Teacher at Sea Log: Kathy Virdin

Day: Tuesday, July 20, 3004

Time: 2:20 p.m.

Latitude: 55 degrees 39.4 N

Longitude: 158 degrees 00.3 W

Visibility: 10 nautical miles (nm)

Wind direction: Northwest

Wind speed: 7 kts

Sea wave height: 0-1 ft.

Swell wave height:2-3 ft.

Sea water temperature:13.3 degrees Celsius

Sea level pressure:1010.1mb.

Cloud cover:3/8 partly cloudy

Science and Technology: Today we reached the point where we would begin our surveys. I watched the survey technicians lower a Seabird (sound velocity profile unit) into the water, then raise it back up and hook it into a computer, where they could download the information. This will give them the salinity (salt content), temperature and pressure of the water. They lowered the Seabird 117 meters down into the water, before retrieval. At the same time, from the hull of the ship, a transducer sound wave emitter is sending sound waves to the bottom and measuring the time it takes for their return. From this information, they will calculate the distance to the floor of the ocean. They use this data from the Seabird to help them make corrections in the sound wave speeds from the transducer. The salinity, temperature and pressure will cause variations in the speed of sound, so they need to correct for this effect to gain an accurate depth measurement. This information is being processed and viewed by cartographers (map designers) who will take what data the Rainier gives them to update old maps or develop new maps and charts. These maps are used by fishermen, geologists or anyone who navigates through these Alaskan waters. We are headed for the Shumagin Islands where we will send

out launches (smaller boats) to measure depths in places where the Rainier might not otherwise go. I found it interesting to note that environmentalists would also use this information, since they know where certain species of fish are likely to live, and they can decide how best to protect them if they are endangered. We will go back and forth three times in one plotted line to make sure our data is accurate and complete. When we send out a launch in more shallow water, they will use a different sonar device, called a Reson. It emits higher sound waves which will give a more accurate reading. For middle to deep depth measurement, they will use the Elac sonar and a vertical beam echo sounder which goes straight down that can be used for shoreline measurements. Because Alaska has such rough terrain, it's important to get accurate measurements for those who use her waters.

Personal: I am amazed by how specific the data is that the survey technicians collect and how well everyone knows their job. This is truly a finely tuned, professional organization. Everyone has been so kind to answer my many questions even though I'm sure I've gotten in their way. I've spent a lot of time in the Plot room, where the data is logged into the computers and then interpreted by the technicians. Outside, it's a beautiful, sunny day, which is the first pretty weather we've had. We saw a pod of whales, recognizable by the blow of water coming from their nostrils. I could see them really well through the high-powered binoculars that belong to the ship. I am working on a list of questions that I will use to interview different members of the crew, as well as the scientists so I can take this information back to my students, as they learn what the roles are on a NOAA vessel. Someday, I want my students to be the next generation of scientists that use the knowledge we are gaining today to frame the discoveries they will make in the future.

Day : Wednesday, July 21, 2004
Time: 6:00p.m.
Latitude: 55 degrees 49.65 N
Longitude: 157 degrees 56 W
Visibility: 11 nautical miles

Wind direction: 350 degrees NW

Wind speed: 7 kts

Sea wave height: 0-1 ft.

Swell wave height:2-3 ft.

Sea water temperature: 12.2 C.

Sea level pressure: 1013.0 mb.

Cloud cover: Partly cloudy

Science and Technology: Today I was able to go out on a launch (small boat) that did survey lines for eight hours. After the launch got underway, we lowered the transducer into the water where it will send out a spray of sound (approximately 131 pings) that will be measured on the launch's computers. We also did a Reson line measurement which can accurately measure depths of 40 meters. We drove the launch in a line that was approximately 4-5 miles long, then turned and went back on the next line. Each line took about 40 minutes and we were able to cover 7 lines today. So in all, we were able to chart an area of 4-5 square miles. We stopped every four hours to put down a CDT which checks salinity, density and temperature. This information was immediately fed into the computers so that it can adjust the speed of sound through the waters by these factors. This launch also has a motion sensor that can measure the pitch and roll of the boat and that is factored into the speed the sound travels, which gives the calculated distance to the ocean floor. NOAA has about 8 or 9 ships that do hydrography work which is extremely important to scientific research, as well as commerce. About 90-95% of all goods used in the U.S. are brought to us by ships! So it's vital that they have accurate information to chart their path through our waters. The Rainier is the only ship in the world that can do all the hydrographic survey work that it does. It's an honor to work on a NOAA vessel and all members of the NOAA corps must have a degree in one of the sciences. The swath or path of the sonar beam that our launch is sending out covers about 200 meters. We're seeing the data that tells us that the depths in this area are 100 meters. We have successfully measured our plot of the

