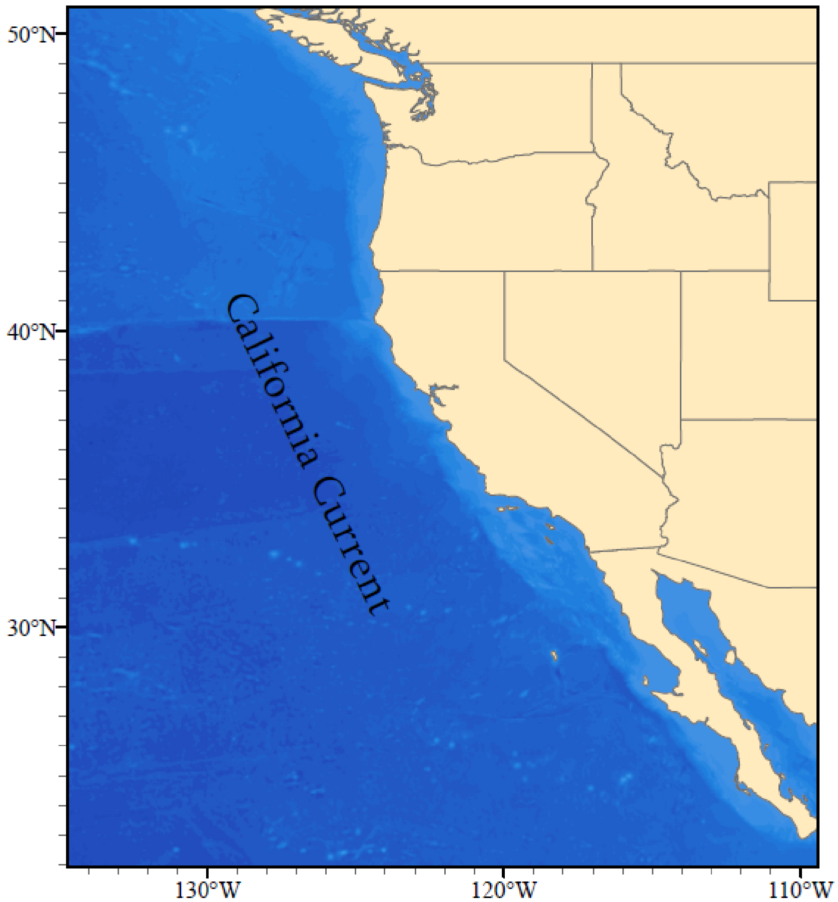
Climatic and Ecological Conditions in the California Current LME for Month to Month Year

Summary of climate and ecosystem conditions for Quarter 1 & 2, 2011 (January to May) for public distribution, compiled by PaCOOS coordinator Rosa Runcie (email: Rosa.Runcie@noaa.gov).
Full content can be found after the Executive Summary. Previous summaries of climate and ecosystem conditions in the California Current can be found at http://pacoos.org/



CLIMATE CONDITIONS IN BRIEF

- **El Niño Southern Oscillation (ENSO):** ENSO-neutral conditions are expected to continue into the Northern Hemisphere fall 2011.
- **Pacific Decadal Oscillation (PDO):** With the advent of a La Niña event late last spring, the PDO has remained in the negative (cold) phase since June 2010, although the negative values have been gradually weakening.
- **Water Temperature and Salinity at station NH 05, OR:** Due to the strongly negative PDO and the ongoing La Niña event, the shelf waters in the northern California Current were relatively cold during the winter of 2010-2011. The temperature measured at a depth of 50 m at the mid-shelf station, NH-05 were the second coldest in our 14 year time series and the third saltiest. This continues a trend which began in summer 2010 of cold shelf waters.
- **Trinidad Head Line, CA Observations:** Conditions in early 2011 are similar to those observed in early 2008. Cool, relatively fresh waters dominated over the shelf during early 2011, and there was

evidence of upwelling in February that was subsequently countered by the effects of storm systems that persisted throughout much of the spring.

- **Upwelling Index (UI):** January began with a strong downwelling event in the northern region of the California Current, followed with two weak upwelling events. Indices showed many calm days through February with a few episodes of strong upwelling or downwelling. In March upwelling indices were negative from 39°N to 60°N and positive to the south. April upwelling indices were above average from 24°N to 39°N and near zero to the north. In May favorable upwelling conditions occurred from 31°N to 40°N and along the coast of southern Baja California. Overall, south of 39N, UI were within the climatological norms. North of 39N, only March was unusual, with stronger than normal downwelling than in an average year.
- **Madden Julian Oscillation (MJO):** The MJO index did not indicate significant MJO activity from January to March. The MJO strengthened early April but began to weaken mid-April as it propagated eastward. The MJO index increased in amplitude early May.
- **CalCOFI Observations – Conditions off Southern California:** The March 2011 CalCOFI cruise coincided with the end of the La Niña conditions off Southern California. Various water column properties, isopycnal depth, mixed layer temperature, nitracline depth anomalies and concentrations of nutrients were by that time back to values that had been observed over the last decade. Concentrations of Chl a, a proxy of phytoplankton biomass, were slightly below long-term averages. Anomalously high subsurface nitrate concentration persisted in the region since 2010.

ECOSYSTEM CONDITIONS IN BRIEF

- **California Current Ecosystem Indicators:**
  1. **<u>Copepods</u>:** Copepod species richness anomalies were strongly positive through the first half of 2010 due to the El Niño but began to weaken in July 2010 following the onset of La Niña conditions (June 2010). Richness continued to become less positive into the autumn months and apart from a positive spike in February 2011, richness values were negative in January, March and April of 2011. This signals a return to "cold ocean conditions" and a "cold water copepod community".
  2. **<u>Krill</u>**
  3. **<u>Juvenile Rockfish</u>**
  4. **<u>Coastal Pelagics</u>:**
     <u>Humboldt Squid</u>: Over the past few years Humboldt Squid (*Dosidicus gigas*) have been conspicuous predators off the coast of California. However, there were few reports in 2011 of landings since Southwest Fisheries Science Center scientists captured 70 adult specimens off Northern California in September 2010.
     <u>Pacific Sardine</u>: The Pacific sardine fishery opened on January 1, 2011 and closed on March 4, 2011, when the first allocation of 15,270 mt was attained. Daily sardine landings ranged from 7 – 1,155 mt/day, with 82% of the landings by weight occurring in the San Pedro/Terminal Island port complex.
  5. **<u>Salmon</u>:** Generally, 2010 – 2011 had higher returns of anadromous salmonids to native streams (runs) than the 2009 - 2010 season. Returns of wild Chinook to the Central California Valley were the best in the last 4 years. Chinook returns to the Klamath and Trinity rivers in northern California were similar to the previous year. However, many salmonid stocks on the West Coast of the United States appear moderately to severely depleted. The returns in 2010 - 2011 were low-average compared to the most recent ten-year average.
  6. **<u>Groundfish</u>:** NMFS' final environmental impact statement (EIS) for 2011-2012 harvest specifications and management measures was published on March 11. The EIS includes a NMFS-preferred alternative for 2011 and 2012 with a 17 metric ton (mt) annual catch limit (ACL) for yelloweye rockfish and a 3 mt cowcod ACL.

