Physical and Ecological Conditions in the California Current LME for July to September, 2010

This summary of climate and ecosystem conditions for Quarter 3, 2010 are for public distribution, and compiled by the PaCOOS coordinator Rosa Runcie (email: Rosa.Runcie@noaa.gov). Data and management decisions are summarized when they are made available and don't necessarily coincide with the publication of the quarterly.
Full content can be found after the Executive Summary. Previous quarterly summaries of climate and ecosystem conditions in the California Current can be found at http://pacoos.org/

PHYSICAL CONDITIONS

- **El Niño Southern Oscillation (ENSO):** La Niña conditions that were initiated in equatorial waters in June 2010 are expected to last at least through the Northern Hemisphere winter 2010-11.
- **Pacific Decadal Oscillation (PDO):** The August PDO value had the most extreme negative value since April 2009 when the PDO was reaching the end of a 23-month period of negative values.
- Measurements at NOAA Buoy 46050 (20 miles off Newport OR) indicate coastal waters cooled during summer 2010, with SST values showing weak negative anomalies.
- **Madden Julian Oscillation (MJO):** July to September, the MJO index indicated incoherent MJO activity.
- **Upwelling Index (UI):** Patterns of coastal upwelling indicated average values along the coast of North America from 27°N to 60°N with strong August upwelling**.**
- **Newport, Oregon Water Temperature and Salinity Survey Line Observations:**
  Deep waters on the mid-to-inner shelf off Newport during the summer of 2010 were the coldest in the past 14 years, likely reflecting the strong La Niña conditions.

- **Trinidad Head, California Survey Line Observations:**
  Early July cruise encountered conditions consistent with continued strong upwelling that dominated most of June with a brief relaxation event in mid July. Observations from September and October cruises appear to indicate the onset of seasonal warming and freshening of shelf waters.

ECOSYSTEM CONDITIONS

- **California Current Ecosystem Indicators:**
  1. **Copepods:** During late 2009 through early summer 2010, species richness was very high, reflecting the influence of the 2009-2010 El Niño on the northern California Current (NCC). Species richness has declined through the summer of 2010 to "normal" levels in Septermber.
  2. **Krill:** Seabird and marine mammal observations indicate robust krill populations in the central-northern California Current during the period (but no direct data on krill available for July-September). During May-June, NMFS Juvenile Rockfish Survey acoustic and net surveys revealed high relative abundance of krill.
  3. **Juvenile Rockfish:**
  4. **Coastal Pelagics:**

Pacific Sardine: The second allocation of the Pacific sardine fishery opened on July 1 and closed on July 22, 2010. Daily sardine landings ranged from 38-627 metric tons (mt)/day. Of the 26,000 ton total, about 20,000 tons were landed in Washington and Oregon and most of the remainder in Southern California. During August the only directed fishing for Pacific sardine occurred as part of the Aerial Sardine Survey (EFP-07/12-2010).

Pacific Mackerel: In June, the Council adopted management measures for the 2010-2011 Pacific mackerel fishery, which runs July 1, 2010 through June 30, 2011. The measures are almost the same as those from 2009-2010, with the exception of an increase in the incidental set-aside, from 2,000 mt to 3,000 mt.

Salmon in the Pacific Northwest: Adult Chinook and sockeye salmon and steelhead trout that went to sea during the spring and summer of 2008 are now returning to the Columbia River in near-record numbers. Counts of spring Chinook at Bonneville Dam, were the third highest on record. Fall Chinook are just now returning to the Columbia River and final counts will be available in early December.

5. **Groundfish:** In June, the Council adopted final harvest specifications and management measures for 2011 and 2012 groundfish fisheries.
6. **Pacific Hake:**
7. **Midwater species:**
9. **Sablefish:**
10. **Cassin's Auklet:**

- **Highly Migratory Species (tuna, sharks, billfishes):** In June, the Council took final action to adopt the Highly Migratory Species Fishery Management Plan (HMS FMP) lowering the number of managed species from 13 to 11 and introducing "ecosystem component" species into the FMP.
- **Marine Birds and Mammals:**

  Marine Birds: Cassin's auklet had extremely high reproductive success, best since 2002 which was the highest value on record.

  Marine Birds and Mammals: Bird and mammal observations on summer CalCOFI cruises revealed a shift towards subarctic seabird species in comparison with the winter and spring (during El Niño) surveys; this is consistent with changes in the copepod community composition (species richness) off Oregon.
- **Harmful Algal Blooms:**

  Washington: In late May and early June 2010, paralytic shellfish poisoning (PSP) levels in razor clam tissue rose well above the closure limit of 80 µg/100g tissue along the northern beaches of the Washington coast.

  Oregon: Extremely high levels of *Pseudo-nitzschia* (P-n) were recorded along the northern and central Oregon coast. Counts of the larger type *Pseudo-nitzschia* cells were the highest since shoreside monitoring began in 2006.

  California: The annual mussel quarantine began on May 1 and applied to sport harvesting of mussels along the entire California coastline, including all bays and estuaries.

PHYSICAL CONDITIONS IN QUARTER 3, 2010

El Niño Southern Oscillation (ENSO):

Source:**http://www.cdc.noaa.gov/people/kl`aus.wolter/MEI/mei.html,**
http://www.cpc.noaa.gov/products/analysis_monitoring/enso_advisory/

La Niña is present across the equatorial Pacific. In July, La Niña conditions developed and during August conditions strengthened as negative sea surface temperature (SST) anomalies reached at least -1°C across most of the equatorial Pacific Ocean (Figure 1). Consistent with this, the subsurface heat content (average temperature in the upper 300 m of the ocean (Figure 2) decreased further, reflecting the additional cooling of subsurface waters east of the Date Line. Negative sea surface temperature anomalies persist across much of the Pacific Ocean. Collectively, both oceanic and atmospheric anomalies reflect the strengthening of La Niña. La Niña is expected to last at least into the Northern Hemisphere Spring 2011. La Nina is predicted to become a strong episode by November-January season before gradually weakening.

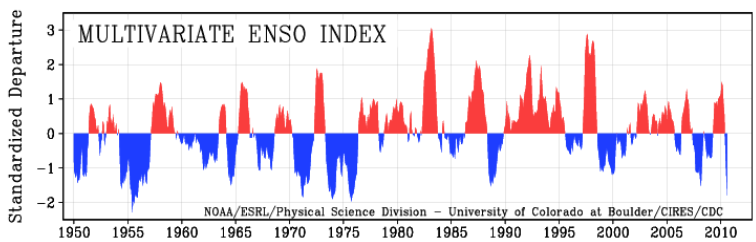

Figure 1. NOAA OAR monitors ENSO using a Multivariate ENSO Index (MEI) on six observed variables over the Pacific: sea-level pressure, zonal and meridional components of the surface wind, sea surface temperature, surface air temperature, and total cloudiness fraction of the sky.

