV DSC_0456.jpg	 Millennium 14 DSC_0458.jpg
 Front of Millennium 14 DSC_0459.jpg	

 Sector Scan Sonar Head DSC_0460.jpg	 Lifeboat DSC_0461.jpg
 Tuna Carcass DSC_0462.jpg	 Tuna DSC_0463.jpg
 Shea McDonald prepping tuna DSC_0464.jpg	 ‘Seabird’ DSC_0465.jpg
 Shea placing tuna on ROV DSC_0466.jpg	 Shea placing tuna on ROV DSC_0467.jpg
	

Shea putting tuna on cage DSC_0469.jpg	Styrofoam cups in bag on cage DSC_0470.jpg
 ROV area DSC_0471.jpg	 Shea, Dave, and Rodney DSC_0475.jpg
 Shea, Dave, and Rodney DSC_0477.jpg	 Shea, Dave and Rodney DSC_0478.jpg
 Rodney flying the ROV DSC_0480.jpg	 Rodney flying the ROV DSC_0482.jpg
 Shea running the winch DSC_0483.jpg	 ROV area during deployment DSC_0484.jpg

 Rig tower DSC_0486.jpg	 Shea running the winch DSC_0487.jpg
 Seascape DSC_0490.jpg	 Shea running the winch DSC_0493.jpg
 Rig floor DSC_0497.jpg	 Rodney at the controls DSC_0498.jpg
 Styrofoam cups before and after DSC_0499.jpg	

MISSION 81

EDDA FAUNA, MORVIN, NORWEGIAN SEA

DANIEL JONES

GENERAL INFORMATION

Client:	STATOIL
Vessel operator:	Deep Sea
Vessel name:	Edda Fauna
Vessel location:	Morvin, Norwegian Sea
Centre position (pipe):	65°08’14.41” N 006°28’40.34 E (International 1924)
Geodesy:	UTM 32 North Datum: ED50 Ellipsoid: International 1924 (Hayfords) Transformation: WGS84 to ED50 using EPSG north of 62° N
Seabed depth:	369 m
Seabed temperature:	6.3°C
ROV operator:	Deep Sea
ROV:	Kyst Design Supporter 5 and Supporter 6

ROV team:

Rune Ksøllesdal	Day shift supervisor
Einar Andreas Gaard	Day shift
Birger Hauge	Day shift
Kristian Lunde	Day shift
Stian Nordberg	Day shift
Kristoffer Vika	Day shift
Kjell Arne Rovik	Night shift supervisor
Arne Tven	Night shift supervisor
Vidar Amdal	Night shift
Øystein Helle	Night shift
Jore Hustoft	Night shift
Kim Rune Sørensen	Night shift

GEAR

Supporter 5 ROV
Supporter 6 ROV (with digital stills and sediment sampling equipment)
Colour video camera
Imenco stills camera (camera altitude 1.55 m from deck)

SERPENT Gear

Box 1

Weight – 40kg
20 x core sampler tubes
20 x 1 L sample bottles
Core processing kit
10x core sampler handles
8 x core sampler holsters
5 x sample buckets
1 x core sampler holding frame
2 x pack of 100 plastic zip-lock bags
2.5 L Formaldehyde
1 x 250ml RNA Later
100 x epindorf sample containers
Stationary
Sample labels

Box 2 – Cool box

Weight 5 kg:
Cool box containing cool bag and extra sample bottles

Box 3 – Black pelican case

Weight – 11 k:
Datalogger Titanium body RBR Model XR-420CTDmTi+pH+DO
Includes conductivity (Marine Conductivity), temperature, pressure and Oxygen (Aanderaa AA 3830 Optode) sensors (pH sensor disabled).
Serial Number: 17023

Coral sampling gear

2 x Aluminium box 750 x 600 x 500 modified for ROV opening. One with wooden division.
4 x polystyrene boxes
150 kg dry ice
Sampling bags

NARRATIVE

Note: All times are all in local time (GMT + 1) as 24 hour clock.

Monday 15th March 2010

Arrived in Kristiansund approx 1900. Stayed at Rica Hotel in town centre.

Tuesday 16th March 2010

).

Transferred onto the Edda Flora at 12:00. Induction and briefings in the afternoon.

The decision was made to conduct survey from Edda Fauna which was due to arrive the next day so transferred off the Edda Flora at 18:00 and stayed overnight in the Quality Hotel in Kristiansund.

Wednesday 17th March 2010

Met the Edda Fauna at Quay 8 in Vestbase.

The ship left the dock at 15:00

Thursday 18th March 2010

Safety briefings and inductions during transit.

Friday 19th March 2010

Gave briefings to survey crew and the ROV

Arrived at Morvin location to start work at 23:00

Saturday 20th March 2010

Core sampling and video transect work continued from 2300 on Friday to the early hours of Sunday morning. See dive log for details.

Sunday 21st March 2010

ROV work was completed by 0130 am and transit was made back to shore in order to collect equipment required for operations.
17:30 Arrive Kristiansund

Initially it was intended that I would return with the ship to Morvin but before departure the decision was made that there was not sufficient time to complete the final set of samples before the weather was due to come up. Therefore arrangements were made to leave the ship and organise onward transport of the samples:

Details: Ivar Pedersen and I unloaded the samples from the Edda Fauna into the warehouse behind Vest Supply in Vestbase, Kristiansund . The three grey polystyrene boxes are on a single pallet in the small warehouse.

Coral samples: There are two boxes. Both are grey polystyrene boxes 50 cm long x 40 cm wide x 60 cm tall. They weigh approximately 15 kg each. They are both full of dry ice. These boxes are labelled with this address: Havforskningsinstituttet Marin miljøkvalitet v/Sonnic Meier, Nordnesgt. 50, 5005 Bergen. The boxes are also marked with the reef name written on the box in pen.

Sediment samples: There is one grey polystyrene box (I sent the sediment in the same sort of box as the coral in dry ice as I wanted to ensure that they remained frozen for as long as possible). 50 cm long x 40 cm wide x 60 cm tall. They weigh approximately 15 kg each. The box contains dry ice. The box is labelled with this address: Nina Aas, Forskningssenter, Arkitekt Ebbellsvei 10, Rotvoll, Trondheim, 7005, Norway. In pen is written Morvin sediment samples.

Equipment dispatch to NOCS is 6 boxes all on a single pallet. Vest-supply will arrange transport. Survey Engineer on Edda Fauna has arranged this (efaprojeng@deepocean.no).

Monday 22nd March 2010

Following discussions with Nina Aas I stayed in Norway for the day to arrange the safe transport of the samples to the addresses mentioned above.

Tuesday 23rd March 2010

Return to UK via Oslo.

The Edda Fauna on Quay 8 at Vestbase, Kristiansund

DIVE LOG

DIVE 1 ROV Supporter 5

Survey start 23:41 at discharge point (E 382157 N 7226380)

23:47 only fish – no inverts observed
23:48 End of full disturbance (77m from discharge pipe) E 382134 N 7226446
23:48:30 first inverts observed (7226450 N)
23:52 End of partial disturbance (125m from discharge pipe) E 382121 N 7226493

Saturday 20th March 2010

Fix 1 – at first major group of animals

Had to stop transect at fix 2 (time 23:56:25; after 180m distance) to jump over anchor chain. Retrieve ROV to 50m and move ship over anchor chain (anchors from nearby Transocean Leader Rig that was still drilling at Morvin).

00:31:40 Restart transect E382104 N 7226543 (Fix 2). Restart at same place as left off

00:34:54 Ridge of pebbles. This is material dumped on a pipeline E 382093 N 7226585

00:41:36 Patch of low invertebrate density

00:44:23 Stichopus seen (not the first observation)

00:47:09 Coral reef
00:50:10 End of coral reef
00:51:30 Geodia sponge
00:52:03 Rubble field
00:55:11 Soft sediments with extensive bioturbation, likely *Geryon* crabs
00:58:18 Lots of invertebrates and rocks
01:02:43 480m into transect
01:10:00 end of transect 600m

Sample site 1: E 381975 N 7226949: D – NEG (downstream negative ~ 600 m from disturbance)

Time	Event	Sample
01:17:40	Core 1	D-NEG 1 (HM / THC)
01:23:40	Core 2	D-NEG 2 (HM / THC)
01:30:27	Core 3	D-NEG 3 (HM / THC)
01:39:11	Core 4	D-NEG 4 (Spare)

Sample site 2 (6 m south of coral reef on transect – reef next to MRRE)

Time	Event	Sample
02:05:30	Core 5	D-MRRE 1 (HM / THC)
02:09:08	Core 6 (on retrieval found large rock in sample)	D-MRRE 4 (Spare)
02:12:02	Core 7	D-MRRE 3 (HM / THC)
02:14:07	Core 8	D-MRRE 2 (HM / THC)

02:16:50 Bring ROV 5 up
02:38:00 ROV 5 on deck

Dive 1 ROV Supporter 6

ROV 6 launched to sample corals at MRRE (2 colonies)

02:23:56 arrived at corals at MRRE
02:27:00 Bivalves in amongst coral with red gills (*Acesta*)
02:39:00 Sampling first part

ROV 6 retrieved

04:22 Finished processing coral samples from MRRE and sediments from D-MRRE and D-NEG. All samples preserved in dry ice.

Dive 2 ROV Supporter 5

04:21 ROV 5 in water
04:50 ROV 5 on seabed

04:53 at sample site D-NV (Downstream no visible disturbance) 135 m from pipe approximately 10 m from the edge of the visible cuttings

Time	Event	Sample
05:00	Core 1	D-NV 1 (HM / THC)
05:07	Core 2	D-NV 2 (HM / THC)
05:09	Core 3	D-NV 3 (HM / THC)
05:14	Core 4	D-NV 4 (Spare)

05:22 at sample site D-PART (Downstream partial disturbance) 100 m from pipe in partial disturbance zone

Time	Event	Sample
05:26	Core 5	D-PART 1 (HM / THC)
05:31	Core 6	D-PART 2 (HM / THC)
05:34	Core 7	D-PART 3 (HM / THC)
05:38	Core 8	D-PART 4 (Spare)

05:58 ROV on deck

Dive 3 ROV Supporter 5

07:06 off deck
07:36 at seabed

At site D-POS (downstream positive – within full disturbance) 50m from discharge pipe
All of these samples were difficult to take. They often fell out between pulling the core tube out of the sediment and storing the core in the grey holster. Most required several attempts.

Time	Event	Sample
07:40	Core 1	No sample retrieved
07:48	Core 2	No sample retrieved

07:58	Core 3	No sample retrieved
08:02	Core 4	D-POS 1 (HM / THC)
08:07	Core 5	No sample retrieved
08:13	Core 6	Small sample that washed out on retrieval

Dive 4 ROV supporter 5

09:37:15 start transect in approximately southerly direction (precise direction based on current flow - upstream)
09:38:07 End of full disturbance (13 m from pipe) E 382164 N 7226362

Fix 1 was first animal

09:39:20 End of partial disturbance (32 m from pipe) E 382169 N 7226345
09:40:00 Stichopus observed (this sea cucumber has been observed to avoid disturbed areas)
09:42:00 Geodia sponge observed
09:45:49 Slope area (quite near coral reef)
09:46:30 rubble
09:49:22 end of transect

10:09 At sample site U-NV (upstream, no visible disturbance) 40 m upstream of pipe

Time	Event	Sample
10:14	Core 1	U-NV 1 (HM / THC)
10:17	Core 2	U-NV 2 (HM / THC)
10:20	Core 3	U-NV 3 (HM / THC)
10:24	Core 4	U-NV 4 (Spare)

10:27 at sample site U-PART (upstream, partial disturbance) 25 m upstream of pipe

Time	Event	Sample
10:31	Core 5	U-PART 1 (HM / THC)
10:33	Core 6	U-PART 2 (HM / THC)
10:36	Core 7	U-PART 3 (HM / THC)
10:39	Core 8	U-PART 4 (Spare)

10:46 at transponder
10:48 leave seabed
12:00 Finish processing
12:00 End shift

20:00 Start shift

Dive 5 ROV supporter 5

20:10 ROV off deck
20:42 Start survey on centre position along approximately easterly transect

20:43:55 End of full (43 m from pipe) E 382170 N 7226413
20:44:13 some sponges but look dead
Fix 1 – start f bioturbation
20:46:00 End of partial cuttings (100m from pipe) E382190 N 7226463
20:46:50 Fix 2 – Stichopus and sponge community

20:50:24 Ripples near anchor chain
20:52:45 Stop transect to go over anchor chain
21:20:30 Resume transect
21:26:47 Stop transect E 382297 N 7226772

East and west transects approximately 430 m in length

21:50:50 Start transect at end of westerly line (heading towards pipe) ~ E 381789 N 7226661
22:01:20 Gravel over pipeline
22:06:26 pause transect to move ship over anchor chain from Transocean Leader

22:32:00 resume survey
22:32:24 End of partial (136m from pipe) E 382049 N 7226457
22:34:36 End of full (90 m from pipe) E 382085 N 7226428
22:38:22 large mound of cuttings visible in sonar
22:39:48 survey end at pipe outlet (centre of survey)

22:49 At location E-PART (East, partial disturbance) 75 m from pipe E 382182 N 7226441

Time	Event	Sample
22:51	Core 1	E-PART 1 (HM / THC)
22:54	Core 2	E-PART 2 (HM / THC)
22:56	Core 3	lost
22:59	Core 4	E-PART 3 (HM / THC)

23:06 at E-NV (East, no visible) 110m from pipe E 382193 N 7226476

Time	Event	Sample
23:10	Core 5	E-NV 1 (HM / THC)
23:13	Core 6	E-NV 2 (HM / THC)
23:17	Core 7	E-NV 3 (HM / THC)
23:19	Core 8 broke	

ROV retrieved

Sunday 21st March 2010

Dive 2 ROV supporter 6

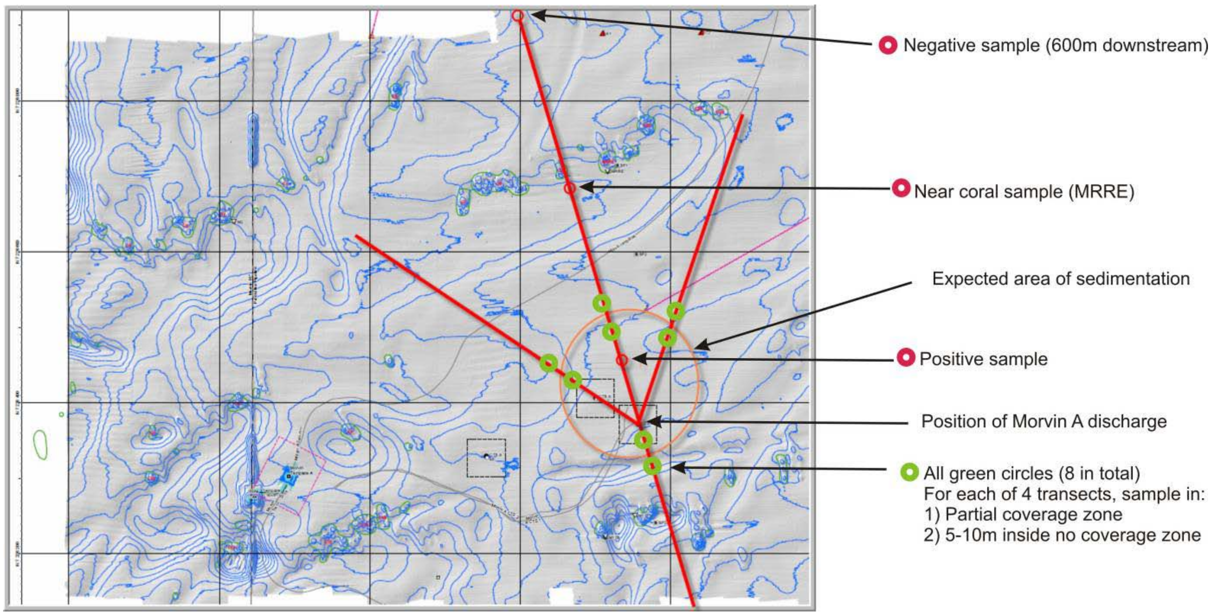
Dive on coral reef M27

00:34 at M27 starting to take samples (using dustpan on handle for sampling – effective)
Sample 1 fell down the front of the drawer
00:40 second sample (large lump) in aluminium box
00:47 sample 3

00:50 Retrieve ROV

SURVEY DESIGN

The survey design is shown in the figure below. This is based on Statoil's modelled cuttings distribution which is represented by the large red circle on this diagram. A video survey is planned to establish the extent of drill cuttings around the well (red lines). The centre point represents the discharge point of the cuttings pipe. Using this information SERPENT will select locations to take push core samples of the seabed inside and outside the "partial disturbance" zone on each transect heading (green circles on the map below). Samples will also be taken within the area of full cuttings coverage (positive disturbance sample), 600m away from the discharge point (negative disturbance sample) and from near the MRRE coral reef. These sampling locations are shown as small red circles on this map.



SAMPLES

The survey plan was followed as strictly as possible during the work at sea. A summary of the samples collected is given here with an extensive sample list below.

During this visit to Morvin core samples and video transects were collected to investigate the extent of the disturbance. Samples of the coral *Lophelia pertusa* MRRE reef were also collected to determine the effects on these important organisms. In addition, and opportunistically some faunal samples were retained from the coral samples. Physical data from the water column were also collected.

Video transects – transects were carried out in three headings downstream of the discharge location and one heading upstream. The transects were analysed (although megafauna were not counted) at sea in order to create a "sediment impact map" to determine the locations for the core samples.

Core samples – Samples were collected upstream of the discharge point, outside (negative) and inside (positive) the cuttings pile, close to the MRRE coral reef and on two of the downstream headings (North and East). Unfortunately it was not possible to take samples on the West heading as planned because the ship returned to Kristiansund early for operational reasons before the final set of samples had been collected.

Coral samples – Small specimens of *L. pertusa* were collected from the MRRE and M27 coral reefs located downstream of the discharge point.

Physical data – temperature, salinity and oxygen data were collected using SERPENT's CTD data logger mounted on the ROV which was set to record these information during all dives.

CODE STRUCTURE:

D = downstream
U = upstream
E = east
NEG = negative
NV = not visible
PART = partial
MRRE = the coral reef of that name

Therefore:

D – NEG:	Downstream negative ~ 600 m from disturbance
D-MRRE:	6 m south of the MRRE coral reef
D-NV:	Downstream no visible disturbance, 135 m from pipe approximately 10 m from the edge of the visible cuttings
D-PART:	Downstream partial disturbance 100 m from pipe in partial disturbance zone
D-POS:	Downstream positive sample – within full disturbance
U-NV:	Upstream, no visible disturbance 40 m upstream of pipe
U-PART:	Upstream, partial disturbance 25 m upstream of pipe
E-PART:	Uast, partial disturbance 75 m from pipe
E-NV:	East, no visible disturbance 110m from pipe

HM = Heavy metals
THC = Hydrocarbons

In the table below the sample locations are bordered by **bold** lines. Each sample alternates Grey and White in colour and contains 2 sections, one of which is for hydrocarbon analysis and one for Heavy Metals.Spare samples are shown in Yellow.

SAMPLE STATIONS:

Station	Sample details	Location	Sample	Type	Preservation
D-NEG	Heavy Metals from 600m Downstream	E 381975 N 7226949	D-NEG 1 HM	Sediment	Frozen
D-NEG	Hydrocarbons from 600m Downstream	E 381975 N 7226949	D-NEG 1 THC	Sediment	Frozen
D-NEG	Heavy Metals from 600m Downstream	E 381975 N 7226949	D-NEG 2 HM	Sediment	Frozen
D-NEG	Hydrocarbons from 600m Downstream	E 381975 N 7226949	D-NEG 2 THC	Sediment	Frozen
D-NEG	Heavy Metals from 600m Downstream	E 381975 N 7226949	D-NEG 3 HM	Sediment	Frozen
D-NEG	Hydrocarbons from 600m Downstream	E 381975 N 7226949	D-NEG 3 THC	Sediment	Frozen
D-NEG	Spare from 600m Downstream	E 381975 N 7226949	D-NEG 4 (Spare)	Sediment	Frozen
D-MRRE	Heavy Metals from Reef MRRE	E 382060 N 7226694	D-MRRE 1 HM	Sediment	Frozen
D-MRRE	Hydrocarbons from Reef MRRE	E 382060 N 7226694	D-MRRE 1 THC	Sediment	Frozen
D-MRRE	Spare from Reef MRRE	E 382060 N 7226694	D-MRRE 4 (Spare)	Sediment	Frozen
D-MRRE	Heavy Metals from Reef MRRE	E 382060 N 7226694	D-MRRE 3 HM	Sediment	Frozen
D-MRRE	Hydrocarbons from Reef MRRE	E 382060 N 7226694	D-MRRE 3 THC	Sediment	Frozen
D-MRRE	Heavy Metals from Reef MRRE	E 382060 N 7226694	D-MRRE 2 HM	Sediment	Frozen
D-MRRE	Hydrocarbons from Reef MRRE	E 382060 N 7226694	D-MRRE 2 THC	Sediment	Frozen
D-NV	Heavy Metals Downstram Not Visible Dist.	E 382121 N 7226506	D-NV 1 HM	Sediment	Frozen
D-NV	Hydrocarbons Downstram Not Visible Dist.	E 382121 N 7226506	D-NV 1 THC	Sediment	Frozen

D-NV	Heavy Metals Downstram Not Visible Dist.	E 382121 N 7226506	D-NV 2 HM	Sediment	Frozen
D-NV	Hydrocarbons Downstram Not Visible Dist.	E 382121 N 7226506	D-NV 2 THC	Sediment	Frozen
D-NV	Heavy Metals Downstram Not Visible Dist.	E 382121 N 7226506	D-NV 3 HM	Sediment	Frozen
D-NV	Hydrocarbons Downstram Not Visible Dist.	E 382121 N 7226506	D-NV 3 THC	Sediment	Frozen
D-NV	Spare Downstram Visible Dist.	E 382121 N 7226506	D-NV 4 (Spare)	Sediment	Frozen
D-PART	Heavy Metals Downstream Partial dist.	E 382130 N 7226468	D-PART 1 HM	Sediment	Frozen
D-PART	Hydrocarbons Downstream Partial dist.	E 382130 N 7226468	D-PART 1 THC	Sediment	Frozen
D-PART	Heavy Metals Downstream Partial dist.	E 382130 N 7226468	D-PART 2 HM	Sediment	Frozen
D-PART	Hydrocarbons Downstream Partial dist.	E 382130 N 7226468	D-PART 2 THC	Sediment	Frozen
D-PART	Heavy Metals Downstream Partial dist.	E 382130 N 7226468	D-PART 3 HM	Sediment	Frozen
D-PART	Hydrocarbons Downstream Partial dist.	E 382130 N 7226468	D-PART 3 THC	Sediment	Frozen
D-PART	Spare Downstream Partial dist.	E 382130 N 7226468	D-PART 4 (Spare)	Sediment	Frozen
D-POS	Heavy Metals Downstream Positive Dist.	E 382143 N 7226425	D-POS 1 HM	Sediment	Frozen
D-POS	Hydrocarbons Downstream Positive Dist.	E 382143 N 7226425	D-POS 1 THC	Sediment	Frozen
U-NV	Heavy metals Upstream Not Visible Dist.	E 382172 N 7226331	U-NV 1 HM	Sediment	Frozen
U-NV	Hydrocarbons Upstream Not Visible Dist.	E 382172 N 7226331	U-NV 1 THC	Sediment	Frozen
U-NV	Heavy metals Upstream Not	E 382172 N 7226331	U-NV 2 HM	Sediment	Frozen

