NOAA West Watch

Reporting Regional Environmental Conditions & Impacts in the West

September 10, 2019
Call Agenda

- Project Recap & Updates (Dan McEvoy and Kevin Werner)
- The emerging Marine Heat Wave of 2019: Toby Garfield
- Regional Climate and ENSO brief (Dan McEvoy)
- IOOS Nearshore Conditions brief (Jan Newton, Alex Harper, Clarissa Anderson)
- Discussion - Environmental conditions and impacts reporting (All)
  - Additional impacts to share?
Project Recap and Updates

• NOAA West Watch bi-monthly webinars are a project of the NOAA Western Regional Collaboration Team (NOAA West), in partnership with the Western Regional Climate Center with standing contributions from the three Integrated Ocean Observing System Regional Associations.

• Initiated in 2015, evaluated in 2016 and re-instated as a bi-monthly offering in 2018. Current goals:
  – Serve as forum for bringing together NOAA staff and partners from across the agency and region to share information about regional scale environmental observations and impacts on human systems.
  – Help facilitate interdisciplinary connections and the exchange of information among agency staff and partners on regional climatic and oceanic conditions, particularly departures from normal.

These webinars are not formal public releases of data.
• NOAA West provided funding to the Western Regional Climate Center to offer three webinars in Fiscal Year 2019 (November, January & September).

• The Western Regional Climate Center has agreed to provide funding to support a quarterly NOAA West Watch in 2020 in January, April, July, and October. The NOAA West Watch will be reassessed again at the end of 2020.

• Request: If you find these webinars helpful, or if you have ideas of in-region entities that may be open to taking on this webinar please let me know: (mcevoyd@dri.edu).
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The emerging Marine Heat Wave of 2019

NOAA West Watch
Toby Garfield*
SWFSC
10 September, 2019

* A whole gaggle of folks contributed, led by Chris Harvey, Nate Mantua, Andy Leising, Mike Jacox, Eric Bjorkstedt, Greg Williams, Brian Wells, John Field, Kym Jacobson, Dale Robinson, Elliott Hazen, Tom Good, Dean Roemmich, Alex Tardy, Michael Milstein and more
The NE Pacific has been experiencing a new Marine Heatwave (MHW) since mid-June 2019, with similarities to “The Blob” of 2013-2016.

What defines a Marine Heatwave (MHW)?

Hobday et al. (2018): Any parcel of water with a Sea Surface Temperature (SST) > 90% of the climatological mean for > 5 days

- This is taken strictly from the land-based definition for heatwaves, yet lacks the terrestrial concept of a “region”, e.g. just because its warm at my house for 5 days does not mean my state is experiencing a heatwave.

Leising (CCIEA 2019) proposed: Contiguous region > 500,000 km$^2$ in area, normalized SST anomaly > 95% of the data, and lasting > 6 days

- These adjustments are proposed to account for advection of features, natural oceanic temporal scales of variability, adds a “regional” spatial component, allows for tracking individual features, and selects only the top 5% of SSTa data.
Current MHW vs. “The Blob”: SST anomalies

The Blob
- October 2013
- February 2014
- June 2014
- July 2014
- Aug 19, 2014

Current MHW
- October 2018
- February 2019
- June 2019
- July 2019
- Aug 19, 2019
Area of MHWs in the NE Pacific over time. The different colors denote times when there were multiple, spatially separate MHWs on any given day. The horizontal line is for reference at 500,000 km$^2$, the proposed threshold for the “regional” portion of declaring a MHW.
This is the second-largest MHW on record for the NE Pacific (although it’s still only a few months old)

(Numbers indicate year in which each MHW began. Recent events in pink; “BLOB” years of 2014-2016 and the El Niño of 97 are in red)
Persistent high pressure over Gulf of Alaska, low pressure in NE Pacific in summer of 2019

This combination has reduced winds over last several months that would otherwise extract heat and mix the surface waters with cooler waters below

Consequence: rapid warming of surface waters in NE Pacific
Satellite images of sea surface temperatures (SST) indicate serious coastal compression of cooler upwelling habitat:

Sept 2, 2012 “cool period”

Sept 2, 2019 “MHW”

sea surface temperature (Celsius)
NOAA Global Coral Bleaching Monitoring Products: Daily 5-km
(2012-09-02T12:00:00Z)
Data courtesy of NOAA Coral Reef Watch

sea surface temperature (Celsius)
NOAA Global Coral Bleaching Monitoring Products: Daily 5-km
(2019-09-02T12:00:00Z)
Data courtesy of NOAA Coral Reef Watch
This is not a static feature!

