

Vessel Name: M/V Ryan Chouest

Trustee Report

Cruise Dates: 15-22 September 2010 (Cruise 16)

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Figure 1 – M/V Ryan Chouest preparing to get underway in Theodore, Alabama.

Cruise notes: (Overall summary of operations/assessment)

Cruise 15 (the previous cruise which ran 09-14SEP10) work included continuous echo-sounding, CTD/fluorometry casts, and nearly continuous near surface water sampling with the towed hydrocarbon array. Eleven CTD casts were completed in areas of potential interest but no evidence of natural seeps was found at the sites selected for investigation. Additionally, two wave gliders were deployed in the vicinity of the Macondo well site and left to semi-autonomously collect and transmit data for approximately four weeks after which they will be recovered. Observations of sea-surface conditions were made throughout the cruise.

This cruise was the M/V Ryan Chouest's 16th Cruise and the first cruise of the new Natural Seep Water Sampling mission and as such was seen as a "shake-down" cruise covering the period of 15-22SEP10. The objective of this cruise was to chemically characterize the hydrocarbons being emitted from previously identified seafloor seeps into the water column (BP Scope of Work attached). This was achieved by utilizing the echo-sounder to relocate previously identified active seep sites and then the CTD/rosette array was deployed for acquisition of conductivity, temperature, depth, fluorometry, dissolved oxygen, methane, and at-depth water sample data.

The ship was scheduled to depart Theodore, AL on 15SEP10 but was delayed one day due to personnel and equipment transfer and the requirement to build a platform and mount two new water sample refrigerators on deck (Figure 2) along with several other smaller projects. The vessel got underway at 1900L on 16SEP10 and arrived at the first potential sample station at approximately 0900L on 17SEP10. After a period of searching with the echo-sounder it was determined that the vessel was at an incorrect coordinate. The ship then transited to the correct location (RC001, MC110-01) and began operations at 1215L.



Figure 2 – New water sample refrigerators installed on newly fabricated platform.



Figure 3 – Sonar acquisition station for the Simrad EK-60 split-beam echosounder. The station allowed surveyors to identify potential hydrocarbon seeps in the seafloor for investigation with the CTD sensor package described below.

The vessel was equipped with a Simrad EK-60 split-beam echo-sounder system with a 38kHz transducer generating a 7° acoustic beam angle. This results in an approximately 123m diameter acoustic footprint on the seafloor in 1000m of water. The echo-sounder was operated by C&C surveyors working in two 12-hour shifts who were running the system nearly continuously while transiting (Figure 3). The surveyors monitored the data in real-time and marked potential seeps for later investigation. The echo-sounder was also used while on station to reoccupy previously identified seeps.

The CTD sensor array was deployed and recovered by C&C technicians and included sensors for measuring conductivity, temperature, and depth as well as two fluorometers, a dissolved oxygen sensor, a methane sensor, an altimeter, and a water sample rosette. The rosette contained 12 Go-Flow bottles that were deployed in the open position during each cast and independently triggered at the desired depth. Bottle 2 leaked during a previous cruise so Bottles 2 and 3 were fired in rapid sequence to ensure a full sample. Bottles 10 and 11 both fire from the single command for Bottle 10 so fill simultaneously but neither were used during this cruise. All bottles were decontaminated with deionized water and Alconox detergent prior to each cast.

Water samples were collected from the rosette by Entrix technicians in amber glass bottles for analysis. A water sample was collected from each sample depth for independent laboratory analysis and a sub-sample was tested aboard the ship by Shaw chemists using a gas chromatograph / mass spectrometer (GC/MS). The samples and sub-samples were refrigerated at 4-5°C (the water samples collected on 17SEP10 were stored in a cooler with ice until the new refrigerators had cooled to the desired temperature).



Figure 4 – CTD / rosette array being deployed by C&C technicians.