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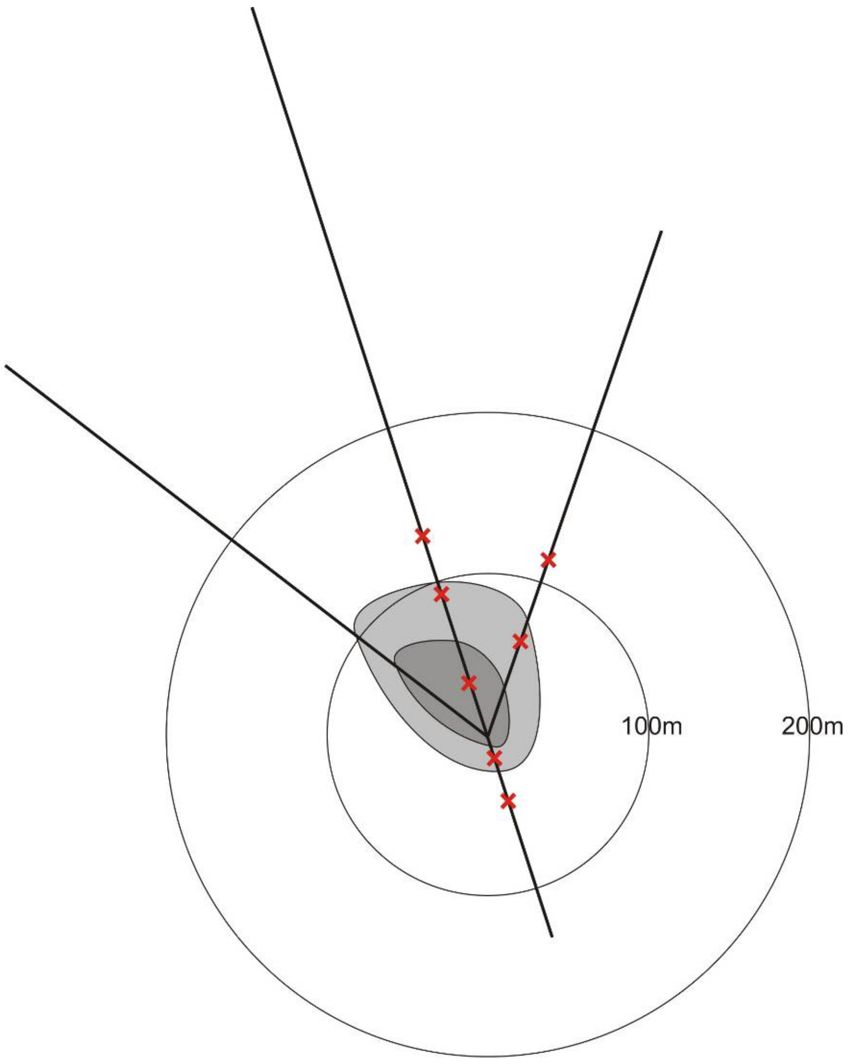
	Visible Dist.				
U-NV	Hydrocarbons Upstream Not Visible Dist.	E 382172 N 7226331	U-NV 2 THC	Sediment	Frozen
U-NV	Heavy metals Upstream Not Visible Dist.	E 382172 N 7226331	U-NV 3 HM	Sediment	Frozen
U-NV	Hydrocarbons Upstream Not Visible Dist.	E 382172 N 7226331	U-NV 3 THC	Sediment	Frozen
U-NV	Spare Upstream Not Visible Dist.	E 382172 N 7226331	U-NV 4 (Spare)	Sediment	Frozen
U-PART	Heavy metals Upstream Partial Dist.	E 382168 N 7226350	U-PART 1 HM	Sediment	Frozen
U-PART	Hydrocarbons Upstream Partial Dist.	E 382168 N 7226350	U-PART 1 THC	Sediment	Frozen
U-PART	Heavy metals Upstream Partial Dist.	E 382168 N 7226350	U-PART 2 HM	Sediment	Frozen
U-PART	Hydrocarbons Upstream Partial Dist.	E 382168 N 7226350	U-PART 2 THC	Sediment	Frozen
U-PART	Heavy metals Upstream Partial Dist.	E 382168 N 7226350	U-PART 3 HM	Sediment	Frozen
U-PART	Hydrocarbons Upstream Partial Dist.	E 382168 N 7226350	U-PART 3 THC	Sediment	Frozen
U-PART	Spare Upstream Partial Dist.	E 382168 N 7226350	U-PART 4 (Spare)	Sediment	Frozen
E-PART	Heavy metals East Partial Disturbance	E 382182 N 7226441	E-PART 1 HM	Sediment	Frozen
E-PART	Hydrocarbons East Partial Disturbance	E 382182 N 7226441	E-PART 1 THC	Sediment	Frozen
E-PART	Heavy metals East Partial Disturbance	E 382182 N 7226441	E-PART 2 HM	Sediment	Frozen
E-PART	Hydrocarbons East Partial Disturbance	E 382182 N 7226441	E-PART 2 THC	Sediment	Frozen
E-PART	Heavy metals East Partial Disturbance	E 382182 N 7226441	E-PART 3 HM	Sediment	Frozen
E-PART	Hydrocarbons East Partial Disturbance	E 382182 N 7226441	E-PART 3 THC	Sediment	Frozen
E-NV	Heavy metals East. Not	E 382193 N 7226476	E-NV 1 HM	Sediment	Frozen

	visible Dist				
E-NV	Hydrocarbons East. Not visible Dist	E 382193 N 7226476	E-NV 1 THC	Sediment	Frozen
E-NV	Heavy metals East. Not visible Dist	E 382193 N 7226476	E-NV 2 HM	Sediment	Frozen
E-NV	Hydrocarbons East. Not visible Dist	E 382193 N 7226476	E-NV 2 THC	Sediment	Frozen
E-NV	Heavy metals East. Not visible Dist	E 382193 N 7226476	E-NV 3 HM	Sediment	Frozen
E-NV	Hydrocarbons East. Not visible Dist	E 382193 N 7226476	E-NV 3 THC	Sediment	Frozen
MRRE			MRRE C1 S1	Coral	Frozen
MRRE			MRRE C1 S2	Coral	Frozen
MRRE			MRRE C1 S3	Coral	Frozen
MRRE			MRRE C1 S4	Coral	Frozen
MRRE			MRRE C1 S5	Coral	Frozen
MRRE			MRRE C1 S6	Coral	Frozen
MRRE			MRRE C2 S1	Coral	Frozen
MRRE			MRRE C2 S2	Coral	Frozen
MRRE			MRRE C2 S3	Coral	Frozen
MRRE			MRRE C2 S4	Coral	Frozen
MRRE			MRRE C2 S5	Coral	Frozen
MRRE			MRRE C2 S6	Coral	Frozen
MRRE			MRRE associated fauna	Associated fauna	Frozen
M27			M27 C1 S1	Coral	Frozen
M27			M27 C1 S2	Coral	Frozen
M27			M27 C1 S3	Coral	Frozen
M27			M27 C1 S4	Coral	Frozen
M27			M27 C1 S5	Coral	Frozen
M27			M27 C1 S6	Coral	Frozen
M27			M27 C2 S1	Coral	Frozen
M27			M27 C2 S2	Coral	Frozen
M27			M27 C2 S3	Coral	Frozen
M27			M27 C2 S4	Coral	Frozen
M27			M27 C2 S5	Coral	Frozen
M27			M27 C2 S6	Coral	Frozen
M27			M27 C3 S1	Coral	Frozen
M27			M27 C3 S2	Coral	Frozen
M27			M27 C3 S3	Coral	Frozen
M27			M27 C3 S4	Coral	Frozen
M27			M27 C3 S5	Coral	Frozen
M27			M27 C3 S6	Coral	Frozen
M27			M27 Associated fauna	Associated fauna	Frozen

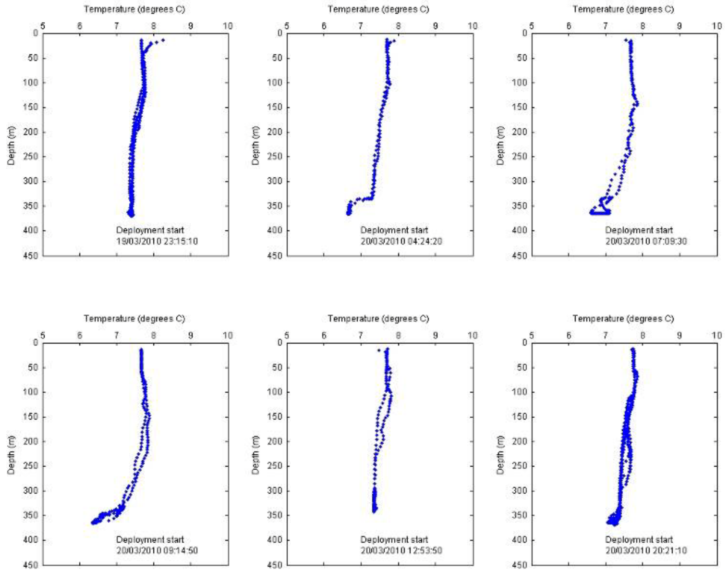
Cuttings distribution

Video transects were carried out along the paths shown in the following diagram. The centre point represents the discharge point of the cuttings pipe. The circles on this diagram represent 100m scale rings from the centre. The dark grey circle represents full coverage of the seabed with cuttings. The light grey circle represents partial coverage with cuttings. Seabed core samples collected from the disturbed area are shown here as red crosses. Additional sediment samples were collected at 600m from the well and close to the MRRE coral reef.

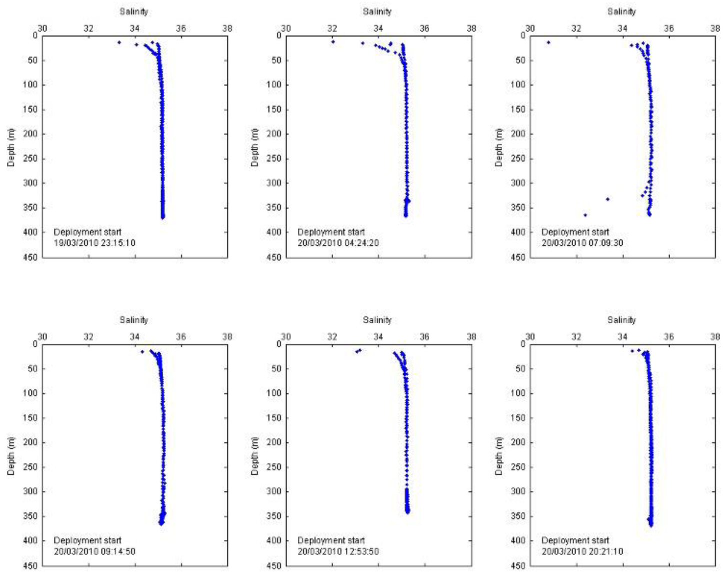


Physical Data

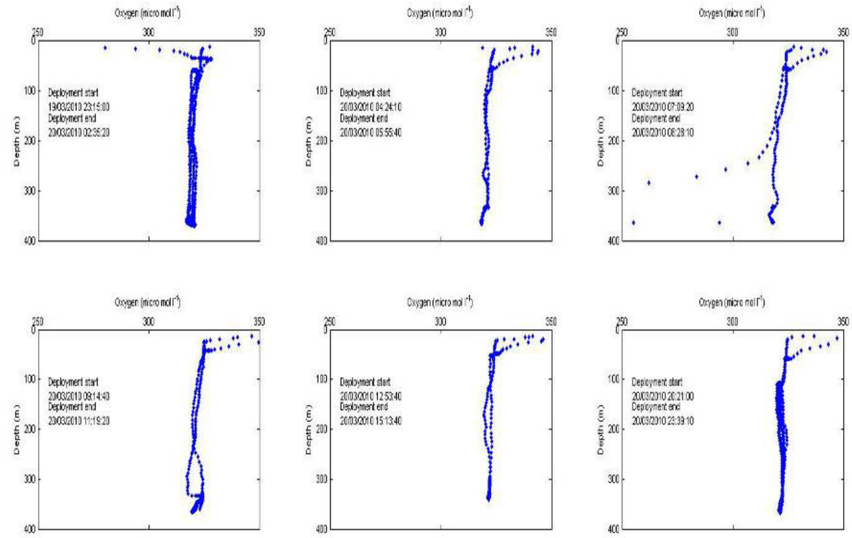
Water column temperature profiles for each deployment of ROV Supporter 5 at Morvin



Water column salinity profiles for each deployment of ROV Supporter 5 at Morvin



Water column oxygen profiles for each deployment of ROV Supporter 5 at Morvin



MISSION 82

BORGSTEN DOLPHIN, LANCASTER 2, WEST OF SHETLAND

ANDREW GATES

1. GENERAL INFORMATION:

Well name: Well 205/21a-C (Lancaster)
Rig Name: *Borgsten Dolphin*
Rig Operator: AGR/Dolphin
Client: Hurricane Exploration (HEX)

Dates of visit: Tuesday 24th May – Tuesday 1st June 2010

Position: 60° 11' 13.738 N, 003°51'18.497 W
Depth: 155m
Seabed temperature: 9.4°C

ROV Operator: Subsea 7
ROV: Pioneer 027
ROV team:

Day Supervisor	Tony Church
Day Pilot	Rich Cowie
Day Pilot	Derrick Souter
Night Supervisor	Brendan Dunne
Night Pilot	Allan Proctor
Night Pilot	Scott Rennie

SERPENT Representative: Dr. Andrew Gates

2. GEAR:

The Subsea 7 Pioneer 027 ROV was equipped with suitable video camera systems and good manipulator arm functions. The 5 function arm did not fit the core sampler holder perfectly but addition of some padding to the T-bar ensured that a workable solution was reached. Some maintenance was required on the ROV during the visit including some work to fit the digital stills camera at the start of the visit (detailed below), some repairs to the tether which was causing problems during the video transect work and some maintenance to fix a leak alarm. Overall little time was lost to maintenance.

On arrival at the rig there was no Sonar available on the ROV. It was not initially clear if it was the Sonar head or the software that had failed but the team were waiting on replacements. It turned out that it was a software problem. The spare arrived and was fitted half way through the visit which enabled more accurate navigation around the site.

The Kongsberg OE-14 digital stills camera produced some good images although there were some problems setting up the camera. This was related to integration with the system in place on the Pioneer ROV (the camera worked during testing in the control room). It was identified that it was not getting enough power, this was resolved and the camera worked well. Later in the visit there was an intermittent fault with the camera in which it would fail to start up. This seemed to be relieved by leaving the camera switched on for a long period of time before it was required. This problem also occurred when in USB mode causing problems with the photo download. This was resolved by leaving the camera connected to the power source and switched on for the rest of the morning.

Current meter: The current meter was again deployed at Lancaster. The current meter was mounted in the base of a weighted traffic cone and worked successfully.

CTD: The CTD logged Conductivity (salinity), temperature, depth and oxygen on all dives during the visit to Lancaster. The device was simple to use although instead of downloading data at the end of each day it is likely to be possible to leave the device logging for the whole trip as battery life was unaffected over the 7 days. Reliable data were acquired from the conductivity, temperature, depth and oxygen sensors Synchronization of wrist watch, PC and CTD time, also note time difference to video log on ROV.

There were a number of operational problems at the start of the well which delayed running the BOP. This enabled dedicated SERPENT ROV time for the duration of the visit. The visit concluded when the ROV was required for running the BOP

3. NARRATIVE:

Monday 24rd May 2010 – Travel to Aberdeen on the 1905 flight from Southampton. Stay overnight at the Speedbird Inn at Aberdeen airport.

Tuesday 25th May 2010 – Check-in 0700 at Bristows. Arrival at *Borgsten Dolphin* 1000 followed by safety induction and tour of the rig. Lunch with Robert Trice and out to ROV to meet Tony Church and the dayshift team. I spent the afternoon preparing SERPENT equipment (current meter, CTD and core sampler) whilst the ROV team started to set up the stills camera. The team were having some problems with the camera because there was not enough power for it. They replaced some faulty equipment and left it with the nightshift.

Wednesday 26th May 2010 – 0600, out to ROV. The nightshift team had apparently fixed the problems with the stills camera.

Morning meeting 0730. It was reported that there were to be delays with the drilling so SERPENT work should go ahead ASAP. However, despite the apparent overnight fix, there were still some power problems with the stills camera. The dayshift crew worked hard to solve the problem but it was not until late on in the shift when the vehicle was ready for diving. During the day I had assisted to dismantle and reassemble the pan and tilt unit to fit the stills camera and the flash alongside the usual video camera and lights.
After dinner I was back out at the ROV to work with the night shift. Following pre-dive checks, with a plan of visiting the overtrawlable structure to investigate the shoals of fish reportedly inhabiting the area the ROV was launched:
ROV off deck 1950
Unfortunately the video zoom camera went down and there was a leak alarm at 1959 and the ROV was recovered. Although not a serious problem it would take some time to fix so I went in at 2130.

Thursday 27th May 2010 – Out to the ROV 0625. The ROV had been fixed overnight and was in the water with the stills camera working. Overnight Brendan and the rest of the nightshift crew had spent some time collecting “ecohgihlights” footage for me. The most significant find was some footage of the squat lobster, *Munida* sp. feeding on krill, similar to that recorded on the first SEPRENT mission to Schiehallion (in close proximity to Lancaster) in 2003.
There was no Sonar available which made carrying out the video transects impossible at this stage so we spent the morning continuing to collect ecological highlights data. A variety of organisms were observed and both photographic and video data were collected. Observations included Asteroids, amphipods, barnacles and sponges. In addition it became apparent that, apart from the main cuttings pile close to the guidebase, the disturbance from last year’s drilling operations was hard to distinguish. The exception was litter, which was seen commonly on this preliminary survey.
The ROV was recovered at the end of the morning.
ROV on deck 1120.
I prepared for the next dive by setting the CTD datalogger to record for the next 2 days and loading the core sampling equipment to the five-function arm. It was decided that because the poor navigation, owing to the lack of Sonar, the best course of action was to start work that could be carried out close to the guidebase. We planned to start the core sampling programme at the guidebase.
ROV off deck 1416.
ROV at depth 1422.
The first samples were taken on the cuttings pile very close to the guidebase. This team had not used such samplers before but successfully cored the soft drill cuttings.
First sample 1445.
Final (6th) sample 1554.
Six samples were collected in this area before a brief section of video footage was taken of the seabed to show the area sampled and then recovery to the rig.
ROV back on deck 1605.
I downloaded the data from the datalogger on return to the surface and before going in for the day.

Friday 28th May 2010 – 0630 out to ROV. With very calm weather and small swell the corers were again loaded to the ROV and the CTD datalogger set. The ROV was launched to collect core samples further from the source of disturbance.
ROV off deck 0840
ROV out of TMS 0850
Again without Sonar, it was necessary to take the samples in an identifiable location. For this reason we decided that the samples would be collected close to the TMS which was located below the ROV control room on the rig and about 20-30m east of the well. It was not possible to use the push corers correctly in the more natural, gravel and rocky sediment so scrape samples were taken.
Start of sample collection 0901.
First sample completed 0928.
Final (6th) sample completed 1059.
During this dive the samples were successfully taken and some other interesting faunal observations were made including a large colony of the ascidian *Clavelina lepadiformis*.

ROV back on deck 1124.
The samples were processed and preserved before lunch.

ROV off deck 1440.
A further series of samples were collected at greater distance from the guidebase. Without the operational Sonar it was not possible to determine the exact location but based on heading and the amount of tether released it was estimated that this location was approximately 75m to the E of the well.
First sample: 1515
Final (6th) sample: 1606.
Back to TMS: 1610
ROV back on deck 1630 and I processed the samples before dinner.
I joined the nightshift to see if I could continue sampling but the new Sonar had arrived during the day so they planned to fit it in time for more SERPENT work the following day. I set the current meter up for deployment and Brendan agreed to put it close to the overtrawlable structure when they dived to test the Sonar.

Saturday 29th May 2010 – Sonar mended by night shift. Night shift also deployed the current meter close to the overtrawlable structure, which started logging at 0800. Plan to make use of the sonar to carry out the video transect survey.
ROV off deck 0824.
TMS at depth 0830.
Fly over to the overtrawlable structure to move the current meter as it was too close to the large structure which would likely affect the hydrodynamic regime.
Video transects were planned to be carried out using the guidebase as a Sonar target so that distances could be accurately recorded.
With the guidewires and the overtrawlable structure providing obstacles to key transect headings it was important to ensure the tether was not likely to be caught up, for this reason we would initially only attempt the transects to the north and east of the well before proceeding cautiously from there.
ROV transects started 0859.
4 transects successfully completed by 1035.
The fifth transect was abandoned because problems with the tether paying in and out when travelling into the current. The ROV was recovered to investigate this fault.
ROV on deck 1130.
After lunch the ROV team worked on the TMS.
During the afternoon I spent time downloading and working on the data from the dives to date with the CTD. I was informed that some whales were seen close to the rig by the drill crew. I spent some time watching for whales that afternoon but there was no further sign of them.

Sunday 30th May 2010 – The night-shift ROV team burned the DVDs over night.
Morning meeting 0715: There were still problems with the BOP crane so no operational dives yet and SERPENT work can continue.
I downloaded the stills photographs from the trip so far after some minor problems with the kit (see “gear” section).
To test the TMS before continuing the transect survey we decided to complete the Ekman sampling.
ROV off deck 1000.
First sample attempted 1024 but it didn’t close properly.
Inside for lunch and the *Borgsten Dolphin’s* weekly safety meeting (1300).
ROV off deck 1346
At depth 1350
Again the sampler won’t close properly even on the finer sediment close the guidebase.
Back on deck 1425.
Adjust the length of the cables on the Ekman to prevent pebbles from getting stuck between the box and the arms.
ROV at seabed 1500.

Sample successfully collected at 1525 and samples processed .
As the Sonar was now working well I went back out to ROV with the night shift at 1900 to try and complete the video transect survey.
ROV off deck 1930.
At depth 1940.
First transect started 1955.
Final transect completed at 2100.

Monday 31st May 2010 – I arranged to leave the *Borgsten Dolphin* because progress had been made on the BOP and the ROV will be required for operational work in the near future. I packed up the samples and sent them back to Southampton. With some final tasks to complete the ROV was launched.
ROV off deck 1300.
Some ecological highlights (*Gadus morhua*, *Molva molva*, *Cancer pagurus*) data were collected around the guidebase and then the current meter was recovered. During this dive I was given the opportunity to fly the ROV.
ROV back on deck 1425.
I downloaded the data from the current meter and CTD and the instruments packed away and stored in the Subsea 7 container ready for the next visit.

Tuesday 1st June 2010 - I took the chopper back to Aberdeen at 0930. Returned to Southampton on the 1255 Eastern Airways flight.

4. SAMPLES:

VIDEO TRANSECTS:

The 2009 video transect survey was repeated. To the west of the well it was not possible to reach the full 100m extent because of the limitation of the tether length and the position of the TMS to the east of the well. The transect headings and lengths are shown in Figure 1 and the location of sediment sampling stations is also shown.

