

data report

SURFACE WATER TEMPERATURE AND
SALINITIES AT SHORE STATIONS

California

2017

SIO Reference
June 2018
Updated March 2019

UNIVERSITY OF CALIFORNIA, SAN DIEGO
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LA JOLLA, CALIFORNIA 92093-0218

SURFACE WATER TEMPERATURES AND SALINITIES AT SHORE STATIONS
Including five-meter temperatures and salinities at Scripps Pier

United States West Coast

2017

M. L. Carter, J. T. Fumo, J. A. McGowan, E. Terrill, and R. E. Flick

SIO Reference
June 2018
Updated March 2019

Sponsored by:

State of California, Natural Resources Agency
Department of Parks and Recreation, Division of Boating and Waterways

With the assistance of the Coastal Ocean Observing Laboratory Personnel:
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INTRODUCTION

This report presents temperature and salinity data observed during 2017 at shoreline stations along the California coast from La Jolla to Trinidad. The data consist of daily temperature and salinity values when available with monthly means and ranges based on these observations. The data are also shown in plots, along with a climatological mean calculated from all the available historical data at each location.

This research is made possible through the cooperation of many groups and individuals who collect samples, process data, and provide financial support. Various agencies and individuals volunteer to make daily observations which are sent to the Coastal Ocean Observing Laboratory, Integrative Oceanography Division, Scripps Institution of Oceanography (SIO), for the preparation of this data report and to update computer records of the historical shore stations database. The agencies are: University of California at San Diego, University of California at Davis, Stanford University, Humboldt State University, Harbor Patrol for the City of Santa Barbara, Point Blue Conservation Science, Los Angeles County, the cities of Santa Barbara, San Clemente, and Newport Beach, California. Prior to 1994, financial support for data processing was provided by the State of California through SIO (1916-1949), then through the Marine Life Research Group at SIO (1949-1993). Starting in 1989, partial support was provided by both the State of California through the Marine Life Research Group (SIO) and the National Oceanic and Atmospheric Administration through the National Ocean Survey (1989-1993). Support for data processing was provided by the Joint Institute for Marine Observations, a cooperative agreement between SIO and the National Oceanic and Atmospheric Administration, from 1993-1995. SIO provided funding for basic observations during a ten-year funding gap from 1995 to 2005. Currently, support for program management and data processing is provided by the State of California, Natural Resources Agency, Department of Parks and Recreation, Division of Boating and Waterways (2005-2017).

Daily temperature values are collected by hand with an insulated bucket at 0.5 m from the ocean surface. Immediately after collection, a calibrated digital thermometer is immersed in the water and allowed to stabilize before recording to 0.01° C. Temperature measurements are rounded to 0.1° C and reported with data quality flags to indicate potential observer or instrument errors. However, occasional suspect extreme values may also be flagged to indicate that the value is believed to be uncertain.

Salinities from Trinidad Beach, Southeast Farallon Island, Granite Canyon, Balboa/Newport Beach, San Clemente, and La Jolla are obtained from the analyses of sea water collected in glass salinity bottles supplied by SIO. Seawater samples are forwarded to SIO at the end of each month for laboratory processing of each sample to determine salt concentration by measuring electrical conductivity using a GuildLine Instruments 8410A Portasal high precision conducting salinometer. Routine calibrations of the laboratory salinometer and secondary seawater standards are performed using IAPSO P35 Standard Seawater. IAPSO P35 and secondary seawater standards of known salt concentration are used as a reference for accurate determination of salinity. Salinities are reported to hundredths of a part per thousand based on the Practical Salinity Scale (PSS-78). Values of maximum salinities may possibly be in error due to evaporation or contamination of the samples, and may be flagged with a data quality flag to indicate a leaky bottle or uncertainty.

Reported salinities exceeding 34 PSU may represent freshly upwelled water, or they may be due to faulty sampling techniques, or to loosely sealed sample bottles. Salinity data are also compared to local rainfall data sets, available through the National Oceanic and Atmospheric Administration, National Climatic Data Center, to verify low salinity values. Generally, salinities less than 33 PSU are due to local precipitation or freshwater runoff. All salinities higher than 34.5 PSU have been omitted and uncertain salinities may also be flagged.

Data quality checks include elimination of gross errors and transcription errors, inclusion of calibration data, and verification of range and precision limits (0.1° C for temperature and 0.01 PSU for salinity). The data quality assurance and control routines are employed on a monthly basis for temperature data and on a quarterly basis for salinity. Data flags are employed to indicate data quality issues for archived temperature and salinity. Data flags are defined as follows: 0 = good, 1 = illegible entry, 2 = information on datasheet differs from salinity bottle label, 3 = uncertain, 4 = leaky bottle, 5 = sample collected as part of the SIO Pier Chlorophyll Program, 6 = data collected at slightly different location than normal.

The year's daily observations are shown on a parameter-versus-time plot for each station and parameter. Data flagged with 1, 3, and 4 are not included in any computations or plots. A climatological mean of all of the available daily historical data is also shown on each plot. The climatological mean for each julian day is a mean value calculated from all historical data at each location within an 11-day window, including 5 days prior and 5 days after the day of interest. Climatology is further smoothed with a 30-day running average. A table of climatological means and the current year's monthly means are presented below the plot for each station. Annual mean, maximum, minimum and percentage of days sampled and flagged are presented at the bottom of the table. Annual statistics are calculated using daily data for the year of interest. Percentage of days sampled includes all data and data flags, while days flagged represents the percentage of days with data flags of 1, 3, and 4, which are considered in error.

Data from active shore stations can be accessed online through the program website: <http://shorestation.ucsd.edu>. The header of each file contains a brief description of the station, data, and any long-term sampling changes.

STATION DESCRIPTIONS

The paragraphs that follow provide information about the active stations listed in geographical order as they occur from south to north. Many of the agencies and participants are volunteers, people seriously interested in the sea at their doorstep; it is these people to whom we owe the success of this long-range program, and we thank them for their help.

La Jolla, California *32°52.0'N, 117°15.5'W* Scripps Institution of Oceanography
1916-2017 (Surface) University of California, San Diego
1925-2017 (Bottom)

Aquarists and volunteers from Birch Aquarium at Scripps take daily temperature and salinity samples from the end of the Scripps Pier at the sea surface and near the bottom at a depth of about 5 meters. The proximity of Scripps Pier to the deep waters at the head of La Jolla submarine canyon results in data quite representative of oceanic conditions. Scripps Pier is a total of 1084 ft. long (330.4 M) and 22.5 ft. wide for most of its length. However it is 46.0 ft. wide at the end where the lab/pump house structure is situated with the west wall standing 88.0 ft. from the end of the pier (=996 ft. from the shore). The orientation is 277/97 degrees magnetic, 14 degrees east variation. The deck of the pier is 33.5 ft. above Mean Low Low Water (MLLW).

San Clemente, California *33°25.0'N, 117°37.0'W* City of San Clemente
1955, 1965-2017

Personnel of the Department of Marine Safety take daily temperatures and salinity samples from the San Clemente pier, with the salinity samples being returned to Scripps once a month for analysis by salinometer. This station was established to take over the temperature monitoring of this section of the coast from the old Dana Point station (1955-1970), and the site is so similar that the long record for this area is still preserved.

Balboa, Newport Beach, California *33°36'N, 117°54'W* City of Newport Beach
1925-2017

City lifeguards of the Marine Operations Division take daily temperature and salinity samples from the Newport Beach Pier, and return them to Scripps once a month for analysis. The waters surrounding the Newport Pier are located about two miles from the mouth of the Santa Ana River. Analysis of these salinity samples indicates that they reflect oceanic conditions except during winter storms when the salinity is strongly affected by runoff from the river. During the first half of this century, these data were recorded predominantly from the Balboa Pier, which is located just 1.7 miles southeast of the Newport Pier. For the last several decades, however, the data has been collected almost exclusively from the Newport Pier. These 2 pier stations are so similar that the data collected from either location are consistent with the long-term record.

Point Dume, California
1957-2017

34°01.1'N, 118°49.5'W

Los Angeles County

To reduce the effects of solar warming on the waters near the beach, water temperatures are taken in the surf early each morning by the Los Angeles County Lifeguards at Zuma Beach County Park. Temperatures at this site west of Point Dume, are therefore thought to be representative of nearshore waters.

Santa Barbara, California
1955-2017

34°24.2'N, 119°41.6'W

City of Santa Barbara

Each morning Santa Barbara Harbor Patrol personnel record the surface water temperature from their boat dock at the west end of the harbor. Exchange from tidal circulation in the harbor is high, and the sample is taken before solar warming is evident, so the recorded temperatures should be representative of coastal waters.

Granite Canyon, California
1971-2017

36°25.9'N, 121°55'W

Marine Pollution Studies Laboratory
University of California, Davis

Personnel of the Marine Pollution Studies Laboratory take daily temperature and salinity samples off the rocks near the water intake for the laboratory, and return the salinity samples to Scripps once a month for analysis. This sampling site is considered to be a good representation of spring-summer upwelling that is typical of the central California coast.

Pacific Grove, California
1919-39, 41-74, 77-2017

36°37.3'N, 121°54.2'W

Hopkins Marine Station
Stanford University

Staff from Stanford University's Hopkins Marine Station take daily temperature measurements from a beach on the north side of Point Cabrillo just north of their main laboratory buildings. Exposed to the northwest swell as it sweeps past Point Piños, this location is representative of coastal conditions on the south side of Monterey Bay.

Farallon Islands, California
1925-43, 55-2017

37°41.8'N, 122°59.9'W

Point Blue Conservation Science

The Farallon Islands, seven rocky islands comprising the Farallon Islands National Wildlife Refuge, are the breeding grounds for more than one-quarter of all California seabirds and home to populations of seals and sea lions. The largest seabird colony south of Alaska, this critical habitat provides protection for 12 different species, numbering more than 200,000 individuals. Historically, data was collected from North Farallon Island (1925-43); however the sampling location changed to Southeast Farallon in 1955. As a small part of their ongoing studies, Point Blue Conservation Science researchers stationed on Southeast Farallon take daily temperature and salinity samples and return the salinity samples to Scripps once a month for analysis. Because of their location 26 miles west of the Golden Gate Bridge, where they catch the full force of winter storms and the strong summer northwesterers, data collection can be interrupted from time to

time. The sampling site at the boat landing on the southeast side of the island is steep and rocky, so measurements are representative of the oceanic waters around the islands.

