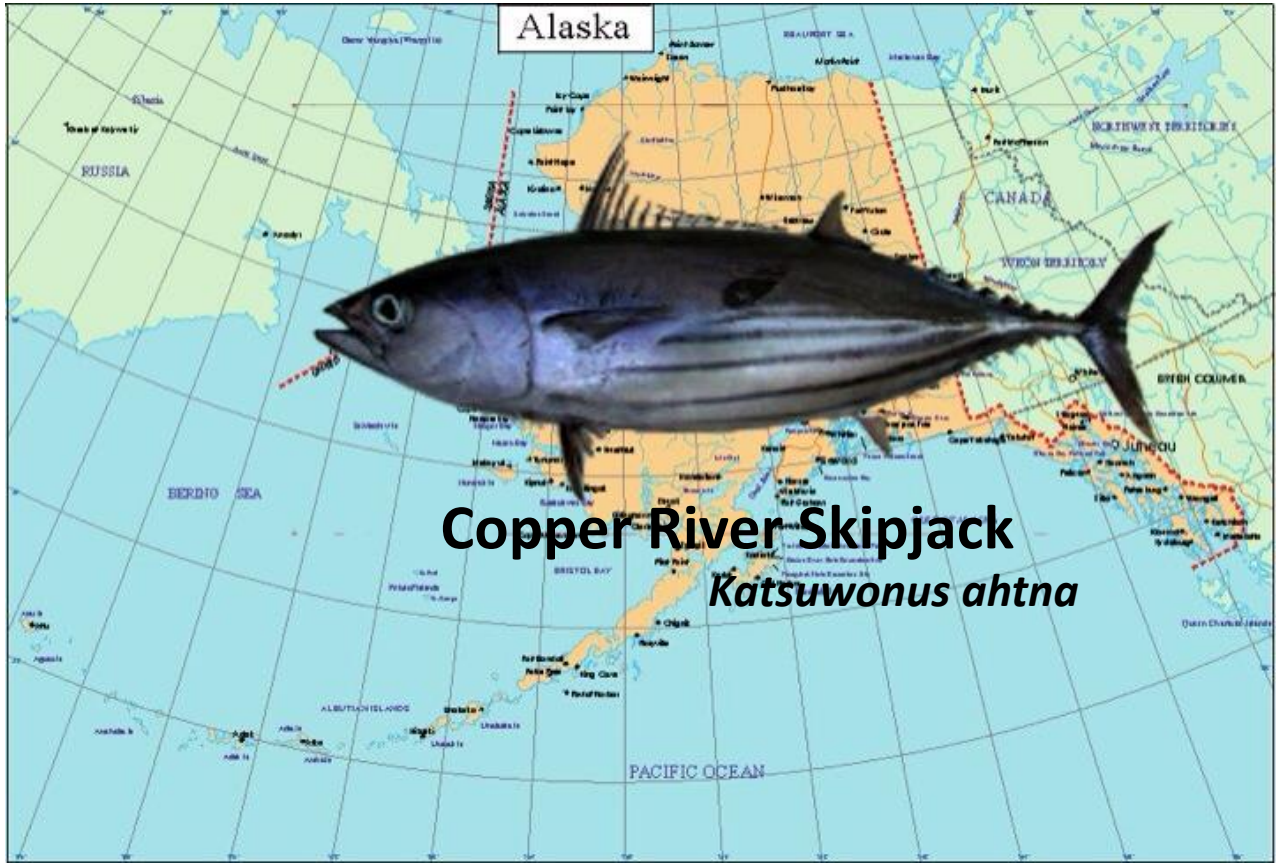
“The Blob” and ocean life in the North Pacific



FishWithJD

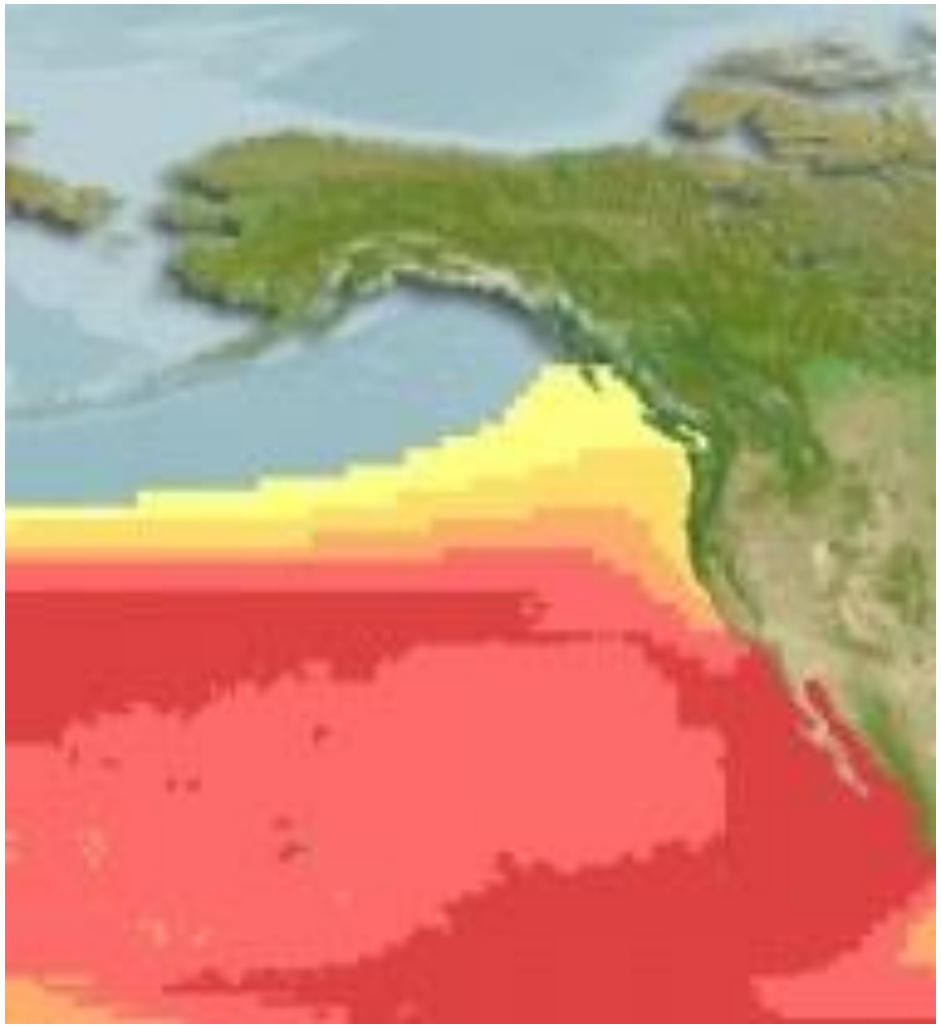
Thomas A. Okey, PhD

Ocean Integrity Research, Victoria, BC, Canada

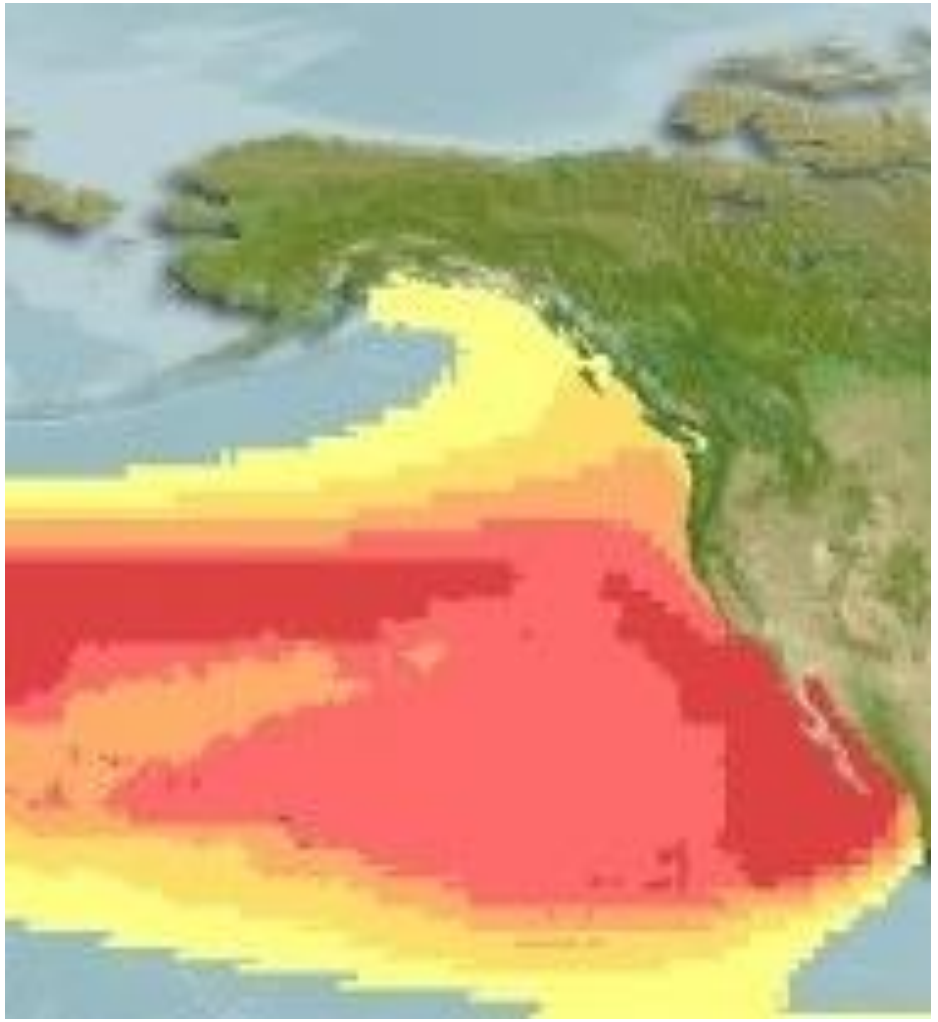
University of Victoria School of Environmental Studies