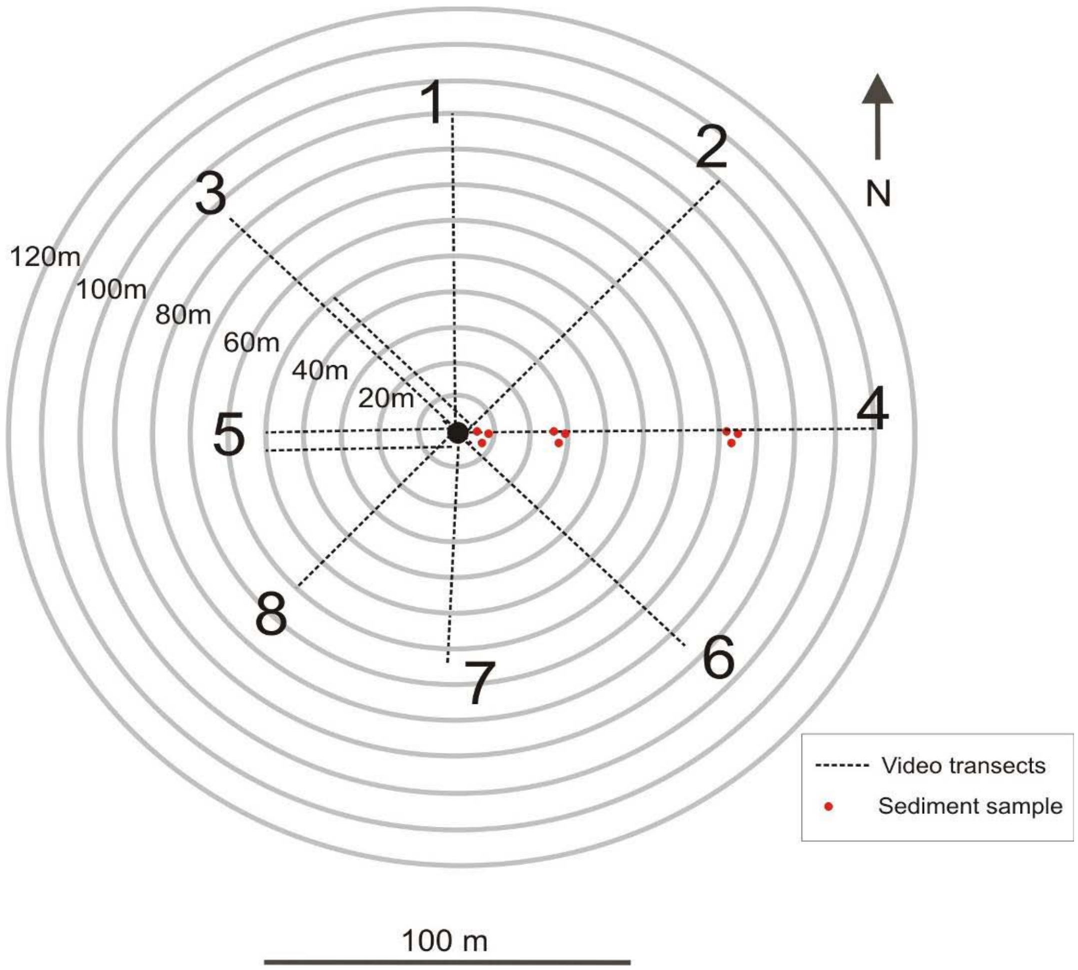


Figure 1: A map of the video transects and sediment sampling locations at Lancaster in 2010.

PUSH CORE SAMPLES

Sediment samples were collected using ROV operated push corers. 6 samples were collected at each site: Near (5m), Intermediate (30m) and Far (80m). Although ROV operated push corers were used, because of the nature of the sediment it was not possible to collect quantitative samples so the corers were used to scrape sediment from the surface.

At each site 5 of the samples were preserved in Formalin for meiofaunal analysis and one frozen for chemical analysis. In addition a small subsample was taken from each sample to analyze the bacterial content, an important consideration in the recovery of benthic communities.

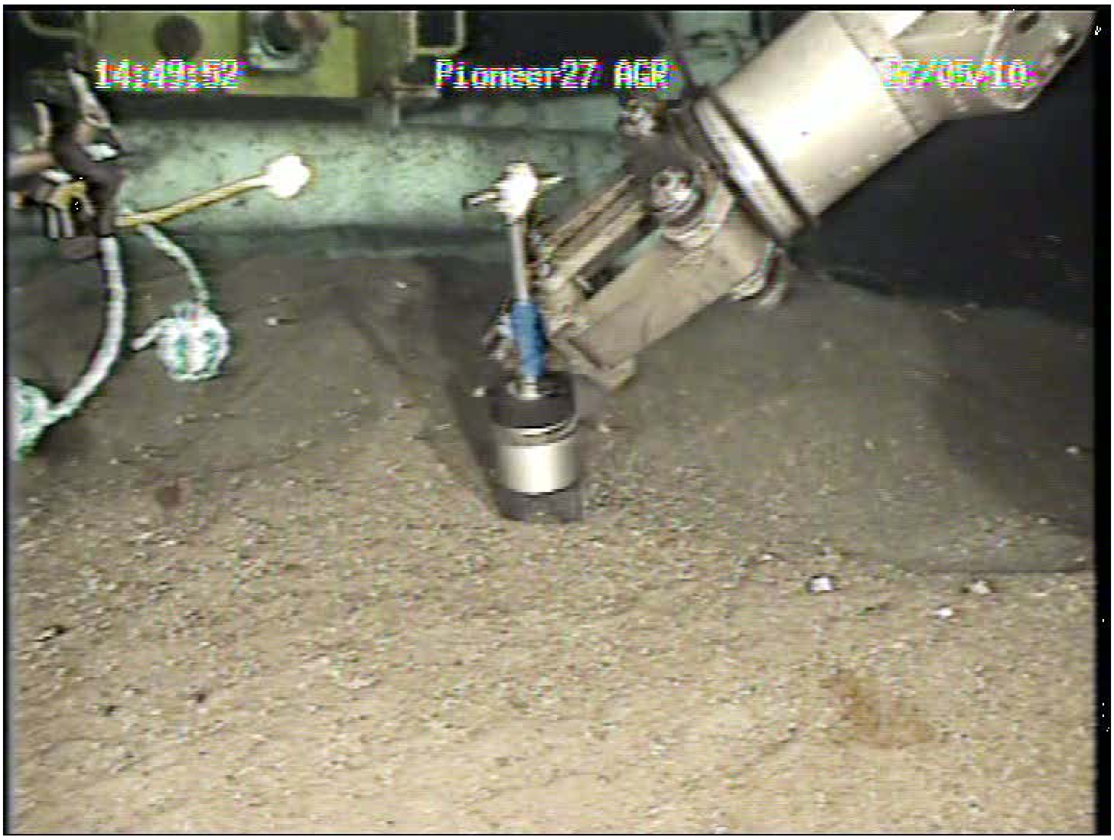


Figure 2: Collection of push core samples close to the guidebase at Lancaster.

EKMAN SAMPLES

Sediment samples were also collected using the ROV operated Ekman sampler. Only 1 sample was collected at each of the sampling sites because one dive is required for each deployment. The Ekman sampler was most successful at the cuttings pile site because of the softer sediment remaining from the drill cuttings but samples were obtained at greater distance by selection of positions away from larger rocks. The samples were preserved in Formalin and returned to Southampton for analysis of the macrofauna.

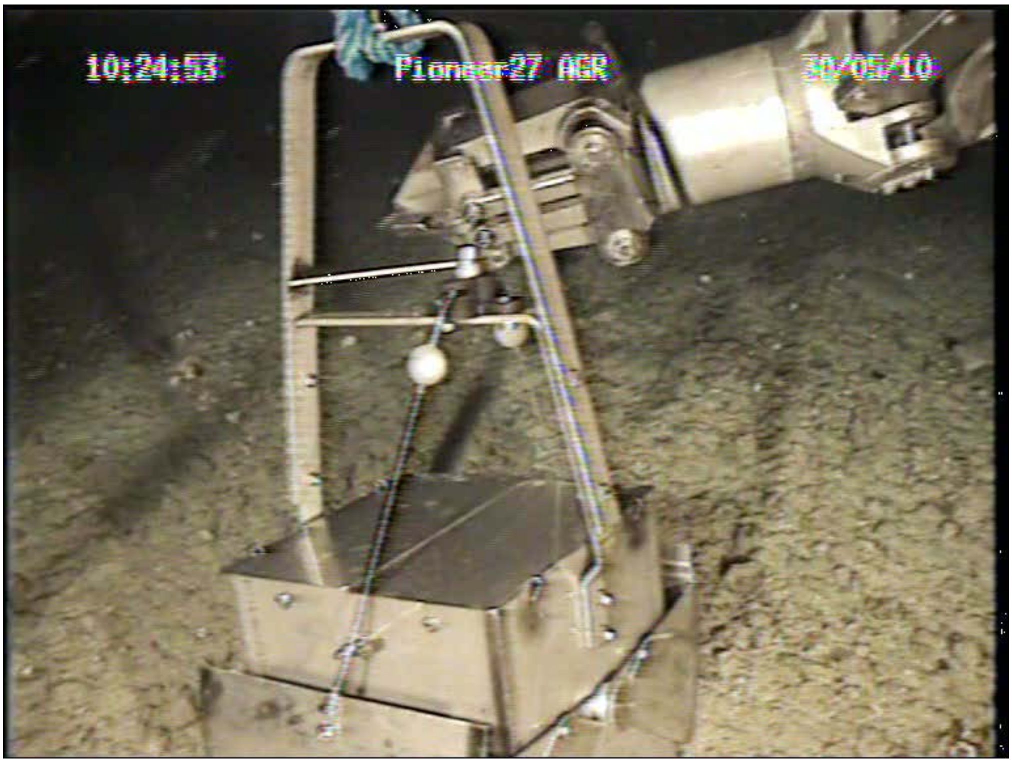


Figure 3: Deployment of the Ekman sampler. The sampler was held in the 5-function manipulator arm, pushed into the sediment and the trigger mechanism operated with the 7-function arm.

SENSOR DATA

Environmental data were also collected from sensors deployed during the visit. These include a seabed mounted current meter (Figure 4) and a CTD datalogger attached to the ROV to monitor temperature, salinity and Oxygen concentration with depth in the water column. As an example the temperature profiles for the dives up to 27.05.2010 are shown in Figure 5. Further analysis is required on the other parameters.

Figure 4: Deployment of the current meter at Lancaster

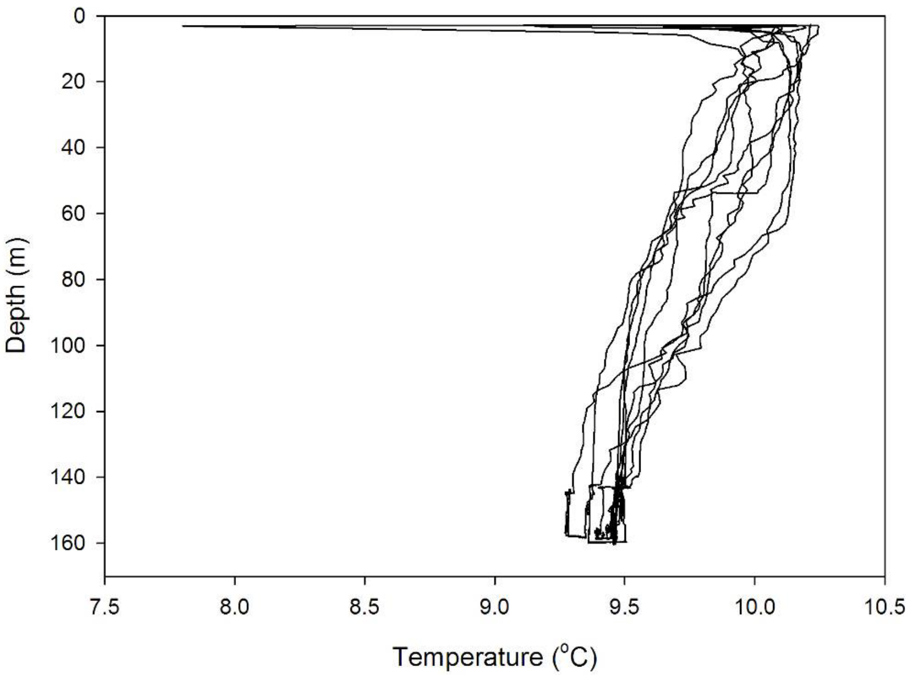


Figure 5: Temperature profile for dives at Lancaster up to 27.05.2010

SAMPLE LIST

The sediment samples, video data and sensor data collected at Lancaster are listed below:

CODE STRUCTURE:

BD/250510/001#1
Borgsten Dolphin / Date / ROV SERPENT dive log # replicate

Sample reference	Location	Sample type	Details
BD/270510/001 #1	At guidebase	Meiofauna push core	Formalin
BD/270510/001 #2	At guidebase	Microbial ecology subsample	Frozen
BD/270510/002 #1	At guidebase	Meiofauna push core	Formalin
BD/270510/002 #2	At guidebase	Microbial ecology subsample	Frozen
BD/270510/003 #1	At guidebase	Meiofauna push core	Formalin
BD/270510/003 #2	At guidebase	Microbial ecology subsample	Frozen
BD/270510/004 #1	At guidebase	Meiofauna push core	Formalin
BD/270510/004 #2	At guidebase	Microbial ecology subsample	Frozen
BD/270510/005 #1	At guidebase	Meiofauna push core	Formalin
BD/270510/005 #2	At guidebase	Microbial ecology subsample	Frozen
BD/270510/006	At guidebase	Chemical push core	Frozen
BD/280510/007#1	Intermediate distance (30m)	Meiofauna scrape sample	Formalin
BD/280510/007#2	Intermediate distance (30m)	Microbial ecology subsample	Frozen
BD/280510/008#1	Intermediate distance (30m)	Meiofauna scrape sample	Formalin
BD/280510/008#2	Intermediate distance (30m)	Microbial ecology subsample	Frozen
BD/280510/009#1	Intermediate distance (30m)	Meiofauna scrape sample	Formalin
BD/280510/009#2	Intermediate distance (30m)	Microbial ecology subsample	Frozen
BD/280510/010#1	Intermediate distance (30m)	Meiofauna scrape sample	Formalin
BD/280510/010#2	Intermediate distance (30m)	Microbial ecology subsample	Frozen
BD/280510/007#1	Intermediate distance (30m)	Meiofauna scrape sample	Formalin
BD/280510/007#2	Intermediate distance (30m)	Microbial ecology subsample	Frozen
BD/280510/011#1	Intermediate distance (30m)	Meiofauna scrape sample	Formalin
BD/280510/011#2	Intermediate distance (30m)	Microbial ecology subsample	Frozen
BD/280510/012	Intermediate distance (30m)	Chemical scrape sample	Frozen
BD/280510/013	Intermediate distance (30m)	Macrofauna scrape sample	Formalin
BD/280510/014#1	Far (75m)	Meiofauna scrape sample	Formalin

BD/280510/014#2	Far (75m)	Microbial ecology subsample	Frozen
BD/280510/015#1	Far (75m)	Meiofauna scrape sample	Formalin
BD/280510/015#2	Far (75m)	Microbial ecology subsample	Frozen
BD/280510/016#1	Far (75m)	Meiofauna scrape sample	Formalin
BD/280510/016#2	Far (75m)	Microbial ecology subsample	Frozen
BD/280510/017#1	Far (75m)	Meiofauna scrape sample	Formalin
BD/280510/017#2	Far (75m)	Microbial ecology subsample	Frozen
BD/280510/018#1	Far (75m)	Meiofauna scrape sample	Formalin
BD/280510/018#2	Far (75m)	Microbial ecology subsample	Frozen
BD/280510/019	Far (75m)	Chemical scrape sample	Frozen
BD/280510/020	Far distance (75m)	Macrofauna sample	Formalin
BD/300510/021	At guidebase	Macrofauna sample	Formalin
BD/300510/022	At guidebase	Macrofauna sample	Formalin
BD/290510/023	90m N of guidebase	ROV video transect	DVD
BD/290510/024	100m NE guidebase	ROV video transect	DVD
BD/290510/025	85m NW guidebase	ROV video transect	DVD
BD/290510/026	>100m E guidebase	ROV video transect	DVD
BD/290510/027	50m W guidebase	ROV video transect	DVD
BD/300510/028	85m SE guidebase	ROV video transect	DVD
BD/300510/029	65m S guidebase	ROV video transect	DVD
BD/300510/030	50m W guidebase	ROV video transect	DVD
BD/300510/031	60m SW guidebase	ROV video transect	DVD
BD/300510/032	60m NW guidebase	ROV video transect	DVD
BD/310510/033	30m NW of guidebase	Current data	SD card
BD/310510/034	Water column	8 dives of CTD data	Hard disc

5. OBSERVATIONS

DISTURBANCE OBSERVATIONS

Eight video transects carried out, each extending to approximately 100 m from the BOP in each of the main headings.
Observations of sediment and notes on classification into Partial, Total coverage and unimpacted seabed are shown in the table below:

The cuttings pile with the guidebase at the top. The guidewires can also be seen lying from the top right of the picture to the bottom left.	
Sediment environment at approximately 30m from the well	
Sediment at 60-70m from the well	

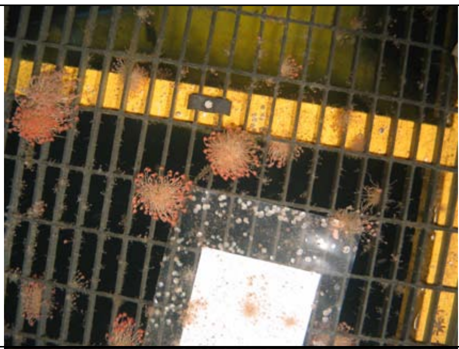
FAUNAL OBSERVATIONS

Date	Time	Observation	Photo/video grab
27.05.2010	01:55	*Anseropoda placenta*, the goosefoot star	
27.05.2010	02:29	A typical bethic scene at Lancaster. Rocky substratum with Squat lobster, *Munida* sp. (foreground),Bryozoan and small spider crab, perhaps *Macropodia* sp.	
27.05.2010	02:59	Krill, likely *Meganictyphanes norvegica* were abundant at times and were attracted to the ROV lights.	
27.05.2010	03:02	Squat lobsters, *Munida* sp. were common around the rocks at Lancaster.	

27.05.2010	03:05	Galatheid squat lobster under sponge/bryozoan	
27.05.2010	03:16	*Molva molva*, ling hiding under a rock	
27.05.2010	03:30	The mutualistic relationship between the hermit crab *Pagurus prideaux* and the anemone *Adamsia carcinopados*	
27.05.2010	04:40	*Munida sarsi* feeding on krill	

27.05.2010	07:25	Anemone	
27.05.2010	07:34	Bryozoan (left), *Reteporella* sp. and an asteroid feeding on a hydroid.	
27.05.2010	07:54	Asteroid, *Stichastrella rosea*	
27.05.2010	08:13	Colonial anemones, *Parazoanthus* sp?	

27.05.2010	08:32	Ascidian	
27.05.2010	09:08	Small sponges?	
27.05.2010	09:23	*Cancer pagurus*	
27.05.2010	10:28	*Porania pulvillus*	

27.05.2010	14:36	Hydroids (likely *Tubularia* sp.) growing on the overtrawlable structure	
28.05.2010	09:27	*Clavelina lepadiformis*	
30.05.2010	13:25	Cod (*Gadus morhua*) near the guide wires	

Observations of litter

It was noted that there was a large amount of litter on the seabed at Lancaster, perhaps articles lost overboard during operations the previous year. Examples of the observations are shown in the table below:

Date	Time	Observation	Photo/video grab
27.05.2010	09:08	Welding rod or wire?	
29.05.2010	09:14	Cable seen 40m NE of the well	
30.05.2010	19:59	Large sling seen at 50m to the SE of the guidebase	
30.05.2010	20:00	Grease gun 40-50m SE of the well.	

MISSION 83 & 84

BORGSTEN DOLPHIN, WHIRLWIND, WEST OF SHETLAND

ANDREW GATES

1: GENERAL INFORMATION:

Well name: Whirlwind (UK well 205/21a-5)
Rig Name: *Borgsten Dolphin*
Rig Operator: AGR/Dolphin
Client: Hurricane Exploration (HEX)

Dates of visit
Visit 1: Friday 10th September – Tuesday 14th September 2010
Visit 2: Sunday 4th October – Monday 11th October 2010

Position: 60^{o}11'13.738"N 003^{o}50'19.071W
Depth: 184m
Seabed temperature: 10.1^{o}C

ROV Operator: Subsea 7
ROV: Pioneer 027
ROV team:

Visit 1	Supervisor	Nick Crownshaw
	Pilot	Derrick Cruickshanks
	Pilot	Slavomir Gasecki
Visit 2	Supervisor	Glynn Westwood
	Pilot	Allan Proctor
	Pilot	Slavomir Gasecki

SERPENT Representative: Dr. Andrew Gates

2. GEAR:

The Subsea 7 Pioneer 027 ROV was equipped with suitable video camera systems and good manipulator arm functions. The ROV was a bit short of power for the transect work in the strongest of currents, particularly during the first visit. There was no working depth meter on the ROV and the compass did not work well.

Initially there was too much interference with the Sonar meaning it was not possible to determine Sonar targets such as the BOP from the seabed, however this was easily resolved by turning the threshold down (bar on the left hand side of the monitor).

The Kongsberg OE-14 digital stills camera was fully operational when I arrived although the ROV crew did have to rewire the cable to their power unit in the first visit. Some good images were obtained but on occasions the flash would fail. This could be resolved by resetting the camera. The camera continued to function well during the second visit.

CTD: The CTD logged Conductivity (salinity), temperature, depth and oxygen on all dives during the visits to Whirlwind. Reliable data were acquired from all the sensors Synchronization of wrist watch, PC and CTD time allowed for comparison with dive log notes although it was necessary to record the time difference to video log on ROV as this was not correct.

Timelapse camera: The frame was put together with relative ease. However, it was constructed outside the control room and before deployment containers had been moved around the rig blocking the route to the ROV. It is a bulky device to manoeuvre around the rig so it is important to ensure that there is an easy route to the vehicle or build the frame close to the vehicle.

The timelapse camera worked well when tested on deck. It was deployed 30m to starboard of the BOP. On recovery it was clear that the flash hadn't worked. On examination of the camera, flash and cable a cut was found in the cable that suggested it had been being pinched. Water leaked out of the cable so it was clear that this was the problem. A new cable was connected and the deployment repeated the following day. On deployment the camera was observed to ensure the flash was operating at the programmed time. This was the case so the camera was left for 24 hours (see attached documents for deployment settings).

3. NARRATIVE:

Thursday 9th September 2010 – Travel to Aberdeen on the 1925 Eastern Airways flight from Southampton. Stay overnight at the Speedbird Inn at Aberdeen airport.

Friday 10th September 2010 – Check-in 1100 at Bristows. Arrival on *Borgsten Dolphin* 1400 followed by safety induction and tour of the rig. On arrival I saw Allan Proctor (ROV) at crew handover. He informed me of the video data they had collected pre-drill. Out to ROV to meet the ROV crew and have a look at the data already collected before drilling (24/08/2010).

Saturday 11th September 2010 – 0715 morning meeting. Out to ROV after meeting. Good weather for diving. In the morning we set up SERPENT equipment including datalogger and stills camera.
Pre-dive checks: 1030.
ROV off deck:1204
ROV at depth: 1210
Bulls eye checks, photos of BOP to check height above seabed level for AGR then start SERPENT work at 1315.

Out on headings of 320^0 225^0 from BOP to carry out a photo survey as far as possible, reaching a maximum extent of approximately 120m.
Finish photo survey at 1556.
Back at TMS 1625.

Sunday 12th September 2010 - Morning meeting 0715. Weather due to come up. Drilling supervisor (Jason) concerned about apparent rig equipment seen on the floor in some of the SERPENT photos. Asked us to recover it if we found it again, unfortunately we did not see it again despite searching on the approximate heading on which it was seen.
.
ROV off deck: 0832
Start ROV video transect survey 0906.Had to record transect headings based on rig heading and use the BOP and sonar for navigation as compass did not work.
Complete 8 video transects, including repetition of T.5 because of poor visibility by lunchtime.
Safety meeting 1300.
Back out to ROV at 1330 to start survey of marker cones. Complete cone survey by 1410 and commence further photo survey.
Back to TMS 1510, ROV back on deck 1520.

Monday 13th September 2010 – Spoke with logistics coordinator about the SERPENT equipment supposedly on board. (It was in container KA123, which had been confirmed to be on the rig in time for my visit by AGR onshore). However, the container still on the ship and was a low priority lift. With the swell it might be some time before it comes onboard.
Moring meeting – big swell predicted so unlikely to dive (but it is still flat at lunchtime).
ROV team start maintenance and I prepare current meter for deployment alongside timelapse once it is on board.
I was informed in the evening that because of the bad weather I would be sent home on the following day’s chopper. I arranged that if at all possible I would come back when there was a better weather window.

Tuesday 14th September 2010 – There was a lot to sort out before returning home. I packed the equipment boxes and prepared them for return to Southampton, sorted out packing lists but arranged to leave them with the Subsea 7 container in case I can come back offshore. Frozen samples from Lancaster were collected from the galley, DVDs made of the data from this trip and data downloaded from the datalogger.
Chopper to Bristows, Aberdeen at approximately midday. Return flight to Southampton 1600.
Drop off samples at NOCS 2030.

