Science, Service, Stewardship

NOAA Applications of OC data

Cara Wilson
NOAA/NMFS/SWFSC/ERD

NOAA FISHERIES SERVICE

2017 IOCS Meeting, Lisbon, Portugal, May 16

NOAA poster presentations

2017 IOCS Meeting

Name	Subject
Foster et al.	OC Cal/Val
Hyde et al.	Fisheries Applications
Lance et al.	In situ validation
Liu & Wang	OC DINEOF
Mikelson & Wang	OCView
Moore et al.	SeaPRISM in Lake Erie
Son et al.	GOCI-VIIRS Comparison
Son & Wang	VIIRS Evaluation
Sun & Wang	VIIRS Calibration Update
Chu et al.	MODIS-VIIRS Comparison
Wilson	BioArgo data
Zheng & DiGiacomo	Estuarine Suspended Particles

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NOAA User Applications of OC data

Cara Wilson
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NESDIS = Data Provider

NMFS, NOS, NWS and OAR are Data Users

NMFS: National Marine Fisheries Service
NOS: National Ocean Service
NWS: National Weather Service
OAR: Oceanic and Atmospheric Research

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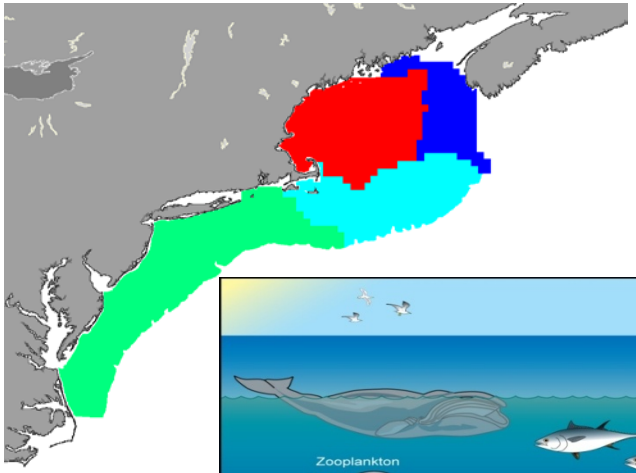
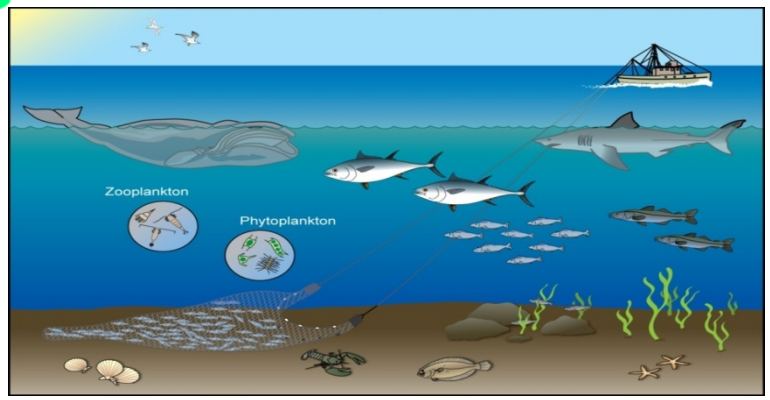
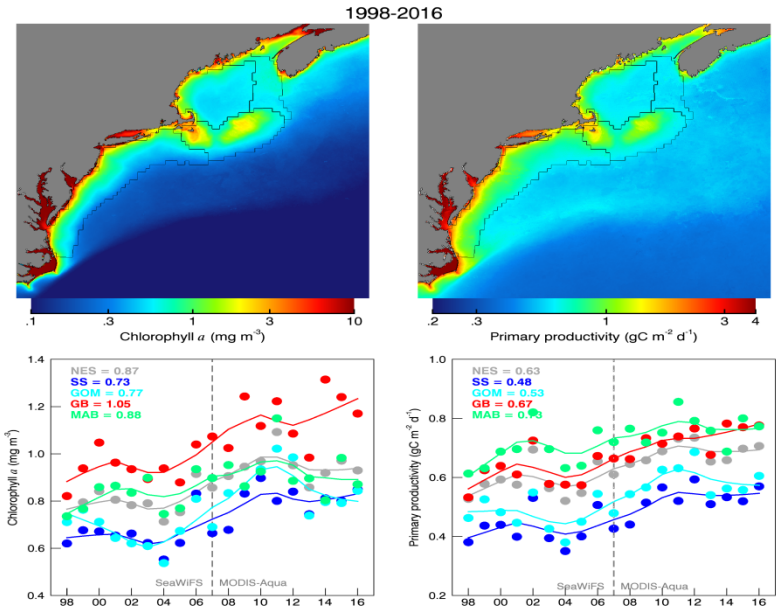
Ecosystem Based Management





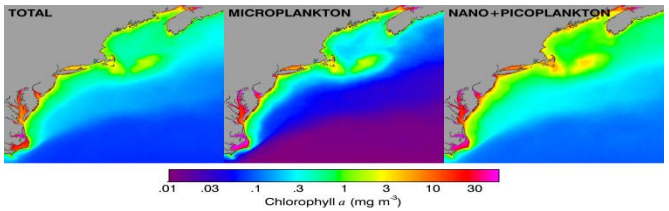


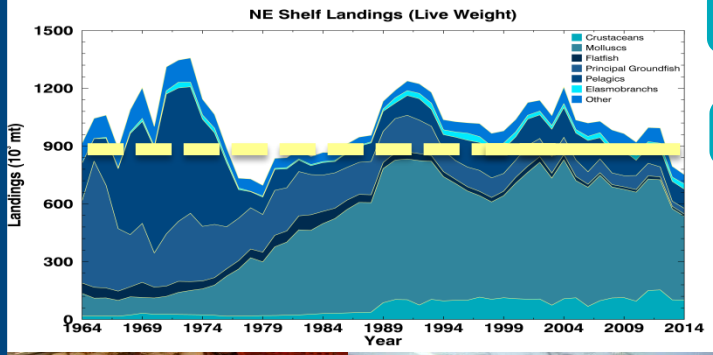
Physiographic and satellite derived lower trophic level datasets (i.e. chlorophyll, primary production, and chlorophyll gradients) were statistically analyzed to establish spatial management units, intended for Ecosystem Based Management (R. Gamble & M. Fogarty).