chart today with multi-beam swaths that intersect at the outskirts with one another. This is another measure taken to ensure accuracy.

Personal: I asked a lot of questions today while we were surveying, as the field operations officer with us had time to answer them. The work was mostly being done by the computers, so we were watching and checking them periodically. I learned that the launches are expensive boats because of all the high-tech equipment they carry (all of it necessary to get the job done). When we came back to the Rainier, the sun came out and we went up on the deck to enjoy the view. I saw puffins flying over the water, and one of them flapped its wings across the water as it skimmed along the surface. This was a treat to watch the puffins as they entertained us with their antics. Tomorrow, I'm looking forward to following up on the data that was gathered from the two launches that went out today. It will be scrutinized and evaluated by the survey technicians and then stored in the folder for the day.

Day: Thursday, July 22, 2004
Latitude: 55 degrees 39'N.
Longitude: 157 degrees 54'W.
Visibility: 10 nautical miles
Wind direction: 270 degrees W.
Wind speed: 6 kts.
Sea wave height: 0-1 ft.
Swell wave height: 2-3 ft.
Sea water temperature: 12.8 C.
Sea level pressure: 1013.0 mb.
Cloud cover: Partly cloudy

Science and Technology: Today I interviewed several crew members, which gave me a much better perspective of the extent of work that is being conducted on the Rainier. I first spoke with Jeremy Taylor, who is a survey technician whose job is to

collect data on the ocean floor depths for the purpose of updating nautical charts. The Rainier is dedicated to survey work that can enable all maritime vessels to successfully maneuver the ocean waters. As a survey technician, Jeremy is considered a scientist on board since the data he gathers is used by the scientific community. He collects the data from the multi-beam swaths and cleans it by deleting invalid or weak information, then sends it to other branches of NOAA (such as the cartographers) who review it, compare it to current nautical charts and then update those charts based on the new data. What is amazing to me is that the Rainier does survey work in areas which may not have been surveyed since the 1800's and have only had a few soundings listed. Their work is vital to commerce, fisheries management and the fishing industry. Jeremy said what he enjoys most about his job is being in Alaska, having the opportunity to go out in launches and receiving good data. He feels his job is extremely important since scientists need this data to find the habitats of various marine species. One example he gave was the fact that they can chart seamounts which are an area that contain a lot of marine life. This gives data that could help scientists discover new habitats for various species. Jeremy recommends a degree in hydrography to best prepare for this work, but also maintains that a degree in any area of science would be good basic preparation and on-the-job training would be supplied.

Next, I interviewed Briana Welton who is a Junior Officer, an Ensign in the Corps. She has a degree in math which has helped her greatly in her work. She is undergoing training to be an Officer of the Deck who will drive the ship. She also participates in the hydrographic surveys. She recommends students applying to the Maritime Marine Academy which is in New York. Briana loves the experience of being a hydrographic pioneer, as they are often charting unmeasured waters. She also loves being at sea and says it's exciting to drive the ship. There are several divisions of ships that NOAA operates, such as the oceanographic studies, hydrographic and fisheries. The information gained by a hydrographic ship is first and foremost to be used for nautical charts, which are used by all mariners, from small fishing boats to large Navy vessels. The Rainier also takes bottom samples that they can process in their lab to determine content and physical features of the ocean

floor. The CDTs that they lower give temperature, salinity and density information to scientists that enable them to look for variations in the ocean climate that will affect marine habitats. Briana loves working on a ship and being part of a close-knit community.

