Identification and Monitoring of Chinook Oceanic Habitat off Central California

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(and many others)

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Outline

- Why Monitor Chinook?
- Different Strategies for Different Life Stages
- Oceanic Habitat Mapping Example
- Thoughts for the future

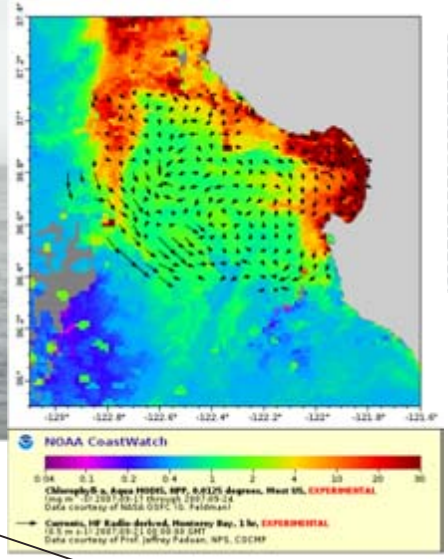
Motivation

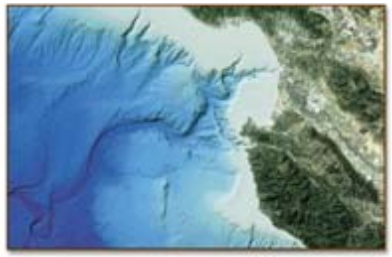
- In 2008 and 2009 the California Chinook stocks collapsed resulting in the complete closure of the recreational and commercial fisheries
- On the order of $60-70 Million in lost revenue per year.
- Loss of an iconic aspect of the California lifestyle
- In 2010, the commercial fishery was opened for very limited periods, under intense scrutiny, following a lackluster recreational season.

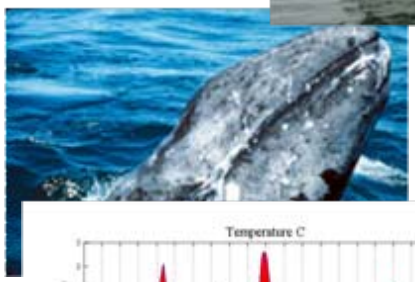
Monitoring Life Stages of Chinook

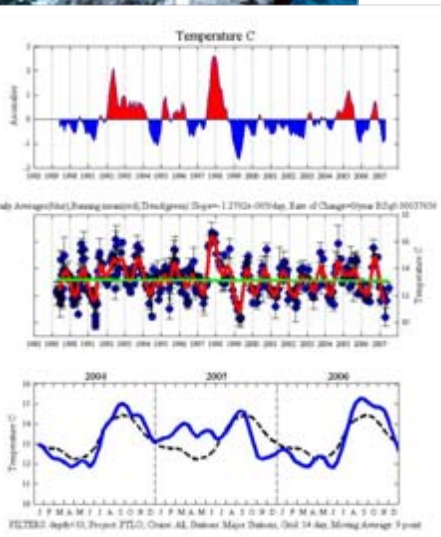
- River conditions after hatching
  - Possible mitigation through adjustments in water discharge
- Ocean conditions at time of ocean entry
- Ocean conditions during oceanic phase
  - Possible mitigation by time/area closures of fishery
- Return to river for spawning

