Ecological Conditions in the California Current LME for January to March 2008

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Summary – Full content can be found by the links below.

CLIMATE PREDICTIONS

- **El Nino Southern Oscillation (ENSO):** Continued La Nina conditions.
- **Madden Julian Oscillation (MJO):** January to February 2008, the MJO index was moderate-weak in activity. In March the MJO signal strengthened.
- **Pacific Decadal Oscillation (PDO):** The Pacific Decadal SST Oscillation has been in negative phase since September 2007.
- **Upwelling Index (UI):** During the late January storm the UI for locations 30°N through 39°N were strongly negative. Otherwise UI-values were low during January 2008.

ECOSYSTEMS

- **California Current Ecosystem Indicators:**
  1. Coastal Pelagics (Market squid, Pacific sardine, Northern anchovy).
     Sardine: 2007 California sardine (*Sardinops sagax*) landings was one of the largest since the decline of the early sardine fishery of the 1940s and 1950s. Landings in California, Oregon and Washington state fisheries were 89,231 metric tons (mt), 43,052 mt and 4,663 mt, respectively. The 2008 harvest guideline (HG) for Pacific sardines was established at 89,093 mt.
  2. Salmon
     Salmon return to natal rivers of the Pacific coast during 2007 was poor to fair compared to 10-year average returns.
     Salmon Management: The PFMC has released a report indicating that Sacramento fall Chinook salmon returns will fill to an all-time low in 2008. At the March meeting in Sacramento, the Council reviewed a list of 46 possible factors that may be contributing to the decline. At the April 6-12 Meeting the CA salmon management plan will be decided based on three options (see below).
  3. Copepods along the OR coast are of the "cold-water community" variety, and the prediction is an early arrival for upwelling, and productivity prognosis.
  4. Groundfish
  5. Pacific Hake
  6. Sablefish
  7. Midwater species (Watson) from tropic & Central jack mackerel
  8. Rockfish juveniles
  9. Cassin's Auklet
- **Invasive Species:** Invasive Mussels may have hit Columbia Basin
- **Marine Birds:** Mexican Socorro Mockingbird Added to Endangered List
  Relocating Terns to South Central Oregon to Reduce Salmon Consumption
  Secretary Kempthorne Announces Funding for Wetland Projects
- **Harmful Algal Blooms:**
  California: PSP toxins persisted at low levels in mussels from Santa Barbara and increased in San Diego.

Oregon: Paralytic Shellfish Poisoning levels remain below alert level on the North and Central Coast. Domoic acid results continue to be in safe range.

- **Low Dissolved Oxygen Levels:** Oxygen concentration in bottom waters on the shelf off Newport, Oregon follow the seasonal cycle of upwelling.

