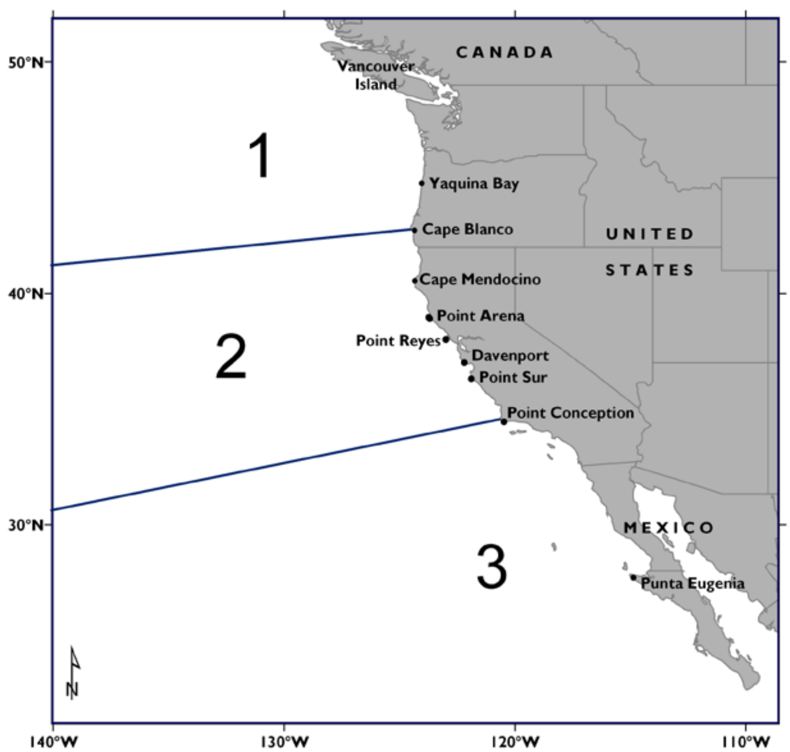
Climatic and Ecological Conditions in the California Current LME for April to early July 2009

Summary of climate and ecosystem conditions for Quarter 2, 2009 (April 1 – early July) for public distribution, compiled by PaCOOS coordinator Rosa Runcie (email: Rosa.Runcie@noaa.gov). Full content can be found by the links below.

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):** Current conditions and recent trends favor the continued development of a weak-to-moderate strength El Niño into the Northern Hemisphere Fall 2009, with further strengthening possible thereafter.
- **Pacific Decadal Oscillation (PDO):** The PDO index continued to be negative for 22 consecutive months. The May PDO index suggests weakening of the PDO pattern.
- **Upwelling Index (UI):** The UI was lower than average off Oregon and California in both May and June.
- **Madden Julian Oscillation (MJO):** The MJO remained week to inactive, significant MJO activity is not expected.
- **Deep Water Temperature and Salinity at Newport Hydrographic Line, Oregon:** Bottom temperatures during the spring quarter (April-June) at a mid-shelf station off Newport were the second coldest of the recent 12 year time series and salinities were relatively fresh.



CCLME (~Vancouver Island to Punta Eugenia) and the three Eco-Regions as defined by U.S. GLOBEC (1992)

ECOSYSTEM CONDITIONS IN BRIEF

- **California Current Ecosystem Indicators:**
  1. **Copepods:** Along the OR shelf, cold water copepod species dominated the zooplankton community and is commensurate with the presence of cold and salty water on the shelf from late-March to present.
  2. **Krill:** Krill biomass has been relatively low this winter and spring off the Newport, OR coast. A prolonged spawning event by *Euphausia pacifica* which lasted for approximately a month, with high numbers of eggs and/or nauplii was observed on cruises on 23 April, 7 May and 16 May, 2009.
  3. **Juvenile Rockfish**
  4. **Coastal Pelagics:**
     Pacific Sardine: The combined landings for CA, OR, and WA in 2008 totaled 87,183 t, down 30% from 127,597 t landed in 2007. In November 2008, the Council adopted a Harvest Guideline (HG) of 66,932 t for the 2009 Pacific sardine fishery. This is a 25% reduction from the 2008 HG.
     Pacific Mackerel: Landings in CA totaled 3,535 t in 2008, which is consistent with landings since 2002. OR reported 58 t landed in 2008, down from the 2007 catch of 702 t. No landings have been reported in WA since 2005.
     Jack Mackerel: In 2008, landings represented less than 1% of the total catch of coastal pelagic species (CPS) in CA with 274 t landed. Landings in OR continue to be low with 46 t landed in 2008. WA reported no landing during 2008.
     Northern Anchovy: CA landings of northern anchovy in 2008 amounted to 14,285 t. OR reported landings totaling 260 t and WA reported 109 t for 2008. Northern Anchovy ranked the second most valuable CPS finfish after the Pacific sardine.
     Market Squid: CA landings in 2008 declined by 23% compared to 2007 landings, from 49,473 t to 38,100 t.
  5. **Salmon:** In April 2009, the Council and Commission closed all commercial and severely limited recreational ocean salmon fishing in CA during 2009, specifically to protect Sacramento River Fall Chinook population.
  6. **Groundfish:** In 2008, 13,109 t of commercial groundfish were landed in CA. This is a 25% increase from landings in 2007 (10,513 t). Pacific whiting (4,944 t), Dover sole (3,018 t), and sablefish (1,549 t) continued to be the top species landed by weight in 2008.
  7. **Midwater species**
  8. **Cassin's Auklet**
- **Highly Migratory Species (tuna, sharks, billfishes):** In 2008, the Council evaluated the need to limit the sport take of common thresher sharks. Concerns were raised that the established HG might be exceeded, that the majority of this catch was occurring during the spring thresher shark pupping season, and that many pregnant females were being caught. The Council decided no to make changes to thresher shark regulations for the 2009-2010 management cycle, but did make a number of recommendations (see section below).
- **Ecosystem Indicators for the Central California Coast, May-June 2009:** The annual midwater trawl for juvenile rockfish and other pelagic nekton along the Central CA coast occurred in late spring 2009. The data showed trends of increasing abundance for fish species and assemblages that tend to prosper in cool and productive conditions, including juvenile rockfish, Pacific hake, market squid and krill. By contrast, coastal pelagic forage species such as northern anchovy that are typically observed in greater numbers during warmer, less productive periods were at low levels in 2009.
- **Invasive Species**: The draft *Spartina* eradication plan for the West Coast Governors' Agreement is available online (see reference below).
- **Marine Mammals**

- **Harmful Algal Blooms:**
  Oregon: Cell counts from the north coast in mid June remained high in dinoflagellate abundance and diversity. *Pseudo-nitzschia* counts increased along Clatsop Beach with a high 115,000 cells/liter.
  California: In early May some bird and marine mammal strandings occurred in the Los Angeles and Orange County areas with a possible link to domoic-acid (DA) poisoning. In mid May, a widespread domoic acid poisoning event took place as a result of a *Pseudo-nitzschia* bloom in the waters off southern California.
- **Dissolved Oxygen Concentration:**
  Oregon: Near bottom oxygen concentrations at the Newport Line mid-shelf station, NH 05, declined to relatively low levels (2.4 ml L^{-1}) in early April, and 1.87 ml L^{-1} in late April as a result of an early start to the upwelling season.
  California**:** Oxygen anomalies at a depth of 100 m continued to be negative along the inshore sections of the CalCOFI survey lines, continuing patterns observed since 2003.
- **Spatial Patterns and Oxygen Anomalies from the Spring CalCOFI Survey:** Mixed layer temperatures, averaged over the CalCOFI 66 station survey area were similar to those observed over the last decade, suggesting that the influence of the equatorial La Niña conditions had abated. Nutricline depths had returned to normal values as well after a period of shallow nutricline depths associated with the La Niña conditions. Concentrations of nutrients in the mixed layer were at or below long-term averages and possibly as a consequence phytoplankton biomass (Chl a) and rates of primary production were below values expected for this season.
- **Quarterly Publications and Websites related to the California Current published during Quarter 2, 2009 (see Appendix for cumulative list for 2008)**

  Marine Biotoxin Monitoring Program, Annual Report 2008.
  Submitted to: California Department of Fish and Game
  By: California Department of Public Health, Division of Drinking Water and Environmental Management. Prepared by: Gregg W. Langlois, Senior Environmental Scientist.
  http://www.cdph.ca.gov/HealthInfo/environhealth/water/Documents/Shellfish/AnnualReports/Annual_Report_PSP_2008.pdf

  West Coast Governors' Agreement on Ocean Health, Action Plan
  The Office of the Governors: Washington, Oregon, and California
  http://www.westcoastoceans.gov/docs/WCGA_ActionPlan_lowest-resolution.pdf

  News & Updates from the Southwest Fisheries Science Center homepage:
  http://swfsc.noaa.gov/news.aspx?id=15134

CLIMATE CONDITIONS

El Niño Southern Oscillation (ENSO):

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

During February to April 2009, negative SST anomalies weakened across the equatorial Pacific. Since the beginning of May 2009, positive SST anomalies have increased across the equatorial Pacific. July 2009 observations indicate El Niño conditions are present in the equatorial Pacific Ocean. Positive sea surface temperature (SST) departures continue to increase across much of the equatorial Pacific Ocean (Figure 1). Dynamical model forecasts indicate El Niño conditions will continue to develop and are expected to last through Northern Hemisphere Winter 2009-10.