7. **Pacific Hake**
8. **Midwater species**
9. **Sablefish**
10. **Cassin's Auklet**

- **Highly Migratory Species (tuna, sharks, billfishes):** In April, the Council asked the Highly Migratory Species Management Team to work with the Highly Migratory Species Advisory Subpanel to develop recommendations for U.S. delegations to regional fishery management organizations, in case the stock assessment raises concern about stock status. These recommendations will be presented at the June Council meeting.
- **Invasive Species**
- **Marine Birds and Mammals:**
  Marine Mammals: During April a total of 80 California sea lions, 22 common dolphins, and 1 Dall's porpoise stranded in Los Angeles and Orange counties, with domoic acid (DA) toxicity the suspected cause of many strandings. Sampling by the CPPH-Maine Biotoxin Monitoring Program has shown *Pseudo-nitzschia*, the diatom that produces DA, at most shore stations along the California coast. Relatively high DA levels were detected in mussels from the Channel Islands and from Santa Barbara County. However, high DA levels have not been observed in the vicinity of most strandings. The 2011 California mussel quarantine went into effect in April instead of May because of persistent high DA levels in California shellfish.
- **Harmful Algal Blooms:**
  Washington: No harmful marine algae have been detected along the outer Washington coast until late March, and cell counts remain well below the respective action levels.
  Oregon: The Oregon Department of Agriculture reported increased levels of domoic acid (DA) in razor clams collected from Gold Beach in mid-May. Razor clams and mussels collected through May remain below the regulatory DA closure limit of 20 ppm. *Alexandrium* was observed in mid-May at Gold Beach. Paralytic shellfish toxins have not been detected in any samples through May.
  California:
  Pseudo-nitzschia was observed at a number of sites along the entire southern California coast from January to May. In February, the concentration of domoic acid remained high in samples of lobster viscera from offshore near Anacapa and Santa Cruz islands. In March, domoic acid was detected at numerous sites between San Luis Obispo and Ventura counties, and toxin levels exceeded the alert level throughout this range. In April, domoic acid was detected at numerous sites between San Luis Obispo and Ventura counties. Domoic acid concentrations dropped below the detection limit by the beginning of May at sites in Santa Barbara and Ventura counties.
  During January to March, low numbers of *Alexandrium* were detected at sampling sites throughout southern California. *Alexandrium* was not observed at any northern California sampling sites in January and was observed at only two sampling sites in February. *Alexandrium* was observed at sites in most northern California counties in March. In April and May, *Alexandrium* was mostly absent from samples along the entire California coast. PSP toxins were absent from all shellfish samples from January to March, and in May. During the third week in April mussels from offshore of Santa Barbara contained a low concentration of PSP.
- **Dissolved Oxygen Concentration:** Oxygen concentrations measured at a depth of 50 m at mid-shelf station NH 05 (five miles off Newport, Oregon) during November 2010 through May 2011 were typical of other recent years.

CLIMATE CONDITIONS

El Niño Southern Oscillation (ENSO):

***Source: Bill Peterson (NOAA, NMFS),* <u>http://www.cdc.noaa.gov/people/klaus.wolter/MEI/mei.html</u>, <u>http://www.cpc.noaa.gov/products/analysis_monitoring/enso_advisory/</u>**

The Multivariate ENSO Index (MEI) turned negative in April 2010 and remains strongly negative. Such large negative values have not been seen since 1955 and the early 1970s (Figure 1). Another ENSO index, the Oceanic Niño Index (not shown) became negative in June 2010, remains negative at present with values resembling those observed only in 1988-89, 1999-2000 and 2007-2008. These two indicators of ENSO activity bring a somewhat mixed message – ONI time series suggest that the La Niña is weakening whereas the MEI suggests that the 2010-2011 La Niña was among the strongest on record and that it is continuing.

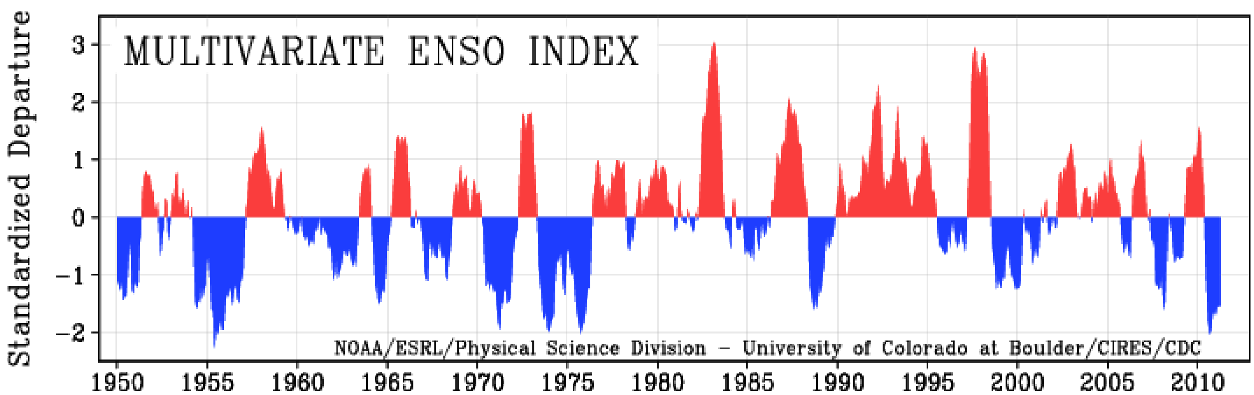


Figure 1. NOAA Physical Sciences Division attempts to monitor ENSO by basing the Multivariate ENSO Index (MEI) on the six main observed variables over the Pacific. These six variables are: sea-level pressure, zonal and meridional components of the surface wind, sea surface temperature, surface air temperature, and total cloudiness fraction of the sky.

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

***Source: The Coast Watch* <u>http://coastwatch.pfel.noaa.gov/elnino.html</u> <u>http://www.cpc.noaa.gov/products/analysis_monitoring/enso_advisory/ensodisc.doc</u>**

The upper-ocean heat anomalies since January 2011 are consistent with weakening La Niña conditions (Figure 2). From June 2010 to January 2011 upper ocean heat content was fairly uniform; but during January subsurface oceanic heat content increased and positive anomalies (average temperatures in the upper 300m of the ocean) in March were observed mostly in association with an eastward shift in the above-average temperatures at depth in the central equatorial Pacific.

The return to subsurface oceanic heat content anomalies near zero in February and weakly positive in March in response to the eastward progression of a strong oceanic Kelvin wave, and the atmospheric circulation patterns over the equatorial Pacific are consistent with a weakening La Niña.

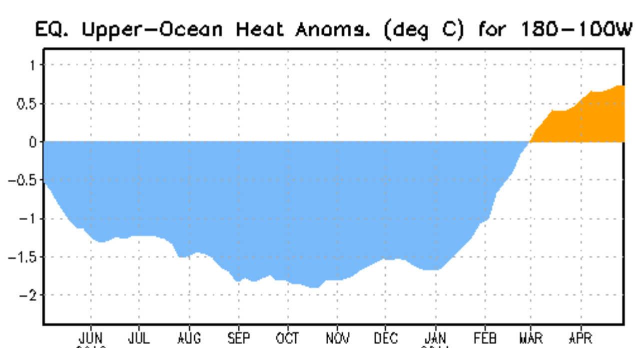


Figure 2. Area-averaged upper-ocean heat content anomalies (°C) in the equatorial Pacific (5°N-5°S, 180°-100°W). Heat content anomalies are computed as departures from the 1982-2004 base period pentad means. In January 2011 negative anomalies began to decrease in magnitude, with anomalies becoming positive in March and continuing to increase into May.

Pacific Decadal Oscillation (PDO) and Sea Surface Temperature at Newport, Oregon:

Source: Jerrold Norton, NOAA (Jerrold.G.Norton@noaa.gov), 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/ http://jisao.washington.edu/pdo/PDO.latest

The Pacific Decadal Oscillation Index (PDO) quantifies a longer-duration El Niño-like pattern of Pacific climate variability. The PDO is based on sea surface temperature (SST) measurements north of 10°N. The last negative PDO value of a 23 month run was calculated for July 2009. A period of predominately positive PDO index values occurred from August 2009 until May 2010 (Figure 3). June 2010 brought another change to negative PDO index values. The PDO remained consistently negative through May 2011. The shift negative PDO occurred at about the same time as the NOAA Oceanic Niño Index (ONI is calculated from the Pacific SST) changed sign from positive to negative values. A feature of the canonical negative PDO pattern is a band of negative SST anomaly along the coast of North America from 30°N to 50°N. This band, that is typically more than 1000 kilometers wide, has persisted along the coast since May 2010 (http://www.osdpd.noaa.gov/ml/ocean/sst/anomaly.html).

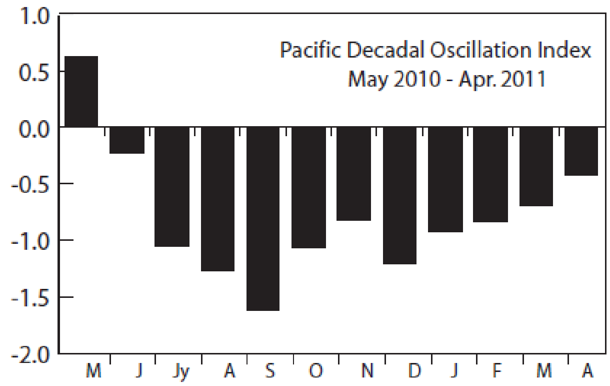


Figure 3. The graph shows monthly values for the Pacific Decadal Oscillation (PDO) Index for May 2010 through April 2011. With the advent of a La Niña event late last spring, the PDO has been in negative (cold) phase since June 2010 and has remained so through May 2011, although the negative values have been gradually weakening.