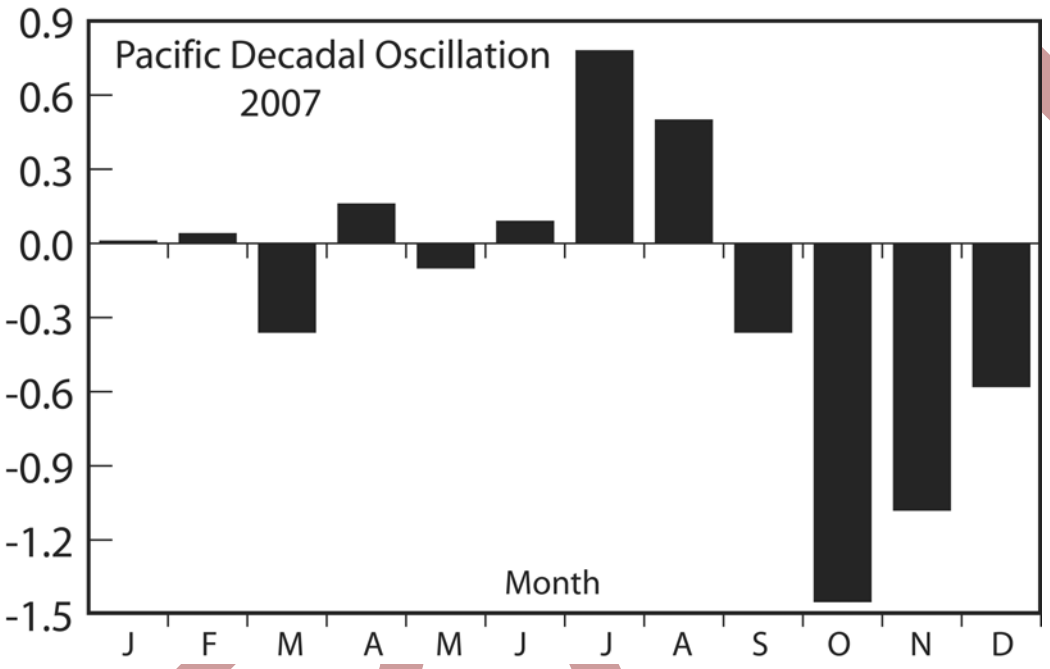
CLIMATE PREDICTIONS

El Nino Southern Oscillation (ENSO):
Recent SST forecasts indicate a continuation of La Nina conditions into the Northern Hemisphere for spring 2008. Models predict a moderate strength La Nina to continue through February-April, followed by weaker La Nina conditions. Recent Madden-Julian Oscillation (MJO) activity has contributed to short-term fluctuations in low level winds and convection over the equatorial Pacific, which has acted to modify some of the typical La Nina impacts on a sub-seasonal timescale. Atmospheric and oceanic conditions during February 2008 continued to reflect a strong La Nina. Equatorial SSTs were more than 2.0°C below average across large portions of the central and east-central equatorial Pacific, and the corresponding weekly values of the Niño-4 (150ºW-160ºE and 5ºN-5ºS) and Niño-3.4 (5°N-5°S, 170°W-120°W) indices remained between −1.6°C and −2.1°C during February. In contrast, SSTs in the far eastern equatorial Pacific were above average during February 2008, in association with a warming trend that began in mid-December. The upper-ocean heat content (average temperatures in the upper 300m of the oceans between 180° - 100°W) remained below average across the equatorial Pacific during February, with the largest temperature anomalies averaging −2°C to −6°C at thermocline depth. Consistent with these oceanic conditions, stronger-than-average low-level easterly winds and upper-level westerly winds persisted across the central equatorial Pacific, convection remained suppressed throughout the central equatorial Pacific, and enhanced convection covered the far western Pacific. Collectively, these oceanic and atmospheric conditions are similar to those accompanying the last strong La Niña episode in 1998-2000.
http://www.climate.noaa.gov/index.jsp?pg=./data_products/data_index.jsp&data=fa
Regional Integrated Sciences & Assessments http://www.climate.noaa.gov/cpo_pa/risa/
http://www.cpc.noaa.gov/products/analysis_monitoring/enso_advisory/ensodisc.doc
The Coast Watch http://coastwatch.pfel.noaa.gov/elnino.html *(submit year and month)*

Madden Julian Oscillation (MJO):
January:
Observations indicate continued moderate-weak MJO activity but very slow eastward movements of enhanced convection into the western Pacific Ocean during early January.
Mid-January, the statistical MJO forecast indicates moderate-strong MJO activity. Late January, the enhanced phase of the MJO was centered across the central Pacific Ocean and eastward propagation took place at moderated strength.
February:
Early February, a moderate MJO continued to slowly shift eastward over the eastern Maritime Continent. Both the MJO and La Nina contributed to strong westerly wind anomalies between 160ºW and 130ºW. Mid-February, a moderate-strong MJO continued with the enhanced phase centered over Maritime Continent, also, the amplitude of the MJO index increased. Positive heat content anomalies developed across the western Pacific and shifted eastward associated with the downwelling Kelvin wave. Late February, indicated weak MJO activity. Large westerly wind anomalies developed across the eastern Pacific.