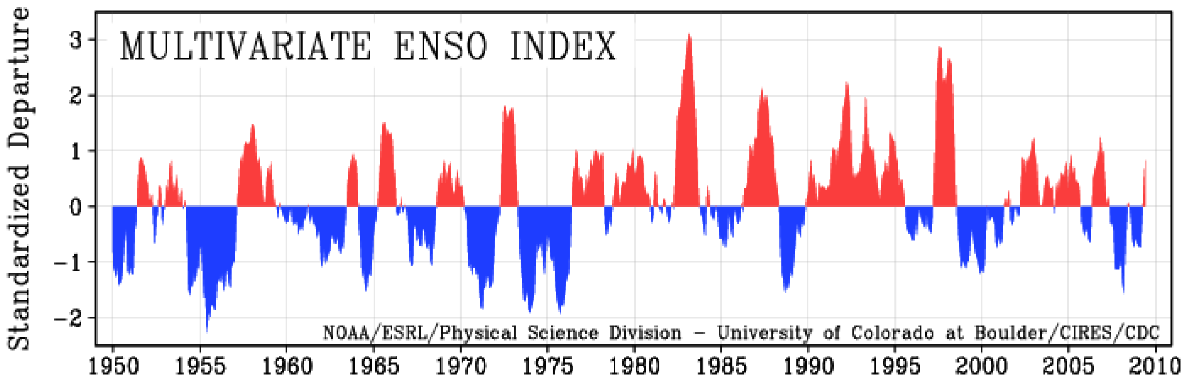


Figure 1. NOAA Physical Sciences Division attempts to monitor ENSO by basing the Multivariate ENSO Index (MEI) on the six main observed variables over the Pacific. These six variables are: sea-level pressure, zonal and meridional components of the surface wind, sea surface temperature, surface air temperature,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

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

Source: The Coast Watch* http://coastwatch.pfel.noaa.gov/elnino.html *(Advisory 2008)
http://www.cpc.noaa.gov/products/analysis_monitoring/enso_advisory/ensodisc.doc ***(July 2009 report)***

ENSO- neutral conditions persisted across the equatorial Pacific Ocean during May 2009. However, sea surface temperatures (SST) increased for the sixth consecutive month, with above-average temperatures extending across the region. Subsurface oceanic heat content anomalies (average temperatures in the upper 300 m of the ocean, Figure 2) also continued to increase as the thermocline continued to become shallower. Current conditions and recent trends favor the continued development of a weak-to-moderate strength El Niño into the Northern Hemisphere Fall 2009, with further strengthening possible thereafter.

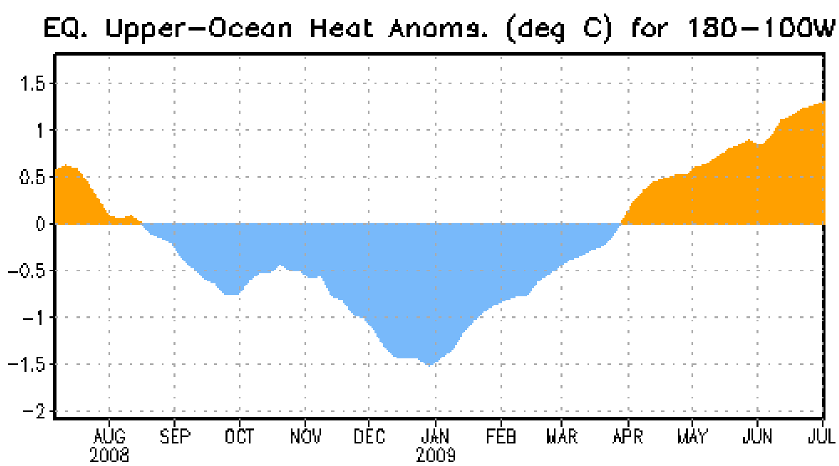


Figure 2. Area-averaged upper-ocean heat content anomalies (°C) in the equatorial Pacific (5°N-5°S, 180°-100°W). Heat content anomalies are computed as departures from the 1982-2004 base period pentad means. The upper ocean heat content was below-average across the eastern half of the equatorial Pacific Ocean between mid-August 2008 and March 2009, with a minimum reached in late December 2008. The heat content anomalies have been positive since April 2009, and have steadily increased since that time.

Pacific Decadal Oscillation (PDO):

Source: Jerrold Norton, NOAA (Jerrold.G.Norton@noaa.gov)

Environmental Research Division (ERD), 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

Major changes in northeast Pacific marine ecosystems have been correlated with phase changes in the PDO; warm periods (+PDO) have generally seen enhanced coastal ocean biological productivity in Alaska and reduced productivity off the west coast of the contiguous United States, while -PDO periods have the opposite north-south pattern of marine ecosystem productivity. These patterns have been particularly conspicuous in salmon production, but physical processes not well represented by the PDO index may become important in particular years. Standardized values for the PDO index (Figure 3) are derived as the leading principal component of monthly SST anomalies in the North Pacific Ocean poleward of 20N. Monthly mean global average SST anomalies are removed to separate "global warming" from the PDO index.

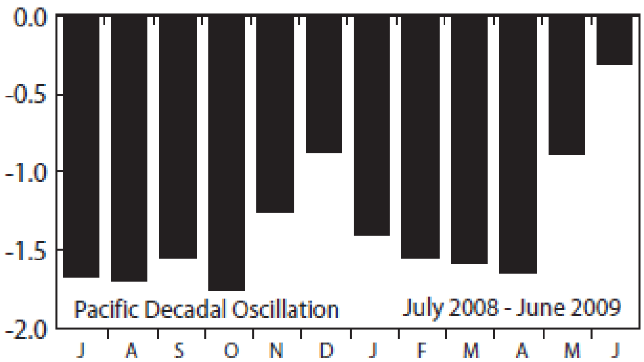


Figure 3. The graph shows monthly values for the Pacific Decadal Oscillation (PDO) Index for July 2008 through June 2009. The PDO is a long-lived El Niño like pattern of Pacific climate variability. This index has been negative (-PDO) for the last 22 months, which is the longest run of negative values since the 1966-1968 period. Higher May and June 2009 values suggests weakening of the -PDO pattern, with the June value of -0.31 being the highest index value since September 2007.

PDO and Sea Surface Temperature at Newport:

Source: Bill Peterson, NOAA, http://jisao.washington.edu/pdo/ http://jisao.washington.edu/pdo/PDO.latest

The PDO index continues to be negative and has now been negative for 22 months (since September 2007, Figure 4). Sea surface temperatures at NOAA Buoy 46050, located 22 miles off of Newport, continued to be anomalously cool throughout the fall and winter 2008/2009, and spring 2009, with values around -1 °C cooler than climatology. However the PDO values for May and June have increased dramatically to values of only 0.88 and – 0.31, a pattern that typically mirrors the MEI Index, and indicates that the eastern Pacific Ocean is warming.

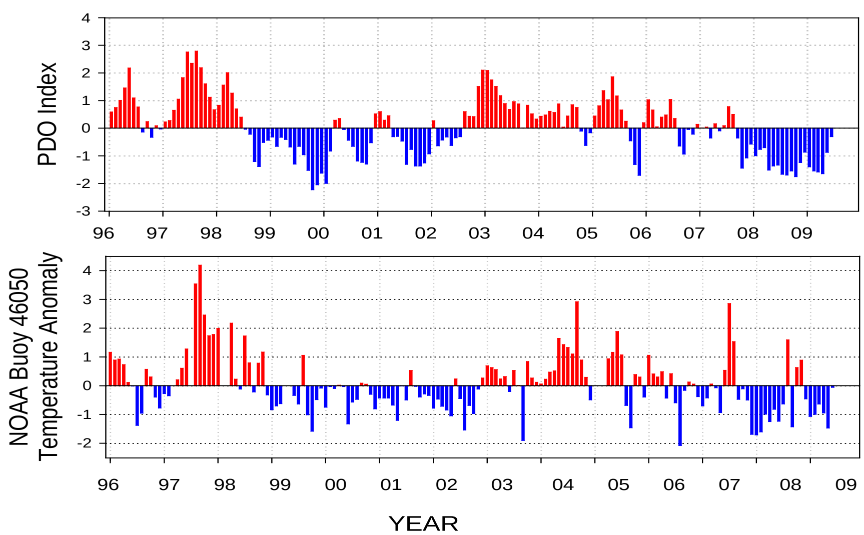


Figure 4. Time series of PDO (upper) and monthly temperature anomalies at the NOAA Buoy 46050 (lower) since 1996.

Upwelling Index:

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

Coastal upwelling-favorable winds characterized the U.S. West Coast. Between 24°N and 42°N (Figure 5), the NMFS/SWFSC/ERD monthly coastal upwelling index (UI) had a similar magnitude in April and May, such that UI anomalies were positive in April and negative in May. Strongly positive wind stress curl was observed in the San Francisco- Monterey Bay area and north of Cape Mendocino. The UI was lower than average off Oregon and California in both May and June.

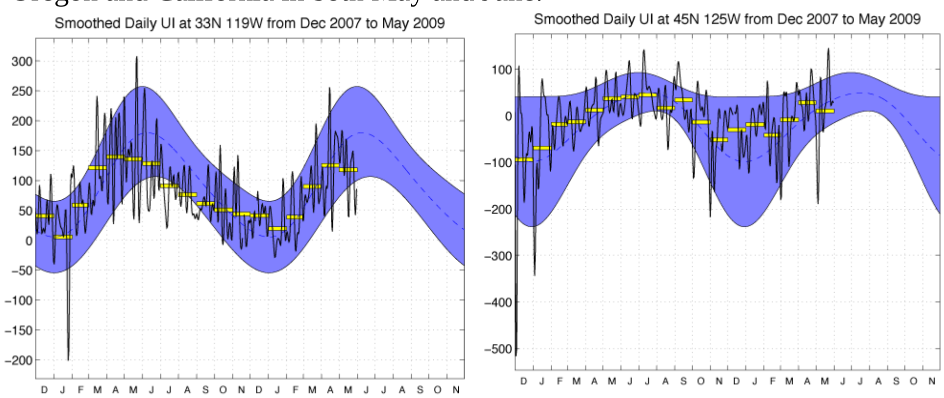


Figure 5. Left panel is recent 18 month record of upwelling for 33°N 119°W. Right panel is same for 45°N 125°W. Positive values are upwelling; negative values are downwelling. Dashed line is the climatological mean. Yellow bars are the means for each month during the period shown.

Regional Oceanic Conditions:

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

April 2009 monthly mean NOAA AVHRR sea surface temperature (SST) fields showed widespread negative anomalies east of 135°W and between 30°N and 50°N (Figure 6). This is part of a persistent pattern in the eastern Pacific in which coastal areas of negative anomaly extend offshore to the north and south and are flanked by extensive areas of positive SST anomaly centered near 160°W, 40°N. Negative SST anomalies to -2.0°C occurred along the coast north of Point Conception.

May 2009 monthly mean sea surface temperature (SST) fields show negative anomalies east of 130°W and between 30°N and 50°N. The strip of negative SST anomaly extended northwest into the Gulf of Alaska and southwest toward the Hawaiian Islands. Extensive areas of positive offshore SST anomaly were centered near 160°W, 40°N, while neutral to positive SST anomalies were found in the Southern California Bight.

June 2009 mean NOAA AVHRR sea surface temperature (SST) fields show that positive SST anomalies have become wide spread in the northeastern Pacific. Anomalies have increased along the west coast of North America and positive SST anomalies and monthly average conditions have replaced negative anomalies in large areas between 30°N and 50°N.