Skipjack tuna *(Katsuwonus pelamis)*

2013



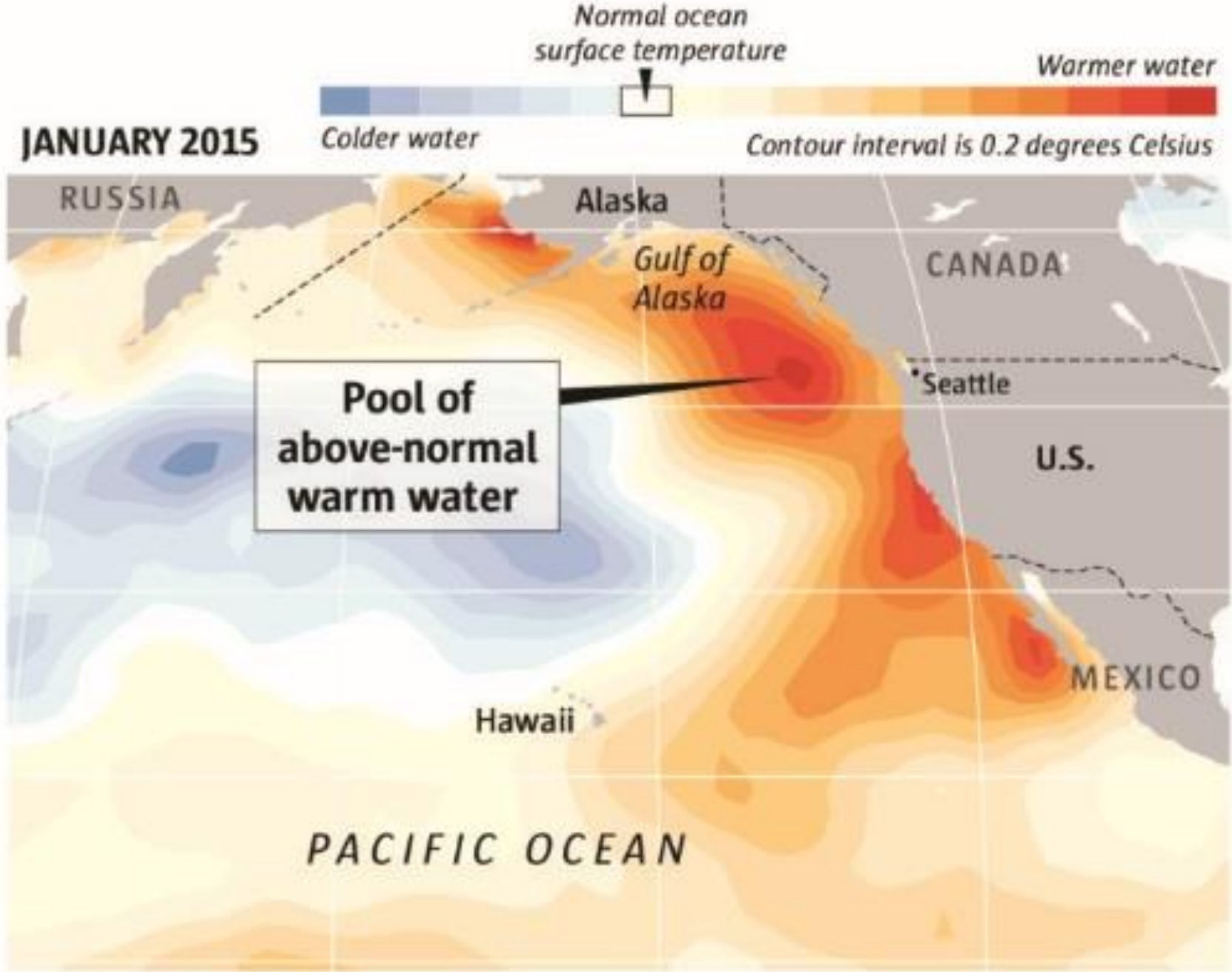
2100



Reviewed Native Distribution Map for *Katsuwonus pelamis* (modelled 2100 map based on IPCC A2 emissions scenario) (Skipjack tuna). www.aquamaps.org, version of Aug. 2013.

The blob off our coast

Scientists say a vast pool of warm water off our coast is affecting marine life and local weather, and is part of a bigger pattern that includes California's drought and East Coast blizzards.



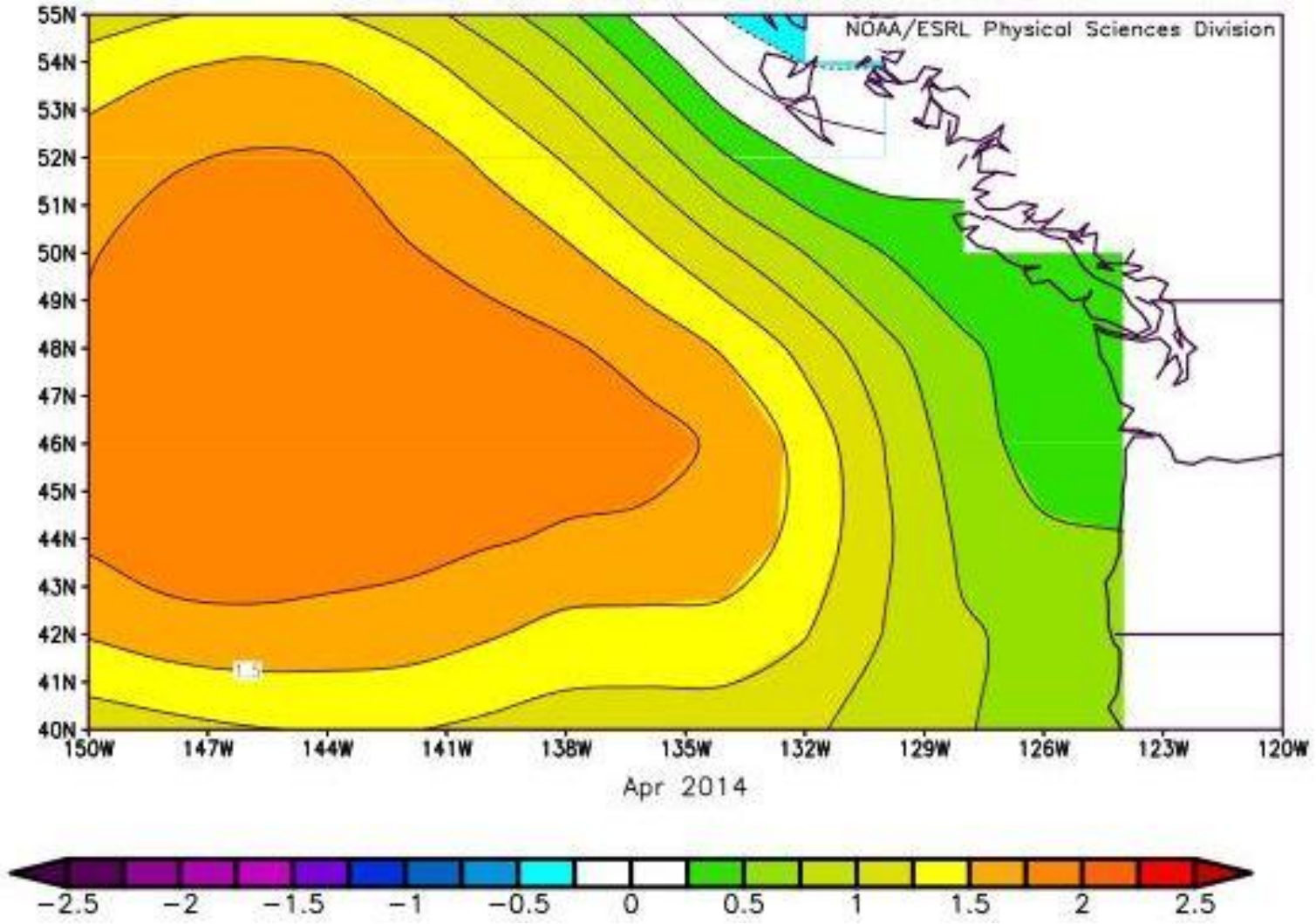
Source: Department of Atmospheric Sciences, University of Washington

MARK NOWLIN / THE SEATTLE TIMES

“The Blob” is an area of unusually warm water in the North Pacific

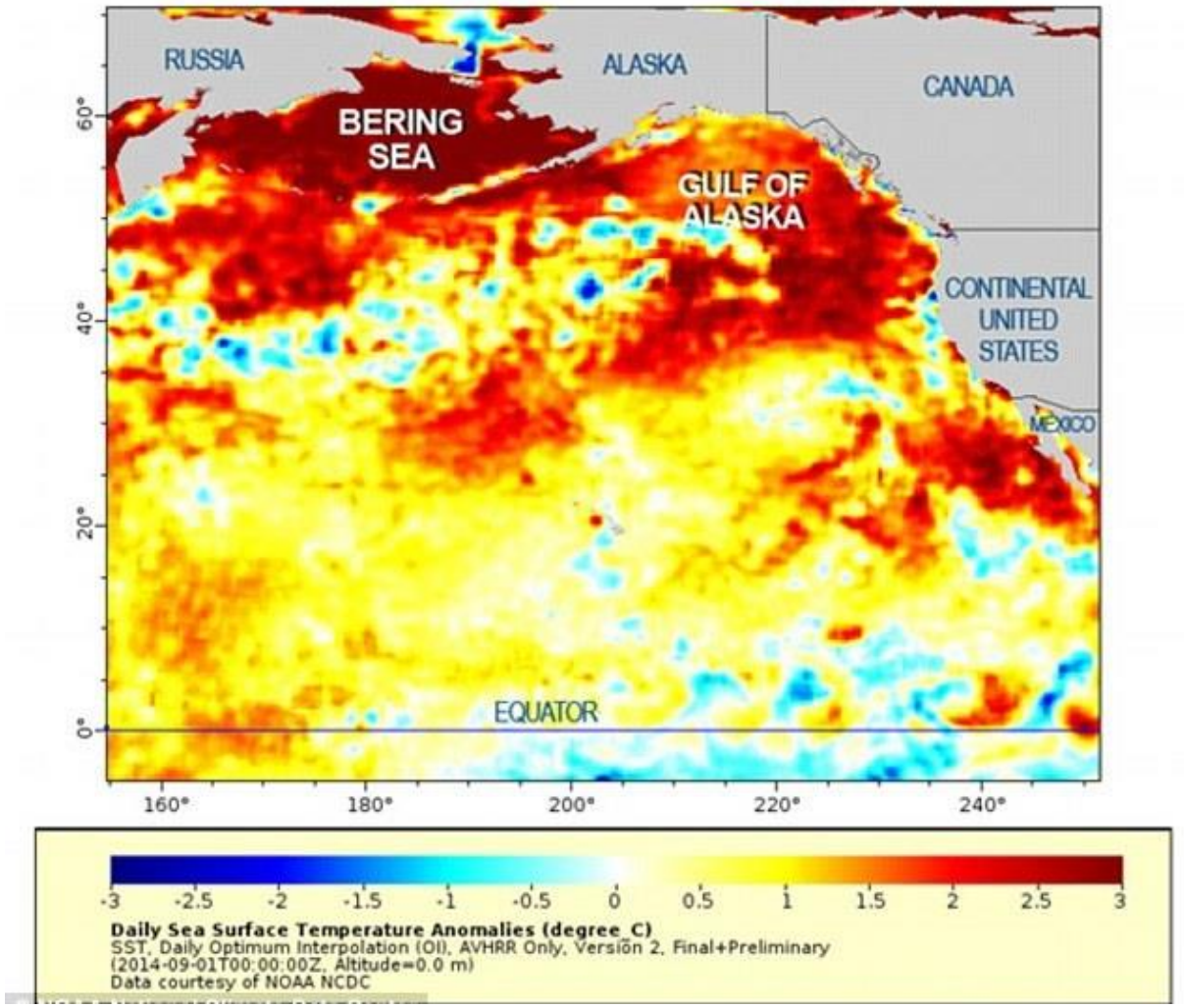
Nick Bond, PhD
JIASO, University of Washington