Trinidad Beach, California
and Trinidad Bay, California
1975-2017

41°03.6'N, 124°08.9'W
41°03.3'N, 124°08.8'W

Telonicher Marine Laboratory
Humboldt State University

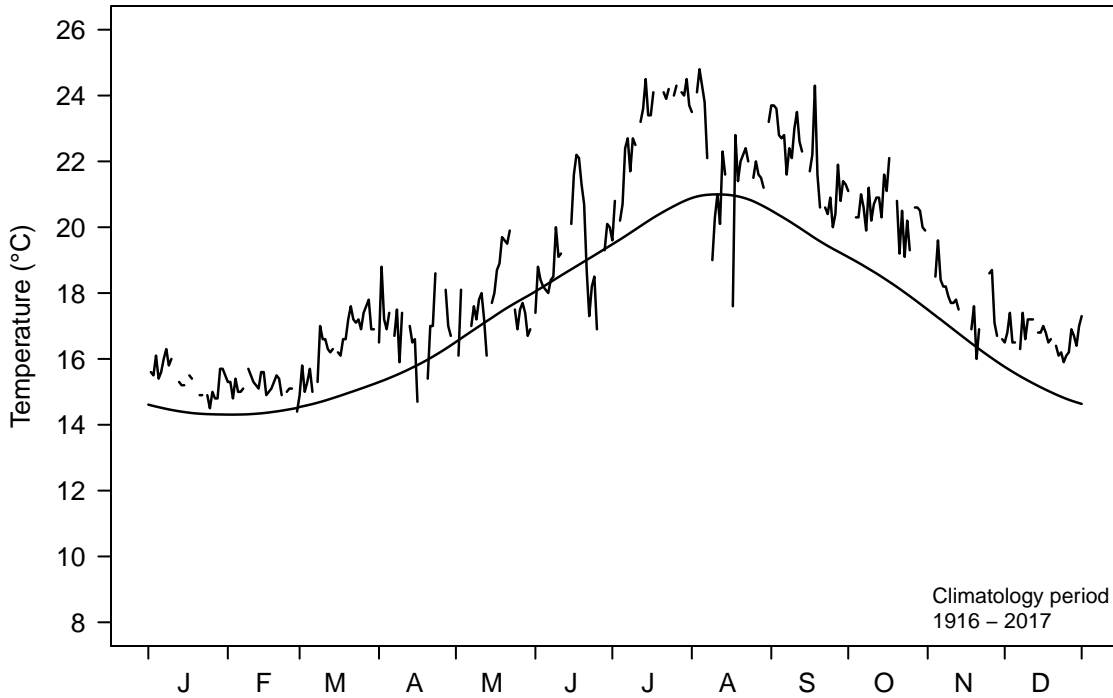
Measurements are made at the Telonicher Marine Laboratory, Humboldt State University located on the rocky headland between the Pacific Ocean and Trinidad Bay. Bay temperature is measured from the fishing pier on the lee or southeast side of the headland. Ocean temperature and salinity samples are taken from the beach on the northwest side. Salinity samples are returned to Scripps once a month for analysis. Except during periods of heavy runoff, salinity values from the coast and the bay are nearly identical.

STATION LOCATION CHART



SIO (Surface) La Jolla, CA

2017



Climatological

2017

| | Mean | Max | Min | Mean | Max | Min |
|-----|------|------|------|------|------|------|
| Jan | 14.4 | 18.1 | 11.2 | 15.4 | 16.3 | 14.5 |
| Feb | 14.3 | 19.4 | 10.8 | 15.2 | 15.7 | 14.4 |
| Mar | 14.8 | 20.0 | 10.1 | 16.5 | 17.8 | 14.9 |
| Apr | 15.8 | 22.0 | 11.0 | 16.9 | 18.8 | 14.7 |
| May | 17.3 | 22.7 | 10.8 | 17.8 | 19.9 | 16.1 |
| Jun | 18.7 | 23.7 | 12.7 | 19.2 | 22.2 | 16.9 |
| Jul | 20.2 | 25.8 | 12.9 | 23.0 | 24.5 | 19.6 |
| Aug | 21.0 | 25.4 | 14.2 | 21.9 | 24.8 | 17.6 |
| Sep | 19.8 | 25.3 | 13.9 | 22.0 | 24.3 | 20.0 |
| Oct | 18.4 | 24.4 | 13.5 | 20.5 | 22.1 | 19.1 |
| Nov | 16.6 | 21.1 | 12.5 | 17.8 | 19.6 | 16.0 |
| Dec | 15.1 | 18.9 | 10.6 | 16.7 | 17.4 | 15.9 |

Annual Mean
18.6

Annual Max
24.8

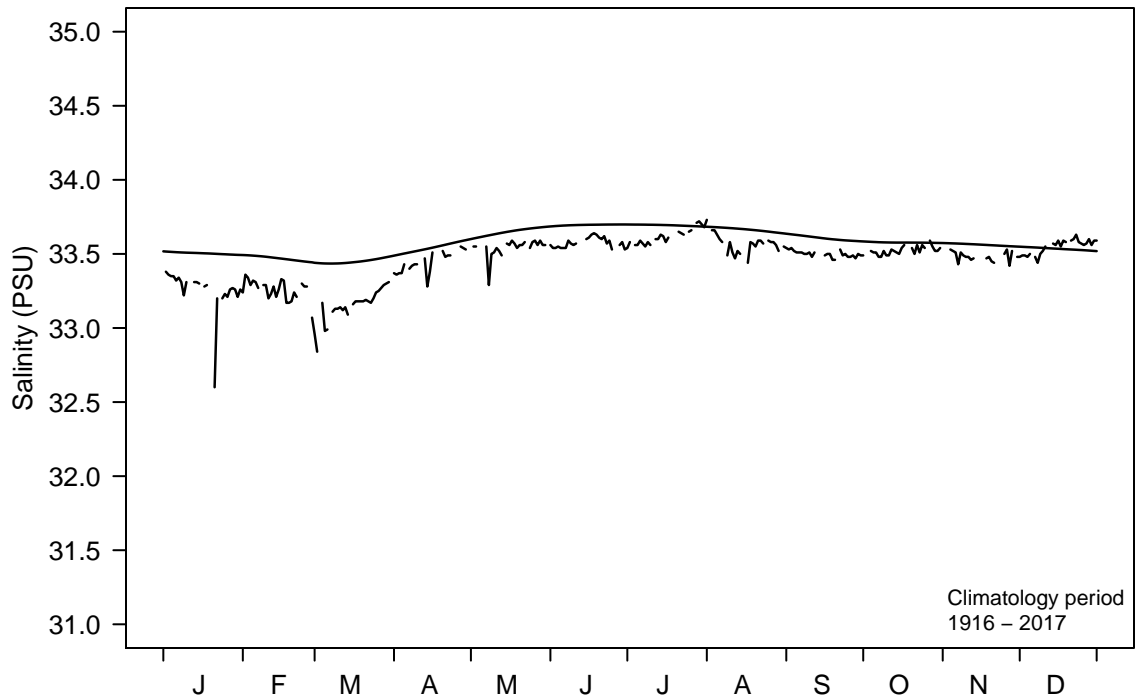
Annual Min
14.4

Days Sampled
301/365 (82.5%)

Days Flagged
0/365 (0.0%)

SIO (Surface) La Jolla, CA

2017



Climatological

2017

| | Mean | Max | Min | Mean | Max | Min |
|-----|-------|-------|-------|-------|-------|-------|
| Jan | 33.51 | 34.22 | 31.42 | 33.26 | 33.38 | 32.60 |
| Feb | 33.47 | 34.09 | 30.31 | 33.26 | 33.36 | 33.07 |
| Mar | 33.45 | 34.04 | 31.65 | 33.15 | 33.31 | 32.84 |
| Apr | 33.54 | 34.11 | 32.48 | 33.45 | 33.55 | 33.28 |
| May | 33.65 | 34.18 | 32.82 | 33.54 | 33.59 | 33.29 |
| Jun | 33.70 | 34.29 | 32.67 | 33.58 | 33.64 | 33.53 |
| Jul | 33.70 | 34.38 | 33.22 | 33.62 | 33.72 | 33.54 |
| Aug | 33.67 | 34.17 | 33.28 | 33.57 | 33.73 | 33.44 |
| Sep | 33.61 | 34.14 | 29.64 | 33.50 | 33.55 | 33.46 |
| Oct | 33.58 | 34.86 | 31.08 | 33.52 | 33.59 | 33.48 |
| Nov | 33.56 | 34.60 | 32.51 | 33.48 | 33.55 | 33.41 |
| Dec | 33.53 | 34.80 | 32.14 | 33.55 | 33.63 | 33.44 |

Annual Mean
33.50

Annual Max
33.70

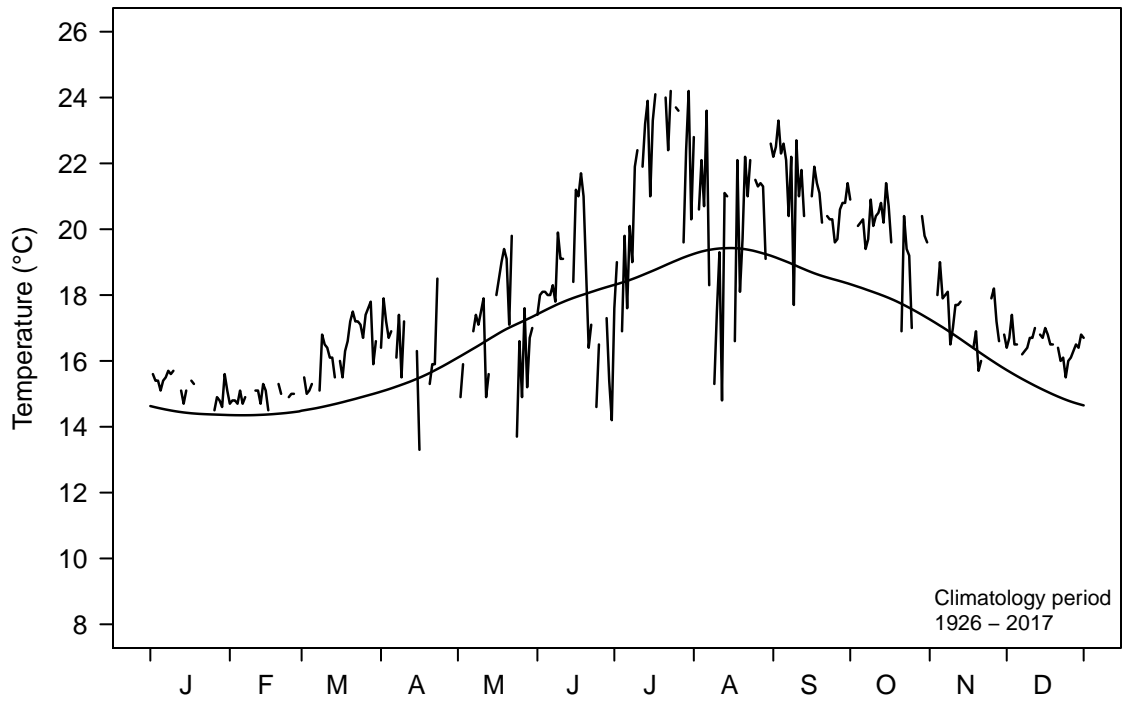
Annual Min
32.60

Days Sampled
301/365 (82.5%)

Days Flagged
2/365 (0.5%)

