Science, Service, Stewardship

Satellite Oceanography: NMFS Vantage Point

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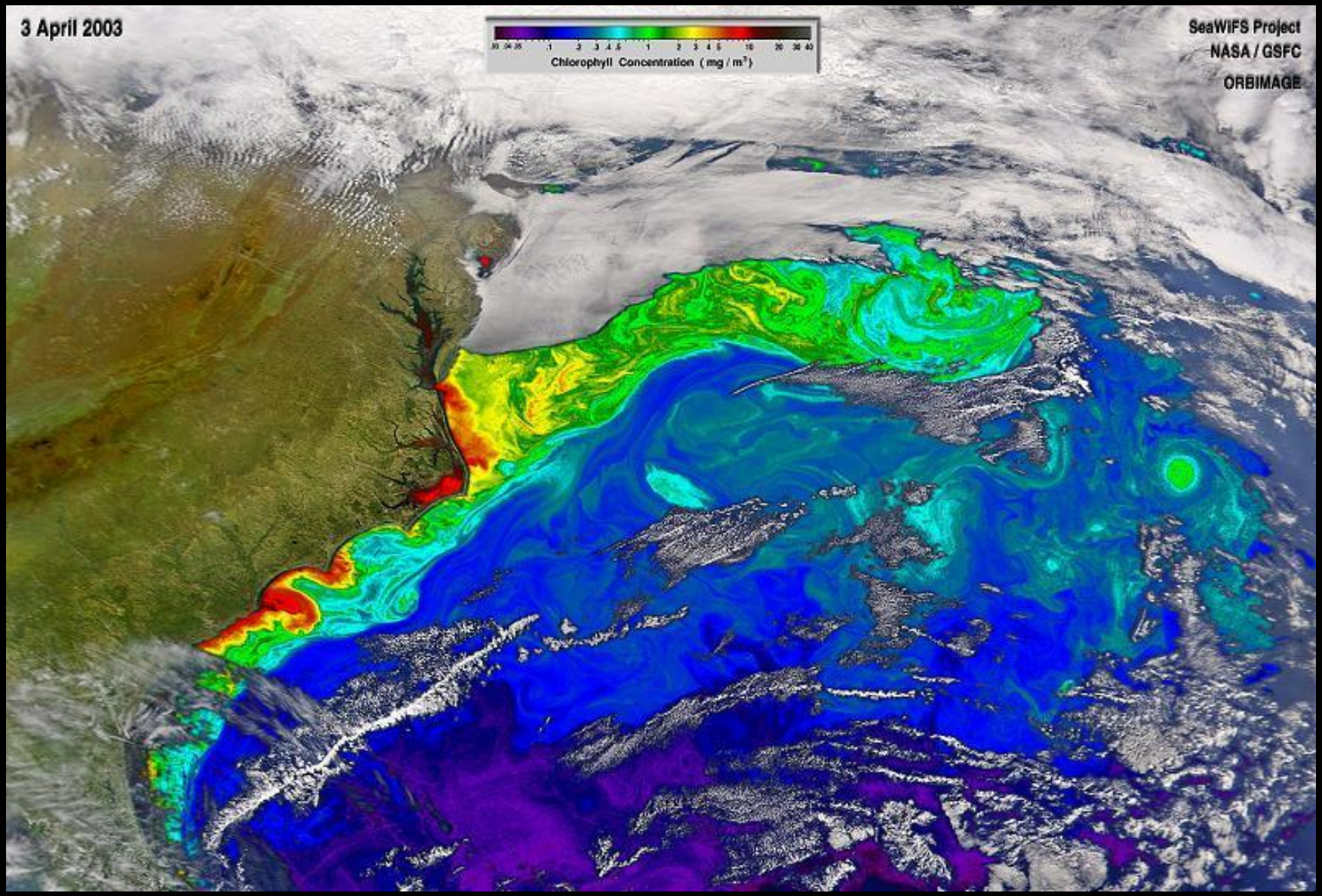
NOAA FISHERIES SERVICE

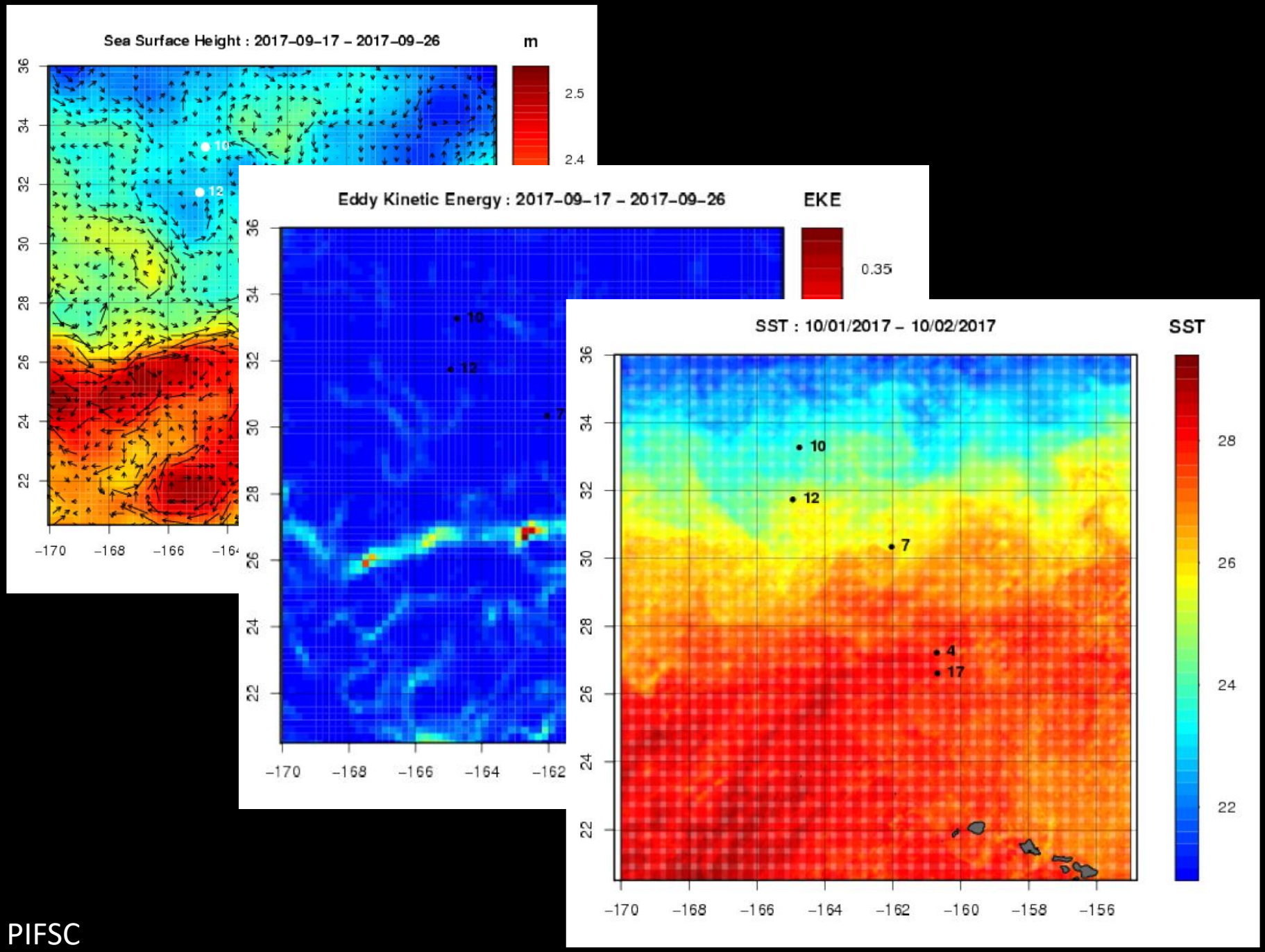
1.6 million jobs and $208 billion in sales