Wednesday 15th September to 2nd October 2010
Onshore at National Oceanography Centre, Southampton awaiting instructions to return.

Sunday 3rd October 2010 – Travel Southampton to Aberdeen, Eastern Airways 1910 flight. Stay overnight at Speedbird Inn.

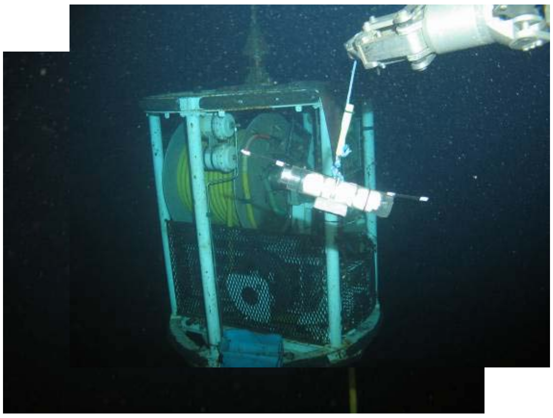
Monday 4th October 2010 – Helicopter to Borgsten Dolphin, check-in 1300.
Arrive on rig quite late. Meet Robert and Clare. Check with logistics and the timelapse camera and all other gear is on board.

Tuesday 5th October 2010 – Morning meeting 0715. Meet Glynn, ROV supervisor. Other ROV team are Allan and Swav from previous trips.
Spend the morning setting up the timelapse frame whilst the ROV team prepare the vehicle.
Full test of T/L in workshop and it was working well. Following construction we had to move it to the ROV but the path had been blocked by containers that had been moved. Lesson – build frame right next to ROV if possible as when fully ballasted it is very heavy and awkward to carry.

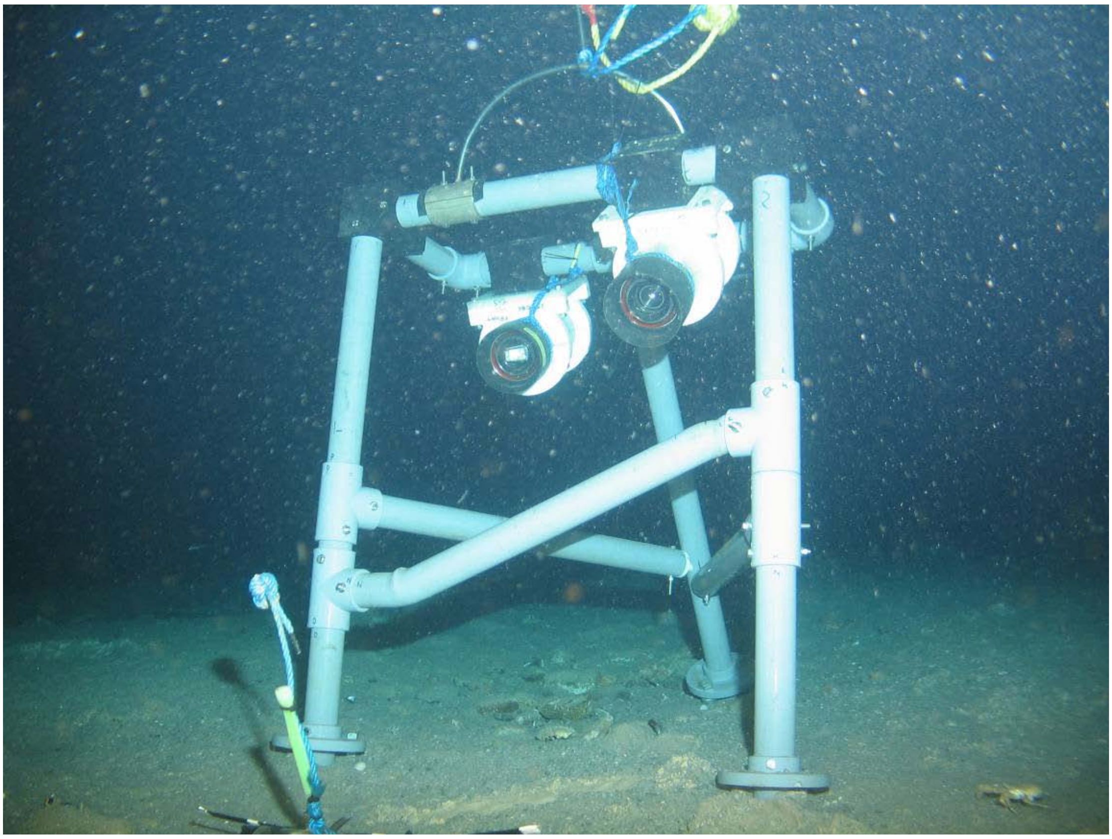
Also prepared bait (whitefish from galley) to deploy with camera plus size ruler with black and white 10cm graduations for estimation of organism size.
Ready to dive at 1500 but Glynn hesitant because of swell size. I agree to delay until tomorrow because forecast is better.

Wednesday 6th October 2010 – Morning meeting 0715 (changed to 0730 from today onwards by new drilling supervisor). Swell still quite big but coming down over next few days.
Final preparations for camera deployment, change O-rings, set for high resolution (220 shots on 2 gb card), approx 1 shot every 7 minutes.
Again decision not to dive because of the swell.

Thursday 7th October 2010 – Out to ROV 0645. Weather good!
Set T/L camera again (high res, infinite pics, start shooting at 1040).
Set current meter recording every 20 minutes from 1030.
Full details in form filled out in T/L manual.
ROV off deck 0953 (ROV overlay).
Plan: Dive with the current meter first, put in place then return for T/L frame.
At depth 1004.
Place current meter at 35m Starboard of the BOP at 1016.
ROV back on deck 1040.
ROV off deck 1129. The launch was a little uncomfortable with the small moonpool, also very close to the pontoon on the way down. The camera frame was held in the 5 function arm, the bait stowed in the basket on the TMS:



T/L in location at 1145. Collect bait from the side of the TMS 1150. Bait deployed 1158. Photos taken of timelapse camera in place before recovery of ROV at 1205:



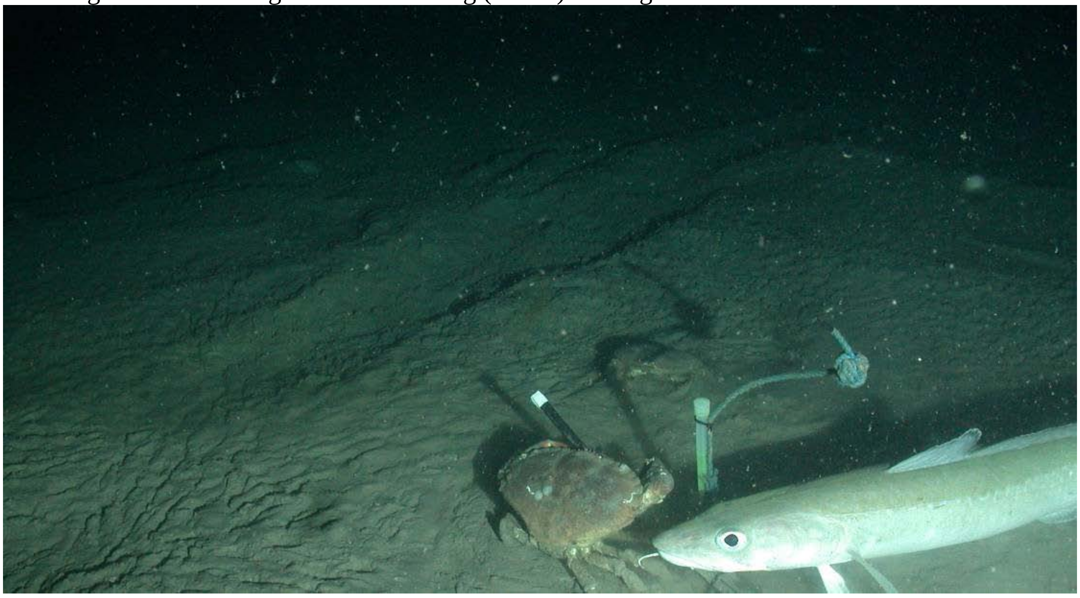
ROV team carry out maintenance in afternoon:

Friday 8th October 2010 – Out to ROV 0700. Wait until after 1040 to recover T/L camera. Decide to launch after lunch.
ROV off deck 1236. Start video transect survey.
Complete 4 transects by 1405 before attempting to recover T/L.
Go to 30m starboard to locate equipment bring current meter closer to BOP because without the camera it was a small sonar target and may be difficult to locate again. The movement of the current meter can be seen in the outputs from the current meter, see later in report. 1438. Bait seems to have moved out a lot, probably out of the field of view of the camera.
1444, recover T/L camera and bait.
1452 back in TMS.
Recovery was difficult with the swell size. The vehicle was swinging a great deal and with the addition of the frame it made it hard to get it through the moonpool. The ROV crew did a good job using ropes to stabilize the vehicle to get it through the moonpool and back on deck.
When the photos had been downloaded there it was clear that the flash had failed. All the photos were black.

Saturday 9th October 2010 – On examination of the camera the following morning it was clear that the flash cable had been damaged on deployment. There was a pinch mark in the cable and water had entered at this point.
The weather had come down completely and Glynn agreed to attempt to deploy the camera again. The same protocol was followed as above. Some ROV maintenance was done in the afternoon and I reconstructed the camera frame.
ROV off deck 1412
ROV at depth 1432.

Deploy camera in same location and sit in front to observe the flash. First flash was observed at 1433 and the camera left for 24 hours.
The remaining four video transects were commenced at 14:51 and completed by 16:13.
Stills photos were taken alongside the video for improved resolution for the disturbance assessment.
Further observations of fauna were made before recovery of the ROV at 1655.
Operations were coming to an end at Whirlwind and I had been asked during Saturday if I could leave the rig on Sunday. This was disappointing because the camera was just in place and the weather was looking good. I arranged that I would need to work on Sunday but should be able to get off on Monday.

Sunday 10th October 2010 – ROV off deck 0904, at depth 0909.
Large densities of krill observed whilst doing bullseye surveys. Shoaling fish were feeding on them. They looked like mackerel but it was hard to see in the low light camera. By the time the surveys were complete the fish had gone.
Spend 90 minutes making observations at seabed before recovery at 1030. Stills camera removed before lunch and data downloaded.
1300 – safety meeting.
ROV off deck 1345. At Seabed 1352. Located T/L and bait 1355. Pick up camera and bait with 5-function manipulator arm. Back at TMS 1400. Back on deck to remove camera and bait 1410. There was a good catch of isopods in the baited trap as well. These were preserved in formalin for identification in Southampton.
ROV off deck 1415. Dive to recover current meter.
At depth 1420. 1425, recover current meter. 1432 back on deck.
In the afternoon and evening I downloaded all the data from the trip; video data, datalogger, current meter and T/L camera.
T/L was a success with a good sequence of photos of *Cancer pagurus* apparently burying the bait and other organisms including asteroids and ling (below) visiting the bait.

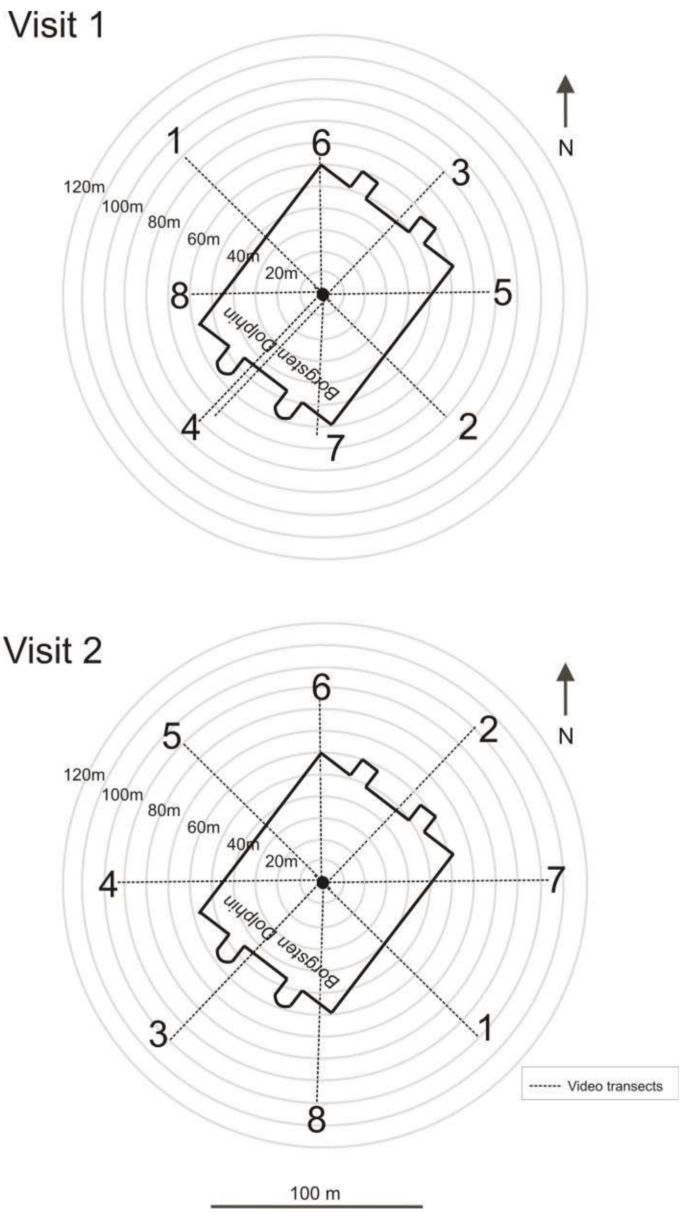


Monday 11th October 2010 – After a successful trip at Whirlwind it was an early chopper on Monday and I was back in Aberdeen by lunchtime and returned home by 1800 via Eastern Airways to Southampton and then the train to Bournemouth.

4. SAMPLES:

VIDEO TRANSECTS:

Video transects were taken by the ROV crew before drilling commenced. During each of the SERPENT visits a video and digital stills photo transect survey was carried out to assess disturbance. The transect length was limited by the tether length and the position of the TMS but stronger currents during the first visit made it difficult reach 100m from the well. The transect headings and lengths are shown below:



Above: A map of the video transects and sediment sampling locations at the 2 visits to Whirlwind

VISIT 1- VIDEO TRANSECT NOTES

Transect	Heading	Time	Distance (m)	Photo	Notes
1 BD/120910/011	STB	09:06:27	100		
		09:08:22	90		
		09:09:59	75		
		09:12:42	60		
		09:14:15	50		
		09:15:30	40		
		09:17:10	25		
		09:17:52	15		
		09:18:12	7.5		
		09:18:30	0		
2 BD/120910/012	Port	09:28:40	80	1	
		09:29:28	70	2	
		09:30:56	55	3	
		09:32:32	40	4&5	
		09:33:57	30	6&7	
		09:35:12	22	8&9	
		09:35:56	15	10&11	
		n/a	5	12&13	
		09:37:00	0	14	
3 BD/120910/013	Aft	09:43:47	80		
		09:44:27	75		
		09:45:10	75 (still)		
		09:47:12	60		
				Plumose anemone	
		09:49:13	50		
		09:50:30	40		
		09:51:59	30		
		09:52:39	20		
		09:53:24	15		
		09:53:47	0		
4a BD/120910/014	forward	10:03:24	80	30	Poor vis
		10:05:50	80		Waiting
			50		Abandon
4 BD/120910/015	forward	10:24:14	75		
		10:25:47	60		
		10:26:50	50		
		10:27:40	40		
		10:28:48	30		
		10:29:37	20	fish	
		10:30:00	15		
		10:30:36	8		
		10:31:06	0		
5 BD/120910/016	Port/aft	10:38:00	80		
		10:39:39	65		
		10:40:12	63		
		10:40:35	58	Crab	
		10:41:17	50		
		10:42:27	40	Star	
		10:43:04	38		
		10:43:51	30	Crinoid	

		10:44:50	20	Sand ripples	
		10:45:31	15		
		10:46:07	7		
		10:46:30	0		
6 BD/120910/017	STB/Aft	10:53:56	63		
		10:54:36	60		
		10:55:16	50		
		10:55:38		fish	
		10:55:49	40		
		10:56:35	30		
		10:57:15	25		
		10:57:32	20		
		10:58:00	15	Bright	
		10:58:43	10		
		10:58:59	7.5		
		10:59:10	0		
7 BD/120910/018	Fwd/port	11:06:50	70		
		11:07:40	60		
		11:08:20	50		
		11:08:57	40		
		11:09:30		Pagurus	
		11:09:50	30		
		11:10:25	20	Pagurus	
		11:10:56	15		
		11:11:20	10		
		11:11:47	7.5	Spoil	
		11:12:30	0		
8 BD/120910/019	Fwd/STB	11:22:59	60		Problems with tether
		11:23:53	50		
		11:24:45	40	porania	
			30		Marker buoy
		11:25:57	15		
		11:26:20	7.5		
		11:26:45	0		

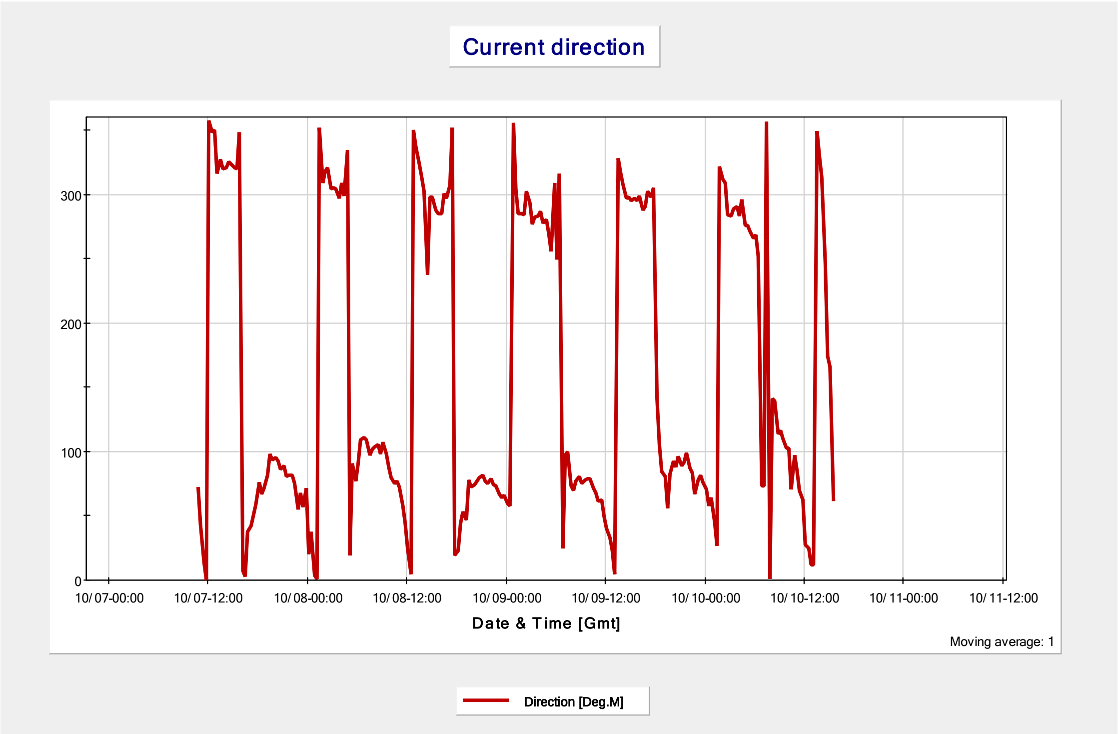
VISIT 2 - VIDEO TRANSECT NOTES

Transect	Heading	Time	Distance (m)	Photo	Notes
1 BD/081010/022	Port	12:54:48	95	1	
		12:56:18	75	2	Poor vis
		12:58:03	50	3	
		12:58:52	40	4&5	
		12:59:26	30	6	
		13:00:07	20	7	
		13:00:43	12		
		13:01:25	7		
		13:01:47	0	8	
2 BD/081010/023	Aft	13:11:43	100	1&2	
		13:12:28	90	3	
		13:13:27	75	Rocks	rocks at 60m aft
		13:15:30	50		
		13:16:20	40	4	
		13:17:00	30	5	
		13:17:40	25	6&7	
		13:18:50	12.5	8	
		13:19:30	0		
3 BD/081010/024	Forward	13:36:00	95		
		13:37:04	80		
		13:37:45	70		
		13:38:22	60		
			55ish		boulder
		13:39:19	50		
		13:40:23	40		
		13:40:43	36		
		13:41:46	30		
		13:42:18	25		
		13:43:00	20		
		13:43:30	15		
		13:44:00	7		
		13:44:16	0		
4 BD/081010/025	Fwd/stb	13:53:41	95	1&2	
		13:54:12	90	3	
				4	Sebastes
		13:55:02	75	5	
		13:56:11		6	
		13:56:42	60	7	
		13:57:35	50	8	
		13:58:25	40	9	
		13:59:20	35?	10	
		14:00:05	25	11	
		14:01:20	15	12	
		14:01:45	7.5	13	
		14:02:04	0	14&15	
5 BD/091010/027	STB	14:51:59	100		
		14:53:39	90		
		14:54:29	75		
		14:55:50	63		
		14:57:05	50		
		14:58:07	40		

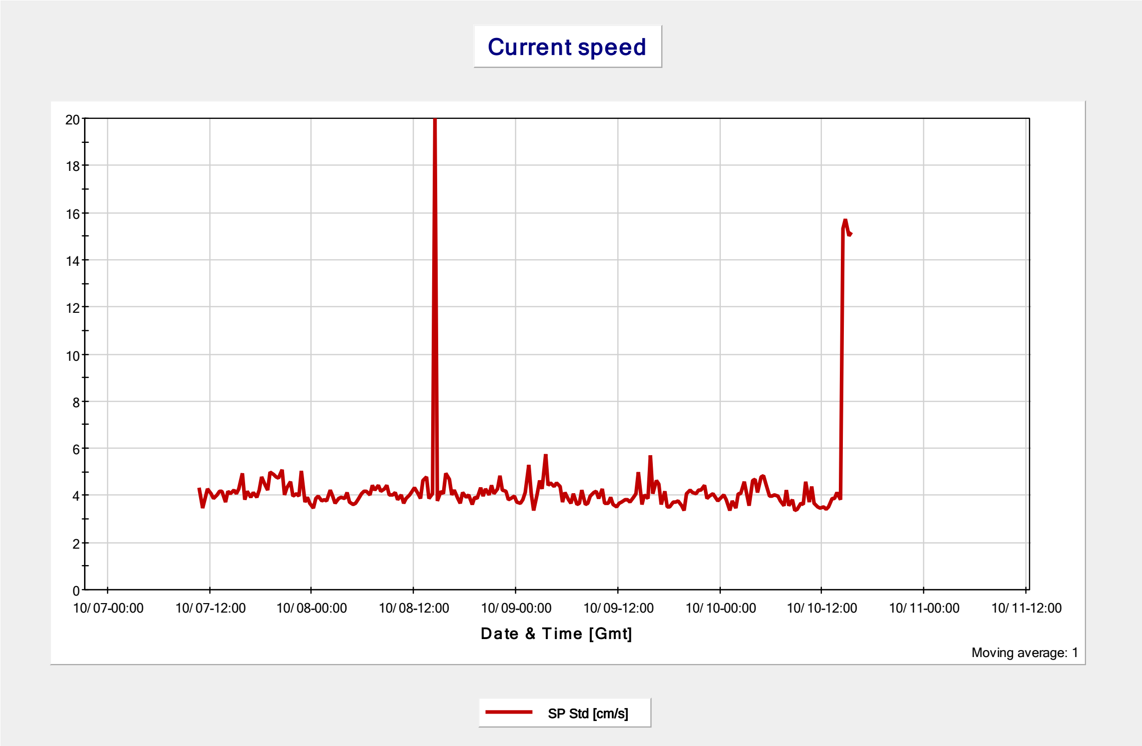
		14:59:06	30		
		14:59:24	25		
		15:00:33	12.5	Cod	
		15:01:10	0		
6 BD/091010/028	Aft/STB	15:33:30	90+ (95?)	1&2	
		15:34:40	80	3&4	
		15:35:45	70	5&6 (rocks)	
		15:36:33	60	7&8	
				9&10 (fish)	
		15:37:23	50	11&12	
		15:38:08	40	13&14	
		15:39:08	25	15&16 (pagurus)	
		15:40:00	20	17,18 &19	Rocks
		15:40:30	15	20	
		15:41:00	7.5	21	
		15:41:13	0	22	
7 BD/091010/029	Aft/port	15:49:30	100 (+)	1,2	
		15:50:09	90		Poor vis
		15:51:04	75		
		15:52:13	60	3	
		15:52:30	50		
		15:53:43	38	4	
		15:54:08	30		
		15:54:55	15	5	
		15:55:14	8	6	
		15:55:35	0		
8 BD/091010/030	Fwd/port	16:07:06	100	1,2 & 3	
		16:08:15	80 ?	4 & 5	
		16:08:57	75	6&7	
		16:09:45	60	8&9	
		16:10:34	50	10	Many Rocks
		16:11:19	40	11&12	
		16:12:06	25	13&14	
		16:12:52	15	15&16	
		16:13:23	7.5	17	
				18	
		16:13:40	0	19	