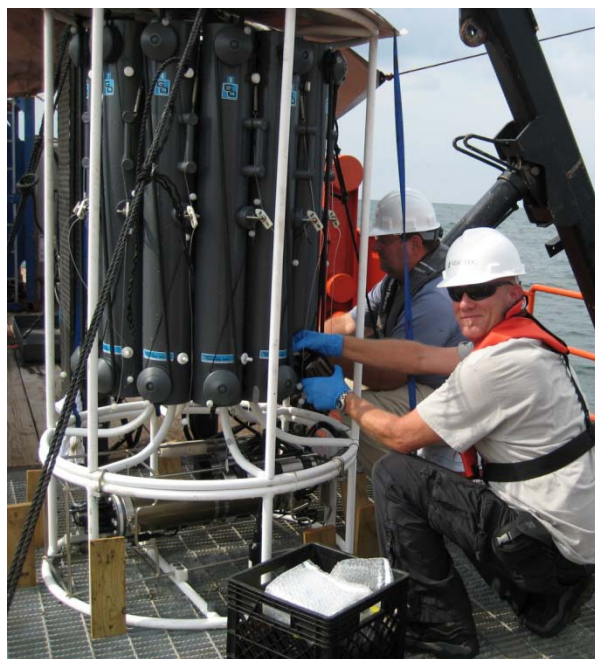


Figure 5 – Water sample collection from the Go-Flow bottles by Entrix techs.

The onboard chemistry lab included an Agilent Technologies GC/MS which was capable of processing approximately one sample per hour. As the Shaw chemists were new onboard, having taken over for the departed CSIRO chemists, they ran a full DFTPP (decafluorotriphenylphosphine) SVOC (semi-volatile organic compound) PAH instrument tune on the GC/MS, ran acetone blanks to clean the system, ran a regimen of surrogates, and then ran a full complement of standards prior to performing any analysis on the water samples collected during the cruise. Once the lab was fully setup they were able to turn around sample results in a matter of a few hours with a detection threshold of ~ 10 parts per billion (ppb).

For all sub-samples that tested positive for polycyclic aromatic hydrocarbons (PAH) above background levels the plan was to send the corresponding samples to Lancaster Laboratories for analysis using Chain of Custody procedures. As no PAHs were found on Cruise 16 this was not necessary, however, the samples from RC001, RC002, and RC006 were sent in as confidence check quality control samples to ensure repeatability of the results being obtained on the shipboard laboratory. This was deemed appropriate to ensure that there were no false negatives obtained during shipboard analysis.

While the chemists received most requested supplies during the alongside emergency repair period on 19SEP10 they did not receive all of their standards which will enable them to run a full 16 compound PAH spectrum analysis, which will be an improvement over previous analyses which tested for only toluene, naphthalene, and phenanthrene. They did receive the requested hexane which meant that they were able to discontinue running samples with dichloromethane acetone (DCA) which is salt-water soluble solvent. The DCA solvent was used by CSIRO and is not anticipated to affect the end positive/negative results but hexane is thought to be a more suitable solvent as it will lower the detection threshold from 30 ppb to approximately 10 ppb (per Shaw chemists) and will be used by Shaw chemists on all future analyses.



Figure 6 – Chemistry lab aboard the ship operated by Shaw contracted chemists analyzed all water samples for polycyclic aromatic hydrocarbons (PAH).



Figure 7 – GC/MS (Gas Chromatograph/ Mass Spectrometer) capable of identifying PAH compounds in concentrations as low as 10ppb.

There was some concern about the output from the amidships stern thruster sea-water coolant being discharged near the CTD during normalization. Water quality samples were taken from the thruster coolant discharge during Cruise 15 and analysis showed no contaminants, however, the water was found to be 2°C higher than ambient. Normalization of the CTD is typically done for 10 minutes at a depth of ~3m and no anomalies in temperature have been noted. To eliminate any possible issue it was hoped that the amidships stern thruster could be disabled during the CTD cast operations but this was not feasible due to ship's system issues and the amount of time needed to get on station. The Chief Scientist, in consultation with the BP Marine Science Coordinator, made the decision to go ahead with the CTD cast and water sample collection with all thrusters engaged and plan to install a deflector shield during the 22SEP10 inport to eliminate the issue.

