NOAA Teacher at Sea
Joel Jaroch
Onboard NOAA Ship ALBATROSS IV
July 13 – 28, 2006

NOAA Teacher at Sea: Joel G. Jaroch
NOAA Ship: ALBATROSS IV
Mission: North Atlantic Sea Scallop Survey
July 9 – 29, 2006

I will be presenting my experience on the ALBATROSS IV a bit different from the typical Teacher at Sea log format because of some challenges we faced in getting to sea and given the work schedule we kept—12 hour shifts, leaving me a bit exhausted from the work.

So, from this entry you will get an overall "look" at what took place during the time at sea for the Sea Scallop survey. Since the work done for each 12 hour shift was the same procedurally and only the change was in content of what was caught, I believe you will find the way in which I am presenting my experiences as more reader friendly.

As my shift ended at noon each day, I will present the weather data from the bridge in a chart for the 1200 hour each day we were at sea. This allows you to see change in the weather over the days at the same time each day. What do you see in terms of sea and air temperature change as we steamed north at the end of our survey? Can you guess which day(s) we felt the effects of Tropical Storm Beryl?

Weather Data from ALBATROSS IV Bridge, July 13 through July 27 – all at 1200 hours

DATE	Present Weather	Visibility (Nautical Miles)	Wind Direction (true degrees)	Wind Speed (Knots)	Sea Wave Height (feet)	Swell Wave Height (feet)	Sea Water Temp. (°C)	Air Temp. (°C)
7/13	Partly cloudy	10	37	7	1 – 2	1 -- 2	19.2	19.2
7/14	Partly cloudy	10	119	5	<1	2	23.4	22.3
7/15	Cloudy	10	93	3	<1	NA	24.6	24.3
7/16	Partly cloudy	8	25	10	1	1	25.3	24.5
7/17	Clear	10	340	6	<1	1	25.9	26.6
7/18	Clear	10	200	10	1	1	26.0	26.6

7/19	Partly cloudy	10	69	11	1	2 -- 3	26.3	26.6
7/20	Overcast	4	323	32	7	7	24.3	23.3
7/21	Partly cloudy	6	217	16	2 -- 3	NA	22.9	25.4
7/22	Cloudy	4 -- 5	168	20	2	3	22.8	22.1
7/23	Partly Cloudy	8	225	12	3	4 -- 5	23.3	23.3
7/24	Partly Cloudy	10	220	7	1 -- 2	3	23.3	22.7
7/25	Partly Cloudy	12	175	11	1 -- 2	4	19.4	20.6
7/26	Overcast	10	177	10	<1	<1	15.7	19.8
7/27	Partly Cloudy	10	244	7	<1	1 -- 2	17.7	20.1

The ALBATROSS IV at port prior to departure for the North Atlantic Sea Scallop survey Leg 1.

Science and Technology Component:
In a 12 hour period of sampling for the North Atlantic Sea Scallop a wide array of organisms were taken from the sea floor bottom with the dredge. The dredge was run for a set amount of time, always 15 minutes. Over those few minutes and the ALBATROSS IV running at about 3.85 knots, the dredge tow covered about 1 nautical mile.

When this is done a station would have been sampled. There are a certain number of stations that are sampled within what is called a stratum. The number of stations sampled in any given strata is dependent upon strata size. A strata is defined by an area of uniform depth AND what substrate exists on the sea floor. Substrate is the living and non-living things found on the sea floor bottom.

The number of stations per stratum is determined based on two factors – area of stratum and the importance of that area to the scallop assessment (the computer randomly picks the locations but the number or stations is predetermined.) A non-random station becomes part of the survey sample when a site is picked on purpose by NOAA scientists or other scientists because there is a specific reason to go there for sampling. For example, one reason a station is non-random is because a scientist wants to develop a history for a station to monitor changes over time.