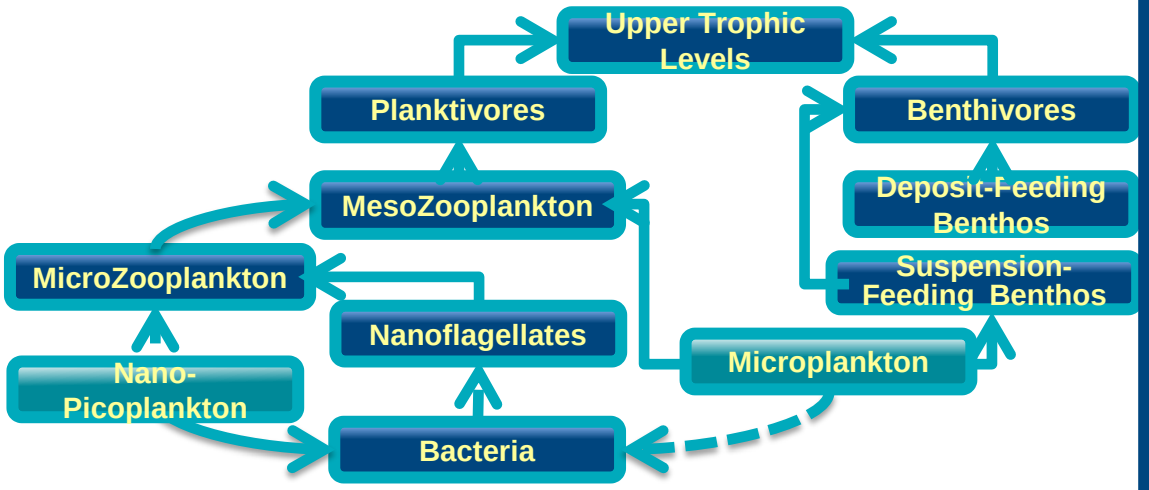
From Hyde et al., poster

Production Potential

Phytoplankton size class and primary production data are used in food web models to estimate fisheries production potential and develop harvest strategies (K. Hyde & M. Fogarty).





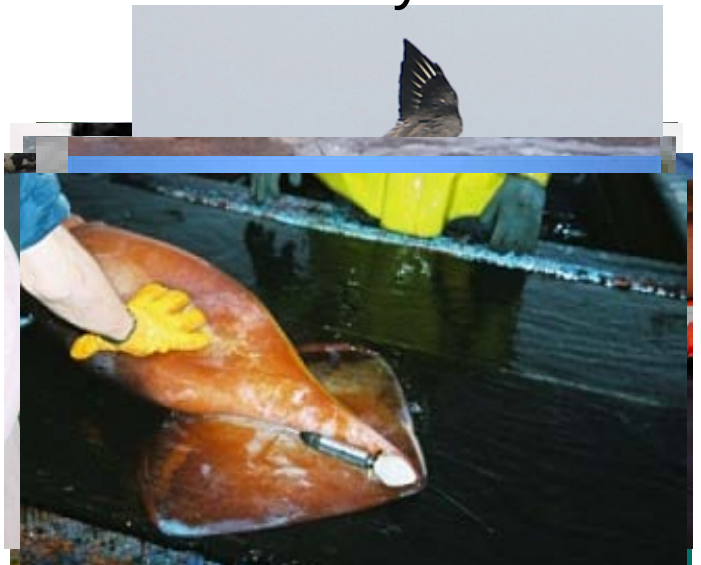


From Hyde et al., poster

Tagged Species

Electronic tagging is a key methodology used by NOAA Fisheries to gather information on stock productivity and recruitment, fish behavior, feeding ecology and habitat selection– information needed for accurate and responsible fisheries management.[1]

