



**NOAA Teacher at Sea
Justin Czarka
Onboard NOAA Ship *McArthur II*
August 10 – 19, 2009**

NOAA Teacher at Sea: Justin Czarka

NOAA Ship *McArthur II* (link: <http://www.moc.noaa.gov/mt/>)

Track the *McArthur II* online at <http://shiptracker.noaa.gov/default.aspx>.

Mission: Hydrographic and Plankton Survey

Geographical area of cruise: North Pacific Ocean from San Francisco, CA to Seattle, WA

Date: August 12, 2009

Weather Data from the Bridge

Sunrise: 06:25 a.m. Sunset: 20:03 (8:03 p.m.)

Weather: isolated showers/ patchy coastal fog

Sky: partly cloudy

Wind direction and speed: North 10-15 knots (kt)

Visibility: unrestricted to less than 1 nautical mile (nm) in fog

Waves: northwest 4-6 feet

Air Temperature: 17.3 °C / Water Temperature: 16.6 °C

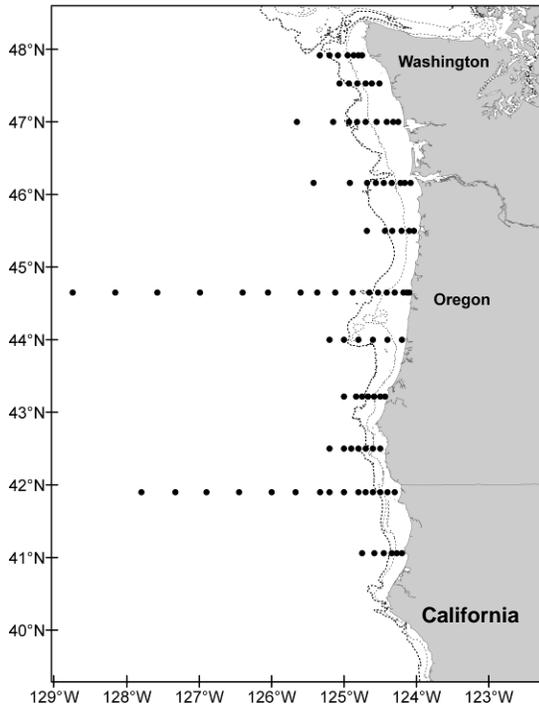
Science and Technology Log

This log discusses the purpose behind the scientific cruise aboard the *McArthur II*. The cruise is titled, "Hydrographic and Plankton Survey." The cruise is part of a larger study by many scientists to, in the words of chief scientist, Bill Peterson, "understand the effects of climate variability and climate change on biological, chemical and physical parameters that affect plankton, krill, fish, bird and mammal populations in Pacific Northwest waters." This specific cruise focuses on hydrology, harmful algal blooms, zooplankton, krill, fish eggs, fish larvae, and bird and mammal observations.

I will provide an overview of these aspects of the cruise. The *McArthur II* is set up with sensors for salinity, temperature, and fluorescence that provide a continuous monitoring of the ocean (hydrology) throughout the cruise. In addition at various points along the transect lines (see the dots on the diagram of the cruise route on page 2), the CTD is deployed into the water column at specific depths to determine salinity (via



Justin Czarka collects water samples to use in nutrient and chlorophyll research. While on the deck during "ops" (operation) all personnel must wear a life jacket and hardhat.



A map of the transect line profiled on the cruise. The dots represent planned sampling station. Due to sea conditions, these have been slightly modified.

measuring conductivity), water temperature, and depth (via pressure), and collect water samples (which we use to measure chlorophyll and nutrient levels at specific depths). The transects (predetermined latitudes that forms a line of sampling stations) have been selected because they have been consistently monitored over time, some since the late 1980s. This provides a historical record to monitor changes in the ocean environment over time. One scientist, Morgaine McKibben from Oregon State University, is researching **harmful algal blooms** (HAB). HABs occur when certain algae (the small plants in the ocean that are the basis of the food web) produce toxins that concentrate in animals feeding on them. As these toxins move up the food web through different species, they cause harmful effects

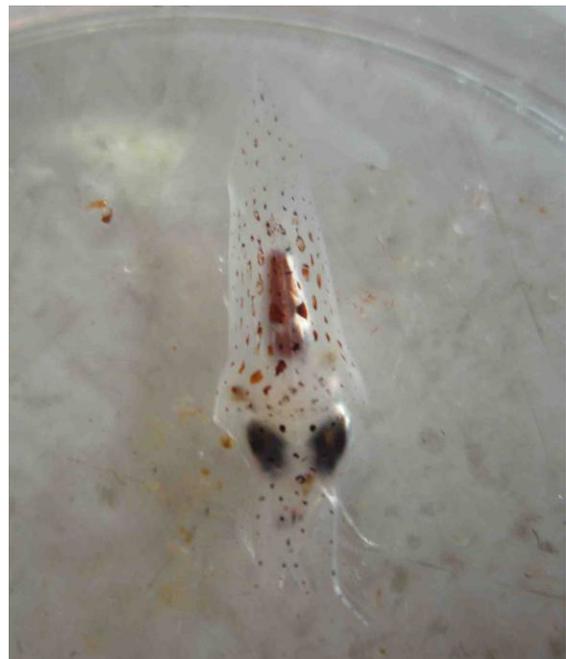
in those species, including humans. Bill Peterson (NOAA/ Northwest Fisheries Science Center) and Jay Peterson (OSU/Hatfield Marine Science Center) are studying copepod reproduction. They are

collecting data on how many eggs are laid in a 24 hour period, as well as how the copepod eggs survive in hypoxic (low oxygen) conditions. Mike Force, the bird and marine mammal observer is keeping a log of all species spotted along the cruise route, which is utilized by scientists studying the species.

Personal Log

Who said you never find the end of the rainbow? All you have to do is go out to sea (or become a leprechaun!). We have been going through patches of fog today, putting the foghorn into action. When it clears out above, yet is foggy to the horizon, you get these white rainbows which arc down right to the ship. We have become the pot of gold at the end of the rainbow. Who knew it was the *McArthur II*! If you follow the entire rainbow, you will notice that it makes a complete 360° circle, half on top the ocean and half in the atmosphere near the horizon.

I enjoyed using the dissecting microscope today.



Tiny squid collected in a vertical net and viewed under microscope on Crescent City transect line at 41 deg 54 min North.

The water collected from the vertical net is stored in a cooler on the deck to be used in experiments. I was able to collect a sample of the water, which contained a diverse group of organisms, from tiny squids to copepods to euphausiids. These tiny organisms from the size of a pinhead to a centimeter long are critical to the diets of large fish populations, such as salmon. Under magnification, one can see so much spectacular detail. I have learned how essential it is to have an identification guide in order to identify the names of each copepod and euphausiid. On the other hand the scientists tend to specialize and become very adept at identifying the different species.

Animals Seen Today

Arrow worms (long clear, with bristles)

Shrimp

Copepods

Tiny rockfish (indigo colored eyes)

Fish larvae