NOAA Teacher at Sea
Elizabeth Martz
Onboard NOAA Ship ALBATROSS IV
August 5 – 16, 2007

NOAA Teacher at Sea: Elizabeth Martz
NOAA ship ALBATROSS IV
Mission: Sea Scallop Survey
Date: August 7, 2007
Woods Hole, MA and North Atlantic

Weather Data from the Bridge
Visibility = <.2 nautical miles
Cloud cover = Fog
Wind direction = 185 degrees
Wind speed = 5 knots (kts.)
Sea wave height = <1 feet
Swell wave height = 2 feet
Seawater temperature = 15.2 degrees Celsius
Sea level pressure = 1013.8 mb

Science and Technology Log
8:00 a.m.—Breakfast. Yummy! Breakfast is one of the best meals of the day. Great food and selection.

9:30 a.m.—I went to the local post office! I went to the Marine Biological Laboratory. I viewed information on the Alvin launch in 1964. This submersible is amazing! It can withstand such water pressure changes. Science Rules!

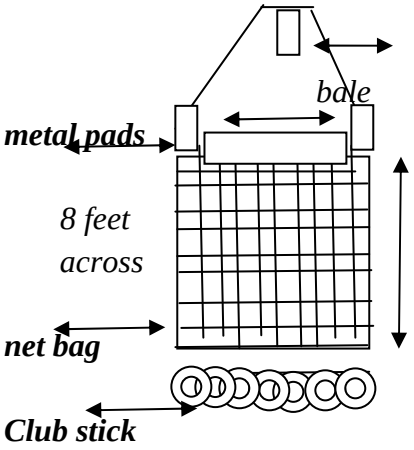
11:00 a.m.—Sea Scallop research and information: Presentation by Victor Nordahl: Chief scientist!

The dredge has a net liner and its purpose is to keep fish and scallops in the dredge. The liner is often damaged by rocks & boulders that enter it. These 2 scientists are repairing the ripped net

This is a standard dredge. The dredge has an 8-ft. wide opening and a sweep chain. This opening moves across the bottom of the ocean floor collecting organisms. The sweep chain is heavy metal that holds the opening … well… open!

liner on our standard dredge. On a common dredge found on fishing boats, there is no liner. Fishermen finding scallops do not want to catch & analyze fish. They just want the scallop meats. As scientists, we want to study everything. The basic dredge haul provides us with lots to study.

The Dredge details = weight: 1600 lbs; 8 feet across, 19 feet in length.



Inclinometer= measure incline of dredge (0-90 degrees)

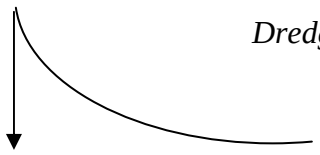
Rings are on each section of this net. The ring sections are connected by links. Each ring is 2 inches in diameter.

The dredge is 19 feet long.

It is 7' wide metal rod covered with rubber disks across the bottom of the dredge. There are dumping chains attached to the clubstick that help with the dumping of materials out of the dredge.

The dredge goes out three times the water depth. For example: If the water depth is 100 meters, the dredge will send 300 meters of metal cable out. To calculate the distance of the dredge from the ship, you could use the Pythagorean Theorem (a^2 + b^2 = c^2. BUT the net curves & the equation doesn't give you the most accurate results. So, you can calculate the amount and make a estimate of the net distance from the ship. In this example, the dredge is about 260 meters away from the ship.

100 m (depth of water)

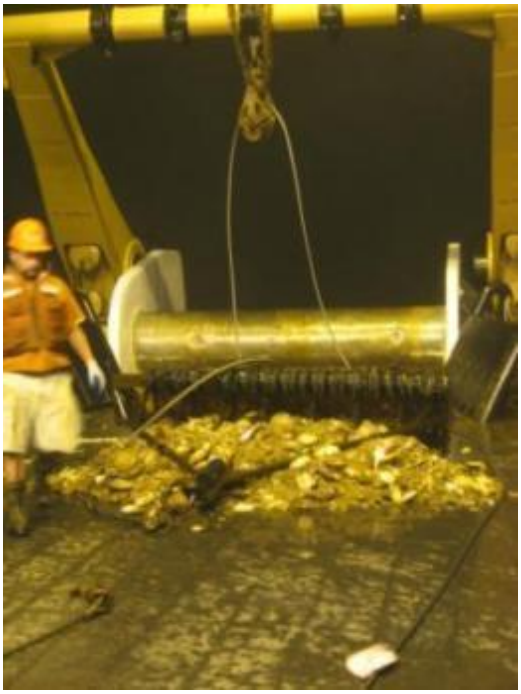


Dredge goes out 300 m

When calculated, the dredge is about 260 m.