Along the North Atlantic there are many strata and the potential for hundreds of stations for NOAA scientist use to assess the sea scallop population. Therefore, for the first leg of the 2006 Sea Scallop survey 295 stations were sampled. This was done with two teams of 8 to 9 people working 24 hours a day. One shift worked from noon to midnight while the other team began work at midnight and finished at noon. The following chart shows how many stations were sampled by each team for the dates July 13 through 27. The primary reason for the wide range of stations sampled from shift to shift and day to day has to do with the distance between stations. The greater the distance the longer it took the ALBATROSS IV to steam to the next station. Also weather conditions had certainly slowed some of the sampling. With any thunder and lightening, the NOAA officers would not permit the team to be on the back deck sorting a sample for obvious safety reasons.

Dates:	7/14	7/15	7/16	7/17	7/18	7/19	7/20	7/21	7/22	7/23	7/24	7/25	7/26	7/27
Noon to Midnight shift	**13**	**14**	**17**	**12**	**12**	**13**	**5**	**10**	**8**	**10**	**10**	**11**	**10**	**8**
Midnight to Noon Shift	**5**	**12**	**14**	**16**	**9**	**15**	**5**	**13**	**11**	**8**	**9**	**4**	**12**	**9**

A TEAM:
So, who is on a team? Two people on the bridge at all times, a NOAA officer and lookout. As safety is the number one priority of the NOAA officer on the bridge, the lookout helps the officer by looking out for anything that may not be caught by the ship's radar so that the officer can navigate the ship from station to station. There are two people on constant watch of the two 565 horsepower engines, the two smaller engines that generate electricity, the units that produce freshwater from sea water, the hydraulic machinery that power the boom, Gantry and winch along with all the other mechanical parts and machinery, the two cooks that

keep us fueled for the long shifts, a watch chief (Sean Lacey for my shift) who is under the guidance of the chief scientist (Stacy Rowe) for this leg, two other NOAA Biological Science Technicians (Bill Duffy and Alicia Long), the two fisherman – deck crew that manage the boom, Gantry, and winch cables because of safety issues (Steve Flavin and Mike Conway for my shift), the boom, Gantry, and winch operator (Lino Luis) and three volunteers.

Teamwork and constant communication between ALL parties took place to ensure that sampling success was achieved and safety was always observed.

A STATION:

What happened at the end of any 15 minute dredge tow? A series of events would be put into action by all members of the shift. Those on the bridge move the ship to the next station, the engineers ensure that the machine components are running properly, and the science and volunteer crew, along with the greatly appreciated help of the fisherman (Steve Flavin and Mike Conway on my shift) and the Gantry operator (Lino Luis) got to the task of analyzing the haul. THE routine on the stern of the ALBATROSS IV was always the same when it came to going through a station haul—the only change seen from station to station was the contents of a haul.

So, for the 14 days that the two teams worked, 295 stations were sampled and the work to analyze each haul looked the same. Needless to say, as each station and day passed, the actual processing of a haul was done more efficiently.

And what would this work look like for a team? Below are the procedures we used to analyze each haul. In addition, you will find the data we collected for one 12 hour shift combined in a chart to give you an idea of what was caught. The data was for the midnight to noon shift on July 16th.

PROCEDURES FOR ANALYZING A STATION HAUL:

1. Gantry hauls the dredge from sea floor bottom and nearly aboard the ship after the 15 minute tow through the designated station. A winch does the final work and brings the dredge aboard the ship on the back deck.
2. An Inclinometer reading is gathered from dredge using the Optic Shuttle to transfer data to computer so as to check how the dredge ran on sea floor bottom. NOTE: Only twice did the dredge flip in the process of sampling the 295 stations! Although the graphed data from the inclinometer verified this, the NOAA scientist also suspected a dredge flip given the amount of material hauled from sea floor bottom as well as the marks on the top of the dredge as it ran upside down on the sea floor bottom – the sand shining the metal of dredge top.