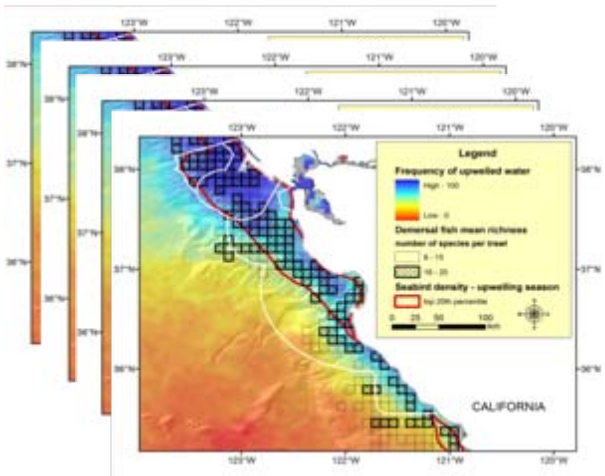
Data Integration for Monitoring



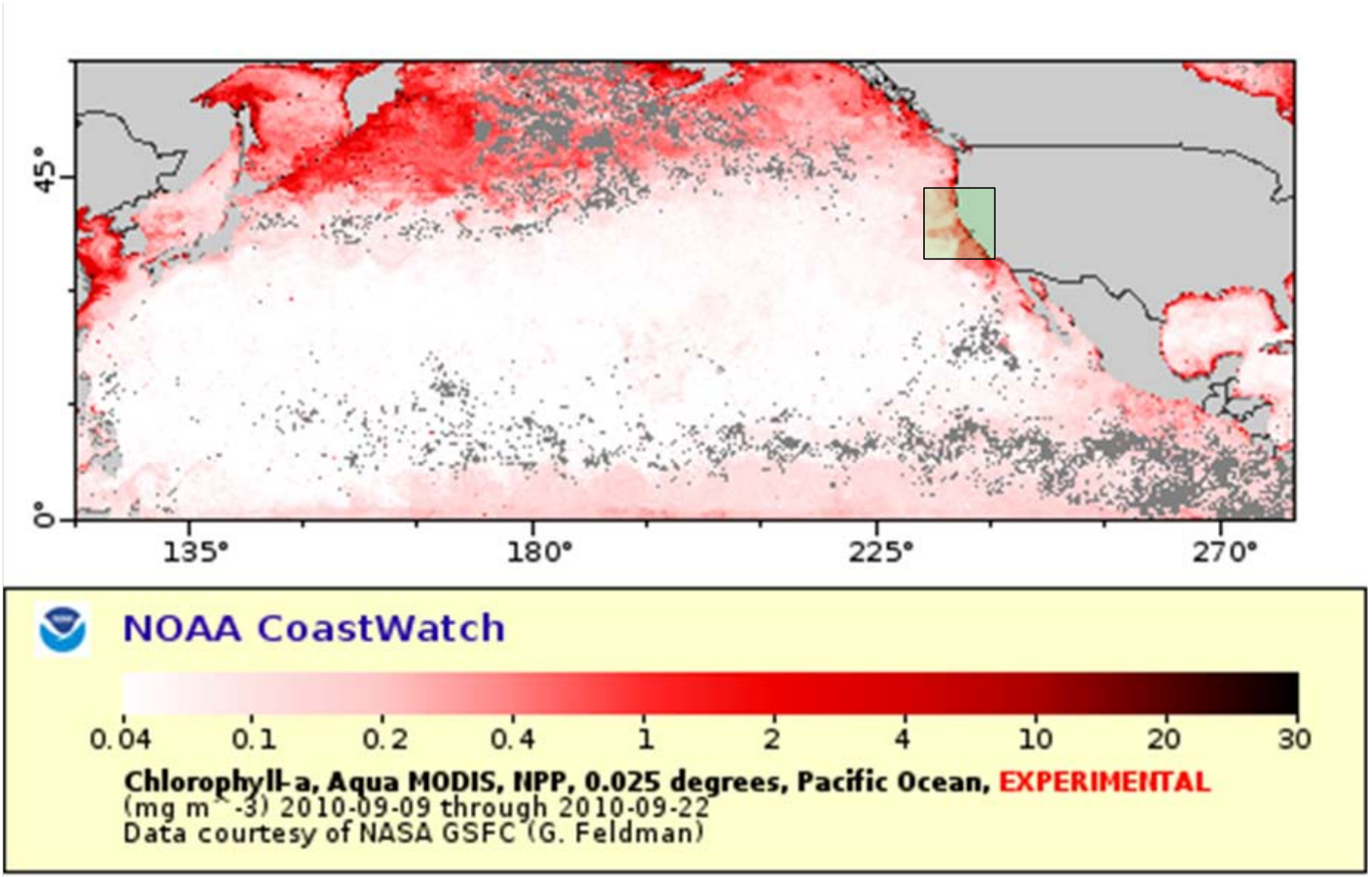








Ocean Habitat Mapping Example



Applying Electronic Tag to Chinook

Pacific Fisheries Environmental Laboratory

Live Access to Salmon Data

Choose release year

Choose tag number

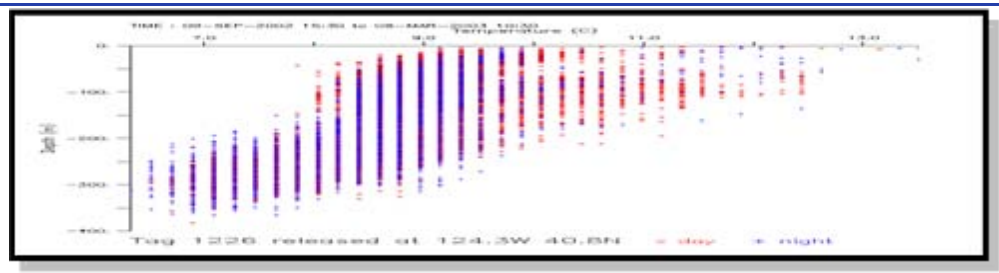
Choose output

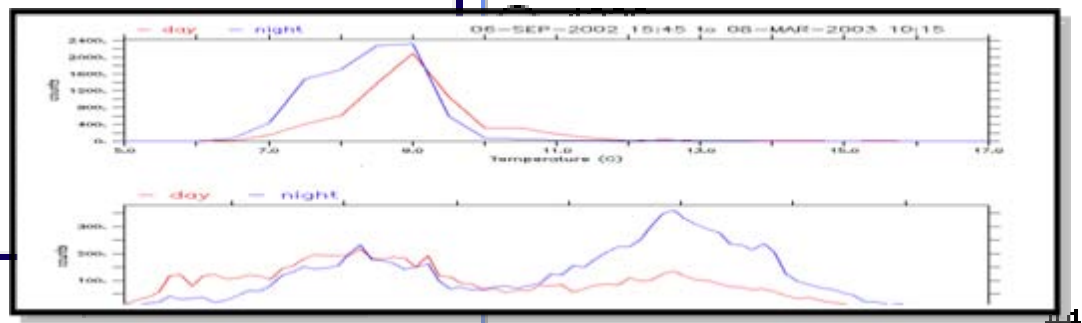
View output

Datasets > 2002

Select a tag number and then click Next > (or click Choose Output fi

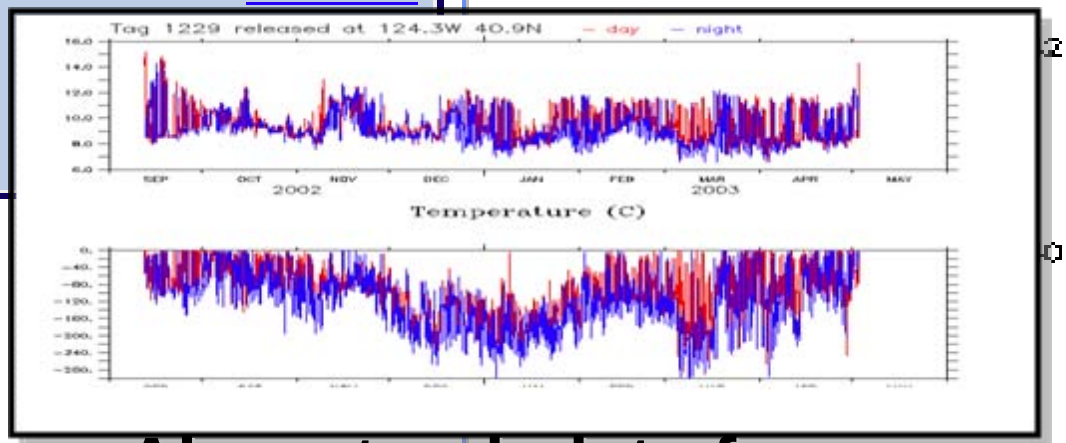
Select tag number:



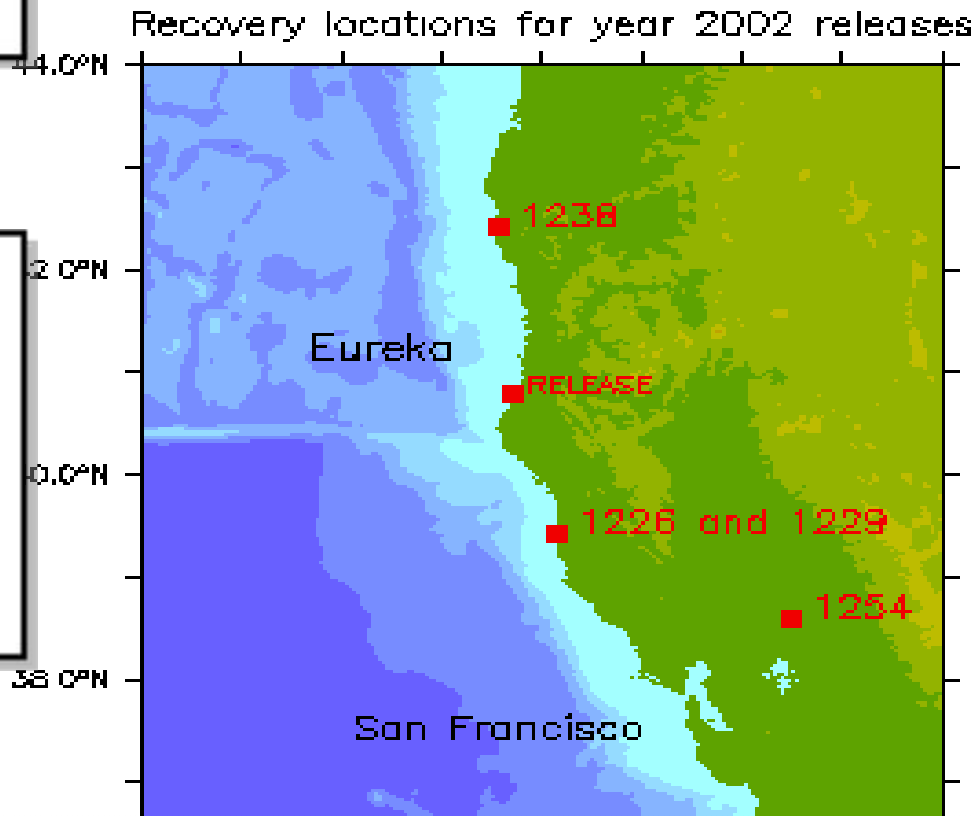


About Salmon Data

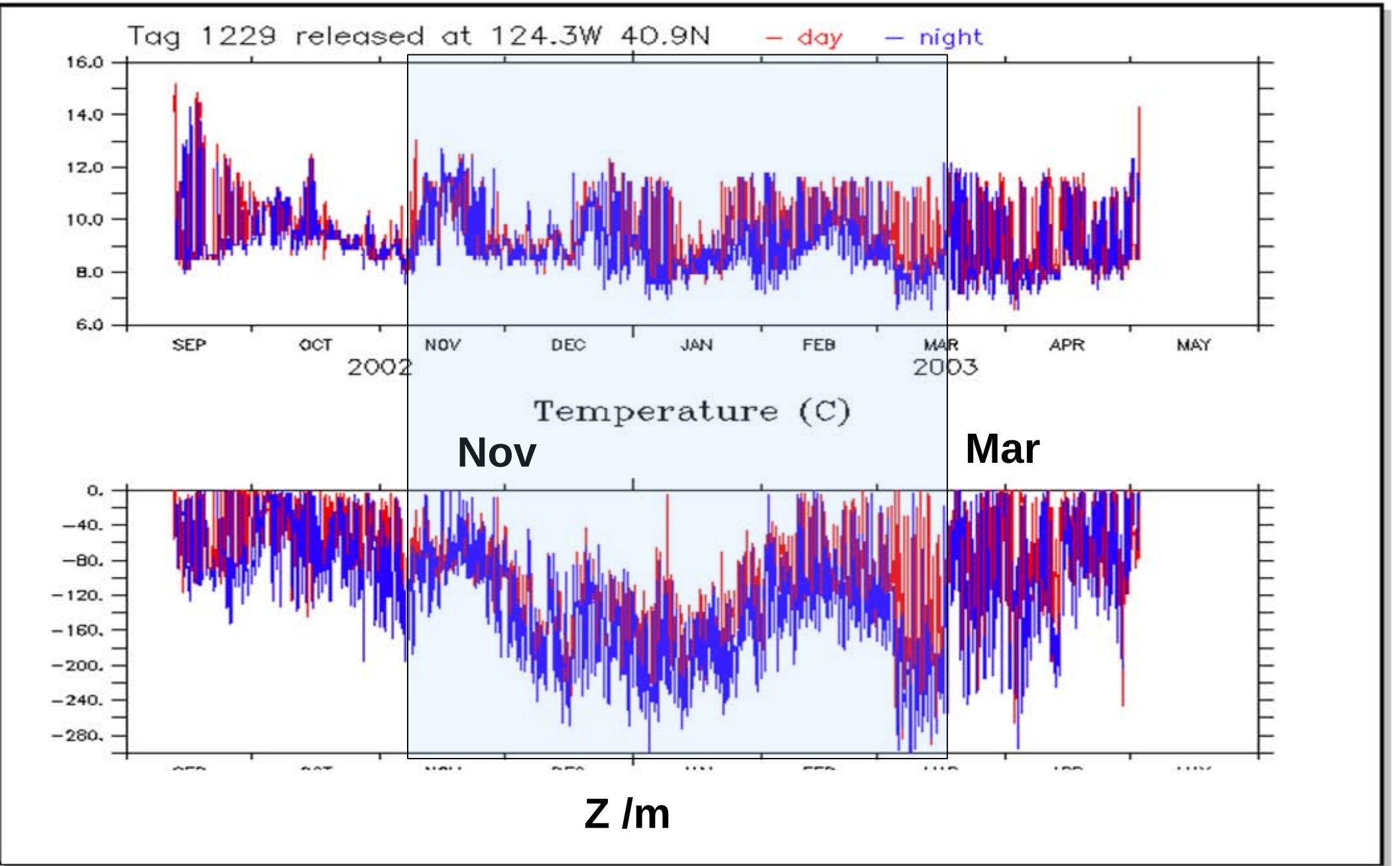
Instruments