April 2014



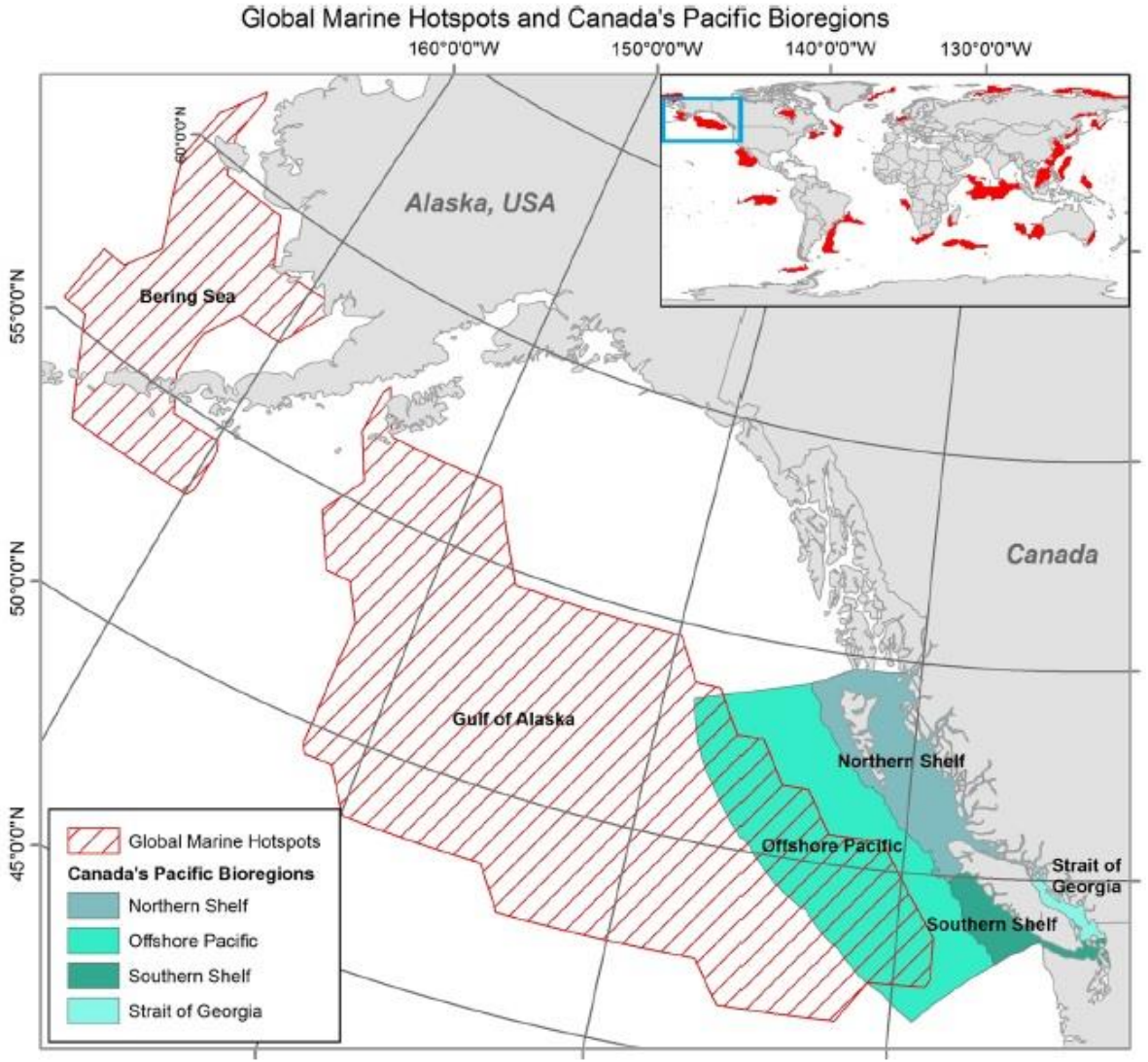
1 September 2014

"The Blob" moved onshore in late 2014



NOAA, NCDC - http://www.dailymail.co.uk/sciencetech/article-3033598/Mystery-blob-Pacific-Ocean-Strange-patch-warm-water-causing-California-s-mega-drought.html

Projected hotspots for long-term change



Rev Fish Biol Fisheries (2014) 24:519–559
DOI 10.1007/s11160-014-9342-1

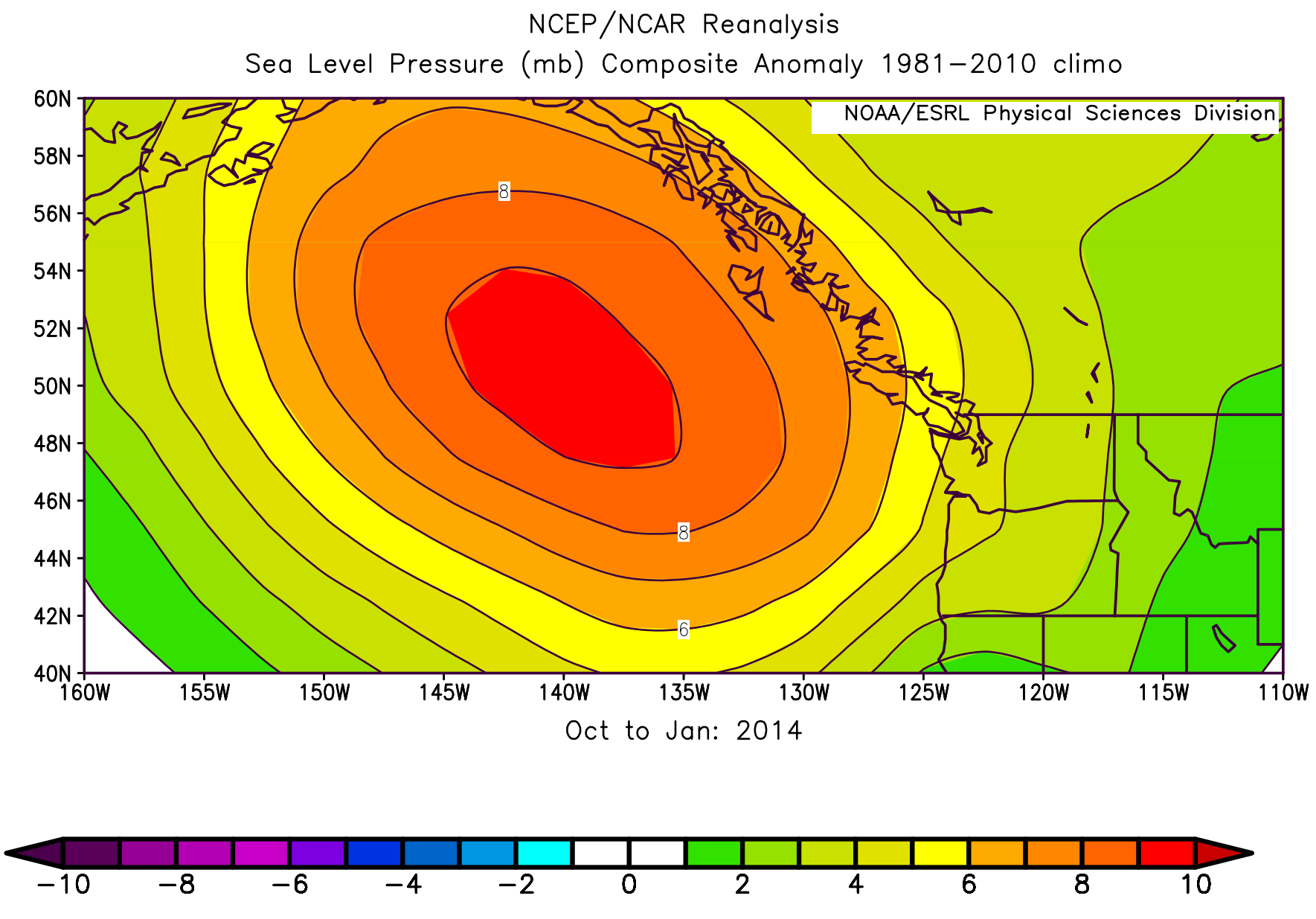
RESEARCH PAPER

Effects of climate change on Canada's Pacific marine ecosystems: a summary of scientific knowledge

Thomas A. Okey · Hussein M. Alidina · Veronica Lo · Sabine Jessen

Received: 25 August 2013 / Accepted: 20 January 2014 / Published online: 22 February 2014

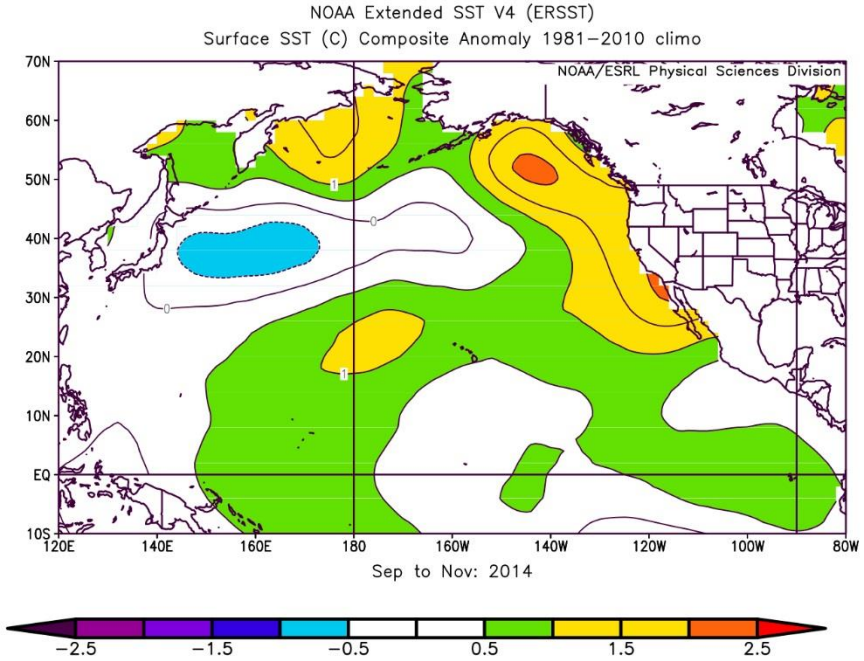
Abstract The marine life of Canada's Pacific marine ecosystems, adjacent to the province of British Columbia, may be relatively responsive to rapid oceanographic and environmental change associated with global climate change due to uniquely evolved plasticities and resiliencies as well as particular sensitivities and vulnerabilities, given this dynamic and highly textured natural setting. These marine ecosystems feature complex interfaces of coastal geomorphology, climate, and oceanography, including a dynamic oceanographic and ecological transition zone formed by the divergence of the North Pacific Current into the Alaskan coastal current and the California Current, and by currents transporting warm tropical waters from the south. Despite long-term warming in the region, sea surface temperatures in Canada's Pacific have been anomalously cool since 2007 with *La Niña*-type conditions prevailing as we


NCEP/NCAR Reanalysis
Sea Level Pressure (mb) Composite Anomaly 1981–2010 climo
NOAA/ESRL Physical Sciences Division
60N
58N
56N
54N
52N
50N
48N
46N
44N
42N
40N
160W
155W
150W
145W
140W
135W
130W
125W
120W
115W
110W
8
8
6
Oct to Jan: 2014
−10
−8
−6
−4
−2
0
2
4
6
8
10

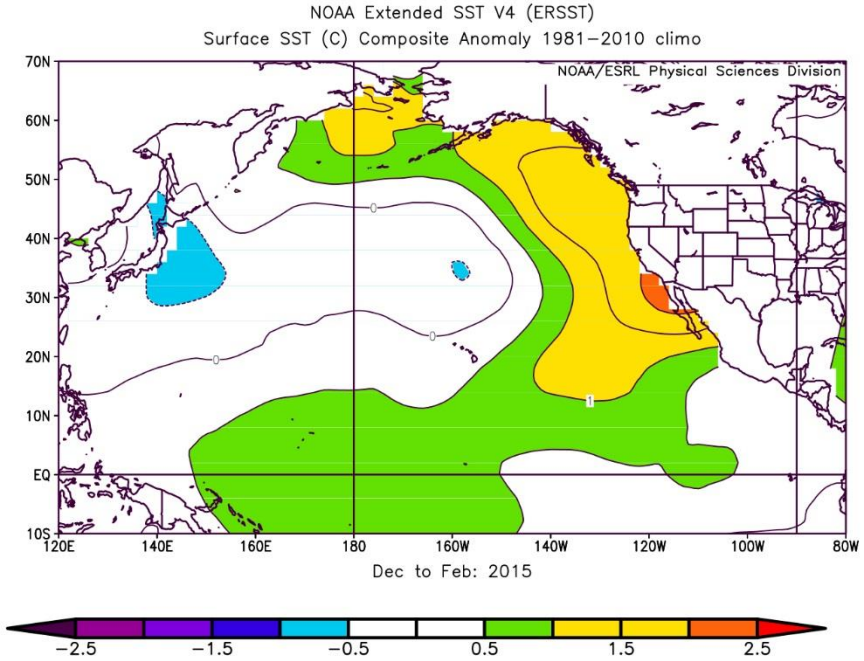
North Pacific Currents

Figure 2.2 Main current systems in the area of interest. (Source: GLOBEC (http://www.cop.noaa.gov/stressors/climatechange/current/fact-globecpne.aspx)