Central & Eastern Equatorial Pacific Upper-Ocean (0-300 m) Heat Content Anomalies:

Source: The Coast Watch* http://coastwatch.pfel.noaa.gov/elnino.html *(Advisory 2010)
http://www.cpc.noaa.gov/products/analysis_monitoring/enso_advisory/ensodisc.doc ***(July, Aug., Sept. 2010 report)***

The upper-ocean temperature anomalies increased sharply during October 2009 in association with the strengthening of El Niño. The anomalies decreased beginning in late February 2010, becoming negative in late April. The large negative anomalies since June 2010 are consistent with the development and strengthening of La Niña.

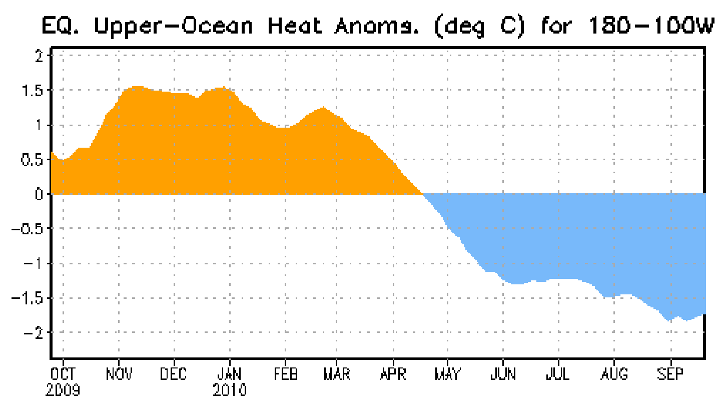

Figure 2. Area-averaged upper-ocean heat content anomalies (°C) in the equatorial Pacific (5°N-5°S, 180°-100°W). Heat content anomalies are computed as departures from the 1982-2004 base period pentad means.

Pacific Decadal Oscillation (PDO):

Source: Jerrold Norton, NOAA NMFS

http://coastwatch.pfel.noaa.gov/cgi-bin/elnino.cgi NMFS/SWFSC/ERD monthly coastal upwelling index, http://jisao.washington.edu/pdo/ http://jisao.washington.edu/pdo/PDO.latest

The PDO is a long-lived El Niño like pattern of Pacific climate variability based on sea surface temperature measurements north of 10°N. From September 2009 to May 2010, the monthly PDO index was positive except for a negative value in November 2009. The persistent positive values from Jan-May 2010 correspond to the El Niño winter of 2009-2010. The index was weakly negative in June then more strongly negative in July and August 2010. The August PDO value is the most extreme negative value since April 2009 when the PDO was reaching the end of a 23-month period of negative values.

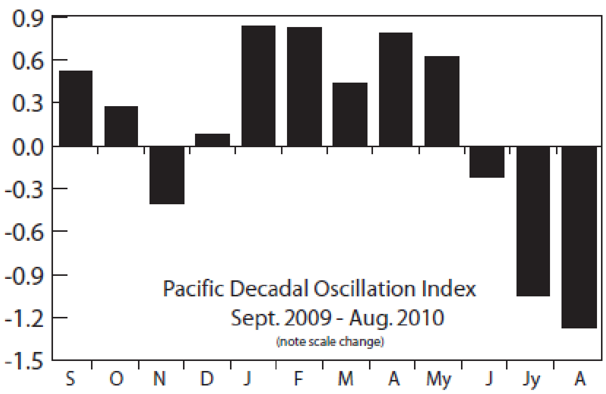

Figure 3. Monthly values for the PDO Index for September 2009 through August 2010.

SST at NOAA Buoy 46050, Newport, Oregon:

Bill Peterson, NOAA, NMFS

http://jisao.washington.edu/pdo/, http://www.pfeg.noaa.gov/products/PFEL/modeled/indices/upwelling/NA/data_download.html http://coastwatch.pfel.noaa.gov/cgi-bin/elnino.cgi NMFS/SWFSC/ERD monthly coastal upwelling index, http://jisao.washington.edu/pdo/

The 2009-2010 El Niño was initiated during summer of 2009 (at the equator) and first appeared as SST anomalies in the northern California Current in mid-summer 2009. SST anomalies were never very large (in comparison to the 1998 El Niño, or the weaker 2002-03 event), thus the 2009-2010 event might be classified as a weak La Niña. Large-scale ocean conditions have now reversed, the PDO and MEI returned to negative phase in June 2010. Notably the MEI value for July/Aug 2010 is the most negative since 1996. Although some cooling of coastal waters has been observed during summer 2010, SST values at NOAA Buoy 46050 (20 miles off Newport OR) are only showing weakly negative anomalies (order of - 0.4°C).

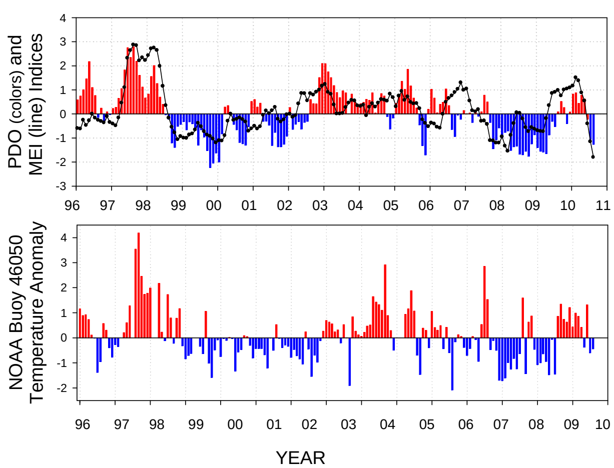

Figure 4. Upper Panel. Time series of the Pacific Decadal Oscillation (PDO) and Multivariate ENSO Index (MEI) from 1996 through August 2010.
Lower Panel. Time series of monthly averaged sea surface temperature anomalies measured at the NOAA Buoy 46050 located 17 miles off Newport, Oregon.

Madden Julian Oscillation (MJO):

Source: **http://www.cpc.ncep.noaa.gov/products/precip/CWlink/MJO/mjo.shtml** ***(Expert Discussions)***
http://www.cpc.ncep.noaa.gov/products/precip/CWlink/MJO/ARCHIVE/ ***(summaries)***

The MJO index indicated incoherent MJO activity during the first week in July. Strong 850-hPa westerly wind anomalies and 200-hPa easterly wind anomalies were evident across the eastern Pacific. The MJO signal weakened during the first week in August and remained weak through September. During the last week in September, the MJO index again indicated an incoherent signal.

