



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 27, 2009

Weather Data from the Bridge

Wind speed: 13 knots

Wind direction: 003° from the north

Visibility: clear

Temperature: 13.6°C (dry bulb); 13.2°C (wet bulb)

Sea water temperature: 15.1°C

Wave height: 1-2 ft.

Swell direction: 325°

Swell height: 4-6 ft.

Science and Technology Log

Each night beginning at around 9:00 p.m. or 21:00, if you refer to the ship's clock, Dr. Steve Pierce begins his research of the ocean. He is a Physical Oceanographer and this marks his 11th year of conducting **CTD, Conductivity, Temperature, and Density** tests.

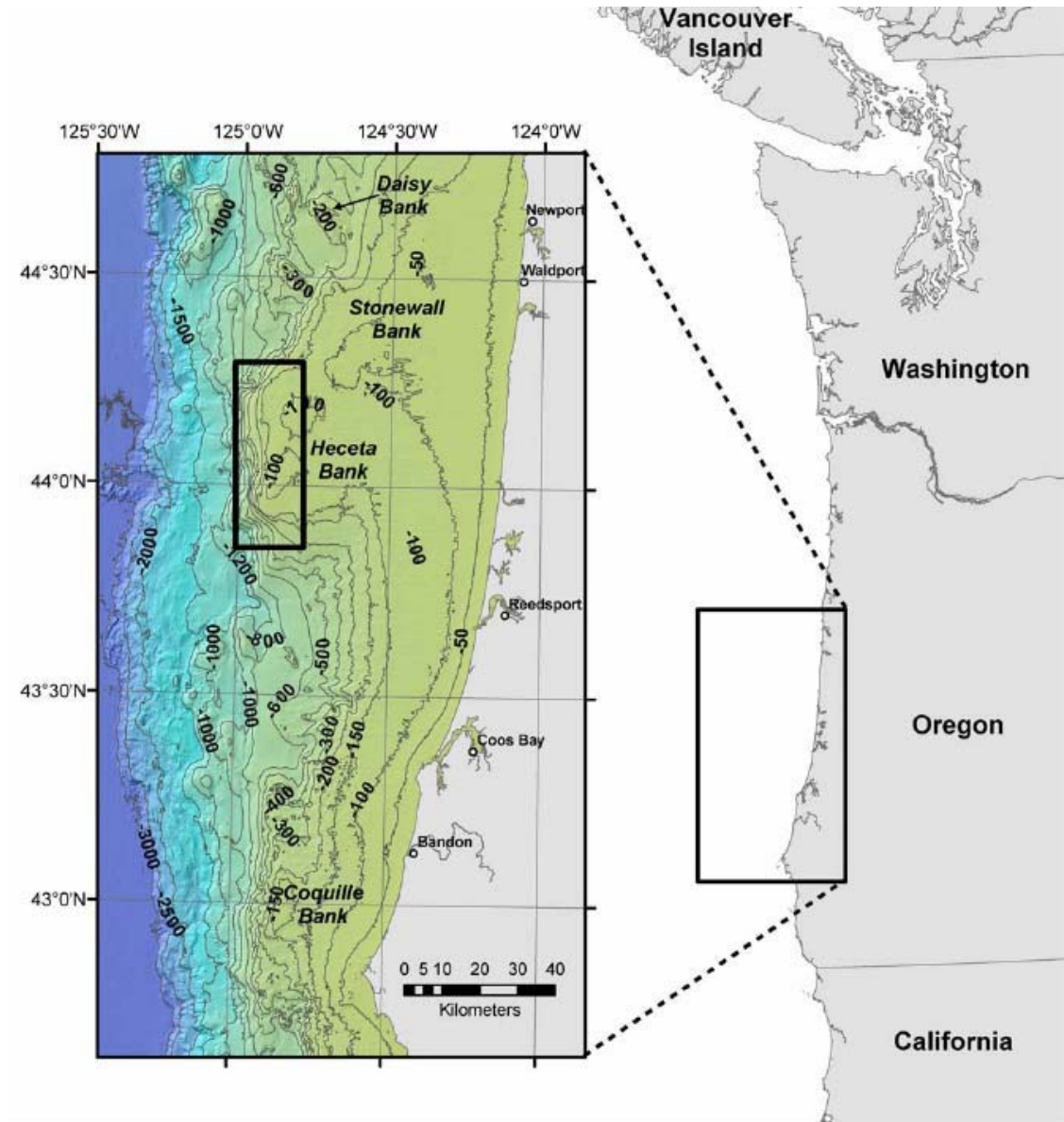
It takes 24 readings per second as it sinks to the seafloor. The **CTD** only records data as it sinks, insuring the instruments are recording data in undisturbed waters. For the past 11 years Dr. Pierce and his colleagues have been studying density of water by calculating temperature and salinity in different areas of the ocean. By studying the density of water, it helps to determine ocean currents. His data helps us examine what kind of ocean conditions in which the hake live.