Sea surface temperatures measured at the NOAA Buoy 46050, 22 miles west of Newport, Oregon: No sea surface temperature data from the NOAA Buoy 46050, 22 miles west of Newport, Oregon is available because the temperature sensor failed on 6 January 2011 and has not yet been repaired/replaced. However, in situ CTD measurements (discussed below) show that the ocean was cold during the winter of 2010-2011.

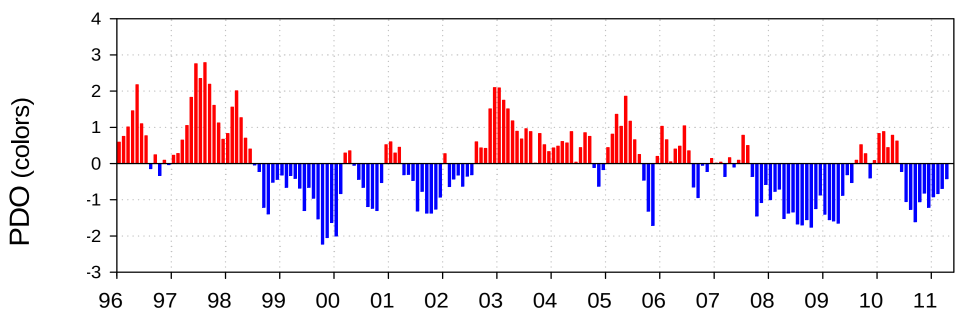


Figure 4. Time series of the PDO (1996-2011) showing that cold ocean conditions have persisted through summer and fall of 2010 and into the winter and spring of 2010-2011.

Hydrography at Newport, Oregon: Due to the strongly negative PDO and the ongoing La Niña event, the shelf waters in the northern California Current were relatively cold during the winter of 2010-2011. The temperature measured at a depth of 50 m at the mid-shelf station, NH-05 (five miles off Newport, Oregon along the Newport Hydrographic line) were the second coldest in our 14 year time series (9.52°C averaged from November through February) and the third saltiest (Figure 5). This continues a trend which began in summer 2010 during which the coldest waters of our 14 year time series were seen.

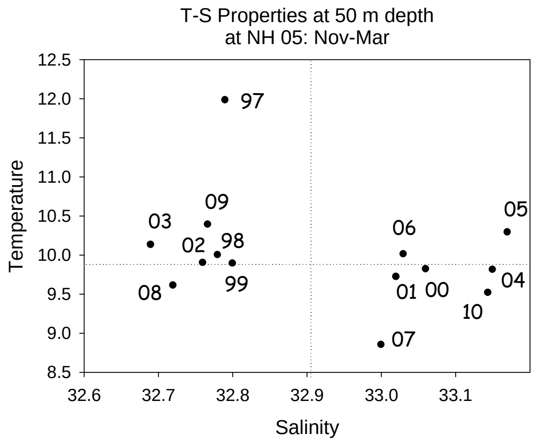


Figure 5. Temperature and salinity in November-April of 2010-2011 (labeled '10') measured at a depth of 50 m at a station five miles off Newport (NH 05) showing that during spring 2010, the deep waters were relatively cold and salty.

Trinidad Head Line (41° 03.5' N):

Source: Eric Bjorkstedt (NOAA, NMFS, Humboldt State University), Jeff Abell and Phil White (Humboldt State University)

Observations along the Trinidad Head Line in Northern California indicate conditions in early 2011 are similar to those observed in early 2008 and differ starkly from the El Niño conditions observed in early 2010. Cool, relatively fresh waters have dominated over the shelf during early 2011. The time series of observations at midshelf station TH02 (Figure 6) showed evidence of upwelling in February that was subsequently countered by the effects of storm systems that persisted throughout much of the spring.

The assistance of the Captain and crew of HSU's R/V Coral Sea, and the efforts of the scientific crew—especially Kathryn Crane, Caymin Ackerman, Jose Montoya, and Phil White—in collecting the most recent data is gratefully acknowledged.

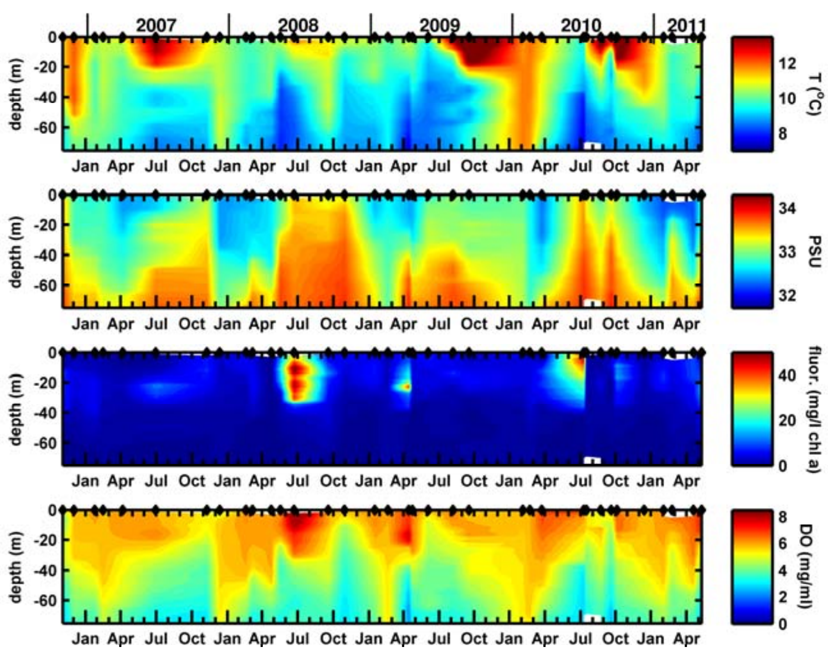


Figure 6. Hovmoller plots (time by depth) of temperature (T), salinity (PSU), fluorescence (fluor), and dissolved oxygen (DO) at station TH02 (41° 03.5' N, 124° 16' W, approximately 7 nm offshore, 75m depth) along the Trinidad Head Line. Small symbols along top of each plot indicate timing of each cruise. Interpolations between widely spaced points should be interpreted with greater caution.

Upwelling Index:
Source: El Niño Watch, Advisory **http://coastwatch.pfel.noaa.gov/cgi-bin/elnino.cgi**, NMFS/SWFSC/ERD monthly coastal upwelling indices

During January-March, UI in regions south of 39°N were near climatological averages for those months. North of 39°N, January and February were typical of most years, but March was more strongly dominated by downwelling than normal.

February coastal upwelling indices were weakly negative north of 45°N, and positive south of 30°N. Indices computed on a daily basis showed many calm days through February with a few episodes of strong upwelling or downwelling.

In March upwelling indices were negative from 39°N to 60°N and positive to the south. Anomalous, strongly negative UI anomalies were computed from 42°N to 51°N. During the storm of 20-21 March the barometer dropped below 1000 millibars on the central California coast.

April upwelling indices were above average from 24°N to 39°N and near zero to the north. Between 24°N to 39°N the UIs increased during April, with maxima after the April 20th and a strong UI event south of 39°N during the last days of the month.

In May favorable upwelling conditions occurred from 31°N to 40°N and along the coast of southern Baja California. Coastal upwelling indices were about average from 30°N to 39°N. North of 40°N, variable winds led to near zero monthly UI values.