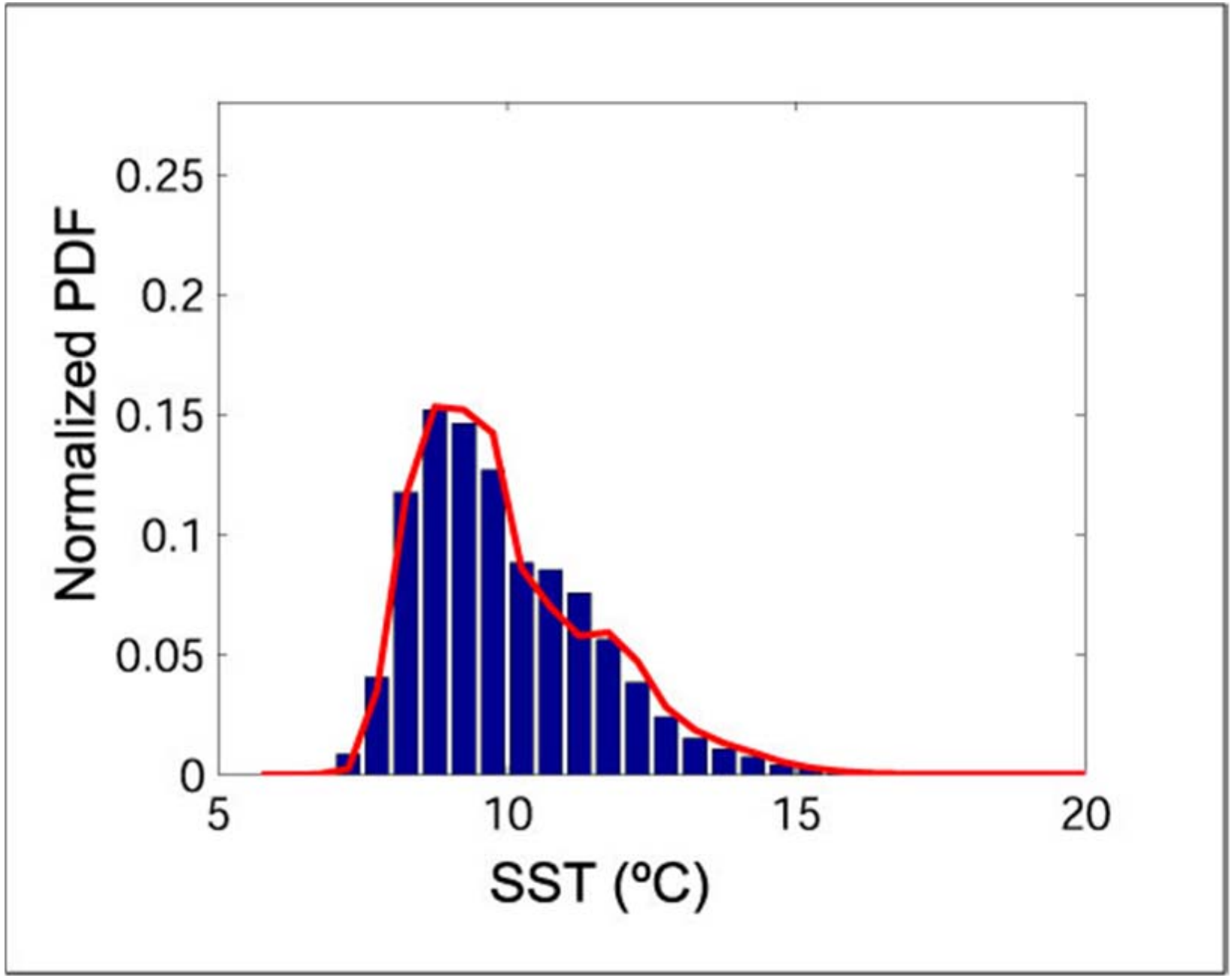
Along-track data from tag



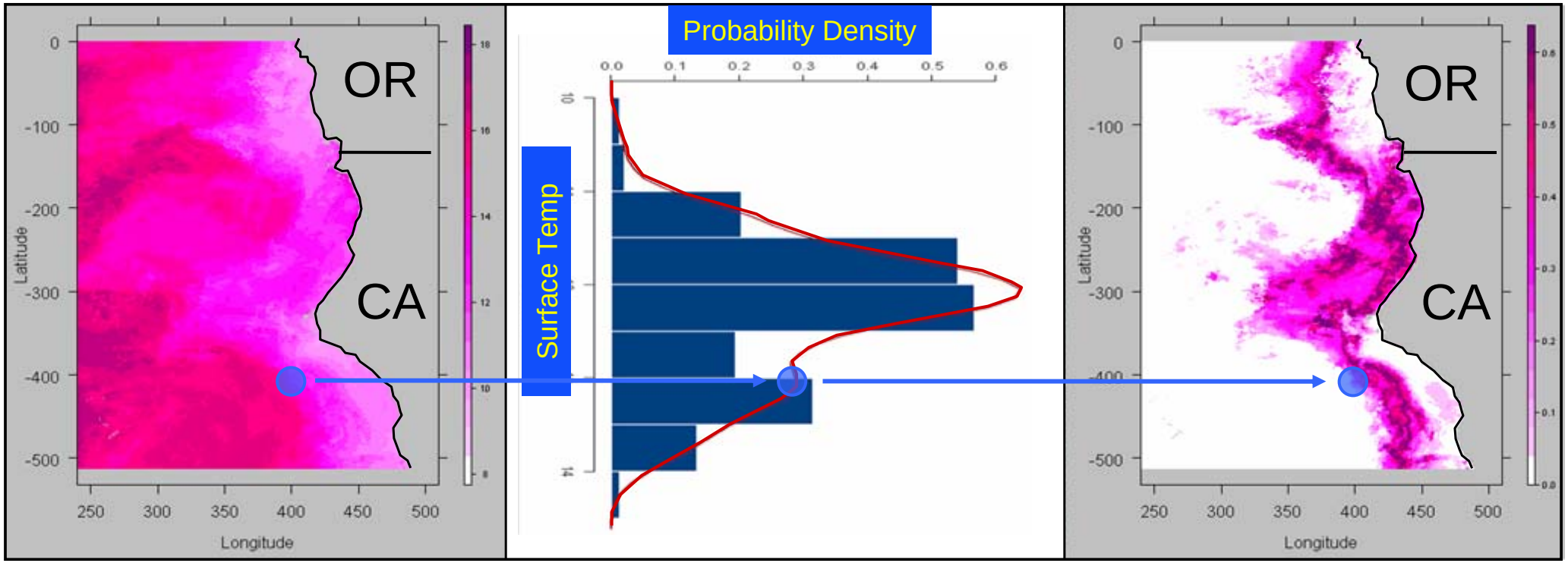
Sample Tag (Sep 2002 – Apr 2003)