3. Dredge tow contents are emptied onto deck for processing using boom.

Jon Jarrell and Peter Kiss, NOAA General Vessel Assistants, help ensure the dredge contents are completely emptied on stern.

4. Digital camera records haul pile along with a small white marker board that gives strata number, station number, tow number, whether it is a random or non-random station, and if the stratum was open or closed to certain fishing. Closed area regulations vary – often it does not mean that it is closed only to scallop fishermen, some areas are completely closed to all fishing, some are open at certain times of the year to certain types of fishing.

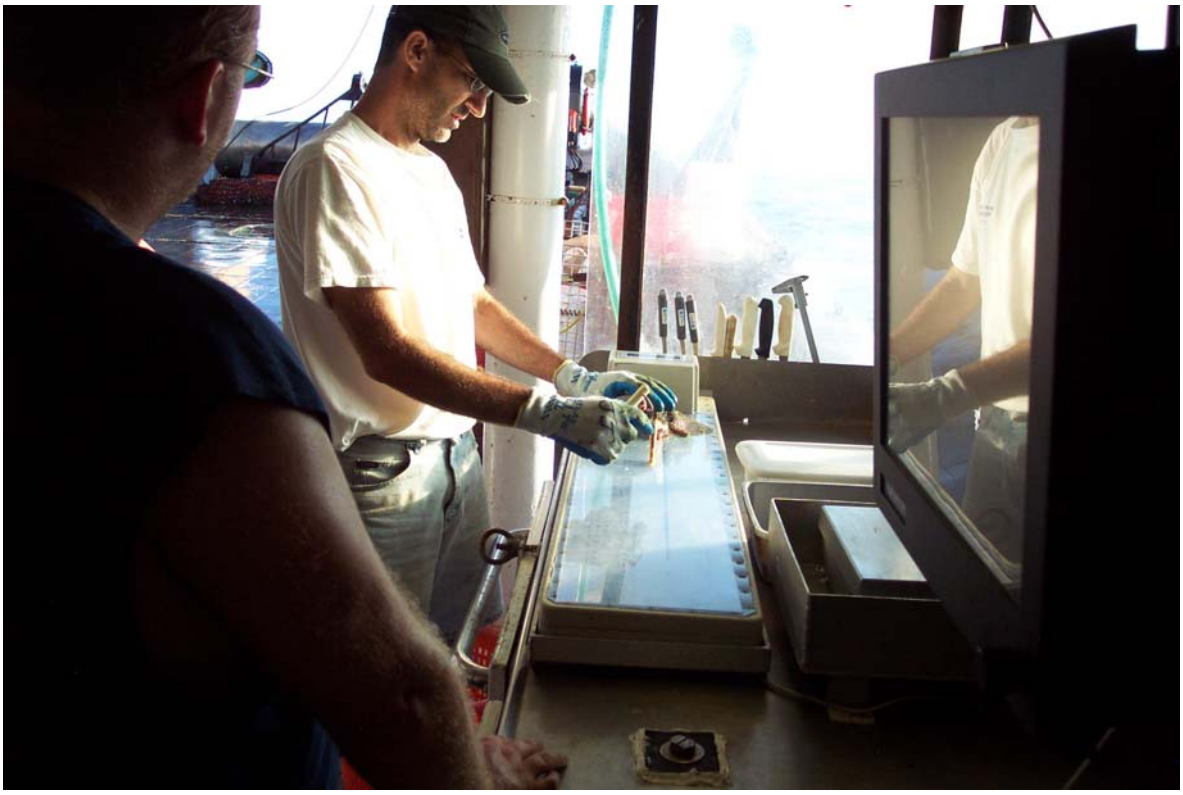
Bill Duffy, NOAA Biological Science Technician on the ALBATROSS IV has the honor of getting his picture taken with the necessary haul information written on the small white board in his hand.