The dredge's bag has an opening where all the organisms enter. The ring bag is built to hold rocks, living organisms, movement on the floor, and store many organisms for

study. The dredge sometimes needs to be repaired due to weather conditions or course substrate (items found on the ocean floor).



This is the standard dredge that we use on the ALBATROSS IV. This dredge collects organisms from the ocean floor. Notice the strong metal cable and metal pulley which help to reel the dredge back onto the ship. Also notice the golden metal roller in the center of the picture. This roller helps move the dredge in and out of the water. When the dredge is empty, it weighs 1600 pounds. The pulleys and metal cable help scientists bring the dredge back up on the ship's deck! Then the fun begins.

LOOK at the dredge above. This is showing the longer top side. Try to imagine a metal opening on the other side. This opening is about 6 feet from the top of the dredge. When the dredge is in the water, the longer side is on top. The part with the opening is found underneath. The dredge runs along the bottom floor and collects the organisms. It is amazing how many organisms you can find on the ocean floor. It is incredible how many diverse species are located in the Atlantic Ocean.

More Notes about the Dredge

We have 5 dredges on board the ship. When we get to the end of the Leg III, we will be conducting surveys in areas with lots of rocks and materials that will harm the dredges. We will determine the strength of the dredges.

We will be using different dredges. We will use the standard dredge and the rock- chain dredge. The standard dredge can capture large rocks or boulders during the dredge haul. The rock-chain dredge is designed to stop large rocks from entering the dredge. With the rock-chain dredge, the scientists who analyze the findings from the dredge have fewer rocks to sort out.

ALBATROSS IV: Sea Scallop Survey = Goals and Information

The Sea Scallop Survey is an important and interesting task for scientists onboard the ALBATROSS IV.

Purpose of the scientific expedition of learning:

1. What is range of the scallops? Do you find them in shallow water? Do you find them in deep water? Where do scallops prefer to grow and survive? Do we find more scallops in areas of a smaller rocks, bigger boulders, or small particles of sand?

2. Scientists can estimate how many scallops we will find. Marine biologists would like to learn more about the population of scallops in various areas. Scientists would like to come to an understanding about where most scallops reside on the ocean floor.
3. Scientists have randomly selected stations from Cape Hatteras, NC to Georges Bank (east of Cape Cod). An area close to Nova Scotia is where scientists test to see the existence of scallops.
4. Scientists ask, "How many scallops are out there?"
5. Scientists ask, "How will the scallop population be different in the future?"

This picture is taken right off the fantail of the ALBATROSS IV. It is a gorgeous view of the sunrise from the back deck of the ship.

- I ask: Why will the population be different?
- I ask: What makes one species survive and another species not survive in an area?
- I ask: How can science help the scallop population increase? Will helping the scallop population help or hurt the ecosystem?

Other questions:

This was the basic size of a tow. It is incredible how many organisms and sea scallops are found in one dredge tow. It is beautiful to see such amazing animals and species from our ocean.

- What bottom substrate is most prevalent in areas with large sea scallop harvests? (This year, the scientists found the most scallops on an area with a sandy bottom.)
- Why is that bottom substrate a better environment for sea scallop growth? {little scallops = gravel, sand; bigger scallops orientate to areas by the current (moving water)}
- How long do sea scallops live? (10-15 years)
- What temperature is the best for sea scallop survival? (The most important temperature is one that produces the

most spawning. When more scallops are born, then more scallops survive.

- How much do sea scallops cost to buy in the store? (about $12/pound)
- How much do the fisherman make for spending a day at sea catching scallops that they sell to the local restaurant or buyer?
- What topics do scientists find interesting about scallops? (Each scientist has their own ideas and opinions.)