SENSOR DATA

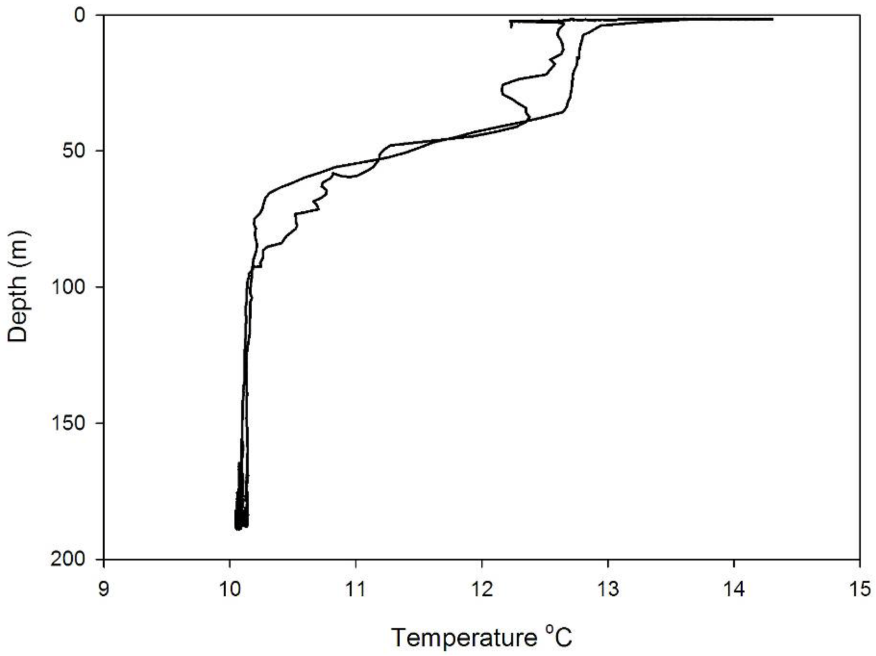
Environmental data were collected from sensors deployed during the visit. These include a seabed mounted current meter and a CTD datalogger attached to the ROV to monitor temperature, salinity and Oxygen concentration with depth in the water column. Some examples of the data are shown below:



Above: Current direction data for Whirlwind (output direct from current meter). There is a tidally reversing current regime at Whirlwind. There are slight anomalies on 08/10/2010 (also see below) and at the end of the deployment as the current meter was moved at this time.



Above: Current speed at Whirlwind (output direct from current meter). Note the current speed rises dramatically after 1200 on 08/10/2010 because the current meter was moved after the first deployment of the timelapse camera. This occurs again at the end of the deployment when the current meter was recovered.



Above: Temperature profile of the water column above the seabed at Whirlwind from the first ROV dive in Visit 1.

SAMPLE LIST

The samples, video, photographic and sensor data collected during the pre-drill work by the ROV team and the two SERPENT visits to Whirlwind are listed below:

CODE STRUCTURE:

BD/250510/001#1
Borgsten Dolphin / Date / ROV SERPENT dive log # replicate

Sample reference	Location	Sample type	Details
BD/240810/001	50m N BOP	Video transect	Pre-spud video transects – DVD
BD/240810/002	40m E BOP	Video transect	Pre-spud video transects – DVD
BD/240810/003	40m S BOP	Video transect	Pre-spud video transects – DVD
BD/240810/004	50m W BOP	Video transect	Pre-spud video transects – DVD
BD/240810/005	40m SW BOP	Video transect	Pre-spud video transects – DVD
BD/240810/006	40m NE BOP	Video transect	Pre-spud video transects – DVD
BD/240810/007	40m NW BOP	Video transect	Pre-spud video transects – DVD
BD/240810/008	40m SE BOP	Video transect	Pre-spud video transects – DVD
BD/240810/009	unknown	Eco Highlights	DVD and JPG
BD/110910/010	North of BOP up to 100m	Eco Highlights	DVD and JPG
BD/120910/011	95m STB BOP	Video Transect	Post drill 1 – DVD
BD/120910/012	80m Port BOP	Video Transect	Post drill 1 – DVD
BD/120910/013	80m Aft BOP	Video Transect	Post drill 1 – DVD
BD/120910/014	80 m FWD	Video Transect	Post drill 1 – DVD
BD/120910/015	75m FWD	Video Transect	Post drill 1 – DVD Repeated transect
BD/120910/016	80m Port/aft	Video Transect	Post drill 1 – DVD
BD/120910/017	63m STB/Aft	Video Transect	Post drill 1 – DVD
BD/120910/018	70m FWD/Port	Video Transect	Post drill 1 – DVD
BD/120910/019	60m FWD/STB	Video Transect	Post drill 1 – DVD
BD/120910/020	5 and 15 m from BOP	Marker buoy survey	DVD
BD/120910/021	Water column	CTD data	txt file
BD/081010/022	95m Port	Video Transect	Post drill 2 - DVD
BD/081010/023	100 m Aft	Video Transect	Post drill 2 - DVD
BD/081010/024	95m FWD	Video Transect	Post drill 2 - DVD
BD/081010/025	95m FWD/STB	Video Transect	Post drill 2 - DVD
BD/081010/026	30m STB	Time Lapse deployment 1	JPG files
BD/091010/027	100m STB	Video Transect	Post drill 2 - DVD
BD/091010/028	95m Aft/STB	Video Transect	Post drill 2 - DVD
BD/091010/029	100m+Aft/Port	Video Transect	Post drill 2 - DVD
BD/091010/030	100m FWD/Port	Video Transect	Post drill 2 - DVD
BD/101010/031	Varied	Eco Highlights	DVD & JPG
BD/101010/032	30m STB	Time Lapse deployment 2	JPG files
BD/101010/033	Water column	CTD data	txt file
BD/101010/034	30m STB	Current data	txt file
BD/101010/035	30m STB	Baited trap specimens	Preserved in formalin

5. OBSERVATIONS

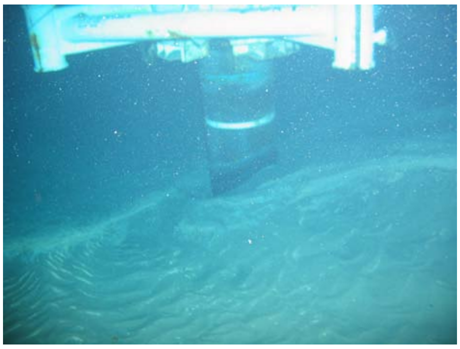
DISTURBANCE OBSERVATIONS

Eight video transects carried out on each visit. During Visit 1 they extended to a minimum 60m from the BOP and in Visit 2 to a minimum of 90m.

As an example the digital stills images from Transect 2 (to the port side of the rig) during Visit 1 are shown in the table below:

80m Natural seabed visible (small boulders and the background gravel)	
70m Evidence of cuttings covering the seabed	
55m Clear cuttings with limited natural seabed exposed	

40m Complete coverage with cuttings	
30m	
22m	
15m Sediment ripples evident, deep cuttings.	

5m	
End of the transect at the BOP	

FAUNAL OBSERVATIONS

The table below shows images of the first or noteworthy observations of each species of megafauna made during SERPENT work at Whirlwind.

Date	Time	Observation	Photo/video grab
11/09/2010	13:56	*Cancer pagurus* on the cuttings pile close to the BOP IMG_0357	
11/09/2010	14:22	Hermit crab, likely *Pagurus prideaux* in foreground with octopus in the background. Eye is just visible IMG_0375	
11/09/2010	14:28	*Filograna* sp. tubeworms and unidentified anemone IMG_0381	
11/09/2010	14:32	Small criniod on a rock IMG_0386	

11/09/2010	14:36	Tube worm IMG_0391	
11/09/2010	14:36	*Porania pulvillus* IMG_0932	
11/09/2010	14:41	Serpulid tube worm in centre of image. Claws of squat lobster also visible behind rock IMG_0398	
11/09/2010	14:46	Asteroid, possibly *Stichastrella* IMG_0402	

11/09/2010	14:51	Unknown. Small sponge, top left and possible hydroid in centre IMG_0405	
11/09/2010	14:59	*Filograna* tubeworms IMG_0410	
11/09/2010	15:02	Large plumose anemone (*Metridium*). Also *Filograna* and hydroids IMG_0415	
11/09/2010	15:06	Small unidentified yellow anemone IMG_0419	

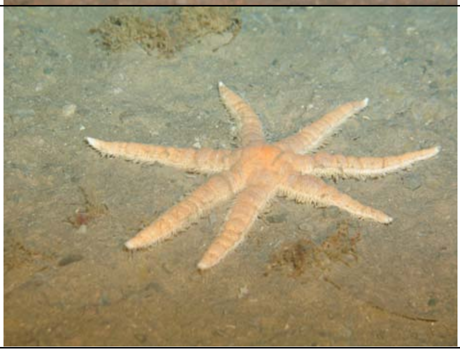
11/09/2010	15:13	Large anemone on rock, small orange cushion star, indeterminate yellow anemone (as above) and crinoids (likely *Antedon* sp.) on rock. IMG_0425	
11/09/2010	15:22	Large anemones, *Filograna*, squat lobsters (likely *Munida* sp.) IMG_0426	
11/09/2010	15:29	Large plumose anemone IMG_0432	
11/09/2010	15:29	Echinoid, likely *Echinus* sp. (Sea urchin) IMG_0433	
11/09/2010	15:30	Asteroid, likely *Stichastrella rosea* IMG_0435	

11/09/2010	15:34	*Anseropoda placenta* (goosefoot star) IMG_0437	
11/09/2010	15:35	Large ophiuroid IMG_0438	
11/09/2010	15:40	Serpulid, small asteroid and sponge? IMG_0439	
11/09/2010	16:03	Small squid/cuttlefish. Poor quality image but observation confirmed from field notebook IMG_0445	
11/09/2010	16:08	Large plumose anemone (*Metridium*). Common at Whirlwind IMG_0451	

11/09/2010	16:29	Anemone orientated into the current. Seemingly on the sediment but other similar are attached to rocks. Attached to small buried rock? IMG_0466	
11/09/2010	16:49	Unknown hydroids. IMG_0471	
12/09/2010	11:38	Small fish. Unidentified IMG_0520	
12/09/2010	15:38	*Porania pulvillus* apparently feeding on a hydroid (species as above) IMG_0580	
12/09/2010	15:49	Redfish. Likely *Helicolenus dactylopterus*. IMG_0598	

12/09/2010	15:55	Flatfish, likely Megrim (*Lepidorhombus whiffiagonis*) IMG_0602	
12/09/2010	15:59	*Gadus morhua* - Cod IMG_0605	
08/10/2010	14:11	Unidentified yellow asteroid IMG_0638	
08/10/2010	14:31	*Molva molva* (ling) hiding under rocks covered with plumose anemones IMG_0646	
08/10/2010	15:31	Large 8 armed starfish near the seabed mounted current meter. Probably *Luidia* sp. IMG_0674	
08/10/2010	15:41	*Cancer pagurus* attracted to baited trap in front of timelapse camera on first deployment IMG_0680	

10/10/2010	10:16	Sponge, ophiuroids, *Munida* sp. and anemones on rocks IMG_0757	
10/10/2010	10:19	Bryozoan IMG_0763	
10/10/2010	10:29	*Lophius piscatorius* (Monkfish) IMG_0768	
10/10/2010	10:36	Sabellid tubeworm IMG_0779	
10/10/2010	10:41	Small flatfish (unidentified), redfish and small cushion star IMG_0783	

10/10/2010	10:44	Black ophiuroid and plumose anemone IMG_0786	
10/10/2010	10:58	*Porania pulvillus* feeding on hydroids? IMG_0806	
10/10/2010	11:05	*Munida* sp. Squat lobster IMG_0808	
10/10/2010	11:19	Seven armed asteroid, likely *Luidia* sp. IMG_0817	

MISSION 85 & 87

AKER BARENTS, DALSNUTEN, NORWEGIAN SEA

KERSTIN KRÖGER

1. GENERAL INFORMATION:

Well: Dalsnuten
Project partner: Shell Norge
Rig: *Aker Barents*
Rig operator: Aker Drilling
ROV operator: Oceaneering
SERPENT representative: Drs Kerstin Kröger + Andrew Gates (for part of first visit)

Position: 66°34'33.2"N 03°32'46.1"E

Water depth: 1452 m

Water Temperature: Approximately -1ºC (reading switching between -0.84 and -1.02)

Oceaneering ROV team:

	29.10.-03.11.2010	03.11.-08.11.2010
Supervisor	Geir Magne Abrahamsen	Øyvind Økland
Pilot	Vilhelm Sunnanå	Vilhelm Sunnanå
Pilot	Karl Marius Breivik	Ole Rasmus Sevheim
	29.11.-01.12.2010	01.12.-10.12.2010
Supervisor	Jan Arild Andersen	Geir Magne Abrahamsen
Pilot	Frode Ravnestad	Frode Ravnestad
Pilot	Thomas Ellevseth	Peter Haukaas
Pilot		Vilhelm Sunnanå

2. GEAR:

- Magnum 142 work class ROV
- Remote Oceans Camera OAS 220103N (low light)
- Kongsberg Camera ER021-004-01 (colour)
- Deepsea Systems Ocean Pro HD (high definition)
- Kongsberg OE14-208, 5m pix titanium, 14-208-0222 (still camera; 2nd visit only)
- SERPENT ROV push cores
- Amphipod trap
- Ekman Grab (2nd visit only)
- Specimen collector (2nd visit only)

3. NARRATIVE:

FIRST VISIT (29.10.-08.11.2010)

Thursday 28th October 2010
The travel from Southampton to Brønnøysund went smoothly. I am met at the airport by my colleague Andy Gates. We stay at the Hotel Brønnøysund at the airport.

Friday 29th October 2010
Arrival at at Brønnøysund airport for the 10:00 video meeting with Shell Norge's to detail safety requirements offshore. While checking in for helicopter flight we get informed that one of the SERPENT team is bumped off the flight. This is due to the cancellation of the heli flight the day before (bad weather) and the need to get personnel on board the rig. We decided that Kerstin would continue to the rig with Andy to follow on the next available flight.

Helicopter departs for the Aker Barents at approx. 12:00 (stop over at Aker Spitsbergen for re-fuelling). Flight arrives approx. 14:00. Brief introduction, safety meeting and familiarisation tour of rig with Kai Henning Boring, the H&E supervisor. Meet with the Oceaneering team and am shown their facilities. Until dinner the team shows me video footage with biological content taken at Dalsnuten. The team is very keen for me to identify the species they have filmed in any related information on the biology of those species. One video stands out in particular. It shows a Dumbo octopus (genus *Cirrotheuthis*) close up with the specimen displaying some interesting swimming manoeuvres before it swims into the ROV apparently to investigate it. I am also shown footage taken at other locations in order to identify the species recorded. After dinner I unpack and settle in.

Saturday 30th October 2010
Morning meeting 07:30 where I shortly report about the aims of the SERPENT visit on Aker Barents. I am informed of the on-going bad weather precluding any deployment of the ROV until at least Monday late in the day.
The morning meeting is followed by a detailed tour and introduction to the Oceaneering's ROVs on board and the Oceaneering facilities by Vilhelm Sunnanå. I locate the SERPENT boxes in the Oceaneering workshop. The Oceaneering supervisor Geir Magne Abrahamsen takes me to the bridge and around the rig with detailed explanations of rig operations.

After lunch I attend to emails, paperwork and with Geir Magne's help sort out IT problems. During a telephone discussion with Andy Gates we decide that a visit of Andy to the rig would be beneficial to the outcome of the project despite the high unlikelihood of an ROV deployment within the next few days. His training and guidance are especially important because this is my first visit to a rig. I put SERPENT's request to the Shell representative on the rig, Georg Karvell and get his approval for Andy to join me on the rig with the next flight and to stay until Wednesday.
After dinner I attend a safety meeting on the risks of H_2S exposure, how to recognise this gas, its specifics, where it could occur on the rig and which precautions to take to avoid exposure to H_2S.

Aker Barents rig

Sunday 31st October 2010
I attended the morning meeting (7:30) again but was told that my presence at the meeting was not required any further until I had samples to report. Later on Geir Magne took me on a tour of the drill floor, the moon pool and other areas of the rig I had not seen during previous tours. These tours and the explanations given improved my understanding of the complex working processes of an exploring rig operation substantially. Upon return to the ROV control room I worked on the SERPENT gear protocols. After lunch I waited for Andy Gates' arriva but due to bad weather the heli did not arrive until approx. 17:30. After dinner Andy attended the safety meeting and tour of the rig. He then met the Oceaneering team and realised that he had worked with Vilhelm before on the Cashel site in the Irish Sea.

Monday 1st November 2010
Weather still too bad for any ROV deployment (max. wave height >6 m). Andy and I locate the frozen sediment chores (chemical analyses) taken shortly after drilling (instead of pre-drilling) by the Oceaneering team. The chores were clearly taken with care, evident from the state of the sediment in the cores and as documented by the video footage provided by Oceaneering.

While the cores defrost I get trained on the set up and use of the RBR data logger (recording conductivity, temperature and depth).We also investigate the possibilities of designing a simple baited trap for amphipod capture.

After lunch we start processing the sediment chores. Three cores had been taken, labelled carefully and stored correctly in the cool box. Two of these cores were approximately 12 cm long with the third core being approximately 6 cm long with a sloped surface. The cores were taken 10 m, 50 m and 100 m North of the BOP shortly after drilling. We sliced the cores according to the protocol for heavy metal analyses, transferred each slice to a separate labelled plastic bag and refroze the samples. Contact of metal with the sediment was avoided. After dinner I attended to report writing.

Tuesday 02nd November 2010
After the morning meeting Andy is informed that he leaves the Aker Barents tomorrow with the lunch time flight. The weather is still too bad for any ROV deployment. My request for a permit to take still images on the rig for outreach and documentation purposes is granted. The rest of the morning and part of the afternoon is spent in clarifying any questions I have with regard to sampling procedures and sampling protocols and discussing such protocols with the

Oceaneering team. Andy watches footage from Gro II for comparison with previous SERPENT work at Gro and downloads additional footage of zoarcids (eelpout; ålebrosme).

In a telephone conference with Helena MacielGalli we inform her of progress on board and request from her to obtain permission for Oceaneering to release any already existing Dalsnuten video footage to SERPENT. Also discussed is the possibility of a second SERPENT visit to Aker Barents should the on-going bad weather prevent us from achieving all deliverables during this visit.

The time until dinner is spent on constructing baited traps for amphipod food preference experiments. Similar experiments have been carried out on Gro II during SERPENT's visit and we would like to repeat such experiments in order to better understand the scavenger communities at these depths. Baiting the traps with different food sources (tinned mackerel, tinned salmon, dried seaweed, cold-light stick and an un-baited control) should provide us with abundant scavenger specimens and help us elucidate whether different species have different food preferences.

From 17:30 to 18:00 we attend a safety meeting before going to dinner.

Wednesday 3rd November 2010

After the morning meeting Geir Magne informs us that the ROV will probably be deployed on Thursday. Since today is Andy's final day offshore we spent most of the morning doing a final run-through of the equipment in Vilhelm who will remain on board whereas the other two members of Oceaneering team leave today as well. We discuss how the different gear types (push corer, Ekman grab, amphipod traps) operate, how to mount them on the ROV and how and where to deploy them on the seafloor (i.e., the amphipod traps).

Afterwards Andy and I prepare and set up the data logger for deployment with the first ROV dive tomorrow. My laptop and the data logger are synchronised with the ROV with regard to time and the data logger programmed to record data from 7:00 tomorrow morning until 19:00 on Friday (10 sec frequency). At 14:00 I see Andy, Geir Magne and Karl Marius off before the heli departs and I meet the new Oceaneering team Øyvind Økland (supervisor) and Ole Rasmus Sevheim (ROV pilot). One of their first tasks is to blanket the open interfaces on the data logger. The data logger is mounted on the inside of the ROV frame on the right hand side towards the back near a thruster. The team then prepares and checks the ROV for potential deployment tomorrow.

We turn in for the 18:30 emergency muster exercise which lasts until ca. 19:00. For this exercise I am required to report to my muster station (the mess) carrying my survival suit. After a short while an announcement is made that the exercise has been carried out very successfully with a very short response time from everybody on the rig and is ended. After dinner I return to my cabin to prepare for the first ROV dive tomorrow.

Thursday 4th November 2010

From the morning meeting on we are on 'stand by' for the maximal wave height to drop to <6 m so that the ROV can be deployed. At 10:30 the ROV is launched for pre-dive tests with the actual dive starting at 10:44 (dive #172). I take the distance of camera at both ends to the lower end of the ROV (180 mm back, 340 mm front; camera at most vertical angle) for calculation of width of viewing field but since the cameras has to be moved for BOP maintenance work before we can begin the exploratory section of the dive these measurements might not be accurate. The altimeter is not used during this dive because the ROV is normally flown without it.

The ROV is taken out of the cage at depth (1430 m) and re-fills 18 l of glycol into the BOP system to prevent the sub-zero water temperature interfering with the operation of the BOP (11:53-12:05). This completed we move on to check the bullseye and observe the mud plate of the BOP for any movement which has been observed previously.

At 12:52 the ROV returns to the cage (lunch). At 13:35 start of SERPENT survey with taking an inventory of the megafaunal species being present around the Aker Barents rig and obtaining detailed footage. This is very successfully completed by 17:58
At 17:50 we start the video transect survey with transect 1 (180 °) 200 m due North of the BOP. We head South with a constant speed and no change in the camera settings. Following the advice of the Oceaneering team the footage is recorded with the colour camera and the low light camera (black & white) instead of the HD camera since the colour camera provides a wider field of vision than the HD camera. Transect 1 is completed at 18:10 but of unsatisfactory quality due to sediment disturbance by the ROV tether.
The ROV returns to the cage and completes a survey of the riser on the ascent. ROV returned on deck at 19:15 by 19:45 we go for dinner. I leave the data logger (which is programmed to record until tomorrow 19:00) on the ROV in the hope that we will complete another dive tomorrow. The forecast, however, is for a maximal wave height >6 m.

ROV control room. From left to right ROV pilot Vilhelm Sunnanå, supervisor Øyvind Økland and ROV pilot Ole Rasmus Sevheim.

Friday 5th November 2010
Weather still too bad for any ROV deployment with the outlook being bad until the next day. I work on the protocols of the previous dive and the identification of some of the species we saw. After lunch I prepare the necessary documentation for shipment of the SERPENT gear. Because of the possibility of a second SERPENT visit to Dalsnuten it is arranged with logistics and the Oceaneering team that the SERPENT gear would remain in their hangar Following this I download the data of dive 172 (04.11.2010) from the data. Discussion with the Oceaneering Supervisor Øyvind about the dive plan for Sunday.