Using prior data, current **CTD** data, and acoustic Doppler current profiler, a type of sonar, Dr. Pierce is



The CTD, resembling a giant wedding cake constructed of painted steel, measures the composition of the water, salinity, temperature, oxygen levels, and water pressure.

trying to find a deep water current flowing from south to north along the west coast. This current may have an effect on fish, especially a species like hake.



This map illustrates part of the area of the hake survey.

Dr. Steve Pierce reminds us, “None of this research is possible without **math**. Physical oceanography is a cool application of math.”

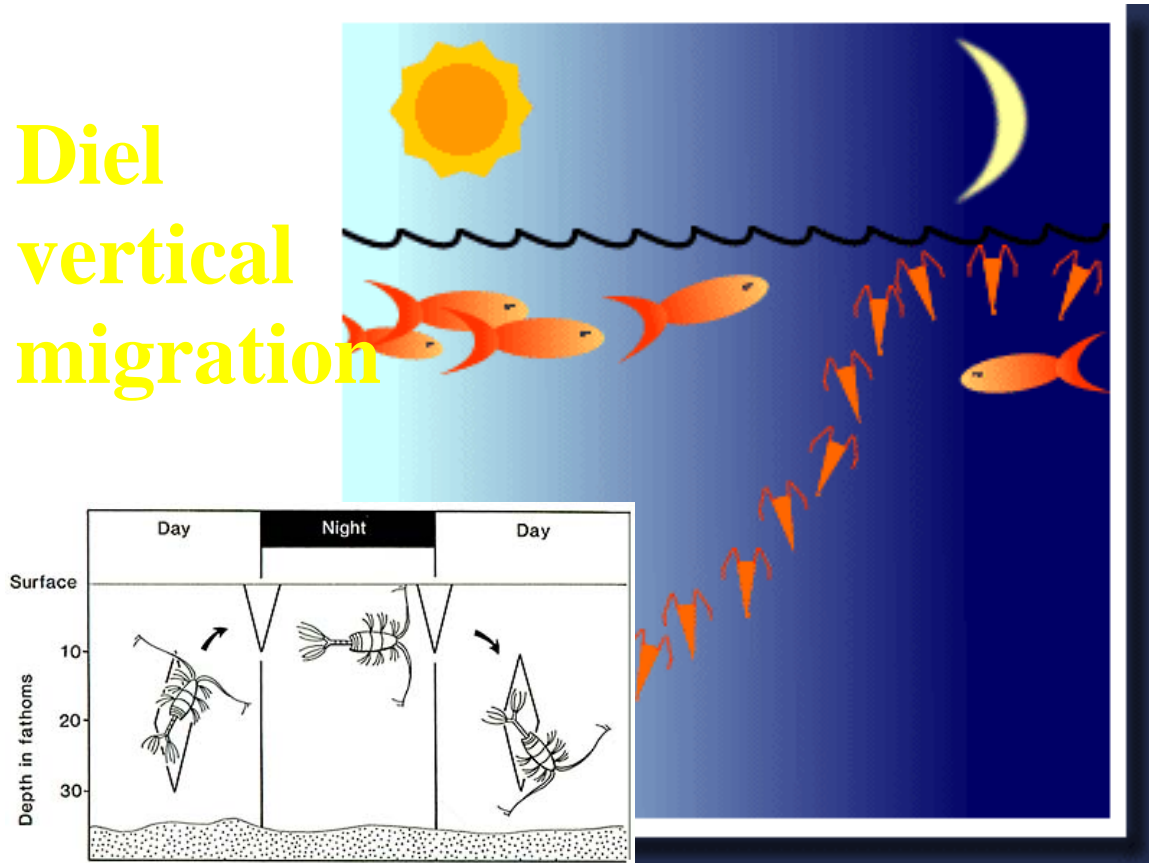
Another testing instrument housed on the **CTD** apparatus is the **VPR**, Visual Plankton Recorder. It is an automatic camera that records plankton, microscopic organisms, at various depths. The scientists aboard the *Miller Freeman* collect data about plankton’s feeding habits, diurnal migration, and their position in the water column. Diurnal migration is when plankton go up and

down the water column to feed at different times of day (see illustration below). Plankton migration patterns vary depending on the species.



Dr. Steve Pierce at his work station (left) and standing next to the CTD "wedding cake" on a bright sunny day in the Northern Pacific Ocean.

Diel vertical migration



This illustration depicts the diurnal migration of plankton.

Fishing Trawl Report

The scientists aboard the *Miller Freeman* followed the east to west transect lines conducting fishing trawls. The first one produced 30 small hake averaging 5 inches in length. The scientists collected marine samples by weighing and measuring them.

Personal Log

It was extremely foggy today. We traversed through the ocean evading many obstacles including crab and fishing buoys and other small boats. Safety is the number one concern on the *Miller Freeman*. The NOAA Corps Officers rigorously keep the ship and passengers out of harm's way. I am grateful to these dedicated men and women. LTjg Jennifer King, marine biologist and NOAA Corps officer says, "Science helps understand natural process: how things grow and how nature works. We need to protect it. Science shows how in an ecosystem, everything depends on one another."