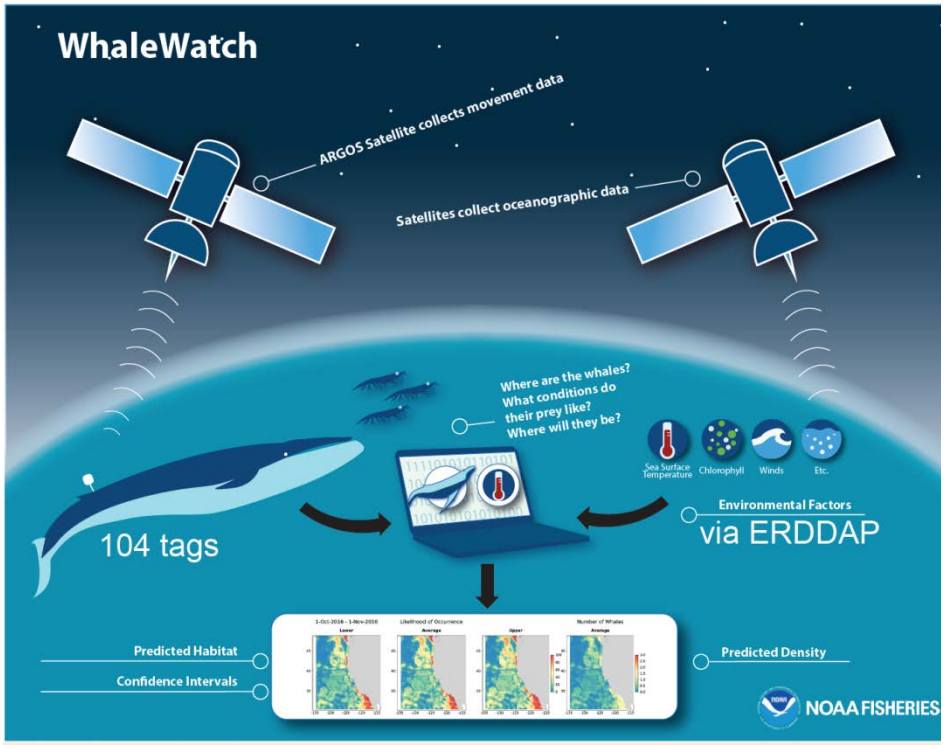
Satellite data, such as ocean color, SST, SSH and SVW, are necessary to place the telemetric data from tags in an environmental context as part of the transition to an ecosystem approach to management.



[1]Report of the NMFS Workshop on advancing electronic tag technologies and their use in stock assessment. NOAA Tech. Memo. NMFS-F/SPO-82, 82 pp, 2007.

http://spo.nmfs.noaa.gov/tm

Whale Watch



Dead whale

Journal of Applied Ecology

BRITISH ECOLOGICAL SOCIETY

Journal of Applied Ecology 2016 doi: 10.1111/1365-2664.12820

WhaleWatch: a dynamic management tool for predicting blue whale density in the California Current

Elliott L. Hazen*[,1,2], Daniel M. Palacios[3], Karin A. Forney[4], Evan A. Howell[5], Elizabeth Becker[4], Aimee L. Hoover[6], Ladd Irvine[3], Monica DeAngelis[7], Steven J. Bograd[1], Bruce R. Mate[3] and Helen Bailey[6]

[1]*Environmental Research Division, NOAA Southwest Fisheries Science Center, Monterey, CA 93940, USA;* [2]*Department of Ecology and Evolutionary Biology, University of California Santa Cruz, Santa Cruz, CA 94023, USA;* [3]*Marine Mammal Institute, Oregon State University, Hatfield Marine Science Center, Newport, OR 97365, USA;* [4]*Marine Mammal and Turtle Division, NOAA Southwest Fisheries Science Center, Santa Cruz, CA 95060, USA;* [5]*NOAA Pacific Islands Fisheries Science Center, Honolulu, HI 96818, USA;* [6]*Chesapeake Biological Laboratory, University of Maryland Center for Environmental Science, Solomons, MD 20688, USA; and* [7]*NOAA West Coast Regional Office, Long Beach, CA 90802, USA*

Summary

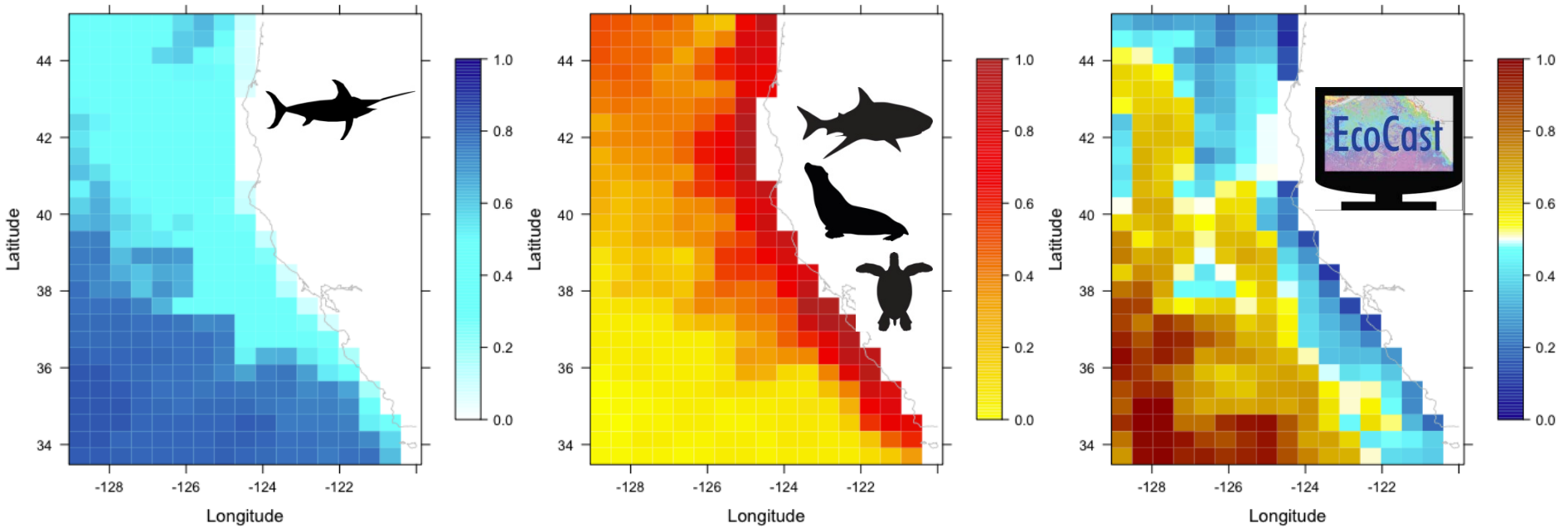
1. Management of highly migratory species is reliant on spatially and temporally explicit information on their distribution and abundance. Satellite telemetry provides time-series data on individual movements. However, these data are underutilized in management applications in part because they provide presence-only information rather than abundance information such as density.
2. Eastern North Pacific blue whales are listed as threatened, and ship strikes have been suggested as a key factor limiting their recovery. Here, we developed a satellite-telemetry-based habitat model in a case–control design for Eastern North Pacific blue whales *Balaenoptera musculus* that was combined with previously published abundance estimates to predict habitat preference and densities. Further, we operationalize an automated, near-real-time whale density prediction tool based on up-to-date environmental data for use by managers and other stakeholders.
3. A switching state-space movement model was applied to 104 blue whale satellite tracks from 1994 to 2008 to account for errors in the location estimates and provide daily positions (case points). We simulated positions using a correlated random walk model (control points) and sampled the environment at each case and control point. Generalized additive mixed models and boosted regression trees were applied to determine the probability of occurrence based on environmental covariates. Models were used to predict 8-day and monthly resolution, year-round density estimates scaled by population abundance estimates that provide a critical tool for understanding seasonal and interannual changes in habitat use.
4. The telemetry-based habitat model predicted known blue whale hot spots and had seasonal agreement with sightings data, highlighting the skill of the model for predicting blue