March:
The MJO signal strengthened at the beginning of March. The velocity potential anomalies also increased in some equatorial regions and minor eastward propagation is evident.
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)*

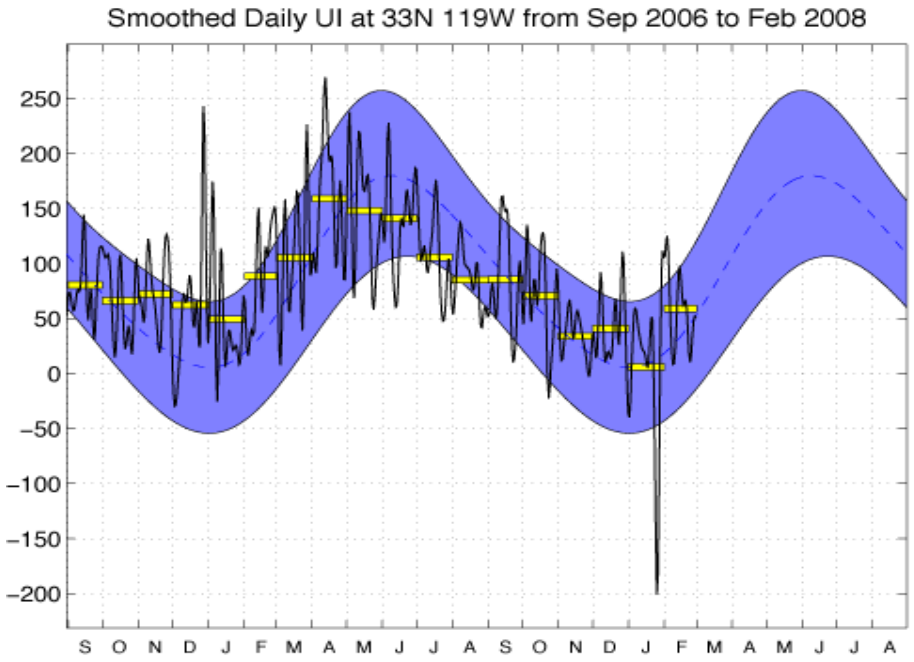
Pacific Decadal Oscillation (PDO):



Source: Jerrold Norton, NOAA (Jerrold.G.Norton@noaa.gov)
The graph presents monthly values for the PDO index. Major changes in northeast Pacific marine ecosystems have been correlated with phase changes in the PDO; warm eras (positive index values) have seen enhanced coastal ocean biological productivity in Alaska and inhibited productivity off the west coast of the contiguous United States. Cold PDO eras (negative index) have seen the opposite north-south pattern of marine ecosystem productivity. http://jisao.washington.edu/pdo/

Source: Bill Peterson, NOAA
PDO remains negative and has been so since last September. The ocean has been very cold this winter in the northern California Current, expected with a negative PDO.

Upwelling Index:
Currently the most recent data provided is up through February 2008 (NOAA fisheries, SWFSC).



The Environmental Research Division of the Pacific Fisheries Environmental Laboratory
http://www.pfeg.noaa.gov/products/PFEL/modeled/indices/upwelling/NA/daily_upwell_graphs.html
http://www.cpc.ncep.noaa.gov/products/precip/CWlink/upwelling/mainupwelling.html
http://www.pfeg.noaa.gov/products/PFEL/modeled/indices/upwelling/NA/upwell_menu_NA.html