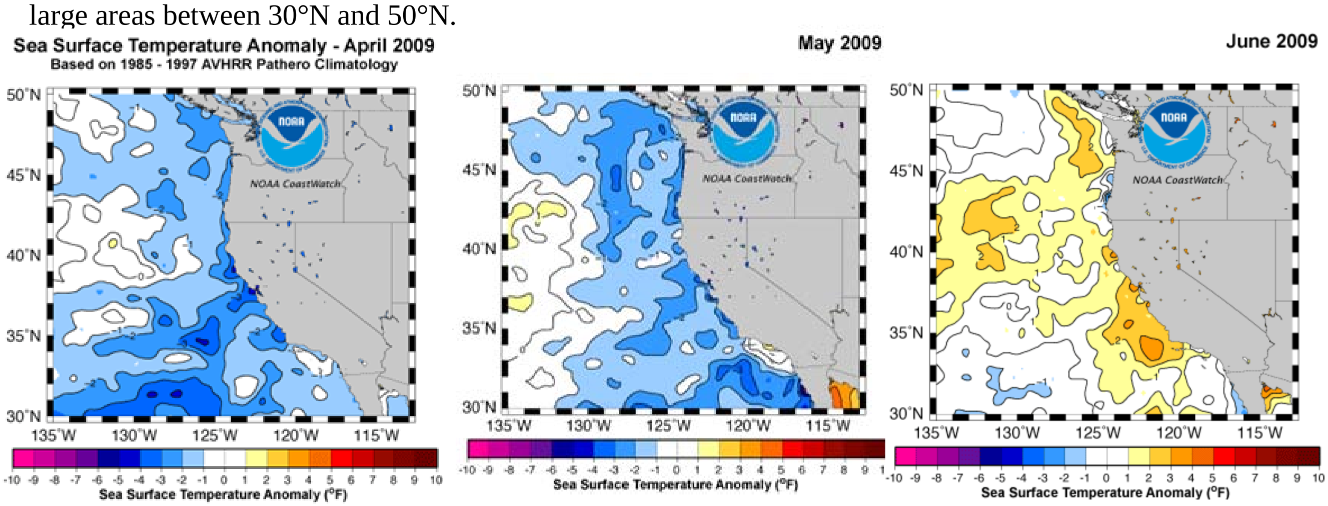


Figure 6. Regional oceanic conditions in the California Current Region.

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 was active from mid-January to mid-February 2009 and again from mid-March through early May 2009. The MJO weakened in May. 850-hPa westerly vector wind anomalies weakened across the Pacific during late June. July update, the MJO is currently not active and significant MJO activity is not expected.

Deep Water Temperature and Salinity at Newport Hydrographic Line, Oregon:
Source: Bill Peterson, NOAA
Bottom temperatures during the spring quarter (April-June) at a mid-shelf station off Newport were the second coldest of the recent 12 year time series, averaging 7.61°C (Figure 7). Bottom salinities were fresher than springtime values of 2007 and 2008, averaging 33.72, similar to values observed in 1999, 2001 and 2002. Last spring (2008) was the coldest of the time series at 7.40°C and the saltiest (33.88).

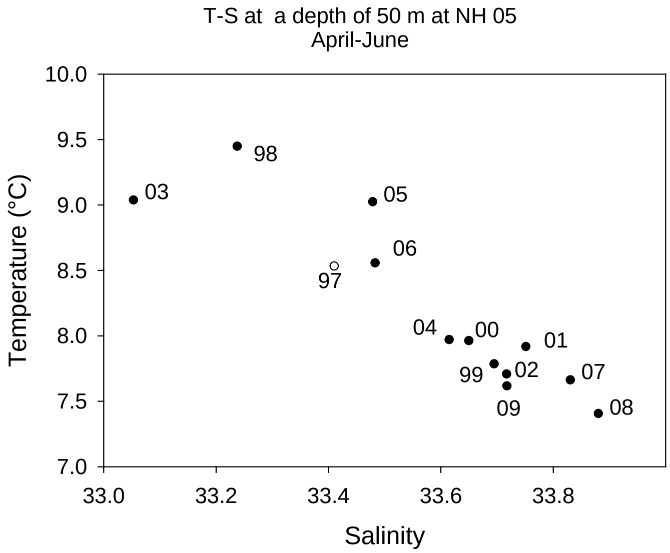


Figure 7. Temperature vs. salinity measured at depth of 50 m at station NH 05 (water depth 62 m), averaged for the months of April-June. Averages for each spring are identified, e.g., 98 indicates the spring of 1998.

ECOSYSTEMS

California Current Ecosystem Indicators:

Copepods:
Source: Bill Peterson, NOAA
From the viewpoint of the copepods, the spring transition occurred early in 2009, and occurred sometime between the March 6th and 24th, 2009 cruises. A thick phytoplankton bloom developed shortly thereafter which stimulated egg production by both euphausiids and copepods. Since that date, northern species have completely dominated the samples. Copepod species richness anomalies continued to be strongly negative through May but were neutral in June, perhaps as a result of the trend towards El Niño conditions. Negative species richness anomalies indicate a cold water zooplankton community and is commensurate with the presence of cold and salty water on the shelf from late-March to present (Figure 8).

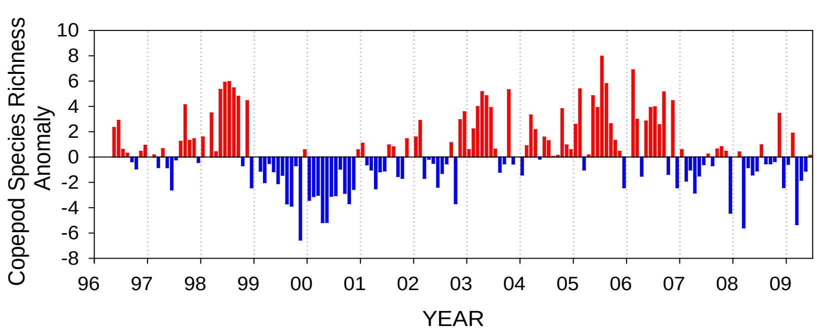


Figure 8. Time series of the copepod species richness, taken from Newport Hydrographic (NH) line, Oregon.

Krill:

Source: Bill Peterson, NOAA

Krill biomass has been relatively low during winter 2008/09 and spring 2009; however, no data are shown in this report because not all the samples have been analyzed. Two euphausiid spawning events have been observed this calendar year. *Thysanoessa spinifera* spawned in February commensurate with a winter phytoplankton bloom on 17 February. A second prolonged spawning event by *Euphausia pacifica* lasted for approximately a month, with high numbers of eggs and/or nauplii observed on cruises on 23 April, 7 May and 16 May. Another spawning event was triggered in early July.

Coastal Pelagics:

Source: Review of Selected California Fisheries for 2008: Coastal Pelagic Finfish, Market Squid, Ocean Salmon, Groundfish, California Spiny Lobster, Spot Prawn, White Seabass, Kelp Bass, Thresher Shark, Skates and Rays, Kellet's Whelk, and Sea Cucmber. CDFG, CalCOFI & Dale Sweetnam

Coastal Pelagic Finfish:

Pacific sardine (*Sardinops sagax*), Pacific Mackerel (*Scomber japonicus*), jack mackerel (*Trachurus symmetricus*), northern anchovy (*Engraulis mordax*), and Pacific herring (*Clupea pallasi*) form a finfish complex known as coastal pelagic species (CPS). These species, with the exception of Pacific herring, are jointly managed by the Pacific Fisheries Management Council and NMFS. In 2008, total commercial landings for these four species equaled 75,897 t (Figure 9), and was worth nearly $9.9 million in ex-vessel value. Compared to landings in 2007, this represents a 29% and 4% decrease in quantity and ex-vessel value, respectively. Once again Pacific sardine ranks as the largest fishery among these four species, contributing 51% of the combined biomass and 77% of the combined ex-vessel value.

Pacific Sardine:

In 2008, the total tonnage of Pacific sardine (57,803 t) landed in California was 29% lower than in 2007 (80,950 t) due in large part by the HG that was 48% lower than in 2007. Commercial landings of sardine averaged 51,910 t over the ten-year period from 1999–2008 (Figure 9). Nearly all (99%) of California's 2008 sardine catch was landed in Los Angeles (54%, 30,949 t) and Monterey (45%, 26,212 t) port areas.

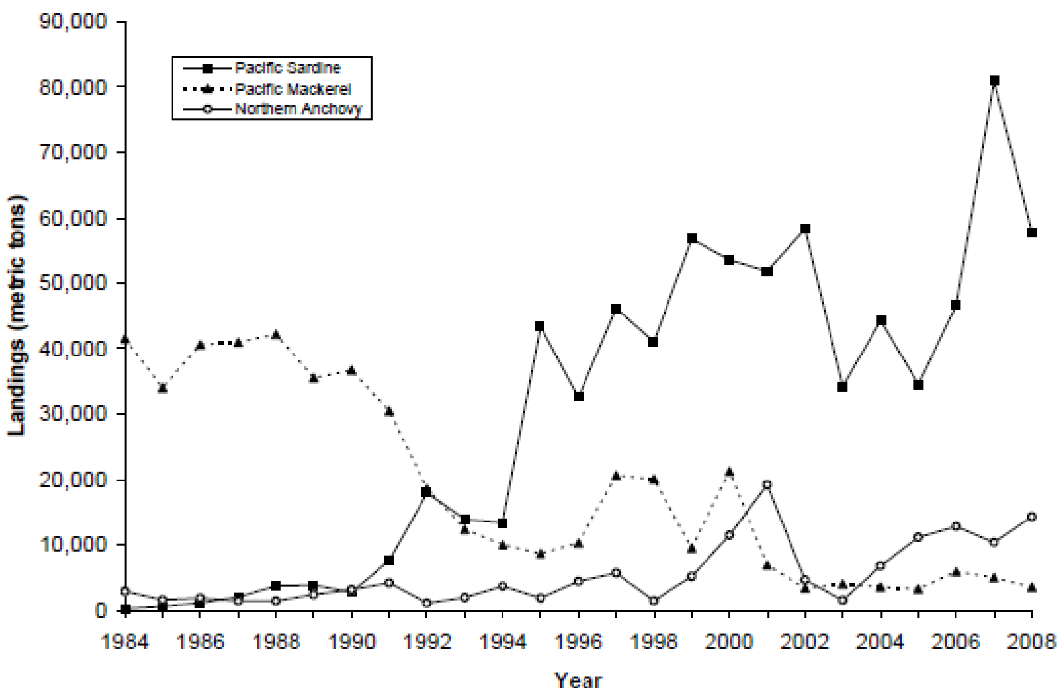


Figure 9. California commercial landings of Pacific sardine, Pacific Mackerel and northern anchovy, 1984-2008.