http://www.westcoast.fisheries.noaa.gov/whalewatch/index.html

EcoCast

Predicting fishery bycatch for management

Predicted catch + **Predicted bycatch** ➔ **EcoCast**

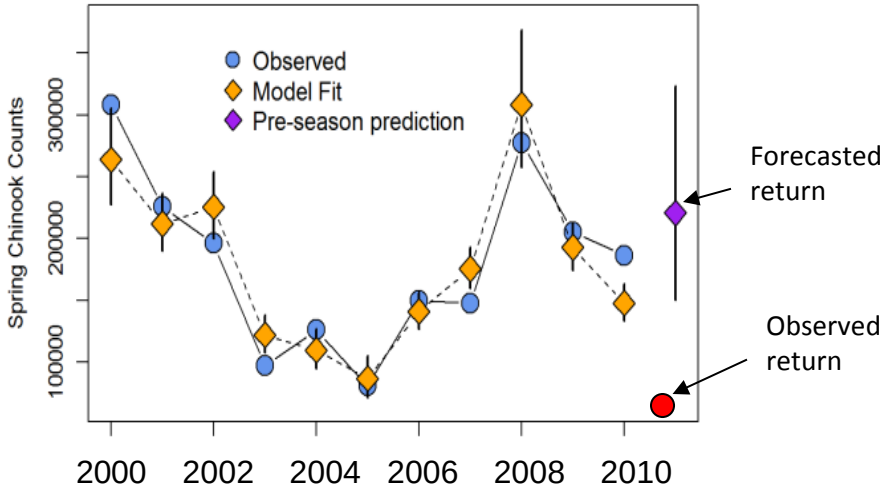


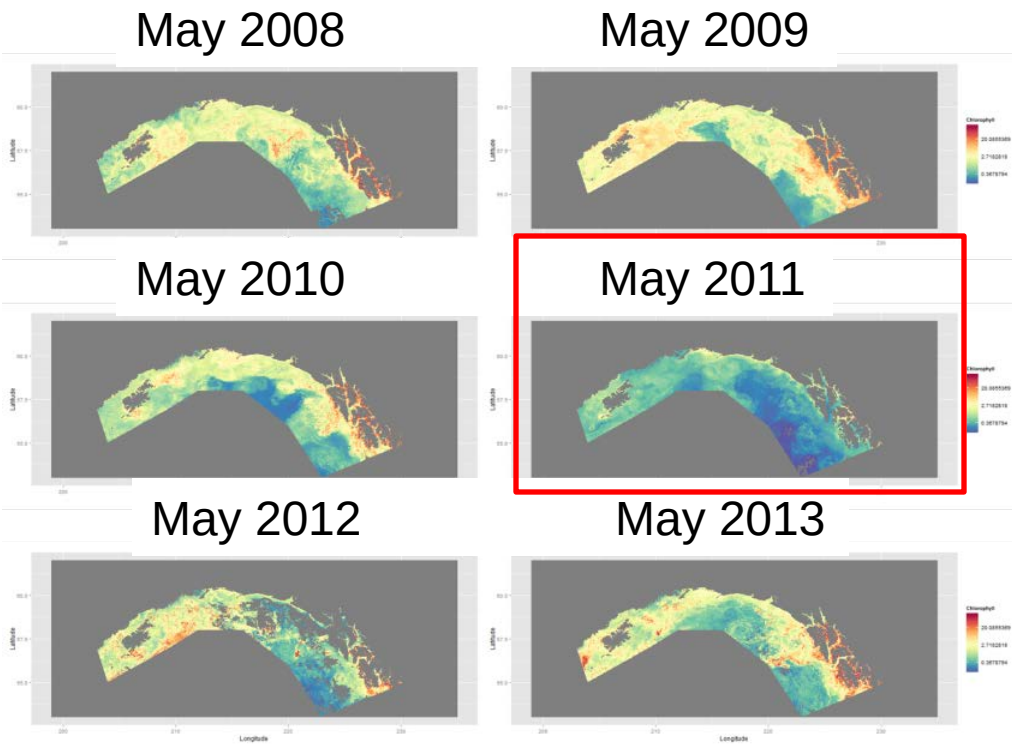
Using satellite data, areas optimized for fish catch and minimal bycatch can be predicted in near-real time for use by managers and fishers. Currently a RShiny app is under development. A NASA funded project.