5. The crew systematically searched through the haul to pull out all ***specified*** living organisms and nonliving items to be placed in either 5 gallon buckets (white) or bushel baskets (red)—fish generally placed into the buckets and scallops into the baskets. The watch chief tells all members to switch spots at the pile once the first search is done so that we all look through the pile a second time, working from a spot that someone else worked to ensure all required items are pulled from the pile.

Sometimes so many scallops were brought aboard the ALBATROSS IV, that every available bushel basket was filled.

6. *Every third station* a member takes handfuls from the haul—moving around the haul to get as random sample as possible, and fills a one gallon bucket to sub-sample the entire haul for starfish. The sub-sample is searched for all starfish which are then sorted by species and counted. The actual number of starfish, by species, is expanded to an Expected Number of starfish for the entire haul using an expansion factor. In addition, all Cancer species crabs were counted in total while other crabs are not counted. The reason Cancer species are counted is because there appears to be a relationship to the number of these crabs and scallops – ie. more of these crabs means less scallops.
7. Every third station the CTD test is deployed the the sea floor bottom using the SeaBird Senory Device to test for three specific water parameters: Conductivity, Temperature, and Density. Twice a day a water sample is also collected—in the General Oceanics 12 tube and bottled during this same CTD cast for the purpose of calibrating the Sensory Device. The software used to record this data was created by NOAA with the wiring from the device running all the way into the designated computer from the boom where the CTD sensor instrument is lowered to sea floor and brought back by the boom.
8. All specified specimens—living and non-living, are entered into the NOAA created software: Fisheries Scientific Computer System (FSCS). There are three processing

stations to do this, each with their own touch screen monitor to activate and record the data to FSCS. All members helped in the processing of the catch, first by sorting fish by species, counting crabs and starfish when required as third station.



NOAA Teacher at Sea Joel Jaroch measures a Little Skate on the Limnoterra FMB IV under the watchful eye of Bill Duffy, NOAA Biological Science Technician, at one of the processing stations.

9. The sea scallops is generally the first to be entered into FSCS for weight. If the haul contains a great number of bushel baskets, a sub-sample will be used to represent the whole and then expanded to represent the whole catch for that station. For example, if 12 bushel baskets of sea scallops were collected from the haul, approximately 500 scallops are to be measured for length. This could be 2 to 3 baskets from the 12. Say it is 2 baskets given the size distribution—that is, they are nearly all the same size OR the size varies greatly among the scallops, all the scallops in those 2 baskets will be measured using the Limnoterra FMB IV measuring board —an magnet wand that will activate a signal to record the scallop length to the FSCS. The program then expands, in this case, the sub-sample to the entire catch by an expansion factor of 6 to give an Expected Number of scallops for this haul.
10. The weight of all fish, by species is recorded into FSCS while only certain fish species (see chart below) are measured for length to go along with the number of fish caught by species.
11. For non-random sites or for specific requests from scientists, certain fish species and specific scallop data may need to be collected, processed, and put into the flash freezer. For example, a scientist want all Fawn Cusk-eel fish for sound production

study while another scientist wants scallop meat weights and gonad weights for an age and growth study. Labels for such requests are printed on an Eltron TLP 2742 printer. Specimens are put into either ziplock plastic bag or cloth sacks.

12. Using the saltwater hoses, processing stations and deck area is cleaned for the next station haul. We all take a breather—especially necessary when we have a large haul of scallops requiring a lot of processing.

Some unusual fish were brought up onto the ALBATROSS IV from the sea floor bottom, in this case, Goose Fish.

The chart below identifies all the data recorded for stations 45 through 57 for July 16th during the midnight to noon shift. This includes all living and non-living items collected and recorded.