Saturday 6th November 2010
No ROV dives today due to maximal operational wave height >6 m. Outlook for tomorrow is promising from lunchtime onwards. I prepare and programme the data logger for further ROV deployments on Sunday and Monday. Since the weather is so promising for Monday I organise to remain on the rig until Tuesday in order to get more dive time.

After lunch discussion with the Oceaneering team about the deployment of the amphipod traps Ole Rasmus spends the afternoon welding a platform for the traps so they sit approximately 10 cm above sediment and can be easily deployed and picked up by the ROV. The rest of the shift is taken up by preparing the SERPENT gear for shipment back to Southampton and preparation for the dive tomorrow.
Saturday evening it is the traditional BINGO evening – taking part in the fun is definitely good for my Norwegian!

Sunday 7th November 2010
The weather looks good today but wave height in the morning still above 6 m. I prepare the bait for the amphipod traps (except of light stick which only glows for 12 hrs). Vilhelm and Ole run the pre-dive checks to enable us to start the dive as soon as possible and attach the push core holder to the 5-function arm while I fill the amphipod traps with the bait. The trap is attached to the top of the cage.
By 14:00 we prepare the push core holder for deployment and break the light stick for the amphipod trap. The ROV launched at 14:15 for Dive #173, but problems with the cable guidance system of the winch prevent us from starting the dive until 15:34. The amphipod trap is deployed at 16:13 approximately 11 m Northwest of BOP with the opening of the traps facing away from the BOP.
Attempts to locate the potential phytodetritus fluff seen on previous dive fail. We start the coring process at 17:10 ca. 20 m East of the BOP but sediment too fine to remain in the cores (sediment surface covered by drill cuttings).
We try again approximately 50 m East from the BOP with the sediment being less covered by drill cuttings. By 18:23 we have taken 5 cores and return to the cage. The ROV is back on deck 19:15. After dinner I process the cores (finished 22:00). Only 3 cores are suitable for slicing; the other 2 contain very little sediment. Samples stored in chill bin in the galley freezer (-25 °C). Meanwhile the ROV is back in water after dinner for a routine maintenance dive (glycoling the BOP and inspections).

Monday, 08.11.2010
While running the pre-dive checks a system failure is discovered. ROV is deployed at 10:48, leaving the cage at 11:12 (dive #174). We continue with the video transect survey (transects 2-8, starting 200 m away from BOP) throughout the day. After dinner we repeat transect 1 and collect the Amphipod trap on the way back to the cage (5 function arm). ROV back on board at 22:45. Although no amphipods are visible to the eye in any of the traps, I fix the water from the traps in labelled nalgen bottles using buffered Formalin. Following that I clean the gear and hangar and start packing up the SERPENT equipment until approximately midnight.

Tuesday, 09.11.2010
On the final day offshore the SERPENT equipment is packed and prepared for shipping in case I do not return to the rig in order to complete the sampling programme. The complete equipment remains stored in the Oceaneering workshop. The Logistic Supervisor Per organises the transport of the frozen sediment samples to the M-Scan lab in the UK. The downloading of the video footage on CDs and external drives by the Oceaneering team is just finished by the time I leave the rig. After lunch I say my good byes. The helicopter departs at 13:30 and arrives in Brønnøysund. At the airport I hand over the frozen sediment samples to a courier for further transport to a laboratory in the UK (M-Scan Ldt. in Wokingham). My

connecting flight to Trondheim has been cancelled and thus I stay in the Thon Hotel Torgatan for the night.

Wednesday 11.11.2010
Flight to Trondheim where I stay for the night with a friend of mine.

Thursday 12.11.2010
Flights from Trondheim to Oslo and onwards to London. National Express from Heathrow to Winchester where I arrive at ca. 22:00.

NARRATIVE ANDREW GATES (28.10.– 03.11.2010)

AG visit to Aker Barents to help Kerstin Kröger with first SERPENT mission.

Thursday 28th October 2010
AG travel to from Newcastle to Brønnøysund, Norway. Arrive 1630 and Stay overnight at Thon Hotel, Torghatten (new hotel next to the airport). Meet KK at the airport and return to hotel.

Friday 29th October 2010
Check in 1030 at Brønnøysund airport. Pre-check-in briefing at Wideroe Service Centre at main airport. Video call with Shell to detail safety requirements when offshore. Food provided. After check in we were informed that one SERPENT had been bumped from the flight. This was because Thursday's flight had been cancelled because of bad weather so personnel had been rearranged and some people had been put onto our flight.
The decision was made that KK would continue to rig and AG would follow on next flight. Return to hotel and check back in to room and await instructions from Gunnar Johannessen. No more flights today but there would be a special flight on Sunday on to which I was booked.

Saturday 30th October 2010
Wait in Brønnøysund. I hired a bicycle and rode to Torghatten to climb the hill and view the natural tunnel that passes through it. Weather was bad but the trip enjoyable.

Sunday 31st October 2010
Check in 1430. No pre-check in conference with Shell.
Long flight out to rig, stopping at Heidrun platform for refuelling on the way. Only 2 on the flight but more people returning to shore. Arrive at rig at 1730.
Safety briefing and tour of rig with Shell HSE staff (Kai???) at 1830

Monday 1st November 2010
I met the Oceaneering team, one of whom I had worked with at Cashel (Vilhelm).
The weather was poor, with a swell of 6m (max wave height) meaning that we could not dive. The day was well spent training KK by preparing equipment for diving and processing the core samples already collected by the ROV team earlier in the operations at Dalsnuten. The samples were clearly well taken, evident from both the nature of the sediment in the corer and the video footage provided by Oceaneering.
KK was trained in the set-up and use of the datalogger and the coring equipment.

KK put in a request for a permit to work for using a stills camera on deck.

Tuesday 2nd November 2010
The weather was still bad with little hope of improvement for the next few days.
We continued to prepare equipment for diving and discussed protocols with the Oceaneering team. I viewed footage from Gro II for comparison with the previous SERPENT work at Gro. In addition interesting footage was downloaded of zoarcids (eelpout) from earlier dives at Dalsnuten.
Teleconference with Helena from Shell to discuss progress.
With the ongoing poor weather conditions and with confidence that KK was well trained in the use of the equipment I spoke with the Shell DSV about returning from the rig. It was decided that I would return the following day.

Wednesday 3rd November 2010
We spent the morning doing one final run-through of the equipment with Wilhelm (the other ROV team members were on a crew change today). The bait choice amphipod trap was completed and prepared from diving.
The helicopter arrived at the rig at 1340 and I returned to Brønnøysund. From Brønnøysund I took a flight to Trondheim where I stayed overnight before onward travel to London the following morning.

For future reference – I had trouble finding a hotel room in Trondheim. According to local residents this was because of a combination of conferences in the city and a European League football match between Trondheim and Madrid so many Norwegians were visiting the area. It is not normally a problem to find accommodation in Trondheim.

SECOND VISIT (29.11.-10.12.2010)

Friday 26.11.2010
Flight from Heathrow via Stavanger to Trondheim where I stay for the weekend with friends.

Sunday 28.11.2010
Flight from Trondheim to Brønnøysund where I stay for the night in the Thon Hotel Brønnøysund near the airport.

Monday 29.11.2010
I attend the video meeting at Bronnoysund Airport at 10:00 with the heli check in following at 10:30. Departure of the heli at 11:30 and arrival at the Aker Barents at 13:30 after a refuelling stop on the 'None' drill ship.
After the safety meeting I meet the Oceaneering team (supervisor: Jan Arild Andersen, pilots: Frode Ravnestad, Thomas Ellevseth). The still camera has been mounted on the ROV and tested. We discuss the dive plan for tomorrow and I prepare the data logger to be mounted on the ROV (changing batteries, checking O-rings, reloading driver software and data logger software on laptop, programming the logger for tomorrow with data recording sequence set to 10 sec). I also prepare the core holder for deployment tomorrow.

Oceaneering ROV team (from left to right): Frode Ravnestad (pilot), Jan Arild Andersen (supervisor), Kerstin Kröger, Thomas Ellevseth (pilot).

Tuesday 30.11.2010
During the morning the ROV is deployed for a BOP maintenance dive. After the dive some of the tubing is removed and the core holder mounted on the 5 function arm. At 10:57 the ROV is off deck again (dive #187) and leaves the cage 11:57. We first conduct a biodiversity survey flying West of BOP. As during the first SERPENT visit the arktisk ålebrosme *Lycodes ?frigidus* seems to be the most abundant fish species. At 13.43 we encounter a unknown squid. Ophiuroidae and an asteroid species become more abundant ca. 150 W of BOP. From there we head East and take 6 very successful push core samples 200 m due East of the BOP. Due to other work on the rig the ROV has to back in the cage at 15:45 and is back on deck at ca. 16:10. I process the cores with the help of the ROV team and we finish just before 19:00.

Wednesday 01.12.2010
The ROV is off deck at 7:48 for dive #188, a biodiversity survey, and by 08:17 leaves the cage going S. The first fauna is visible ca. 70 m SE of the BOP (asteroidae). We take very good footage of a polychaete (borsteørm) belonging to the Nereidae with an approximate length of 15 cm length lying on the sediment surface (ca. 70 m SE of BOP). This is followed by footage of a big burrow with a honeycomb-like pattern of side burrows very likely to be created by an amphipod species. Such burrows were observed during previous visits and also at other sides. So far our identification of the species creating such burrows is based on image identification but an affirmative identification of a physical specimen has not been possible. The survey takes us approximately 110 m SE of BOP before we have to return to the cage due to the crew change-over of the Oceaneering team. The ROV is back in the cage at 09:29 and back on deck by 10:00.
I download the data from the data logger and prepare the push cores and core holder for the next deployment and start constructing the amphipod trap. This is followed by downloading the still images taken and screen shots during dives #187 and 188 and discussing them with Frode.

The new ROV team arrives on the rig by 14:00 (Geir Magne Abrahamsen which whom I worked during my first visit and Peter Haukaas) and I spent the afternoon working on the report.

Thursday 02.12.2010
No ROV deployment today due to bad weather. The ROV team prepares the ROV for the dives tomorrow (the tubing for glycoling the BOP is mounted again, the HD camera is mounted further forwards along with the still and colour cameras). Geir Magne constructs a specimen collector and I prepare the amphipod trap, programme the data logger for further depth profiles and download the footage of dives #187 and #188 onto CD. Sending images of the polychaete to the Annelida net, an international network of annelid specialists, results in a consensus on the identification: the polychaete is most likely *Nereis gracilis* the only Nereid species reported from these waters. The family Nereidae consists mainly of mobile predatory and/or scavenging species. The day finishes with a game of ‘Geni’.

Friday 03.12.2010
The ROV is off deck at 08:15 for a maintenance dive (dive #189). Meanwhile I prepare the amphipod trap with the same bait choices as during the previous visit: mackerel, crab meat, dried seaweed, a 12 hrs glow stick and a control trap. The bait (ca. 100 g) is wrapped in 20 x 20 cm strips of cotton (except of the glow stick). The glow stick trap is taped up so that the light only emits from the entrance to the trap. The control trap (without bait) also contains a 20 x 20 cm strip of cotton.
After lunch we deploy the ROV for dive #190 (off-deck 13:35) with the amphipod trap mounted on the cage and the ‘specimen collector (opening diameter 260 mm), basically a net with a steel-enforced rim, in the 7 function arm.
The amphipod trap is set onto the sediment 200 m due Southeast of the BOP beside transponder 4. Our attempts to relocate the Nereid polychaete seen during dive #188 fail and we head due East. Approximately 30 m due E of BOP we encounter a dumbo octopus (*Cirrotheutis* sp.). We then proceed as far as ca. 170 m E of BOP and use the specimen collector to take samples of amphipoda seen in big burrows, ophiuroidae and possibly *Filograna* sp., a polychaete genus which forms clumps of tubes easily confused with bryozoans. The collector is used to scoop up sediment containing the specimen(s) and sediment. At 17:35 we head back to the BOP with the ROV being back on board at 18:30. The net bag of the specimen collector contains approximately 8 l of deep sea mud (light brown colour; see images below) which I treat as a macrofauna sample and sieve (500 µ) using freshwater (seawater not available).
The major part of the qualitative sample is preserved in 5% formalin with specimen samples (an ophiuroid and some ?*Filograna* tubes) preserved in RNA-later for DNA analysis.
The sieve content consisted mainly of foraminifera, polychaetes and two amphipod specimens of the genus *Neohela* sp. (still images taken). By 22:00 the sample is processed and I turn in.

‘Specimen Collector’ sample AB/031210/015#1 a) in collector; b) content in 500 µ sieve; c) sieved sample and d) *Neohela* sp. (amphipoda) found in sample

Saturday 04.12.2010
The ROV is off deck at 8:30 for dive #191 and by 09:15 the ROV is out of the cage. We take 2 push cores at 50 m E of BOP since we did not get enough replicates for analyses during the first visit. Additionally 4 push cores are taken 120 m E of BOP. The coring is completed by 10:23 and the ROV is back on deck by 11:00. Only one core from 50 m E of BOP can be processed since the second core from this site flushes out during processing. Otherwise all cores are of high quality. After lunch all cores have been processed.
At 13:42 the ROV is off deck again for dive #192 and by 14:35 out of the cage. At 100 m E of BOP we continue a biodiversity survey out to 480 m E of BOP. We get very good footage of a carnivorous gastropoda (130 m E of BOP), the soft coral *Corymorpha* sp. (135 m E of BOP), Ampharetidae (polychaeta; 150 m E of BOP), Sabellidae (polychaeta; 230 m E of BOP), sponges, ?Enteropneusts (290 m E of BOP), *Elpidia* sp., an elipsiid holothurian (sea cucumbers , 320 m E of BOP). At 17:06 we reach 480 m E of BOP and return to the BOP (17:07). From there we head to transponder 4 (200 m SE of BOP) to collect the amphipod trap. The ROV is back on board by 18:00. This time the baited traps all contain a few amphipoda. Only the control trap (contained just the cotton strip) remained empty. By the time I have processed and fixed the samples in formalin it is dinner time. The day finishes with the traditional Bingo session – and I even win!

Sunday 05.12.2010
Despite the forecast the weather remains good enough for ROV deployment and the ROV is off deck by 11:20 for Dive #193 and out of the cage at 11:56. We will use an Ekman grab (see image below) in order to take macrofauna samples. The Eckman grab has the advance of covering a greater surface area (300 x 300 mm) area than the push core samples (see image below). The grab can penetrate 300 mm+ into the sediment. The BOP maintenance tasks are completed by 13:00 and the Ekman grab is taken out of the bin on top of the cage. At 13:09 we take a sample with the grab 50 m E of BOP. The sediment is very soft and the grab sinks into the sediment by its own weight. The filled grab is stored again in the bin on top of the cage and the ascent to the surface starts at 13:17. The ROV is back on deck at 14:00. The Ekman grab contains approximately 8 l of soft sediment. The sediment consists of light brown well oxygenated and grey sediment. I sieve the sample over a 500µ sieve and fix the sieve content in 5% formalin.
While I process the sample the ROV team deploys the ROV for dive #194 (off deck 15:03, out of cage: 15:43). We take another Ekman grab sample130 m E of BOP on undisturbed sediment as indicated by asteroid imprints and of the big burrows over one of which the grabs is placed. The ROV is back in the cage at 16:22 and back up on deck shortly before 17:00. Grab content is approximately 4 l (grab gaps slightly open on retrieval, so some sediment loss has occurred). The sample is processed the same way as the first sample which is completed by dinner time.

Ekmann grab (open) for taking macrofauna samples

Monday, 06.12.2010
Wave height is too high for diving today. I download the data from the data logger and start downloading the video and image data from dives #190-192. After discussions with Helena and the SERPENT team it is agreed that I stay on board until Friday (or longer if necessary) in order to take more macrofauna samples using the Ekman grab.

Tuesday, 07.12.2010
The still camera is taken off the ROV since it indicates some failed function. The ROV is off deck at 09:06 for Dive #195. The maintenance tasks are completed by 11:00 and the ROV heads 200 m E of BOP to take another Ekman sample (taken at 11:36). The grab gapes slightly upon return to the ROV, but not much sediment is lost. By the time the grab is stored

in the tub on top of the cage (11:28) the buckets are closed. This gaping is likely to be caused by sediment trapped on the outside of the grab buckets or by the spring mechanism not being strong enough.
Due to work on the riser the ROV cannot be brought up on deck until 18:30. The sample is small (3-4 l, 700 mm sediment depth in grab) and gets processed for macrofaunal analysis. I finish processing the sample by 20:00.
With the help of the logistic team on board and on shore we organise the transport of the frozen samples which will be transported to shore by helicopter tomorrow.

Sieving of macrofauna samples

Wednesday, 08.12.2010
The ROV is off deck by 08:18 for Dive #196. Out of cage by 08:56. We head 50 m W and take an Ekman grab sample (09:25) and 6 push cores at the same location in order to compare the sampling efficiency of a full set of push cores via the Ekman grab. For this purpose the push core samples get pooled and sieved together. However, the uppermost 6 cm of the shortest core is used for particle size analysis.
Frode Ravnstad leaves the rig today and agrees to hand over the frozen samples at Brønnøsund Airport to a courier service. Vilhelm Sunanå arrives as Frode's replacement.
After lunch I keep processing the samples while the ROV is off deck at 14:16 for Dive #197. Out of cage at 15:16 to fly 130 m due W of BOP in order to collect an Ekman grab sample and 6 push cores (last core taken at 17:45). ROV back in cage at18:03 and back on deck at 18:30. I process the samples until 21:00. The grab sample possibly contains an ?Enteropneust.

Thursday, 09.12.2010
ROV off deck at 08:35 for a maintenance dive. The ROV is back on board by 11:00. Further dive plans for the day have to be cancelled due to a pressure problem with a ROV. I use the time to download data and pack and arrange the transport of the SERPENT gear. After dinner I attend an information meeting arranged by Shell.

Friday, 10.12.2010

The Oceaneering team is still working on the ROV problems; hence we cannot conduct another biodiversity dive today. I pack, clarify the shipment of gear with the logistics team and copy the last of necessary files.
The helicopter leaves at 14:00 to arrive at Bronnoysund at approximately 15:30. I fly on to Trondheim and stay the night in the Rica Hotel in Trondheim.

Saturday, 11.12.2010
I board the flight to Heathrow (via Kopenhagen) at 11:30, arrive in Heathrow at 16:00 and arrive in Winchester at 18:30.

4. SAMPLES:

FIRST VISIT

The ROV did not have a still image camera therefore all images taken of specimens are screen cuts from video footage. A detailed video survey was carried out which extended about 200m in eight headings. Transect 1 was repeated twice due to the high levels of sediment disturbance caused by the tether.

Three replicate push cores were taken from one site 50 m to the east of the BOP. The shortest core (length 6 cm) was used for particle size distribution analysis for which the uppermost 6 cm are needed. The two remaining cores (17 and 30 cm long, respectively) are divided into the sections 0-1 cm, 1-3 cm and 3-5 cm according to the protocol for chemical analyses (heavy/trace metals/TOM). All sediment samples were frozen immediately after processing remained frozen on transport until analysis.

Five baited amphipod traps for a bait-selection experiment were deployed ca. 11 m northwest of the BOP with the opening of the traps facing away from the BOP. Each trap contained a different food source (tinned mackerel, tinned salmon, dried seaweed, cold-light stick and an un-baited control) with the goal of attracting different species of amphipods in the different traps. After 29 hrs of deployment the traps were recovered but did not contain any amphipoda.

SECOND VISIT

Six very good push cores were taken 200 m East of BOP. All surfaces were undisturbed as indicated by the clear supernatant water. The shortest core (17 cm length) was processed for particle size analysis. Three replicate cores (core length between 22 and 29 cm) were processed for heavy/trace metals/TOM analysis. One core was processed for hydrocarbon analysis (length of core 21 cm). The remaining core (core length 20 cm) was processed for macrofauna analysis (0-10 cm sieved over 500 µm sieve and fixed in 5 % buffered formalin).

One push core was taken 50 m E of BOP (for heavy/trace metal/TOM analysis) in order to increase the number of replicates from this location. Additionally four push cores of high quality were taken 120 m E of BOP and sliced according to the protocols for particle size analysis, heavy/trace metal/TOM analysis and hydrocarbon analysis. All push cores consisted of very fine mud with a relatively high water content in the uppermost layers. In some cores a layering was noted and the depth of the layer recorded.

The baited amphipod traps were deployed again for a period of approximately 27 hrs (200 m SE of BOP). During retrieval some content of the traps might have got lost. The baited traps all contained some amphipoda, only the control trap remained without amphipoda or any other fauna. Whereas the traps with the light stick, the seaweed and the tinned crab meat contained each two amphipoda only the trap with the tinned mackerel contained several amphipoda. The animals were fixed in 5% formalin solution for taxonomic analysis.

The specimen collector constructed by the Oceaneering team proved to be a useful sampling instrument for macrofauna. The sample contained two specimens of the amphipod *Neohela* sp. which creates the big burrows often during this survey. These specimens are very fragile and are often damaged using routine sampling devices such as epibenthic sleds or bottom trawls. The two specimens obtained using the Magnum ROV with the specimen collector during the SERPENT survey are in an excellent state according to expert opinion (M. Thurston, pers. Comment).

The Ekman grab was deployed successfully at 50 m, 130 m and 200 m E of BOP and at 50 and 130 m W of BOP parallel with taking 6 push cores from each of these sites. The content of the grab was sieved on a 500 µm sieve. The sample from 50 m away from BOP contained fine mud with a high water content. Some of the sediment was well oxygenated (indicated by light brown colour), but grey sediment (indication of hypoxic conditions) was also present. After emptying the grab into a tub these layers were mixed. For a comparison of the sampling efficiency of a pooled set of push cores versus the Ekman grab both gear types were used at the same sites and sieved for macrofauna analysis.
The remains on the sieve mainly contained brown agglutinating and white globular foraminifera and some polychaetes and were fixed in formalin (5 %, buffered).
Some of the macrofauna samples (especially from the specimen collector and the Ekman grab) contained specimens that might lead to an affirmative identification of the specimens recorded by camera. The Ekman grab sample taken 130 m W of BOP contains, for example, what could be an enteropneust.