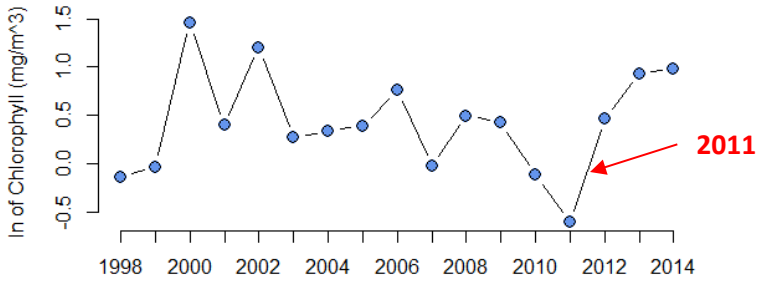
Elliott Hazen et al., NMFS/SWFSC

Salmon Survival in 2011

Adult Chinook Returns – What happened in 2011?





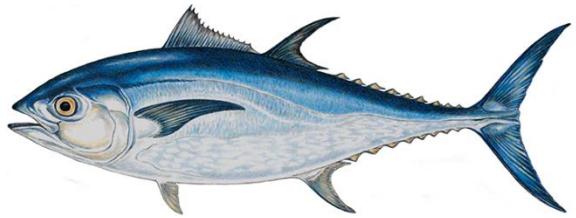


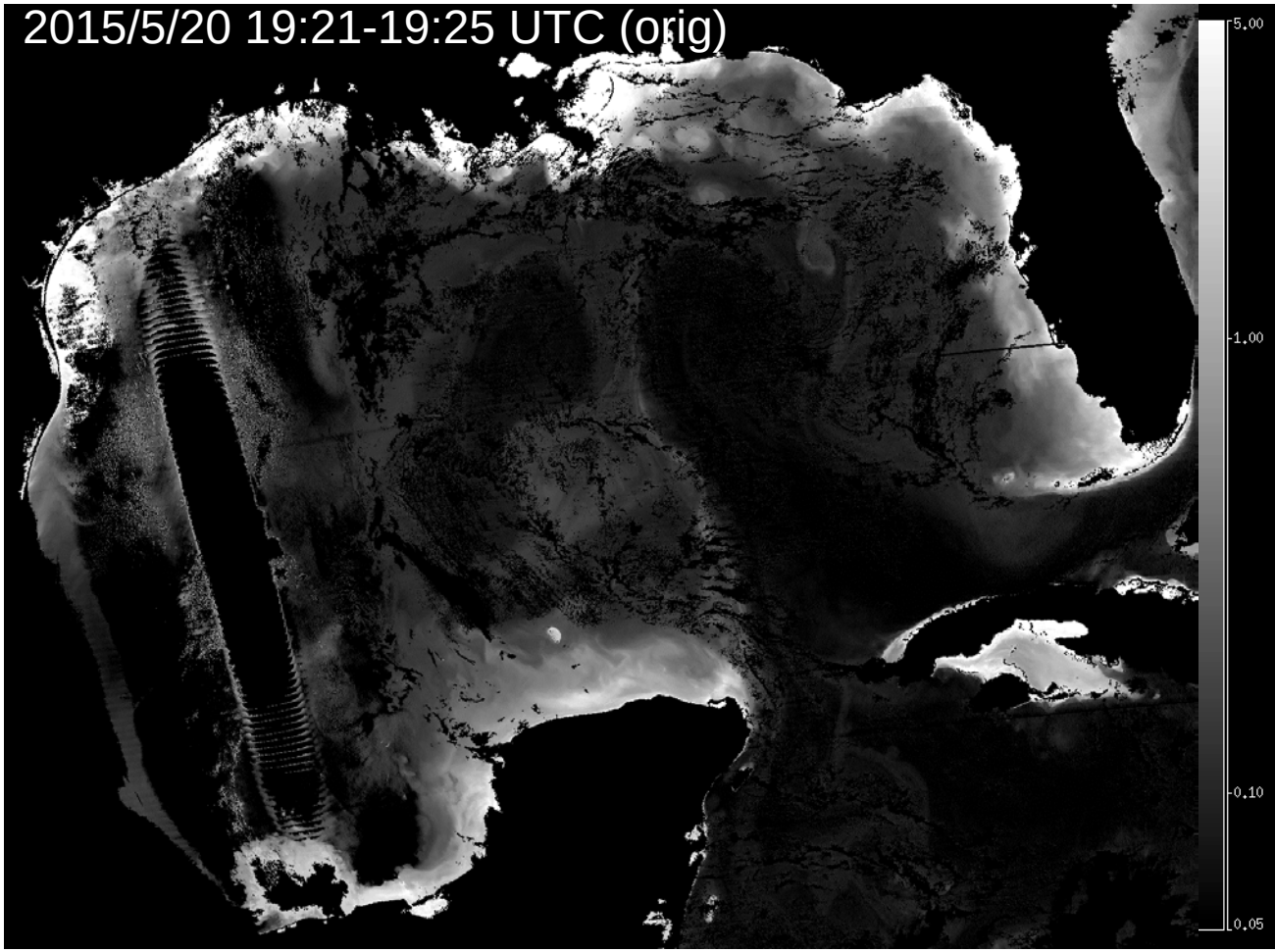
Time series of average April-May chlorophyll concentrations in coastal Gulf of Alaska. The lowest value (2011) suggests that low productivity could have negatively influenced salmon survival that year.

Brian Burke
Fish Ecology Division
NWFSC, NOAA Fisheries

NRT Cruise support

- VIIRS chl image generated by NESDIS in support of a SEFSC survey cruise looking for bluefin tuna larvae.
- Images are used to position stations to cover frontal features, small and mesoscale oceanographic features, and to ensure as many different water masses as possible are sampled.
- They requested the images in gray scale.