Personal: This morning I thoroughly enjoyed talking with several crew members about their work and getting new information about all the facets of ship life. This afternoon I plan to work on lesson plans and tonight I'll watch the survey technicians scan and clean up the data that comes in from the two launches that went out today. I also hope for some time to do more research on the complexities of the mission of NOAA and study some nautical charts. It's amazing to me that I can walk out on deck at 10:30 at night and it will still be light. In Alaska in the summer there are about 19 hours of daylight.
Wow!

Day : Friday, July 23, 2004
Latitude:55 degrees 43.34'N
Longitude: 159 degrees 10.967' W
Visibility: 10 nautical miles
Wind direction: 175 degrees
Wind speed: 8 kts.
Sea wave height: 0-1 ft.
Swell wave height: 0-1 ft.
Sea water temperature: 11.7 C.
Sea level pressure: 1016.2 mb.
Cloud cover: Cloudy

Science and Technology: Today we have been in transit to the Shumagin Islands. Two launches were sent out to do Reson (shallow to mid-depth) measurements and one launch did the Elac (mid-depth to deep waters). This area really needs accurate depth measurement, since it's an area where fishermen come frequently. The

information that is received and processed on board the Rainier is then sent to the Nautical Data Branch of NOAA where it is interpreted and made into the hydrographic sheets with added interpretative data. Then it next goes to a production team who apply it to charts. The next step for the information is to go to the Update Service branch which combines all data and puts it in the final form of nautical charts that is used by the Navy, cargo ships, tanker ships and all mariners (such as fishermen). So the Rainier plays a vital role in getting critical information to those who use it daily to ensure their safety.

I was able to catch several of the crew for an interview. I interviewed Megan Palmer, who is a survey technician. To prepare for her job, Megan received a degree in geography and received additional training in computer systems, including the complex GIS system. She explained that NOAA is moving toward electronic nautical charts that will allow you to set your scale close or far away on the computer, depending on what you need. Alarms will go off if you get into shallow water. However, there will always be a need for nautical charts and that's where NOAA excels. Megan enjoys her job as it gives her the opportunity to see Alaska while being on the water, and the chance to look for the unexpected in surveys. Often, she is part of the team that is charting waters that have very few depth soundings. She also enjoys the fact that NOAA tests software to see how well it works and then make recommendations to companies to improve features that the survey technicians need. She notes that there is definitely a need for more survey technicians and that it's a rewarding and exciting career for any student who loves the ocean and wants to travel.

Personal: Today we had the thrill of seeing a whale swimming in the distance while we all tried to take a picture (very difficult since it moves in the water so quickly). We dropped anchor tonight in the Shumagin Is. We'll stay here several days while the survey launches run lines in different areas. We've entered into an area of heavy fog and it was neat to hear the fog horn being sounded every few minutes as we move through the water. I enjoyed looking a computer file of pictures that show all the places the Rainier has been in Alaska. Beautiful scenery!

Day : Saturday, July 24, 2004
Latitude: 55 degrees 17.194 N.
Longitude: 160 degrees 32.23 W.
Visibility: 3 nautical miles
Wind direction: 100 degrees
Wind speed: 10 kts.
Sea wave height: 1-2 ft.
Swell wave height: 2-3 ft.
Sea water temperature: 10 degrees C.
Sea level pressure: 1002.0
Cloud cover: Cloudy with rain

Science and Technology: Today we went out on a launch (my first in the Shumagin Islands). We traveled near the area of Simeon Bight to run lines to check depth measurement. An example of why this is so important is that in one of their launches, they found after an earthquake, a 30 meter drop-off near a fault line. This wasn't on any charts because it had been caused by the earthquake itself. Before they begin the depth measurements, it's vital that they take a cast with the salinity, pressure and temperature instrument. This information is then hooked directly into the computer to be calculated into the depth findings, so that the depth can be corrected by these factors. We ran cross lines (lines that cris-crossed each other) as a quality check to be sure that no area had been missed. The transducer (which sends out a multi-beam swath of sound) is lowered into the water by a mechanical arm. This is high-tech stuff! The computers are also recording the GPS (global position system) location of our boat at all times. When we learn the depths of the waters we pass over, we have to know exactly where we are in order to record this on nautical charts. Out of 24 satellites, we need at least 5-7 within range plotting our location to ensure accuracy. The computers divide the screen into sections which show our depth reading, a picture of the ocean floor by sonar calculations and the range our instruments will accurately reflect. We have traveled a range of 88 meters