Upwelling Index:

Source: El Niño Watch, Advisory **http://coastwatch.pfel.noaa.gov/cgi-bin/elnino.cgi, NOAA/SWFSC/ERD Upwelling Index (UI)**

Southeastward coastal winds in July were stronger than average between 39°N to 52°N and from 24°N to 33°N. Southward winds increased in intensity towards the west, leading to strong wind stress curl from 32°N to 52°N. These coastal winds led to vigorous upwelling that was evident in the negative SST anomalies between 38° and 44°N. Patterns of coastal upwelling, as measured by the upwelling index or UI (NMFS/SWFSC/ERD monthly coastal upwelling index), indicated nearly average upwelling north of 51°N and generally average upwelling between 24°N and 51°N. Six hourly observations indicate fluctuating conditions through July, with strong diurnal effects south of 36°N.

Compared to July, August coastal and offshore winds weakened north of 40°N and strengthened between 29°N and 35°N. South and southeastward winds remained stronger than average between 37°N to 52°N, averaging about 10 m s^{-1} between Point Arena (39°N) and Cape Blanco (43°N). Positive, upwelling-favorable, wind stress curl occurred along the coast from 27°N to 35°N, from 36°N to 38°N, and from 48°N northward beyond 52°N.

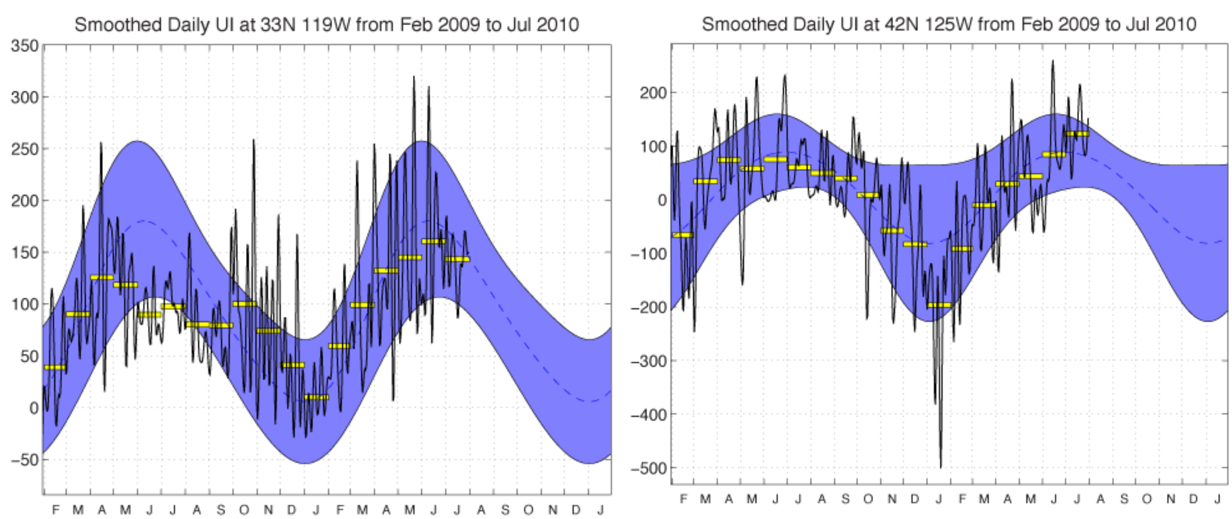

Figure 5. Left panel is recent 18 month record of upwelling for 33°N 119°W. Right panel is same for 45°N 125°W. Positive values are upwelling; negative values are downwelling. Dashed line is the climatological mean. Yellow bars are the means for each month during the period shown.

Regional Oceanic Conditions:

Source: El Niño Watch, Advisory **http://coastwatch.pfel.noaa.gov/cgi-bin/elnino.cgi**

Monthly mean sea surface temperature (SST) fields indicated negative SST anomalies, to -2°C, over a band of coastal ocean that extended 300 kilometers (km) to more than 1000 km offshore between 20°N and 60°N in July and between 20°N and 45°N in August. This pattern has persisted and intensified since May off the west coast of the US. In patterns similar to those seen in July, relatively intense coastal upwelling of cooler water

(10°-13°C) was found from 37°N to 44°N.

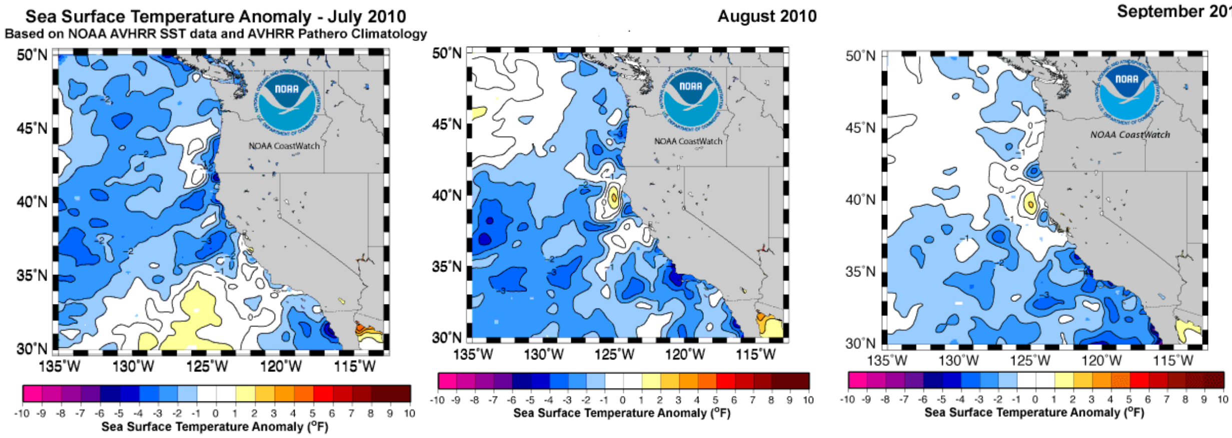

Figure 6. Regional oceanic conditions in the California Current Region.

Water Temperature and Salinity at Newport Hydrographic Line, OR:

Source: Bill Peterson, NOAA, NMFS

Despite the lack of dramatic cooling of sea surface waters at the NOAA buoy off Newport, OR, the deep waters on the mid-to-inner shelf off Newport during the summer of 2010 were the coldest in the past 14 years (Fig. 7), reflecting unusually strong coastal upwelling, and likely the strong La Niña conditions that were initiated in equatorial waters in June 2010.