Catch Data for Stations 45 – 57 North Atlantic Sea Scallop Survey 2006

Living Organisms	Recorded Number [1]	Length Recorded Yes or No
Fawn Cusk-eel	**25**	**No**
Four Spot Flounder	**18**	**No**

Goose Fish	**32**	**Yes**
Little Skate [2]	**47**	**Yes**
Snake Eel	**31**	**No**
Spotted Hake	**30**	**No**
Pipe Fish	**1**	**No**
Red Hake	**7**	**No**
Gulf Stream Flounder	**19**	**No**
Silver Hake	**1**	**No**
Bobtail Squid	**2**	**No**
Ocean Pout	**1**	**No**

Living Organisms	Expected Number [3]	Length Recorded Yes or No
Star Fish [4]	**40,957**	**No**
Sea Scallops	**22,142**	**Yes**

Non--Living Components	Recorded Number	Length Recorded Yes or No
Sea Scallop Clapper [5]	**93**	**Yes**

1 Recorded Number: Actual number of organisms collected, counted, and recorded.
2 Little Skate: A certain number of this fish is also evaluated for sexual maturity and recorded.
3 Expected Number: When a large number of organisms are caught for any given haul (in our case only for starfish and scallops) a small subset of the specific organism catch would be randomly selected. That subset would be counted and recorded. Using an expansion factor, an expected number of the specific organism for that haul would be determined to represent the entire catch for that haul.
4 StarFish: For this chart I have combined all starfish species into one group whereas NOAA scientists record the starfish by species. In addition, starfish are sub-sampled every third station only from the entire haul.
5 Sea Scallop Clapper: This refers to sea scallop shells that are still attached at the hinge, as a bivalve, but do not have a living scallop inside. NOAA records this data because the number and size of clappers provides a means for determining recent death in a given area.

As the chart above represents the entire catch for stations 45 through 57 over a given 12 hour period of July 16th, the next 12 hour period of work, or the next could look completely different from a data point of view. For example, during several of my 12 hour shifts we caught few scallops compared to the data given above—an expected number of scallops of 22,142 for stations 45 through 57. Certainly for that 12 hour period we had a significant work load given the number of scallops hauled aboard the ship with the need to put them all in the bushel baskets and then measuring the length of a sub-sample of the entire haul when such a large number were brought aboard.

Summary of Science and Technology Component:
After reading all of the above information there are a few things that I would like you to understand completely. The procedures that we carried out each 12 hour shift was the same. This allowed us to become familiar with the steps we needed to take in analyzing each haul and therefore work more efficiently as a team. Following the same procedures on every tow allows for tows to be comparable with other tows – this is true for all tows conducted this year and throughout the history of the scallop survey. This is very important when it comes to analyzing the data. The aspect that changed was the contents of each haul brought aboard the ALBATROSS IV at each station that we sampled. For me there was always that little bit of excitement in seeing if something new would be in the next haul. Inevitably I was able to see new and different organisms with each haul. The pipe fish and sea horse being just two examples.

Finally, I appreciate the work that ALL aboard the ALBATROSS IV are doing to continue this North Atlantic Sea Scallop Survey. As such a long ongoing survey, the amount of data that NOAA has and continues to build year to year, their work and efforts seem to prove truly worthwhile as the vitality of the sea scallop population is healthy. I think of the relationship that must exist between the fisherman making their livelihood from the sea scallop and entire NOAA crew that studies the scallop and believe the relationship is a good one. The wild stock sea scallops that you and I can buy from the local grocery store is evidence that all involved parties are making this marine resource a well managed one based upon a cooperative relationship between many parties. Three cheers for all involved!!!

The top side of many scallops can be quite beautiful as these samples show.

Conversations I had with NOAA Crew:

1. Who needs more “fuel” in one 24 hour period, 33 hard working individuals aboard the ALBATROSS IV or a 565 horse power engine?