SIO (Bottom) La Jolla, CA

2017



Climatological

2017

| | Mean | Max | Min | Mean | Max | Min |
|-----|------|------|------|------|------|------|
| Jan | 14.4 | 18.3 | 11.3 | 15.2 | 15.7 | 14.5 |
| Feb | 14.3 | 17.9 | 10.7 | 14.9 | 15.3 | 14.4 |
| Mar | 14.7 | 19.3 | 10.0 | 16.4 | 17.8 | 15.0 |
| Apr | 15.4 | 20.8 | 11.0 | 16.4 | 18.5 | 13.3 |
| May | 16.8 | 22.5 | 10.7 | 17.0 | 19.8 | 13.7 |
| Jun | 17.9 | 23.2 | 11.1 | 18.1 | 21.7 | 14.2 |
| Jul | 18.7 | 25.0 | 11.0 | 21.5 | 24.2 | 16.9 |
| Aug | 19.4 | 25.2 | 12.6 | 20.2 | 23.6 | 14.8 |
| Sep | 18.7 | 24.6 | 12.1 | 21.1 | 23.3 | 17.7 |
| Oct | 17.9 | 24.6 | 12.7 | 19.9 | 21.4 | 16.9 |
| Nov | 16.5 | 21.1 | 12.3 | 17.4 | 19.2 | 15.7 |
| Dec | 15.1 | 18.9 | 10.6 | 16.5 | 17.4 | 15.5 |

Annual Mean
18.0

Annual Max
24.2

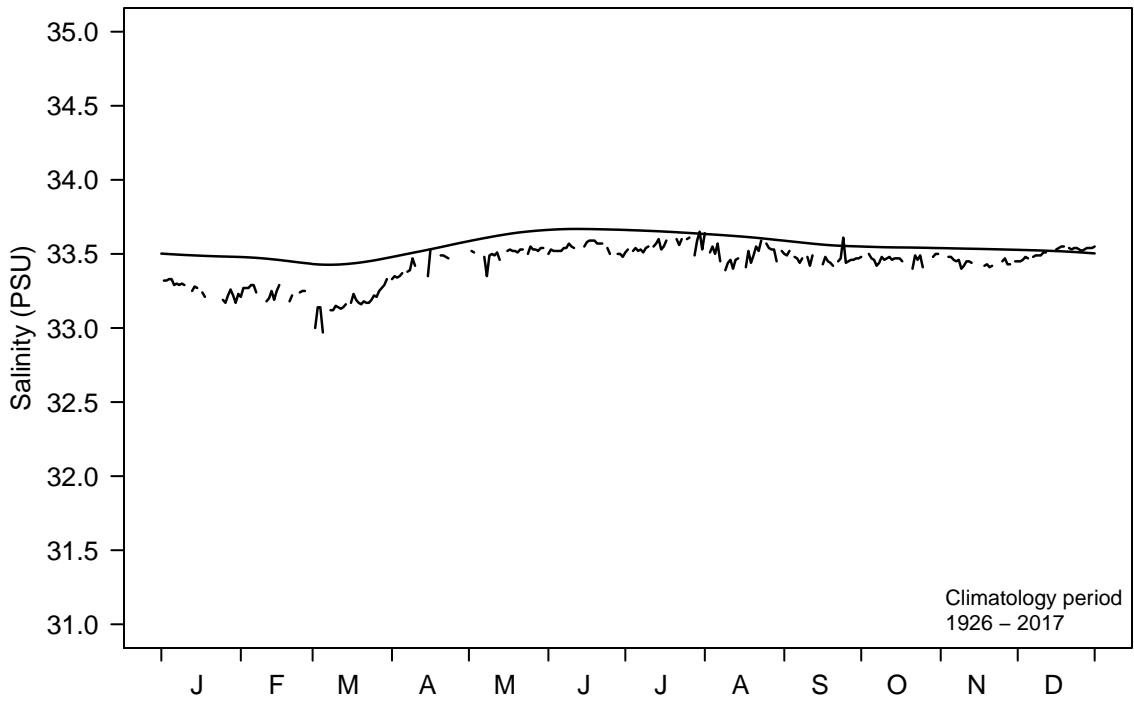
Annual Min
13.3

Days Sampled
282/365 (77.3%)

Days Flagged
0/365 (0.0%)

SIO (Bottom) La Jolla, CA

2017



Climatological

2017

| | Mean | Max | Min | Mean | Max | Min |
|-----|-------|-------|-------|-------|-------|-------|
| Jan | 33.49 | 34.31 | 30.40 | 33.26 | 33.33 | 33.17 |
| Feb | 33.47 | 34.21 | 31.36 | 33.23 | 33.29 | 33.03 |
| Mar | 33.44 | 34.07 | 31.72 | 33.17 | 33.33 | 32.97 |
| Apr | 33.53 | 33.94 | 32.07 | 33.42 | 33.54 | 33.33 |
| May | 33.64 | 34.33 | 32.98 | 33.51 | 33.55 | 33.35 |
| Jun | 33.67 | 34.10 | 33.02 | 33.54 | 33.59 | 33.48 |
| Jul | 33.65 | 34.20 | 33.23 | 33.56 | 33.65 | 33.49 |
| Aug | 33.62 | 34.28 | 33.11 | 33.50 | 33.64 | 33.39 |
| Sep | 33.56 | 34.06 | 33.21 | 33.47 | 33.61 | 33.39 |
| Oct | 33.55 | 34.12 | 32.92 | 33.47 | 33.50 | 33.40 |
| Nov | 33.54 | 33.99 | 33.06 | 33.44 | 33.49 | 33.40 |
| Dec | 33.52 | 34.10 | 32.65 | 33.51 | 33.55 | 33.45 |

Annual Mean
33.40

Annual Max
33.60

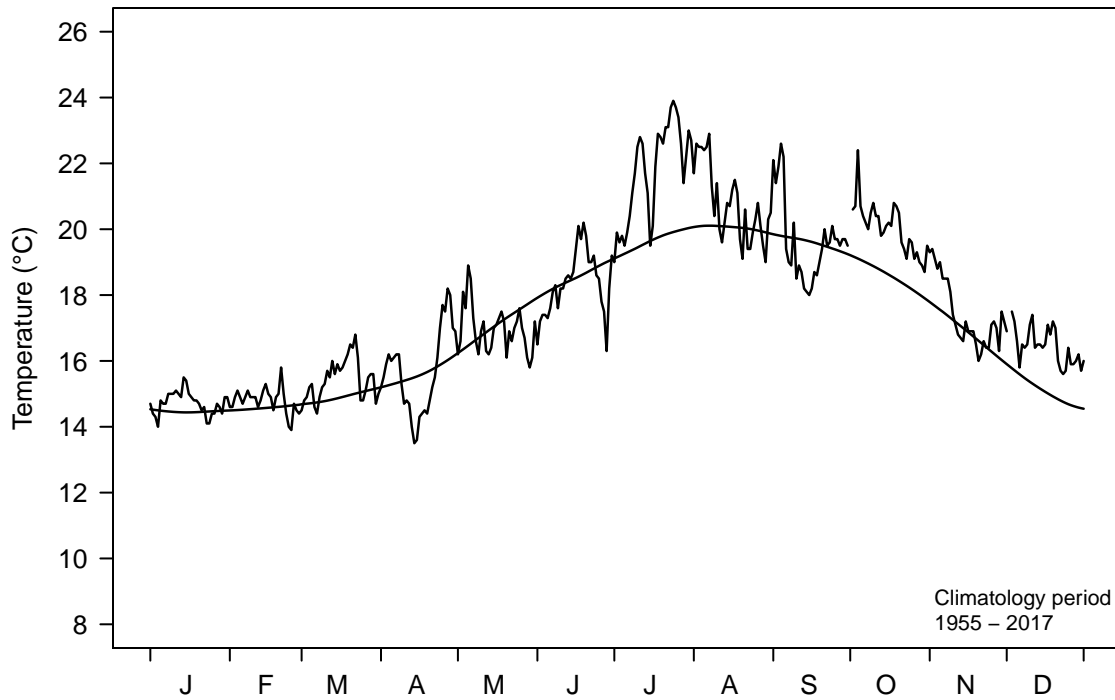
Annual Min
33.00

Days Sampled
283/365 (77.5%)

Days Flagged
3/365 (0.8%)

San Clemente, CA

2017



Climatological

2017

| | Mean | Max | Min | Mean | Max | Min |
|-----|------|------|------|------|------|------|
| Jan | 14.4 | 17.6 | 10.5 | 14.7 | 15.5 | 14.0 |
| Feb | 14.6 | 17.4 | 10.8 | 14.8 | 15.8 | 13.9 |
| Mar | 14.9 | 18.3 | 9.8 | 15.4 | 16.8 | 14.4 |
| Apr | 15.5 | 20.6 | 10.8 | 15.6 | 18.2 | 13.5 |
| May | 17.1 | 25.4 | 11.0 | 16.9 | 18.9 | 15.8 |
| Jun | 18.5 | 22.8 | 13.5 | 18.4 | 20.2 | 16.3 |
| Jul | 19.7 | 25.1 | 13.0 | 21.7 | 23.9 | 19.0 |
| Aug | 20.0 | 26.2 | 14.0 | 20.8 | 22.9 | 19.0 |
| Sep | 19.6 | 24.7 | 14.3 | 19.6 | 22.6 | 18.0 |
| Oct | 18.6 | 23.1 | 14.0 | 20.0 | 22.4 | 18.7 |
| Nov | 16.9 | 21.6 | 11.8 | 17.4 | 19.4 | 16.0 |
| Dec | 15.1 | 19.5 | 10.6 | 16.4 | 17.5 | 15.6 |

Annual Mean
17.7

Annual Max
23.9

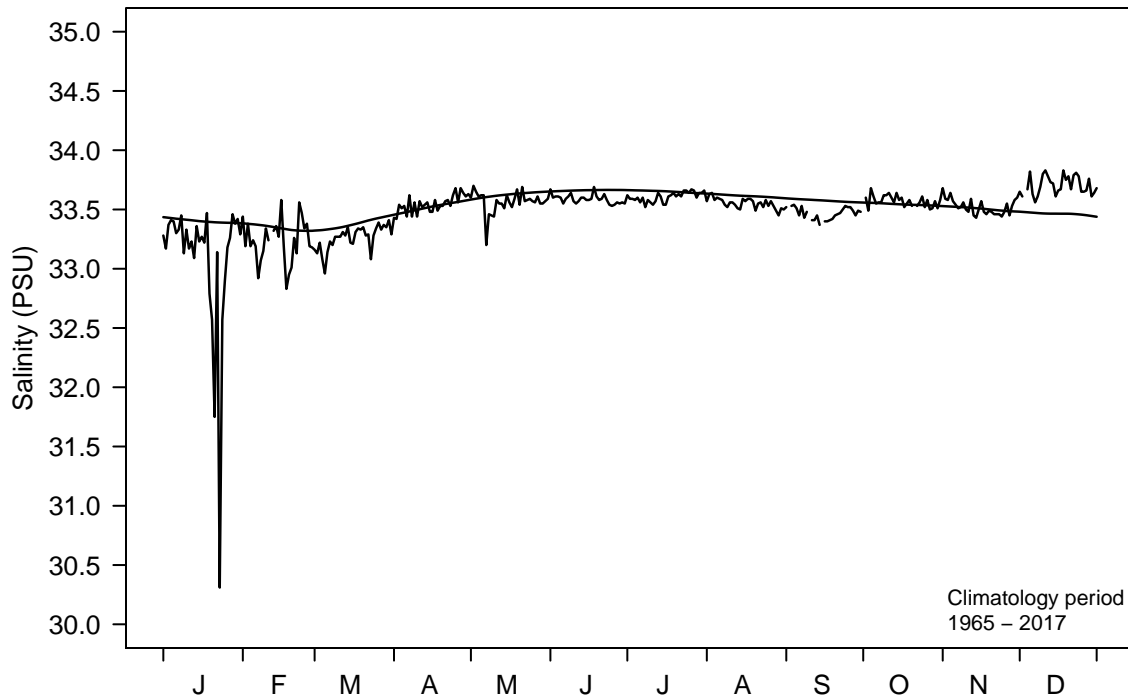
Annual Min
13.5

Days Sampled
364/365 (99.7%)