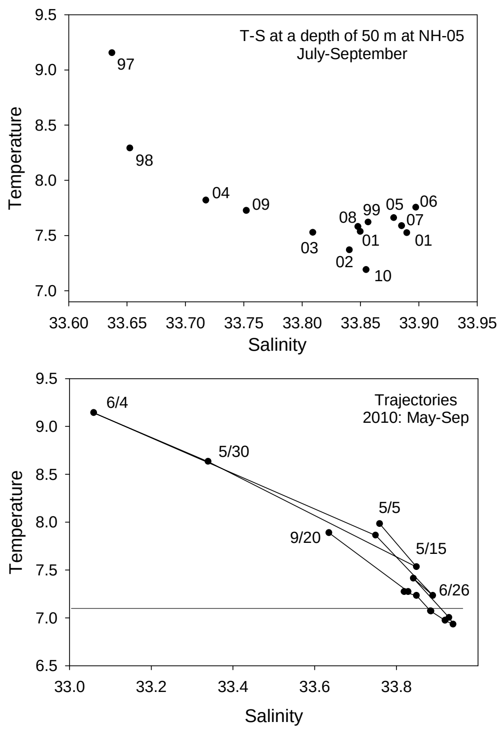

Figure 7. Upper Panel: Temperature and salinity measured at a depth of 50 m at a baseline station off Newport, Oregon located 9 km from shore along the **N**ewport **H**ydrographic line for the months of July to September. Water depth at this station is 62 m. Averages for each year are identified.

Lower Panel: The trajectory of T-S properties, from 5 May through 20 September. Note that although a weak upwelling event was initiated in early May, sustained upwelling was not initiated until 26 June. Once initiated though, deep shelf waters remained cold and salty through 9 September 2010. This pattern of delayed upwelling was quite similar to 2005 when sustained upwelling was not initiated until 14 July and remained strong through September.

Trinidad Head, California Survey Line Observations

Source: Eric Bjorkstedt, NOAA, NMFS, Jeffrey Abell (HSU) and Jeff Borgeld (HSU)

Preliminary observations for a mid-shelf station along the Trinidad Head Line (Station TH02 at 41.058°N and 124.266°W, 77 m depth) indicate substantial variability in shelf water characteristics, presumably related to variation in wind forcing. For example, a cruise in early June encountered some of the warmest and freshest water surface waters observed in the recent time series presumably associated with several bursts of downwelling favorable winds in late May and early June 2010. In contrast, an early July (7/7/2010) cruise encountered conditions consistent with continued strong upwelling that dominated most of June, but the apparent effects of intense upwelling were not apparent a week later (7/14/2010) following a brief relaxation/downwelling event. Preliminary observations from September and October cruises appear to indicate the onset of seasonal warming and freshening of shelf waters.

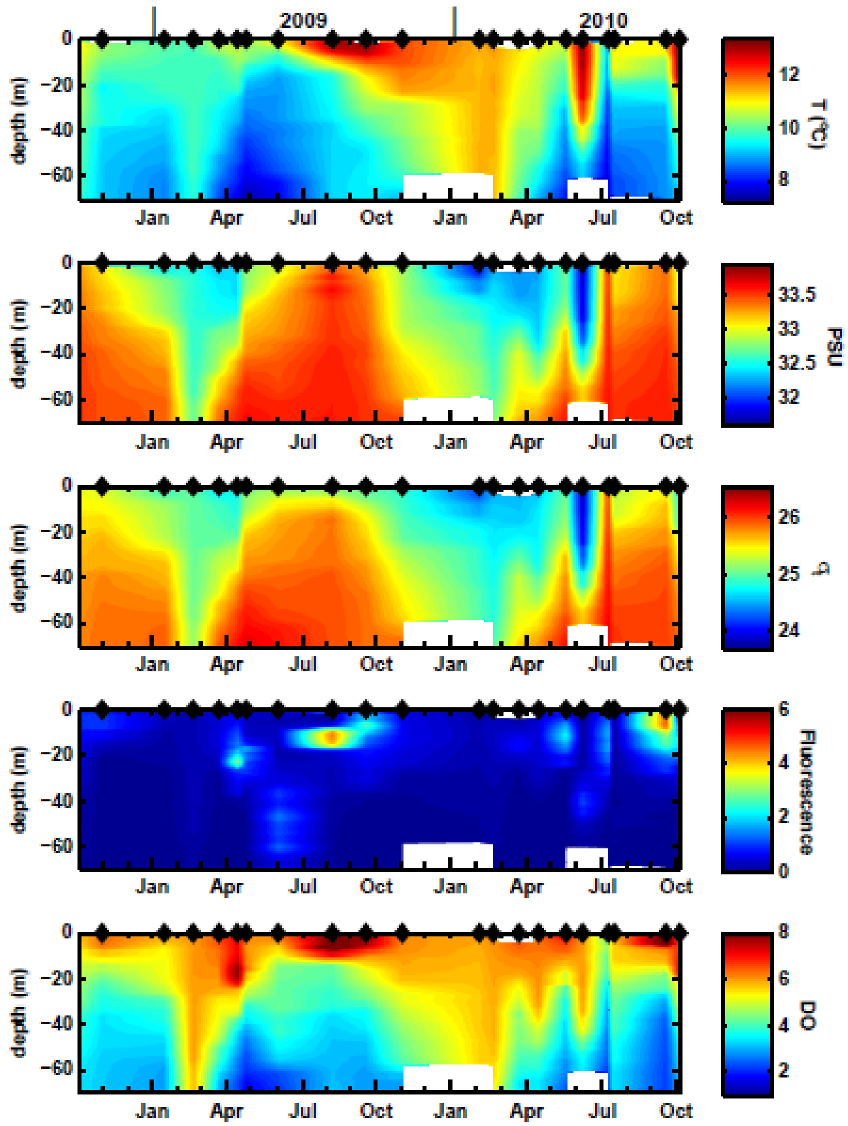

Figure 8. Time series of vertical structure at station TH02 (41.058°N, 124.266°W) along the Trinidad Head Line from late 2006 through early October 2010. Panels from top to bottom display temperature (°C), salinity (PSU), density (σ_t), fluorescence (volts), and dissolved oxygen (ml/L). Black diamonds indicates sampling dates.