The Pacific sardine fishery ranges from British Columbia, Canada, southward to Baja California, Mexico (BCM). Since the 1970s the majority of landings occur in southern California and northern Baja California. However, since the expansion of the sardine fishery in 1999, landings have steadily increased in the Pacific Northwest. The combined landings of Pacific sardine for California, Oregon, and Washington totaled 87,183 t, down 30% from the 127,597 t landed in 2007. The HG for the 2008 season was 89,093 t based on a biomass estimate of 832,706 t. This was 48% lower than the HG for 2007.

The steady increase of sardines landed in Oregon since 1999 may have leveled off or slowed in the last three years (Figure 10), possibly due to the persistent spring-summer temperature anomalies (cold water conditions) off Oregon during the past three years (Figure 7). Oregon landings of sardine totaled 22,949 t in 2008, a considerable decrease from 2007 (42,144 t). In 2008, Oregon exported 4,050 t of sardine product worth a little over $3.8 million.

Washington landings of Pacific sardine decreased to 6,435 t in 2008 since a peak in 2000 (15,832 t, fig. 3), although this is an increase from 2007 (4,665 t). Washington exported more sardine (19,201 t) than they landed (6,435 t), possibly product that was landed in Oregon or California or landed in 2007.

In November 2008, the Council adopted a HG of 66,932 t for the 2009 Pacific sardine fishery based on a biomass estimate of 662,886 t and the harvest control rule in the CPS (Fishery Management Plan) FMP. This HG is a 25% reduction from the 2008 HG. It also incorporated a new-for-2009 2,400 t set-aside allocated for dedicated Pacific sardine research activities during the 2nd allocation period.

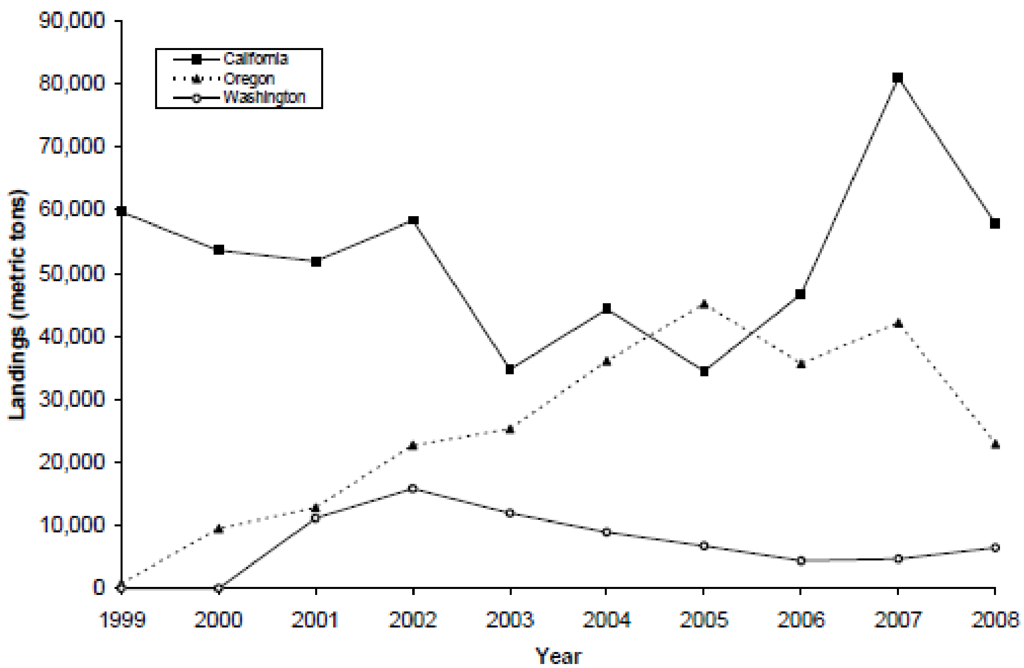


Figure 10. Commercial landings of Pacific sardine in California, Oregon and Washington, 1999-2008.

Pacific Mackerel:

Pacific mackerel landings in California totaled 3,535 t in 2008, which is consistent with landings since 2002 (Figure 9). The majority of this catch was landed in Southern California port areas.

Oregon reported 58 t of Pacific mackerel landed there in 2008. This is considerably down from the 2007 catch of 702 t. No landings of mackerel have been reported in Washington since 2005. Washington landings of Pacific mackerel are typically low, with an annual average of 72 t (unspecified mackerel) since 1999.

Similar to sardines, the majority of Pacific mackerel landings occur in southern California and Ensenada, Baja California Mexico. At the start of the 2008-2009 season NMFS estimated the biomass at 264,732 t and the

Council set the HG at 40,000 t, with an 11,772 t set-aside for incidental landings in other fisheries. These values are lower than the prior season (biomass: 359,290 t; HG: 40,000 t). Landings above the HG would be constrained by an incidental catch rate of 45% by weight when landed with other CPS.

Jack Mackerel:
In 2008, jack mackerel landings represented less than 1% of the total catch of CPS in California with 274 t landed. This is less than half of the total 2007 catch (632 t). Landings in Oregon continue to be low with 46 t landed in 2008. Washington reported no landings of jack mackerel during 2008.

The 2008 recreational jack mackerel catch as sampled from California Recreational Fisheries Survey (CRFS) was 5 t (86,000 fish), a 67% (161%, by number of fish) increase from 2007. Commercial passenger fishing vessels (CPFV) reported 408 fish landed.

Northern Anchovy:
The vast majority of northern anchovy are landed in California, with occasional landings in Oregon and Washington. Presently, landings of northern anchovy are relatively modest, averaging about 9,800 t per year over the last 10 years (Figure 9). California landings of northern anchovy in 2008 amounted to 14,285 t. This is a 37% increase from 2007 landings (10,390 t) and ranked as the second most valuable CPS finfish after Pacific sardine. Oregon reported landings totaling 260 t and Washington reported 109 t for 2008. The 2008 California recreational catch for Northern anchovy as sampled by CRFS totaled 3 t (194,000 fish).

California Market Squid:
Of all the marine commercial species landed in California during 2008, market squid, *Loligo (Doryteuthis) opalescens* ranked second in volume. Landings in 2008 declined by 23% compared to 2007 landings, from 49,473 t to 38,100 t.

The fishery can be separated into a northern and southern component based on the timing of when environmental conditions are optimal for squid spawning. The northern component is centered in and around Monterey Bay in the spring and summer, while the southern component is centered in the southern California Bight usually in the fall and winter. Although the fishery has its historical origins in Monterey Bay, the fishery has been dominated by the southern component especially in the last few seasons, which have seen minimal landings in the northern component (Figure 11).

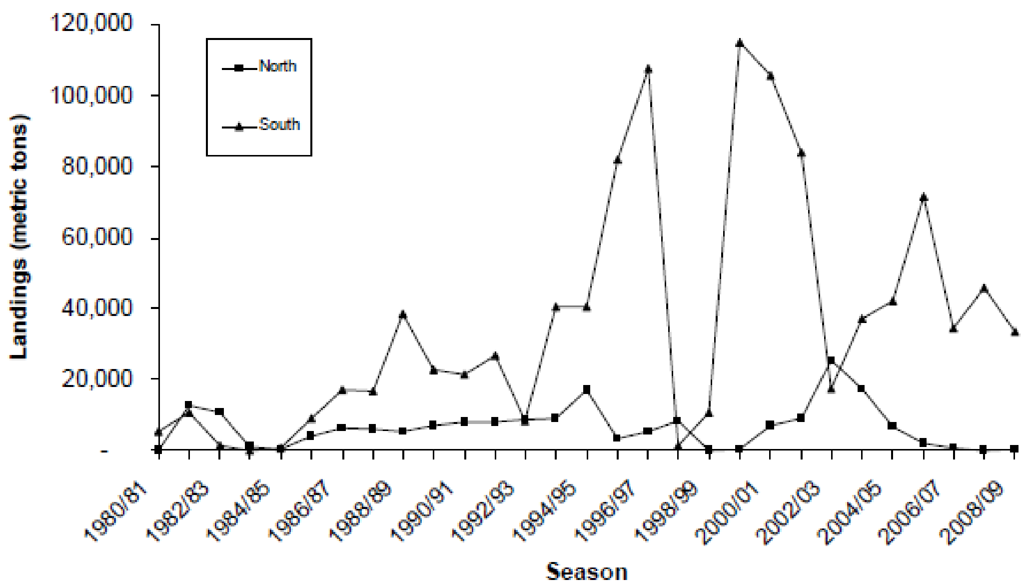


Figure 11. Comparison of market squid landings from the northern and southern fisheries by fishing season (1 April – 31 March), from 1980-81 to 2008-09 seasons.

The summaries provided and the appearance of external links do not constitute an endorsement by the Department of Commerce/National Oceanic Atmospheric Administration of the information, products or services.

Ocean Salmon:

Source: Dale Sweetnam, CDFG

In 2008, California commercial salmon fisheries were closed by the Council due to a significant decline in the abundance of Sacramento River fall Chinook (SRFC). This stock generally contributes 80-90% of California's ocean landings. In the fall of 2008, only 66,264 SRFC adults returned to spawn in the Sacramento River basin, which was the lowest escapement on record and is well below the FMP's conservation goal of 122,000-180,000 adult spawners. In addition, only 4,061 SRFC jacks (age-2 fish) returned to spawn in 2008, the second lowest return on record. The number of returning jacks is used to estimate the following year's adult ocean abundance. Based on these data, the forecasted ocean abundance for 2009 was approximately 122,196 SRFC, without any additional ocean or river fishing. This would predict the third lowest adult escapement of SRFC since 1992. In April 2009, the Council and Commission closed all commercial and severely limited recreational ocean salmon fishing in California during 2009, specifically to protect SRFC.

No commercial landings occurred in 2008 compared to estimated total commercial landings of 114,141 Chinook (686 t) in 2007. There were zero days open compared to 341 (days open in each of four management areas combined) in 2007.