3 million square miles of
open-ocean and more than
95,000 miles of coastline

474 fish stocks; 46 fishery management plans

157 endangered and threatened species


3 April 2003
Chlorophyll Concentration (mg / m³)
SeaWiFS Project
NASA / GSFC
ORBIMAGE


Sea Surface Height : 2017-09-17 – 2017-09-26
m
2.5
2.4
Eddy Kinetic Energy : 2017-09-17 – 2017-09-26
EKE
0.35
SST : 10/01/2017 – 10/02/2017
SST
28
26
24
22
10
12
7
4
17
36
34
32
30
28
26
24
22
-170
-168
-166
-164
-162
-160
-158
-156

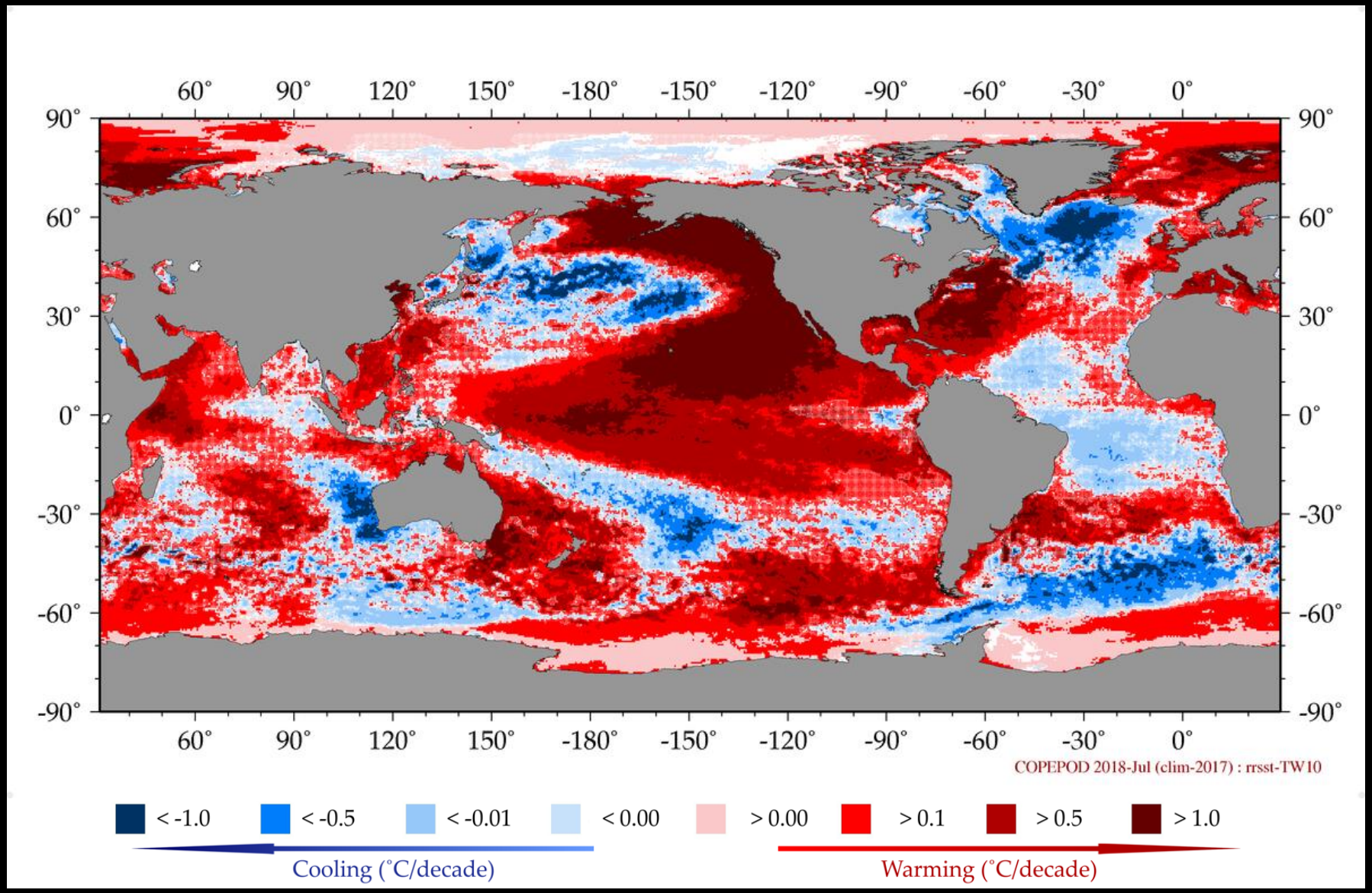
PIFSC

- Maintain highest quality long-term time series (preferably hyperspectral)

- Advance all capabilities to measure phytoplankton functional groups/size classes on the continental shelf – sensors & algorithms

- Develop products that resolve mesoscale features (e.g. Lagrangian Coherent Structures, Chlorophyll fronts)