John Lamkin, NOAA/NMFS/SEFSC

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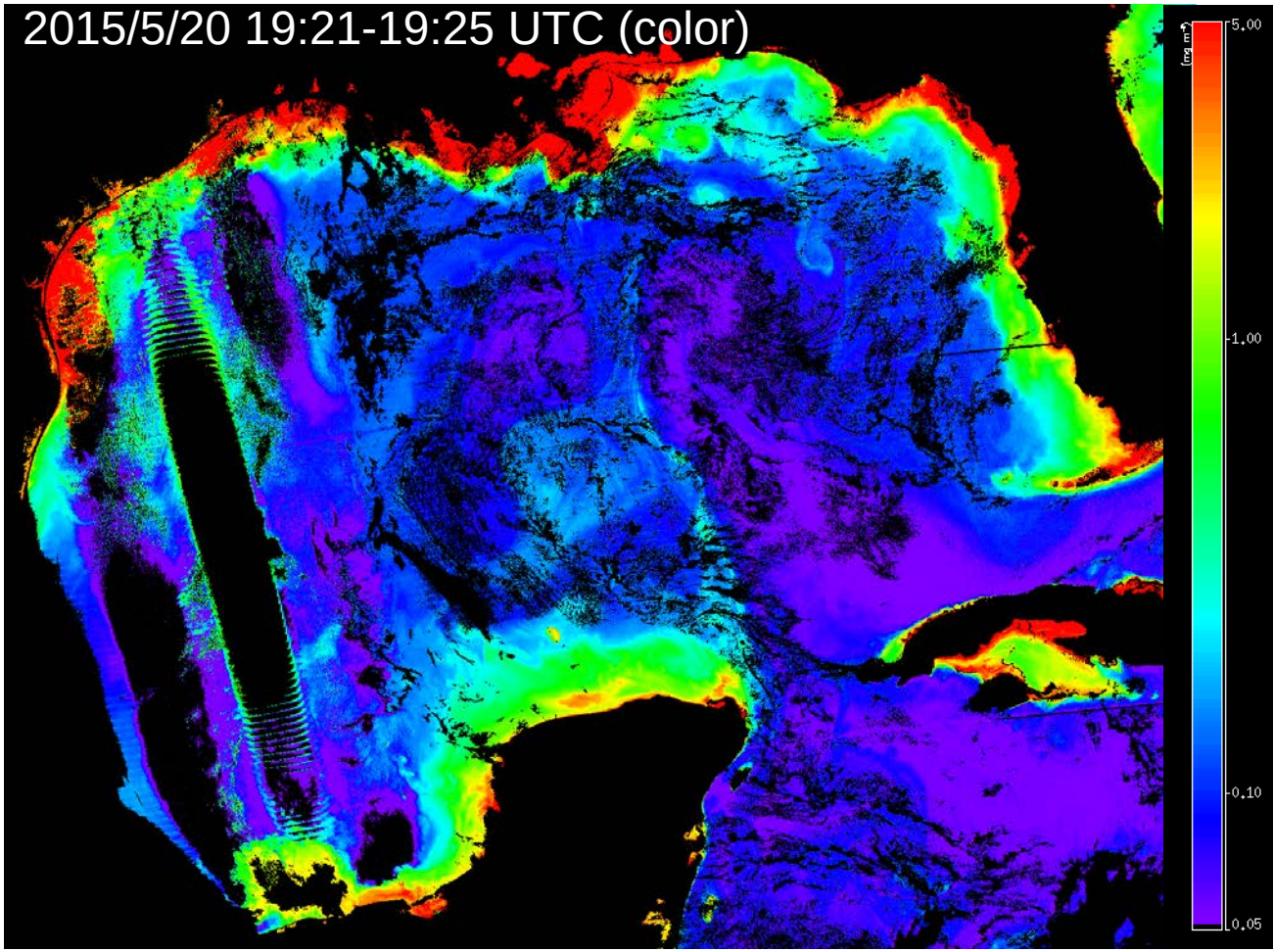
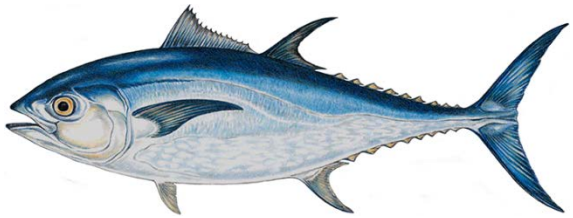
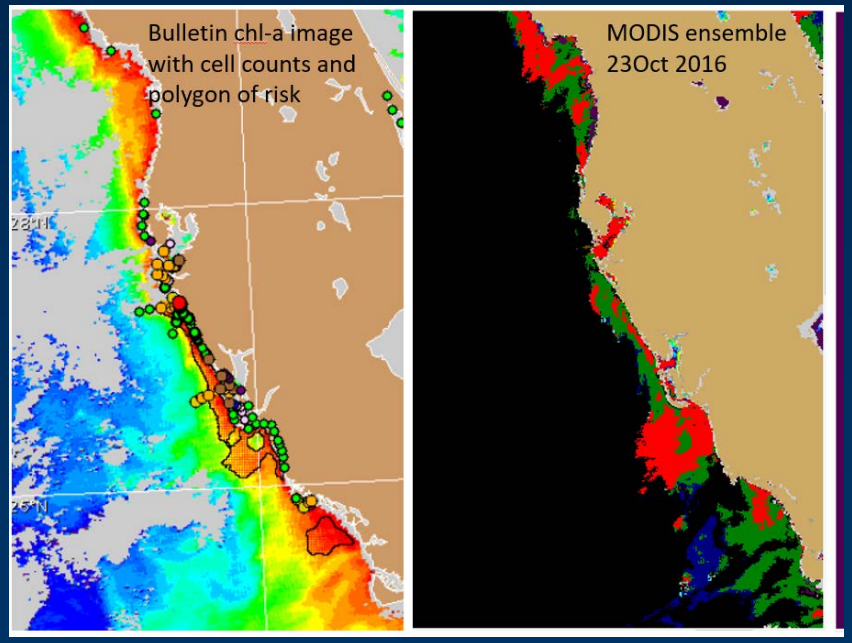