Source: Jerrold Norton, NOAA (Jerrold.G.Norton@noaa.gov)
The January 2008 monthly mean wind stress and wind stress curl (WSC) patterns showed that the effects of the Aleutian Low atmospheric pressure system (AL) intensified, on average, over December 2007 conditions, but overall wind forcing was less intense than in December 2007. Strong Pacific storms traversed the coast at the beginning and end of January. Coastal areas of Oregon and California had wind gusts over 65 mph (105 km/hr) and sustained winds over 80 km/hr. Precipitation in central and southern California, which had been in near drought conditions, was brought to totals that were nearly twice the corresponding cumulative totals for January 2007. High winds, waves and tides caused widespread damage and coastal bluff erosion. In January 2008, the subtropical high atmospheric pressure system (STH) was shifted to the southwest and its effects along the coast of the U. S. and Baja California were less extreme than in December 2007. The cyclonic circulation of the AL and its storm systems brought positive WSC along the coast north of Point Conception, in the California Current Region along the coast of the U.S. and Mexico, and in subarctic Pacific east of 135°W. These areas of positive WSC correspond to areas of negative SST anomaly. Positive WSC persisted in the Gulf of California, an area of widespread negative SST anomaly. Negative WSC was found offshore near areas of -0.5° to 0.5°C SST anomaly. In January 2007 wind stress and WSC patterns were not similar to January 2008. Strong STH forcing in the

eastern Pacific between 20°N and 50°N occurred in January 2007. January 2007 wind patterns were similar to spring months, eg. April 2007.
The NOAA/SWFSC/ERD monthly coastal upwelling index (UI) showed negative UI values north of the 42°N computation point, corresponding in position to positive UI anomalies. This suggests weaker than January average AL activity. South of 36°N the UI values were positive and the UI anomalies were negative, indicating weaker than average coastal upwelling and weaker than average STH development off the coast. UI computed at six-hour intervals for locations 30°N through 39°N were strongly negative during the late January storm. Otherwise UI-values were low during January 2008.

ECOSYSTEMS

California Current Ecosystem Indicators:
Coastal Pelagics:
Sardines and Market Squid:
Source: Jerrold Norton, NOAA (Jerrold.G.Norton@noaa.gov)
The total 2007 California landings of sardines (*Sardinops sagax*) was one of the largest since the decline of the early sardine fishery of the 1940s and 1950s. Landings in California, Oregon and Washington state fisheries were 89,231 metric tons (mt), 43,052 mt and 4,663 mt, respectively. The low catch into Washington ports may have been partially due to the low abundance of sardines over 160grams (g). Ocean surveys off southern California have not detected sardine or anchovy eggs and have detected only a few hake eggs. This may be due to environmental displacement of the adult populations of these species. Market squid landings for 2007 totaled 34,423 mt. Only a small fraction of the 2007 market squid catch was from Monterey Bay (37°N), which historically has been an important source of squid for domestic use and export. The shift of the market squid fishery to southern California continued in January 2008, with no squid catch reported from Monterey Bay ports and 5,017 mt landed in ports south of Point Conception. These landings of market squid were more than 20% less than the January and December 2007 landings.

Source: Oregon Department of Fish and Wildlife
At the November PFMC meeting, the 2008 harvest guideline (HG) for Pacific sardines was established at 89,093 metric tons (mt) for the fishing year beginning January 1, 2008. Also, an incidental catch set aside of 10% (8,909 mt) of the HG was established to prevent premature closures of other coastal pelagic species (CPS) fisheries. Furthermore, incidental catch set aside amounts for each seasonal period were created based on historical landings of sardine catch in CPS fisheries such as squid and anchovy. Therefore the directed sardine fishery will operate under an Adjusted Allocation of 80, 083 mt.
Pacific Fisheries Management Council http://www.pcouncil.org/
ODFW http://www.dfw.state.or.us/MRP/finfish/sardine/sardland08.asp

Salmon:
The first publically available version of the coho and steelhead distributions are now published on CalFish. You can access the data via the CalFish Map Viewer and you can download the data from the CalFish Data Downloads page.
Coho Distribution: http://www.calfish.org/DesktopDefault.aspx?tabId=122
Steelhead Distribution: http://www.calfish.org/DesktopDefault.aspx?tabId=121

Source: Jerrold Norton, NOAA (Jerrold.G.Norton@noaa.gov)
Salmon return (escapement) to natal rivers of the Pacific coast during 2007 was poor to fair compared to 10-year average returns. Southern rivers and streams tended to have poor to non-existent salmon escapement. Salmon returns in January 2008 remained low, but several reports from video counting stations and recreational angler success suggest that winter steelhead (*Oncorhynchus mykiss*) are returning in fair to good numbers from their ocean sojourns. Steelhead were observed entering southern rivers, such as the Carmel River, soon after river mouth bars were breached by January storms. Striped bass (*Morone saxatilis*) were also being taken in unusually large numbers by recreational anglers at river mouths in Central California.