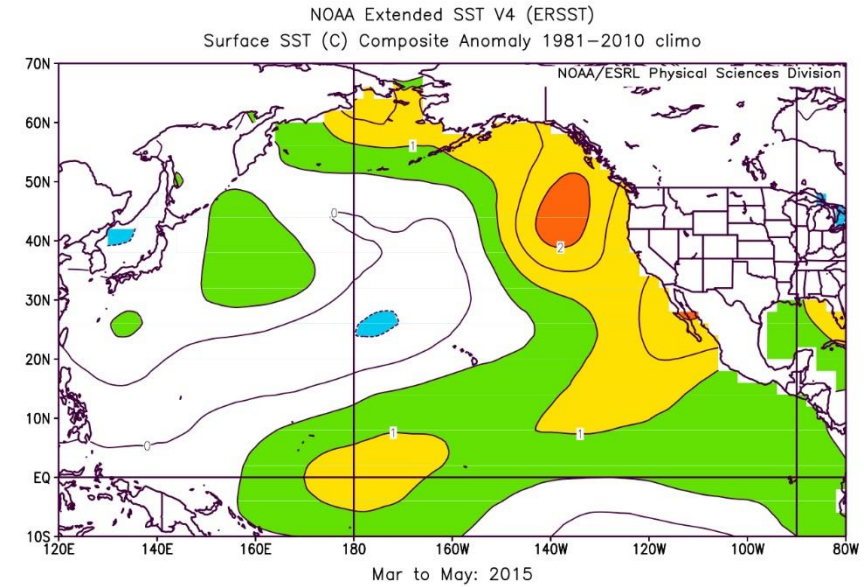
Sep-Nov 2014



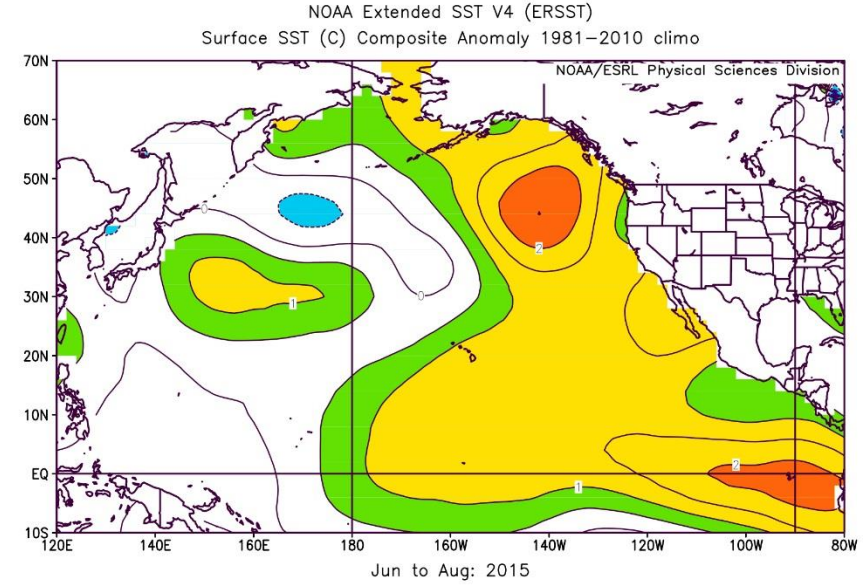
Dec-Feb 2015



Mar-May 2015



Jun-Aug 2015

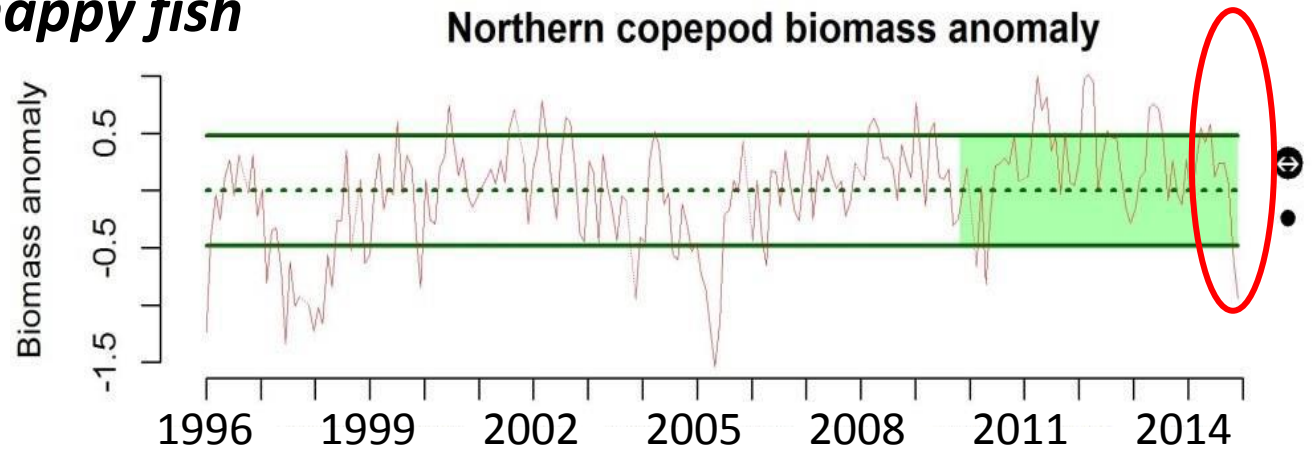


There are northern and southern copepod assemblages:

≈

northern copepod = happy fish

- "Northern" copepods are rich in lipids that support fish production
- Northern copepods associated with cooler waters in the California Current
- In recent years off Newport, OR: northern copepods have been abundant
- But, a major shift occurred in late 2014



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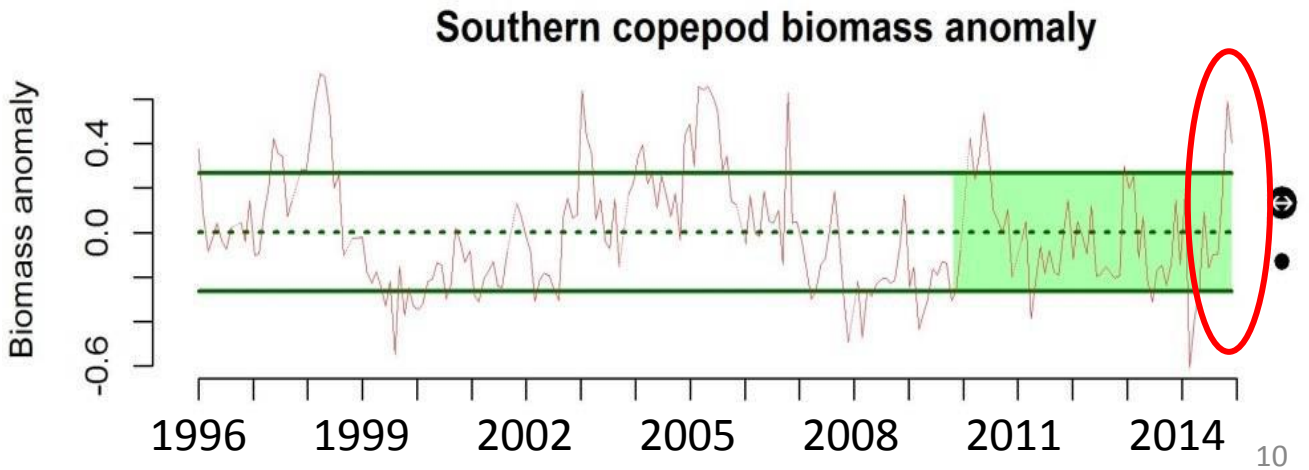
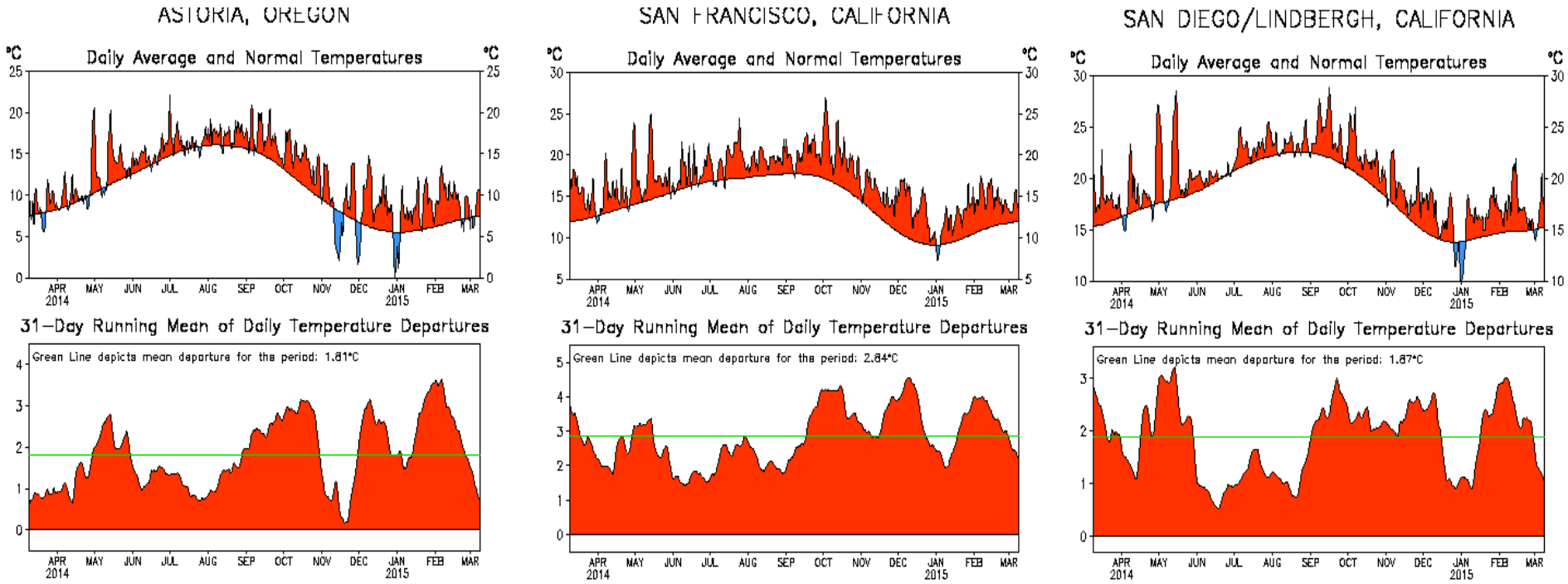
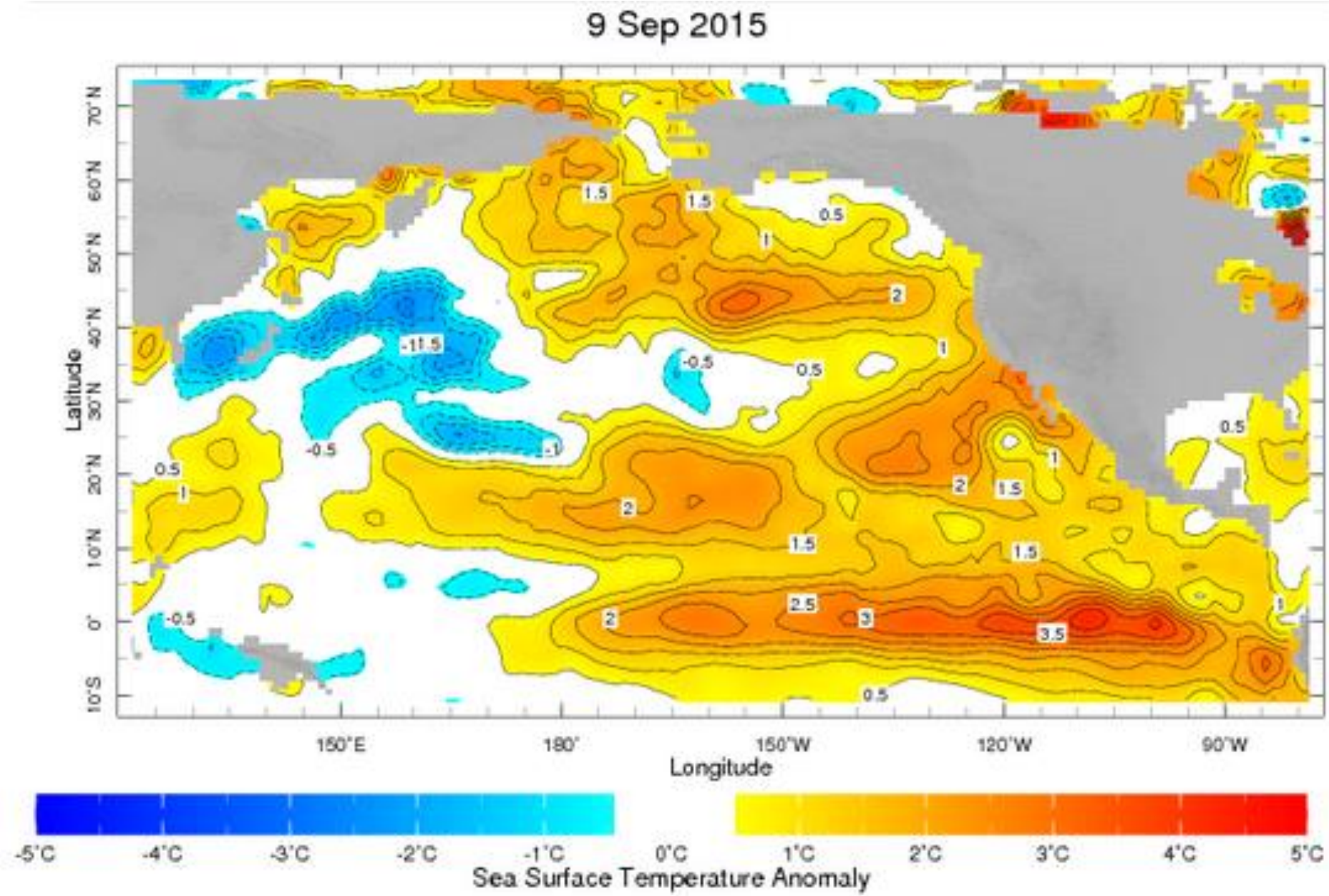