John Lamkin, NOAA/NMFS/SEFSC

HAB Operational Forecast System: Gulf of Mexico *Karenia brevis*

Padre Island National Seashore Closes Park to Dogs (December 9, 2009)



Gulf of Mexico Harmful Algal Bloom Bulletin

Region: Southwest Florida

Monday, 24 October 2016

NOAA National Ocean Service

NOAA Satellite and Information Service

NOAA National Weather Service

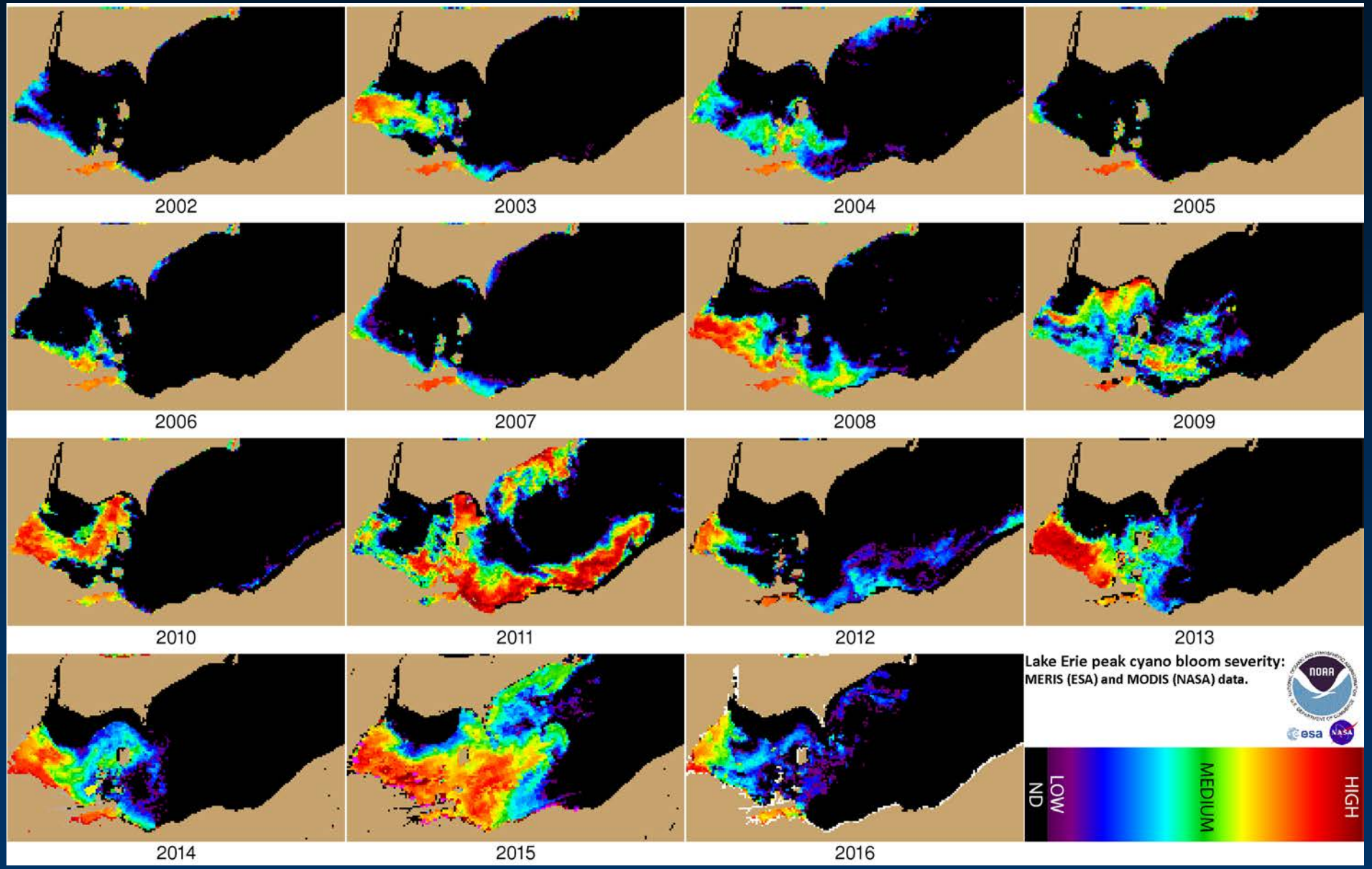
Last bulletin: Thursday, October 20, 2016

Conditions Report

Not present to high concentrations of *Karenia brevis* (commonly known as Florida red tide) are present along- and offshore portions of southwest Florida, and not present in the Florida Keys. *K. brevis* concentrations are patchy in nature and levels of respiratory irritation will vary locally based upon nearby bloom concentrations, ocean currents, and wind speed and direction. The highest level of potential respiratory irritation forecast for Monday, October 24 through Thursday, October 27 is listed below:

http://tidesandcurrents.noaa.gov/hab

Lake Eire cyanobacteria bloom, annual peak biomass: MERIS 2002-2011, MODIS 2012-2016

