NOAA Teacher at Sea
Jennifer Fry
Onboard NOAA Ship *Miller Freeman*
July 14 – 29, 2009

NOAA Teacher at Sea: Jennifer Fry
NOAA Ship *Miller Freeman* (link: http://www.moc.noaa.gov/mf/)
Current location of ship: www.shiptracker.noaa.gov (choose *Miller Freeman*)
Mission: 2009 United States/Canada Pacific Hake Acoustic Survey
Geographical area of cruise: North Pacific Ocean from Monterey, CA to British Columbia, CA.
Date: July 17, 2009

Weather Data from the Bridge
Wind speed: 20 knots
Wind direction: 340°from the north- north west
Visibility: foggy
Temperature: 15.2°C (dry bulb); 13.0°C (wet bulb)

Science and Technology Log
Each day I observe the NOAA scientists using the scientific process. These are the same process skills we learn in the classroom.

Hypothesizing	Stating a problem to be solved as a question.

The scientists determine what they want to find out and state it in a question form. These are some of the questions/hypotheses that they are trying to answer.

- What and where are the populations of hake?
- In what environments do the hake best thrive?
- When do they migrate?
- What do they feed on?
- What feeds on the hake?

Observing	Using the senses to collect information**.**

Once the hake are **observed** on the sonar, the trawl net is dropped into the water. The fish are hauled out onto the deck where they are emptied into huge holding bins.

Scientists want a good sampling of hake for the survey, not too much and not too little. Getting a good sample is important to the scientists; both for their research and the environment. The scientists don't want to take too many hake each time they fish, doing this might diminish the hake population.

Left: Hake are unloaded into holding containers, soon to be weighed and measured.

Otoliths—fish ear bones—are extracted and placed in vials (test tubes) for later study.

The otoliths look like small oval "wing-like" structures.

Collecting Data:
Observing
Using the senses to collect information.
Classifying
Sorting or ordering objects or ideas into groups or categories based on their properties.
Measuring
Determining dimensions (length/area), volume, mass/weight, or time of objects or events by using instruments that measure these properties.

The scientists then **collect** their data. Fish are separated by species or classified. All hake collected are then weighed. A certain number of them are **measured** in length, and their sex is determined.

Scientists **observe;** dissect a group of hake, and collect the fish's ear bones, called the otoliths, (2 white oval shapes pictured above). Otoliths are stored in small vials, which are like test tubes, for later study. The test tube has a serial number which is fed into a computer as well.

Later, scientists will **observe** the otoliths under a microscope. The otolith helps determine the age of the fish. When **observed** under a microscope, the otolith, or ear bone has rings similar to rings of a tree. The more rings, the older the fish. The age of the fish or data is then **recorded** in a computer spreadsheet.

Communicating
Using pictorial, written, or oral language to describe an event, action, or object.

- **Making Models**

Making a pictorial, written or physical representation to explain an idea, event, or object.

- **Recording Data**

Writing down the results of an observation of an object or event using pictures, words, or numbers.

As **data is collected** it is **recorded** into a computer database, then scientists create tables and graphs from information in this database.

Inferring
Making statements about an observation that provide a reasonable explanation.
Predicting
Guessing what the outcome of an event will be based on observations and, usually, prior knowledge of similar events.
Interpreting Data
Creating or using tables, graphs, or diagrams to organize and explain information.

Once all the data is in the computer, scientists can **analyze** or figure out the answers to these questions.

- What and where are the populations of hake?
- In what environments do the hake best thrive?
- When do they migrate?
- What do they feed on?
- What feeds on the hake?

Scientists use the data to **infer** or make a statement about the data that gives a reasonable explanation.

Scientists also make **predictions** by guessing what the outcome might be based on the data/observations.

Marine Mammal Watch
NOAA Fisheries instructs the scientists to conduct a "marine mammal watch" prior to a fishing trawl. This is to protect the marine mammals, such as dolphins, whales, sea lions, and seals. When the nets go into the ocean, the curious sea lions want to see what's going on and play around the nets. This can prove dangerous for the animals because if they get tangled in the net, they cannot come up for air, and being mammals, they need air. As it happened, a half a dozen sea lions were spotted around our trawl net. To protect the inquisitive animals we found another spot in which to put our net.

California sea lion

Personal Log
Everyone aboard the *Miller Freeman* is a team. It's an amazing working environment. The ship runs like a well oiled machine. The crew is always so helpful and are dedicated to their work. The scientists are incredibly dedicated to their specific field and are committed to helping the world and the ocean's biome. Everyone is so patient with all my questions. I am so grateful and honored to be part of this hake survey which is so scientifically important in determining the health of our ocean.

Animals Seen Today
California sea lions
Hake
Myctophidae: lantern fish