The 2008 recreational fishery was open for 45 days in the Fort Bragg area prior to the 1 April closure, compared to a combined season total of 794 days for all areas (i.e. Horse Mountain is open for 200 days, Monterey area is open for 300 days, etc.) in 2007. In the abbreviated 2008 recreational fishery an estimated 6 Chinook were landed compared to 47,704 salmon in 2007. There were an estimated 391 angler days in 2008 compared to 105,889 angler days in 2007. No salmon were landed by CPFVs. Regulations permitted two salmon per day of any species except Coho. Single point, single-shank barbless hooks were required north of Point Conception and anglers fishing with bait and by any means other than trolling were required to use circle hooks. The minimum size limit was 508 mm (20 in.) total length (TL).

In 2009, a limited recreational fishery was set for the CA ports of Eureka and Crescent City from 29 August through 7 September 2009. The waters from the Oregon border to Horse Mountain will be open to ocean sport anglers. Regulations permit two salmon per day of any species except Coho. Single point, single-shank barbless hooks are required north of Point Conception and anglers fishing with bait and by any means other than trolling are required to use circle hooks. The minimum size limit is 609 mm (24 in.) TL.

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

Salmonids generally enter Pacific coast rivers during March-June time period. There are initial reports that the spring-summer Chinook runs are not as abundant as 10-year averages. However, some salmonid runs, such as the Columbia river sockeye and steelhead appear healthy. Cumulative 2009 Chinook salmon counts at the Bonneville Dam (Fish Passage Center, Portland, OR), are 94% of last year and 84% of the ten-year averages. The 2009 return of immature male Chinooks (jacks) is very high, over five times the ten- year average.

Groundfish:

Source: Dale Sweetnam, CDFG

Commercial Fishery: In 2008, 13,109 t of commercial groundfish were landed in California. This is a 25% increase from landings in 2007 (10,513 t), a 9% increase from 2006 landings (12,047 t), and a 44% decrease from 1998 landings (23,364 t). Pacific whiting (4,944 t), Dover sole (3,018 t), and sablefish (1,549 t) continued to be the top species landed by weight in 2008, identical to species dominating landings in 1998, 2006, and 2007. Dover sole, thornyheads, and sablefish (collectively referred to as the "DTS" complex) landings accounted for 73% (9,511 t) of all commercial groundfish landings. Overall in 2008, the species group caught most frequently were roundfishes (e.g., sablefish, lingcod, cabezon (*Scorpaenichthys marmoratus*), greenlings (*Hexagrammos* spp.), Pacific whiting (*Merluccius productus*), and Pacific cod (*Gadus macrocephalus*) (50%), followed by flatfishes (34%) and rockfishes (14%). Sharks and skates accounted for two percent of the total commercial groundfish landings. The most important rockfish species to the 2008 commercial groundfish fishery in terms of total landings by weight (101 t) was chilipepper rockfish (*Sebastes goodie*). Overfished rockfish species accounted for less than one percent (68 t) of the landings in 2008, although 21% more were landed than in 2007 (56 t); the predominant species was widow rockfish (*Sebastes entomelas*) in both years.

Recreational Fishery: Information from California Recreational Fisheries Survey (CRFS) indicated that in 2008, California anglers targeting bottomfish participated in an estimated 798,000 trips. This was an 8% increase from 2007 (734,000 angler trips) and a 36% increase from 2006 (587,000 angler trips). Seventy-nine percent of the bottomfish effort occurred in Southern California (south of Point Conception), particularly from commercial passenger fishing vessels (CPFVs) and man-made structures. Central California (Point Conception to Cape Mendocino) accounted for 17% of the bottomfish effort and northern California (Cape Mendocino to the California/Oregon border) accounted for four percent. An estimated 945 t of groundfish were taken by the recreational fishery in 2008, a 27% decrease from 2007 (1,292 t) and a 41% decrease from 2006 (1606 t). The top five species accounting for approximately half (52%) of the groundfish catch by weight were black rockfish, vermilion rockfish (*Sebastes miniatus*), lingcod, blue rockfish (*Sebastes mystinus*), and California scorpionfish (*Scorpaena guttata*). The same five species accounted for 56% of the total groundfish catch in 2007 although vermilion rockfish was the dominant species. Black rockfish was the dominant species caught in the north, followed by lingcod, vermilion rockfish, and blue rockfish. Blue rockfish was the dominant species caught on the central coast, followed by lingcod, vermilion rockfish, and black rockfish. California scorpionfish was the dominant species caught in Southern California, followed by vermilion rockfish, bocaccio (*Sebastes paucispinis*), and California sheephead (*Semicossyphus pulcher*).

Highly Migratory Species (Thresher Shark):
Source: Dale Sweetnam, CDFG

Commercial Fishery: The common thresher shark, *Alopias vulpinus*, is the most common commercially landed shark in California. Although primarily targeted using large-mesh drift gillnets (73% of total) and hook-and-line gear (6%), they are also caught incidentally with small mesh gillnets (21%) and occasionally by harpoon. Commercial landings declined 28% in 2008 to 147 t (round weight) from 204 t in 2007. Much of the commercial fishing for thresher shark occurs in the Southern California Bight, with the highest average proportion of landings over the last ten years occurring in the San Diego port complex. In 2008, however, the greatest amount of landings occurred in the Santa Barbara port complex, followed by San Diego and then Los Angeles/Orange County.

Recreational Fishery: California sportfishing regulations impose a two fish per day per angler limit on thresher sharks. In recent years, interest in thresher shark has increased as other sportfishing species have become more heavily regulated, and some fishing areas are closed to protect other fish species.

Fishery Management: In 2008, the Council evaluated the need to limit the sport take of common thresher sharks. Recreational catch had been increasing, due to the sportfishing public becoming more educated on how to target them. Concerns were raised that the HG might be exceeded and the majority of this catch was occurring during the spring thresher shark pupping season, and many of the fish caught appeared to be pregnant females. Additionally, although many thresher shark anglers practice catch and release fishing methods, a preliminary study indicated that thresher sharks caught by foul-hooking by the tail had poor survival rates when released. On further examination of the recent CRFS data, estimates of recreational thresher shark catches were found not to be causing cumulative landings to exceed the HG (Figure 12). Further, an analysis of bag limits showed that few anglers caught limits and a change in the bag limit would likely have little effect on recreational catch. The Council decided not to make changes to thresher shark regulations for the 2009-2010 management cycle, but did make a number of recommendations including: 1) continuing outreach to fishermen regarding best practices to increase survival of released animals, 2) improving data collection on thresher sharks (especially for private access marinas, and in commercial hook-and-line and non-HMS fisheries), 3) initiating a new stock assessment, incorporating data from Mexico, 4) better estimating the number and condition of released fish, 5) to further investigate recreational gear modifications to increase survival, and 6) to better identify thresher shark nursery areas.

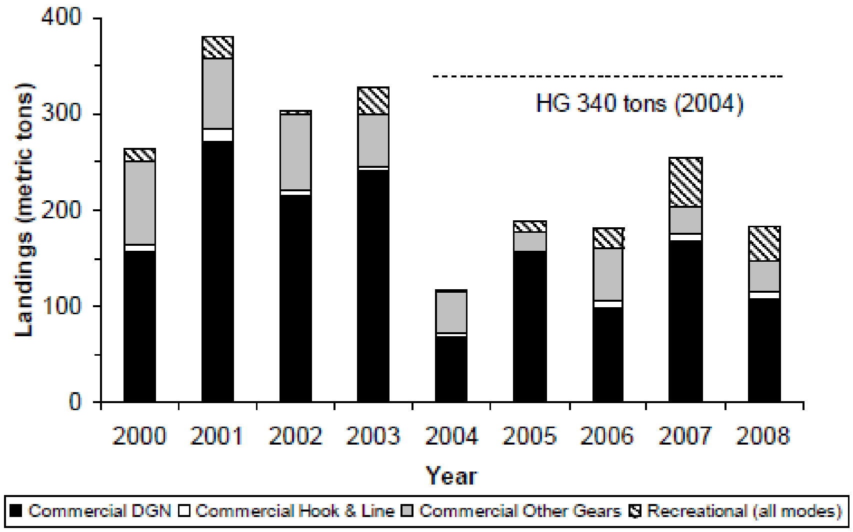


Figure 12. California landings of common thresher by commercial gear type and by the recreational fishery compared to the harvest guideline adopted in 2004. Notes: Commercial landings are from Commercial Fisheries Information System (CFIS) converted from pounds to round weight in metric tons, recreational landings as reported in MRFSS (all modes) from 2000 to 2003, and CRFS (all modes), 2004-2008.

Miscellaneous:

Sea Cucumber:

Source: Dale Sweetnam, CDFG

In 2008 a combined total of 370 t of warty sea cucumbers, *Parastichopus parvimensis*, and giant red sea cucumbers, *Parastichopus californicus*, was landed in California (Figure 13). The warty sea cucumber dive fishery occurs primarily in southern California from Santa Barbara County to San Diego County, including the offshore Islands. The giant red sea cucumber trawl fishery occurs in the southern California Bight with most trawling occurring in the Santa Barbara and the Santa Catalina Channels. Most of the frozen or processed sea cucumber product is shipped overseas to Hong Kong, Taiwan, mainland China, and South Korea. Small quantities are also purchased by Asian markets within the United States.

Commercial landings of sea cucumber in California were first recorded in 1978 at ports in Los Angeles County. Landings averaged less than 15 t annually until 1982, when the principal fishing area shifted to the Santa Barbara Channel. Landings of sea cucumber fluctuated from 24 to 73 t over the next eight years. In 1991 the annual harvest of sea cucumber quadrupled to more than 262 t. Since then, annual harvest has fluctuated between 200-450 t. Through the first 18 years of the fishery, trawl landings comprised an average of 75% of the annual sea cucumber harvest, but between 1997 and 2002, divers accounted for up to 88% of the combined sea cucumber landings.