CODE STRUCTURE:

AK/011110/001#1

Aker Barents / Date / ROV SERPENT dive log #replicate

ALL SAMPLES IN ORDER OF COLLECTION

Station	Date	location	sample type	details
PRIOR TO SERPENT VISIT				
AB/011110/001#1	01.11.2010 (processing date)	10 m N of BOP	Push core	0-1 cm heavy/trace metal/TOM analysis; taken 07.09.2010
AB/011110/001#2	01.11.2010 (processing date)	10 m N of BOP	Push core	1-3 cm heavy/trace metal/TOM analysis; taken 07.09.2010
AB/011110/001#3	01.11.2010 (processing date)	10 m N of BOP	Push core	3-6 cm heavy/trace metal/TOM analysis; taken 07.09.2010
AB/011110/002#1	01.11.2010 (processing date)	50 m N of BOP	Push core	0-1 cm for heavy/trace metal/TOM analysis; taken 07.09.2010
AB/011110/002#2	01.11.2010 (processing date)	50 m N of BOP	Push core	1-3 cm for heavy/trace metal/TOM analysis; taken 07.09.2010
AB/011110/002#3	01.11.2010 (processing date)	50 m N of BOP	Push core	3-6 cm for heavy/trace metal/TOM analysis; taken 07.09.2010
AB/011110/003#1	01.11.2010 (processing date)	100 m N of BOP	Push core	0-1 cm for heavy/trace metal/TOM analysis taken 07.09.2010
AB/011110/003#2	01.11.2010 (processing date)	100 m N of BOP	Push core	1-3 cm for heavy/trace metal/TOM analysis; taken 07.09.2010
AB/011110/003#3	01.11.2010 (processing date)	100 m N of BOP	Push core	3-6 cm for heavy/trace metal/TOM analysis; taken 07.09.2010
FIRST SERPENT VISIT				
AB/071110/004#1	07.11.2010	50 m E of BOP	Push core	0-6 cm Particle Size analysis; core length: 260 mm
AB/071110/005#1	07.11.2010	50 m E of BOP	Push core	0-1 cm for heavy/trace metal/TOM analysis; core length:170 mm
AB/071110/005#2	07.11.2010	50 m E of BOP	Push core	1-3 cm for heavy/trace metal/TOM analysis; core length:170 mm
AB/071110/005#3	07.11.2010	50 m E of BOP	Push core	3-6 cm for heavy/trace metal/TOM analysis; core length:170 mm
AB/071110/006#1	07.11.2010	50 m E of BOP	Push core	0-1 cm for heavy/trace metal/TOM

				analysis; core length:300 mm
AB/071110/006#2	07.11.2010	50 m E of BOP	Push core	1-3 cm for heavy/trace metal/TOM analysis; core length:300 mm
AB/071110/006#3	07.11.2010	50 m E of BOP	Push core	3-6 cm for heavy/trace metal/TOM analysis; core length: 300 mm
AB/041110/007#1	04.11.2010	200 m north of BOP; 0 º	Video transect 1	Transect 1: starting point 200 m due North of BOP, heading straight South (180 º); not to be analysed due to sediment disturbance due to tether
AB/081110/008#1	08.11.2010	200 m South of BOP; 180º	Video transect 2	Transect 2: starting point 200 m due 180º S of BOP
AB/081110/008#2	08.11.2010	200 m SW of BOP; 225º	Video transect 3	Transect 3: starting point 200 m due SW of BOP 225º
AB/081110/008#3	08.11.2010	200 m W of BOP; 270º	Video transect 4	Transect 4, starting point 200 m W of BOP, 270º
AB/081110/008#4	08.11.2010	200 m NW of BOP; 315º	Video transect 5	Transect 5, starting point 200 m NW of BOP, 315º
AB/081110/008#5	08.11.2010	200 m SE of BOP; 135º	Video transect 6	Transect 6, starting point 200 m NW of BOP, 135º
AB/081110/008#6	08.11.2010	200 m E of BOP; 90º	Video transect 7	Transect 7, starting point 200 m NW of BOP, 90º
AB/081110/008#7	08.11.2010	200 m NE of BOP; 45º	Video transect 8	Transect 8, starting point 200 m NW of BOP, 45º
AB/081110/008#8	08.11.2010	200 m N of BOP; 0º	Video transect 1	Repeat of transect 1
AB/081110/009#1	08.11.2010	11 m NW of BOP	Amphipod trap	Bottle 1; bait: crab
AB/081110/009#2	08.11.2010	11 m NW of BOP	Amphipod trap	Bottle 2; bait: dried seaweed
AB/081110/009#3	08.11.2010	11 m NW of BOP	Amphipod trap	Bottle 3; bait: no bait
AB/081110/009#4	08.11.2010	11 m NW of BOP	Amphipod trap	Bottle 4; bait: light stick (12 hrs)
AB/081110/009#5	08.11.2010	11 m NW of BOP	Amphipod trap	Bottle 5; bait: mackerel
SECOND SERPENT VISIT				
AB/301110/009#1	30.11.2010	200 m E of BOP	Push core	0-6 cm Particle Size analysis; core length:170 mm
AB/301110/010#1	30.11.2010	200 m E of BOP	Push core	0-1 cm for heavy/trace metal/TOM analysis; core length: 290 mm
AB/301110/010#2	30.11.2010	200 m E of BOP	Push core	1-3 cm for heavy/trace metal/TOM analysis; core length: 290 mm
AB/301110/010#3	3011.2010	200 m E of BOP	Push core	3-6 cm for heavy/trace metal/TOM analysis; core length: 290 mm
AB/301110/011#1	30.11.2010	200 m E of BOP	Push core	0-1 cm for heavy/trace metal/TOM analysis; core length: 240 mm
AB/301110/011#2	30.11.2010	200 m E of BOP	Push core	1-3 cm for heavy/trace metal/TOM analysis; core length: 240 mm
AB/301110/011#3	30.11.2010	200 m E of BOP	Push core	3-6 cm for heavy/trace metal/TOM analysis; core length: 240 mm
AB/301110/012#1	3011.2010	200 m E of BOP	Push core	0-1 cm for heavy/trace metal/TOM

				analysis; core length: 240 mm
AB/301110/012#2	30.11.2010	200 m E of BOP	Push core	1-3 cm for heavy/trace metal/TOM analysis; core length: 220 mm
AB/301110/012#3	30.11.2010	200 m E of BOP	Push core	3-6 cm for heavy/trace metal/TOM analysis; core length: 220 mm
AB/301110/013#1	30.11.2010	200 m E of BOP	Push core	0-1 cm for hydrocarbon analysis; core length: 210 mm
AB/301110/013#2	30.11.2010	200 m E of BOP	Push core	1-3 cm for hydrocarbon analysis; core length: 210 mm
AB/301110/013#3	30.11.2010	200 m E of BOP	Push core	3-6 cm hydrocarbon analysis; core length: 210 mm
AB/301110/014#1	30.11.2010	200 m E of BOP	Push core	0-10 cm for macrofauna analysis (500 µm); core length: 200 mm
AB/031210/015#1	03.12.2010	50-170m E of BOP	Specimen collector	qualitative macrofauna (≥500µ) sample preserved in 5% formalin; ca. 8 l sediment
AB/031210/015#2	03.12.2010	50-170m E of BOP	Ophiuroidae	From specimen collector sample; preserved in RNA-later
AB/031210/015#3	03.12.2010	50-170m E of BOP	?*Filograna* sp.	From specimen collector sample; preserved in RNA-later
AB/041210/016#1	04.12.2010	50 m E of BOP	Push core	0-6 cm for heavy/trace metal/TOM analysis; core length: 230 mm
AB/041210/017#1	04.12.2010	120 m E of BOP	Push core	0-6 cm for particle size analysis; core length: 210 mm
AB/041210/018#1	04.12.2010	120 E of BOP	Push core	0-1 cm for heavy/trace metal/TOM analysis; core length: 270 mm; layer at 170 mm from top
AB/041210/018#2	04.12.2010	120 E of BOP	Push core	1-3 cm for heavy/trace metal/TOM analysis; core length: 270 mm; layer at 170 mm from top
AB/041210/018#3	04.12.2010	120 E of BOP	Push core	3-6 cm for heavy/trace metal/TOM analysis; core length: 270 mm; layer at 170 mm from top
AB/041210/019#1	04.12.2010	120 E of BOP	Push core	0-1 cm for heavy/trace metal/TOM analysis; core length: 220 cm; layer at 155 mm from top
AB/041210/019#2	04.12.2010	120 E of BOP	Push core	1-3 cm for heavy/trace metal/TOM analysis; core length: 220 mm; layer at 155 mm from top
AB/041210/019#3	04.12.2010	120 E of BOP	Push core	3-6 cm for heavy/trace metal/TOM analysis; core length: 220 mm; layer at 155 mm from top
AB/041210/020#1	04.12.2010	120 E of BOP	Push core	0-1 cm for hydrocarbon analysis; core length: 240 mm
AB/041210/020#2	04.12.2010	120 E of BOP	Push core	1-3 cm for hydrocarbon analysis; core length: 24 cm
AB/041210/020#3	04.12.2010	120 E of BOP	Push core	3-6 cm hydrocarbon analysis; core length: 240 mm
AB/041210/021#1	04.12.2010	200 m SE of BOP	Amphipod trap	bait: light stick (2 amphipoda)
AB/041210/021#2	04.12.2010	200 m SE of BOP	Amphipod trap	bait: tinned mackerel (several amphipoda)
AB/041210/021#3	04.12.2010	200 m SE of BOP	Amphipod trap	bait: seaweed (2 amphipoda)

AB/041210/021#4	04.12.2010	200 m SE of BOP	Amphipod trap	bait: tinned crab (2 amphipoda)
AB/051210/022#1	05.12.2010	50 m E of BOP	Ekman grab	Macrofauna sample sieved on 500 µm sieve; ca. 8 l sediment
AB/051210/023#1	05.12.2010	130 m E of BOP	Ekman grab	Macrofauna sample sieved on 500 µm sieve; ca. 4 l sediment
AB/071210/024#1	07.12.2010	200 m E of BOP	Ekman grab	Macrofauna sample sieved on 500 µm sieve; ca. 3 l sediment (penetration depth 70 mm)
AB/081210/025#1	08.12.2010	50 m W of BOP	Ekman grab	Macrofauna sample sieved on 500 µm sieve; ca. 5 l sediment (penetration 100 mm)
AB/081210/026#1	08.12.2010	50 m W of BOP	Push cores combined	Macrofauna sample sieved on 500 µm sieve; cores pooled
AB/081210/026#2	08.12.2010	50 m W of BOP	Push core	0-6 cm for particle size analysis; core length: 120 mm
AB/081210/027#1	08.12.2010	130 m W of BOP	Ekman grab	Macrofauna sample sieved on 500 µm sieve; ca. 5 l sediment (penetration 80 mm)
AB/081210/028#1	08.12.2010	130 m W of BOP	Push cores pooled	Macrofauna sample sieved on 500 µm sieve; cores pooled

Push cores taken 50 m (top; AB/081210/026#1) and 130 m W of BOP (below; AB/081210/028#1). The layering of the sediment into grey hypoxic and brown oxygenated sediment is well recognisable in the cores from 50 m W of BOP.

5. OBSERVATIONS

FIRST VISIT

This exploratory phase rendered detailed footage of amphipoda (sandhoppers), ophiuridae (brittlestars), an unidentified worm-like organism (possibly enteropneust), polychaetes (bristle worms most likely belonging to the family Ampharetidae), pygnogonida (sea spiders) and fish (mainly belonging to the group Lycodidae, but also a Threadfin seasnail or kongeringbok (*Rhodichthys regina*) and a ray (possibly *Amblyraja hyperboreus*).
Closer to the BOP signs of potential phytodetritus aggregations were visible on the seafloor (greenish material aggregated in sediment depressions) on which Amphipoda such as *Cleippides* sp. seemed to feed However, this phytodetritus was only observed during the first dive and could not be relocated again. Further away from the BOP (from ca. 40 m outwards) the number of ophiuroid imprints in the sediment increased rapidly. Ophiuroidae and Amphipoda seemed to be the most abundant epifaunal taxa (living on the sediment surface). Some sponges were also recorded.

Phytodetritus? aggregates with the amphipod *Cleipiides* sp. feeding on it.

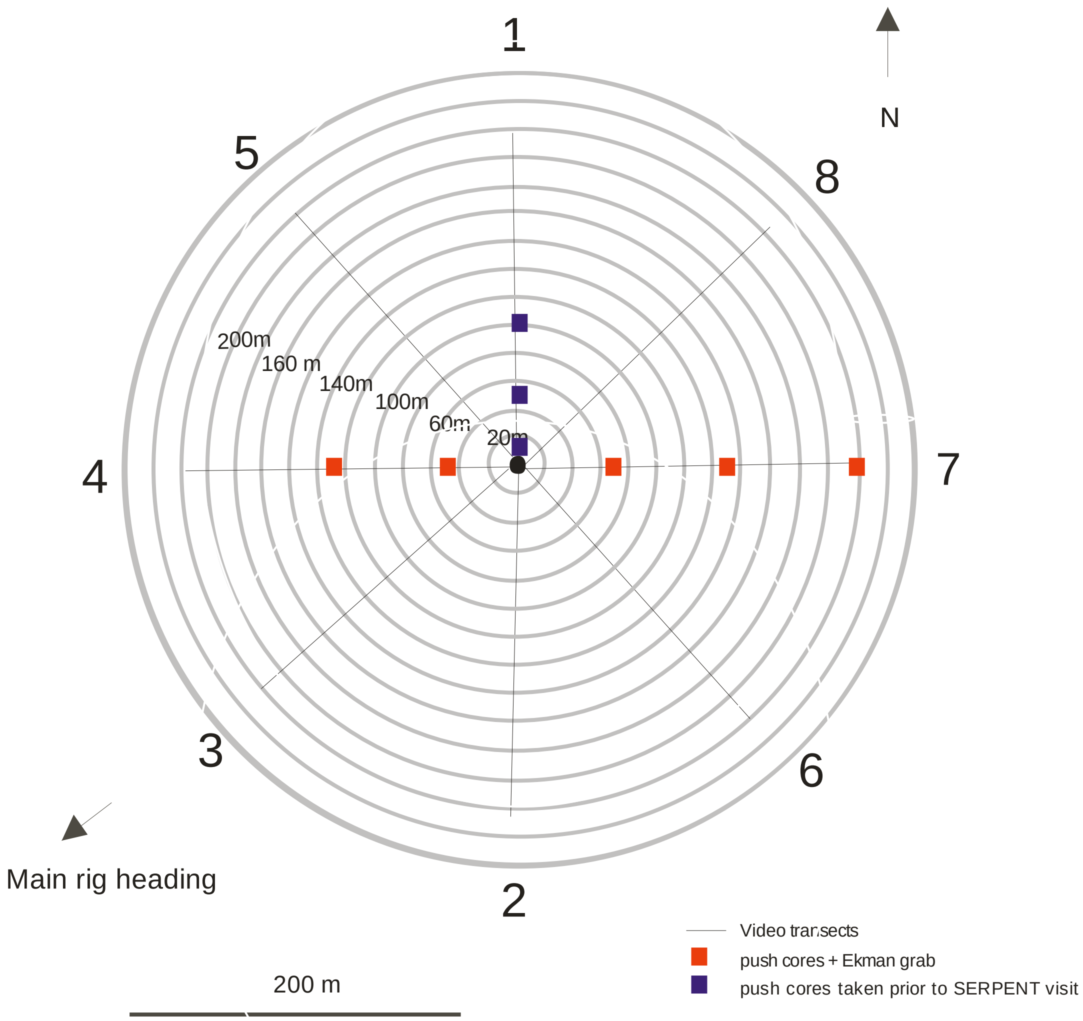
SECOND VISIT

The biodiversity surveys conducted during this visit reached about 480 m E of BOP in order to obtain baseline data from an area that can be considered less exposed to disturbance from the drilling activity. General abundance of fauna remains low even that far away from BOP. Fauna recorded included as well as the same taxa observed during the first visit fauna not previously recorded from this site. For example, the predatory mobile nereid polychaete Nereis gracilis (positive species identification), bryzoa clumps (mosdyr) consisting of different species with different colony growth forms in one clump. These clumps were often located in depressions in the sediment.
The absence of any visible current ripples on the sediment indicates that current velocity in the area is low. No traces of phytodetritus aggregations on the sediment were found during the second visit.

No experimental work was conducted due to the general low abundance of fauna (with the exception of Ophiuridae).

DISTURBANCE OBSERVATIONS

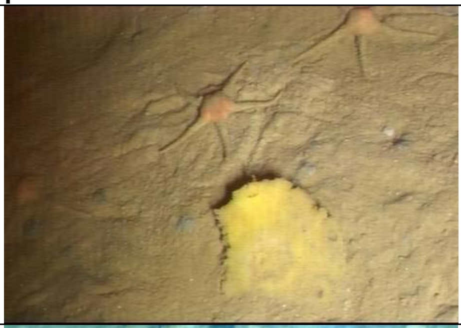
Eight transects were taken, each extending 200 m from the BOP.
Physical disturbance typically extended to 100 m from the BOP. The analysis of the spatial extent of disturbance is still in progress.



Video transects and positions of push cores and Ekman grab samples taken around the BOP at Dalsnuten.

FAUNAL OBSERVATIONS

A selection of species observations made using the colour video camera and the digital stills camera at Dalsnuten are recorded in the table below.

Date	time	observation	photo/video
04.12.2010	???	Unidentified sponge and asteroid *Pontaster tenuispinus*	
04.12.2010	14:57	Hydrozoa: *Corymorpha* sp.	
04.11.2010	16:34	*Amphipoda: Cleippides* sp.	
01.12.2010	09:28	Amphipod burrow; probably caused by *Neohela* sp.	

04.11.2010	16:44	Polychaeta: Ampharetidae sp. in its tube	
01.12.2010	08:45	Polychaeta: *Nereis gracilis*; Approx. 15 cm long	
01.12.2010	9:25	Unidentified polychaete	
03.12.2010	15:48	Polychaeta: *Filograna* sp.,	
03.12.2010	15:17	*Cirroteuthis* sp., Dumbo octopus	

<table>
<tr><td>30.11.2010</td><td>13:14</td><td>Unidentified squid</td><td>
</td></tr>
<tr><td>30.11.2010</td><td>14:08</td><td>Unidentified ophiuroidae</td><td>
</td></tr>
<tr><td>04.11.2010</td><td>16:06</td><td>Asteroidae; probably Pontaster tenuispinus</td><td></td></tr>
<tr><td>30.11.2010</td><td>12:40</td><td>Three species of bryozoans. Red species: ?Reteporella beaniana whereas the larger branches could belong to Palmicellaria sp., the thinner dichotomously branching colonies probably belong to Idmidronea sp.</td><td></td></tr>
</table>

08.12.2010	16:20	Bryozoa (mosdyre): ?*Reteporella beaniana*	
07.11.2010	16:40	Rajiformes (skates and rays): possibly *Amblyraja hyperborea*	
16.011.2010	17:05	Possibly *Rhodichthys regina,* Threadfin seasnail, Kongeringbuk	
30.11.2010	12:28	*Lycodes* ?*frigidus*, Eelpout, Arktisk Ålebrosme	
30.11.2010		Unidentified tracks	

MISSION 86

STENA CARRON, LAGAVULIN, FAROE SHETLAND CHANNEL

DANIEL JONES

LAGAVULIN CRUISE REPORT

1. GENERAL INFORMATION:

Client: Chevron
Vessel operator: Stena
Vessel name: Stena Carron
Vessel location: Lagavulin, North of Shetland
Block: 217/15-A
Well position: 62°39’22.8”N 001°07’33.1” W
UTM: 6948596.26N 596034.00E Zone 30 North
Seabed depth: 1567 m
Seabed temperature: -0.38°C
ROV operator: Oceaneering
ROV: Magnum
ROV team:

ROV superintendent	Paul Stone
Supervisor starboard ROV days	Andrew Angus
Pilot starboard ROV days	Jonathan Gill
Tech starboard ROV days	Mark Flippence

2. GEAR:

Magnum ROV x 2 (Magnum 156 is starboard, Magnum 155 is port)
Deep-sea Systems Colour HD video camera x 2 (different models, one on port ROV is large one on starboard ROV is small)
Deep-sea Systems High Intensity Discharge (HID) lighting
Deep-sea Systems DPC8000 Stills camera
Panasonic DVCPro-HD deck on port camera and 8 x hard-disc array on the starboard

SERPENT Gear

Total shipment = 3 Boxes
Sent 25th September 2010; Arrived at Asco at 0950 on 29/9 – signed for by J.Dalziel

Box 1 – SERPENT ROV sampling equipment
Weight – 65.5 kg; Dimensions: 770 mm x 580 mm x 400 mm

2 x 2.5 l formaldehyde solution (in fibreboard box, LQ, MSDS attached)
1 x wooden core extractor
2 x bags containing plastic bags (2xA4 size)
1 x bag containing labels, 2 rolls tape
1 x core processing kit (ring, scoop and slicing plate)
1 x set of stationary (pens and labels)
20 x plastic core tubes
12 x grey core holders
12 x bases and bungs for core holders
12 x handles
30 x hoseclamps
6 x 1l Nalgene samples bottles
1 x bag of sample collection bait (tin of mackerel, tin of crab meat and bag of seaweed)
Fluorescein disodium dye in small vial inside 250ml plastic bottle
1 x 500ml RNA Later solution (msds attached)

Box 2 – Cool box
Weight – 5 kg; Dimensions: 450 x 450 x 270 mm

7 x sample bottles
8 x 1l sample bottles
2 x freezer blocks

Box 3 – Small aluminium box
Weight – 9 kg; Dimensions: 580 x 400 x 370 mm

17 x sample bottles
7 x sample buckets and lids

Missing gear:

Eppendorf tubes
Dissection kit

1 tin mackerel used up

3. NARRATIVE:

Note times are all in local time (GMT + 1) as 24 hour clock.

Thursday 4th November 2010

Arrived in Aberdeen. Stayed at Speedbird Inn.

Friday 5th November 2010

Checked in at 6:30 at Scotia. Flew on a fixed wing Logan Air flight to Sumburgh Airport in Shetland and then on to the Stena Carron on a Eurocopter Super Puma Mk II. The drilling site is 150 nautical miles due north of Lerwick.

Got to the rig at 10:30. Had the full safety inductions as I had not been to the rig for over 6 months. Went out after and met with Andy Angus, Mark and Jonathan at the stb ROV. They were fitting the stills camera and so we were not able to dive today.

Saturday 6th November 2010

Joined the ROV team at 6 for launch of Magnum 156. After some checks the ROV was off deck at approximately 7:15am. We got to depth and left the cage at 07:59.
08:04 at BOP
08:36 on seabed east of BOP. Seabed depth is 1575m
08:47 *Lycodes* and *Pontaster tenuispinus*
Saw hydroids and several *Lycodes* spp.
Had been taking some stills pictures but had not had the flash on. I turned the flash on and set the ISO: 200; shutter speed 1/125 and exposure F8. This seemed to be a good setting. Unfortunately the camera was set a bit too horizontal for good seabed imaging.
09:43 Saw the unknown white asteroid. I think this may be *Zoroaster fulgens*. Got some pictures
10:05 Some *Ascophyllum nodosum* seaweed found on the seabed, presumably this had come from the rocky shores of Shetland or the Faroes.
10:10 Saw *Hymenaster pellucidus*
10:20 *Bathycrinus carpenteri*
10:27 *Ophiopleura borealis*
Bythocaris?
10:33 Checked parascientific temperature sensor -0.38°C
10:50 White asteroid
11:06 Small, heavily sedimented rock
11:13 Red *Careproctus* – may be female as with white one before disturbed.
11:15 Went in for lunch. The HD video recording computer was not working, it kept getting the blue screen of death and restarting. One of the RAID drives had failed. We spent a few hours trying to fix it before we could do some video transects.

Time	Distance, m	Comments
14:36:45	0m	Start transect going North from BOP
14:39:11	10m	
14:39:53	20m	
14:41:45	30m	
14:42:58	40m	
14:44:40	50m	
14:45:54	60m	
14:47:23	70m	
14:49:31	80m	

14:50:45	90m	
14:52:13	100m	
14:54:18	110m	Ophiuroid
14:56:23	120m	Ophiuroid
14:57:49	130m	
14:58:45	140m	
15:00:38	150m	
15:01:38	160m	
15:03:21	170m	Cerianthid?
15:05:07	180m	
15:07:10	190m	
15:08:04	200m	End transect
15:29:55	0	Start transect going south from BOP
15:31:12	10	
15:31:58	20	
15:32:45	30	
15:33:56	40	
15:35:16	50	
15:36:06	60	
15:38:03	70	
15:41:30	80	
15:43:47	90	
15:45:49	100	
15:47:16	110	
15:48:44	120	
15:51:24	130	
15:52:49	140	
15:53:55	150	
15:55:07	160	
15:56:17	170	
15:58:45	180	
15:59:35	190	
16:02:40	200	End transect

On deck at 16:50

Unfortunately the HD video camera recording computer was not working. It was getting the blue screen of death. Despite spending several hours trying to fix it we did not succeed. I think it had a hardware error and some software errors. They would have required substantial testing and repair to fix so we used the standard def camera for all the transects.

Sunday 7th November 2010

Helped the ROV team adjust the angle of the stills camera and flash so both were pointing much closer to the vehicle and better able to image the benthic organisms (26.2° from horizontal; altitude 190mm). Wind was light at 10kn and swell ok at 4m. The ROV was launched at 7:25 and in the water at 07:35. The ROV was on the seabed at 8:12 and we went to look for megafaunal organisms to photograph. At 8:15 we sae a white asteroid and 8:54 we saw a different white asteroid. One had a central opening. We also took pictures of the stalked crinoid *Bathycrinus carpenteri*, several lycodids and the shrimp *Bythocaris*.