August 2019 marine heatwave

Offshore evolution

Trinidad evolution

September 2019
Water temperature at depth

Temperature anomaly from ARGO floats, 35°N 135°W, 2006-2019

Residual heat at depth possibly from the Blob/El Niño

MHW (heat still only surface ~20 m)
Water temperature at depth

Trinidad line temperature 2007-2019

Temperature anomaly, 38°N, 138°W 2006-2019
Ecosystem responses?

- Albacore much closer to shore in northern California Current
- Harmful algal blooms have recently closed shellfish fishing on Washington outer coast
- **Krill off Trinidad Head, CA are smaller than normal...**

...although that is also related to unusually warm coastal conditions last winter
Ecosystem responses?

- However, cool-water, lipid-rich northern copepods (“cheeseburger” copepods) still dominate off of Newport, OR, where water temperature remains normal for now.

- Salmon returns this year most likely influenced by conditions prior to 2019 MHW (though ocean fisheries have likely been influenced by this year’s warmth).

- Generally, it’s too early to assign cause-and-effect impacts to MHW at this point, but its size, intensity and proximity are concerning.
Next steps

• NOAA and partners will continue to closely monitor conditions
  • Physical conditions and characteristics of MHW
  • Physics, chemistry and plankton off Newport every 2 weeks
  • Physics, chemistry and plankton off Trinidad Head every 4 weeks
  • Physics, chemistry and plankton from regional cruises (e.g. CalCOFI, cps, etc)
  • Overwinter growth and survival of CA sea lion pups at San Miguel Island
  • Partners in states will monitor domoic acid and other HAB-related indicators
  • Coastwide network of partners will monitor bird strandings on beaches

• Some key questions in upcoming months:
  • Will pressure patterns change & break up the MHW before it has major impacts?
  • Will the MHW come ashore when upwelling subsides in the fall?
  • Will major HABs occur in the spring when upwelling resumes?

• We will provide further updates to the PFMC in November, in the IEA report in March 2020, through NOAA websites, and as needed
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Summer Precipitation and Temperature

Precipitation Percentile  
June-August, 2019

Temperature Percentile  
June-August, 2019

https://wrcc.dri.edu/wwdt/
Nonsoon 2019

https://www.climas.arizona.edu/sw-climate/monsoon/tracker
Nonsoon 2019

Record Dry Monsoon Continues...
June 15th – September 2nd

Prescott: 6.17” 10th Driest
Heber: 6.74” 3rd Driest
Payson: 5.80” 5th Driest
Flagstaff: 6.10” 1st Driest
Winslow: 2.43” 4th Driest

Source: National Weather Service, Flagstaff, Arizona
NonSoon 2019
Flagstaff, Arizona accumulated precipitation June 15 – September 8

Normal: 6.64”
2019: 1.22”

http://scacis.rcc-acis.org/
NonSoon 2019

MODIS NDVI anomaly
August 22-September 5, 2019

Map:
https://app.climateengine.org/climateEngine

Vegetation Drought Response Index (VegDRI), September 8, 2019

https://vegdri.unl.edu/Home.aspx
Current Large Wildfires

2019 year-to-date (through 9/9/19):

- 35,605 fires
- 4,226,383 acres burned

10-year average (2009-2018) year-to-date (through 9/9):

- 46,964 fires
- 5,874,497 acres burned

Source: National Interagency Fire Center
• ENSO Alert System Status: **Final El Niño Advisory**

• ENSO-neutral conditions are present.*

• Equatorial sea surface temperatures (SSTs) are above average across the western Pacific Ocean and are below average in the eastern Pacific.

• The pattern of anomalous convection and winds are generally consistent with ENSO-neutral.

• ENSO-neutral is most likely to continue through Northern Hemisphere winter 2019-20 (50-55% chance).*

Credit: CPC

* Note: These statements are updated once a month (2nd Thursday) in association with the ENSO Diagnostics Discussion, which can be found here: http://www.cpc.ncep.noaa.gov/products/analysis_monitoring/enso_advisory/.
The latest weekly SST departures are:

- Niño 4: 0.5°C
- Niño 3.4: -0.2°C
- Niño 3: 0.0°C
- Niño 1+2: -0.6°C
Current Sea Surface Temperatures
ENSO Forecasts

CPC/IRI El Nino forecast:

NMME models + other dynamical models + statistical models

Source: CPC/IRI
September 21-October 4 U.S. Forecasts

Temperature Probability

Precipitation Probability

Source: NOAA/CPC
September-November Forecasts

Temperature Probability

Precipitation Probability

Source: NOAA/CPC
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NOAA West Watch Update 10 September 2019: Washington / Oregon Observations