Chinook Temperature PDF



Transforming Satellite SST into Habitat Maps



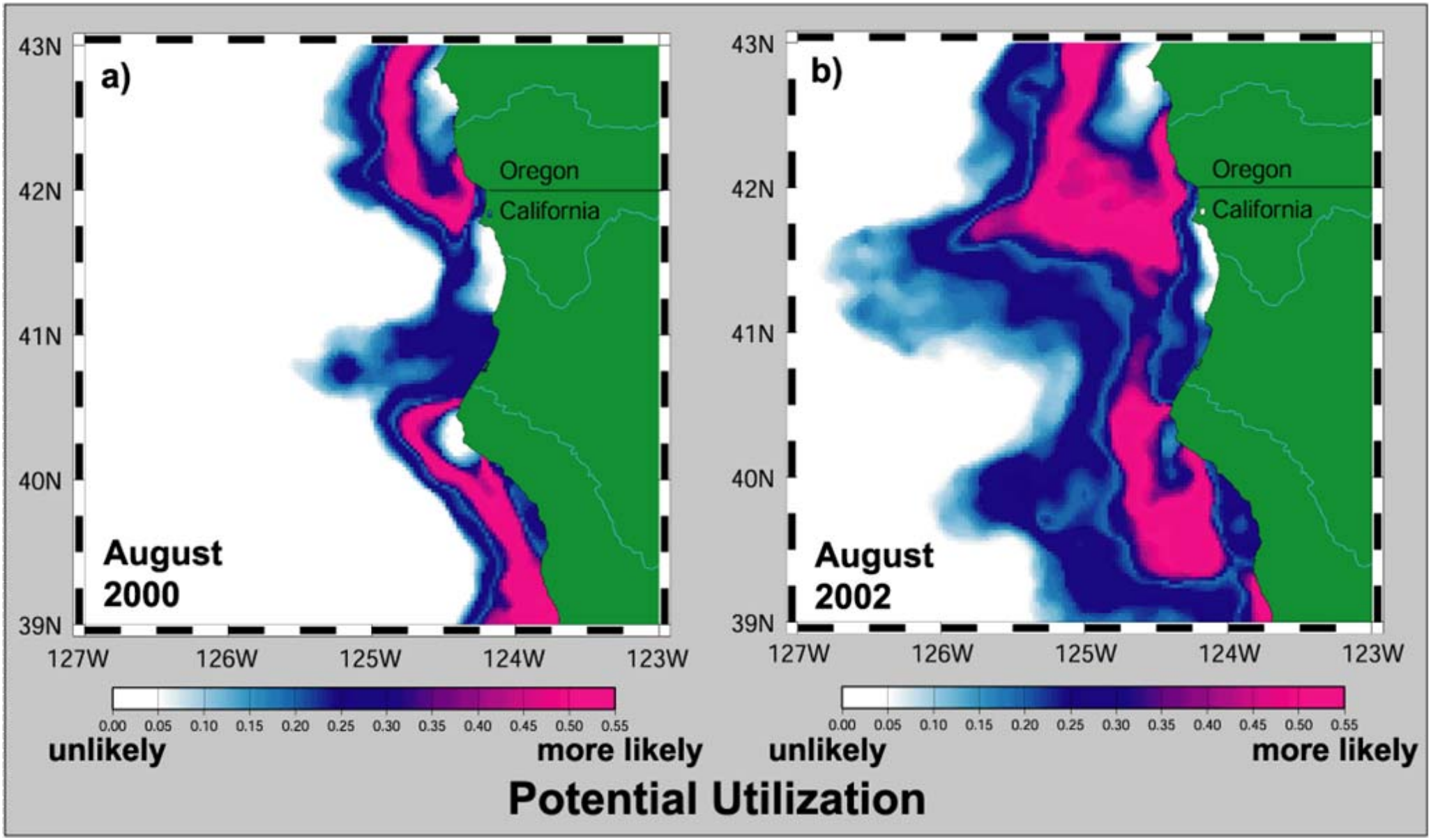
Satellite SSTs

Density of fish's temperature experience at the surface

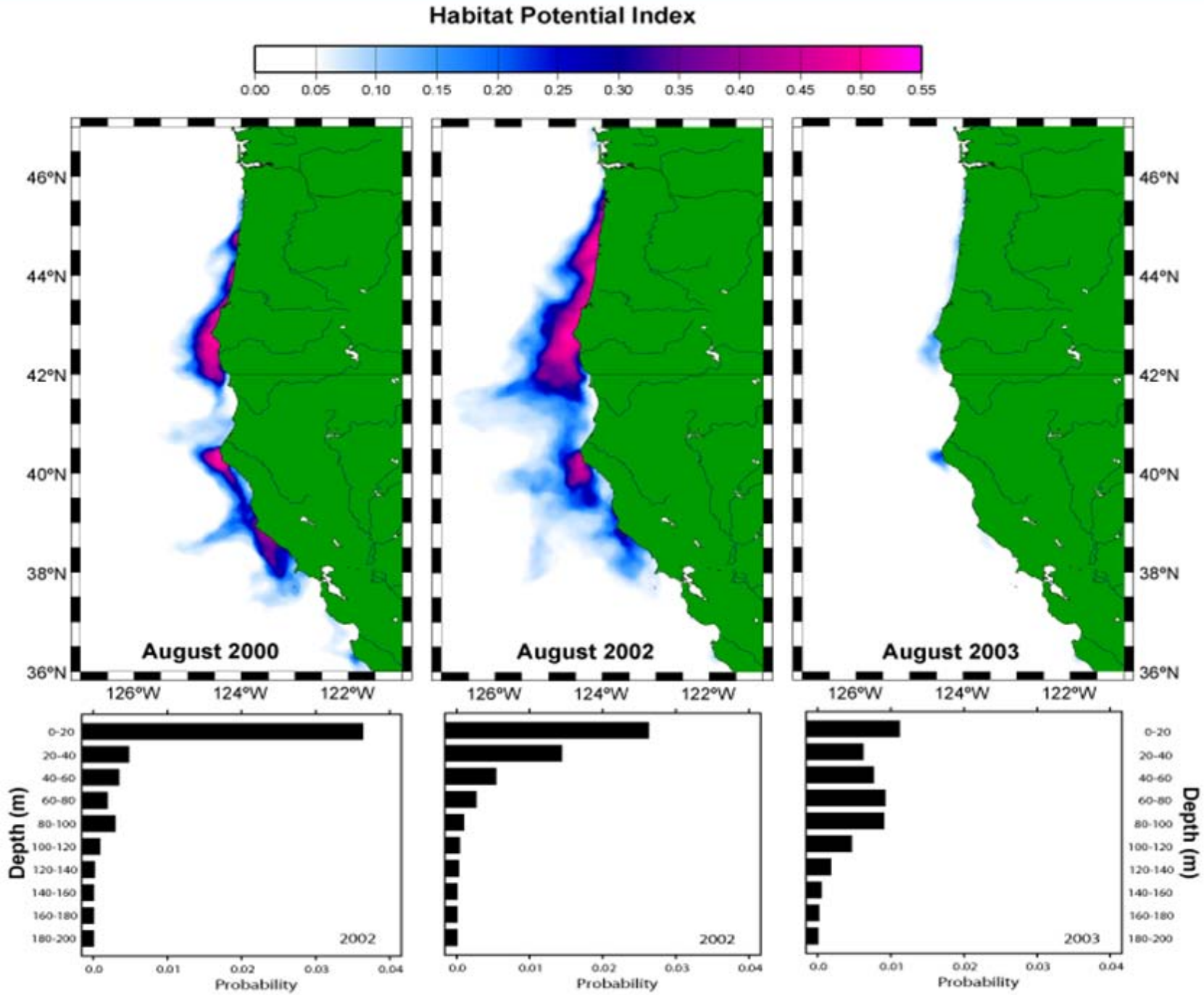
"Contours of utilization" – likely places the fish may have been

Slide courtesy of Cara Wilson (NMFS)