ECOSYSTEMS IN QUARTER 3, 2010

California Current Ecosystem Indicators:

Copepod Biodiversity (Species Richness):

Source: Bill Peterson, NOAA, NMFS

Copepod species richness is a measure of the degree to which the coastal branch of the northern California Current (NCC) is influenced by positive or negative PDO conditions. This is partly related to the degree to which the source waters of the NCC have sub-arctic vs. sub-tropical origins. If sub-arctic water, species richness is generally low (e.g. during the years 2000-2002 (negative PDO years) with an average richness during summer of 7-9 species whereas in 2003-2006 (positive PDO years), richness during summer averaged 11-14 species.

During late 2009 through early summer 2010, species richness was very high, reflecting the influence of the 2009-2010 El Niño on the NCC. Note (Figure 9) that species richness was equal to or greater than values observed during the 1998 El Niño event with values of 15 or more species on most sampling dates between 23 December 2009 and 15 July 2010. Species richness has continued to decline through the summer of 2010 to the point that now species richness has now (September) returned to "normal".

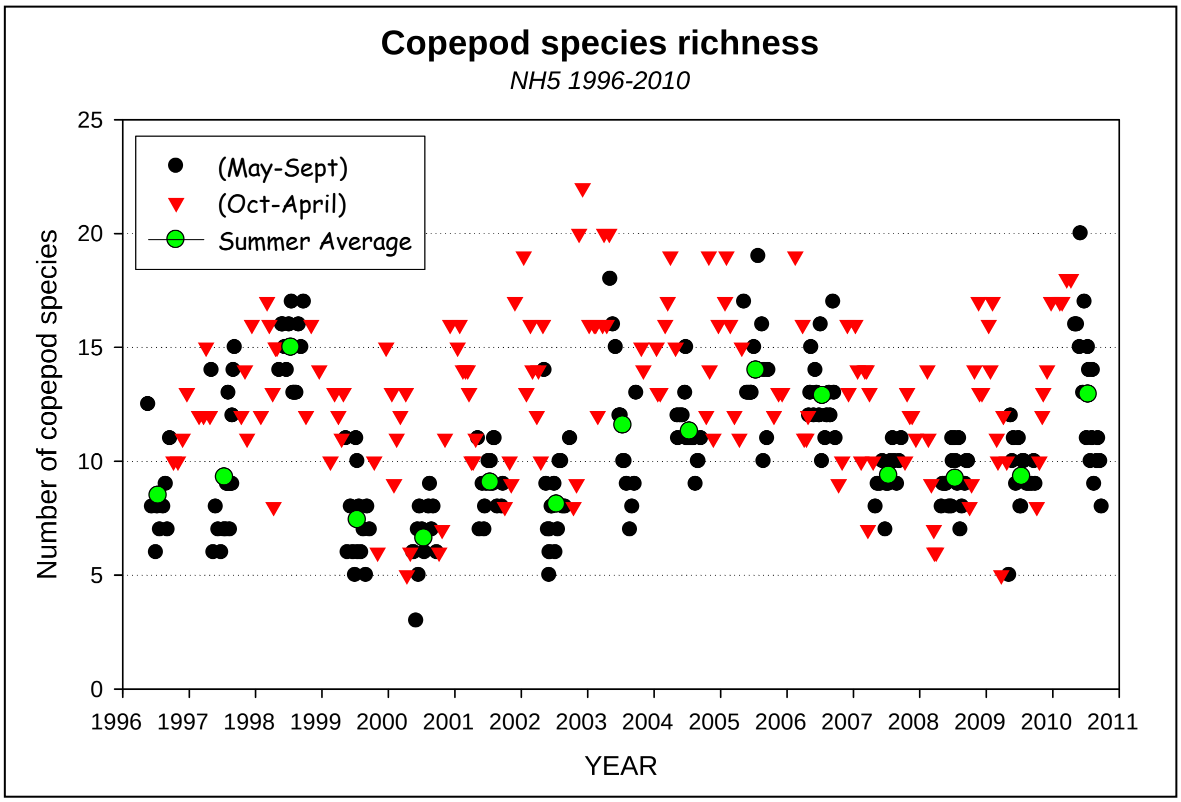

Figure 9. Time series of monthly averaged species richness of copepods collected at a baseline station NH 05, located 9 km off Newport, Oregon along the **N**ewport **H**ydrographic line.

Coastal Pelagics:

Pacific Sardine:

Source: Mandy Lewis (California Department of Fish and Game)

2010 Pacific Sardine Harvest Specifications and Management Measures:

On November 3, 2009 the Pacific Fisheries Management Council adopted a coastwide harvest guideline (HG) of 72,039 mt for the 2010 Pacific sardine fishery. The adjusted allocation of 60,039 mt is to be allocated seasonally as follows:

Coastwide Harvest Guideline = 72,039 mt – 5,000 mt = 67,039 mt				
	Period 1	Period 2	Period 3	Total
	Jan 1 – June 30	July 1 – Sept 14	Sept 15 – Dec 31	
Seasonal Allocation	23,463	26,816	16,760	67,039
Incidental Set Aside	1,000	1,000	1,000	3,000
Management Uncertainty Buffer	0	0	4,000	4,000
Adjusted Allocation	22,463	25,816	11,760	60,039

* Note: All data presented are considered preliminary and subject to change.

The second allocation of the Pacific sardine fishery opened on July 1 and closed on July 22, 2010. The next allocation period opened on September 15, 2010.

Daily sardine landings ranged from 38-627 mt/day. Of the 26,000 ton total, about 20,000 tons were landed in Washington and Oregon and most of the remainder in Southern California.

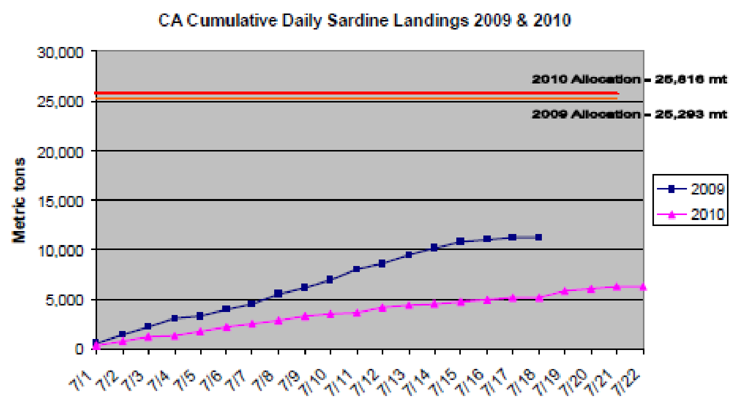

Figure 10. This graph compares the daily Pacific sardine cumulative landings from 2009 and 2010.