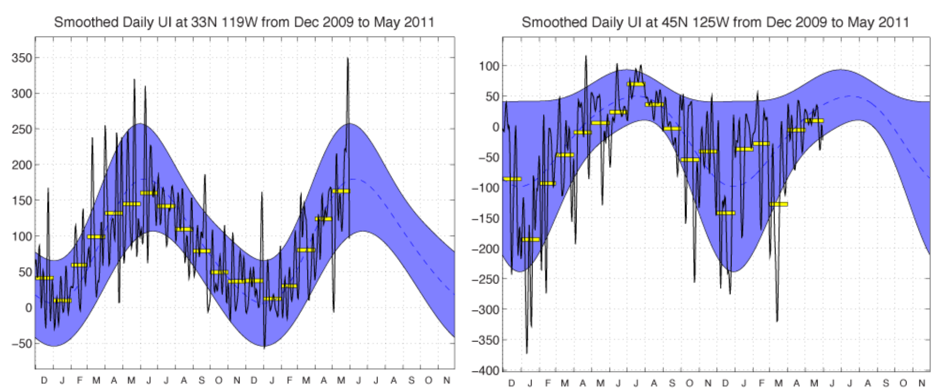


Figure 7. Left panel is recent 18 month record of upwelling for 33°N 119°W. Right panel is same for 45°N 125°W. Positive values are upwelling; negative values are downwelling. Dashed line is the climatological mean. Yellow bars are the means for each month during the period shown.

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

In January and February 2011, the monthly mean sea surface temperatures (SST) off the west coast of the United States were close to the climatological values (Figure 8). Areas of >1C SST anomaly occurred in three isolated eddies 500 km off the coast between 30° and 42° N.

Unlike the Jan-Feb patterns, monthly mean SST anomalies in March were predominately negative along the west coast of North America (Figure 8).

In April monthly mean west coast SST anomalies, weakened south of 35°N (Figure 8). The negative anomaly intensified offshore between 37°N and 45°N. Coastal upwelling became more evident along the central California coast.

In May the pattern of negative SST anomalies that had developed since January became more pronounced. Offshore between 30°N and 45°N, negative anomalies intensified and extended more than 1,000 km west and northwest across the eastern Pacific (Figure 8).

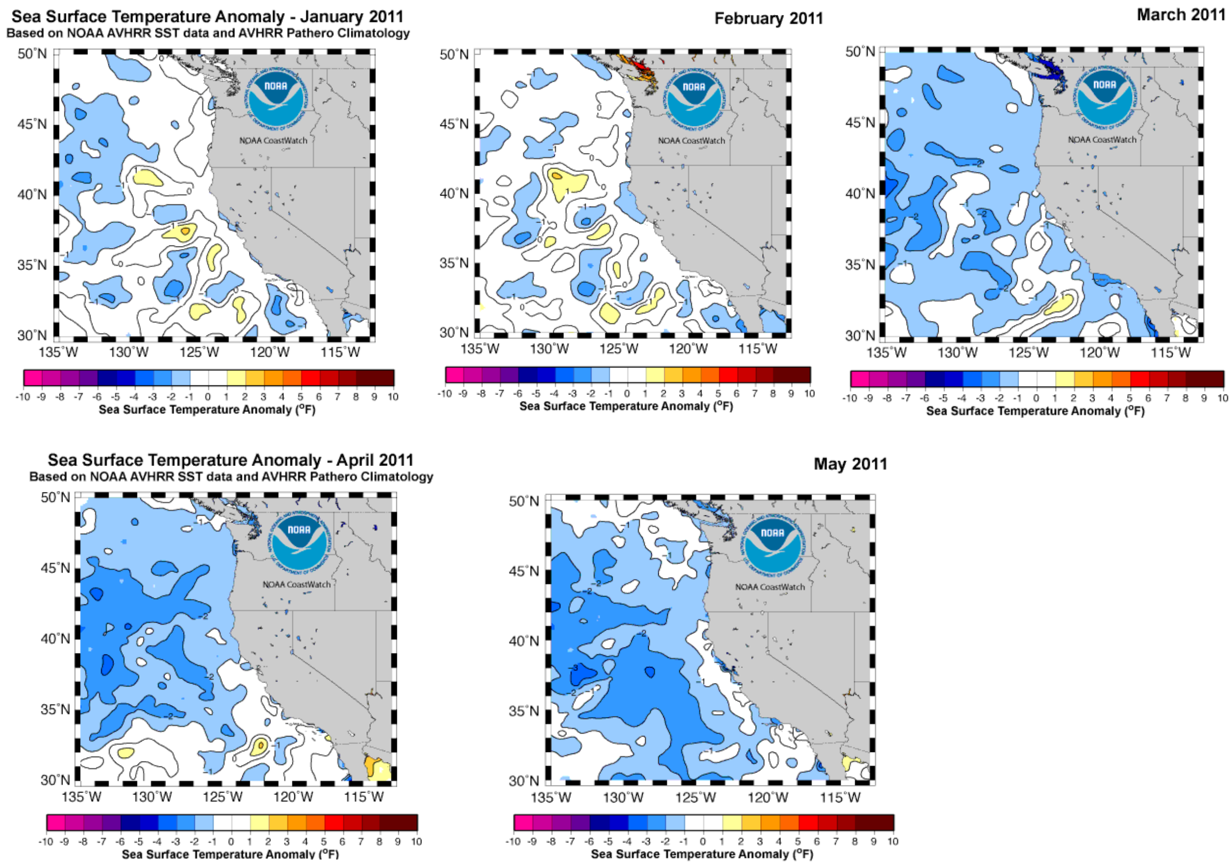


Figure 8. Regional oceanic conditions in the California Current Region (January through May).

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 is an intraseasonal fluctuation or "wave" occurring in the global tropics with a cycle on the order of 30-60 days. The MJO has wide ranging impacts on the patterns of tropical and extratropical precipitation, atmospheric circulation, and surface temperature around the global tropics and subtropics. The MJO does not cause El Nino or La Nina, but can contribute to the speed of development and intensity of El Nino and La Nina episodes. The MJO index did not indicate significant MJO activity during the first week of January. During mid-January the MJO strengthened and by late January the 850-hPa easterly zonal winds weakened and westerly anomalies developed near the Date Line due to increased MJO activity. The MJO weakened the first two weeks in February. Westerly 200-hPa vector wind anomalies weakened during the first week across the equatorial Pacific Ocean. The MJO remained week throughout February and March, although the MJO index indicated an increase in amplitude with eastward propagation of 200-hPa velocity potential anomalies during the first half of March. The MJO strengthened early April and began to weaken mid-April as it propagated eastward. Late April, the MJO index indicated a slight strengthening of the signal with eastward propagation and faster speeds than typically associated with the MJO. The MJO index increased in amplitude early May, with the enhanced convective phase of the MJO located over the western Pacific.

Observations by the SIO CalCOFI group – CalCOFI cruise 201104:
Source: Ralf Goericke, SIO, and http://www.calcofi.org/

The April 2011 CalCOFI cruise coincided with the end of the La Niña conditions off Southern California. Various water column properties (isopycnal depth, mixed layer temperature, nitracline depth anomalies and concentrations of nutrients) were by that time back to values that had been observed over the last decade. Concentrations of Chl a, a proxy of phytoplankton biomass, were slightly below long-term averages.

Maps of dynamic height and salinity at 10 m indicate that the south bound California Current entered the Southern California Bight along the westernmost portion of CalCOFI Line 77 (Figure 9) and flowed southeast, exiting the area along the western half of Line 93 (Figure 10). Weak poleward flow was observed along the shoreward portions of Lines 87 to 80. Maps of temperature at 10 m (Figure 10) and concentrations of nutrients (not shown) suggest active upwelling during the cruise. Extremely high concentrations of nitrate and other nutrients south and southwest of Point Conception and south of the Channel Islands and relatively low concentrations of Chl-a (Figure 10) in those areas suggest that the spring phytoplankton bloom had not reached its full strength.

Unusual subsurface conditions have existed for the past year or two. Specifically, anomalies of properties on the σ_t 26.4 isopycnal (Figure 11A) show a recent return to near long-term average temperatures and depth, but nitrate concentrations are at the highest value observed, and oxygen at the lowest value since measurements began in 1984. Since the mean depth of this isopycnal is ca. 200 m, this pattern might result from a change in the nitrate and oxygen concentrations in the source waters to the Southern California region. It suggests that greater mineralization of nitrate is occurring with concomitant decline in oxygen concentration.