Krill – e.g. *Euphausia pacifica*

Almost every day from spring 2014 to spring 2015 was warmer than average at most West Coast locations



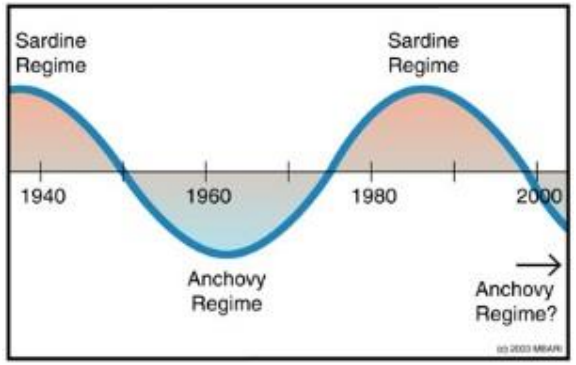
http://www.cpc.ncep.noaa.gov/products/global_monitoring/temperature/global_temp_accum.shtml


9 Sep 2015
70°N
60°N
50°N
40°N
30°N
20°N
10°N
0°
10°S
Latitude
150°E
180°
150°W
120°W
90°W
Longitude
-5°C
-4°C
-3°C
-2°C
-1°C
0°C
1°C
2°C
3°C
4°C
5°C
Sea Surface Temperature Anomaly