During August the only directed fishing for Pacific sardine occurred as part of the Aerial Sardine Survey (EFP-07/12-2010). Survey landings accounted for 95 percent of sardine landings during the month and they occurred at Terminal Island and Ventura, CA. All other fishing for sardines was limited to the live bait fishery or incidental to other fisheries (limited to 30% or less by weight of all fish per trip).

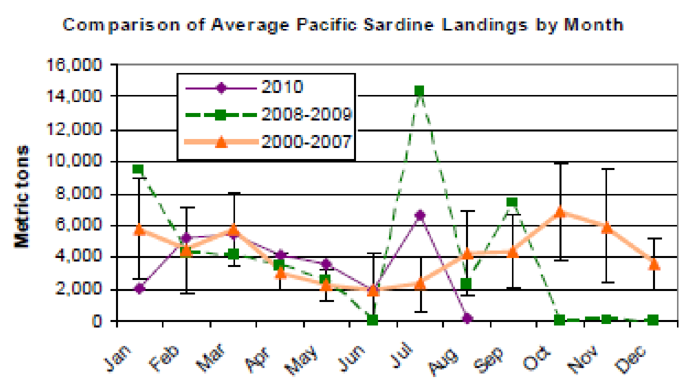

Figure 11. Pacific sardine average landings by month for 2000-2007 and 2008-2009 in comparison to 2010.

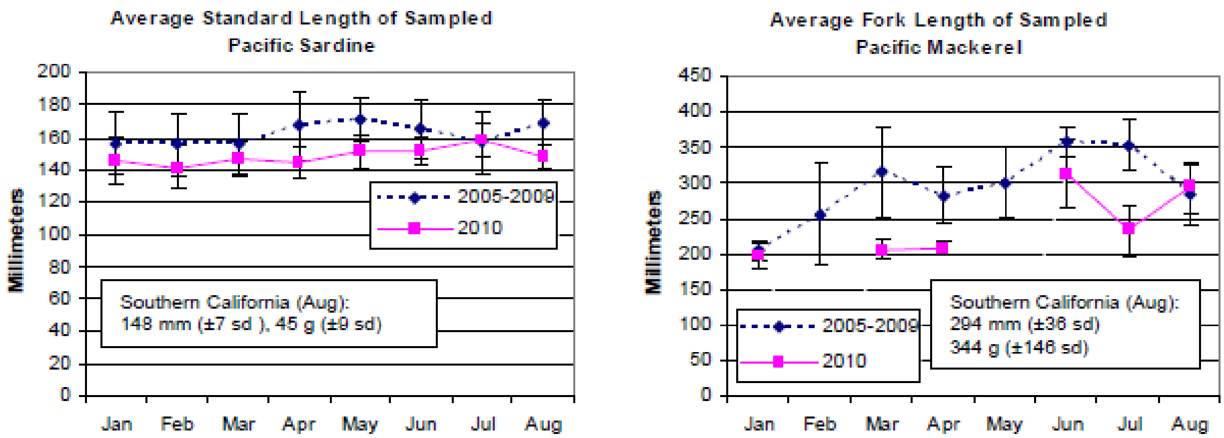

Figure 12. Left graph compares Pacific sardine average standard length for 2005-2009 to 2010. Right graph compares Pacific mackerel average fork length for 2005-2009 to 2010.

Pacific Mackerel:

Source: Pacific Fisheries Management Council (PFMC) www.pcouncil.org

In June, the Council adopted management measures for the 2010-2011 Pacific mackerel fishery, which runs July 1, 2010 through June 30, 2011. The measures are almost the same as those from 2009-2010, with the exception of an increase in the incidental set-aside, from 2,000 metric tons (mt) to 3,000 mt.

There was no updated assessment of mackerel bio-mass this year, so the Council depended on the 2009 full assessment, which produced an estimated biomass of 282,049 mt. Based on this assessment and the Pacific mackerel harvest control rule in the coastal pelagic species (CPS) fishery management plan, the Council recommended an acceptable biological catch (ABC) of 55,408 mt, and an overall harvest guideline of 11,000 mt that includes a 3,000 mt set-aside for incidental landings should the directed fishery close.

Full assessments for actively managed CPS stocks including Pacific mackerel typically occur every third year. A full assessment of Pacific mackerel is scheduled for 2011.

Salmon Stocks in the Northern California Current in 2010:

Source: Bill Peterson, NOAA, NMFS

Adult Chinook and sockeye salmon and steelhead trout that went to sea during the spring and summer of 2008 are now returning to the Columbia River in near-record numbers. Counts of spring Chinook at Bonneville Dam (the first dam on the Columbia River which up-river salmon encounter), were the third highest on record. The highest counts were observed in 2001 and 2002 (for Chinook salmon that went to sea in 1999 and 2000). Further, the returns of both sockeye salmon and steelhead were the highest on record in 2010. Fall Chinook are just now returning to the Columbia River and final counts will be available in early December. The runs to date are very strong with near-record numbers expected.

Groundfish:

Source: Pacific Fisheries Management Council (PFMC) www.pcouncil.org

In June, the Council adopted final harvest specifications and management measures for 2011 and 2012 groundfish fisheries. A new rebuilding plan was adopted for petrale sole, and slight modifications to existing rebuilding plans were also made. New harvest specifications were developed with annual catch limits (ACLs) set for each actively managed stock and stock complex. New management measures were adopted that are predicted to provide fishing opportunity while staying within the adopted ACLs. The Council also adopted state-specific recreational harvest guidelines for canary and yelloweye rockfish.

These decisions were forwarded to the National Marine Fisheries Service as recommendations. New harvest specifications and management measures will be considered final when they are adopted by the Secretary of Commerce and published in the *Federal Register* later this year.

Highly Migratory Species (HMS):

Source: Pacific Fisheries Management Council (PFMC) www.pcouncil.org

Council Takes Final Action on Annual Catch Limits for Highly Migratory Species: In June, the Council took final action to adopt the highly migratory species fishery management plan. The Council's preferred alternative (The Spring 2010 issue of *Pacific Council News* describes the range of alternatives) contains the following elements:

The number of management unit species would be reduced from 13 to 11 species, by moving bigeye and pelagic thresher shark to the newly created ecosystem component species category. The remaining managed species are: albacore tuna, bigeye tuna, skipjack tuna, bluefin tuna, yellowfin tuna, striped marlin, swordfish, blue shark, common thresher shark, shortfin mako shark, and dorado.

The bulk of species currently enumerated in the FMP for monitoring purposes would be dropped from the FMP with the remaining reclassified as ecosystem component species. Combined with the two shark species mentioned above, there would be eight ecosystem component species in the FMP: bigeye, thresher shark, common mola, escolar, lancetfishes, louver, pelagic stingray, pelagic thresher shark, and wahoo.