Source: Pacific Fishery Management Council News Release
The PFMC has released a report indicating that Sacramento fall Chinook salmon abundance will fall to an all-time low in 2008. The reason for the decline is unclear, but both hatchery and naturally-produced fish are similarly affected. At its upcoming meeting in Sacramento, the Council will review a list of 46 possible factors that may be contributing to the decline. In the past, ocean conditions have been a major determinant of Sacramento stock productivity, and may have played an important role in this decline. Freshwater conditions also play an important role in brood year strength. Other possible causes include abnormal interactions with prey species (such as krill) and predators (such as sea lions), as well as human-caused effects such as pollution, water diversions, construction, habitat loss, or changes in hatchery operations. Unfortunately, no quick answers to the question of what caused the decline are expected in the short term.
http://www.pcouncil.org/newsreleases/Feb_2008_Sacramento_News_Release.pdf
http://www.pcouncil.org/salmon/salpreI08/salpreI08.html

Salmon Management:
Source: Pacific Council News
The Council approved the schedule and process for developing 2008 ocean salmon management measures through May 1. http://www.pcouncil.org/newsletters/currentnews.pdf
Salmon Management Public Review Options Adopted by the Council for 2008
(1) Commercial troll management options adopted by the Council for non-Indian ocean salmon fisheries, 2008. (2) Recreational management options adopted by the Council for non-Indian ocean salmon ocean salmon fisheries, 2008. (3) Treaty Indian ocean troll management options adopted by the Council for non-Indian ocean salmon fisheries, 2008.
http://www.pcouncil.org/salmon/salcurr.html#saloptions08

Copepods:
Source: Bill Peterson, NOAA (3/23/08)
Copepods are of the "cold-water community" variety, expected with transport of water from the north. We've had this cold water community for at least a month now.

Upwelling winds have not yet set up, but they are expected any day now.
Prognosis: cold winter, lots of subarctic* water and early arrival of cold water copepods points to a very productive spring and summer; the recruitment of coastal fishes expected to be high this year (salmon, anchovies, smelts, herring); could be a great year for hake as well.
Downside to the Prognosis: upwelling must begin soon, and must persist through September without

significant interruption before we can feel comfortable declaring this a very productive year. For example, last year the winter/spring got off to a great start, but upwelling weakened in summer and very warm water flooded the shelf in July and August, resulting in one of the poorer years for survival of coho salmon and likely other fishes as well.
*Winds this winter have been predominantly from the west, resulting in greater transport of water out of the subarctic Pacific.

Invasive Species:

Plan Developed to Fight Invasive Mussels if Hit Columbia Basin: The establishment of nonnative mussel populations in the Columbia basin would pose "major environmental" problems for the Columbia basin. An ever-evolving "rapid response plan" aims to marshal available forces quickly and efficiently to combat any identified Columbia River basin invasion of environment-and economy-changing zebra and quagga mussels. The draft plan is titled: Columbia River basin interagency invasive species response plan: zebra mussels and other dreissenid species.
The Columbia Basin Fish and Wildlife News Bulletin http://www.cbbulletin.com/Free/252668.aspx
http://100thmeridian.org/ActionTeams/Columbia/CRB%20Dreissenid%20Rapid%20Response%20Plan%202-6-08.pdf

Marine Birds:

Six Bird Species from Mexico, Asia and the South Pacific will be Added to the Endangered List
The Socorro mockingbird is found only on Socorro Island in the Rivillagiged archipelago in Mexico and is threatened by habitat loss.
http://www.fws.gov/news/newsreleases/showNews.cfm?newsId=842987CA-DE73-1449-E8DC78C0D6D230AAU.S. *Fish and Wildlife Service (U.S. FWS)* http://www.fws.gov/pacific/

Corps Moves Ahead on Relocating Terns to South Central Oregon
The avian predation program aims to reduce the number of young salmon consumed by avian predators in the Columbia River estuary and thus improve the survival of fish listed as threatened or endangered under the Endangered Species Act.
The Columbia Basin Fish and Wildlife News Bulletin http://www.cbbulletin.com/Free/252667.aspx
Secretary Kempthorne Announces Funding for Wetland Projects
The Migratory Bird Conservation Commission approved more than $29 million in federal funding for the protection and management of nearly 190,000 acres of wetlands and associated habitats in the U.S. that will benefit ducks and waterfowl nationwide under the North American Wetlands Conservation Act (NAWCA).
U.S. Fish & Wildlife Service
http://www.fws.gov/news/NewsReleases/showNews.cfm?newsId=A31A7FE4-A62A-A2FA-C197A75D1D1A5BD4

Harmful Algal Blooms:

Source: Gregg W. Langlois, Senior Environmental Scientist, CA Department of Public Health
January: The following is a brief update on phytoplankton observations and toxin monitoring for early January in CA. PSP toxicity increased in shellfish samples from San Luis Obispo and offshore of Santa Barbara, exceeding the alert level at the latter location. Pseudo-nitzschia remains almost completely absent. Diatoms dominate in most areas, although pockets of dinos are holding out. Results summarized below are included to highlight species that were found to be abundant (>=50%).

(P-n = Pseudo-nitzschia and Al = Alexandrium).

Santa Barbara	Goleta Pier: Al present earlier; all dinos (Akashiwo abundant, Prorocentrum common).
San Diego	Oceanside Pier: No toxic spp.; Jeff reports mostly dinos (Lingulodinium abundant, Ceratium common) and a few diatoms.

February and early March: Phytoplankton observations and toxin monitoring for late February and early March in CA. Healthy chains of Alexandrium were observed at several sites between Santa Barbara and San Diego. PSP toxins persisted at low levels in mussels from Santa Barbara and increased in San Diego. Pseudo-nitzschia increased briefly in early February but declined again in early March. Sites in Southern California are looking more like springtime, with increases in species diversity and abundance. Results summarized below are included to highlight species that were found to be abundant (>=50%).

(P-n = Pseudo-nitzschia and Al = Alexandrium)