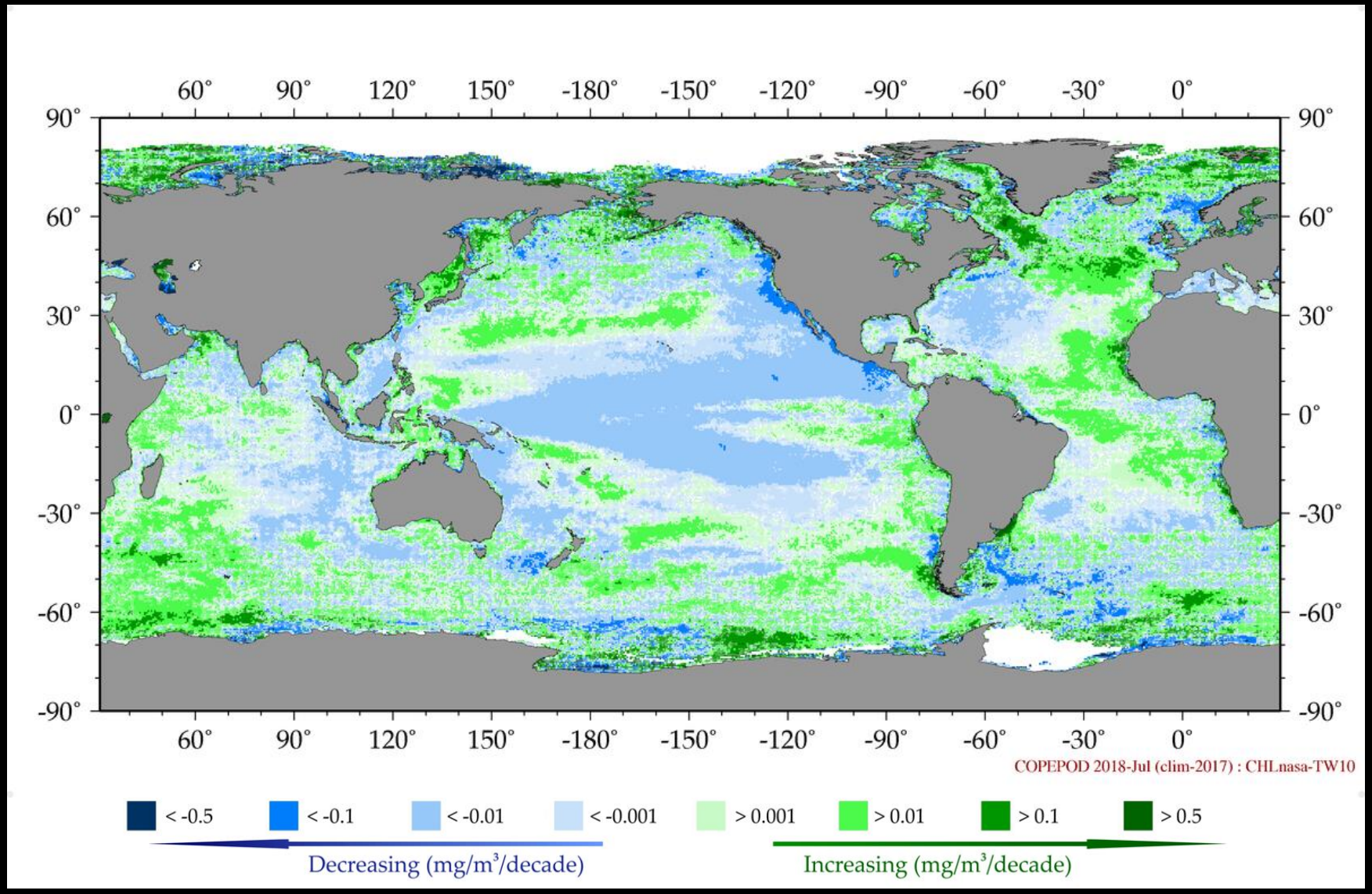
- Cross-platform integration of Chl products (e.g., GHRSST, ROMS)



10-year (2008-2017) SST trends (C/decade)

In this figure, 72% of the ocean surface has a warming trend, with 8% warming at > 0.5 C/decade!