Days Flagged
1/365 (0.3%)

San Clemente, CA

2017



Climatological

2017

| | Mean | Max | Min | Mean | Max | Min |
|-----|-------|-------|-------|-------|-------|-------|
| Jan | 33.41 | 34.26 | 27.86 | 33.07 | 33.47 | 30.31 |
| Feb | 33.36 | 34.78 | 22.82 | 33.24 | 33.58 | 32.83 |
| Mar | 33.37 | 34.42 | 19.15 | 33.26 | 33.41 | 32.96 |
| Apr | 33.52 | 34.37 | 31.50 | 33.54 | 33.68 | 33.42 |
| May | 33.63 | 34.52 | 32.67 | 33.56 | 33.70 | 33.20 |
| Jun | 33.66 | 34.72 | 32.77 | 33.59 | 33.69 | 33.53 |
| Jul | 33.65 | 34.53 | 33.00 | 33.61 | 33.67 | 33.52 |
| Aug | 33.61 | 34.89 | 29.71 | 33.55 | 33.64 | 33.45 |
| Sep | 33.58 | 34.61 | 32.68 | 33.47 | 33.54 | 33.37 |
| Oct | 33.54 | 34.69 | 31.77 | 33.57 | 33.68 | 33.49 |
| Nov | 33.51 | 34.23 | 30.06 | 33.52 | 33.68 | 33.43 |
| Dec | 33.47 | 34.11 | 27.45 | 33.70 | 33.83 | 33.56 |

Annual Mean
33.50

Annual Max
33.80

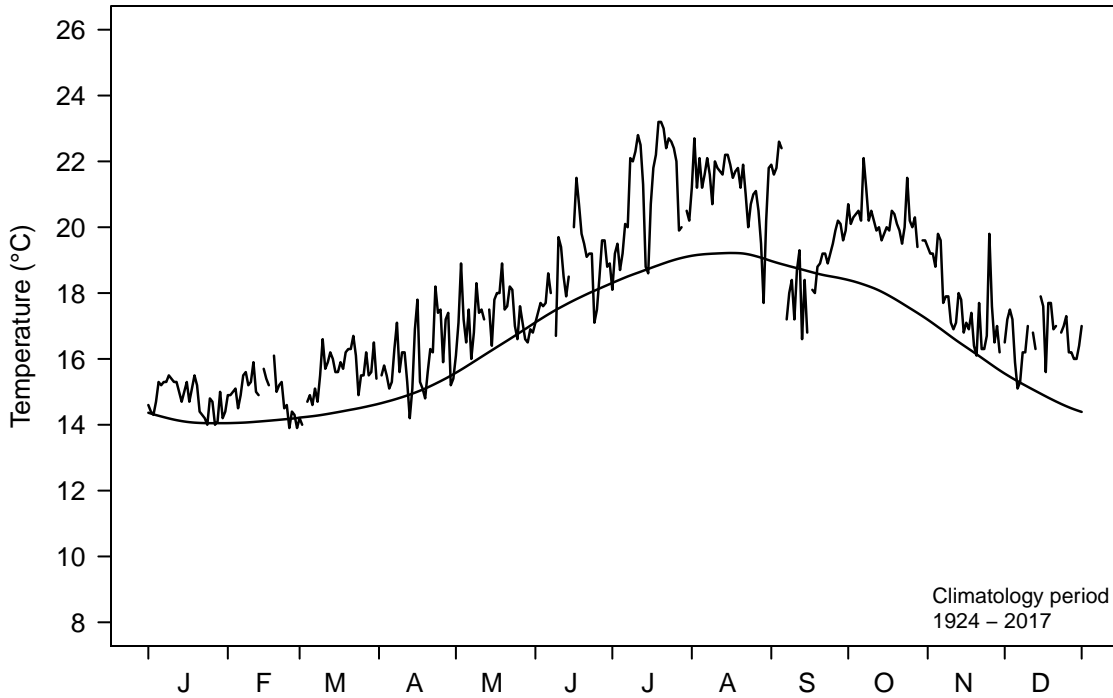
Annual Min
30.30

Days Sampled
364/365 (99.7%)

Days Flagged
6/365 (1.6%)

Newport Beach, CA

2017



Climatological

2017

| | Mean | Max | Min | Mean | Max | Min |
|-----|------|------|------|------|------|------|
| Jan | 14.1 | 17.5 | 10.0 | 14.8 | 15.5 | 14.0 |
| Feb | 14.1 | 18.6 | 10.2 | 15.0 | 16.1 | 13.9 |
| Mar | 14.4 | 18.7 | 9.9 | 15.6 | 16.7 | 14.0 |
| Apr | 15.0 | 19.5 | 10.0 | 16.0 | 18.2 | 14.2 |
| May | 16.3 | 22.5 | 10.4 | 17.3 | 18.9 | 16.0 |
| Jun | 17.8 | 22.9 | 11.5 | 18.7 | 21.5 | 16.7 |
| Jul | 18.8 | 25.0 | 12.0 | 21.1 | 23.2 | 18.1 |
| Aug | 19.2 | 24.0 | 12.3 | 21.3 | 22.7 | 17.7 |
| Sep | 18.7 | 24.1 | 12.2 | 19.3 | 22.6 | 16.6 |
| Oct | 18.0 | 23.3 | 12.2 | 20.2 | 22.1 | 19.4 |
| Nov | 16.4 | 21.1 | 10.2 | 17.6 | 19.8 | 16.1 |
| Dec | 14.9 | 18.7 | 10.6 | 16.7 | 17.9 | 15.1 |

Annual Mean
17.8

Annual Max
23.2

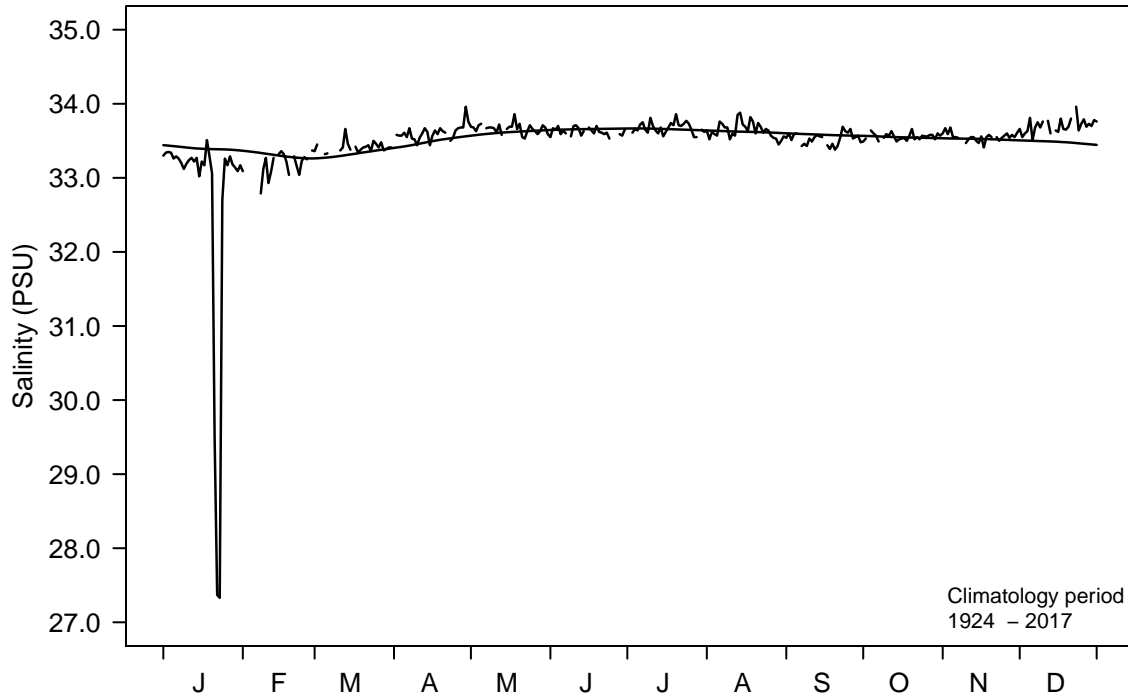
Annual Min
13.9

Days Sampled
351/365 (96.2%)

Days Flagged
1/365 (0.3%)

Newport Beach, CA

2017



Climatological

2017

| | Mean | Max | Min | Mean | Max | Min |
|-----|-------|-------|-------|-------|-------|-------|
| Jan | 33.39 | 34.35 | 23.29 | 32.71 | 33.51 | 27.33 |
| Feb | 33.30 | 34.80 | 15.96 | 33.18 | 33.37 | 32.79 |
| Mar | 33.32 | 34.49 | 22.56 | 33.41 | 33.66 | 33.32 |
| Apr | 33.49 | 34.20 | 26.57 | 33.61 | 33.96 | 33.44 |
| May | 33.62 | 34.89 | 28.28 | 33.66 | 33.86 | 33.53 |
| Jun | 33.66 | 34.45 | 29.51 | 33.62 | 33.71 | 33.53 |
| Jul | 33.66 | 34.68 | 33.17 | 33.67 | 33.86 | 33.55 |
| Aug | 33.62 | 34.55 | 32.21 | 33.64 | 33.88 | 33.45 |
| Sep | 33.58 | 34.87 | 26.76 | 33.53 | 33.69 | 33.38 |
| Oct | 33.55 | 34.81 | 28.27 | 33.56 | 33.66 | 33.49 |
| Nov | 33.53 | 34.36 | 28.41 | 33.55 | 33.68 | 33.41 |
| Dec | 33.49 | 34.43 | 26.71 | 33.70 | 33.96 | 33.51 |