There are no seasonal restrictions, size limits or harvest quotas for the commercial take of sea cucumbers. A restricted access permit was required beginning with the 1992-1993 fishing season. The permit was based on meeting a 22.7 kg (50 lb) landing requirement during a four year (January 1988 to June 1991) window period. In 1997 new legislation imposed additional regulatory measures on the sea cucumber dive and trawl fisheries. The major management changes included the creation of separate permits for the dive and trawl fisheries, and the imposition of a permanent ceiling on the total number of permittees allowed to harvest sea cucumbers (130 divers and 40 trawl fishermen). Additionally, a mechanism allowing for the transfer of sea cucumber permits was included in the new legislation. By 2000 there were 113 sea cucumber dive permittees and 36 sea cucumber trawl permittees. In 2008, the numbers of permitted dive and trawl sea cucumber fishermen had further dropped to 84 and 18, respectively. The decline in numbers was primarily due to retirements and attrition among the older permittees, and by the shift by some of the dive and trawl fishermen into other, more lucrative, commercial fisheries.

Sea cucumbers exhibit a patchy distribution, a relatively short life span, a low age at maturity, sporadic recruitment, and a high natural mortality. Species with these characteristics typically have a low maximum yield per recruit and are vulnerable to overfishing; however, it is expected that the southern California populations of warty and giant red sea cucumber can sustain current harvest levels, based on the effort-limiting permit restrictions placed on the trawl and dive fisheries.

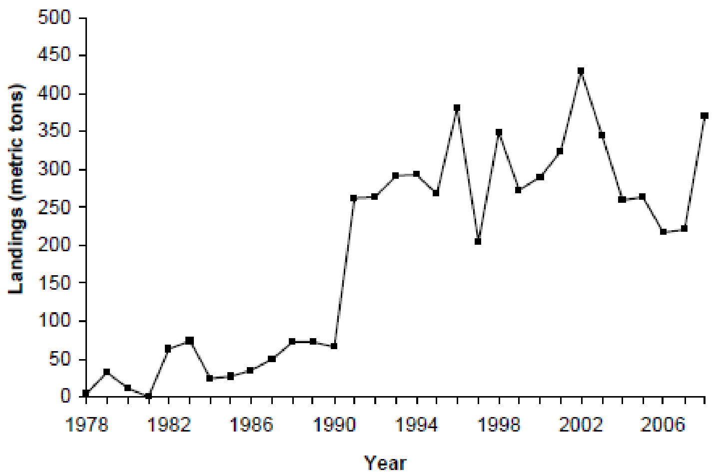


Figure 13. California commercial landings of warty (*Parastichopus parvimensis*) and giant red (*Parastichopus californicus*) sea cucumbers, 1978-2008.

Ecosystem indicators for the Central California Coast, May-June 2009:
Source: John Field, Steve Ralston and Keith Sakuma, Fisheries Ecology Division, SWFSC
The Fisheries Ecology Division of the SWFSC has conducted an annual midwater trawl survey for juvenile rockfish and other pelagic nekton along the Central California coast in late spring (May-June) since 1983. The survey targets pelagic juvenile rockfish for fisheries oceanography studies and for developing indices of year class strength for stock assessments, although many other commercially and ecologically important species are captured and enumerated as well. Results here summarize trends in the core area of the survey (Carmel to Bodega Bay) since 1990, as not all species were consistently identified in earlier years. All previous cruises took place on the NOAA ship DAVID STARR JORDAN, but in 2009 the NOAA Ship MILLER FREEMAN was utilized. The data for the 2009 survey presented here are preliminary and do not take into account possible differences in catchability between the two vessels. Additionally, this cruise has sampled a greater spatial area since 2004 (Cape Mendocino to the U.S./Mexico border); however the results presented here focus on the core survey area. Results from the expanded survey area will be developed for future reports.

Standardized anomalies from the log of mean catch rates are shown by year for six key forage species and assemblages that are sampled in this survey (Figure 14). Most are considered to be well sampled, although the survey was not designed to accurately sample krill, and those numbers should be considered with caution (interpretation of acoustic data from this survey to better assess krill trends in abundance is ongoing). Trends in 2009 were of increasing abundance for the species and assemblages that tend to prosper in cool and productive conditions, including juvenile rockfish, Pacific hake, market squid and krill. However, while the trends in relative abundance for rockfish and squid have increased since record low values in the 2005-2006 period, this increase has only returned levels close to the long term mean (krill being a possible exception). By contrast, coastal pelagic forage species, and especially northern anchovy, that are typically observed in greater numbers during warmer, less productive periods were at low levels in 2009.

The trends observed in these six indicator species are consistent with trends across a number of other taxa within this region. When the covariances among fifteen of the most frequently encountered species are evaluated in a Principal Components Analysis (PCA), there are strong loadings for the groundfish young-of-the-year taxa (rockfish, Pacific hake, rex sole and sanddabs) as well as cephalopods, and euphausiids, with slightly weaker (and inverse) loadings for Pacific sardine, northern anchovy, and several species of mesopelagic fishes. The first and second components (Figure 15) explain 39% and 14% of the variance in the data respectively (component scores and loadings were shown in the fall 2008 PaCOOS report for reference, and have changed little in the most recent analysis), and plotting the time trend of the two components against each other, some patterns seem to emerge. In particular, the clupeoid-mesopelagic group was prominent during the 1998 El Niño and during the anomalous 2005-2007 years, while the groundfish group prospered during the early 1990s and the cool-phase between 1999 and 2003. As with the 2008 data, results from this year continue to represent a return to approximately long term mean conditions.

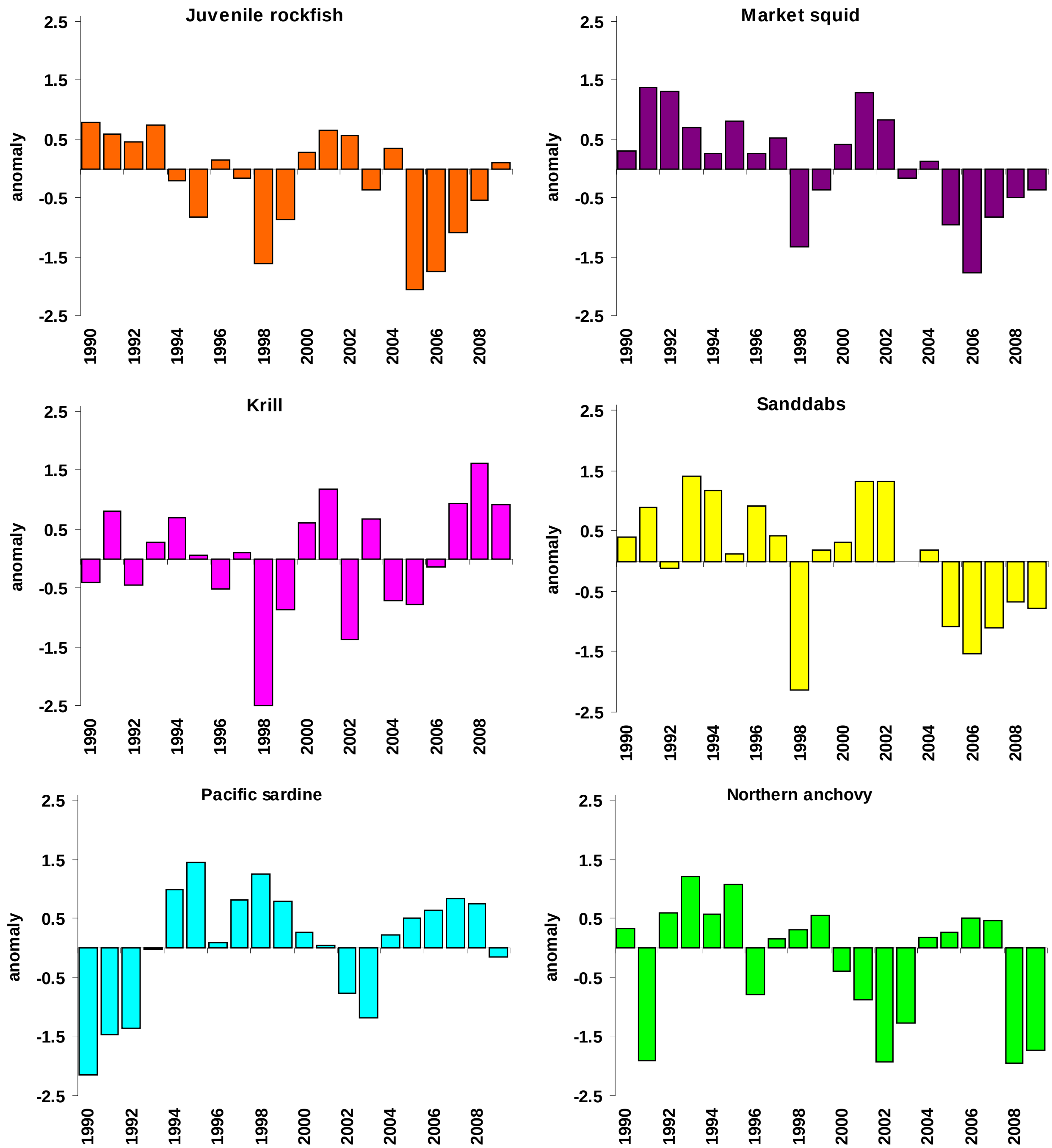


Figure 14. Long-term standardized anomalies of several of the most frequently encountered pelagic forage species from the central California rockfish recruitment survey in the core region (anomalies are based on the entire 1983-2009 period for all groups except krill).

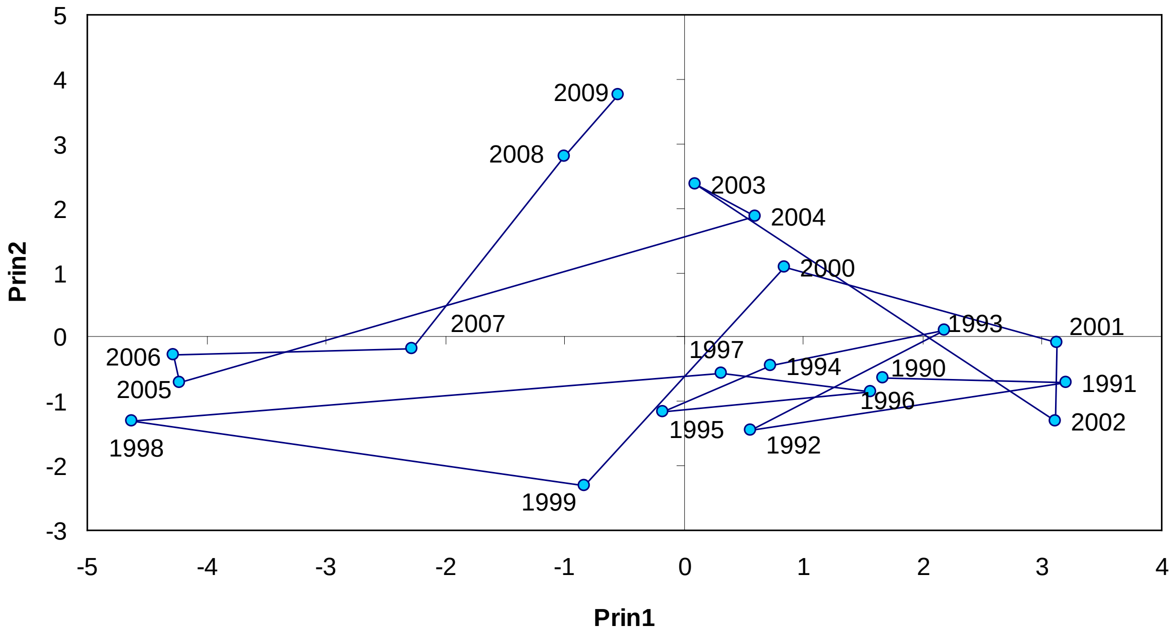


Figure 15. Principal component scores plotted in a phase graph for the most frequently encountered species sampled in the central California core area in the 1990-2009 period.