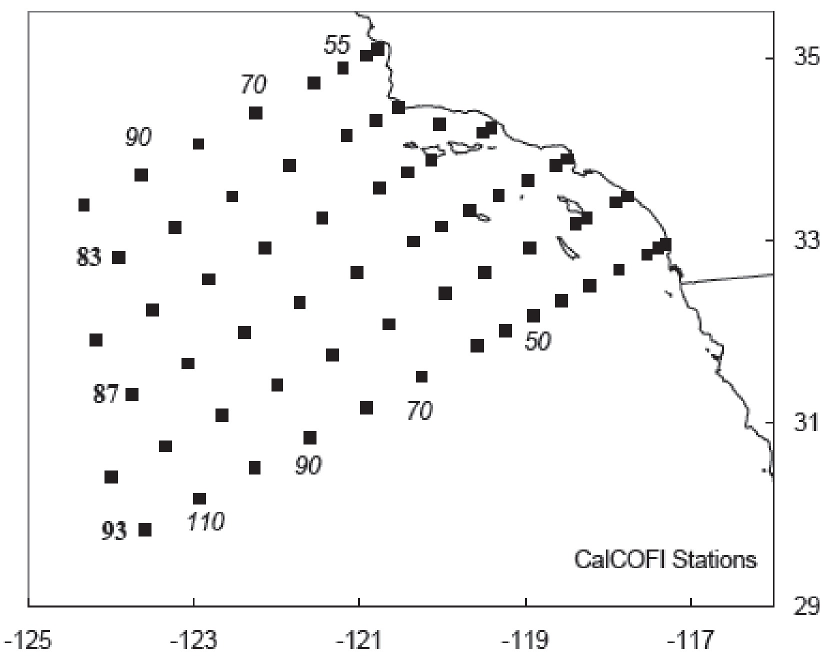


Figure 9. CalCOFI observational lines. Observational lines are labeled using bold numbers; stations are labeled using numbers in italics immediately below or above the respective stations.

1104SH State of the Current Figure

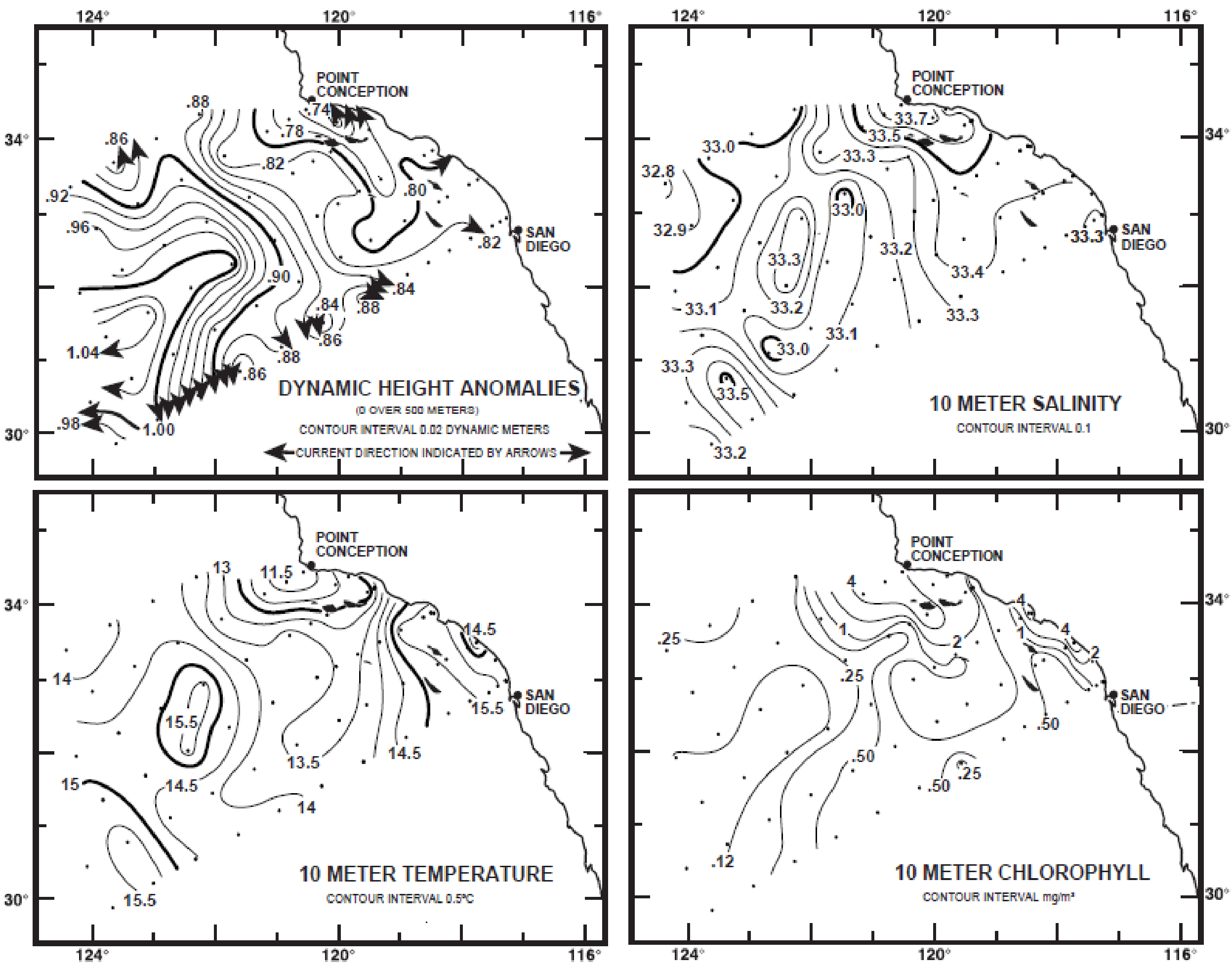
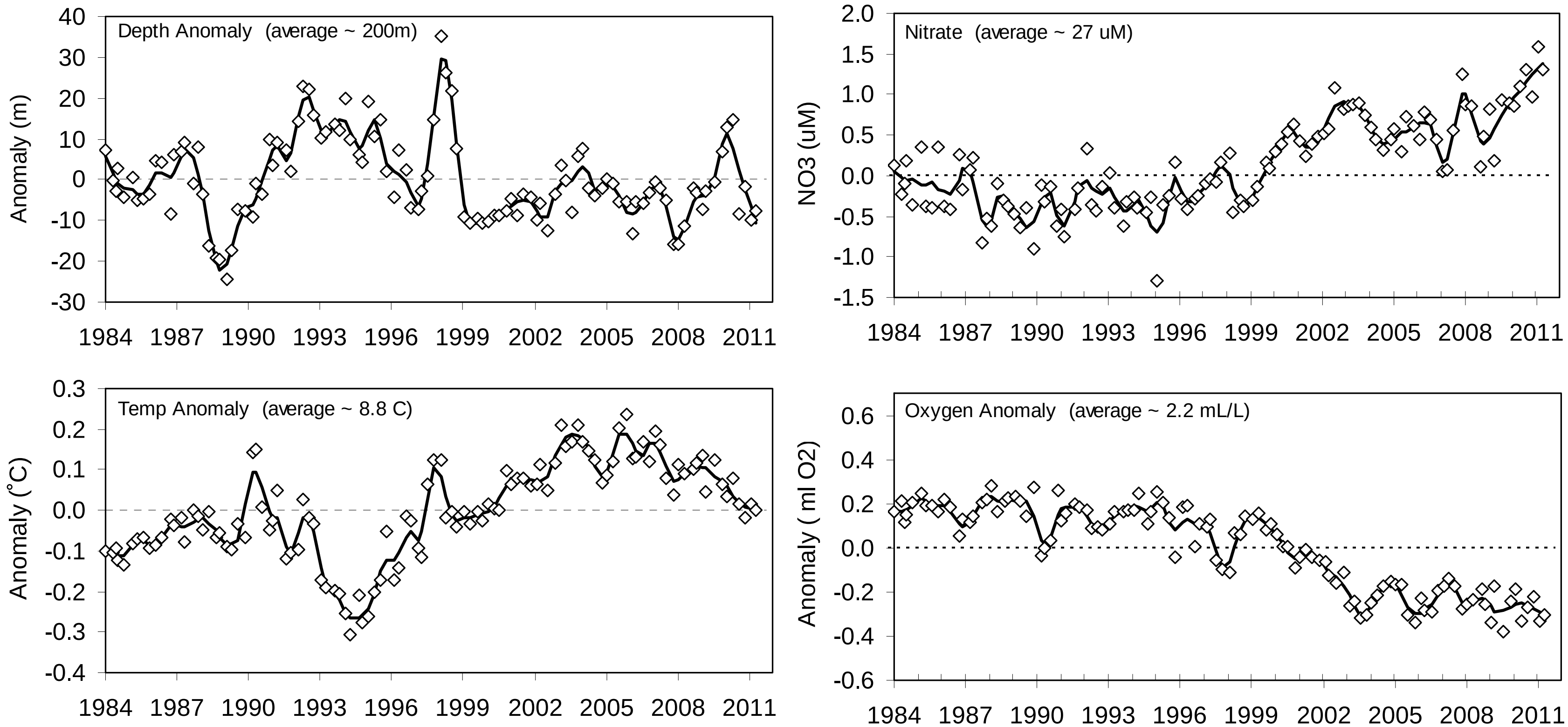


Figure 10. Spatial patterns of properties for the spring 2011 CalCOFI cruise 201104, including upper-ocean geostrophic flow estimated from the 0/500 dbar dynamic height field, 10 m salinity, 10 m temperature, and 10 m chlorophyll a.