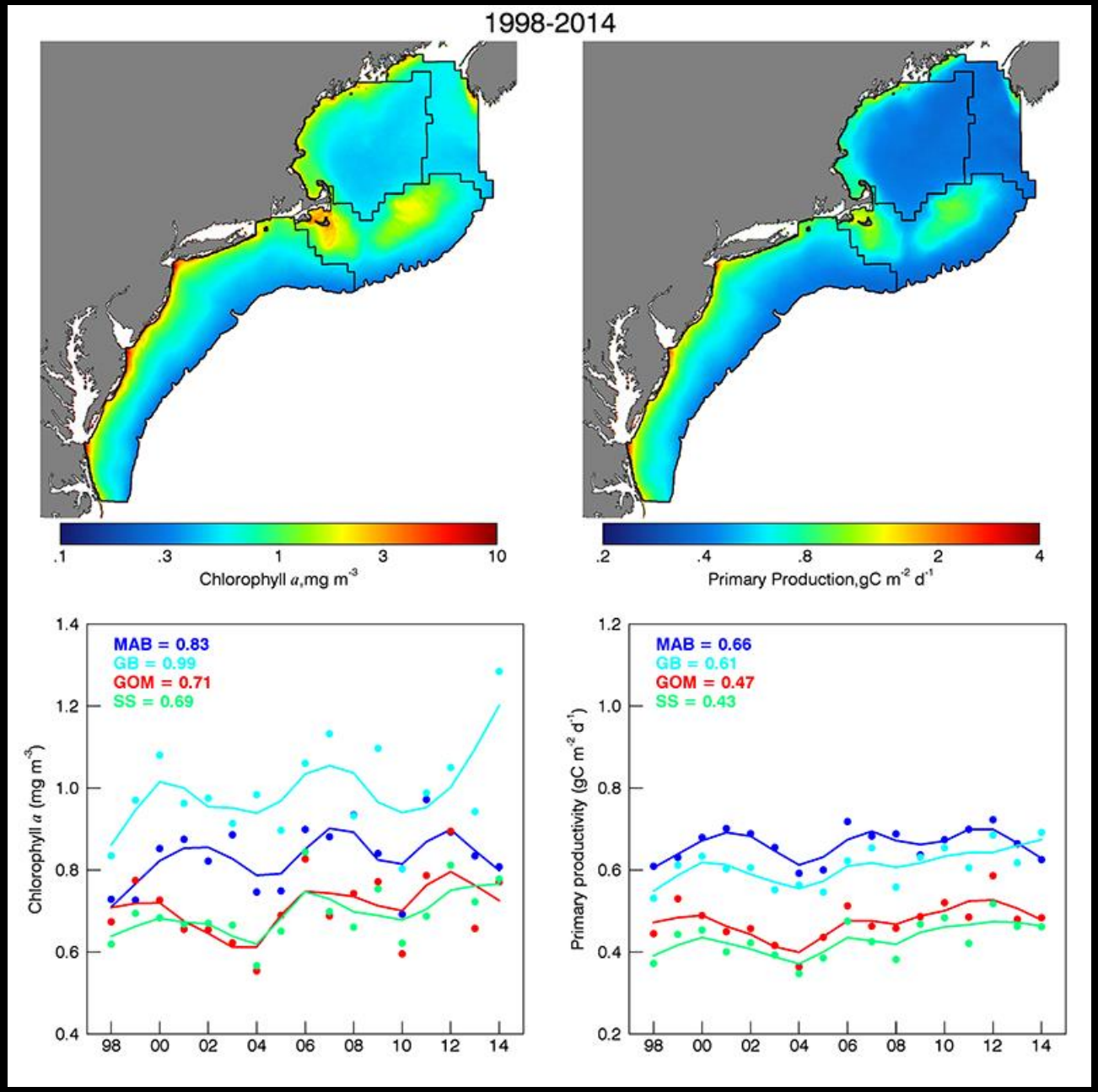
O'Brien et al. NMFS S&T; IGMETS



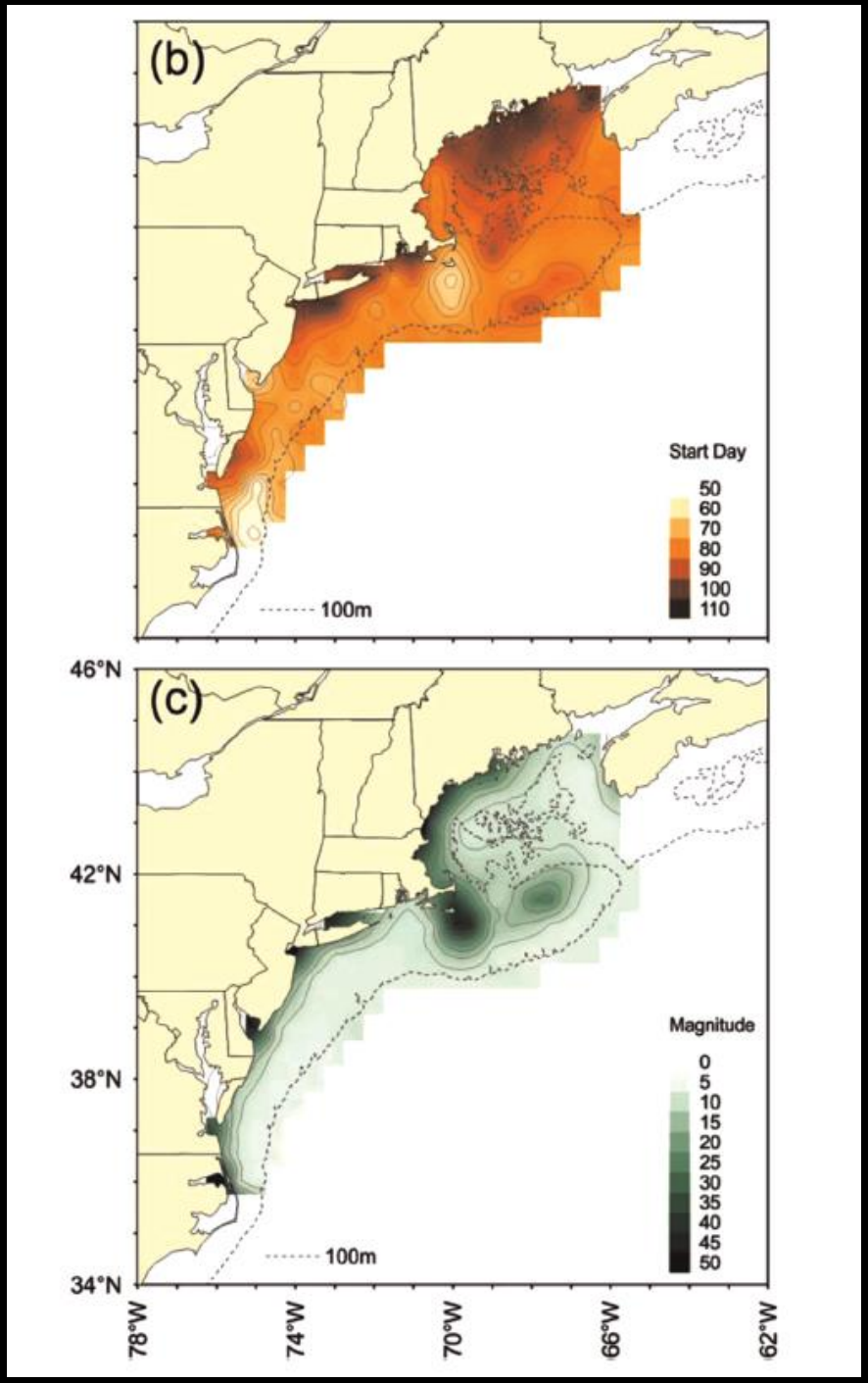
10-year (2008-2017) Chlorophyll trends (mg/m^3/decade)

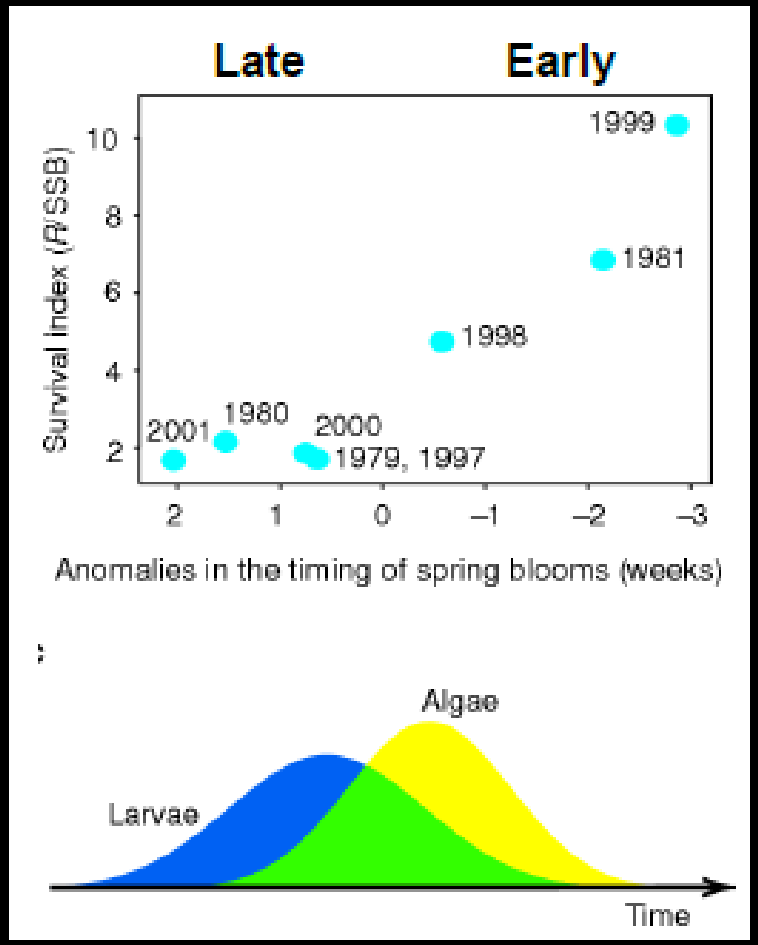
In this figure, 53% of the ocean surface has a negative (decreasing biomass) trend.

O'Brien et al. NMFS S&T; IGMETS


1998-2014
.1
.3
1
3
10
Chlorophyll a, mg m-3
.2
.4
.8
2
4
Primary Production, gC m-2 d-1
MAB = 0.83
GB = 0.99
GOM = 0.71
SS = 0.69
Chlorophyll a (mg m-3)
MAB = 0.66
GB = 0.61
GOM = 0.47
SS = 0.43
Primary productivity (gC m-2 d-1)
98
00
02
04
06
08
10
12
14