The FMP would describe how the Pacific Council is to coordinate with the Western Pacific Fishery Management Council (WPFMC) to determine the "primary FMP" for the managed species, because WPFMC also includes them in their Pelagics Fishery Ecosystem Plan.

The current description in the FMP of how maximum sustained yield (MSY), optimum yield (OY), and status determination criteria (SDC) are determined would be modified to ensure consistency with the revised Guidelines.

The current biennial process for setting or adjusting management measures would be expanded so that the Council may adopt updated estimates of MSY, OY, and SDC for managed stocks.

Harmful Algal Blooms:

This section provides a summary of two toxin-producing phytoplankton species *Pseudo-nitzschia* and *Alexandrium*. *Pseudo-nitzschia* is a diatom that produces domoic acid, and *Alexandrium* is a dinoflagellate that produces a toxin called paralytic shellfish poisoning (PSP).

Washington HAB Summary

Source: Anthony Odell (University of Washington, Olympic Natural Resources Center), Vera Trainer (NOAA, NMFS), and Stephanie Moore (NOAA, NMFS). Washington Department of Health

http://ww4.doh.wa.gov/gis/mogifs/biotoxin.htm, http://www.wdfw.wa.gov/fish/shelfish/razorclm/season.htm

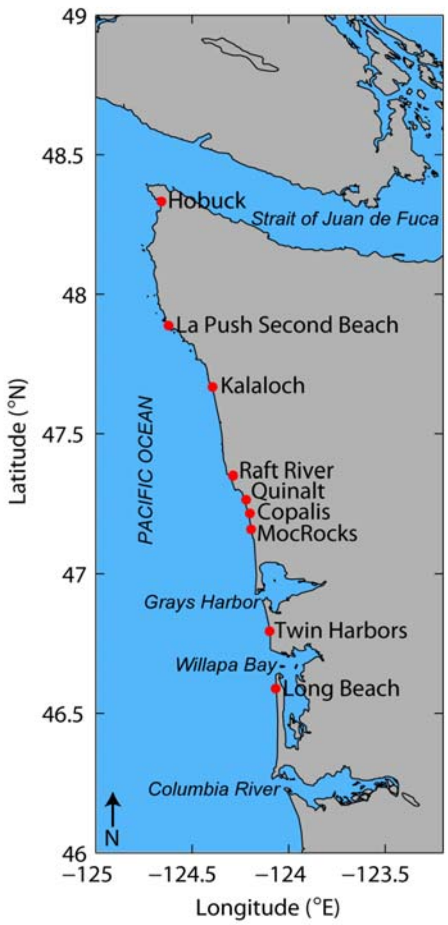

Figure 13. ORHAB monitoring locations on the outer coast of Washington State.

Washington's Olympic Region Harmful Algal Bloom (ORHAB) partnership monitors nine regular sites along Washington's outer coast (Figure 13) for the presence of several harmful phytoplankton species including *Pseudo-nitzschia* spp., *Alexandrium* spp., and *Dinophysis* spp. The smaller *Pseudo-nitzschia* cell type commonly includes *P. delicatissima, P. pseudo-delicatissima, P. cuspidata, P. calliantha* and the larger cell type commonly includes *P. australis, P. multiseries, P. pungens, P. heimii, P. fraudulenta*. When action levels for the 2 cell sizes are exceeded (50,000 cells/L for the larger cell type; 1,000,000 cells/L for the smaller cell type), toxin testing in seawater and shellfish is initiated.

In late May and early June 2010, PSP levels in razor clam tissue tested by The Washington Department of Health rose well above the closure limit of 80 µg/100g tissue along the northern beaches of the Washington coast. The highest levels were found in California mussels collected at Second Beach south of La Push at 3601 µg/100g tissue. PSP levels declined to under the closure limit by the end of June at all samples sites. PSP in CA mussels exceeded the closure limit at Neah Bay on 8/9/2010 at 100 µg/100g tissue. Paralytic shellfish toxins continued to be observed in shellfish tissues in various samples taken along the Washington coast, but remain well under the closure limit.

According to the Washington Department of Health and the Olympic Region Harmful Algal Bloom (ORHAB) monitoring partnership, domoic acid levels in shellfish have remained well below closure level of 20 ppm along the entire Washington's outer coast. The highest levels only being 3 ppm at Kalaloch Beach on 7/13/2010.

Alexandrium catenella have been commonly observed along the Washington coast in recent months. The highest counts occurring at Second Beach south of La Push, WA on 6/1/ 2010 at 53,000 cells/L.

Dinophysis spp. have been commonly observed during the summer months and are found along the central and southern coast of Washington from Kalaloch to Long Beach as well as Grays Harbor and Willapa Bay. Cell counts for *Dinophysis* spp. in the summer of 2010 were the highest and the spatial distribution of the bloom covered the largest area since regular ORHAB monitoring began in 2000. The highest counts were 76,000 cells/L at Copalis Beach on 8/26/2010. The species observed were *D. acuminata*, *D. fortii, D. parva*, *D. acuta* and *D. rotundata*.

Only a few small blooms of *Pseudo-nitzschia* spp. have occurred in recent months along the outer Washington coast. The highest cell counts (337,000 cells/L of the smaller cell type) were found in samples taken from Neah Bay on 6/16/2010. Cell counts never exceeded the action levels to prompt event response testing for toxin in seawater or shellfish.

Cochlodinium sp. and *Akashiwo sanguinea* have been observed in recent months along the outer Washington coast, but not in great abundance. Performing cell counts on these species proves difficult since they do not preserve well.

The dominant species in the outer Washington coastal phytoplankton assemblage in recent months have been *Attheya armatus, Asterionellopsis socialis,* and *Thalassiosira* spp.

Oregon HAB Summary
Source: Oregon Department of Fish and Wildlife http://www.dfw.state.or.us/MRP/shellfish/razorclams/plankton.asp
Source: Zach Forster, Oregon Department of Fish and Wildlife

Oregon Department of Fish and Wildlife reported extremely high levels of *Pseudo-nitzschia* (P-n) along the northern and central Oregon coast. Counts of the larger type *Pseudo-nitzschia* cells have well exceeded any level we have seen since shoreside monitoring began in 2006. The highest cell counts were at Cannon Beach where P-n hit 1,566,000 cells/L on 9/8/2010 and at Agate Beach where cell counts reached 2,306,000 cells/L on 9/13/2010. Razor clamming remains closed from Bandon to Alsea Bay; another coast wide round of toxin testing is scheduled for the week of 9/20/2010.