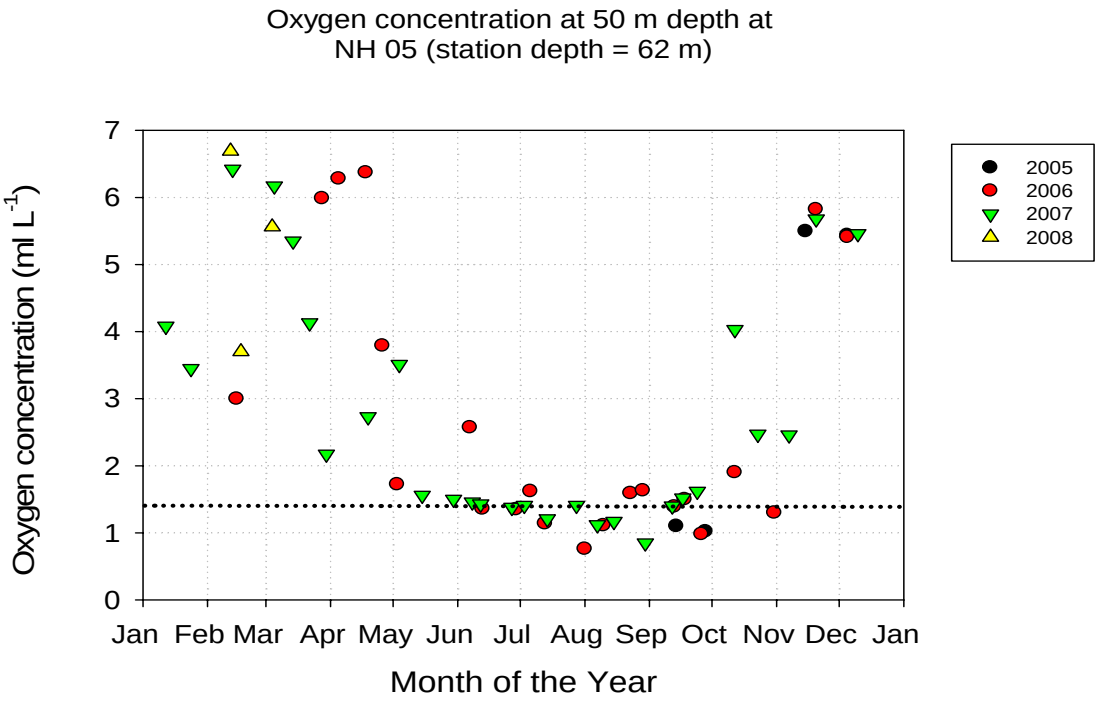
Santa Barbara	SB Channel: P-n common; lots of diatoms (Chaetoceros abundant) and smaller numbers of several dinos.
	Pitas Offshore: P-n present; mix of diatoms (Chaetoceros abundant, Lauderia common) and some dinos.
Orange	Newport Offshore: P-n present earlier in Feb.; diversity of diatoms (Skeletonema) and dinos (Prorocentrum abundant).
San Diego	Oceanside Pier: Al present, P-n rare; lots of dinos (Lingulodinium abundant, Prorocentrum common) and a few diatoms. ~ increasing levels of PSP toxins in mussels from nearby Agua Hedionda Lagoon

The link below provides a summary of biotoxin activity for the month of January, 2008. Ranges of toxin concentrations are provided for the paralytic shellfish poisoning (PSP) toxins and for domoic acid (DA).
http://www.cdph.ca.gov/HealthInfo/environhealth/water/Documents/Shellfish/MonthlyandQuarterlyReports/2008/Biotoxin_Monthly_0108.pdf

Recreational shellfish harvesting status in Oregon:
Source: Oregon Department of Agriculture Food Safety Division
- Paralytic Shellfish Poisoning levels remain below alert level on the North and Central OR Coast. The area has been open to recreational harvesting of mussels since December 20, 2007. With the closure lifted, the entire Oregon coast is now open to all recreational shellfish harvesting.
- Domoic acid (DA) results continue to be in safe range
Results from shellfish samples obtained during January were below detection levels, at all sites. Mussels, clams and oysters sampled the week of February 18, 2007 contained very low levels of domoic acid.
- Harmful algae bloom monitoring: no reports of elevated levels
ODA and ODF&W monitor for the toxigenic alga or plankton that produces domoic acid and PSP. The latest reports provided to ODA indicated that levels of algae that produce domoic acid and/or Pseudo-nitzschia were present but at lower numbers than seen earlier this year.
http://egov.oregon.gov/ODA/FSD/shellfish_status.shtml

Biotoxin Results of Interest in Oregon:
"Alert" level for either biotoxin -20 parts per million (ppm) for domoic acid and 80 micrograms per 100 grams for PSP. Results summarized from the week of January 7 to the week of February 18, 2008 for domoic acid (DA) and // PSP did not indicate any "alert" locations.

Low Dissolved Oxygen Levels:



Source: Bill Peterson, NOAA

Oxygen concentration in bottom waters on the shelf off Newport, Oregon follow the seasonal cycle of upwelling. When upwelling is in progress (generally from May through September), cold and salty water with low oxygen appears in deep waters of the shelf. During winter months when downwelling is the dominant process and the poleward-flowing Davidson current dominates, oxygen values are high.