The attempt to disable the amidships stern thruster at Site RC002 overtaxed the remaining thrusters and resulted in a hard failure of the vessel's dynamic positioning system which required a return to Theodore, AL for an emergency repair on 18SEP10. The vessel was repaired overnight and got underway at 1615L on 19SEP10 and returned to Site RC002 to resume sampling operations. Following repair of the thrusters on 19SEP10 the stern thrusters were disabled during CTD deployments. No anomalies were seen in data from Site RC001 and the Trustee does not believe that the data or samples were compromised. The deflector will still be installed during the 22SEP10 inport to allow use of all thrusters without concern.

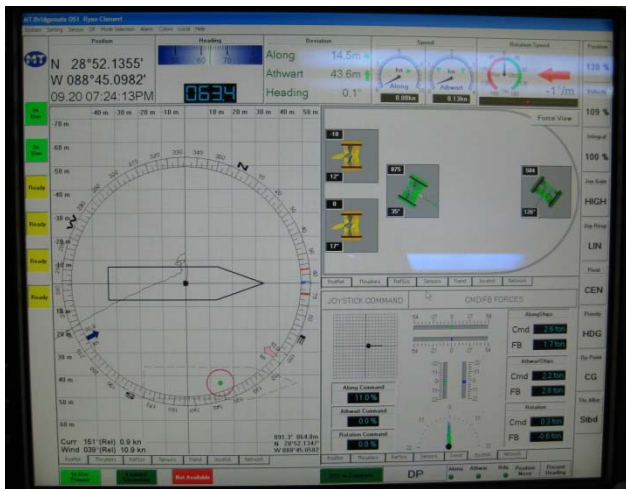


Figure 8 (above) – Vessel dynamic positioning system which enables the M/V Ryan Chouest to maintain station within less than a meter of desired location during sampling operations.



Figure 9 (right) – Working deck of the M/V Chouest: Upper left van houses sonar and CTD ops; lower left is the Chief Scientist's van; lower right van is the chemistry laboratory; and upper right van is the data lab. Far upper right is the A-frame used to deploy the CTD.

The data from this Cruise were intended to be used to help determine the source of hydrocarbons present in the water and sediments in the Gulf of Mexico. Cruise 16 was planned to include a maximum of 72 hours of sample collection due to limitations on storage times for the water samples and available sample storage space onboard the vessel. No PAHs were detected in any of the water samples analyzed during this cruise but methane was found during the cast at site RC001 (MC110-01).

All available data from this cruise has been uploaded to the NOAA FTP site by the NOAA Data Management Coordinator. The M/V Ryan Chouest docked in Port Theodore at 0600L on 22SEP10 for regularly scheduled crew change and vessel modifications. The post-Cruise 16 inport schedule includes installation of the amidships stern thruster coolant discharge deflector shield, the possible installation of a USBL transponder system, and a crew change including the Master, Trustee, and C&C Lead Surveyor. Cruise 17 objectives are thought to be similar to Cruise 16 and departure is planned for 1800L on 23SEP10 with a new NOAA Trustee. The current Data Management Coordinator will be remaining aboard.