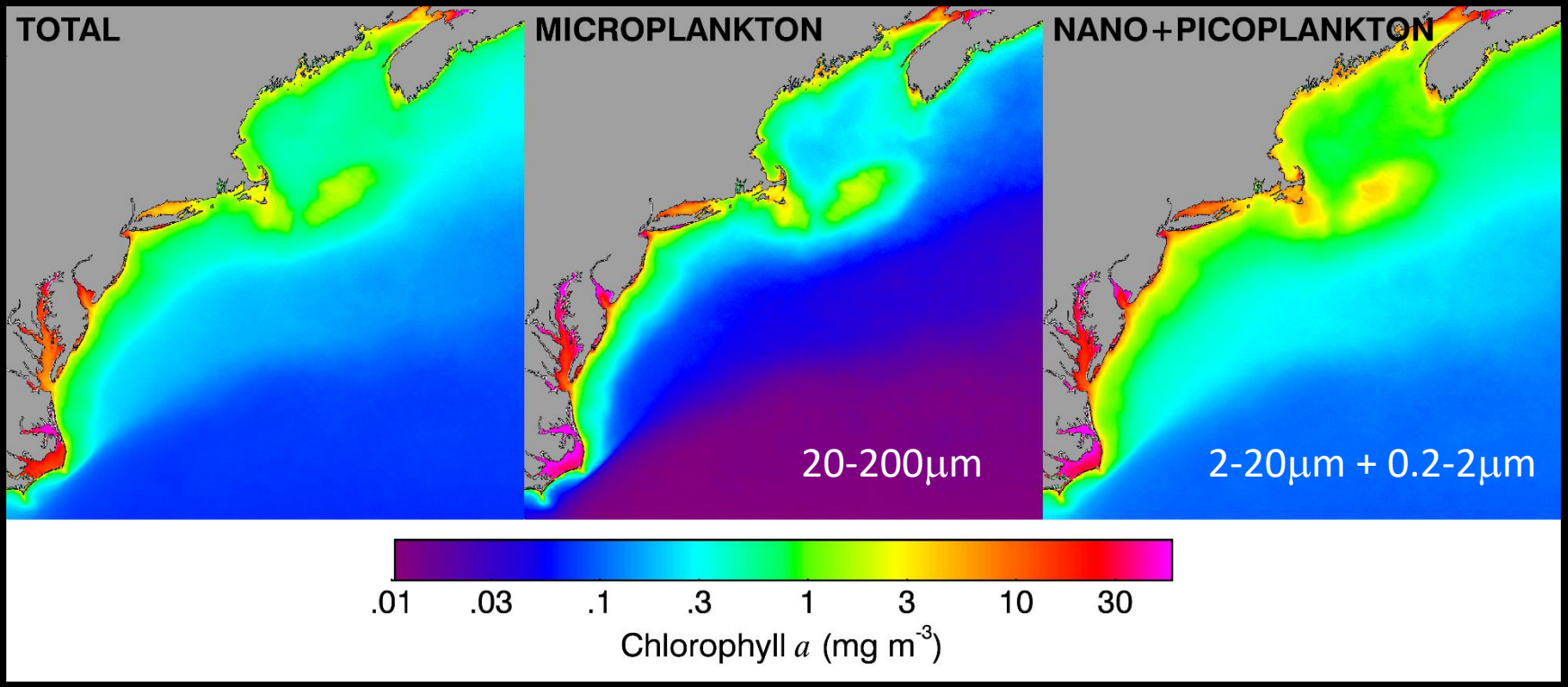
NEFSC


(b)
Start Day
50
60
70
80
90
100
110
100m
(c)
Magnitude
0
5
10
15
20
25
30
35
40
45
50
100m
46°N
42°N
38°N
34°N
78°W
74°W
70°W
66°W
62°W

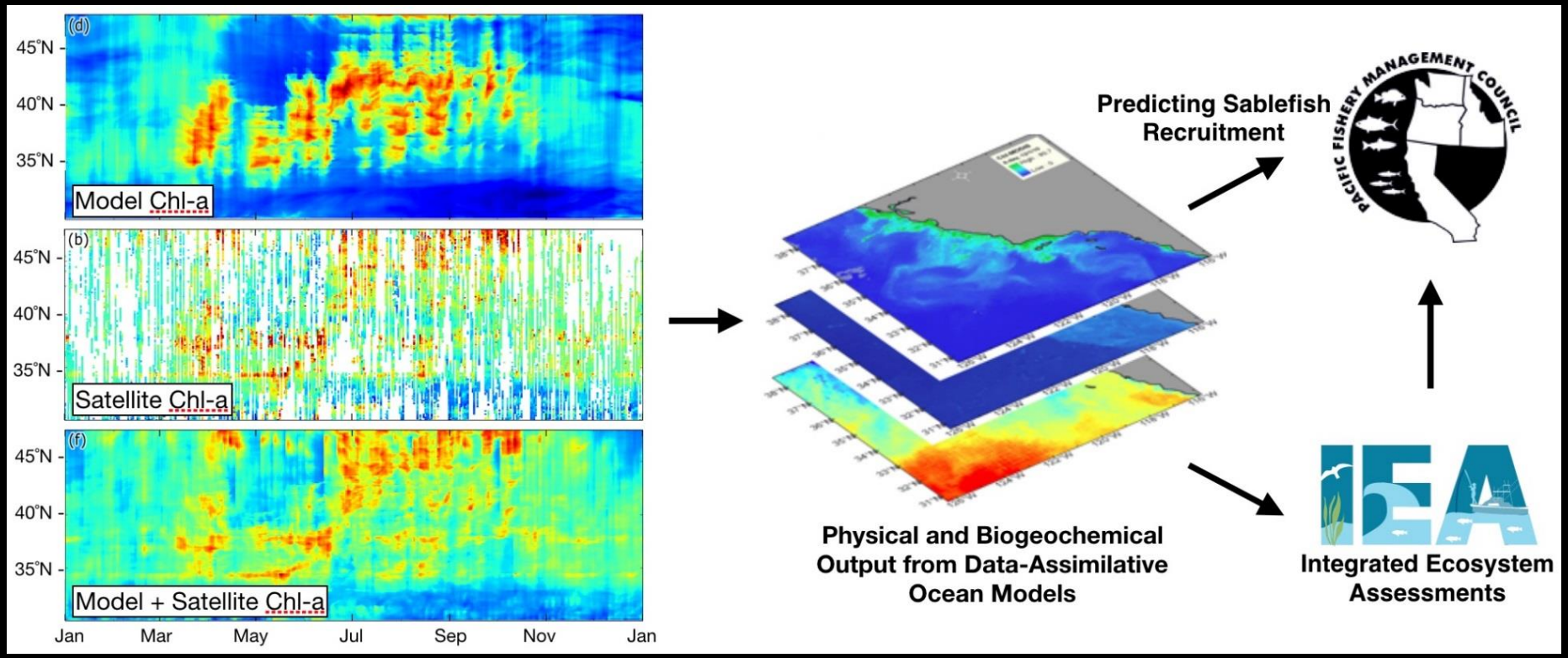

Late
Early
Survival Index (R/SSB)
10
8
6
4
2
1999
1981
1998
2001
1980
2000
1979, 1997
2
1
0
−1
−2
−3
Anomalies in the timing of spring blooms (weeks)
Algae
Larvae
Time