Annual Mean
33.50

Annual Max
34.00

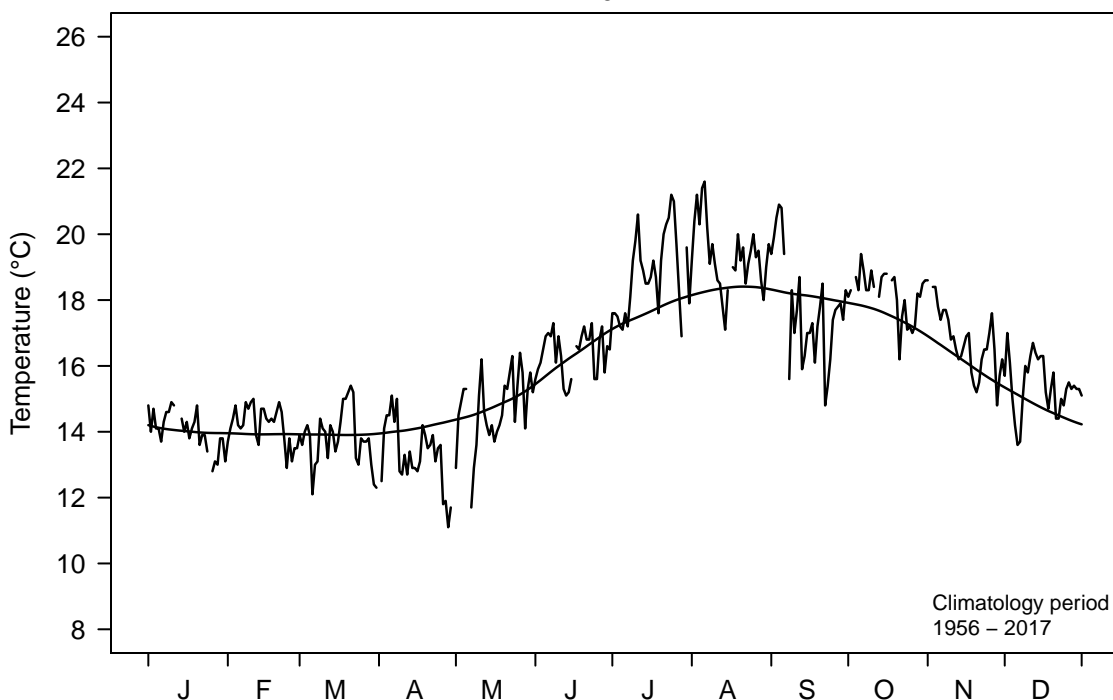
Annual Min
27.30

Days Sampled
350/365 (95.9%)

Days Flagged
19/365 (5.2%)

Point Dume, CA

2017



Climatological

2017

| | Mean | Max | Min | Mean | Max | Min |
|-----|------|------|------|------|------|------|
| Jan | 14.0 | 17.4 | 10.4 | 14.0 | 14.9 | 12.8 |
| Feb | 13.9 | 17.2 | 9.8 | 14.2 | 15.0 | 12.9 |
| Mar | 13.9 | 17.2 | 10.0 | 13.8 | 15.4 | 12.1 |
| Apr | 14.1 | 19.2 | 10.1 | 13.3 | 15.1 | 11.1 |
| May | 14.8 | 20.0 | 8.9 | 14.7 | 16.4 | 11.7 |
| Jun | 16.3 | 20.8 | 10.7 | 16.4 | 17.3 | 15.1 |
| Jul | 17.6 | 22.5 | 11.1 | 18.8 | 21.2 | 16.9 |
| Aug | 18.4 | 23.6 | 12.4 | 19.3 | 21.6 | 17.1 |
| Sep | 18.1 | 23.9 | 12.6 | 17.7 | 20.9 | 14.8 |
| Oct | 17.6 | 22.4 | 12.4 | 18.2 | 19.4 | 16.2 |
| Nov | 16.1 | 21.5 | 9.8 | 16.7 | 18.6 | 14.8 |
| Dec | 14.7 | 18.9 | 9.5 | 15.4 | 17.0 | 13.6 |

Annual Mean
16.1

Annual Max
21.6

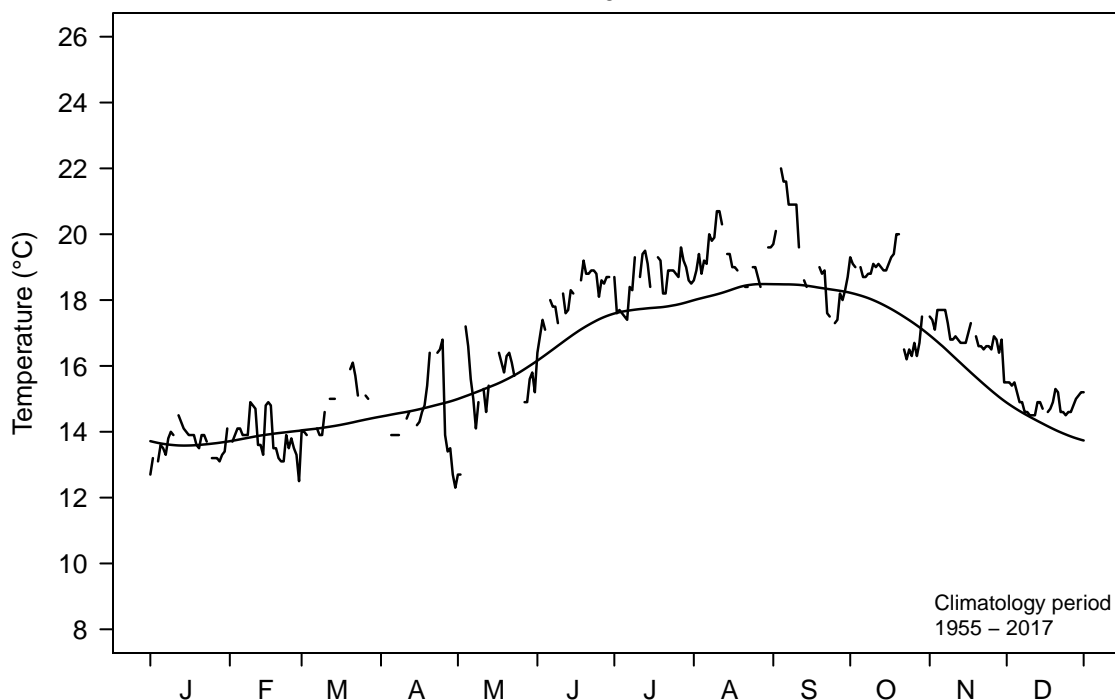
Annual Min
11.1

Days Sampled
352/365 (96.4%)

Days Flagged
1/365 (0.3%)

Santa Barbara, CA

2017



Climatological

2017

| | Mean | Max | Min | Mean | Max | Min |
|-----|------|------|------|------|------|------|
| Jan | 13.6 | 17.8 | 10.0 | 13.6 | 14.5 | 12.7 |
| Feb | 13.9 | 17.2 | 10.0 | 13.8 | 14.9 | 12.5 |
| Mar | 14.1 | 18.2 | 10.2 | 14.8 | 16.1 | 13.9 |
| Apr | 14.6 | 18.8 | 10.5 | 14.4 | 16.8 | 12.3 |
| May | 15.4 | 19.4 | 11.1 | 15.4 | 17.2 | 12.7 |
| Jun | 17.0 | 21.6 | 12.7 | 18.1 | 19.2 | 16.4 |
| Jul | 17.7 | 22.2 | 12.7 | 18.6 | 19.6 | 17.4 |
| Aug | 18.3 | 23.4 | 14.3 | 19.3 | 20.7 | 18.4 |
| Sep | 18.4 | 23.2 | 13.6 | 19.3 | 22.0 | 17.3 |
| Oct | 17.7 | 23.2 | 13.9 | 18.4 | 20.0 | 16.2 |
| Nov | 15.9 | 21.0 | 11.5 | 16.9 | 17.7 | 15.5 |
| Dec | 14.2 | 18.5 | 10.1 | 14.9 | 15.5 | 14.5 |

Annual Mean
16.5

Annual Max
22.0

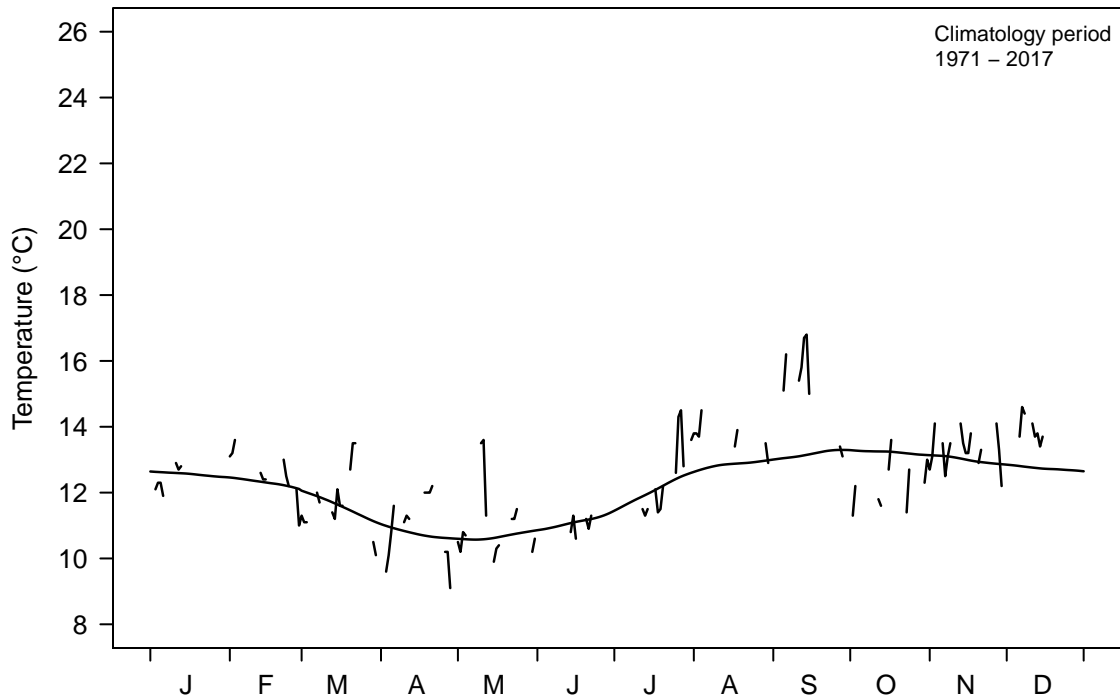
Annual Min
12.3

Days Sampled
312/365 (85.5%)

Days Flagged
4/365 (1.1%)