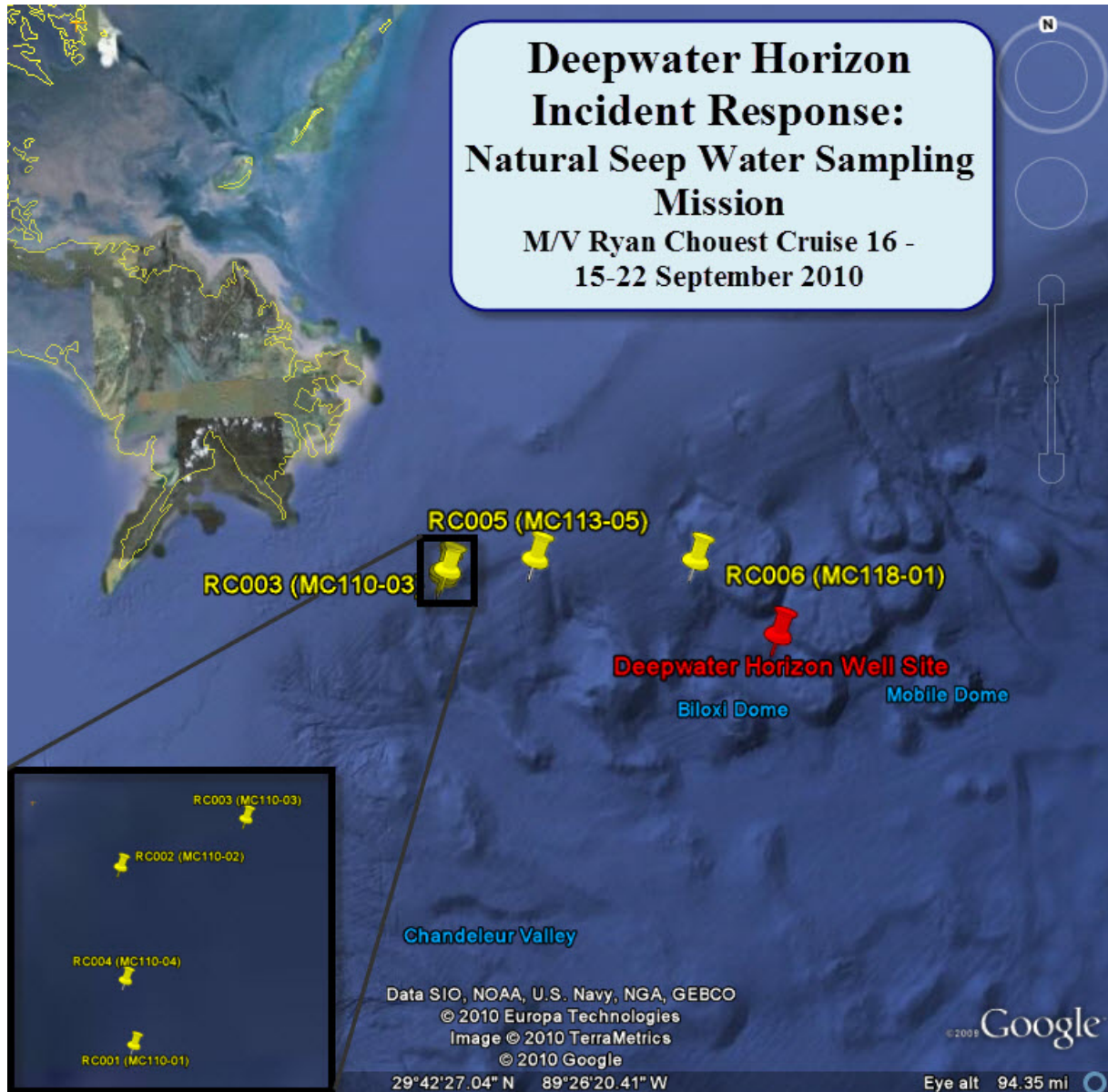


Figure 10 – Overview of the Cruise 16 water sampling sites. This was the first cruise of a new mission and as such was seen as a “shake-down” cruise which resulted in a less than typical quantity of samples while procedures were being refined and equipment was calibrated, etc. Note: There was a second cast at the RC006 site which is not shown (RC007, MC118-02).

Cruise 17 is scheduled to depart Theodore, Alabama at 1800L on 22SEP10 and will continue the same type of work as was conducted during Cruise 16. There are plans to install a sediment sampler at some point in the future but there are no specific plans for when that will take place.

Recommendations for improvement of efficiency / increase in productivity for future missions of a similar nature:

- 1) Installation of a moving vessel profiler would allow continuous monitoring of CTD, fluorescence, dissolved oxygen, and methane throughout the water column while underway. This would provide a much more complete indication of the monitored parameters than the current point sampling that is being conducted. This would also facilitate towing the sensor package through potential seep plumes to determine whether they are hydrocarbon or methane seeps which would help to refine the decision making process for where water samples should be collected; a process that takes several hours from start to finish.
- 2) Utilization of multibeam echo-sounder (MBES) would enable full bottom coverage of the seafloor with higher resolution data than achievable with the current single-beam echo-sounder system. The currently installed system has a 7° beam angle meaning that it will provide a single track of ~ 125m in diameter on the seafloor in 1000m of water. A typical MBES system has a 60°+ across ship area of ensonification which results in a ~1750m or wider swath of coverage under the vessel. This would result in more than a magnitude increase in the amount of area that could be surveyed in a given amount of time. Additionally, many MBES systems have effective beam widths of ~ 1-2° meaning that significantly higher resolution would be provided enabling better positioning of identified seeps and would help to differentiate between seeps and fish or shrimp near the seafloor.
- 3) Using side-scan sonar (SSS) in shallow water areas would cover a much wider area than the single-beam echo-sounder and is much more effective at differentiating between schools of fish/shrimp and potential seeps. The current methodology of marking every contact as a potential seep has resulted in a high number of targets along the vessel's transit path in shallow water which, based on past experience working with SSS in the Gulf of Mexico is unlikely. Experience indicates that most of these shallow water contacts are likely shrimp or fish.
- 4) Replacing the winch lowered CTD/rosette assembly with a Remotely Operated Vehicle (ROV) would allow a much higher probability of success in obtaining water samples from within a seep plume. The current methodology of lowering the cast based solely on the single-beam echo-sounder position (which is only accurate to a circle of 125m diameter in 1000m of water) has had a fairly low success rate. In addition to the issue of being unable to definitively position the seep on the seafloor there is a current induced catenary in the CTD/rosette array cable which results in the cast reaching the seafloor at an unknown location relative to the ship's position. Using an ROV with thrusters and a live video feed would allow the operator to visually confirm the presence of the seep and allow them to maneuver into the plume prior to triggering the water sample collection apparatus.

Daily Operations:

Data Collection	Collected (Y/N)?	Comment
CTD Casts	Y/N	
Fluorometry	Y/N	
LISST	Y/N	
Dissolved Oxygen	Y/N	
Sampling – TPH	Y/N	
Sampling – VOA	Y/N	
GC/MS	Y/N	
Acoustics	Y/N	
MOCNESS	Y/N	
PAH Detection	Y/N	
Biota	Y/N	
Rototox	Y/N	
Other:		

NOTES:

15 September 2010:

Reported aboard M/V Ryan Chouest at 1400L at the Construction Solutions facility in Theodore, Alabama. The vessel was scheduled to get underway at 1800 but was delayed for transfer of personnel, demobilization/ mobilization of equipment, and installation of two new water samples refrigerators on deck. Ship scheduled to get underway ~ noon on 16SEP10.

Science Procedural Observations:

Time (GMT or Local)	Transect/ Station ID	Position (3 Position Reports minimum per day)	Fluorescence Signal*	Signal Depth (m)	DO Comments	Depth (m)
N/A	N/A	N/A	N/A	N/A	N/A	N/A

Planned activities for next 24 hours:

Complete personnel and equipment transfers, demobilize and ship out CSIRO equipment. Orient newly arrived personnel including safety briefings and emergency procedures. Allow two newly delivered sample refrigerators to stand upright for 24 hours prior to activation and install a raised platform on deck to accommodate them. Install and activate two new sample refrigerators. Obtain necessary supplies and equipment for upcoming Cruise 16. Transit to site RC001 where sampling operations will begin.

Daily Operations:

Data Collection	Collected (Y/N)?	Comment
CTD Casts	Y/N	
Fluorometry	Y/N	
LISST	Y/N	
Dissolved Oxygen	Y/N	
Sampling – TPH	Y/N	
Sampling – VOA	Y/N	
GC/MS	Y/N	
Acoustics	Y/N	
MOCNESS	Y/N	
PAH Detection	Y/N	
Biota	Y/N	
Rototox	Y/N	
Other:		

NOTES:

16 September 2010:

Completed personnel and equipment transfers. All CSIRO equipment was picked up by transport agent ~ 0830L. Vessel departure delayed until two new sample refrigerators were satisfactorily installed on new raised platform on the main deck. Vessel departed Theodore, AL at ~ 1900L and is transiting towards the Deepwater Horizon well site to begin survey and sampling operations. It is anticipated that the vessel will arrive onsite at 0800L on 17SEP10 and will begin sampling after identifying target.