NEFSC

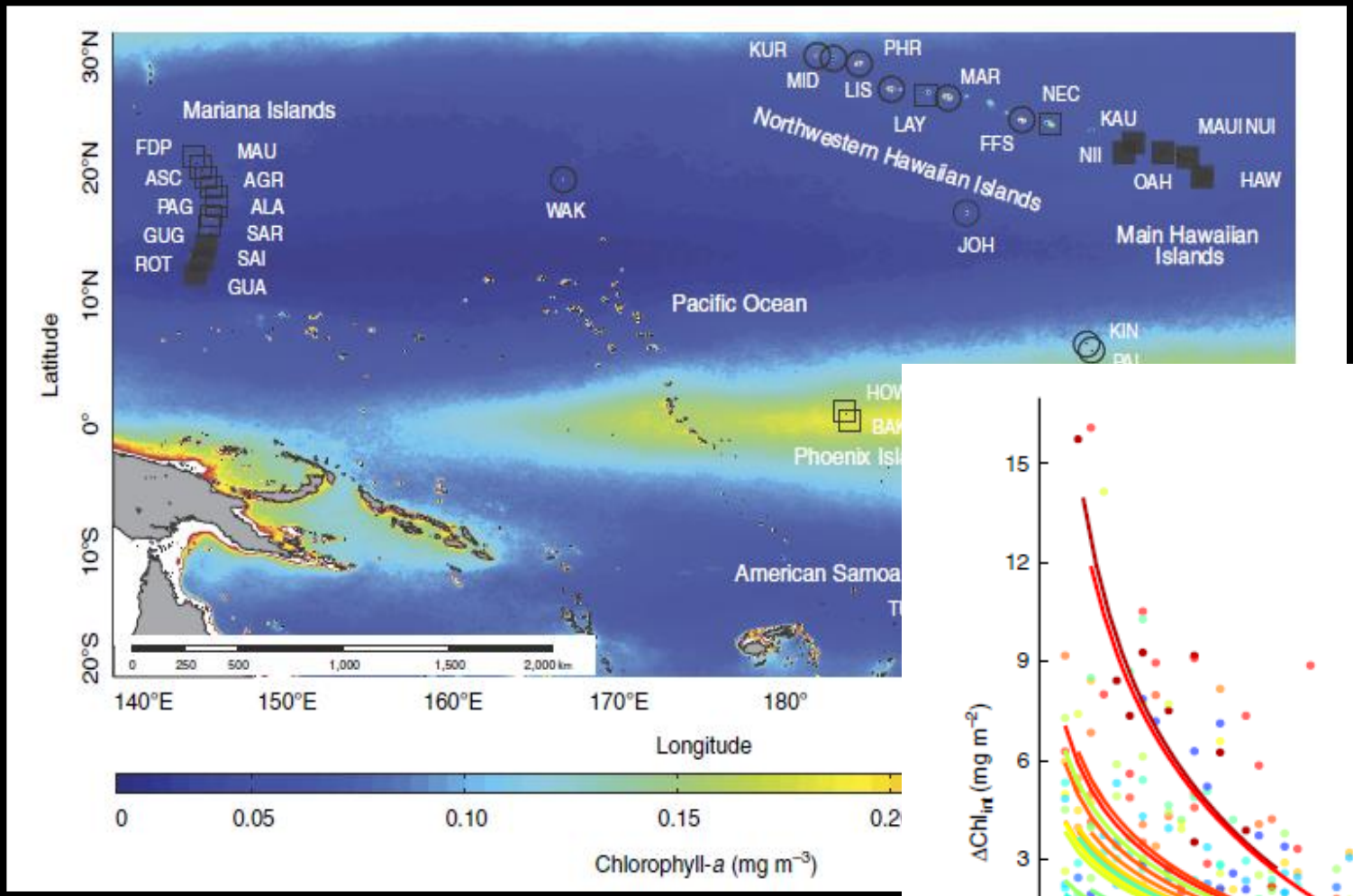
Satellite ocean color data is used to derived phytoplankton functional groups a series of Remote Sensing Reflectance (R_{RS}) band ratio algorithms at 490, 555 and 670 nm.

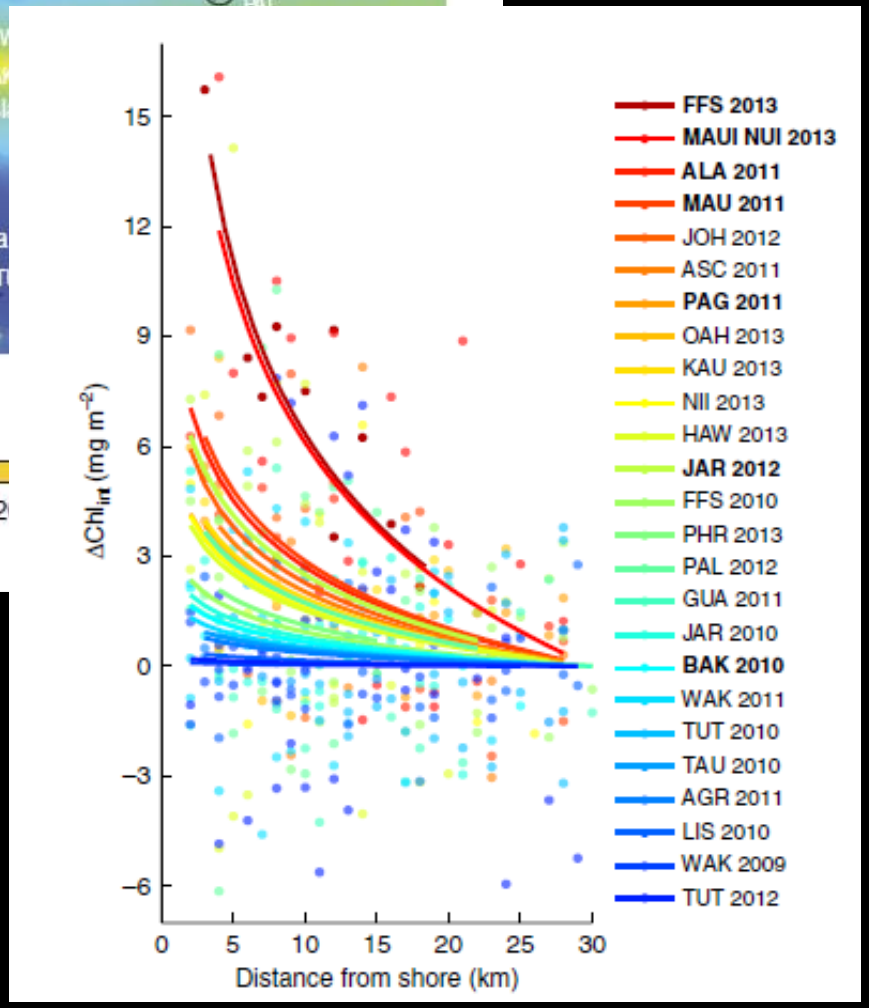


Hyde at al. (JPSS) with STAR



Satellite Ocean Color in models for U.S. West Coast (Jacox et al. JPSS)