Interannual Variability – Habitat Constriction



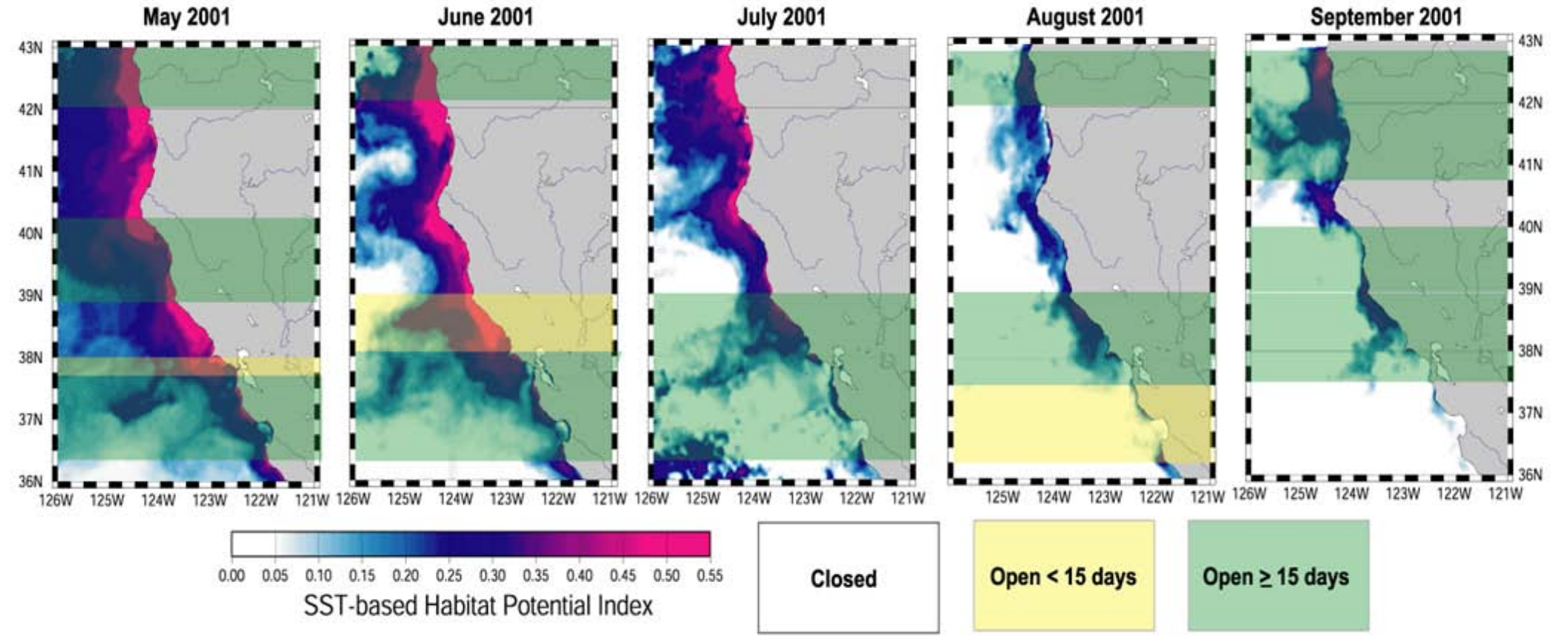
Link to Behavioral Variations



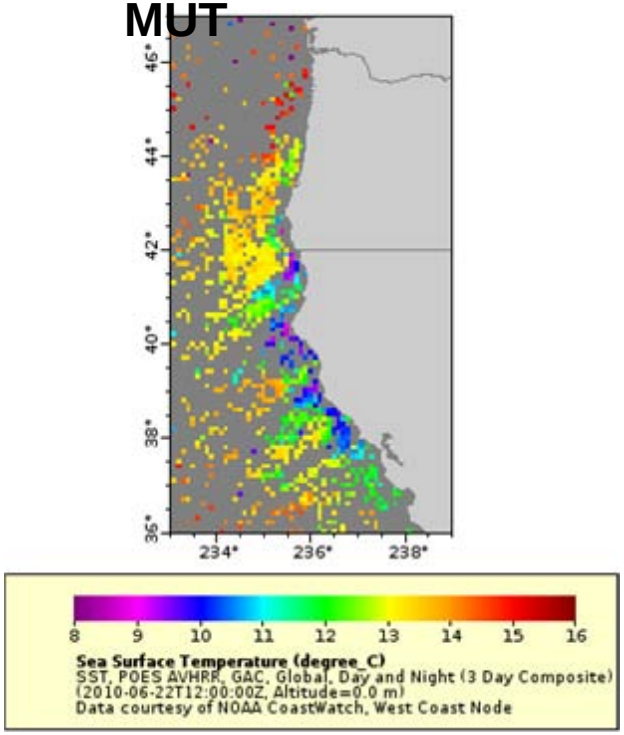
New SST Data Sets : Why GHRSST?

- The fishery is managed on the time scale of days
- We wish to provide information that resolve features on that time scale
- The habitat calculation requires accurate SST
- The efforts at intercomparison and monitoring associated with GHRSST provide this.
- The L4 fields provide “gap-free” end products.

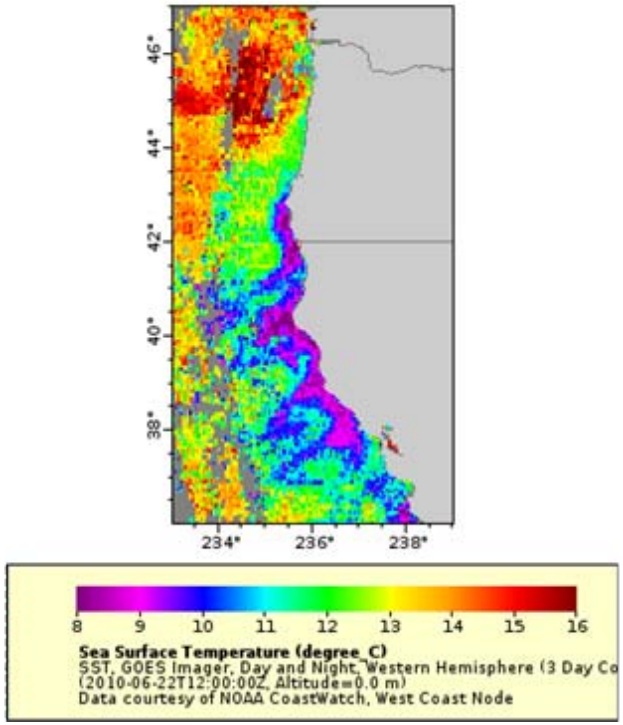
Management of the Fishery Time/Area Closures