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.

Washington HAB Summary

Source: WA Department of Fish and Wildlife **http://www.wdfw.wa.gov/fish/shelfish/razorclm/levels/levels.htm**

The Washington Department of Fish and Wildlife (WDFW) provides the latest information on domoic acid levels from five major management zones, which include Long Beach, Twin Harbors, Copalis Beach, Mocrocks, and Kalaloch. Regular samples of both razor clams and Dungeness crab are collected by WDFW and are tested for domoic acid levels. The level of domoic acid determined to be unsafe for human consumption by the Federal Food and Drug Administration (FDA) is 20 ppm in shellfish meat tissue. Please visit the WDFW website for the most current information on domoic acid levels and closures.

Oregon HAB Summary

Source: Oregon Department of Agriculture Food Safety Division **http://egov.oregon.gov/ODA/FSD/shellfish_status.shtml**

Paralytic shellfish poisoning (PSP) and domoic acid:

Mussel sampling for evaluation of shellfish toxin levels are done frequently by the Oregon Department of Agriculture. The shellfish safety toll-free hotline (1-800-448-2474) provides the most current information regarding shellfish safety closures for Oregon. Status of HABs in OR as of July 10, 2009: PSP levels have risen above the alert level in mussels on the North and Central Oregon Coast and domoic acid results continue to test below the alert level along the entire Oregon Coast, from the mouth of the Columbia River to the California border.

Source: Oregon Department of Fish and Wildlife http://www.dfw.state.or.us/MRP/shellfish/razorclams/plankton.asp
Source: Zach Forster, Phytoplankton Sampling Coordinator. MOCHA Project, Shellfish Project
Marine Resources Program, Oregon Department of Fish and Wildlife

Oregon's Harmful Algal Bloom (OHAB) project monitors ten sites along the coast of Oregon (three along Clatsop Beach, one on Cannon Beach, two on the central coast and four sites on the south coast, Figure 16) for evidence of the phytoplankton species *Pseudo-nitzschia* and *Alexandrium*.

Cell counts from the north coast in mid June remained high in dinoflagellate abundance and diversity. *Pseudo-nitzschia* counts increased along Clatsop Beach with a high 115,000 cells/liter comprised mainly of what appears to be *P-n australlis* and *P-n multiseries*. *Pseudo-nitzschia* cell counts from south coast sample sites fluctuated a bit although sampled cells are consistently in the smallest (*P.deli*) group and well below alert levels. Dinoflagellate activity remains low.

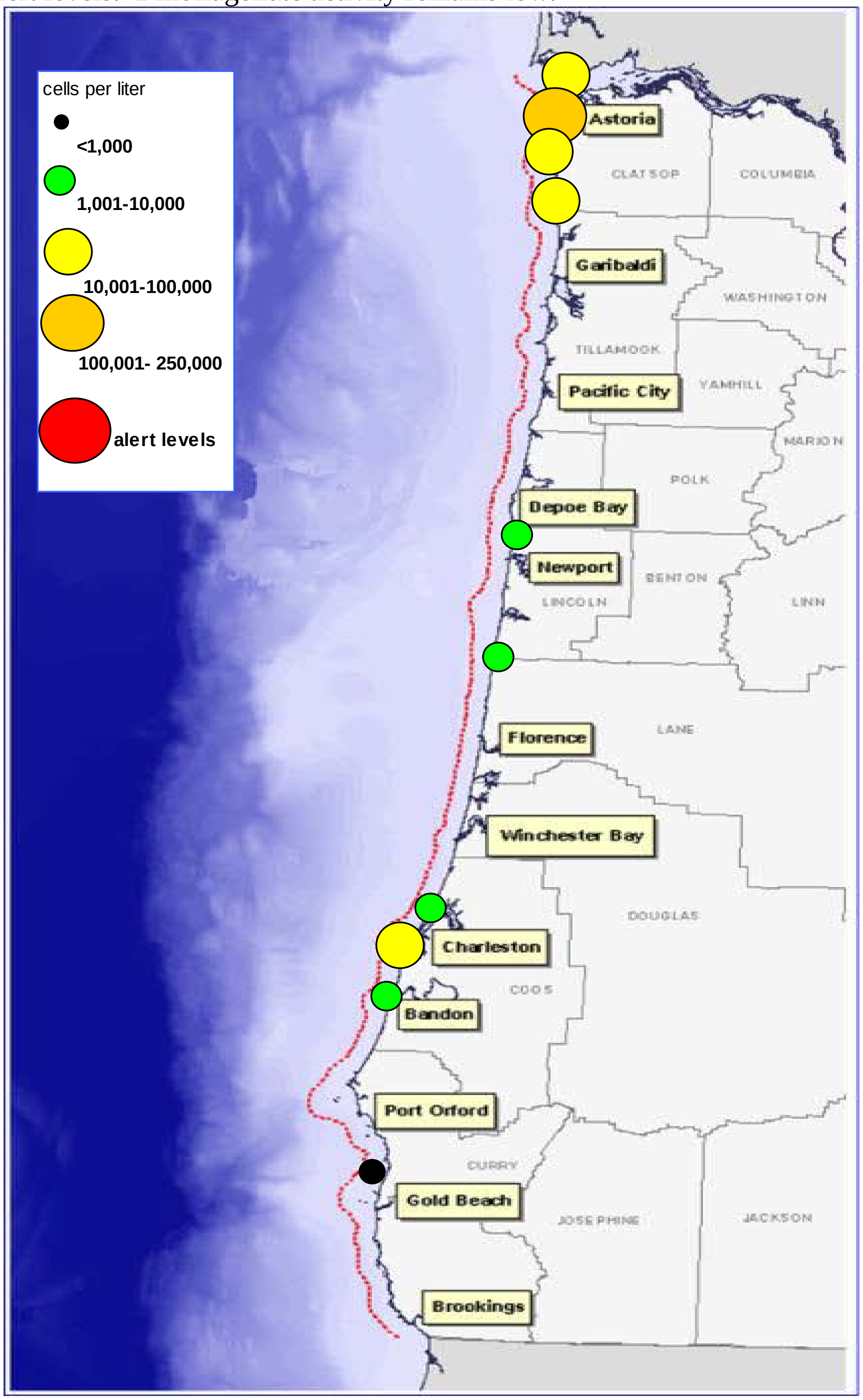


Figure 16. Oregon's Harmful Algal Bloom monitoring project in conjunction with Oregon Department of Agriculture is working to monitor ten sites along the Oregon coast. The coastal distribution of *Pseudo-nitzschia* (cells per liter) for June, 2009 are shown.

California HAB Summary

Source: SCCOOS HAB monitoring team, the NOAA-funded MERHAB RADPALERT project at USC, the Center for Embedded Networked Sensing project at USC, the Orange County and Los Angeles County Sanitation Districts, the Pacific Marine Mammal Center, the Fort MacArthur Marine Mammal Care Center, the Wetlands and Wildlife Care Center and the International Bird Rescue Research Center, http://www.sccoos.org/

In early May 2009, bird and marine mammal strandings occurred in the Los Angeles and Orange County areas with a possible link to domoic-acid (DA) poisoning. Significant numbers of the domoic-acid producing diatom *Pseudo-nitzschia* were detected at SCCOOS Harmful Algal Bloom study sites at Stearn's Wharf, Newport Pier, and Scripps Pier the first week in May. USC Webb Gliders running transects around Catalina Island also showed significant subsurface chlorophyll maximum. Additionally, low levels of domoic acid were detected in and around the Los Angeles Harbor at the end of April.

In mid May, a widespread domoic acid poisoning event occurred as a result of a *Pseudo-nitzschia* bloom in the waters off southern California. Over the last few months *Pseudo-nitzschia* has been consistently detected in samples from the Santa Barbara, Los Angeles and Orange County regions. Domoic acid has been detected in low concentrations throughout the region from San Luis Obispo to San Diego, based on monitoring from piers. More extensive sampling in coastal waters in the San Pedro Shelf area during April and early May confirmed a domoic acid event with significant levels of domoic acid and *Pseudo-nitzschia* detected. There have been a substantial number of marine mammal and bird strandings and deaths in the Los Angeles and Orange County areas, especially during the first few weeks of May, and approximately half of the marine mammal samples that had been analyzed were positive for domoic acid.

USC Webb Gliders showed a subsurface chlorophyll maximum in the thermocline in San Pedro Bay south of Newport Beach and samples confirmed a large population of *Pseudo-nitzschia* and significant levels of domoic acid. In June, the gliders detected a subsurface chlorophyll maximum on the eastside of Catalina Island (no water samples have been obtained). Although the gliders do not measure domoic acid directly, barnacles taken from the gliders after a multi-week deployment showed high concentrations of domoic acid in their tissue.

Dissolved Oxygen Concentration:

Source: Bill Peterson, NOAA

Oxygen concentrations in deep water at the mid-shelf station, NH 05, on the Newport transect line declined to relatively low levels (2.4 ml L^{-1}) in early April, and to 1.87 ml L^{-1} in late April as a result of an early start to the upwelling season (Figure 17). A downwelling event in early May raised concentrations briefly to < 5 ml L^{-1} but a resumption of upwelling lowered values to 1.5-1.9 throughout the remainder of May and through June. Hypoxia (values < 1.4 ml L^{-1}) has not yet been observed.