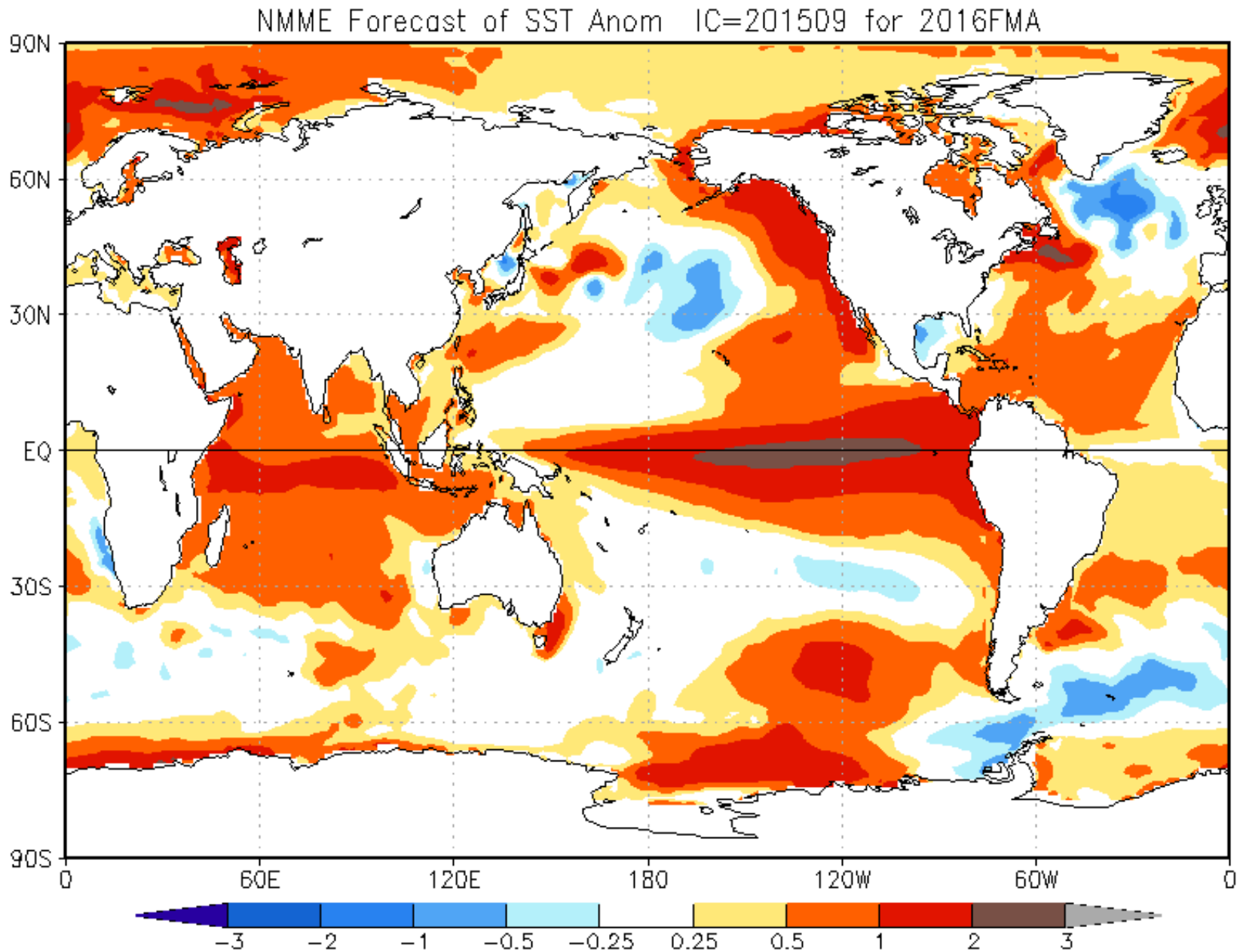
Anchovies

and

Sardines

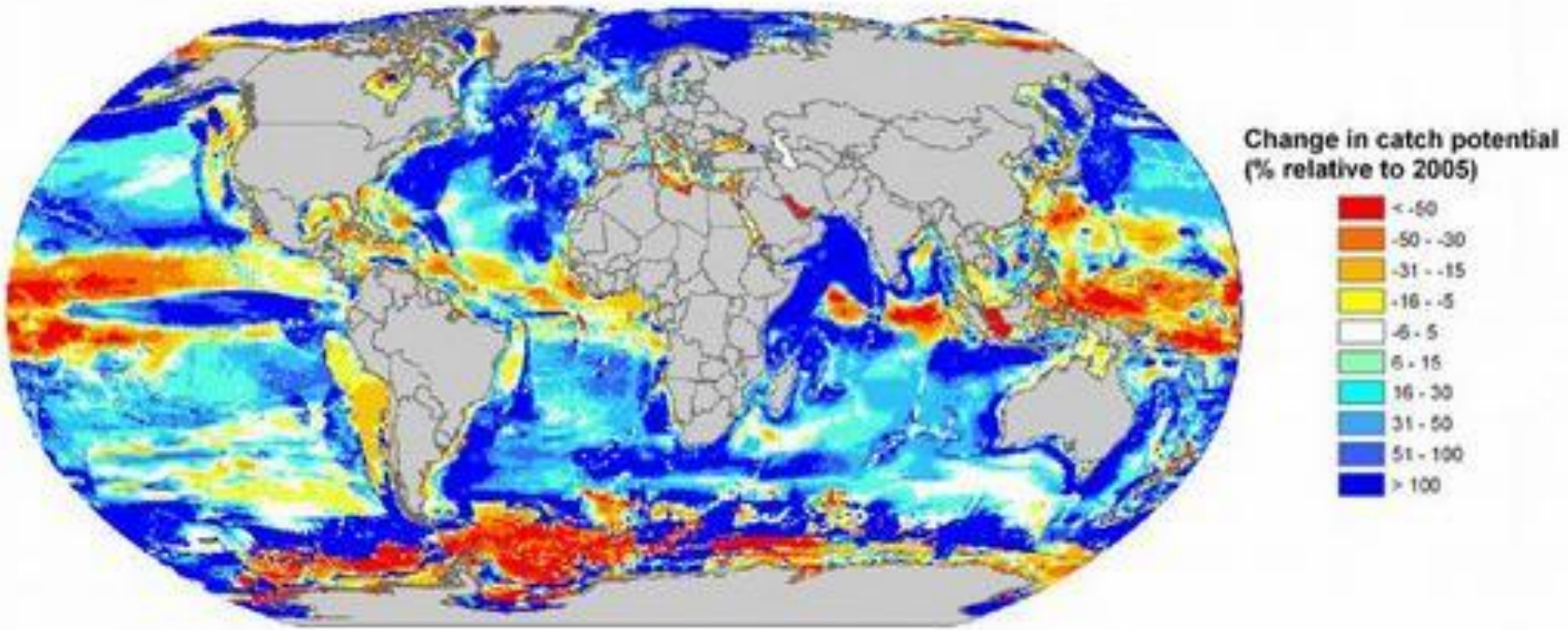


Multi-model Ensemble Average SST Anomaly Forecast



Projected change in catch potential by 2055

Scenario: High-range greenhouse gas emission



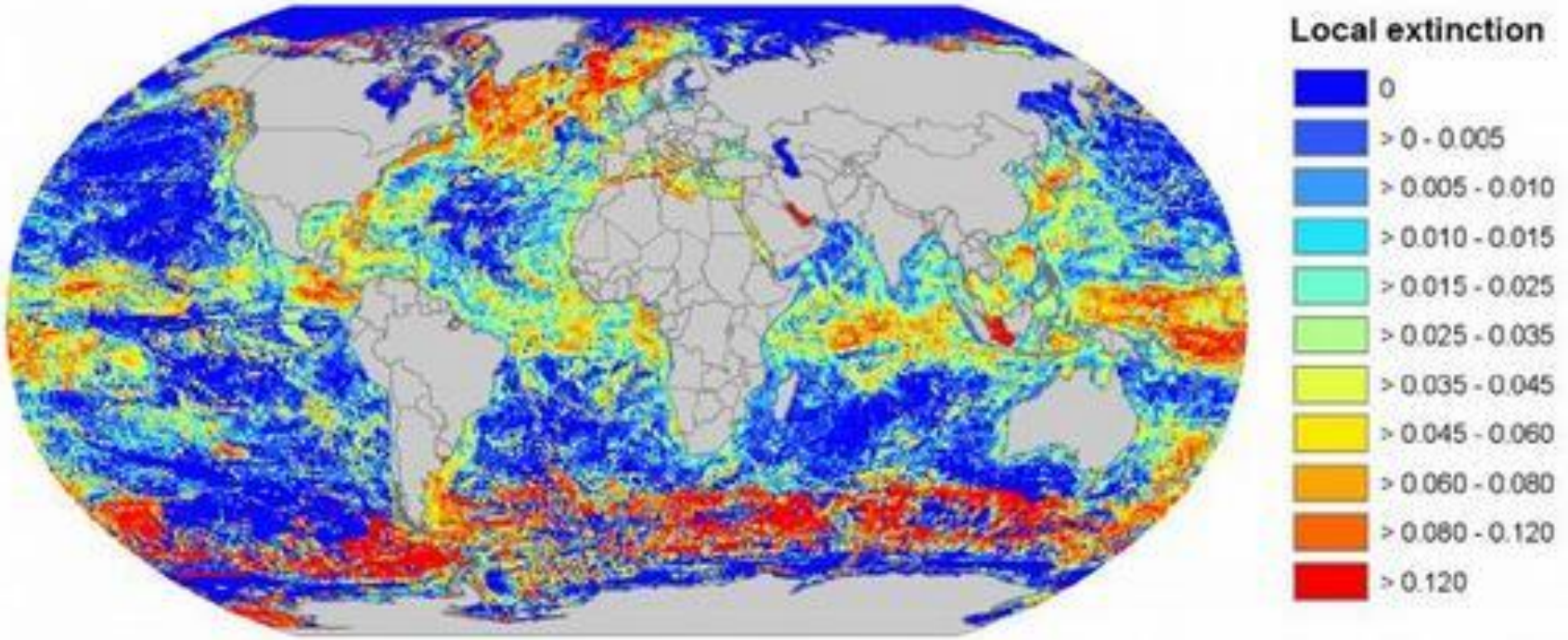
- **High latitude countries are projected to gain in catch potential while countries/regions in the tropics may suffer from losses;**
- **E.g., USA (excluding Hawaii & Alaska) may lose over 15% of their catch potential from 2005 to 2050.**

Source: Cheung, Lam, Kearney, Sarmiento, Watson, Zeller, Pauly (submitted manuscript)

SEA AROUND US PROJECT

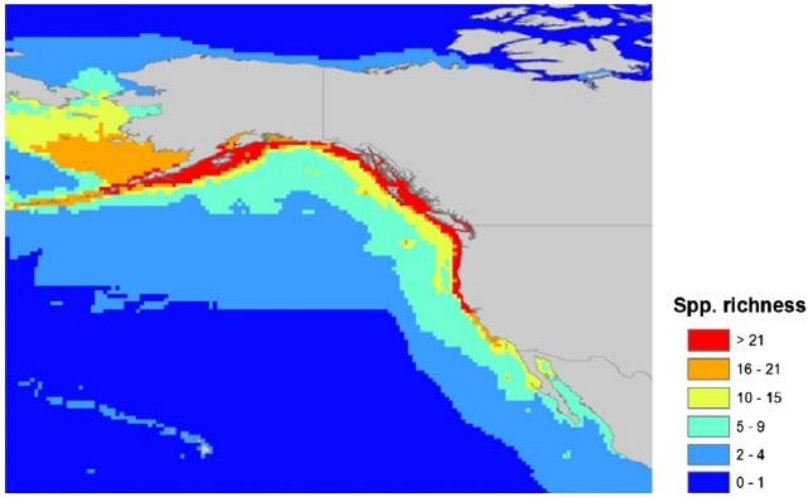
Intensity of local extinction by 2050

Scenario: High-range greenhouse gas emission



- Some marine species are projected to move away from the tropics and the southern boundary of semi-enclosed seas (e.g. Mediterranean Sea);
- This leads to high rate of local extinction in these regions.

Source: Cheung, Lam, Kearney, Sarmiento, Watsonand Pauly (in press) Fish and Fisheries



Predicted latitudinal centroids of 28 pelagic fish species from 2005 to 2060 under the SRES A2 scenario

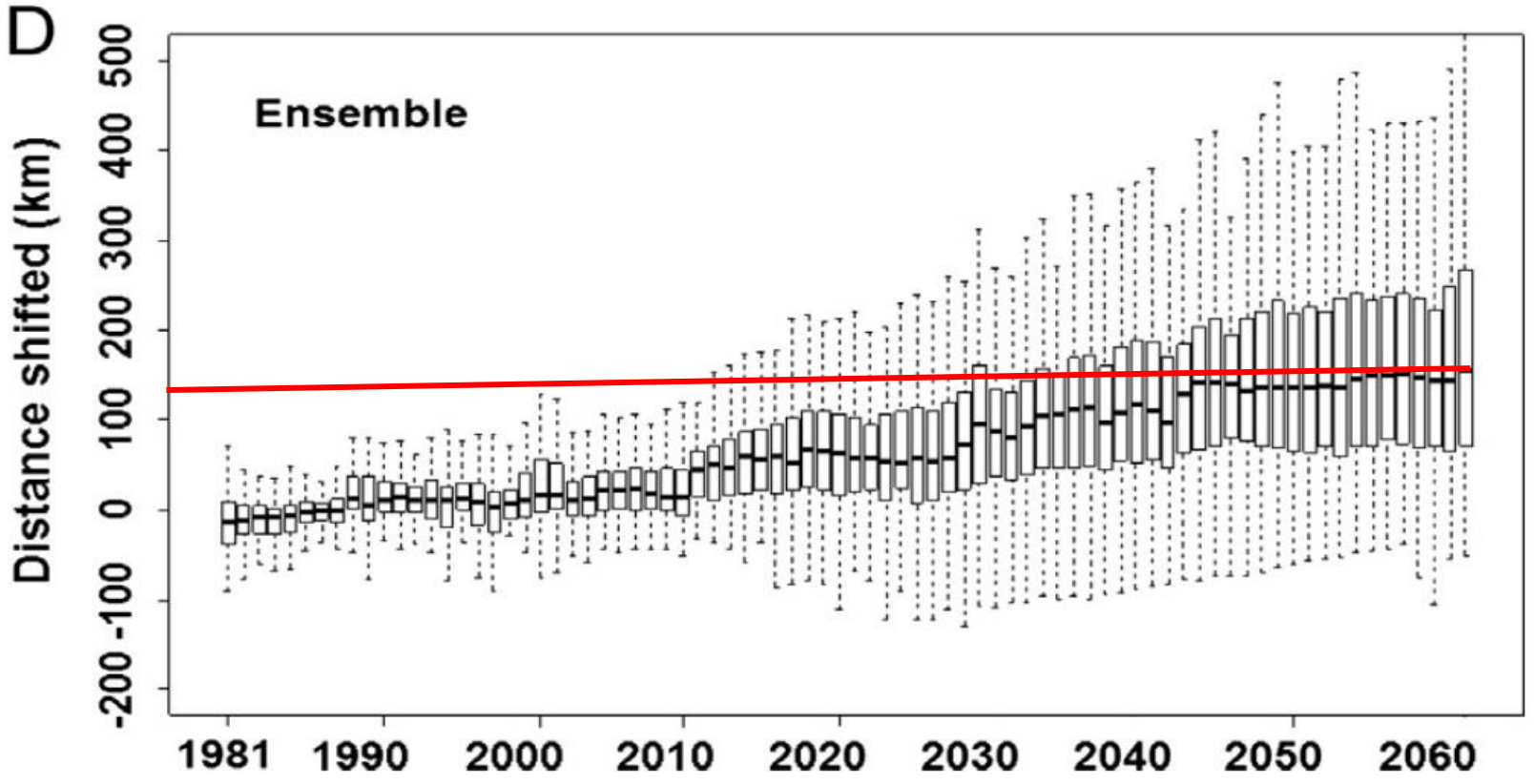
Contents lists available at ScienceDirect