Figure 11. Anomalies of properties of the 26.4 isopycnals averaged over the CalCOFI study area. Shown are anomalies of the depth of the isopycnal, temperature, concentrations of nitrate and oxygen.



ECOSYSTEMS

California Current Ecosystem Indicators:

Copepods:

Source: Bill Peterson, NOAA, NMFS

The winter-time zooplankton assemblage is usually a “warm water community” made up of a mixture of both subtropical neritic species carried north with the Davidson Current, as well as subtropical oceanic species (that are normally found in oceanic waters offshore of Newport) transported shoreward with the winter-time downwelling winds. Thus, the copepod community composition on the Oregon shelf is a function of both the strength of the Davidson Current and frequency and intensity of southwesterly storms.

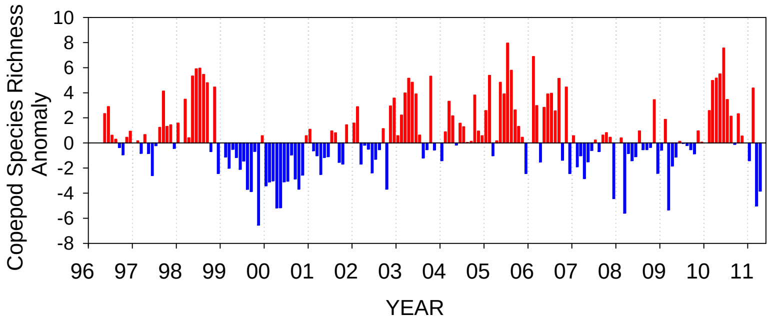
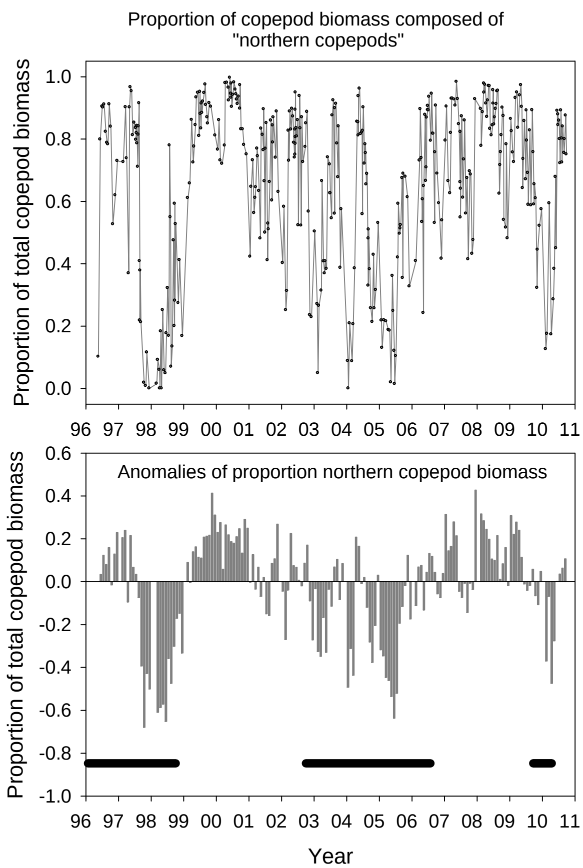


Figure 12. Time series of the copepod species richness, taken from Newport Hydrographic (NH) line, Oregon.

Copepod species richness anomalies were strongly positive through the first half of 2010 due to the El Niño but began to weaken in July 2010 following the onset of La Niña conditions (in June 2010). Richness continued to become less positive into the autumn months and apart from a positive spike in February 2011, richness values were negative in January, March and April of 2011. This signals a return to “cold ocean conditions” and a “cold water copepod community”.



The contribution of “cold water copepods” (*Pseudocalanus mimus*, *Calanus marshallae* and *Acartia longiremis*) to the total copepod biomass is shown in Figure 13 as the proportion (upper panel) and the monthly anomalies (lower panel). When the proportion of these species is low, this indicates that “warm water copepods” dominate the copepod community in terms of their biomass. The figure illustrates two key points: the upper figure shows that there is a strong seasonal cycle in the proportion of the biomass that is composed of northern copepods - during winter months the proportion drops due to the northward advection of southern copepods with the Davidson Current; during summer months, the proportion of northern copepods usually increases except for the summers of 1998 and 2005.

Figure 13. Proportion of total copepod biomass at Newport, OR (NH05 that was from the dominant northern copepod species (*Pseudocalanus mimus*, *Calanus marshallae* and *Acartia longiremis*), upper graph, and the monthly anomalies of the values (lower graph). The horizontal bars indicate the periods of positive PDO. Negative anomalies of cold water copepod biomass are associated with warm phase of the PDO.

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Summer values are often highly variable, but are generally low during warm PDO years (see horizontal bars at the bottom of the lower figure) and high during cold PDO years. This latter pattern is more easily shown when the data are presented as monthly anomalies of the proportion of the copepod biomass that is composed of the three "cold water" species listed above (lower panel). The horizontal bars indicate the periods of positive PDO; all other months are during negative PDO. The figure shows that this index is a metric of the relative importance of cold water copepods, reflecting the species compositions of the subarctic versus subtropical waters feeding the northern California Current. One can clearly see the impact of the 1997-98 El Niño event, the 2002-2006 positive PDO phase, and the recent (2009-2010) El Niño event on copepods.

<u>Coastal Pelagics</u>:

Humboldt Squid:

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

Over the past few years Humboldt Squid (*Dosidicus gigas*) have been conspicuous predators off the coast of California. During the first half of 2011, there has been a conspicuous absence of them. The Southwest Fisheries Science Center scientists captured 70 adult specimens off Northern California in September 2010.

Pacific Sardine and Pacific Mackerel:

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

On November 8, 2010 the Council adopted a coastwide harvest guideline (HG) of 50,526 mt for the 2011 Pacific sardine fishery. In April 2011 the Council reduced the research set aside by 1,500 mt and added that amount to the third allocation. The adjusted allocation of 47,826 mt is to be allocated seasonally as follows:

Coastwide Harvest Guideline = 50,526 mt EFP set aside = 2,700 mt Adjusted HG = 47,826 mt				
	Period 1	Period 2	Period 3	Total
	Jan 1 - June 30	July 1 - Sept 14	Sept 15 - Dec 31	
Seasonal Allocation (mt)	16,214	18,530	13,082	47,826
Incidental Set Aside (mt)	1,000	1,000	1,000	3,000
Management Uncertaity Buffer	--	--	2,000	2,000
Adjusted Allocation (mt)	15,214	17,530	10,082	42,826

The statewide harvest of 15,270 mt for the first allocation was achieved by March 4, 2011, when the fishery was closed (Figure 14). Daily sardine landings ranged from 7 – 1,155 mt/day, with 82% of the landings by weight occurring in the San Pedro/Terminal Island port complex.