Gove at al. PIFSC

EcoCast
An Eco-informatic Tool for Fisheries Sustainability
Experimental Product

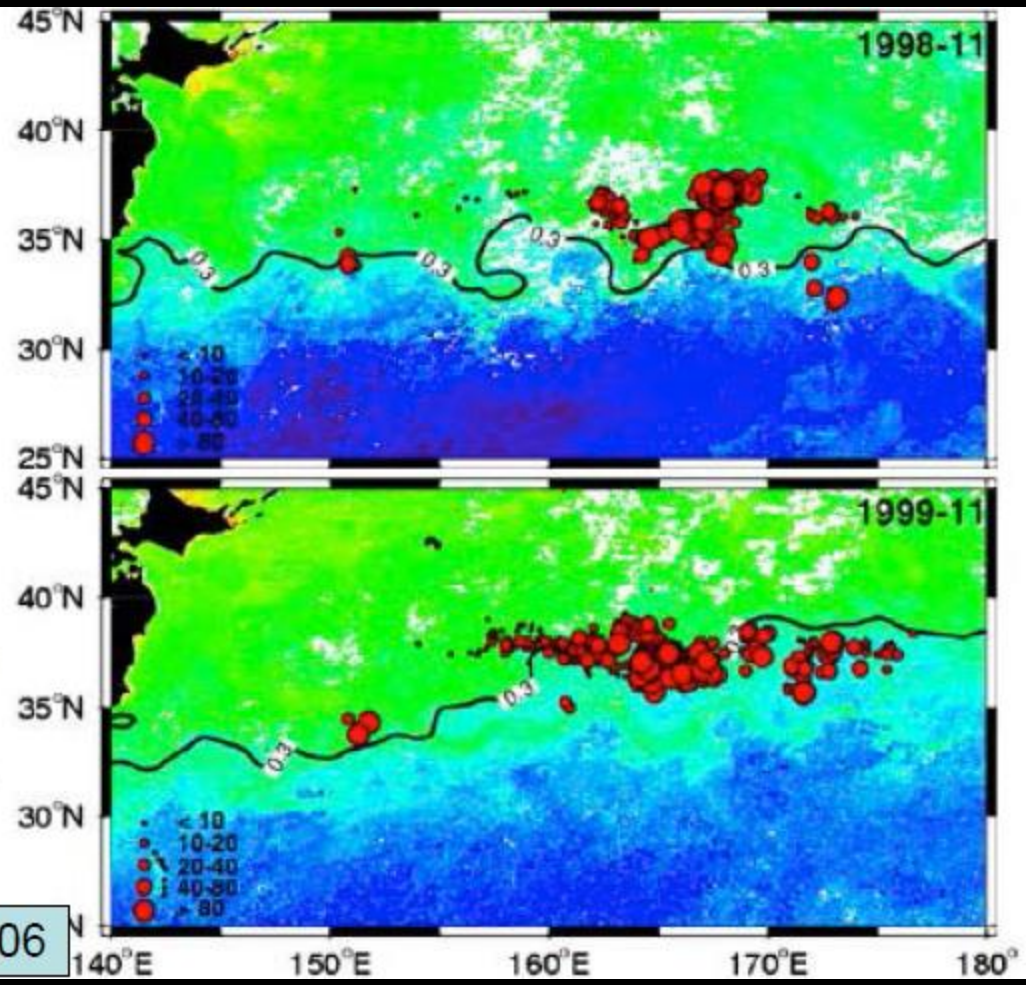
Fishing zones predicted based on ocean features, catch potential, and weighted by bycatch risk

Hazen et al. 2018 *Science Advances*

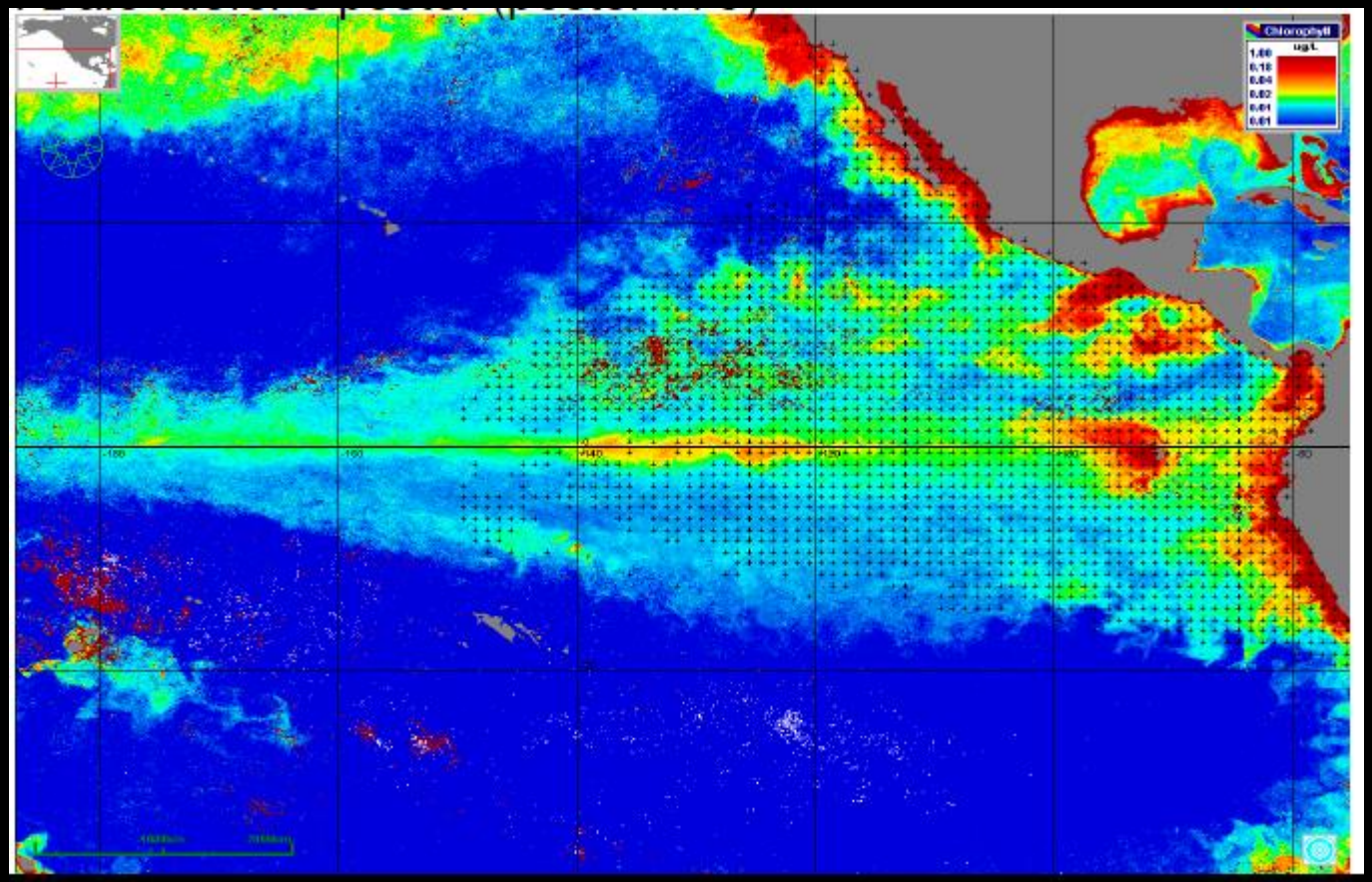
Drew Briscoe

Hazen et al. SWFSC

Albacore CPUE (catch per unit effort) overlain on SeaWiFS chlorophyll, showing that the longline fishery largely operates along the transitional zone chlorophyll front (TZCF)