Cochlodinium cell counts along Clatsop Beach reached a new high of 137,000 cells/L during this period. *Cochlodinium* was also identified as far down as Agate Beach in Newport this week.

Akashiwo cell counts also increased to 13,000 cells/L along Clatsop Beach the week of September 16, 2010.

Alexandrium has also been regularly seen along Clatsop Beach since 9/8/2010 when cell counts were up around 5,000 cells/L. The week of September 16, 2010 both Clatsop and Cannon Beach had 1,000 cells/L each. On 9/10/10 the harvest of mussels was closed from the south jetty of the Columbia River to Cascade head due to elevated levels of PST. Results from mussels collected at the south jetty and Silver Point were 126 and 127 ug/100gm of tissue respectively.

Please view the http://oregon.gov/ODA/FSD/shellfish_status.shtml site for the most current status.

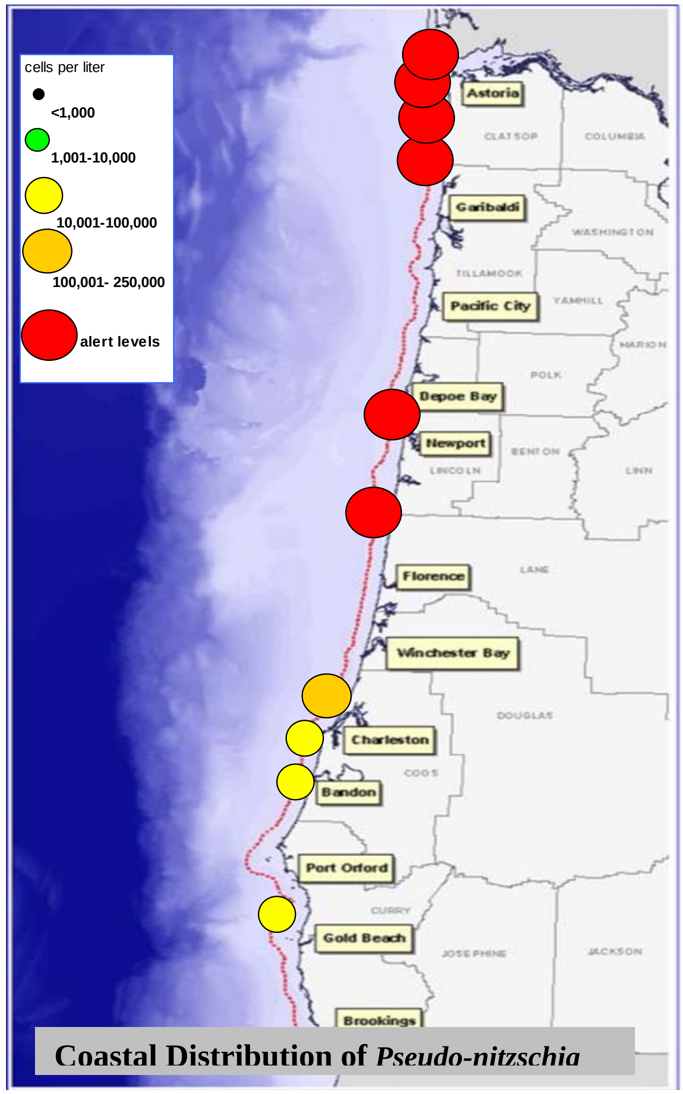

Figure 14. Oregon's HAB monitoring project in conjunction with Oregon Department of Agriculture monitors ten sites along the Oregon coast. The coastal distribution of *Pseudo-nitzschia* (cells per liter) for the third quarter of 2010.

California HAB Summary

Source: Gregg W. Langlois, CA Department of Public Health

http://www.cdph.ca.gov/healthinfo/environhealth/water/Pages/Shellfish.aspx

In late August-early September, *Alexandrium* was observed at a greater number of sampling stations but low concentrations of the paralytic shellfish poisoning (PSP) toxins were detected in shellfish samples from offshore of Santa Barbara.

Pseudo-nitzschia cells were abundant inside Monterey Bay, along the San Luis Obispo coast, at one Santa Barbara site, and at one location inside Santa Monica Bay. But low concentrations of domoic acid (DA) were detected in shellfish samples from offshore of Santa Barbara. Sentinel mussels from the Santa Cruz Pier had nondetectable or very low concentrations of domoic acid. There was no clear pattern of increase despite the persistent high densities of *Pseudo-nitzschia* in this region.

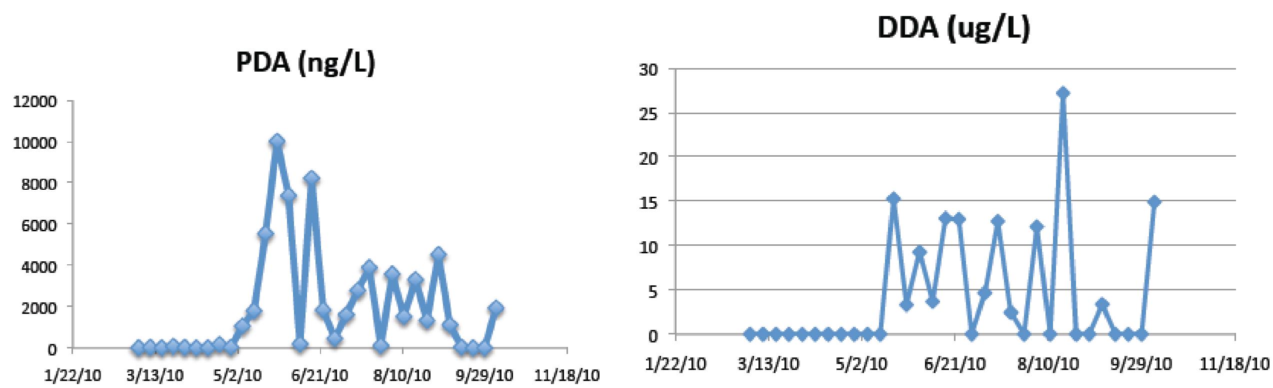

Figure 15. Late September, *Pseudo-nitzschia* and DA values from the Santa Cruz Wharf showed particulate DA at 1935 ng/L, dissolved DA at 14.89 ug/L, a resurgence of DA at the Wharf after 3 weeks of zero values. The graphs above show data for the spring-summer-fall bloom.

The annual CA mussel quarantine began on May 1, and applies to sport harvesting of mussels along the entire California coastline, including all bays and estuaries.

A new map layer of toxigenic phytoplankton distribution for the third week of August can be viewed at:

http://www.cdph.ca.gov/HealthInfo/environhealth/water/Pages/Toxmap.aspx