Granite Canyon, CA

2017



Climatological

2017

| | Mean | Max | Min | Mean | Max | Min |
|-----|------|------|------|------|------|------|
| Jan | 12.5 | 15.5 | 9.4 | 12.5 | 13.0 | 11.9 |
| Feb | 12.3 | 15.2 | 8.4 | 12.7 | 13.7 | 11.0 |
| Mar | 11.5 | 15.5 | 8.0 | 11.7 | 13.5 | 10.1 |
| Apr | 10.6 | 14.2 | 8.0 | 11.1 | 12.9 | 9.1 |
| May | 10.6 | 15.5 | 8.1 | 11.1 | 13.6 | 9.9 |
| Jun | 11.0 | 15.5 | 8.4 | 11.1 | 12.7 | 10.1 |
| Jul | 12.0 | 17.9 | 9.0 | 12.4 | 14.5 | 11.3 |
| Aug | 12.8 | 17.1 | 10.0 | 13.6 | 15.6 | 11.9 |
| Sep | 13.1 | 18.1 | 10.3 | 14.7 | 16.8 | 12.3 |
| Oct | 13.2 | 18.7 | 9.5 | 12.3 | 13.6 | 11.3 |
| Nov | 13.0 | 17.5 | 9.3 | 13.3 | 14.1 | 12.2 |
| Dec | 12.7 | 16.5 | 9.2 | 13.6 | 14.6 | 11.8 |

Annual Mean
12.5

Annual Max
16.8

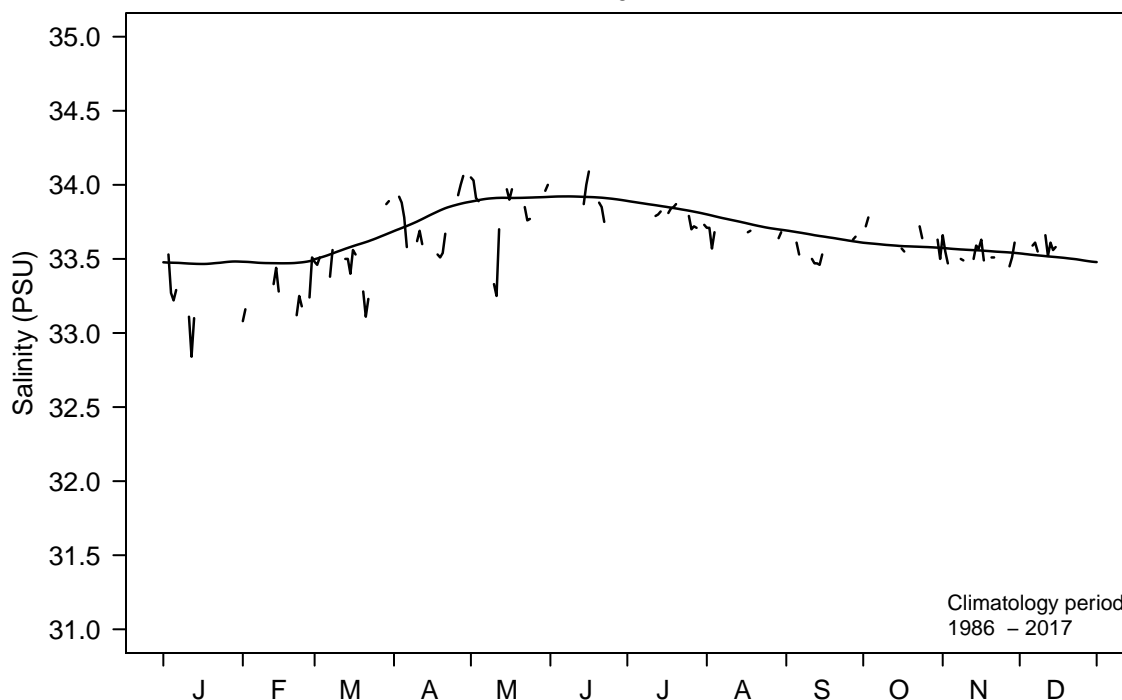
Annual Min
9.1

Days Sampled
164/365 (44.9%)

Days Flagged
0/365 (0.0%)

Granite Canyon, CA

2017



Climatological

2017

| | Mean | Max | Min | Mean | Max | Min |
|-----|-------|-------|-------|-------|-------|-------|
| Jan | 33.47 | 34.16 | 28.20 | 33.16 | 33.53 | 32.84 |
| Feb | 33.47 | 34.11 | 32.70 | 33.19 | 33.51 | 32.70 |
| Mar | 33.58 | 34.47 | 32.66 | 33.48 | 33.89 | 33.11 |
| Apr | 33.81 | 35.41 | 32.21 | 33.75 | 34.06 | 33.51 |
| May | 33.90 | 35.13 | 33.10 | 33.82 | 34.05 | 33.25 |
| Jun | 33.91 | 34.51 | 33.16 | 33.91 | 34.09 | 33.75 |
| Jul | 33.84 | 35.03 | 33.26 | 33.80 | 33.91 | 33.70 |
| Aug | 33.75 | 34.29 | 33.19 | 33.68 | 33.77 | 33.57 |
| Sep | 33.65 | 34.25 | 33.17 | 33.56 | 33.69 | 33.46 |
| Oct | 33.58 | 34.42 | 33.23 | 33.64 | 33.78 | 33.50 |
| Nov | 33.56 | 34.09 | 31.70 | 33.54 | 33.66 | 33.45 |
| Dec | 33.51 | 33.96 | 33.05 | 33.60 | 33.70 | 33.52 |

Annual Mean
33.60

Annual Max
34.10

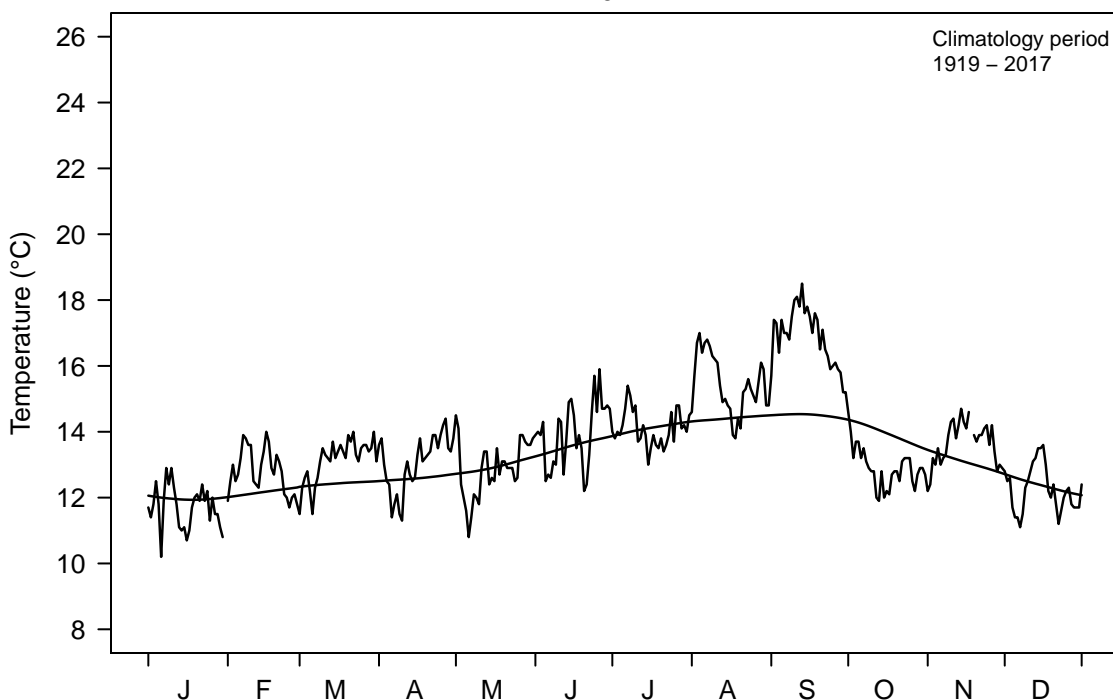
Annual Min
32.70

Days Sampled
163/365 (44.7%)

Days Flagged
2/365 (0.5%)

Pacific Grove, CA

2017



Climatological

2017

| | Mean | Max | Min | Mean | Max | Min |
|-----|------|------|------|------|------|------|
| Jan | 11.9 | 15.0 | 8.3 | 11.7 | 12.9 | 10.2 |
| Feb | 12.2 | 15.0 | 8.3 | 12.8 | 14.0 | 11.7 |
| Mar | 12.4 | 17.5 | 9.0 | 13.1 | 14.0 | 11.5 |
| Apr | 12.6 | 16.9 | 9.0 | 13.1 | 14.4 | 11.3 |
| May | 12.9 | 18.0 | 9.4 | 12.9 | 14.5 | 10.8 |
| Jun | 13.6 | 19.0 | 10.0 | 13.9 | 15.9 | 12.2 |
| Jul | 14.1 | 21.0 | 10.8 | 14.1 | 15.4 | 13.0 |
| Aug | 14.4 | 19.0 | 10.6 | 15.4 | 17.0 | 13.8 |
| Sep | 14.5 | 18.9 | 11.1 | 16.9 | 18.5 | 15.2 |
| Oct | 14.0 | 18.5 | 10.5 | 12.9 | 14.6 | 11.9 |
| Nov | 13.1 | 17.0 | 9.1 | 13.6 | 14.7 | 12.2 |
| Dec | 12.4 | 16.0 | 7.0 | 12.2 | 13.6 | 11.1 |

Annual Mean
13.6

Annual Max
18.5

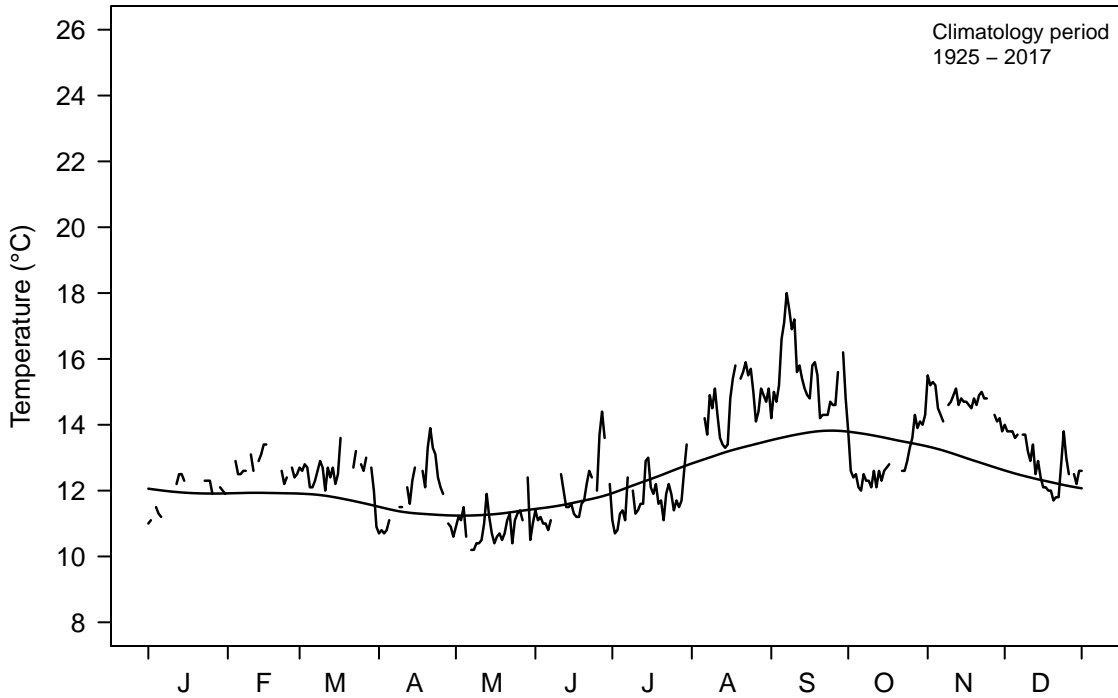
Annual Min
10.2

Days Sampled
364/365 (99.7%)