6. How can scientists protect fisheries (the scallops) and those who harvest them (the fishermen)?
7. Various universities, scientists, and government agencies closed water areas around Nantucket in 1994. In this area, no fishing or dredging is allowed. All citizens must not remove anything from the area.
   - If you have a permit to fish, you need to be knowledgeable of the fishing rules. When water areas are closed for fishing, you need to know where they are and what to do.
   - When they closed the area, the fish did not return.
   - The scallop population has greatly increased.
8. Many areas of the ocean are under a rotational management plan. (This is also called limited access areas). In these areas of the ocean, fishermen are allowed into an area for various times.
   - Sometimes fishermen are not allowed to capture a specific type of fish.
   - There are times when fishermen cannot collect any scallops.
   - These rotational management areas are created due to research and scientific studies that are completed at sea. In other words, all the scientists onboard the ALBATROSS IV are making a difference in the regulations that fishermen adhere to.
9. Scallops are a resource. They are a biotic (living) thing. Many people spend their lives harvesting this resource from the ocean. Many people spend their lives eating this resource. No matter who you are, you can impact the health of the water and the home to this resource. We all need to make an effort to protect our waterways and care about the resources that benefit our lives.

Many people spend their lives collecting and selling organisms from our ocean. Fish, scallops, and other living things are called resources. We should all care about protecting these *awesome* resources. This fishing boat was docked close to the ALBATROSS IV.

10. The ALBATROSS IV has surveyed over 525 randomly- generated locations. The ALBATROSS IV has selected over 25 basic locations to compare studies year after year. The scientists have been collecting data since 1975. (I think that is so outstanding and AWESOME!)
11. Here is a small lesson about how the stations are randomly-generated. First, think of an area in the ocean. Then, divide that area into 100 squares. Next divide those 100 squares into small areas. The randomly-generated stations are determined from all those small areas. Finally, the researchers need to decide the best way to travel to all of those randomly-generated areas.
12. The tow "what you catch" naturally changes year after year. You will never catch all the same organisms every year. You will discover that fish populations change for many reasons. Here is a list of some reasons why a population may be different each year:
    - Birth rate/death rate
    - Habitat change
    - Fish movement
    - Fish maturity
    - Number of fish caught by the fishermen
    - Amount of water in the area
    - Environmental factors = salinity over time, temperature, rainfall, hurricanes, tsunamis, and more…

13. Sometimes ships are retired and new ships replace them. When a new ship surveys an area, the scientists need to make sure that the new ship's equipment is consistent with the old equipment. Long-term data is analyzed. The new equipment and old equipment must keep the data valid. Many factors are taken into consideration:
    - Do ships have the same power, dredge, wire used, and same liner?
    - If the equipment is different, how can we control bias?
    - Do the ships test areas with the same water level, salinity, disease, same amount of fishermen in the

This is a winter flounder. It is a resource to many fisherman and scientist. There were several types of flounder in each dredge tow.

area, wind, etc.?

- There are so many factors to consider and to control!
- A few ways to control bias and determine an average number of scallops include:
  = determine fish mortality: death due to being caught
  = natural mortality: predation/ death
  = don't factor in temperature, salinity, water currents, food availability, recruitment (spawning and growing)

14. The ALBATROSS IV keeps a constant 3.8 knots speed when the dredge is out in the water. The ALBATROSS IV can reach 10- 11 knots when cruising along. I think it is an amazing how it feels on the water.
15. The sea scallop study is a great arena to start an ecosystem investigation. We need to know more about other organisms to determine details about ecosystem! Animals help and hurt each other.
16. As a scientist, you map habitat with a multibeam, tow camera, and dredge an area. The dredge validates the information from the tow camera. (The efficiency issue is solved.) The multibeam shows the entire habitat and determines everything there is to validate animal documented.
17. There are so many characteristics about the sea scallops.
    - Thickness of the sea scallop shell
    - Weight of the meat
    - Color of the meat
    - Shape of the shell
    - Texture of the shell
    - Weight of the shell
18. On the ALBATROSS IV, many procedures are followed for each dredge tow!
    - There is an inclinometer on the dredge. The inclinometer will show if the dredge flipped.
    - A photo is taken right when the dredge tow is dumped on the deck. The picture shows the station number, tow number (location), if it is open or closed area, and more. (See picture above.)
    - When sorting the tow, there are procedures to follow. Always sort what is in front of you. By sorting all animals right in front of you, true randomness and validity of diverse sizes are discovered. Place all fish in one bucket. Put all skates in one bucket. Place all crabs in another (if you need to collect them.) Put all small scallops in a blue bucket. Place all large and medium scallops in another bucket. Put all other animals in another bucket. Place all "habitat" in an orange basket.
19. What do sea scallops eat? Well, they eat starfish. They eat the Asterias Boreal and Elptarstius Tenera. So neat.