NOAA Teacher at Sea
Beth Lancaster
Onboard NOAA Ship McARTHUR II
April 6 – 14, 2008

NOAA Teacher at Sea: Beth A. Lancaster
NOAA Ship McARTHUR II
Mission: Examine the spatial and temporal relationships between zooplankton, top predators, and oceanographic processes in the Gulf of the Farallones and Cordell Bank.
Project Collaborators: This mission is the result of a collaboration between PRBO Conservation Science and Cordell Bank and Gulf of the Farallones National Marine Sanctuaries. The primary investigator for this cruise is Dr. Jaime Jahncke (PRBO) collaborating with Chief Scientist Dr. Lisa Etherington (NOAA.)
Geographical Area: Pacific Ocean, Cordell Bank National Marine Sanctuary and Farallones Escarpment.
Date: April 13, 2008

Weather Data from the Bridge

April 11, 2008
Range throughout the day
Wind – Northwest 4-17 knots
Swell Waves – 3-8 Feet
Surface Sea Water Temperature – 9.3-11.9^{o}C

April 12, 2008
Range throughout the day
Wind – Light
Swell Waves –1 to less than 1 foot
Surface Sea Water Temp – 9.2-12.5^{o}C

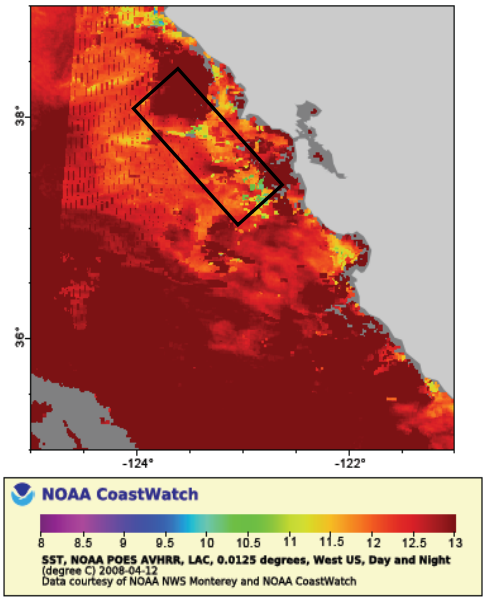

Figure 1: April 12, 2008 reported surface sea water temperatures for the California coast from satellite data. The region of sampling is indicated by the box.

Science/Technology Log April 13, 2008
At the onset of this cruise, ocean winds and swells kept scientists on alert for the next rock of the boat or wave crashing over the side, and into the fantail work area. These winds play an important role in delivering nutrient rich cold waters to the Cordell Bank and the Gulf of Farallones marine areas – this process is referred to as upwelling. Conditions on Thursday April 11 marked a noticeable change in the weather for this research cruise. Winds hit a low of 4 knots and swells of three feet were reported from the bridge for the majority of the day. On April 12 it was hard to believe that we were conducting research out on the ocean. Conditions were magnificent. Winds were light and swells were less than one foot. This change in conditions is termed a period of "relaxation."

The term relaxation refers to a period when winds decrease, allowing for conditions that promote a boost in primary productivity. These conditions include decreased turbulence and the presence of sun and nutrients. The nutrients are readily available from the upwelling and phytoplankton are retained in the well-lit surface waters due to the decrease in wind mixing and the resulting stratification (layering) of the surface waters - thus, providing the optimal conditions for photosynthesis to take place. Figure one shows surface water temperatures from April 12, 2008. There was a visible change over the course of the research cruise in surface temperatures with the decrease in winds and swells indicating conditions suitable for primary productivity.

Left to Right: NOAA Teacher At Sea Beth Lancaster, Rachel Fontana (Graduate Student, UC Davis), and Caymin Ackerman (Laboratory Assistant, PRBO) enjoy the sun and calm waters while waiting for a sample to return off the McARTHUR II April 12, 2008.

Continuous samples of plankton were taken during the day-time throughout the course of the research cruise. My observations suggest that samples collected early in the trip revealed little macroscopic (visible to the eye) plankton, while samples collected later in the trip during the relaxation event are more diverse and robust. Samples will be examined following the research cruise to draw conclusions based upon quantitative data.

Night-time operations included targeted sampling for krill to look at species composition, overall abundance, age and sex. Krill feed on phytoplankton, and will at times appear green after feeding. The optimal conditions for phytoplankton growth during a period of relaxation will result in a feast for krill that migrate up the water column at night to feed. A large portion of many resident and migratory bird and mammal diets consists of krill, indicating their importance to this marine ecosystem.

Weather conditions over the last few days also provided great visibility for mammal and bird observers. Nevertheless, there were still very few sightings of birds and mammals during this time period. One sighting of importance was of a short-tailed albatross, an endangered species that is an infrequent visitor to the California Current ecosystem. The short-tailed albatross population is estimated at 2000, and is currently recovering from feather harvesting in the late nineteenth century and loss of breeding grounds to a natural disaster. For more information on the short-tailed albatross visit: http://www.fws.gov/midway/wildlife/stal.html.

Putting it all together…..

All of the sampling done over the course of this cruise will allow scientists to look at the dynamics of the food chain during the early springtime. This is just a small piece of a larger puzzle. The same sampling protocol has been utilized at different times of year in the same

research area since the projects beginning in 2004. This will allow researchers to look at the entire ecosystem, its health, and the interdependence of species to drive management decisions.

Laysan Albatross. Picture taken by Sophie Webb off the stern of the McArthur II.

Personal Log

As the trip comes to an end I'm grateful to both the scientists and crew members onboard the McARTHUR II. I now have a better understanding of physical oceanography, and the Cordell Bank and Farallones Escarpment ecosystem which I am looking forward to sharing with students for years to come. The McArthur crew has been kind enough to answer every one of my many questions, made me feel welcome, and given me an idea of what life is like at sea. Thank you! This was truly an experience I will remember and look forward to sharing with others.

Animals Seen April 11, 2008

Cassin's Auklet (36)
Western Gull (61)
Red-necked Phalarope (8)
Northern Fulmar (6)
California Gull (6)
Black-footed Albatross (6)
Black-legged Kittiwake (1)
Herring Gull (1)
Sooty Shearwater (12)
Steller sea-lion (35)
Rhinoceros Auklet (9)
Bonaparte's Gull (1)

Animals Seen April 12, 2008

Black-footed Albatross (11)
Western Gull (48)
Cassin's Auklet (25)
Common Murre (58)
Sooty Shearwater (8)
Red-necked Phalarope (26)
California Sea Lion (2)
Humpback Whale (1)
Glaucous-winged Gull (2)
Northern Fulmar (6)
California Gull (5)
Common Loon (2)
Bonaparte's Gull (4)
Dall's Porpoise (6)
Pink-footed Shearwater (3)
Rhinoceros Auklet (10)
Harbor Seal (1)