

CLIMATE NARRATIVE, October 2019 and as noted

UNITED STATES WEST COAST AND NORTH PACIFIC

During the final week of October 2019 sea surface temperatures (SST_o) ranging from 10° to 14°C were common along the coast of the US north of 34°N. Active upwelling occurred from Point Reyes (38°N) to Cape Blanco (42.8°N). Off southern California, SST_o was 16°-20°C. Cooler coastal water extended 300 km off Cape Blanco and 500 km off Northern California. Negative SST_o anomalies ($\leq 1.5^\circ\text{C}$) occurred from 20°-55°N, extending 50-200 km seaward. Positive SST_o anomalies ($\leq 2.5^\circ\text{C}$) were common west of 140°W to 180°E/W from 22°N northward into the eastern Bering and Chukchi Seas (69.5°N). Positive SST_o anomalies were less intense than in September. North of 30°N, areas of negative SST_o anomaly were found westward from 180°E/W to 160°E. Then positive SST_o anomalies extended westward into the Sea of Japan. During late October, negative **sea level height anomaly** (SLA), occurred along the coast of North America from 15°N to 35°N. At 15°N a band of negative SLA (≥ 20 cm) extended across the North Pacific (NP) from 100°W to 120°E and northward along the western boundary to 30°N. Positive SLA anomaly (≤ 15 cm) was characteristic of the NP from 20° to 40°N.

<https://www.ospo.noaa.gov/Products/ocean/sst/anomaly/>

https://coastwatch.pfeg.noaa.gov/el_nino/coastal_conditions.html (current)

<https://coastwatch.pfeg.noaa.gov> <https://climateresearcher.org/wx/DailySummary/#sstanom> (current)

http://www.cpc.ncep.noaa.gov/products/analysis_monitoring/ocean/weeklyenso_clim_81-10/wksl_annm.gif

Late October eight-day composite satellite imagery for the US west coast showed coastal bands of **chlorophyll-a** in mg/m³ concentration units (chl-a) extending farther offshore at generally lower concentrations than in previous months. Concentrations of 0.2- 2.0 mg/m³ were found extending 200-500 km offshore from Southern California to the Gulf of Alaska. A particularly long filament extended west off Northern California at 37°-39°N. Greater concentrations (6-15 mg/m³) occurred within these long filaments. These higher concentrations also occurred within 150 km of the coast between 34°-37°N and 44-55°N. Off Southern California, coastal chl-a bands narrowed and appeared less concentrated on the surface. Chl-a concentrations between 0.01 and 0.1 mg/m³ were found within 200 km of shore and offshore across the temperate NP.

[https://coastwatch.pfeg.noaa.gov/erddap/griddap/erdVHNchl8day_graph?chla\[\(2019-09-26T00:00:00Z\)\]\[\(0.0\)\]\[\(83.65125\);\(-0.10875\)\]\[\(193.76625\);\(-110.00625\)\]&draw=surface&.vars=longitude%7Clatitude%7Cchla&.colorBar=%7C%7C%7C%7C%7C%7C&.bgColor=0xffecccff](https://coastwatch.pfeg.noaa.gov/erddap/griddap/erdVHNchl8day_graph?chla[(2019-09-26T00:00:00Z)][(0.0)][(83.65125);(-0.10875)][(193.76625);(-110.00625)]&draw=surface&.vars=longitude%7Clatitude%7Cchla&.colorBar=%7C%7C%7C%7C%7C%7C&.bgColor=0xffecccff)

<https://coastwatch.pfeg.noaa.gov/coastwatch/CWBrowserWW180.jsp#>

October SST_o at Buoys

Offshore **Torrey Pines**, (46225) 32.9°N, 177.4°W at 549 m depth, the average SST during October 2019 (SST_o) was 19.6°C, with extremes of 16.1°C and 21.7°C occurring on the 31st and 1st of October, respectively. Average temperatures were 20.7, 19.3, 18.8°C for the first, second and final thirds of October, noted below as [20.7_H, 19.3, 18.8_L°C] and indicating the monthly third associated with High (H) and Low SST_o (L).

Santa Barbara Channel Buoy, 46053 at 34.3°N, 119.9°W, multi-year average October SST, (SST_a) and SST_o were 16.9° and 17.6°C (15.8°-19.1°C), respectively, with [17.9, 17.3_L, 17.6_{LH} °C]. At the Harvest Buoy (46218), 34.5°N, 120.8°W, offshore **Point Conception** at 550 m depth, SST_o was 15.7° (12.6-19.4°C), with [15.6, 15.0_L, 16.5_H°C].