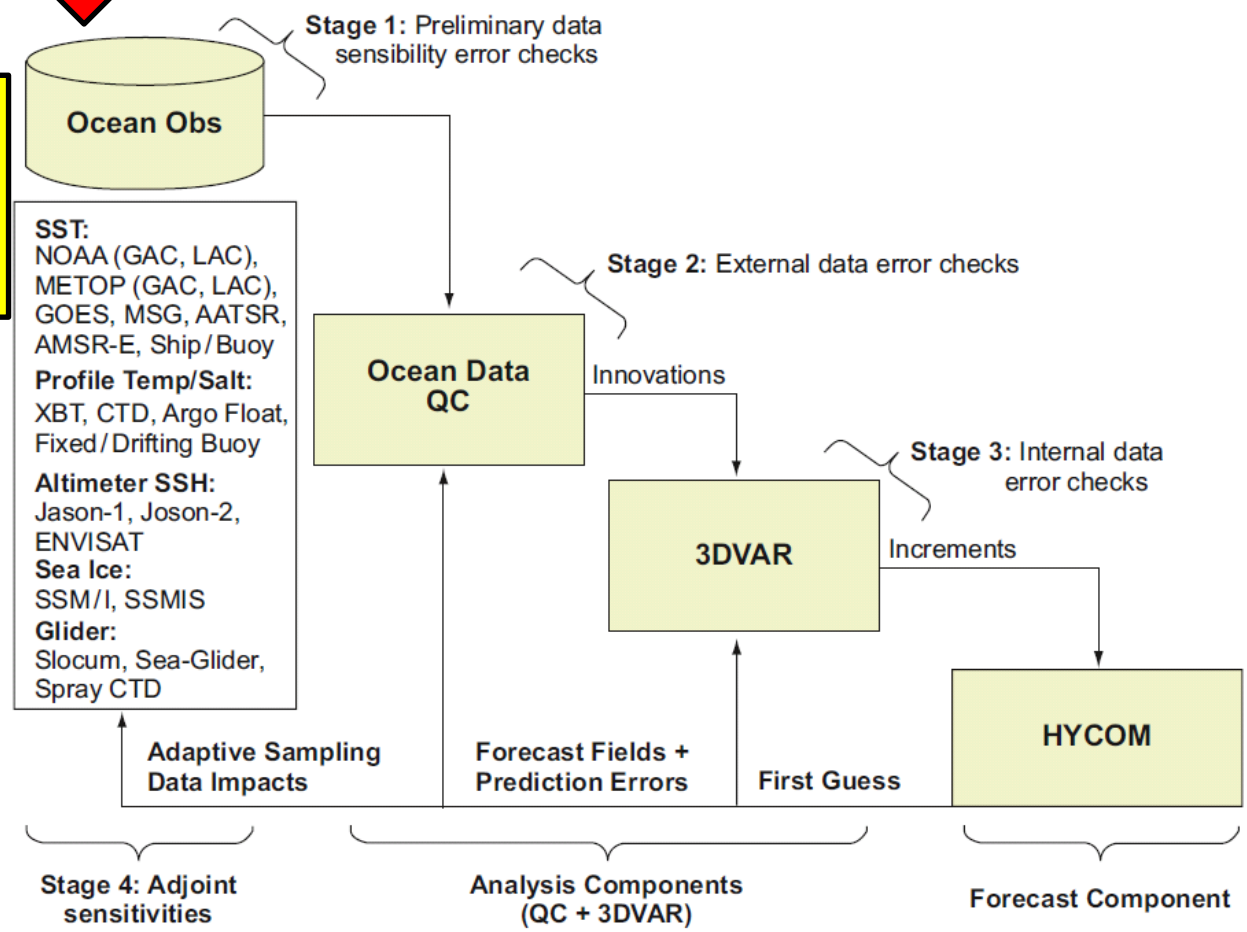


Ocean Data Assimilation

(Navy Coupled Ocean Data Assimilation: NCODA)

Hae-Cheol Kim, NWS/NCEP

VIIRS
NRT
Ocean Color
(K_{dPAR}, Chl-*a*)



NOAA Ocean Satellite Course

Aug 22-24, 2017
UW, Seattle, WA

- 3-day (free!) course aimed at NMFS or NOS participants (the “wet” side of NOAA) who want to learn how to access & use satellite data
- Objective is to help people access and use satellite data ***in the environment they are used to working in*** – a challenging task! Focus has been on GIS, Matlab and R applications.
- Participants bring projects to work on.
- Course initiated by funding from NOAA’s R&O project in 2006. The JPSS program has provided full or partial funding since 2013-2015.
- The learning experience goes two ways. From conducting these courses we get a better idea of users’ needs and wants, and therefor are better able to address those needs.

http://coastwatch.pfeg.noaa.gov/courses/satellite_course2017.html

Take Home Points

- Within NMFS, NOS and NWS, ocean color data is used in a variety of different applications, many of which are not a NRT or 24/7 usage. Examples include:
  - Predicting and Monitoring HABs (NOS)
  - Characterizing sanctuaries and MPA (NOS)
  - Optimizing assessment surveys (NMFS)
  - Improving Stock Assessments (NMFS)
  - Characterizing Animal Habitat (NMFS)
  - Dynamic Ocean Management (NMFS)
  - Modeling & Data Assimilation (NWS)
- The biggest value of VIIRS is that it is part of a longer time-series of satellite chlorophyll measurements that extends back to 1997.
- Long-term climate-quality VIIRS ocean color data are needed for NMFS and NOS applications.

Obrigada!