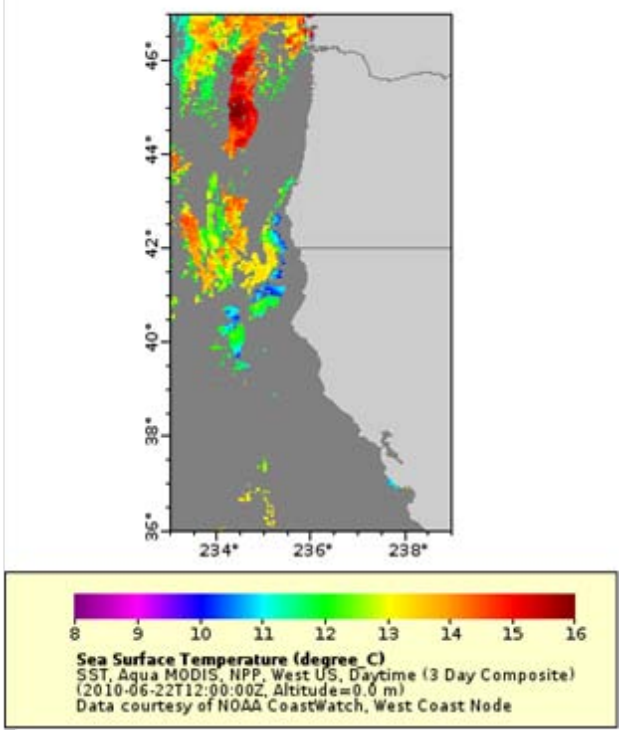
3-d AVHRR MUT



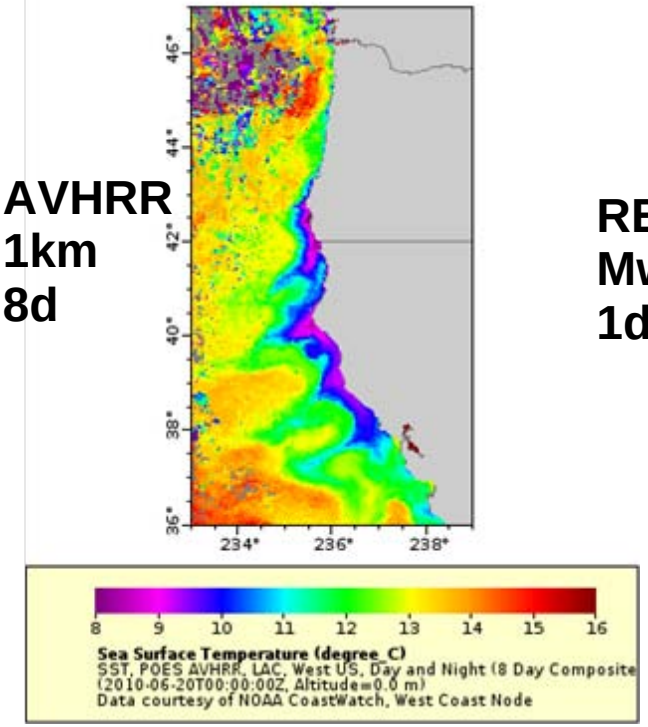
3-d GOES



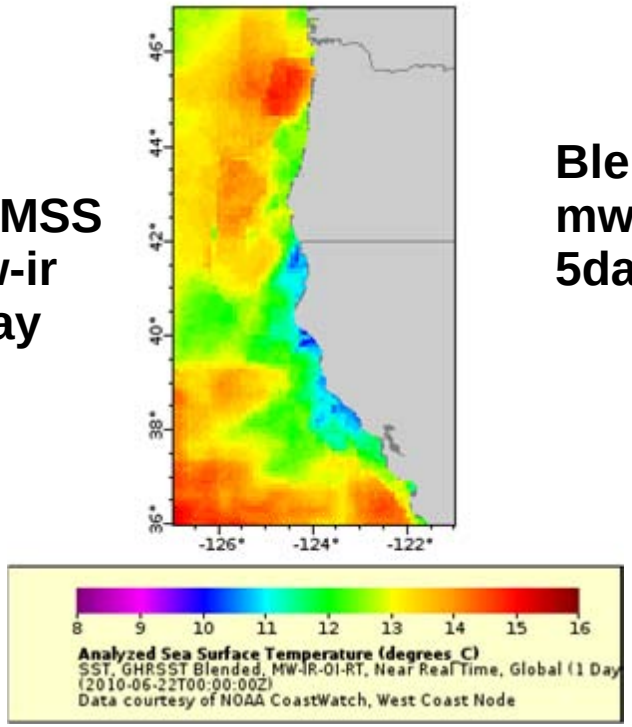
MODIS 3-day



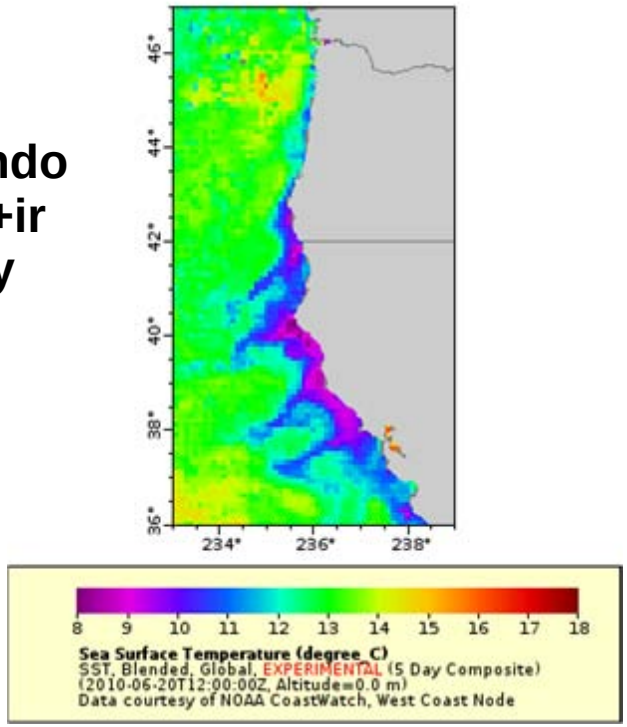
AVHRR 1km 8d