Zainuddin et al., DSR-II, 2006



PIFSC

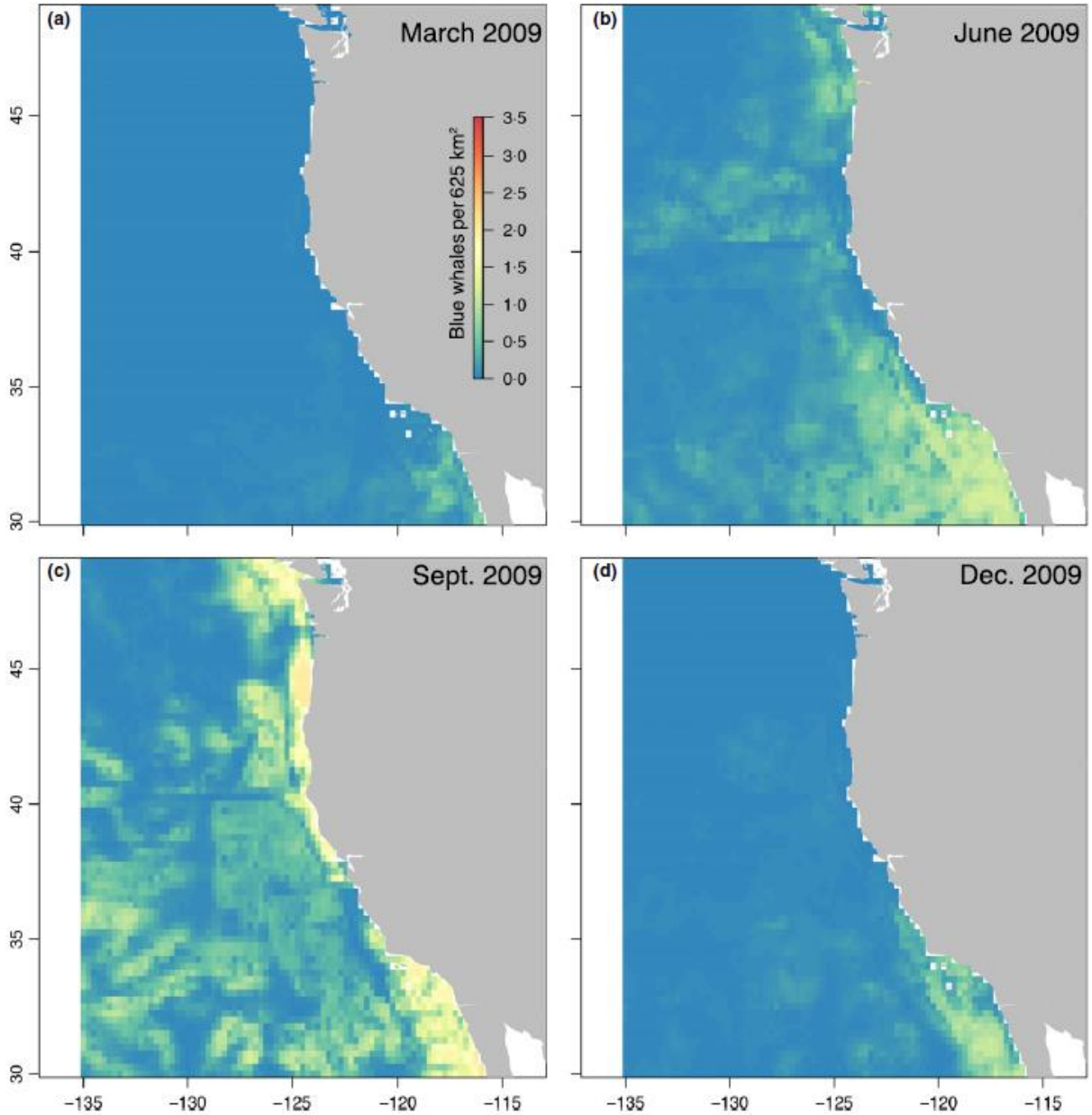
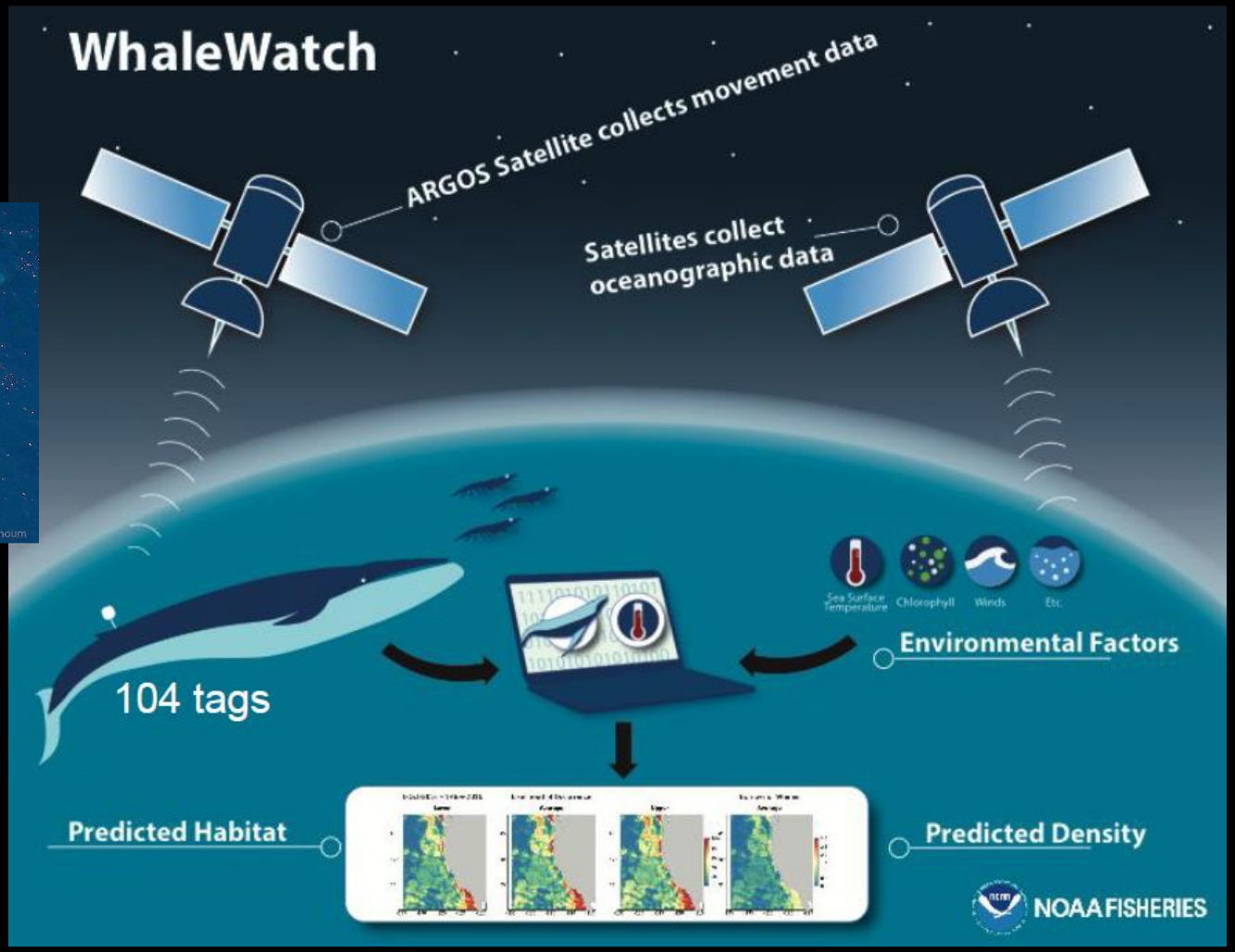


Fig. 4. (a–d) Blue whale habitat predictions from seasonal GAMMs for March, June, September and December of 2009. Density is included as number of whales per 625 km^2.



Hazen at al. SWFSC

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