In talking with Kevin Cruse, Chief Mechanical Engineer, he had told me that the 565 hp Caterpillar engine will consume about 1000 gallons of #2 diesel fuel in a 24 hour period. He went on to tell me that, on average, the total water use during a similar 24 hour period is also about 1000 gallons of water. The ship is equipped with two Maxim Evaporators that can produce 1900 gallons of fresh water a day from the sea water. Usually just one of the evaporators is running at a time. The ALBATROSS IV can hold up to 22,324 gallons of freshwater. Kevin said that it is important to keep as much freshwater in the holding tanks because as the diesel fuel is used up, with the lose of that weight (1 gallon of diesel fuel is about 7 pounds) the ship loses a little bit of stability as it does not ride as low in the water.

2. The conveniences of “staying in touch….”

Although the technology in not truly that new, Billy Dowdell, Electronic Technician, gave me an explanation as to how the integration of computers and a satellite helped me keep in touch with my family while I was at sea. The Skycell Satellite Transceiver takes stored emails from the crew aboard the ship and sends them out two at a time while receiving emails destined for those of us aboard the ALBATROSS IV, also two at a time and only for $6.00 per minute. As a regular schedule, emails are sent and received three times a day. Billy allowed me to help send and receive a batch of emails one afternoon. It all took just a few moments. This technology is a great feature for those at sea so that we can keep in touch with our loved ones. I appreciated the contact from my family.

3. What would be some of your initial thoughts and ideas if I say ALBATROSS IV Engine Room?

I wonder if ‘loud’ and ‘hot’ come to mind? Tim Monaghan, General Vessel Assistant, gave me the grand tour of the engine room, ear protection required. It is a world unto itself! Aside from being loud and hot the next thing that struck me was the overall neatness of the entire place, not to mention what must be miles and miles of wiring and piping. Of course, it also could be the five engines that are so obvious: two 565 hp Caterpillar engines that power the 8 foot diameter—3 blade propeller cursing at 10 knots, three smaller engines for electricity generation and to power the hydraulic systems. Although there is a vast supply of spare parts aboard the ship as back up parts, the crew of the engine room can also fabricate some specific parts if need be. Impressive. Finally, I was told, “It’s a Caterpillar.” As the sea scallop survey runs 24 hours a day and we were at sea for 15 days, I found it incredible that the 565 hp engine (only one was running) was constantly working without a hiccup. The constant burning of the #2 diesel fuel supply would allow the ALBATROSS IV to run about 3900 nautical miles. Not bad for a ship commissioned in May of 1963.

4. So, you wonder about being an NOAA Officer?

I had the chance to talk with all of the NOAA officers and had an interesting conversation with Navigation Officer, Chris Daniels. Safety of all aboard in paramount as Chris made this clear to me from the beginning of our conversation. While on the bridge, this is what Chris is most concerned with. As a great responsibility you have to be able to manage this, otherwise the officer work may not be for you. In addition, he told me that all NOAA officers rotate between assignments at sea and on land; two years at sea and three years on land assignment. So, you must be willing and able to cope with the constant change in job site and environment. Chris feels this is actually a perk because to travel though out the country, whether at sea or on land assignment, is a great opportunity to see other places and constantly meet new people. Which brings up the final point—the family life. Although growing up as a child of a military family, he does not deny that for some to find a person that will cope with the constant change and movement is a real issue needing consideration before becoming an officer. This is especially true given that NOAA officers are at sea 240 days each year!