Days Flagged
1/365 (0.3%)

Farallon Islands, CA

2017



Climatological

2017

| | Mean | Max | Min | Mean | Max | Min |
|-----|------|------|------|------|------|------|
| Jan | 11.9 | 15.5 | 9.4 | 11.9 | 12.5 | 11.0 |
| Feb | 11.9 | 17.1 | 5.1 | 12.7 | 13.4 | 12.2 |
| Mar | 11.8 | 15.0 | 7.8 | 12.5 | 13.6 | 10.9 |
| Apr | 11.3 | 17.1 | 7.6 | 11.9 | 13.9 | 10.6 |
| May | 11.3 | 18.0 | 8.5 | 10.9 | 12.4 | 10.2 |
| Jun | 11.6 | 18.0 | 8.9 | 11.9 | 14.4 | 10.8 |
| Jul | 12.3 | 17.2 | 9.4 | 11.8 | 13.4 | 10.7 |
| Aug | 13.2 | 19.3 | 9.9 | 14.7 | 15.9 | 13.3 |
| Sep | 13.8 | 18.9 | 10.1 | 15.5 | 18.0 | 14.2 |
| Oct | 13.6 | 18.0 | 10.0 | 12.9 | 14.3 | 12.0 |
| Nov | 13.0 | 17.4 | 8.9 | 14.7 | 15.5 | 13.8 |
| Dec | 12.3 | 16.6 | 8.9 | 12.9 | 14.0 | 11.7 |

Annual Mean
12.9

Annual Max
18.0

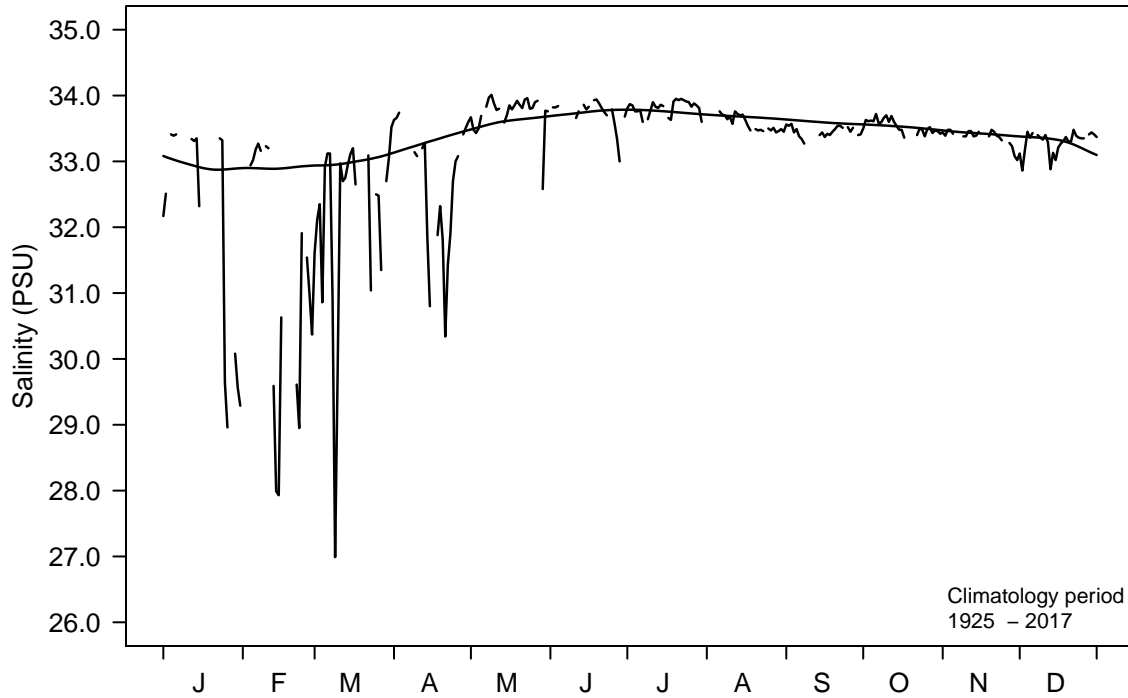
Annual Min
10.2

Days Sampled
309/365 (84.7%)

Days Flagged
0/365 (0.0%)

Farallon Islands, CA

2017



Climatological

2017

| | Mean | Max | Min | Mean | Max | Min |
|-----|-------|-------|-------|-------|-------|-------|
| Jan | 32.90 | 34.57 | 11.00 | 31.94 | 33.41 | 28.96 |
| Feb | 32.89 | 34.49 | 21.15 | 31.28 | 33.27 | 27.93 |
| Mar | 33.00 | 34.31 | 23.04 | 32.19 | 33.52 | 26.99 |
| Apr | 33.31 | 34.90 | 19.78 | 32.67 | 33.74 | 30.34 |
| May | 33.62 | 34.90 | 28.12 | 33.74 | 34.01 | 32.58 |
| Jun | 33.75 | 34.95 | 28.98 | 33.74 | 33.96 | 33.00 |
| Jul | 33.76 | 34.88 | 31.00 | 33.81 | 33.95 | 33.60 |
| Aug | 33.68 | 34.65 | 31.95 | 33.59 | 33.76 | 33.44 |
| Sep | 33.59 | 34.62 | 30.97 | 33.45 | 33.57 | 33.27 |
| Oct | 33.53 | 34.80 | 31.15 | 33.53 | 33.72 | 33.36 |
| Nov | 33.42 | 34.87 | 19.53 | 33.37 | 33.48 | 33.02 |
| Dec | 33.33 | 34.76 | 26.33 | 33.29 | 33.48 | 32.86 |

Annual Mean
33.10

Annual Max
34.00

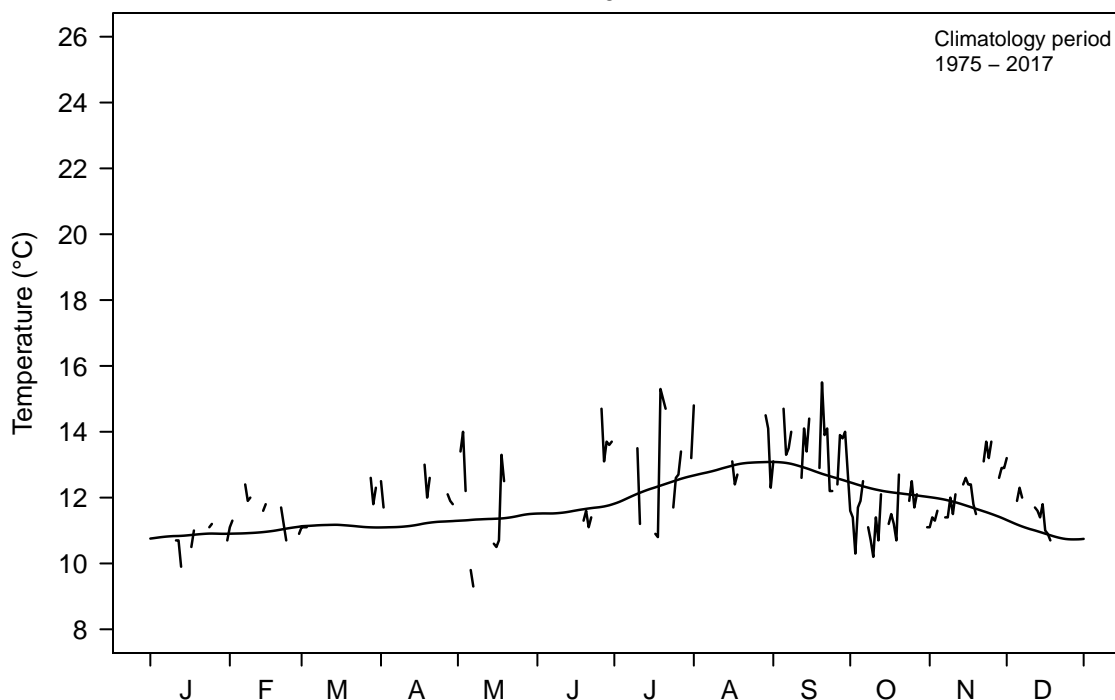
Annual Min
27.00

Days Sampled
308/365 (84.4%)

Days Flagged
16/365 (4.4%)

Trinidad Beach, CA

2017



Climatological

2017

| | Mean | Max | Min | Mean | Max | Min |
|-----|------|------|-----|------|------|------|
| Jan | 10.8 | 14.5 | 6.5 | 10.5 | 11.2 | 9.8 |
| Feb | 10.9 | 16.5 | 5.9 | 11.5 | 12.4 | 10.7 |
| Mar | 11.2 | 17.8 | 7.9 | 11.7 | 12.6 | 11.1 |
| Apr | 11.2 | 15.3 | 7.3 | 12.1 | 13.0 | 10.6 |
| May | 11.3 | 16.8 | 8.0 | 11.6 | 14.0 | 9.3 |
| Jun | 11.6 | 17.1 | 7.9 | 12.6 | 14.7 | 11.1 |
| Jul | 12.3 | 16.9 | 8.2 | 12.9 | 15.3 | 10.8 |
| Aug | 13.0 | 18.8 | 9.2 | 13.5 | 14.8 | 12.3 |
| Sep | 12.8 | 17.7 | 9.6 | 13.5 | 15.5 | 12.2 |
| Oct | 12.2 | 15.9 | 9.2 | 11.4 | 12.7 | 10.2 |
| Nov | 11.8 | 15.8 | 8.2 | 12.2 | 13.7 | 11.1 |
| Dec | 11.1 | 14.7 | 7.6 | 11.6 | 13.2 | 10.5 |

