Midyear Update of Ocean Conditions through June 2012

PDO and ONI. Over the past few months, La Niña conditions weakened, as indicated by values of the Pacific Decadal Oscillation (PDO), Multivariate ENSO Index (MEI) and Oceanic Niño Index (ONI)- each has become less negative. According to the NOAA Climate Prediction Center, a transition to ENSO-neutral conditions occurred during April 2012, as sea surface temperatures at the equator increased to near-average values across much of the equatorial Pacific Ocean with above-average temperatures in the far Eastern Pacific. As of June 2012, there is a 50% chance that El Niño conditions will develop during the second half of the year.

Sea Surface Temperatures, Physical Spring Transition, and Coastal Upwelling. Sea Surface Temperatures (SSTs) were colder than average from October to April, running about 0.3°C cooler than normal nearshore (NH-05; Figure 7). Temperatures further offshore at the NOAA 46050 buoy (20 nmiles offshore) have been 0.9°C cooler from Jan - May, reflecting the persistently negative PDO values observed during these months (Figure 5). The spring transition this year was late, occurring on day 123 (02 May 2012; the 3rd latest date in 15 years). This date is estimated from the Bakun (1973)/PFEL upwelling index. It is often said that the "spring transition" marks the day when coastal upwelling is initiated; however, a more accurate statement is that it marks the day when winter storms end. The upwelling season started out with an extended period of strong winds, which is needed to bring the cold, nutrient-rich water up onto the shelf and near the surface where it can "fuel" phytoplankton blooms. However since the transition, winds have been highly variable with a lack of long periods of strong northerly winds.

Zooplankton. During winter (Dec 2011-March 2012), a high proportion of copepod biomass was composed of northern copepods (primarily *Pseudocalanus*, on the order of 80%). This is an indicator of good ocean conditions and is often the pattern observed during winters when the PDO is strongly negative as it was during both the winters of 2010-11 and 2011-12. Similarly, the copepod species-richness anomaly time series continues to show negative values from January through June 2012 (Figure 21), and northern copepods continued to dominate samples. Low copepod species richness and high biomass of northern species point to greater-than-average transport of subarctic water into the northern California Current. It is noteworthy that the biomass of northern copepod species in winter 2012 (January - March) was extraordinarily high, in fact, the highest in our 16-year time series, at 14.3 mg carbon m^{-3}; total copepod biomass was also the highest on record, averaging 16.7 mg Carbon m^{-3} over the same time period. This is more than double the winter-time average of 6.1 mg carbon m^{-3} over the past 16 years.

Winter Ichthyoplankton. The biomass of the larval fish collected from January-March which, as juveniles, are fed upon by juvenile salmon in May and June, was slightly above average, ranking 6th of 14 years.

Conclusions. Similar to 2011, we have had a promising start to the year in terms of cold La Niña conditions and higher than average abundances of northern copepods. There was a relatively late start to the upwelling season, and since the transition, there has not been a consistent pattern of northerly winds. However, despite the predictions for potential ENSO-neutral or El Niño-like conditions developing during the second half of the year in equatorial waters, we expect the favorable biological conditions to persist through the summer as they typically lag changes in physical parameters by 3 - 6 months.