Jan Newton, NANOOS Executive Director

www.nanoos.org
NANOOS: www.nanoos.org Climatology app

Sea Surface Temperature Anomaly
NCDC Optimum Interpolation SST

Aug 2019
‘Blob’ Indices

Figures and analysis by Dudley Chelton and Craig Risien, OSU
NANOOS: [www.nanoos.org](http://www.nanoos.org) Climatology app

Sea Surface Temperature Anomaly

*NCDC Optimum Interpolation SST*
NANOOS: www.nanoos.org Climatology app

Sea Surface Temperature Anomaly

OSU Modis

July 2019

Aug 2019
NANOOS: www.nanoos.org Climatology app

Sea Surface Temp

NDBC 46089, Tillamook, Or

- 2004–2018
- Seasonal cycle (N = 15 years)
- 2019 (12h smoothing)
- +/- 1 std
- Raw data (limited QC)
- +2 std

Water temperature (degC)

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
NANOOS: www.nanoos.org Climatology app

Sea Surface Temp
NANOOS: [www.nanoos.org](http://www.nanoos.org) Climatology app

Chlorophyll Anomaly: OSU Modis

July 2019

August 2019
NANOOS: [www.nanoos.org](http://www.nanoos.org) Climatology app

Puget Sound profiling buoys
CeNCOOS Climatology
CeNCOOS Climatology
Central & North Coast Heat Content

Line 66.7

Trinidad

CeNCOOS
Central & North Coast Heat Content

Line 66.7, 10 m

Line 66.7, 400 m
“Chlorophyll biomass was significantly higher compared to last sampling. As expected from the water color, dinoflagellates were still dominant this week. The diatom assemblage was sparse with Pseudo-nitzschia spp. only observed in a single live field” Aug 28, 2019
-Jason Smith, Ph.D., HABMAP PI/ MLML/ ACT
New tool: Seabirds and Marine Mammals Surveys

Key features:
- View all beach segments being monitored or zoom in to the beaches of interest to you;
- Identify which seabirds and mammals are most commonly found on beaches;
- Explore when marine mammal and seabird strandings have peaked;
- Compare seabird strandings across Greater Farallones, Monterey Bay, and Channel Islands sanctuaries to explore if an event is local or regional in extent;
- And much more!!
Thank you!

Email Alex Harper at aharper@mbari.org
NOAA West Watch Update:
Southern California Coastal Ocean Observing System (SCCOOS)
Clarissa Anderson
10 September 2019
www.sccoos.org
Temperatures at all glider lines continue to be decoupled from the Equatorial Pacific since the onset of the big warming event that started in 2014.
Persistence of the anomalously warm water since 2014 – return of the blob? Or the new normal?
Will we see more HABs? Hard to say...

McCabe et al. *GRL* 2016  Widespread Ecosystem Impacts!

**2014-2016:** Things got Blobular

**Temperature (NDBC)**

- NDBC 41 (c)
- NDBC 50 (d)
- NDBC 12 (e)

**Dungeness Crab Closure**

$100$ M Losses to California alone
Why was the HAB only in Southern California in 2017?

Broad Impacts: **Animal Strandings/Death** [Sea Lions, Elephant Seals, Guadalupe Fur Seals, Seabirds (Common Murres, Grebes, CA Brown Pelicans); **Shellfish Advisories** in Santa Barbara/Ventura Counties

April 15 = HAB Onset
- Offshore Event
- Low toxins measured at piers
- Animals stranding in large numbers

May 17 = HAB moves South & North
- More Impacts felt near San Diego
- HAB persists in Santa Barbara Channel
- Rock Crab fishery closed in Nor Cal
California Harmful Algae Risk Mapping (C-HARM) System

Cellular Domoic Acid

Probability of Cellular Domoic Acid > 10 picograms/cell (1)
C-HARM Nowcast: Pseudo-Nitzschia, cellular domoic acid, and particulate domoic acid probability, California and Southern Oregon coast
(2019-07-01T12:00:00Z)
Data courtesy of UCSC, UCSD
 Rise in the abundance of potentially toxigenic species of *Pseudo-nitzschia* at Newport Pier
Rise in the abundance of “red tide” forming dinoflagellates, *L. polyedra* and *Prorocentrum* spp.
Here's how phytoplankton are turning the tides red in Manhattan Beach

By Laylan Connelly  Sep 9, 2019  Updated 17 hrs ago  

Red tide, from an algal bloom, made an appearance over the weekend in Manhattan Beach at 36th Street. (Photo courtesy Wayne Powell)
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• Next webinar: Tuesday, January 9th 2020

THANK YOU!