Science Procedural Observations:

Time (GMT or Local)	Transect/ Station ID	Position (3 Position Reports minimum per day)	Fluorescence Signal*	Signal Depth (m)	DO Comments	Depth (m)
N/A	N/A	N/A	N/A	N/A	N/A	N/A

Planned activities for next 24 hours:

Complete transit to Deepwater Horizon well site where sampling operations will begin. Running at ~ 8 knots to allow for acquisition of acoustics en route. Once on-site, echo-sounder operations will be conducted to locate previously identified potential hydrocarbon seeps and then the rosette and CTD will be lowered to a depth as near the seafloor as feasible within the seep plume and samples will be acquired. It is anticipated that sampling will be feasible at two sites on 17SEP10 and three sites on subsequent days. Sampling operations will only be conducted during daylight hours so sampling will be started at daybreak and ceasing at dusk.

Daily Operations:

Data Collection	Collected (Y/N)?	Comment
CTD Casts	Y/N	
Fluorometry	Y/N	
LISST	Y/N	
Dissolved Oxygen	Y/N	
Sampling – TPH	Y/N	May be done at lab
Sampling – VOA	Y/N	
GC/MS	Y/N	
Acoustics	Y/N	
MOCNESS	Y/N	
PAH Detection	Y/N	Toluene, Naphthalene, and Phenanthrene only
Biota	Y/N	
Rototox	Y/N	
Other:		

NOTES:

17 September 2010:

Arrived on-site and began reconnaissance operations ~ 0900L for Cruise 14 Site 1 target (Station RC001). After approximately one hour it was determined that the vessel was in the incorrect location and ship transited to the correct site. Arrived at Cruise 14 Site 1 at 1215L and located the potential seep soon thereafter. Successfully deployed the CTD with Rosette to a depth of 440m and identified an apparent methane spike of 5 µmol / L at a depth of 415m. No anomalies were seen in either the fluorometry or dissolved oxygen

measurements. A total of five water samples were collected and onboard GC/MS testing has been started. No further casts performed today due to increasing sea-state which raised safety concerns.

Science Procedural Observations:

Time (GMT or Local)	Transect/ Station ID	Position (3 Position Reports minimum per day)	Fluorescence Signal*	Signal Depth (m)	DO Comments	Depth (m)
1515L	RC001	28.850533N, 88.902217W	No Anomaly	N/A	No Anomaly	N/A

Planned activities for next 24 hours:

Plan to run echo-sounder reconnaissance on several previously identified potential seeps and then standby until daybreak. Water sampling operations will only be conducted during daylight hours for safety reasons so sampling will be started at the first site at 0630L. Water sampling will consist of the rosette and CTD being lowered to a depth as near the seafloor as feasible within the seep plume and samples will be acquired at several depths determined by analysis of the fluorometer, dissolved oxygen, and hydrogen levels. It is anticipated that three casts will be feasible per day.

Daily Operations:

Data Collection	Collected (Y/N)?	Comment
CTD Casts	Y/N	
Fluorometry	Y/N	
LISST	Y/N	
Dissolved Oxygen	Y/N	
Sampling – TPH	Y/N	
Sampling – VOA	Y/N	
GC/MS	Y/N	
Acoustics	Y/N	
MOCNESS	Y/N	
PAH Detection	Y/N	
Biota	Y/N	
Rototox	Y/N	
Other:		

NOTES:

18 September 2010:

Conducted overnight echo-sounder reconnaissance operations reoccupying three sites and identified six potential seeps. Arrived at Sample Location MC110-02 at ~ 0630L with the intent to begin water sampling operations immediately. Encountered mechanical trouble with the dynamic positioning system and were unable to hold station satisfactorily to conduct a cast. Vessel began transit back to Theodore, AL to effect repairs at 1130L having been unable to collect any additional samples. ETA at Theodore, AL is 2400L.