in depth to 6.7 meters in depth. Interestingly, one possible technology that is being tested and may be the best method of the future is called Lidar, which means sonar transmitted from an airplane, which flies over coastal areas and can give a depth reading on land and in the ocean. The Rainier is testing one area that has been measured by Lidar to compare our measurements with theirs to check their accuracy. This would be a safer method, since lowering the launch boats and retrieving them has a certain amount of risk. We've just seen some lazy puffins that are swimming on top of the water, which makes them look like sitting ducks. As we return to the Rainier in the late afternoon, we bring back a lot of data that the survey technicians will assess and correct to be submitted to the cartographers.

Personal: We had a rainy, foggy afternoon on the water while we were surveying, with clouds that hovered over the green, craggy cliffs. It makes a beautiful sight. We felt we got a lot accomplished and returned with some good data. In talking with various members of the crew, I've gotten some good ideas to use in my lesson plans as they help me think of ways to explain their operations that will simplify it, such as flashlights taped together to represent a multi-beam sonar swath. I'm going to catch up tonight on correspondence, and refine my lesson plan ideas tomorrow. I can't wait to take all these ideas back to the classroom!

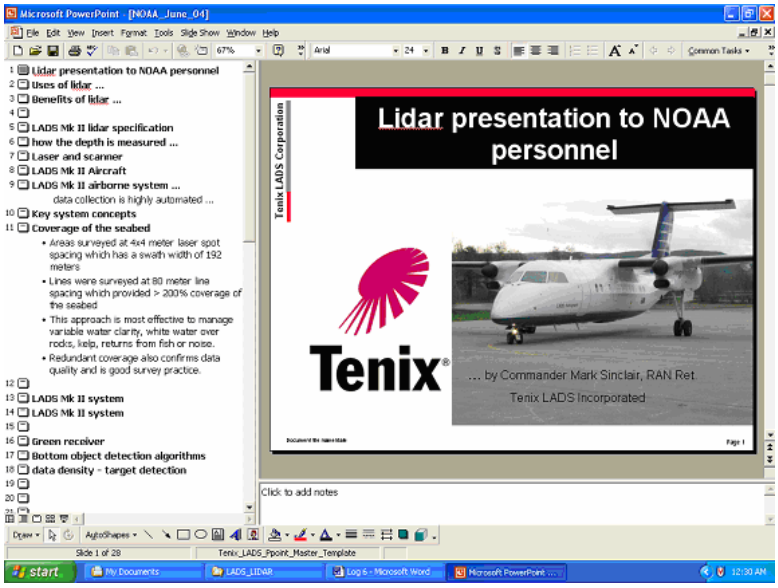
Day : Sunday, July 25 , 2004
Latitude:55degrees 17.215 N.
Longitude: 160 degrees 32.231 W.
Visibility:1 nautical mile
Wind direction:140 degrees
Wind speed: 10 kts.
Sea wave height: 0-1 ft.
Swell wave height: 2-3 ft.
Sea water temperature:10 degrees C.
Sea level pressure: 997.4 mb.