At the **San Francisco Buoy** (46026) 18 NM west of San Francisco (37.8°N, 122.8°W), SST_a and SST_o were 13.8° and 12.8° (11.5-14.4°C), with [12.7, 12.9, 12.8]_{LH}°C]. At the **Eel River Buoy** (46022) 17 NM WSW of Eureka, CA (40.7°N, 124.5°W) October SST_a and SST_o were 12.2°C and 11.4°C (9.6-12.9°C), respectively [16.7_H, 16.6_H, 13.4_L°C]. The **Tillamook Buoy** (46089), 85 nautical miles WNW of Tillamook, OR (46°N, 125.8°W), recorded SST_a and SST_o of 15.1° and 15.4°C (13.3-17.3°C), respectively, [16.6_H, 15.5, 14.3_L°C]. Near **Cape Elizabeth** (46041), 45 NM northwest of Aberdeen, WA (47.4°N, 124.7°W) SST_a and SST_o were 12.3°C and 13.1°C (11.6°-15.6°C), respectively, [13.9_H, 13.0, 12.5_L°C]. **Neah Bay Buoy** (46087), 6 NM north of Cape Flattery (48.5°N, 124.7°W), October SST_a and SST_o were 10.9° and 10.8°C (9.0-12.9°C), respectively, [11.0_H, 11.0, 10.4_L°C]. SST is measured 0.4-1.0 m below the level sea surface, depending on buoy type.

https://www.ndbc.noaa.gov/station_page.php?station=46087

October shore station temperatures

The **La Jolla** (32.9°N) **SIO-Manual Shore Station Program** found SST_o daily highs of 21°C in early October with daily SST_o anomaly about 2°C. SST_o decreased to 18.4°C with daily anomaly less than 1°C at the end of October. Multi-year mean (SST_a) for October is 18.4°C. <https://scripps.ucsd.edu/programs/shorestations/> **La Jolla Subtidal Water Temperature** (STWT), measured at fixed depth below the lowest tide at tide gauging stations, had October mean of 18.8°C, with range from 13.9° to 21.2° (13.9°-21.2°C). Averages during the first, second and third 10-day October periods were 19.6, 18.3 and 18.4°C, respectively [19.6_H, 18.3_L, 18.4_L°C]. At the **Santa Monica pier** (34°N) October average STWT was 19.1°C (16.8-20.6°C), with [19.4, 19.0_H, 18.7_L°C]. At Port San Luis pier (35.1°N) October average STWT was 14.6°C (13.2°-16.4°C), with [15.0_H, 14.7, 14.1_L°C]. In Southern **Monterey Bay** (36.6°N) average October STWT was 14.9°C (11.7-17.5°C), with [16.1_H, 14.8, 13.6_L°C]. **Arena Cove** (38.9°N) average STWT for October was 10.5°C (9.5-11.9°C), with [10.5_H, 10.8_H, 10.3_L°C]. **Crescent City** (41.7°N) average October STWT was 11.5°C (9.9-13.6°C), with [11.9_{LH}, 11.6, 11.1°C]. **Port Orford** (42.7°N) average STWT was 10.2°C (8.1- 12.0°C), with [10.3_H, 10.4_H, 10.0_L°C]. **Neah Bay** (48.4°N) October STWT average was 10.4° (8.1-11.9°C), with [10.7_H, 10.3, 10.2_L°C].

<https://tidesandcurrents.noaa.gov/stations.html?type=Physical%20Oceanography>

EQUATORIAL AND SOUTH PACIFIC (late October and as noted)

During October, areas of negative SST_o anomaly ($\geq -2^\circ\text{C}$) seen along the Equatorial Pacific (EP) in September decreased in western extent, but persisted east of 100°W. Neutral to positive SST_o anomaly also increased in the western EP. Eastern EP upper 300-meter heat content anomaly became strongly positive equaling the values of April 2019. Above 200 m depth subsurface temperature anomalies became positive ($\leq 3^\circ\text{C}$) across the EP between 110° W and 160°E. Neutral to negative SST_o anomaly ($\geq -1.5^\circ\text{C}$) occurred in the South Pacific (SP) east of 120°W and in the west around New Zealand and Australia. The central SP had positive SST_o anomaly that extended spatially north east to 130°W. **Sea level height anomaly** (SLA) was negative along the eastern Pacific boundary from 30°S to 35°N. Negative SLA extended westward to 160°W at 5°S. Negative SLA occurred in the western Pacific around Australia and Indonesia. Positive SLA (≤ 15 cm) occurred in the central SP north of 20°S from 160°W to 160°E.