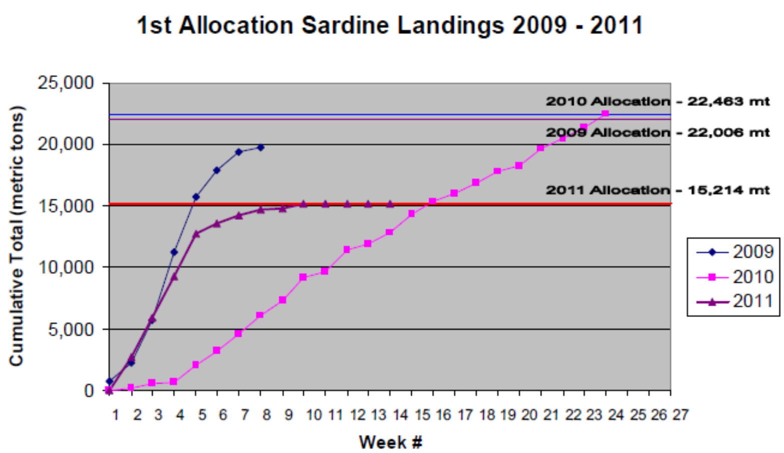
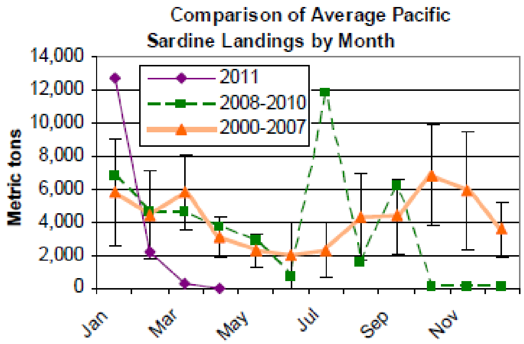


Figure 14. This graph compares weekly sardine landings during the first allocation period 2009-2011.

Both Monterey and southern California Pacific sardine and Pacific Mackerel landings decreased from January to March (Figure 15). Since the closure of the first Pacific sardine allocation in March, 2011, the fleet has been mostly inactive.



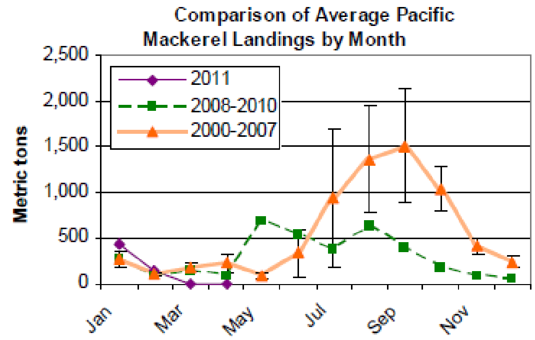


Figure 15. These graphs compare monthly Pacific sardine and Pacific mackerel landings during the last 12 years.

<u>Salmon</u>:

Source: Jerrold Norton, NOAA (<u>Jerrold.G.Norton@noaa.gov</u>)

Generally, 2010 – 2011 had higher returns of anadromous salmonids to native streams (runs) than the 2009 - 2010 season. However, many salmonid stocks on the west cost of the United States appear moderately to severely depleted, Therefore, the increase in 2010-2011, though encouraging so far as restoration efforts are concerned, brought seasonal escapement totals that were low compared to ten-year averages. This is particularly true for California Central Valley (CCV) Chinook salmon returning to the Sacramento and Joaquin Rivers and their tributaries. Estimated returns of hatchery produced CCV Chinook salmon were the largest of the last four years with about 43,360 adults. The return of 15,482 precocious males (jacks) from hatchery production was the highest in the last six years. For the 2010 – 2011 season, the estimates for CCV non-hatchery Chinook salmon were 89,654 and 14,699 for adults and jacks, respectively. These were the best wild returns in the last four years on both the Sacramento and the San Joaquin drainages. The Smith and Eel Rivers on California's north coast had unexpectedly good fall Chinook runs that were higher than recent runs, but lower than historical runs. For the Klamath and Trinity Rivers in northern California fall Chinook salmon runs were about the same for the 2009 – 2010 and 2010 – 2011 seasons. Spring Chinook runs are underway in the Trinity and in several Oregon Rivers.

The Columbia River adult spring Chinook salmon run is nearly complete at the Bonneville fishway. The largest part of the run began on April 24, two weeks later than usual. The run spiked near the first of May with 14,000 counted daily, then fell to an average of 7,000 fish daily, then to a few hundred fish per day by May 18. The run was about equal to the ten-year average (170,000), but only 68 percent of the 2010 run. Columbia River steelhead passage is about 50 percent of last year and 80 percent of the 10-year average. The Columbia River sockeye salmon run is only partially returned. However, it is unlikely that the sockeye run will be equal to the extremely successful years from 2008 to 2010. The 2010 sockeye run was the largest in a record that began in 1942.

Tens of millions of hatchery produced subadult Chinook salmon are introduced into Columbia and Sacramento Rivers in May and June. These are mainly smolts that face many hazards as the progress toward the sea. In May over 22,000 salmon parr and smolts were rescued at the pumps that force southern San Francisco Bay delta water into the aqueducts and canals leading south. However, above average precipitation during winter and spring 2011 will facilitate salmon smolt egress to the sea and adult escapement throughout 2011.

<u>Groundfish</u>:

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

<u>Specifications and Management Measures for 2011-2012 Groundfish Fisheries Adopted</u>: In June 2010, the Council adopted final preferred alternatives for harvest specifications and management measures for 2011-2012 groundfish. As part of this action, the Council adopted Amendment 16-5 (http://www.pcouncil.org/wp-content/uploads/1112GF_SpexFEIS_100806-FINAL_feb21_.pdf) to the groundfish fishery management plan,

which modified all overfished species rebuilding plans, instituted a new rebuilding plan for petrale sole, modified the status determination criteria for assessed flatfish species, and established a new precautionary harvest control rule for flatfish. However, National Marine Fisheries Service (NMFS) disapproved the amendment stating the need to further refine the environmental impact statement (EIS). The final rule for 2011 and 2012 measures not related to Amendment 16-5 are expected to be implemented in April 2011.

NMFS' final environmental impact statement (EIS) for 2011-2012 harvest specifications and management measures was published on March 11 (http://tinyurl.com/3jyvooc). The EIS includes a NMFS-preferred alternative for 2011 and 2012 with a 17 metric ton (mt) annual catch limit (ACL) for yelloweye rockfish and a 3 mt cowcod ACL. The remaining harvest specifications and management measures contained in the NMFS-preferred alternative are the same as the Council's final preferred alternative, except the alternative does not include modifications to the Cowcod Conservation Area (CCA) recommended by the Council which would have changed the CCA boundary from 20 to 30 fathoms and provided for the retention of shelf rockfish.

At the March meeting, the Council re-affirmed their support for the original adoption of harvest specifications for yelloweye rockfish (i.e., a 20 mt ACL) and a 17 mt annual catch target. Further, the Council re-affirmed their adoption of a 4 mt cowcod ACL and the changes to management measures in the CCA. Reconsideration of Amendment 16-5 will occur at the Council's June 2011 meeting in Spokane, Washington.

Highly Migratory Species:

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

In April, the Council asked the Highly Migratory Species Management Team (HMSMT) to work with the Highly Migratory Species Advisory Subpanel (HMSAS) to develop recommendations for U.S. delegations to regional fishery management organizations, in case the stock assessment raises concern about stock status. These recommendations will be presented at the June Council meeting.

The Council also asked the two advisory bodies to consider potential management measures in case the stock assessment prompts National Marine Fisheries Service to determine that overfishing is occurring. The HMSMT will compile information from past reports to the Council on potential management measures and the HMSAS will prioritize these management measures.

Marine Mammals:

Marine Mammals:

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

During April a total of 80 California sea lions, 22 common dolphins, and 1 Dall's porpoise stranded in Los Angeles and Orange counties (33°N), with domoic acid (DA) toxicity the suspected cause of many strandings. Sampling by the CPPH-Maine Biotoxin Monitoring Program has shown *Pseudo-nitzschia*, the diatom that produces DA, at most shore stations along the California coast. Relatively high DA levels were detected in mussels from the Channel Islands and from Santa Barbara County (34.3°N). However, high DA levels have not been observed in the vicinity of most strandings. The 2011 California mussel quarantine went into effect in April instead of May because of persisting high DA levels in California shellfish.