Progress in Oceanography

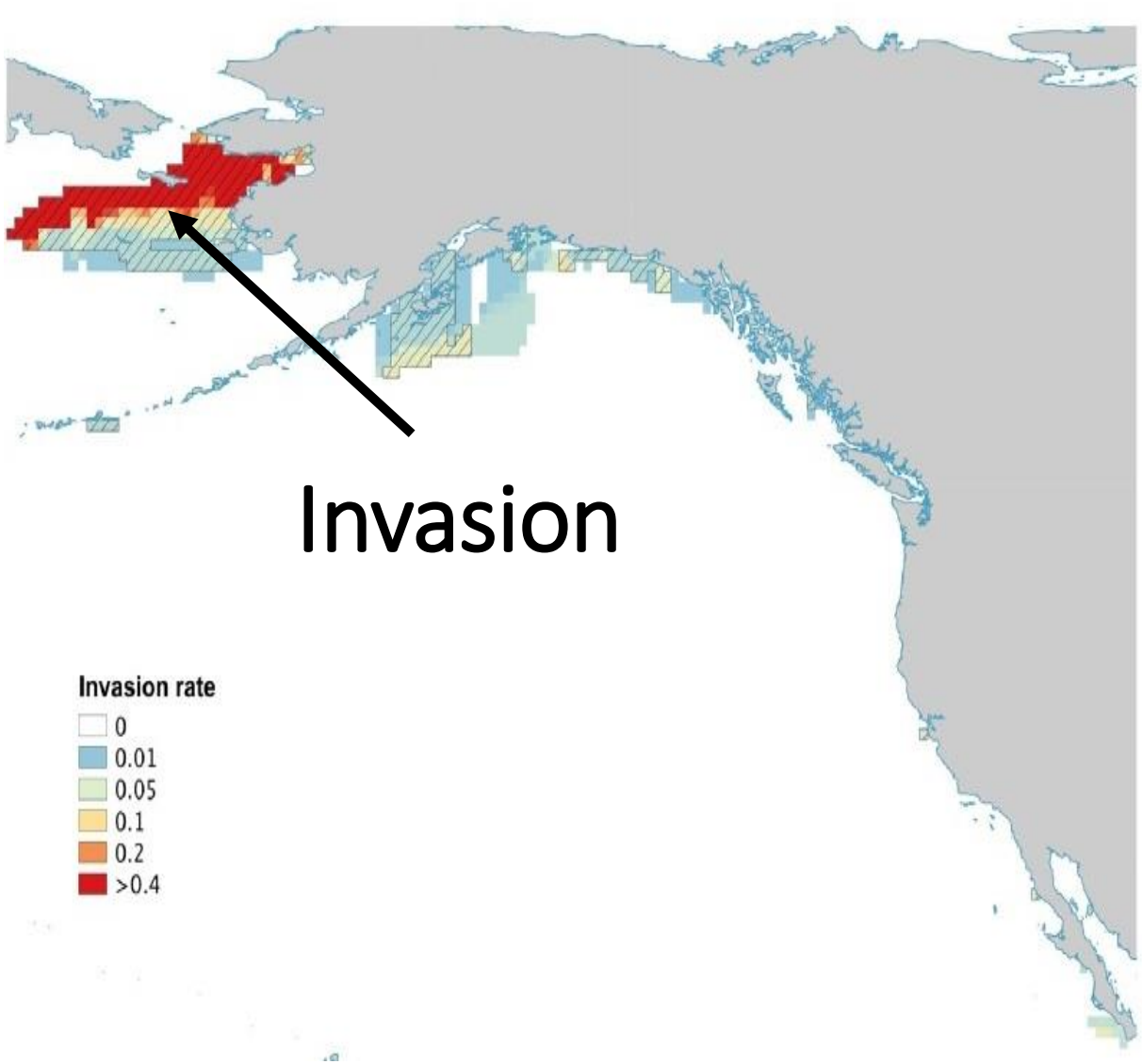
journal homepage: www.elsevier.com/locate/pocean

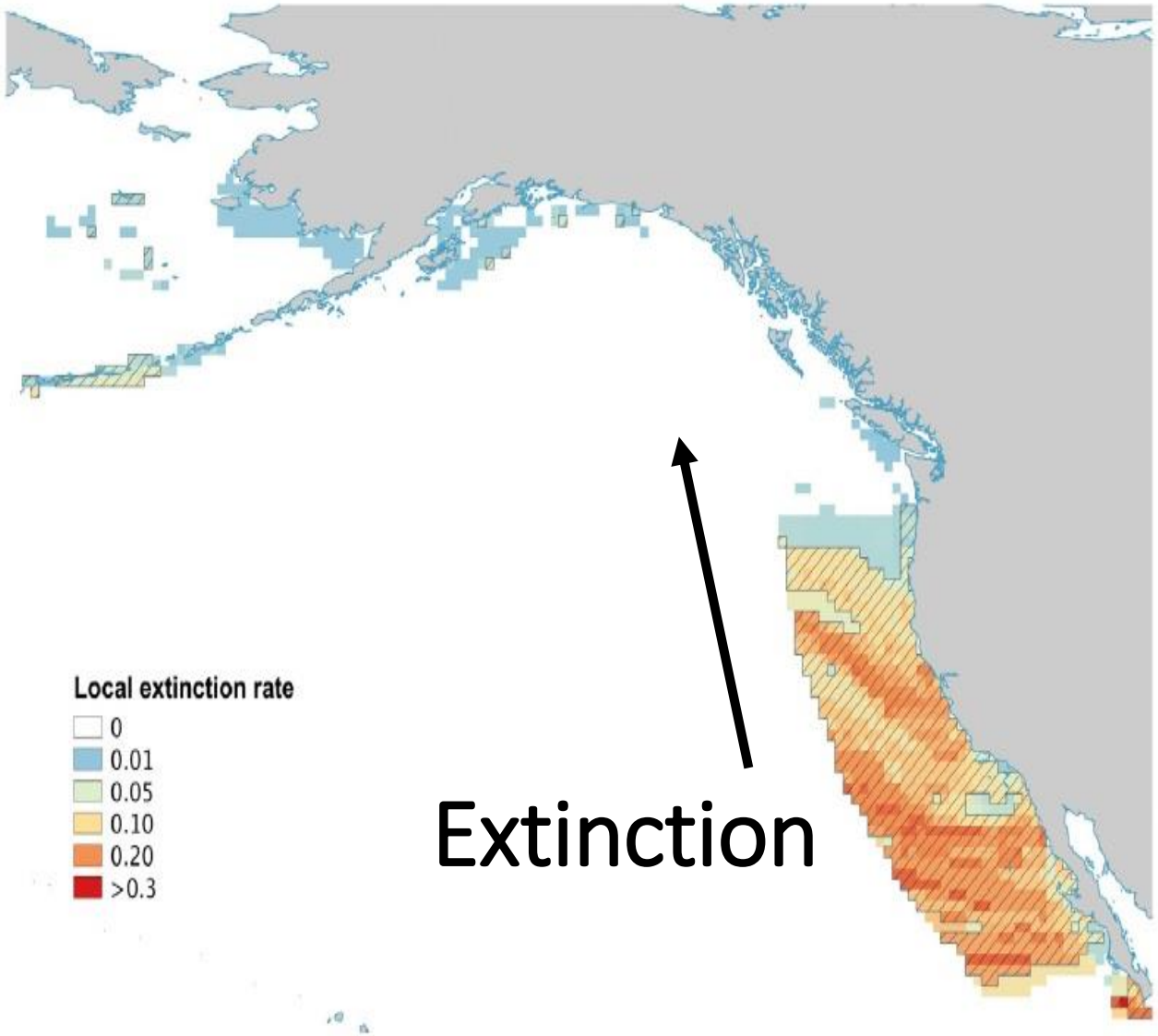
Projecting future changes in distributions of pelagic fish species of Northeast Pacific shelf seas

William W.L. Cheung [a,*], Richard D. Brodeur [b], Thomas A. Okey [c,d], Daniel Pauly [e]

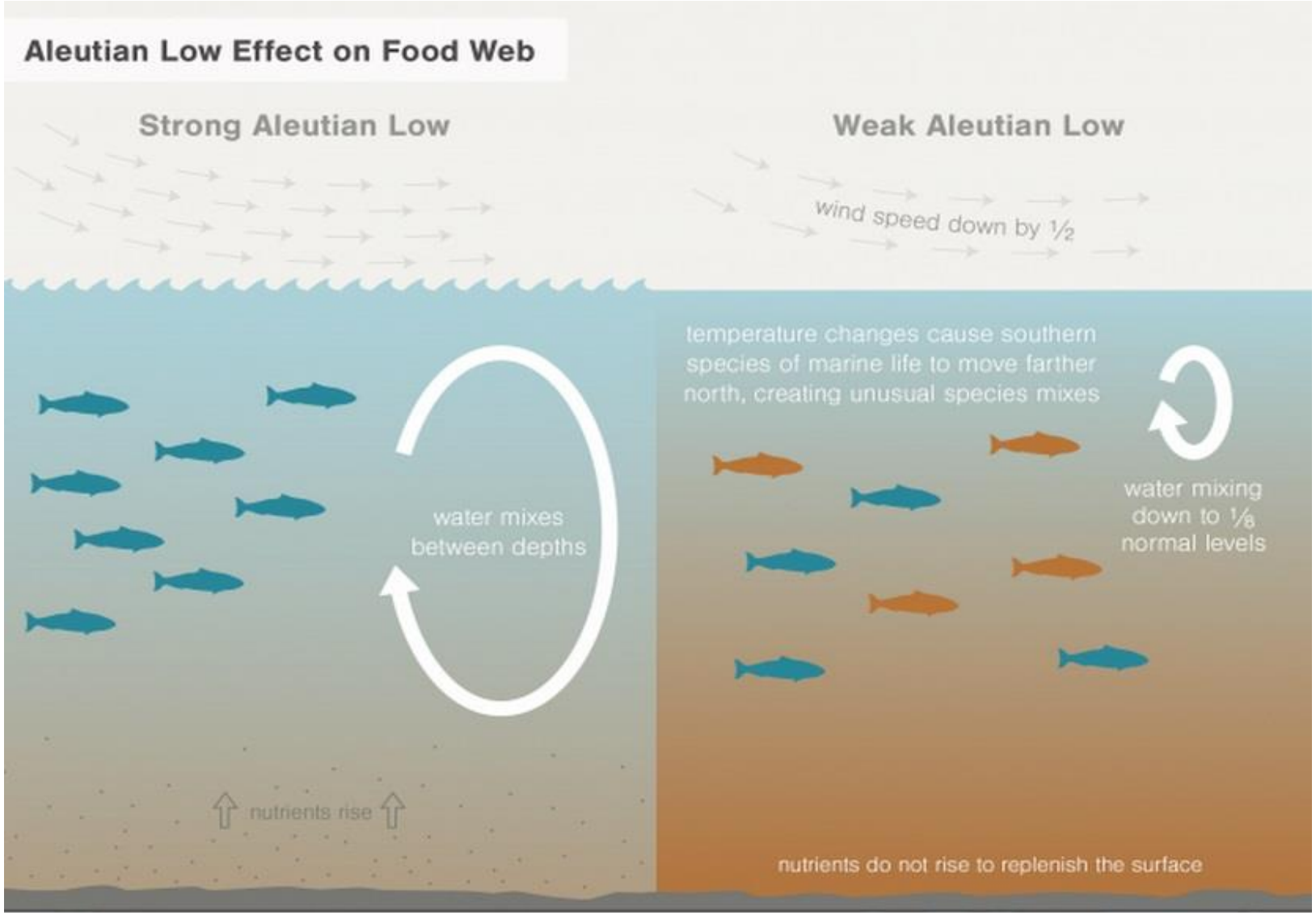


Projected changes shelf pelagic fish distributions





By 2060, SRES A2 scenario



Mark Garrison

James Thomson, “The Blob in the Northeast Pacific Ocean,” *Hakai Magazine*,September 16, 2015, accessed September 21, 2015, http://bit.ly/1LeUmTq.

Illustration by Mark Garrison

James Thomson, "The Blob in the Northeast Pacific Ocean," *Hakai Magazine*,September 16, 2015, accessed September 21, 2015, http://bit.ly/1LeUmTq.