Started a series of video transects:

Time	Distance, m	Notes
10:12:15	0	Start transect going west from BOP
10:13:55	10	
10:15:24	20	
10:17:16	30	
10:18:41	40	
10:20:00	50	
10:21:42	60	
10:22:44	70	
10:23:12	80	
10:24:00	90	
10:25:07	100	
10:26:33	110	
10:27:55	120	
10:28:56	130	
10:30:22	140	
10:31:25	150	
10:32:27	160	
10:33:09	170	
10:33:52	180	
10:34:54	190	
10:35:34	200	End transect
11:40:27	0	Start transect going east from BOP
11:41:25	10	
11:41:55	20	
11:42:44	30	
11:43:49	40	
11:44:45	50	
11:45:40	60	
11:46:33	70	
11:47:22	80	
11:48:26	90	
11:50:01	100	
11:51:35	110	
11:53:39	120	
11:54:24	130	
11:55:40	140	
11:57:10	150	
11:59:44	160	
12:00:34	170	
12:01:00	180	
12:01:48	190	
12:03:11	200	End transect

12:20 we wet back to the cage for a vessel direction change.

We proceeded to complete a photographic transect, stopping every 10 m from the BOP, landing the ROV and taking a still photograph of the seabed. I carried out three replicate transects all in the South direction. With the current they ended up going down current at SSW direction.

Time	Distance, m	No. Photo	Notes
13:00		2	Marker photo of black
13:02	0	2	Start transect going south. Within visual range of BOP (to west)
13:04	10	3	
13:05	20	4	
13:07	30	2	
13:09	40	3	
13:11	50	4	
13:12	60	4	2nd pic has prawn
13:15	70	4	
13:17	80	4	
13:18	90	3	
13:21	100	2	
13:23	110	2	
13:25	120	3	1st has prawn in top left
13:27	130	3	
13:30	140	2	
13:31	150	3	Cross shaped long tracks
13:33	160	3	
13:34	170	3	
13:36	180	3	
13:37	190	3	Sabellid base middle
13:38	200	3	End transect
		3	Marker photo of black cloudy
13:53	0	4	Start replicate 2 transect going south from BOP
13:55:	10	4	2 later ones are dark
13:57	20	3	
13:58	30	3	
14:00	40	3	
14:02	50	2	
14:03	60	2	
14:05	70	2	
14:06	80	2	Stop at 85m to take 5 pictures of white star
14:12	90	2	
14:13	100	2	
14:16	110	2	
14:17	120	2	
14:19	130	2	
14:21	140	2	
14:22	150	2	
14:23	160	2	
14:24	170	2	
14:25	180	2	
14:25	190	2	

14:26	200	2	End transect
		2	Cloudy grey
		2	Dark
		3	Very dark frames
14:36:03	0	2	Start replicate 3 transect going south from BOP
14:37:30	10	3	
14:39	20	2	
14:41	30	2	
14:42	40	2	
14:43	50	2	
14:45	60	2	At 65 there were 3 extra pictures of medusa
14:46	70	3	2 prawns
14:48	80	4	
14:50	90	2	
14:52	100	2	
14:53	110	2	
14:53	120	2	
14:55	130	2	
14:56	140	2	
14:57	150	2	
14:58	160	2	
14:59	170	2	
15:00	180	2	
15:01	190	2	
15:03	200	3	

Brought ROV up at 15:05 and on deck at 16:20

Monday 8th November 2010

Waves over 6m significant wave height so too rough to dive.

Tuesday 9th November 2010

Met with the ROV team at 6:00. Wave height was 5.3m in the morning but it had dropped by 9:00 to a point where we could start work. The ROV was off deck at 9:30 laden with push cores.

Station	Location	Time	Notes
SC/091110/001#1	200m south of BOP	10:50	
SC/091110/001#2	200m south of BOP	11:05	Polychaete in tube
SC/091110/001#3	200m south of BOP	11:10	80mm thick oxygenated (light grey layer) then dark grey layer
SC/091110/002#1	20m south of BOP	11:40	60mm thick light grey and orange layer (cuttings) on top, 80mm thick light grey layer then darker grey layer to base of core
SC/091110/002#2	20m south of BOP	11:48	60mm thick light grey and orange layer

			(cuttings) on top, >50mm thick light grey layer to base of core
SC/091110/002#3	20m south of BOP	11:55	Core failed

ROV was on deck at 13:00

ROV off deck for next dive (Oceaneering dive 293) at 14:20. ROV at the seabed at 15:00. At 15:12 we deployed an amphipod trab baited with mackerel just to the SW (3m away) of the Fugro ADCP current meter (~50m NE of BOP). The amphipod trap was made of a modified push core with a coke bottle top as the funnel.

Went back south to finish off the sediment sampling.

Station	Location	Time	Notes
SC/091110/003#1	20m south of BOP	15:20	Core failed
SC/091110/003#2	20m south of BOP	15:25	Core failed
SC/091110/003#3	20m south of BOP	15:26	Good sample. 75mm of light grey/orange cuttings
SC/091110/003#4	20m south of BOP	15:29	Good sample. 85mm of light grey/orange cuttings

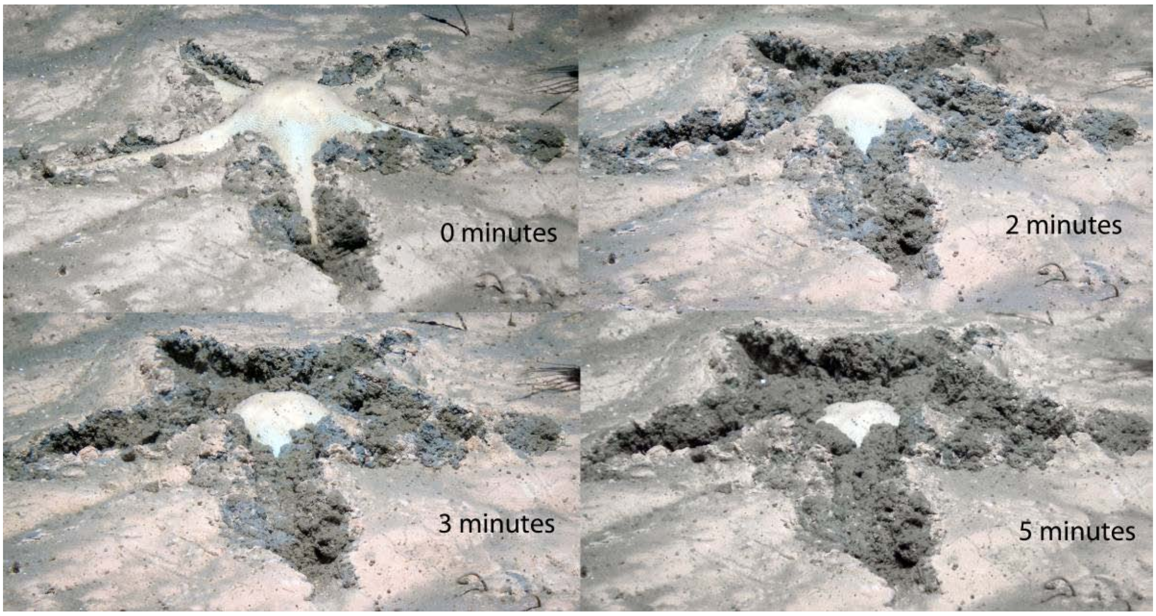
ROV back in cage at 15:35 and heading up to surface. ROV on deck at 16:00.

Core samples put in the galley freezer in a cool box.

Wednesday 10th November 2010

The ROV team were busy in the morning with maintenance. We were going to launch in the early afternoon but one of the hydraulic hoses on the deployment winch bust and the ROV team had to spend some time sorting it all out. We eventually started SERPENT work with the ROV leaving deck at 14:50. By 15:12 it had reached the seabed. We did not have much time so had taken down a net made from the rim of a bucket a metal handle and a mesh laundry bag. It was made by the SERPENT Canada team and did not look like it had been used. We used the net to capture some of the unidentified megafaunal organisms. We first encountered a white starfish which was captured at 15:31.

Another starfish was encountered at 15:49. It was lifted into the water column by the ROV thrusters and when it landed on the seafloor it burrowed quickly. This star was then captured with the net.



We then found an ophiuroid at 16:10 that was captured with the net.

We found another star that was nearly completely buried which was captured at 16:17 (no photo).

We went to the Fugro current meter and retrieved the amphipod trap at 16:37 with the 5-function manipulator. The ROV was at the cage at 16:41 and on the surface at 16:20.

I spent the rest of the time packing up the gear.

Thursday 11th November 2010

Packed up my equipment and it was transferred to the sack store for storage until the next visit.

Left at 11:00 on a Eurocopter Super Puma Mk II to Sumburgh Airport, then went on to a fixed wing flight to Aberdeen.

4. SAMPLES:

CODE STRUCTURE:

SC/051110/001#1
Stena Carron / Date / station number # replicate

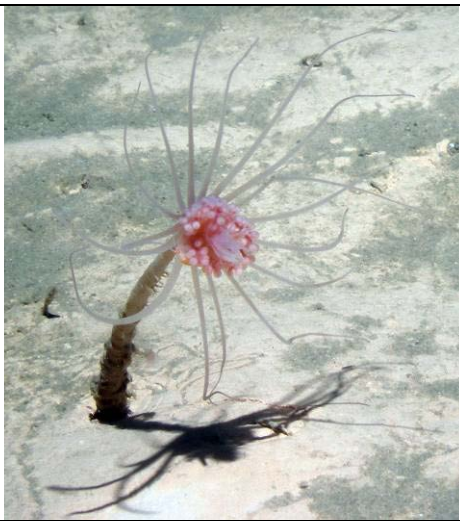
SAMPLE STATIONS:

Station	Location	Sample	Type	Preservation
SC/091110/001#1	200m south of BOP	Top 5cm sediment	Push core	frozen
SC/091110/001#2	200m south of BOP	Top 5cm sediment	Push core	frozen
SC/091110/001#3	200m south of BOP	Top 5cm sediment	Push core	frozen
SC/091110/002#1	20m south of BOP	Top 5cm sediment	Push core	frozen
SC/091110/002#2	20m south of BOP	Top 5cm sediment	Push core	frozen
SC/091110/003#3	20m south of BOP	Top 5cm sediment	Push core	frozen
SC/091110/003#4	20m south of BOP	Top 5cm sediment	Push core	Frozen
SC/101110/004#1	50m NE of BOP	Amphipod trap contents (mackerel bait)	Amphipods	Formalin
SC/101110/005#1	~100m N of BOP	White sea star	Whole	Formalin
SC/101110/006#1	~100m N of BOP	White sea star	Whole	Formalin
SC/101110/007#1	~100m N of BOP	White sea star	Majority	Taken to NOC cold the put straight into alcohol
SC/101110/007#2	~100m N of BOP	White sea star	Arm tip	RNAlater
SC/101110/008#1	~100m N of BOP	Ophiuroid	Disc + arms	Formalin
SC/101110/008#2	~100m N of BOP	Ophiuroid	Arm	RNAlater
SC/101110/008#3	~100m N of BOP	Ophiuroid	Arm	Frozen
SC/061110/009#1	Transect for 200m North from BOP	ROV transect	Video (SD)	DVD
SC/061110/010#1	transect for 200m South from BOP	ROV transect	Video (SD)	DVD
SC/071110/011#1	transect for 200m west from BOP	ROV transect	Video (SD)	DVD
SC/071110/012#1	transect for 200m east from BOP	ROV transect	Video (SD)	DVD
SC/071110/013#1	200m SSW t1	ROV transect	stills	harddrive
SC/071110/013#2	200m SSW t2	ROV transect	stills	harddrive
SC/071110/013#3	200m SSW t3	ROV transect	stills	harddrive

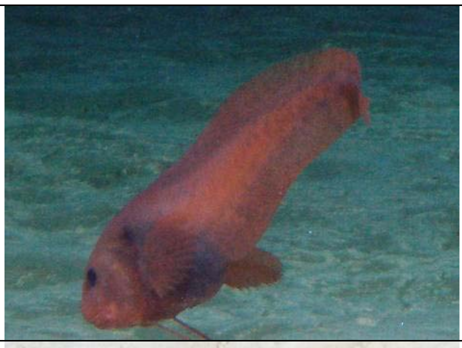
5. Ecological highlights

A total of 17 megafaunal taxa were observed living on or associated with the seabed at Lagavulin, with megafaunal representatives (i.e. those animals greater than 10 mm) from at least 6 phyla. There were almost certainly many additional fauna that were not possible to resolve, there was evidence for polychaetes and small amphipods. A number of pelagic fauna were observed (but not possible to identify) near the seabed including ctenophores, chaetognaths and copepods. The species complement was quite similar to that we have seen at a similar depth in the Norwegian Sea

Table of all species found on this visit. Only pictures from this visit were used. Pictures of all the organisms can be seen in Jones and Gates (2010) Deep-sea life of Scotland and Norway.

Phylum	Species	Notes	Picture
Porifera	Possible sponge		
Cnidaria	*Corymorpha groenlandica*		
Mollusca	*Cirroteuthis muelleri*?		
Arthropoda	*Epimeria loricata*		
	Neohela sp.	Probably the species that lives	

		in the burrows	
	Bythocaris?		
	Prawn		
Echinodermata	*Ophiopleura borealis* ?		
	Bathycrinus carpenteri		

	Hymenaster pellucidus		
	Pontaster tenuispinus		
	Zoroaster fulgens?		
Chordata	*Careproctus* sp.		
	Careproctus sp. 2		
	Lycodes sp. 1		
	Lycodes sp .2		
	Amblyraja hyperborea		

APPENDIX 1 – Contacts

Gear sent to:

ROV team
Stena Carron(Chevron Drilling Ops)
c/o Asco Operations base
Minto Avenue
Altens
AB12 3JZ
FAO Derek Black

Other contacts:

Jim Scott
Drilling Materials Controller
Fircroft
Chevron Upstream Europe
Chevron North Sea Limited
Seafield House
Hill of Rubislaw
Aberdeen AB15 6XL
CTN 677- 4490
Tel +44 1224 334490
Mobile 07919022000
mailto:jias@chevron.com

Marine Julliand
Environmental Specialist
Chevron Energy Technology Co.
Chevron House - Hill of Rubislaw, Room Seafield A/1/009
Aberdeen AB15 6XL -United Kingdom
CTN: 677 3273
Office: +44 1224 338 273
Mobile: +44 7825 843 441
marine.julliand@chevron.com

MISSION 88

DISCOVERER AMERICAS, KIWI, MEDITERRANEAN, EGYPT

ANDREW GATES

1. GENERAL INFORMATION:

Well: Kiwi
Project partner: Statoil
Vessel: *Discoverer Americas*
Vessel operator: Transocean
ROV: Millennium 62
ROV operator: Oceaneering
SERPENT representative: Andrew Gates

Water depth: 2720 m
Sea bed water temperature: 14ºC

ROV team:

	Midnight to Midday	Midday to Midnight
Supervisor	Rodney Payne	Eric Melancon
Pilot	Laurent Mialon	Thomas Morgan
Pilot	Olivier Bateau	William Bryant

Discoverer Americas

2. GEAR:

The Millennium 62 ROV was reliable for the duration of the SERPENT visit.
No 5-function arm, two 7-function arms.
It had the new skid on it which is standard equipment for drill support ROVs in the aftermath of the Deepwater Horizon disaster.
The ROV was required to be in the water most of the time during the visit because of the possibility of gas in the drilling process and the length of time it takes to launch and recover at such depth.
There were major problems with the delivery of SERPENT equipment to the *Discoverer Americas*, despite being informed before travelling to the vessel that the equipment was on board it was not there when I arrived and it was not possible to get it there before the end of the visit.

3. NARRATIVE:

14th December 2010
Travel from Bournemouth to London Heathrow to fly to Cairo at 1700. At the airport I met up with Peter Sidey, Statoil geologist also travelling to Discoverer Americas, this was helpful for the rest of the journey as Peter had been to the rig before and had the same travel itinerary as me. Flight late leaving so arrive at Cairo at 0100 (upgraded to business class for flight). Picked up by Statoil driver and taken to hotel. Stay overnight in Sofitel Cairo booked for me by Statoil (hotel room upgraded to a suite with views across the Nile!).

15th December 2010
0515 pick up by Statoil driver and taken to Cairo main railway station for 0600 departure. Taken to booked seat before the driver left. Train took 2 hours 45 minutes. Arrived at Alexandria and the “meet and greet” wasn’t there. Had to phone Yousra to get someone to meet us, who claimed he had been waiting at the wrong end of the train. Taken to airport for check-in. This was chaotic. The helicopter left from the same terminal as internal flights. There were oil and gas staff waiting in amongst holiday and business travellers. There were three flights to the Discoverer Americas that day and I was on the last one so was waiting for about four hours. Eventually I was called up (airport staff ran around finding everyone individually who then invariably wandered off whilst they found the next person – not efficient but they had guns). The flight was great. It was a Bell 4?? Helicopter, pretty small but with only 5 of us in. We could see out over the pilot’s shoulder so it was more interesting than normal. I arrived on the rig at about 1300, had some lunch and then had my induction. I met the ROV team at 1500 and was shown round the vessel. It is a new boat and truly massive.
After this I went in for dinner and then had H_2S safety training during which I had to try on a respirator mask which they tested for fit by using some smoke (of which they wouldn’t describe the composition). I was informed that my equipment still hadn’t arrived on the rig. At 2030 I went to bed to catch up on lost sleep.

16th December 2010
Out to ROV at 0700 and met the dayshift crew. They had to start off by doing a full riser and BOP inspection. This took up the first part of the morning. After this was complete we began some ecological highlights work. There was not a huge amount of life to be observed and as it was their first time working on SERPENT the crew were not too keen to go far from the BOP. We observed a grenadier fish and some deep-sea crabs but little else. After lunch the nightshift crew came out and we started doing a video survey. We were able to go out to approximately 100m from the BOP and there was more evidence of life, there were more traces but the only megafauna were the decapods. We noticed some white material on the seabed at greater distance and wondered if it was foraminifera but it is unclear from the resolution of the video. If possible some specimens will be collected later in the trip.

By the end of the shift the weather was picking up. It is due to be quite rough tomorrow.
During the day I met Rolf, the Statoil company man who told me that the night company man had worked with DJ on Orca.

17th December 2010
Out to ROV at 0700. ROV already in water to observe the BOP as the swell was quite big. Spend some time in the morning doing more ecological highlights work. Good observations of a zoarcid and grenadier. In to attend logistics meeting and learn that equipment was on route and should be arriving tonight. Swell may be a problem for unloading though.
Continue ecological highlights and observe what seems to be a very small tripod fish. Long projections from pectoral fins and possibly from caudal; hard to tell from video. We observed the fish for a while until it swam off using a similar swimming motion to the tripod fish in previous SERPENT videos.

18th December 2010
Out to ROV at 0700. ROV still in water. Commence repeat of video transect survey.
Complete 5 transects and then go inside for H_2S safety drill at 10am. During the safety drill I observed numerous large pelagic fish at the surface probably *Coryphaena equiselis* (Dorado/Mahi mahi). Return to ROV at 1045 to continue video transect survey which was completed by midday.
A water column temperature profile was recorded on return to the surface using the ROV "parascientific" sensors.
After lunch I spoke with Jeremy about the equipment and he thought it was on the boat that was due to arrive at 2000.

19th December 2010
The equipment had not arrived. I spent the morning looking for it with Jeremy but we were unable to locate it in any of the containers that had been sent out on the ship. It could also not be found onshore. I emailed Nina Aas and Sigurd Arne at Statoil and Somaya (the shipping agent the gear was passed to in Egypt) to find out more information. Somaya replied informing that the gear was still in customs and it had never made it to the dock.
In order to try and make the most of the time and assuming that the time-lapse camera was never going to arrive sourced some fish from the galley and built a built an amphipod trap.
This was taken to the seabed during a riser inspection.
ROV off deck 1405.
ROV at seabed 1510. BOP inspections.
The baited trap was still held securely in the 7-function arm.
Bait deployed at 1536.
First visit to the bait at 1554 – a crab, likely *Geryon* sp.
Continue observing bait into the night. A maximum of around 30 crabs were on it at.
A fish arrived at 2100 but it was not clear if it was attracted to the bait. Observed it for a while as it sheltered near the BOP. It was approximately 30-40 cm in length based on the other visible structures in the video.
Go back inside at 2300.

20th December 2010
Continue observing the bait as there were still crabs (although numbers were down on yesterday) there and the rig didn't want the ROV to come to the surface with the possibility of gas bubble, as it takes so long to launch and recover at this depth.
At 1030, moved one of the baits to the opposite side of the BOP to get it out of the light of the ROV with the aim of checking on it at various times to determine if the ROV light affected the number of visitors to the bait.
This was continued over a 24 hour period until I left the rig.

21st December 2010
Out to ROV 0700 to collect final DVDs and thank the ROV team. Prepared to leave the rig; I was on the last flight of the day which left at 1300. Return to Alexandria by helicopter and then I was on the

Transocean fixed wing flight to Cairo. Met by Statoil driver at Cairo airport and taken to Sofitel el Gezirah where I stayed overnight.
22nd December 2010
I was picked up by the driver at 0600 for my return flight to London, which was the first flight to London from Cairo in 5 days because of the bad European weather. Back in the UK at 1300 to return home for Christmas.

4. SAMPLES

Two video transect surveys were carried out to assess the impact of drilling. 8 transects were taken on the 8 main headings on the two separate occasions. The transect length was limited to approximately 90-100m, despite a much longer tether length, by the range of the Sonar.

CODE STRUCTURE:

DA/161210/001#1

Discoverer Americas / Date / ROV SERPENT dive log # replicate

VIDEO TRANSECTS

SERPENT reference	**Location**	**Sample type**	**details**
DA/151210/001	90m N BOP	Video transect	DVD
DA/151210/002	90m NE BOP	Video transect	DVD
DA/151210/003	90m E BOP	Video transect	DVD
DA/151210/004	90m SE BOP	Video transect	DVD
DA/151210/005	90m S BOP	Video transect	DVD
DA/151210/006	90m SW BOP	Video transect	DVD
DA/151210/007	90m W BOP	Video transect	DVD
DA/151210/008	90m NW BOP	Video transect	DVD
DA/181210/009	90m N BOP	Video transect	DVD
DA/181210/010	90m NE BOP	Video transect	DVD
DA/181210/011	90m E BOP	Video transect	DVD
DA/181210/012	90m SE BOP	Video transect	DVD
DA/181210/013	90m S BOP	Video transect	DVD
DA/181210/014	90m SW BOP	Video transect	DVD
DA/181210/015	90m W BOP	Video transect	DVD
DA/181210/016	90m NW BOP	Video transect	DVD

OBSERVATIONS

DISTURBANCE AND SEDIMENT OBSERVATIONS

The cuttings at the start of the East transect	
Approximately 10m from BOP	
50m from BOP	
80 m from the BOP	

FAUNAL OBSERVATIONS

Species observations made using the colour video camera during the video transect at Kiwi are recorded in the table below.

Date	time	observation	photo/video
16/12/2010	10:55	Deep-sea crabs	
16/12/2010	11:22	Grenadier fish	
16/12/2010	14:22	Unknown at end of transect	

17/12/2010	07:24	Resembles the zoarcids in N.E. Atlantic. According to literature the Bythitid *Cataetyx laticeps* was amongst the most common deepwater fish in the Med (lower shelf). (D'Onghia et al 2004)		
17/12/2010	07:51	Grenadier Several Grenadiers in the Mediterranean including *Chalinura mediterranea* and *Coryphaenoides guenteri* (D'Onghia et al 2004)		
17/12/2010	10:39	Crab feeding on barnacles (fallen from rig?). Likely *Geryon* sp.		
17/12/2010	11:05	Very small, no more than 10cm, probably smaller. Likely *Bathypterois mediterraneus*, one of the most common fish on the deepest bottoms of the Med. (D'Onghia et al 2004)		

17/12/2010	11:06	Fin projections	
17/12/2010	09:05	Crab	
19/12/2010	21:42	Zoarcid – quite distinctive head shape