Harmful Algal Blooms:

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

2011 Quarter 1 Washington HAB Summary

Source: Anthony Odell (University of Washington, Olympic Natural Resources Center)

Washington's Olympic Region Harmful Algal Bloom (ORHAB) partnership monitors nine regular sites along Washington's outer coast for the presence of harmful phytoplankton species weekly. No harmful marine algae have been detected along the outer Washington coast until late March, and cell counts remain well below the respective action levels.

No significant blooms of *Pseudo-nitzschia* spp. have yet occurred in 2011 along the outer Washington coast. Cell counts remain very low; ≤ 2000 cells/L of the smaller cell type and were only recently detected in late March. According to the Washington Department of Health and the Olympic Region Harmful Algal Bloom (ORHAB) monitoring partnership domoic acid levels in shellfish have remained ≤1 ppm along the entire Washington's outer coast, which is well below the closure level of 20 ppm.

Alexandrium catenella has not been observed in any samples along the Washington coast through early May. PSP levels remain quite low at no toxin detected (ntd) or <38 μg/100g on the outer Washington coast in the most recent shellfish samples according to the Washington Department of Health.

The dominant species in the Washington coastal phytoplankton assemblage has been *Attheya armatus* and *Asterionellopsis socialis*, with other chain forming diatoms such as *Thalassiosira* spp. and *Chaetoceros* spp. only recently becoming more common. Dinoflagellates, as well, have only recently begun to be regularly observed in surf zone samples. The transition out of the usual winter phytoplankton assemblage for 2011 appears to be later than usual, which is generally around mid-February to mid March.

Oregon HAB Summary (through May)

Source: Oregon Department of Fish and Wildlife http://www.dfw.state.or.us/MRP/shellfish/razorclams/

Source: Zach Forster, Oregon Department of Fish and Wildlife

Monitoring for Oregon's Coastal Harmful Algae (MOCHA) project monitors ten nearshore sites for the presence of harmful algae for *Pseudo-nitzschia* and *Alexandrium*. Phytoplankton samples are collected weekly. In April, *Pseudo-nitzschia* cells consistent with the smaller *P.del/p.dlei* complex were seen at a few sites along the coast including Gold Beach, Bastendorff Beach, Agate Beach and Clatsop Beach. The highest concentrations were at Gold Beach where cell counts reached as high as 52,000 cells/L on 4/27/11. The Oregon Department of Agriculture reported increased levels of domoic acid (DA) in razor clams collected from Gold Beach on the week of 5/16/11. Razor clams and mussels collected through May remain below the regulatory DA closure limit of 20 ppm. *Alexandrium* was observed for the first time on 5/18/11 in Gold Beach. Paralytic shellfish toxins have not been detected in any samples through May.

California HAB Summary (through May)

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

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

Shellfish samples are collected at different sites along the coast of California. Some stations are sampled on at least a weekly basis.

Paralytic Shellfish Poisoning: In January, low numbers of *Alexandrium* were detected at the following southern California sampling sites: in San Luis Obispo, Santa Barbara, Ventura, and San Diego counties. A low level of the PSP toxins was detected in a mussel sample collected from Goleta Pier on January 12. By the end of January low levels of these toxins were also detected in mussels just offshore of Santa Barbara and at Portuguese Bend (LA County). In February, low numbers of *Alexandrium* were detected at sites in Santa Barbara, Los Angeles, Orange, and San Diego counties. PSP toxins were not detected in any shellfish samples collected during February.

Low numbers of *Alexandrium* were detected at a number of sites between Santa Barbara and San Diego counties in March. This represents an increase in the distribution of this dinoflagellate compared to observations in February. There was a sudden increase in PSP toxins in mussels from Ballona Creek (LA County) by the third week of March, reaching 220 ug/100g.

Alexandrium was not observed at any northern California sampling sites in January and at only two northern California sampling sites in February. *Alexandrium* was observed at sites in most northern California counties in March. In April and May, *Alexandrium* was absent from most samples along the entire California coast. PSP toxins were absent from all shellfish samples from January to May, except for mussels from offshore of Santa Barbara that contained a low concentration of PSP in the 3rd week of April.

Domoic Acid:

Southern California: *Pseudo-nitzschia* was observed at a number of sites along the entire southern California coast from January to May. In January, domoic acid concentrations were high in samples of lobster viscera from offshore of Port Hueneme (46 ppm) and near San Nicolas Island (77 ppm). Toxin levels in samples from the latter location ranged from nondetectable to greater than the alert level. Domoic acid appeared to be declining in samples collected near Santa Cruz Island. By the third week in January this toxin increased to the alert level at an aquaculture lease just offshore of Santa Barbara, then declined by the end of January.

February, the relative abundance of *Pseudo-nitzschia* increased significantly at most sites in San Luis Obispo and Santa Barbara counties. The concentration of domoic acid remained high in samples of lobster viscera from offshore near Anacapa (51 ppm) and Santa Cruz (239 ppm) islands. Low levels of domoic acid were detected inside Morro bay by the second week of the month, persisting through the end of February.

In March, domoic acid was detected at numerous sites between San Luis Obispo and Ventura counties. Toxin levels exceeded the alert level throughout this range. The Santa Barbara region experienced the highest toxin concentrations throughout March, reaching 127 ppm on March 22 in oysters from an offshore aquaculture lease.

Northern California: *Pseudo-nitzschia* was present at the northern California sites between Marin and Monterey counties in January. Low numbers of *Pseudo-nitzschia* were present at sites between Sonoma and Monterey counties. Domoic acid was not detected in any shellfish samples analyzed from January to February.

Pseudo-nitzschia was observed at sites along most of northern California coastal counties. There was a significant increase in this diatom in Monterey Bay. Low concentrations of domoic acid were detected in sentinel mussels from Santa Cruz Pier during the last two weeks of March. The highest concentration detected was 15 ppm.

Pseudo-nitzschia was observed along most coastal counties during April. The diatom remained abundant a numerous sites between San Luis Obispo and Orange counties. Domoic acid was detected at numerous sites between San Luis Obispo and Ventura counties. Toxin levels exceeded the alert level at sites in San Luis Obispo and Santa Barbara counties. A low concentration of domoic acid was detected in razor clams from the Humboldt County coast.

Domoic acid concentrations dropped below the detection limit by the beginning of May at sites in Santa Barbara and Ventura counties. By the second week of May, in concert with the increase in *Pseudo-nitzschia*, domoic acid was detected in mussels from Goleta Pier. By the following week there were low concentrations also detected offshore of Arroyo Burro Beach at Mussels Shoals and Deer Creek in Ventura County.

Dissolved Oxygen Concentration:

Source: Bill Peterson, NOAA, NMFS

Oxygen concentrations measured at a depth of 50 m at mid-shelf station NH 05 (five miles off Newport) did not show anything unusual over the November 2010 through May 2011 period.

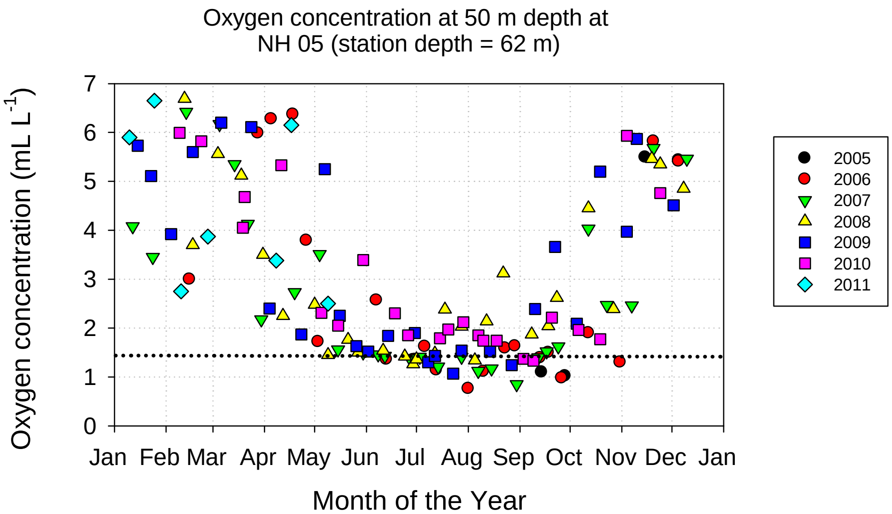


Figure 16. Oxygen concentrations at station NH-05 (five miles off Newport, OR), at a depth of 50 m. Station depth is 60 m.