Cloud cover:Cloudy, light rain

Science and Technology: Today we had a visitor from Tenix Lads, Inc. named Mark Sinclair who does Lidar depth readings for NOAA. Lidar means light detection and ranging. It is done from a small aircraft, flying at an altitude of 1800-2200 ft. They over fly an area with two laser beams that measure the surface of the water and the depth of the water. They get the difference in these heights, with geometric corrections for tides and other factors, to give them the ocean floor depths. They are able to take an incredible 324 million soundings in an hour! Their information is used for nautical charting, coastal zone management, coastal engineering, oil and gas development, military applications and research and development. They will identify depths, buoys, beacons, lighthouses, kelp areas on digital display (via computers) and on spreadsheets. The benefits of the Lidar technology is that it is very cost effective, has amazing speed, and greater safety. They do 200% coverage of an area by measuring lines and then taking new lines in between the first lines. They run a swath beam that is 192 meters, which is larger than the ones that the Rainier does. Each beam of pulsar light is 15 meters with 4 meters in between. They are finding changes that need to be made on maps that date back to the 1940s. NOAA contracts with this company to do soundings for them and NOAA picks small segments of these areas to do spot checks with the ship to compare accuracy. So far, they have been extremely accurate. At this point in time, they are not comfortable with the greater depth measurements that the Rainier does, but expect that to change in the future. Various crew members that I've spoken with foresee this becoming the depth measurement instrument of the future. Eventually, all depth readings may be done from satellites, which could become very accurate, as well as safe. Right now, NOAA will continue to use both methods.

Personal: I spent the day working on the computer, listening to the Lidar presentation and reading the information about this new system. It's very interesting to predict how useful this will become in the next 10-20 years. I'd love to see some of my students flying the airplanes that will send back this newer

technology. Right now, the Rainier is anchored while launches go out to do shallow survey each day. It's fascinating to watch them lower the launches and bring them back onto the boat. They use hydraulic winches that raise and lower the boats. Everyone has to be very careful at this point, wearing hard hats, because it's a time when equipment failure could bring a dangerous situation. Generally three or four people go out on each day's launch. They have several more days of launches scheduled, then they must go to the Kodiak Coast Guard base to refuel.



Day : Monday, July 26, 2004

Latitude:55 degrees 17.192 minutes N.

Longitude: 160degrees 32.214 minutes W.

Visibility: 6 nautical miles

Wind direction: Light

Wind speed: Airs

Sea wave height: 0-1 ft.

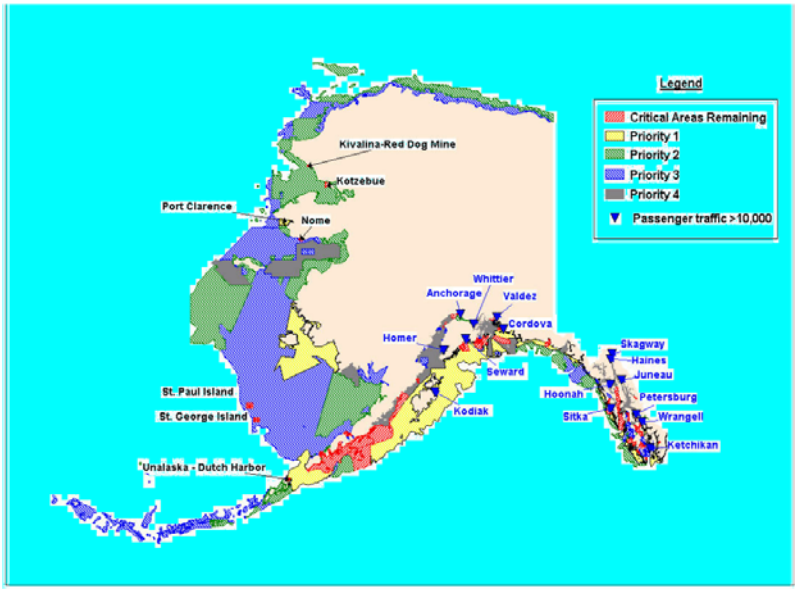
Swell wave height: 0-1 ft.

Sea water temperature:10.6 C.

Sea level pressure:998.9 mb.

