Using Marine Heatwave products for Management

Photo by Abner Kingman

Andrew W. Leising,
NOAA-SWFSC, andrew.leising@noaa.gov
History of Marine Heatwaves - fisheries POV:

“The BLOB” hits the coast of Oregon in Sept, 2014, and puts Marine Heatwaves on the RADAR!

Had a wide range of impacts on marine life (Cavole et al., 2016 diagram)

Understanding potential impacts of MHWs on fisheries becomes a research priority

Developed the “Blobtracker” website and some associated indices for an array of management entities as part of NOAA’s Integrated Ecosystem Assessment (IEA) program

Losers

- Subarctic copepods, krill: Lack of food reduced population, distribution moved northward
- Market squid 2015–2016: Reduced in south as distribution moved far north
- Dungeness crab and mussels: Fishery closed due to toxicity
- Salmon: Warm temperatures decreased recruitment for some species
- Groundfish: Potential loss of habitat due to hypoxia
- Seabirds, seals, and sea lions: Massive die-offs due to lack of food
- Baleen whales: Expected to decline due to lack of food

Winners

- Toxic phytoplankton: Massive bloom closed important fisheries
- Tropical, subtropical copepods: Northward range expansion with warm water
- Market squid 2014–2015: Increased fishery in north caused by range expansion
- Rockfish: Increased recruitment in California
- Tuna: Increased abundances along coast with increased sport fishing
- Orcas: Increased birth rate caused by increased salmon abundances in some regions through population movements

www.integratedecosystemassessment.noaa.gov
Q: What is it? A: Website with products and data

Daily update of SST anomaly, weekly updates of various “products”

Twice monthly update of running “blog” narrative of current conditions

Typically the #1 viewed site for all of the IEA web pages

100% hinges on SST data from NOAA’s OISST dataset.

https://www.ncdc.noaa.gov/oisst/optimum-interpolation-sea-surface-temperature-oisst-v21
**Products used by management: PFMC**
(Pacific Fisheries Management Council)

Data and Analyses used in annual report presented to the PFMC is used to “set the stage” as part of our “Integrated Ecosystem Assessment” from “wind to whales”

Website provides up-to-date information for council members or other stakeholders to view as the year progresses

---

**2. CLIMATE AND OCEAN DRIVERS**

ISAAC D. SCHROEDER, STEVEN BOGRAD, JENNIFER FISHER, TOBY GARFIELD, CORREIGH GREENE, ELLIOTT HAZEN, KYM JACOBSON, MICHAEL JACOX, ISAAC KAPLAN, ANDREW LEISING, STUART MUNSCH, EMILY NORTON, DAN RUDNICK, JARROD SANTORA, SAMANTHA SIEDLECKI

Following the exceptionally warm and variable climate conditions of 2013-19, in 2020 conditions returned to those more favorable to higher productivity. The relatively weak 2019 El Niño shifted into the La Niña state and the positive PDO became negative. These trends suggest cooler waters and higher productivity. On the other hand, the NPGO remained strongly negative, an indication of reduced transport of North Pacific gyre water into the CCE and lower productivity.

The northeast Pacific continues to experience large marine heatwaves in surface waters. In January 2020, a heatwave that began in summer 2019 had reached to an offshore region in the Gulf of Alaska. A new heatwave occurred from February-June 2020 in the area where the 2019 event faltered, but it remained >1500 km from the West Coast. Then, a much larger heatwave formed offshore in June, and by mid-September it had grown to its maximum size of ~9.1M km² (Figure 3.1.2), the second largest North Pacific heatwave on record behind the 2013-16 “Blob” (Appendix D.2). The 2020 heatwave stayed offshore until September, presumably held off by moderate to strong upwelling that occurred in the central and northern CCE for much of 2020. The heatwave lingered in coastal waters through November, particularly the northern CCE, then moved offshore, where it remains as of January 2021.

---

Example text and figures from last years report
Products for Management: NMS

Developed several indices based on discussions with NOAA-National Marine Sanctuaries staff, which they used in their 10 year condition status reports.

Heatwave data for region (blue dash line on map)
Heatwave outlined by thick black line (when present)
Data from NOAA OISST dataset
Top right panel = Current % Region HW coverage vs ave intensity of HW in region
Left panels =
1 = HW coverage of region over time (%)
2 = Intensity of HW over time (SSTa)
3 = Distance to closest Major HW (km)
4 = Cumulative intensity in region (black line)
and climatological Cumulative intensity (red dash line)
Example indices used for sanctuaries condition report
California EPA prepares a report every 3 years that includes a “marine conditions” section. For the most recent report, they included several MHW indices as part of their report.
Improvements (wish list) for MHW research/management:

1. Fairly well understood that wind (and SLP) are key co-indicators of MHWs, however, the data sources for them are not as easy to obtain/work with

1. The OISST dataset is delayed by several weeks - either fixing that delay, or creating other similar datasets that are daily, no gaps, etc. would be great!

1. The pathways from index creation to use for management is not always clear

1. Increased discussion with stakeholders to improve web-based products