5. So you want to be a NOAA Scientist?

I had the great pleasure of working with three young and extremely intelligent people. Their overall effort and diligence were duly noted as Biological Science Technicians. First, Sean Lucey, also serving as Watch Chief for the midnight to noon shift, will begin his masters degree work this fall. What he enjoys most about the survey is the opportunity to be outdoors, on the open ocean, taking in the wonderful view. He also considers it all a great adventure. Although he finds challenges in getting the volunteers to mesh and work together as a group, he welcomes this part of the job also because of how it will help him continue to grow as a crew leader. Second is Bill Duffy, with a hardy laugh that grows from deep down within and rolls out loud and clear. He finds the work he is doing truly rewarding because the sea scallop survey is being done for the sake of science. The work certainly will impact the lives of many and feels his work will help secure the livelihood of fisherman for a long time to come. The challenge of such work for Bill is being away from loved ones for extended periods of time. As the work covers many hours and much of it done on our hands and knees, the physical demands of the job are also noted by Bill as a real challenge. He does marvel at the overall diversity of the volunteers that help out with the survey work, meeting new and interesting people from all walks-of-life. Finally, Alicia Long, having worked for NOAA for the past three years, she also has plans to return to school to get her masters degree. What she finds rewarding about these surveys is that every trip is different, with something new happening each time (and she is not just talking about the volunteers). She went on to say that training volunteers takes time and when we have the routine down, it is about the end of the survey. She finds the ground fish survey work truly challenging with the cold, windy and rough seas—enough to tax even the most seasoned scientist.

Sea Scallops have light sensory spots –the dark circular marks, to help them detect changes in light amount.

6. And the work of a Skilled Fisherman?

I had the great pleasure to talk with Steve Flavin, a Skilled Fisherman, as we worked the same midnight to noon shift. He talked about many aspects of being a Skilled Fisherman for NOAA as well as what it was like to be a fisherman making a living from the sea before coming to NOAA. He certainly has the keen eyes of a fisherman and person who has spent a great deal of time at sea, a great wealth of knowledge about the sea, and a real compassion for the living organisms hauled aboard the ALBATROSS IV—he would often set aside a hermit crab or two so as to return them to the sea as soon as possible. Yet, of all the things we talked about and all that he shared, his interest in the osprey that had found a perch on the upper reaches of the ship did not surprise me as to who he is. After one of the hauls, he had set aside a fish that had been counted for that station. From the back port side of the ship, he tossed the fish in a nice clean arch over the side, to ensure that the osprey would see it. Sure enough, the osprey, in one fluid motion, flew off the perch, down to the sea, and deftly plucked the fish from the sea. Returning to its perch, the osprey proceeded to eat the fish. Within a few hours it took flight from that perch to some distant point. Steve speculated that it may have gained back some strength (as it was on the perch for over 24 hours!!!) and was able to move on. Many land birds that end up blown to sea often end up dying because they eventually drink sea water. Thank goodness the osprey didn't.

Personal Logs:

July 10, 2006

Day one after arriving in Woods Hole, flying into Boston from Philadelphia and taking a bus trip from Logan Airport to the ALBATROSS IV. An entire crew was putting two 1600 meter cables onto winch spools for setting out and hauling back the dredge for each station we sampled. Meet with Ms. Hart and she gave all scientists an overview of the sea scallop survey. Meals aboard ship are filling and complete. We did not get under way because of certain issues that needed addressing on the ALBATROSS IV.

July 12, 2006:

Still at dock because of ship issues. So, Dave, the other teacher aboard ship and I went to a NOAA warehouse to work on two dredges, replacing several parts of the dredge. It was a hands-on learning experience. This work is necessary so that there are always backup dredges available to use on the ALBATROSS IV as the sea floor bottom can cause havoc upon the dredges—you wouldn't believe the size of some of the rocks brought aboard the ship.

July 13, 2006:

All hands aboard and the ALBATROSS IV leaves Woods Hole around 6pm. The breeze in my face felt good as I stood starboard side, taking in the sites and trying to contain my excitement. Need to get to bed as so as possible because I will be getting up in a few hours to start the midnight to noon shift.

July 14, 2006:

End of my first shift of the survey. We did not have to start until about 6am as we had to steam to the very first station to sample. So we got the chance to ease into the work—completing our shift after only 6 hours. Yet, the new smells (the sand dollars produce a strong odor) and the "rough" seas – all new to me, resulted in a weakness in the stomach and legs. The thought of food alone was enough to keep me away from the mess hall and I certainly was not talkative at that time. Water and PLENTY of saltine crackers became my nourishment for the next few days!