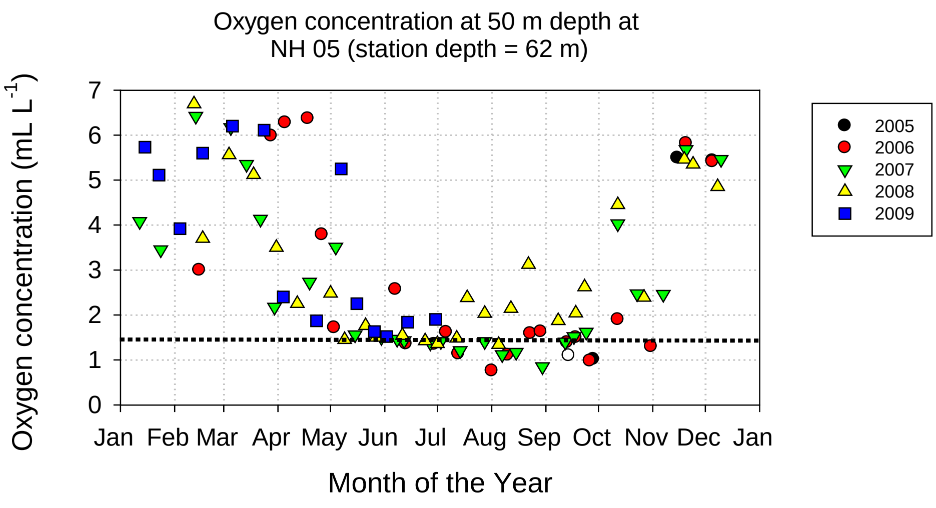


Figure 17. Oxygen concentrations at station NH-05 (five miles off Newport, Oregon, along the Newport Hydographic Line), at a depth of 50m.

Spatial Patterns and Oxygen Anomalies from the Spring CalCOFI Survey:

Source: Ralf Goericke

The spring CalCOFI survey was conducted between March 8th – 22nd, 2009. Data collected during this cruise are still at a preliminary stage of data processing. Mixed layer (ML) temperatures, averaged over the 66 station survey area were similar to those observed over the last decade, suggesting that the influence of the equatorial La Niña conditions had abated. Nutricline depths (the depth where concentrations of nitrate reach values of 1 μM) had returned to normal values as well after a period of shallow nutricline depths associated with the La Niña conditions. Concentrations of nutrients in the mixed layer were at or below long-term averages and possibly as a consequence phytoplankton biomass (Chl a) and rates of primary production were below values expected for this season.

Dynamic height anomalies showed the California Current flowing through our study area in an approximately SSE directions (Figure 18a), branching off towards the SE and SSW along Line 90. Low ML temperatures (Figure 18b) and high concentrations of nutrients off Point Conception and SW of the Channel Islands suggest that coastal and open ocean upwelling had occurred or was occurring actively. However, phytoplankton blooms were only observed in the Santa Barbara basin (Figure 18d). It is likely that the spring bloom had not yet fully developed. Oxygen anomalies at a depth of 100 m continued to be negative along the inshore sections of the survey lines (Figure 19), continuing patterns observed since 2003.

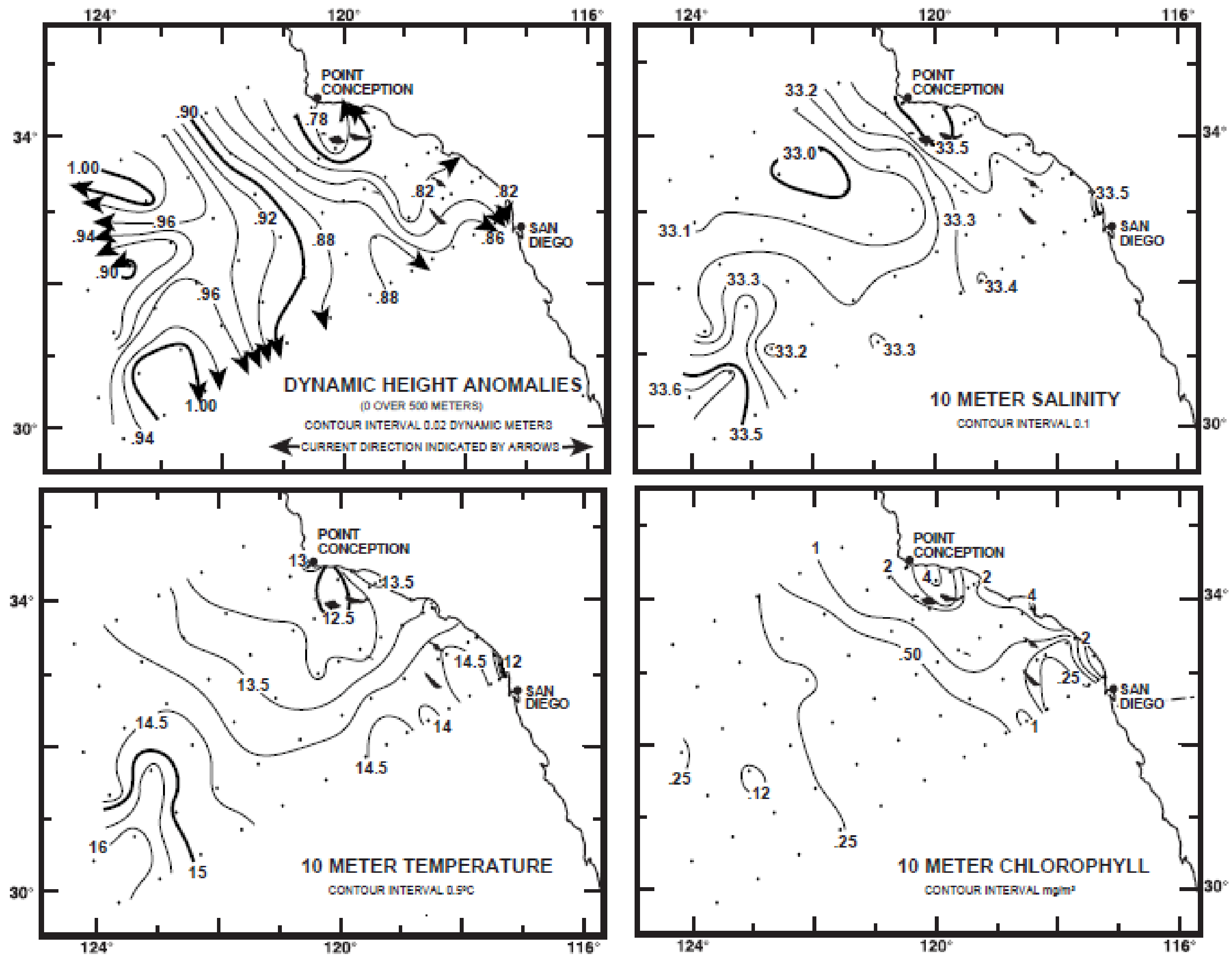


Figure 18. Spatial patterns for CalCOFI cruise 200903 including upper-ocean geostrophic flow estimated from the 0/500 dbar dynamic height field, 10 m salinity, 10 m temperature, and 10 m chlorophyll a.

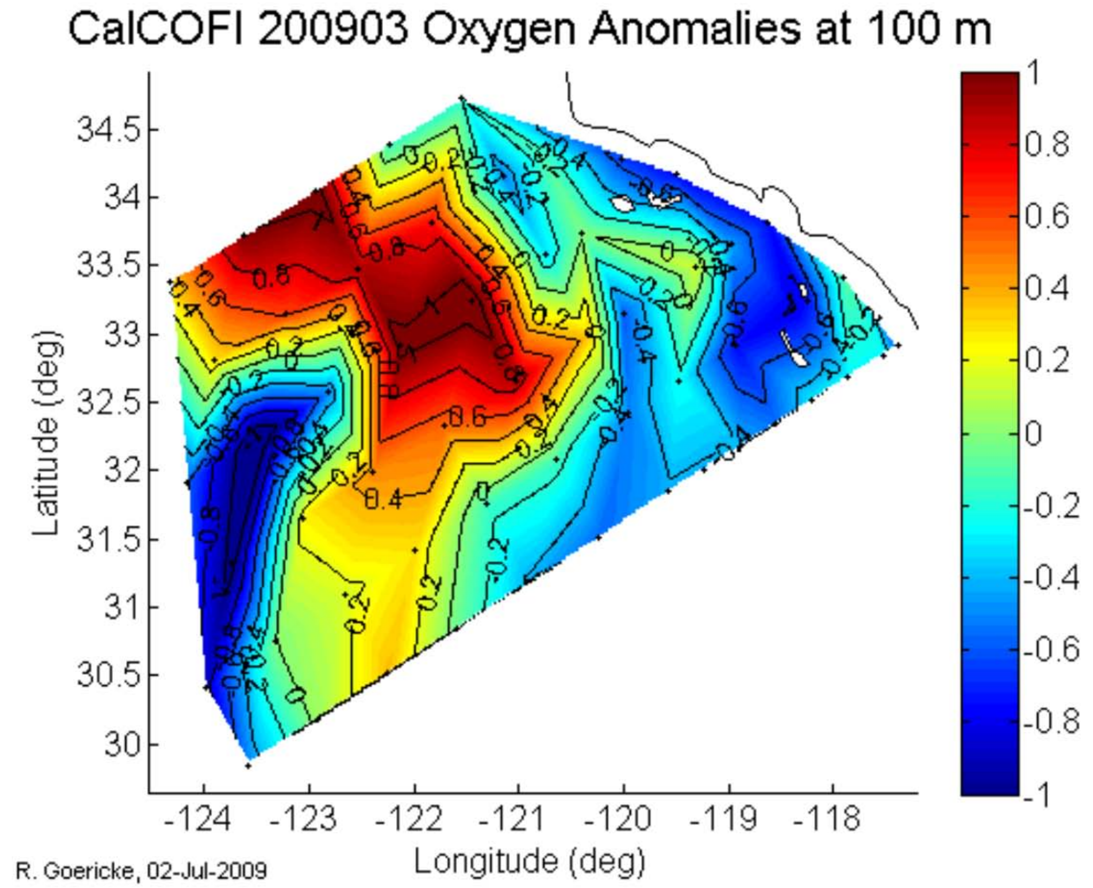


Figure 19. Oxygen concentration anomalies (mL O2 per L; anomalies relative to the 1984 to 2008 time series) at a depth of 100 m in the Southern California Bight.

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