Science Procedural Observations:

Time (GMT or Local)	Transect/ Station ID	Position (3 Position Reports minimum per day)	Fluorescence Signal*	Signal Depth (m)	DO Comments	Depth (m)
N/A	N/A	N/A	N/A	N/A	N/A	N/A

Planned activities for next 24 hours:

Complete transit to Theodore, AL. Once in port, repairs will be made to the ship’s dynamic positioning system and a deflector plate will be installed to divert the outflow of the stern thruster coolant discharge away from the CTD deployment area. Additional work that needs to be completed is the mounting of a USBL transponder system to the CTD frame and site planning for the next cruise but this may be put off. Also, a crew change (including the Captain, lead C&C surveyor, and Trustee) is slated for Wednesday, 22SEP10, which would mean a very short leg if the vessel gets underway immediately after fixing the dynamic positioning system. A decision will be made in the morning as to whether to stay in port until Wednesday or to return to the working grounds to continue water sample collection.

Daily Operations:

Data Collection	Collected (Y/N)?	Comment
CTD Casts	Y/N	
Fluorometry	Y/N	
LISST	Y/N	
Dissolved Oxygen	Y/N	
Sampling – TPH	Y/N	
Sampling – VOA	Y/N	
GC/MS	Y/N	
Acoustics	Y/N	
MOCNESS	Y/N	
PAH Detection	Y/N	
Biota	Y/N	
Rototox	Y/N	
Other:		

NOTES:

19 September 2010:

Completed repairs to the vessel’s dynamic positioning system overnight. Issue turned out to be a loose wire that was shorting out against a separate terminal and causing the system to malfunction. Transferred RC001 water samples to certified courier and received chemistry lab supplies. The installation of the stern thruster deflector plate was put off until the next inport which is slated for Wednesday at which time a USBL transponder system may also be

installed. Underway from Theodore at 1615L towards Sample Location MC110-02 (RC002) where recon ops will be conducted until daylight and water sampling will commence thereafter. Transit speeds at 11 knots to the sea buoy and then 7 knots thereafter to allow for acquisition of sonar data en route.

Science Procedural Observations:

Time (GMT or Local)	Transect/ Station ID	Position (3 Position Reports minimum per day)	Fluorescence Signal*	Signal Depth (m)	DO Comments	Depth (m)
N/A	N/A	N/A	N/A	N/A	N/A	N/A

Planned activities for next 24 hours:

Plan to run echo-sounder reconnaissance on several previously identified potential seeps near sector MC-110 and then standby until daybreak. Water sampling operations will only be conducted during daylight hours for safety reasons so sampling will be started at the first site at 0630L. Water sampling will consist of the rosette and CTD being lowered to a depth as near the seafloor as feasible within the seep plume and samples will be acquired at several depths determined by analysis of the fluorometer, dissolved oxygen, and hydrogen levels. It is anticipated that three to four casts will be feasible.

Daily Operations:

Data Collection	Collected (Y/N)?	Comment
CTD Casts	Y/N	
Fluorometry	Y/N	
LISST	Y/N	
Dissolved Oxygen	Y/N	
Sampling – TPH	Y/N	May be done at lab
Sampling – VOA	Y/N	
GC/MS	Y/N	
Acoustics	Y/N	
MOCNESS	Y/N	
PAH Detection	Y/N	Toluene, Napthalene, and Phenanthrene only
Biota	Y/N	
Rototox	Y/N	
Other:		

NOTES:

20 September 2010:

Transited through the night and arrived at Station RC002 (MC110-02) at 0700L. Attempted but were unable to get on-station using the dynamic positioning system without the stern thruster engaged. Ultimately gave up and began sampling ops at 0915L with all thrusters engaged. Continued to collect data at sites RC003 (MC110-03), RC004 (MC110-04), and RC005 (MC113-01) without any sensor indication of anomalies in fluorescence, dissolved oxygen, or

methane levels. Transited to sector MC118 where the echo-sounder reconnaissance operations will be conducted throughout the night. Following recon ops will transit to Site RC006 (MC118-01) to commence sampling operations at or near first light.