July 16, 2006:

As the 12 hours is a long shift, we have to approach the work as running a marathon and not a sprint—working "slow" and steady. We had many hauls and the catches were large, lots of sea scallops to process. For two of our hauls we filled 28 bushel baskets with large sized scallops! It is a site to see. Starting to challenge my stomach again by eating something other than saltine crackers and it responded with some grumblings.

July 17, 2006:

Such a calm sea has also calmed my stomach on such a beautiful and clear day, just like yesterday. An osprey has been overhead aboard the ALBATROSS IV for over 24 hours. Wonder if it has gotten tired of standing on its perch for so long without "sitting" to rest. One of the crew was able to entice it from it purchase by throwing a fish in a high arch overboard. The osprey didn't miss that and took it's time in eating every part of the fish.

July 18, 2006:

There was a red glowing ball, balanced easily on the morning horizon. What a sight which a photo cannot fully capture. I want it etched into my mind for recall at a later date and truly enjoy and marvel at. I do miss the sunsets as I need to be in bed for a 11pm wake-up call.

After several late night hours of true hard work, we are given a spectacular light show to help ease us into the morning hours aboard the ALBATROSS IV.)

July 21, 2006:

Needed to skip a few days of note taking because of tropical storm Beryl and the havoc it played on my mind and stomach. Understand that the sea was plenty rough for me during the storm but I was told that these 7 to 8 foot waves were typical during the fall and winter ground fish survey. I can't imagine the trials my stomach would need to endure with seas that boil more so. Life jackets were required as we worked in these rough waters on the back deck. The bridge finally made the call around 5am to stop all deck research work as seas riled even more. Interesting, we "jogged"—the ALBATROSS IV running at only a few knots, with the movement of the water and winds with the plan of having the storm pass us up. Therefore, we didn't get many stations sampled. Needless to say, I was in bed shortly after our shift was over—skipping lunch for sure, as a means to quiet my stomach and sleep as much as I could through the storm. I found that lying in my bunk that the movement of the ship did not bother me as much as being seasick—although sleep was fitful.

July 23, 2006:

Given a tour of the engine room and the use of the satellite system to send and receive emails yesterday. Plenty of information and sites to take in as both places are integral parts of ship operations. Rain and thunderstorms today slowed our progress. We can't be out on the back deck during thunderstorms for obvious safety concerns. So didn't get as many stations completed. Have notice a slight change in overall attitude of many of crew aboard the ALBATROSS IV—as the end of the survey is in sight?

July 25, 2006:

Had a chance to talk in detail with one of the young NOAA officers, Chris Daniels. He really shed a great deal of light on what it is like to be an officer. Found it extremely interesting. We had a long steam between 2 stations today, a 6 hour steam, which certainly cut into the number of stations we worked today during my shift. The rest was appreciated as we head towards Georges Bank to sample there.

July 26, 2006:

The size of the scallops on Georges Bank are incredible, many in the 15cm to 16cm range! The weather has been extremely agreeable to my stomach and appealing to the eye—a calm blue sea.

July 27, 2006:

Our last day of sampling and real excitement is in the air. There was a lot of distance between stations so we did not get to many stations. This was kind of a nice way to end all the work, on a bit of an easy note. And then the steam for port while cleaning up all the places that the scientists have used in our work. "Many hands make light work", as both crews work together to clean up our work areas.

And, if you ask me, I would do it all again. There are many people to thank but I want to mention the other Teacher at Sea, Dave Riddle, who so willingly shared his work and photos with me. Also, Alicia Long put together a CD of photos and data for me to use in putting all of this together. So thanks.

Finally, it was a pleasure and honor to meet so many wonderful people aboard the ALBATROSS IV. They all made me feel welcome and at ease even when I was feeling a bit seasick.

Thank you kindly,

Joel