Cloud cover: Cloudy

Science and Technology: Today I interviewed Nicola Samuelson, who is an ensign. Her job on the Rainier is multi-faceted. She is responsible for the ship's safety, must represent the Captain when he is not here, drive the ship from point A to B as assistant navigation officer, preparing the ship's sail plan, and is also a morale officer, who plans activities for the crew when they are in port. She has an undergraduate degree and a master's degree in ocean engineering. She works in four hour shifts and as an officer, may be on 24-hr. duty when the ship is in port. She chose this job because she enjoys the beautiful scenery, likes the important survey work they do, and enjoys working in a setting where you must bring a camera. She also has an interesting background that steered her in the direction of working for NOAA. She grew up on a sailing vessel as her parents sailed around the world. She was home schooled on the boat and sailed around the South Pacific from the time she was three years old until she was twelve years old. They would stop in various ports, such as New Caledonia, Fuji Islands, Samoa, New Zealand, Singapore, Malaysia, New Guinea, and Thailand when they needed to pick up supplies or work for a while. She only lived on land for the first time when she was 17 years old. She grew up speaking English and French as her parents spoke both languages. Because of her upbringing, she knew she wanted a job where she would be on the ocean. After graduate school, she received three months of NOAA officer training, where she learned firefighting skills, first aid, navigation, and how to drive a ship. She feels that her job is extremely significant, since some of the waters in Alaska have never been surveyed. An area that the Rainier just surveyed, that covered



30 miles by 50 miles only had about 5 depth soundings. Ships would have to go around that area, because it's just too dangerous to navigate through without the true depth measurements on the charts. A ship needs 40 feet of water clearance below deck level in order to successfully navigate the waters. Lack of accurate charts means that cruise and cargo ships are limited in where they can sail in the Alaskan waters. Opening up new areas, because of their surveys, means NOAA is contributing toward improvement of safety, commerce and tourism.

Personal: We have learned today, that because of an oil leak, the Rainier will go into port early. We'll have an all hands on deck meeting this afternoon to find out the exact plans. It will be interesting to find our how a ship this size will handle repairs. The weather has turned off pretty this afternoon, so those of the crew who are not working have gone on deck to fish. They will pack their catches in ice to mail back to their families. Fishing in Alaska is some of the best in the world!

Day : Wednesday, July 28. 2004
Latitude:58 degrees 01.110 N.
Longitude: 153 degrees 16.529 W.
Visibility: Less than 1 nautical mile
Wind direction: Light
Wind speed: Airs
Sea wave height: 0 ft.
Swell wave height: 0 ft.
Sea water temperature: 9.4 C.
Sea level pressure: 1003.9 mb.
Cloud cover: Cloudy/ foggy

Science and Technology: Today we have the exciting assignment of surveying the site of an 1860's wreck of a Russian vessel. We'll be making black and white images

of the site of the wreck, giving archaeologists the depths of the whole area of wreckage. What makes this find so unusual, according to the Kodiak News, July 16, 2004, is that divers have already found a cylinder that spells out the name of the vessel "Kad'yak". It is so rare to find an identifying object, that it happens in only about one out of a hundred sunken wreck findings. The Maritime Studies Program of Eastern Carolina University has a permit form the Alaska Department of Natural Resources, the National Science Foundation, and NOAA to do research on the site. They have sent down divers through the month of July and they have found a cannon, deck braces, a ballast pile, and three anchors. This has been identified as the oldest wreck ever found in Alaska waters. These samples all help to identify and date the wreck. After careful cleaning and preservation treatments, they will be put on display in various museums. Our survey will be a multi-beam swath survey, made from several of our launches, that will take several hours. We may not know much immediately from our survey, because all the data will need to be processed, cleaned and sent to the cartographers for charting. Perhaps we'll read more about it in days to come in the newspapers or scientific journals.

Personal: I was excited to know that we were traveling through Whale Pass today and when I went out to the flying bridge to get a good look at the area, I saw a whale, quite near the ship. It was the first time I've seen a whale that close and it stayed on the surface for several minutes. When a whale is spotted, they make an announcement to all hands that a whale is spotted on port side or starboard side. Everyone grabs their cameras to try and get a good picture. I tried too, but I don't know if it'll turn out, as they are notoriously hard to film. They move through the water so gracefully and quickly that photographs are hard to come by. As we are moving through an area of straits, the weather is cloudy and foggy, but when the fog

lifts, it brings a lovely view of the mountains. I'll be headed to Homer, Alaska tomorrow for a few days of sightseeing, then home and back to the classroom. What an adventure this has been! Thank you NOAA!!