At 60°S, Antarctic sea ice area was below average extent and below 2018 extent during 2019. <http://www.ospo.noaa.gov/Products/ocean/sst/anomaly/>
<https://www.climate.gov/news-features/understanding-climate/understanding-climate-antarctic-sea-ice-extent>
https://www.cpc.ncep.noaa.gov/products/analysis_monitoring/lanina/enso_evolution-status-fcsts-web.pdf
http://www.cpc.ncep.noaa.gov/products/analysis_monitoring/ocean/weeklyenso_clim_81-10/wksl_anm.gif

The NOAA **Oceanic El Niño Index** (ONI) (3-month running mean of SST anomalies in the Niño 3.4 region) remained near neutral with a 0.1 value at the end of October. http://www.cpc.ncep.noaa.gov/products/analysis_monitoring/lanina/enso_evolution-status-fcsts-web.pdf
<https://climatedataguide.ucar.edu/climate-data/multivariate-ensio-index> (alternate index)

The October 2019 NOAA/NCEI **Pacific Decadal Oscillation Index** (PDO), calculated from ERSST.v4, was neutral (-0.81), the lowest value since June 2018. PDO and ONI indices are recalculated and may change as data are assimilated into the data base. <https://www.ncdc.noaa.gov/teleconnections/pdo/>, <http://research.jisao.washington.edu/pdo/PDO.latest.txt>

The **Pacific / North American Teleconnection Index** (PNA), computed from atmospheric pressure over the Pacific Ocean and North America had predominately negative daily values, with a monthly mean value of -1.21, the lowest since February 2019. <https://www.cpc.ncep.noaa.gov/data/teledoc/pna.shtml> (see computational alternatives).

October monthly ERD/SWFSC coastal **Upwelling Indices** (UI) had positive UI anomalies from 36°N northward to the Gulf of Alaska (60°N). Conditions favorable for upwelling are indicated only for 42°N southward. Conditions strongly favorable for upwelling were computed for 39°N, with a high seasonal anomaly.

<https://upwell.pfeg.noaa.gov/products/PFELData/upwell/monthly/table.1910> Daily UI calculations indicate favorable upwelling conditions at 39°N on 21-23, 26-27 October.
<https://oceanwatch.pfeg.noaa.gov/products/PFELData/upwell/daily/p09dayac.all> (see computational alternatives)

PRECIPITATION and RUNOFF (late October)

Drought conditions eased in coastal Oregon and Washington and southern Canada with rains in September and October <https://droughtmonitor.unl.edu>. Northern CA, OR and WA received 2-12 inches of rain during September, but the rate of precipitation slowed during October bringing accumulated seasonal rainfall to average or below average values. The **Fraser River**, measured at Hope (130 km upriver from Vancouver, B.C.), was flowing near 3,100 m³/s (109,461 cubic feet /sec or cfs) in late October; multi-year median for Hope is 1,600 m³/s. <https://wateroffice.ec.gc.ca> The **Puyallup River** at Puyallup, WA was flowing at 925 cfs [1,490 historical median as cfs in brackets]. **Skagit River** flow was 11,500 [12,800 cfs] near Mount Vernon. **Stillaguamish River** discharge was 817 [1,360 cfs] at Arlington. **Columbia River** transport at the Dalles was 129,000 [102,000 cfs] and 140,000 cfs [120,000 cfs] at Vancouver WA. At Elkton, OR, the **Umpqua River** transport was 1,400 [1,530 cfs]. **Rogue River** flow was 1,350 [1,500 cfs] at Grants Pass and 1,790 [1,930 cfs] at Agnees. The **Klamath River** near Klamath, CA was transporting 3,150 [4,260 cfs]. Near Crescent City, **Smith River** discharge was 404 [551 cfs]. The **Eel River** at Scotia had 149 [242 cfs] transport. At the **Battle Creek**, Coleman National Fish Hatchery, the flow was 363 [281 cfs]. **Butte Creek** at Chico had 121 [126 cfs] transport. **Sacramento River** transport was 10,700 [9,480 cfs] at Verona and 12,100 [11,000 cfs] at Freeport. **San Joaquin River** flow was 2,260 [1,930 cfs] at Vernalis. **Pescadero Creek** transport was 3 [2.8 cfs] near Pescadero, CA. **San Lorenzo River** discharge was 14.7 [14 cfs] at

Santa Cruz. **Pajaro River** at Watsonville was flowing at 1.9 cfs. The **Salinas River** near Spreckels was not flowing [1.4 cfs]. The **Carmel River** at Carmel was flowing at 4.5 [0 cfs]. The **Big Sur River** near Big Sur, CA flow was 18 [17 cfs].