Science Procedural Observations:

Time (GMT or Local)	Transect/ Station ID	Position (3 Position Reports minimum per day)	Fluorescence Signal*	Signal Depth (m)	DO Comments	Depth (m)
0930L	RC002	28.859323N, 88.902333W	No Anomaly	N/A	No Anomaly	N/A
1430L	RC003	28.861122N, 88.894202W	No Anomaly	N/A	No Anomaly	N/A
1715L	RC004	28.853754N, 88.902459W	No Anomaly	N/A	No Anomaly	N/A
2100L	RC005	28.868647N, 88.751718W	No Anomaly	N/A	No Anomaly	N/A

Planned activities for next 24 hours:

Plan to run echo-sounder reconnaissance on several previously identified potential seeps in sector MC182 and then standby until daybreak. Water sampling operations will be conducted starting at the first site at 0630L. Water sampling will consist of the rosette and CTD being lowered to a depth as near the seafloor as feasible within the seep plume and samples will be acquired at several depths determined by analysis of the fluorometer, dissolved oxygen, and hydrogen levels. It is anticipated that three to four casts will be feasible. Depart DWH site towards Theodore ~ 1800L tomorrow.

Daily Operations:

Data Collection	Collected (Y/N)?	Comment
CTD Casts	Y/N	
Fluorometry	Y/N	
LISST	Y/N	
Dissolved Oxygen	Y/N	
Sampling – TPH	Y/N	May be done at lab
Sampling – VOA	Y/N	
GC/MS	Y/N	
Acoustics	Y/N	
MOCNESS	Y/N	
PAH Detection	Y/N	Toluene, Napthalene, and Phenanthrene only
Biota	Y/N	
Rototox	Y/N	
Other:		

NOTES:

21 September 2010:

Conducted overnight echo-sounder reconnaissance operations in sector MC118 and identified one potential seep with four separate hits. Setup on station at Station RC006 (MC118-01) at ~ 0600L and dropped cast at 0730L with no notable results. Continued to search for additional seeps in the area throughout the day with no luck. Dropped a second cast (RC007, MC118-02) at 1400L at the same location as earlier in the day but still nothing visible in the data.

Vessel began transit back to a previously identified area of interest in the vicinity of Viosca Knoll at 1520L where recon ops were conducted for several hours prior to beginning transit back to Theodore, Alabama for scheduled crew change, resupply, and vessel modifications.

Science Procedural Observations:

Time (GMT or Local)	Transect/ Station ID	Position (3 Position Reports minimum per day)	Fluorescence Signal*	Signal Depth (m)	DO Comments	Depth (m)
0730L	RC006	28.851842N, 88.491653W	No Anomaly	N/A	No Anomaly	N/A
1400L	RC007	28.852135N, 88.491767W	No Anomaly	N/A	No Anomaly	N/A

Planned activities for next 24 hours:

Complete transit back to Theodore, Alabama for scheduled inport.

Daily Operations:

Data Collection	Collected (Y/N)?	Comment
CTD Casts	Y/N	
Fluorometry	Y/N	
LISST	Y/N	
Dissolved Oxygen	Y/N	
Sampling – TPH	Y/N	
Sampling – VOA	Y/N	
GC/MS	Y/N	
Acoustics	Y/N	
MOCNESS	Y/N	
PAH Detection	Y/N	
Biota	Y/N	
Rototox	Y/N	
Other:		

NOTES:

22 September 2010:

Arrive in port at Theodore, AL at approximately 0500L. Vessel to have regularly scheduled crew change and remain alongside for minor modifications and repairs including the installation of a deflector shield to divert the amidships stern thruster coolant discharge away from the CTD cast location.

Science Procedural Observations:

Time (GMT or Local)	Transect/ Station ID	Position (3 Position Reports minimum per day)	Fluorescence Signal*	Signal Depth (m)	DO Comments	Depth (m)
N/A	N/A	N/A	N/A	N/A	N/A	N/A

Planned activities for next 24 hours:

Complete resupply, personnel transfers, and vessel modifications. Depart ~ 1800L on 22SEP10 for Cruise 17 which includes plans to continue the work of Cruise 16 starting in the vicinity of sector MC294.