Vellela vellela – “by-the-wind-sailors”

Photo by Tiffany Boothe / Seaside Aquarium

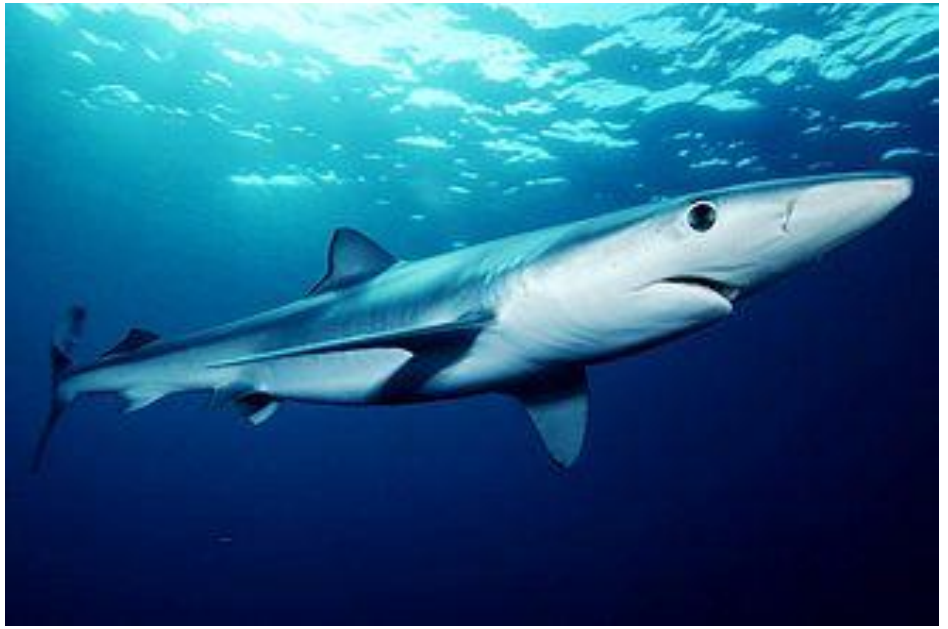
Mola mola – Ocean Sunfish

Scott Pegau from the Oil Spill Recovery Institute in Cordova saw four mola mola (ocean sunfish) off Hinchinbrook Island, Prince William Sound, while conducting forage fish surveys on August 5, 2015.

"Sunfish2" by Per-Ola Norman - Own work. Licensed under Public Domain via Commons - https://commons.wikimedia.org/wiki/File:Sunfish2.jpg#/media/File:Sunfish2.jpg

Sharks

Thresher shark -- Alopias



Blue Shark -- Prionace glauca

King-of-the-salmon -- *Trachipterus altivelis*

Kara Sievewright

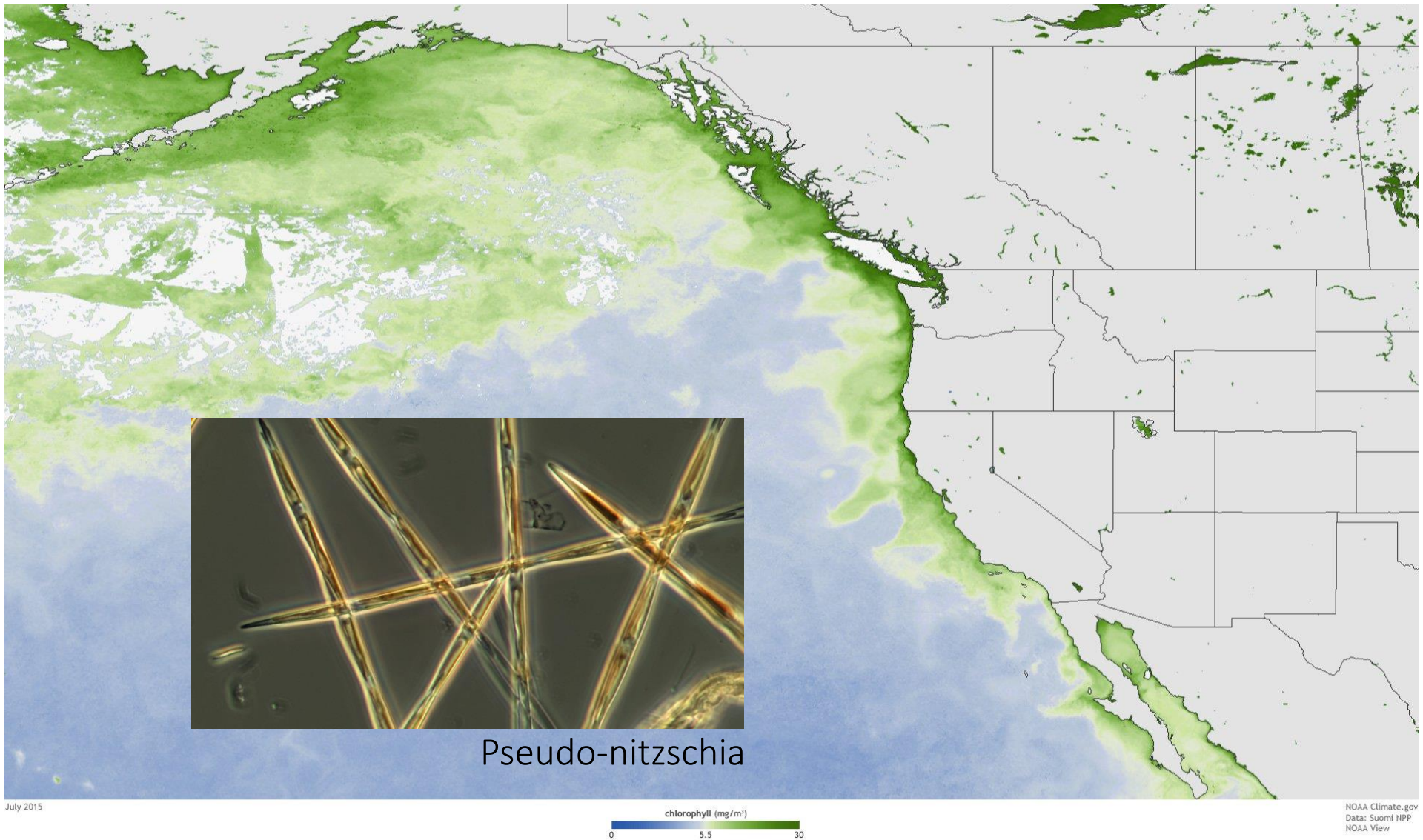
Louvar -- *Luvaris imperialis*

Olive Ridley Sea Turtle -- *Lepidochelys olivacea*

Pleuroncodes planipes -- Tuna Crabs

Mindy Schauer/The Orange County Register via AP)Gregg Adler steps gingerly through a blanket of crustaceans on Balboa Island in Newport Beach, Calif., on Tuesday.

Chlorophyll a - July 2015



Pseudo-nitzschia

NOAA Fisheries

Dead fin whales -- *Balaenoptera physalus*

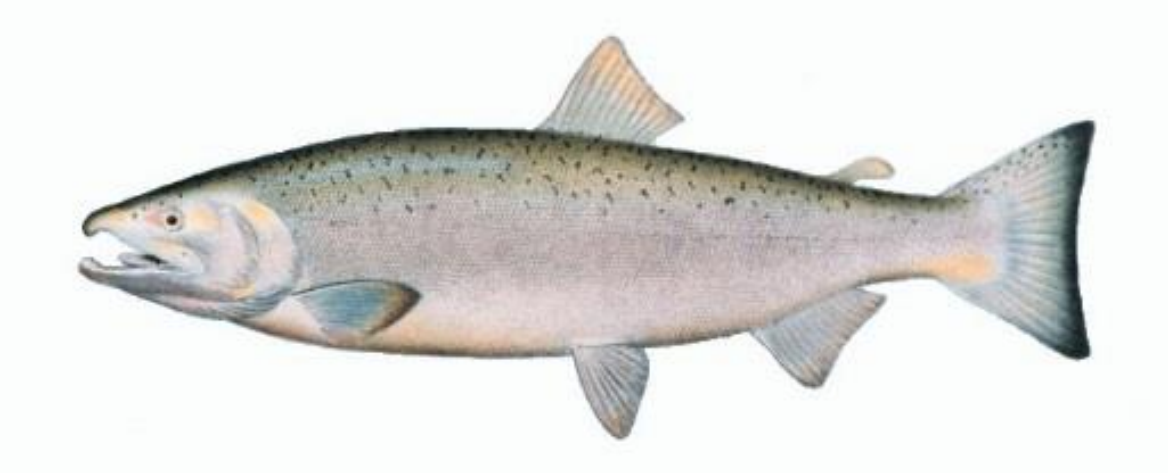
Brown Booby -- *Sula leucogaster*

Brown Pelicans - *Pelecanus occidentalis*

by Terry Foote

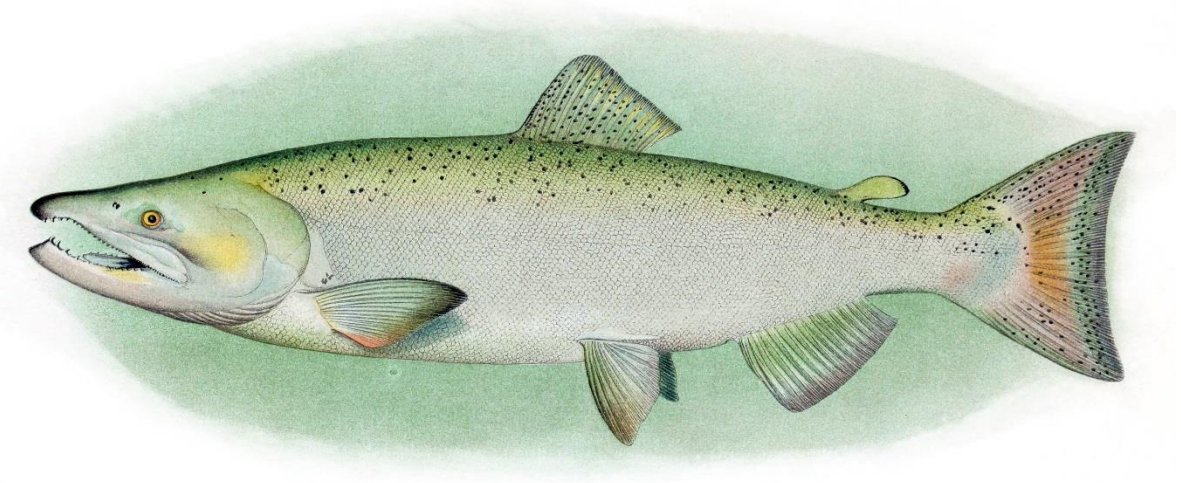
Effects on Pacific salmon

Coho / Silver, Oncorhynchus keta



"Oncorhynchus keta" by NOAA

Chinook, *Oncorhynchus tshawytscha*



"Chinook Salmon Adult Male" by A. Hoen and Co.

LEO Observation of Pink salmon dieoff in Jakolof Creek

Photo by Stephen Payton

California Sea Lions -- *Zalophus californianus*

PHOTOGRAPH BY PETER DASILVA, EPA/CORBIS

AOOS
Alaska Ocean Observing System

Alaska "Blob" Tracker

Story: In The Stomach Of A Seabird, A Glimpse Of An Ocean Heating Up

The multi-year presence of a warm water Blob in the north Pacific can offer insights to how a warming ocean will impact the ecosystem food web. Seabirds are at the top of the food chain and changes in the environment will show up in their diet. In addition to stomach samples, biologists test the bird's blood cells, and can learn what it was eating a few weeks back. The story …

Continue reading

SEPTEMBER 18, 2015

September 21, 11:00 – Noon Alaska Time: Dr. Richard James to give

Archives

Select Month

Pages

- Gallery of Images
- Resources
- What is the "Blob"
- Expert Blog Team
- News and Media Links

Why did “The Blob” appear?

- Tom to Nick (21 September 2015): “Why did that persistent high pressure lead to the blob? Is it what Frank Whitney mentioned about the weakened winds from the Aleutian Low because of slower arctic cooling in late 2013, leading to weaker north Pacific current and thus leading to tropical water pushing north past the transition?”
- Nick to Tom (21 September 2015): “Hi again – Indeed the higher than normal SLP meant weaker winds, and less heat transfer from the ocean to the atmosphere in fall and early winter 2013-14. And the wind anomalies were from the east, which means poleward upper ocean current anomalies. To be precise the upper ocean flow in the region of the blob usually has a bit of a north to south component, but that was more or less absent during the period that the blob really strengthened. – N”