Annual Mean
12.1

Annual Max
15.5

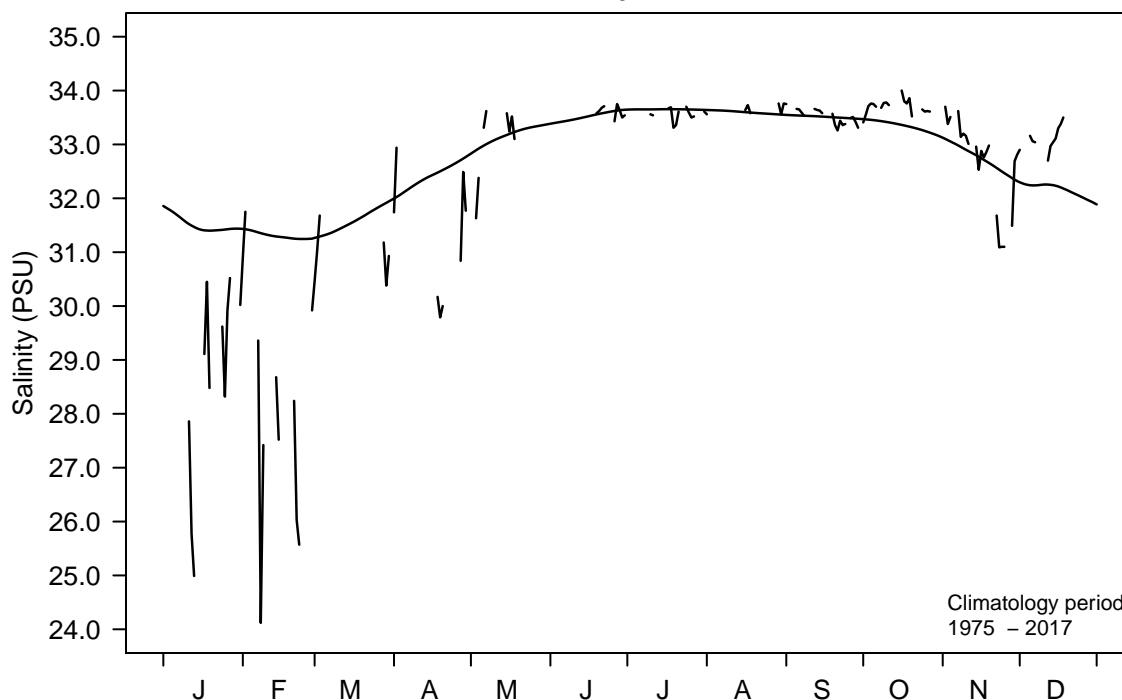
Annual Min
9.3

Days Sampled
174/365 (47.7%)

Days Flagged
0/365 (0.0%)

Trinidad Beach, CA

2017



Climatological

2017

| | Mean | Max | Min | Mean | Max | Min |
|-----|-------|-------|-------|-------|-------|-------|
| Jan | 31.47 | 33.79 | 23.48 | 29.27 | 32.57 | 24.99 |
| Feb | 31.30 | 33.88 | 23.37 | 28.49 | 31.75 | 24.12 |
| Mar | 31.54 | 34.18 | 21.00 | 30.35 | 31.68 | 27.55 |
| Apr | 32.41 | 34.50 | 22.94 | 31.29 | 32.94 | 28.18 |
| May | 33.19 | 34.28 | 24.25 | 33.09 | 33.62 | 31.63 |
| Jun | 33.54 | 34.60 | 30.28 | 33.61 | 33.75 | 33.43 |
| Jul | 33.65 | 34.28 | 31.80 | 33.55 | 33.70 | 33.31 |
| Aug | 33.59 | 34.19 | 32.40 | 33.66 | 33.76 | 33.56 |
| Sep | 33.53 | 34.25 | 32.00 | 33.52 | 33.75 | 33.26 |
| Oct | 33.37 | 34.11 | 29.36 | 33.69 | 34.00 | 33.41 |
| Nov | 32.80 | 34.02 | 25.78 | 32.65 | 33.70 | 31.09 |
| Dec | 32.09 | 33.80 | 24.20 | 33.15 | 33.50 | 32.70 |

Annual Mean
32.20

Annual Max
34.00

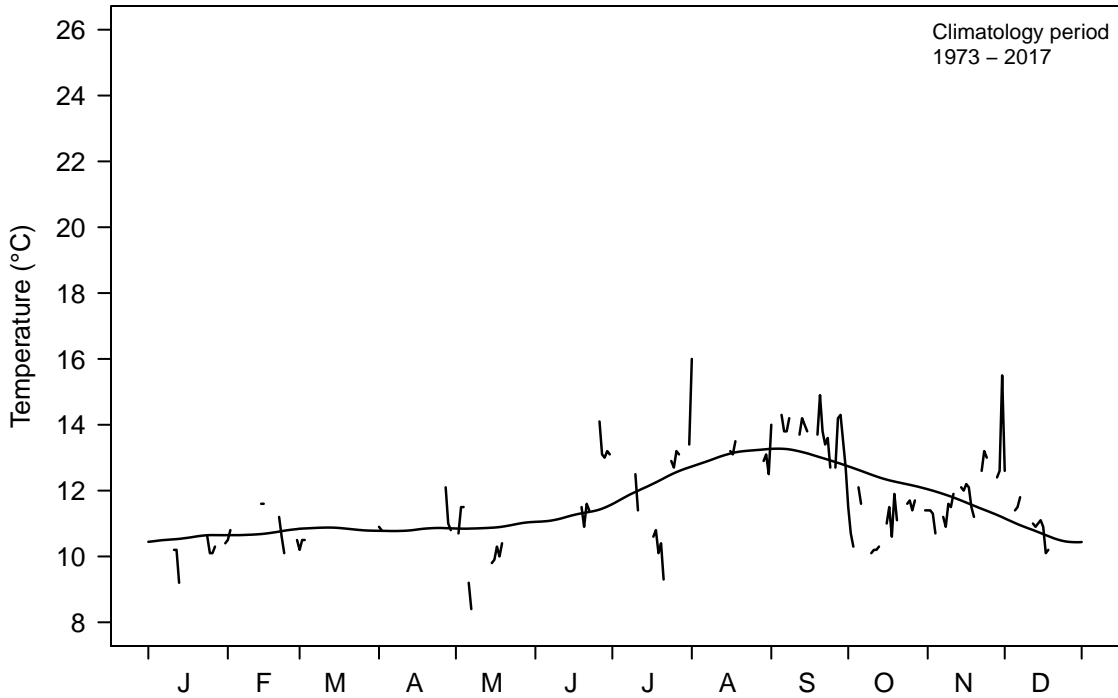
Annual Min
24.10

Days Sampled
179/365 (49.0%)

Days Flagged
4/365 (1.1%)

Trinidad Bay, CA

2017



Climatological

2017

| | Mean | Max | Min | Mean | Max | Min |
|-----|------|------|-----|------|------|------|
| Jan | 10.6 | 14.0 | 6.3 | 9.9 | 10.7 | 8.6 |
| Feb | 10.6 | 14.2 | 5.4 | 10.9 | 11.6 | 10.1 |
| Mar | 10.9 | 15.7 | 7.5 | 11.2 | 12.3 | 10.2 |
| Apr | 10.8 | 15.5 | 7.3 | 11.7 | 14.6 | 10.3 |
| May | 10.8 | 17.0 | 7.2 | 10.4 | 12.3 | 8.4 |
| Jun | 11.2 | 17.0 | 7.5 | 12.2 | 14.1 | 10.9 |
| Jul | 12.2 | 16.9 | 8.3 | 11.7 | 13.4 | 9.3 |
| Aug | 13.2 | 18.2 | 9.0 | 13.4 | 16.0 | 12.5 |
| Sep | 13.1 | 18.0 | 8.9 | 13.8 | 14.9 | 12.7 |
| Oct | 12.3 | 16.3 | 9.3 | 11.1 | 12.1 | 10.1 |
| Nov | 11.7 | 15.5 | 8.0 | 12.0 | 15.5 | 10.7 |
| Dec | 10.9 | 15.5 | 7.3 | 10.8 | 12.6 | 9.6 |

Annual Mean
11.6

Annual Max
16.0

Annual Min
8.4

Days Sampled
172/365 (47.1%)

Days Flagged
0/365 (0.0%)

Appendix A - Station Thermometer Metadata for 2017

| Station | Therm. Serial Number | Start Date | End Date | Date Calibrated | Post Calibration Date | 5°C Offset | 15°C Offset | 25°C Offset |
|------------------------|----------------------|------------|----------|-----------------|-----------------------|------------|-------------|-------------|
| La Jolla | DT001 | 9/13/16 | 7/25/17 | 9/8/16 | 10/19/17 | -0.02 | 0.01 | -0.02 |
| | DT006 | 5/9/17 | 6/17/17 | 9/8/16 | 10/19/17 | -0.02 | 0.02 | -0.02 |
| | DT029 | 7/26/17 | 11/29/18 | 7/6/17 | 11/27/18 | -0.03 | 0.00 | -0.05 |
| San Clemente | DT035 | 9/9/16 | 7/31/17 | 6/28/16 | 11/27/18 | -0.02 | 0.01 | -0.06 |
| | DT012 | 8/1/17 | 11/3/18 | 7/6/17 | TBD | TBD | TBD | TBD |
| Newport Beach | DT007 | 7/15/16 | 11/30/18 | 6/28/16 | 2/13/19 | -0.02 | 0.03 | -0.05 |
| Point Dume | DT016 | 7/15/16 | 5/20/17 | 6/28/16 | 7/6/17 | -0.03 | 0.01 | -0.04 |
| | DT030 | 5/21/17 | 1/22/18 | 9/8/16 | 7/27/18 | -0.02 | 0.01 | -0.04 |
| Santa Barbara | DT018 | 9/14/16 | 11/30/18 | 9/8/16 | 2/13/19 | 0.00 | 0.01 | -0.03 |
| Granite Canyon | DT004 | 7/19/16 | 5/19/17 | 6/28/16 | 7/6/17 | -0.02 | 0.02 | -0.04 |
| | DT033 | 5/22/17 | 5/4/18 | 9/8/16 | 7/27/18 | -0.02 | 0.01 | -0.02 |
| Pacific Grove | DT002 | 1/1/17 | 8/19/17 | 9/8/16 | 10/19/17 | -0.02 | 0.02 | -0.02 |
| | DT023 | 8/20/17 | 9/10/17 | 9/8/16 | 10/19/17 | -0.02 | 0.02 | -0.02 |
| | DT002 | 9/11/17 | 9/14/17 | 9/8/16 | 10/19/17 | -0.02 | 0.02 | -0.02 |
| | DT039 | 9/15/17 | 3/8/18 | 7/5/17 | 9/7/18 | -0.02 | 0.01 | -0.02 |
| Farallon Islands | DT032 | 8/1/16 | 2/6/17 | 6/28/16 | 5/3/17 | -0.03 | 0.00 | -0.05 |
| | DT008 | 2/7/17 | 5/30/17 | 9/8/16 | TBD | TBD | TBD | TBD |
| | DT015 | 5/31/17 | 5/14/18 | 9/8/16 | TBD | TBD | TBD | TBD |
| Trinidad Beach and Bay | DT009 | 7/28/16 | 5/23/17 | 6/28/16 | 7/6/17 | -0.02 | 0.02 | -0.04 |
| | DT005 | 5/24/17 | 12/31/17 | 9/8/17 | 7/27/18 | -0.01 | 0.01 | -0.03 |

TBD = To Be Determined (Post calibration not done as of publishing)