<https://waterdata.usgs.gov/ca/nwis/current/?type=flow>

<https://www.cnrfc.noaa.gov/awipsProducts/RNOWRKCLI.php>= (current

https://wateroffice.ec.gc.ca/search/real_time_results_e.html

https://www.epc.ncep.noaa.gov/products/global_monitoring/precipitation/global_precip_accum.shtml

Notes

The **Oregon Recreational Albacore fishery** is well known and has been featured on National TV. Summer and fall of 2019 brought the best recent season with 7 albacore caught per angler trip (7/angler-trip). One boat out of Charleston, OR (43.3°N), claimed a day's total of 75 fish and a single angler reported a day's catch of 47 albacore. In the previous 20 seasons, only 2001, 2007 and 2018 exceeded a catch rate of 4 albacore /angler-trip. A record 35,853 albacore were landed by the recreational fleet in one week during August, twice the weekly record. An estimated 101,371 albacore were landed by recreational fishers by 22 September, 161% of previous seasonal maximum.

Recreational anglers sometimes travel more than 150 kilometers (km) offshore, but in 2019 productive fishing was occasionally found within 12 km of shore. Albacore came with the warm water ($\geq 15.1^{\circ}\text{C}$) found near shore north of the Cape Blanco upwelling system during July, August and September. Calm weather allowed daily small-boat fishing. Fish ranged in weight from 5 to 35 pounds (2-16 kg), but many fish were in the 2-4 kg range. As is frequently the case, thresher shark, short fin mako shark, bluefin tuna, yellowtail, dolphinfish (dorado), and striped marlin were also reported by the recreational anglers.

<https://myodfw.com/recreation-report/fishing-report/marine-zone>

<https://myodfw.com/fishing/species/albacore-tuna> Details on the life history of albacore and the US West Coast commercial albacore fishery are found, <https://www.fisheries.noaa.gov/species/pacific-albacore-tuna>

Paralytic Shellfish Poison (PSP) is measured in micrograms per 100 grams ($\mu\text{g}/100\text{ gm}$) of shellfish meats and **Domoic Acid (DA)** is measured in parts per million (ppm). A test result of 80 or above for PSP is the closure limit. A result of 20 or above for DA is the closure limit. Coastal shellfish in CA, OR, WA and BC, Canada (each with its own testing and health advisory programs) are monitored. Advisories or quarantines are issued when some of sampled shellfish from an area test $\text{PST} \geq 80$ or $\text{DA} \geq 20$.

Shellfish sold commercially by certified harvesters and dealers are subject to frequent mandatory testing. During August 2019 the California Department of Public Health (CDPH) advised consumers not to eat sport-harvested **mussels, clams, or whole scallops** from Sonoma County, CA. (38.3° - 38.7°N) because of $\text{PST} \geq 80$ in some samples.

At the end of October, the CDPH issued advisories against consumption of **Dungeness Crab** viscera (internal organs) from recreational crab harvest from Shelter Cove (40°N) to Point Arena (39°N) and from Point Reyes (38°N) to Pillar Point (37.5°N). **Razor clams** from Del Monte and Humboldt Counties (40° - 42°N) continue to have $\text{DA} \geq 20$ ppm. **Mussels** from this northern area remained quarantined after the CA statewide seasonal quarantine ended on 31 October. <https://www.wildlife.ca.gov/fishing/ocean/health-advisories>
https://www.cdph.ca.gov/Programs/CEH/DRSEM/CDPH%20Document%20Library/EMB/Shellfish/RazorClams_DA_Table110819.pdf Oregon recreational harvest of razor clams is closed from the south jetty of the Siuslaw River (44°N) to the California border. Some razor clams from Coos Bay and Winchester Bay have $\text{DA} \geq 20$ ppm. Otherwise, Oregon harvest of razor clams is

open. The OR recreational **mussel** harvest is closed from the Coquille River (43.1°N) to the California border, including all beaches, bays, rocks, piers and docks.

https://www.oregon.gov/ODA/programs/FoodSafety/Shellfish/Pages/ShellfishClosures.aspx?utm_medium=email&utm_source=govdelivery https://www.dfw.state.or.us/news/2018/12_december/120718.asp

Several beaches on the Washington coast have recreational harvest prohibition of specific species, however, every closure may not be due to elevated DA or PSP.

<https://fortress.wa.gov/doh/eh/portal/odw/si/BiotxinBulletin.aspx>

https://www.nwfsc.noaa.gov/research/divisions/efs/microbes/hab/habs_toxins/marine_biotoxins/index.cfm

This Narrative may be found, https://coastwatch.pfeg.noaa.gov/elnino/coastal_conditions.html
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