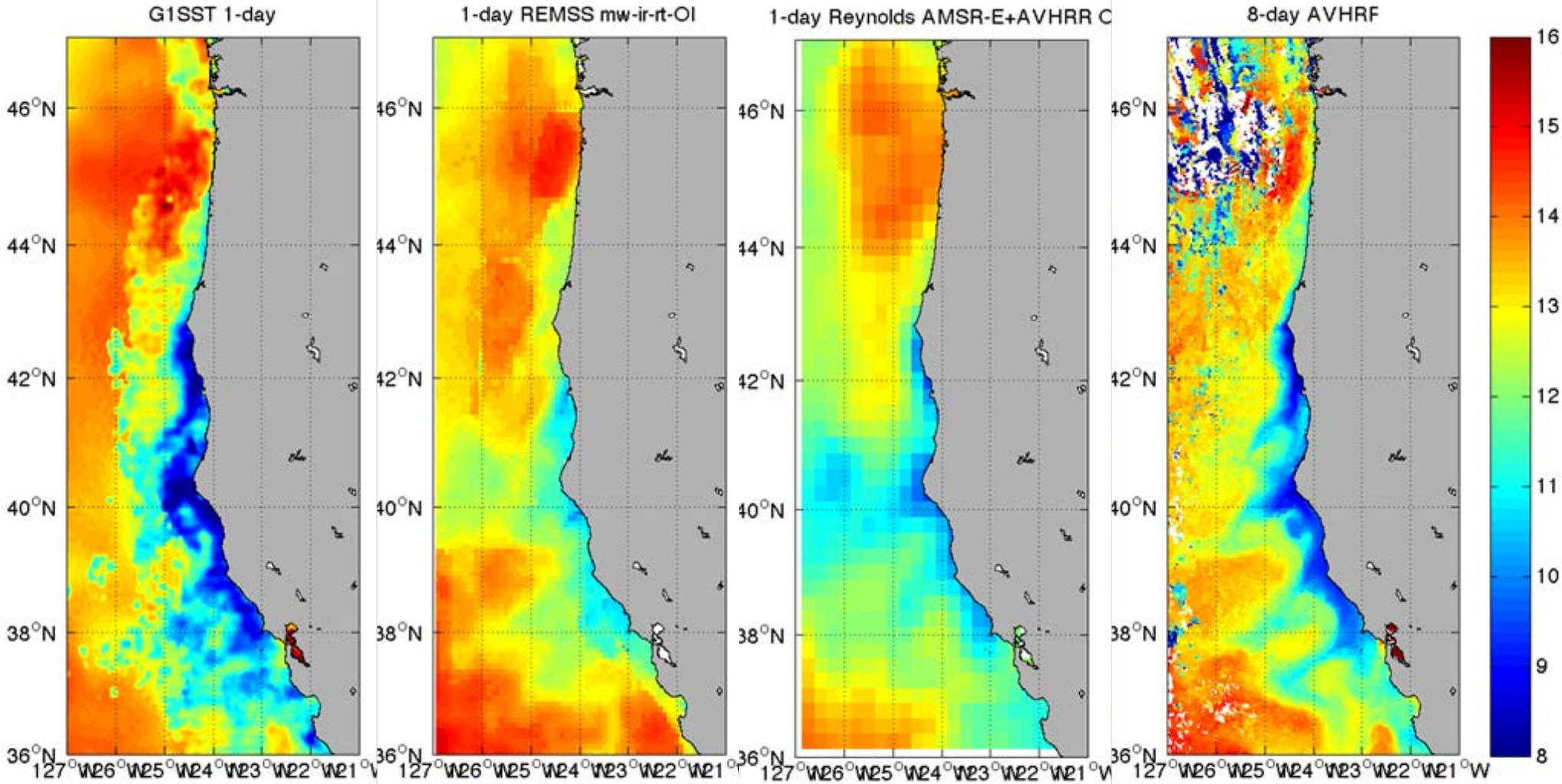
REMSS Mw-ir 1day



Blendo mw+ir 5day



Comparison of Products



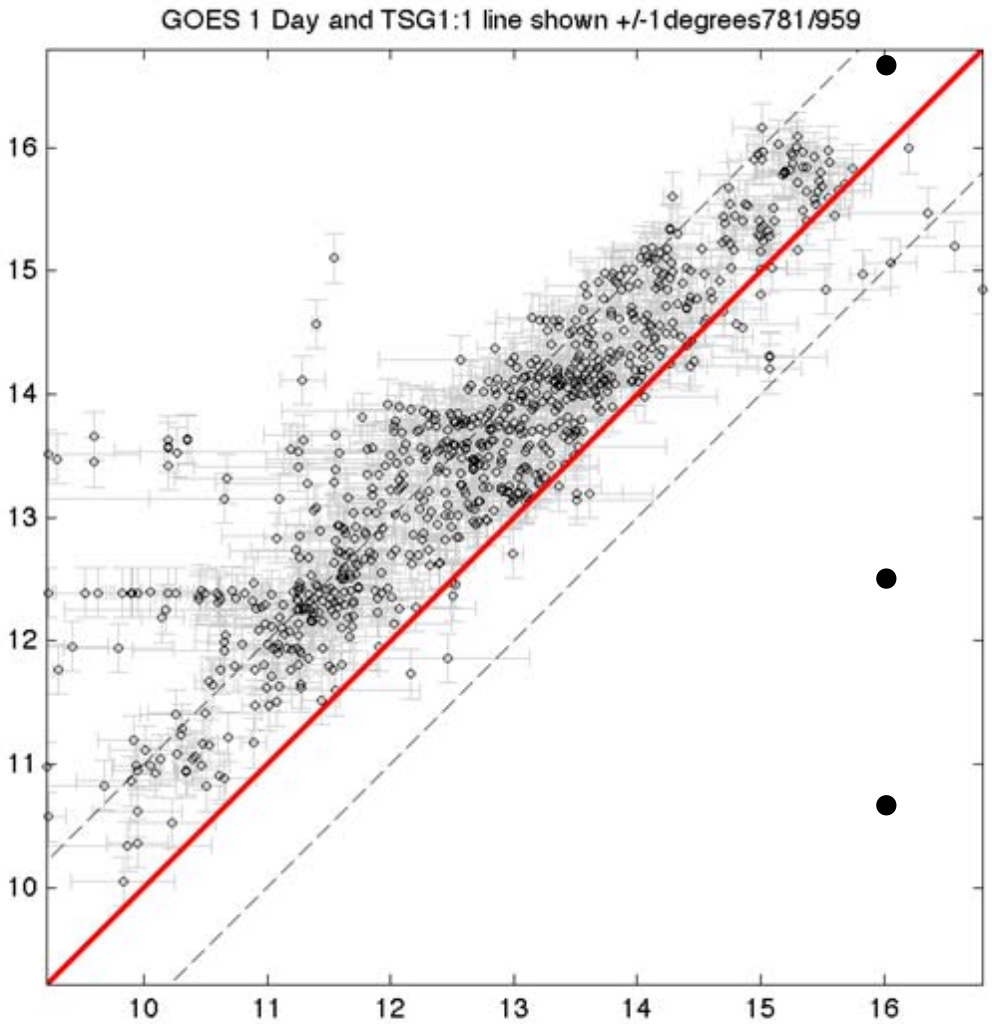
G1SST

REMSS

Reynolds
Ir + mw

POES 1km
8-day

GOES Bias in Upwelling Regions

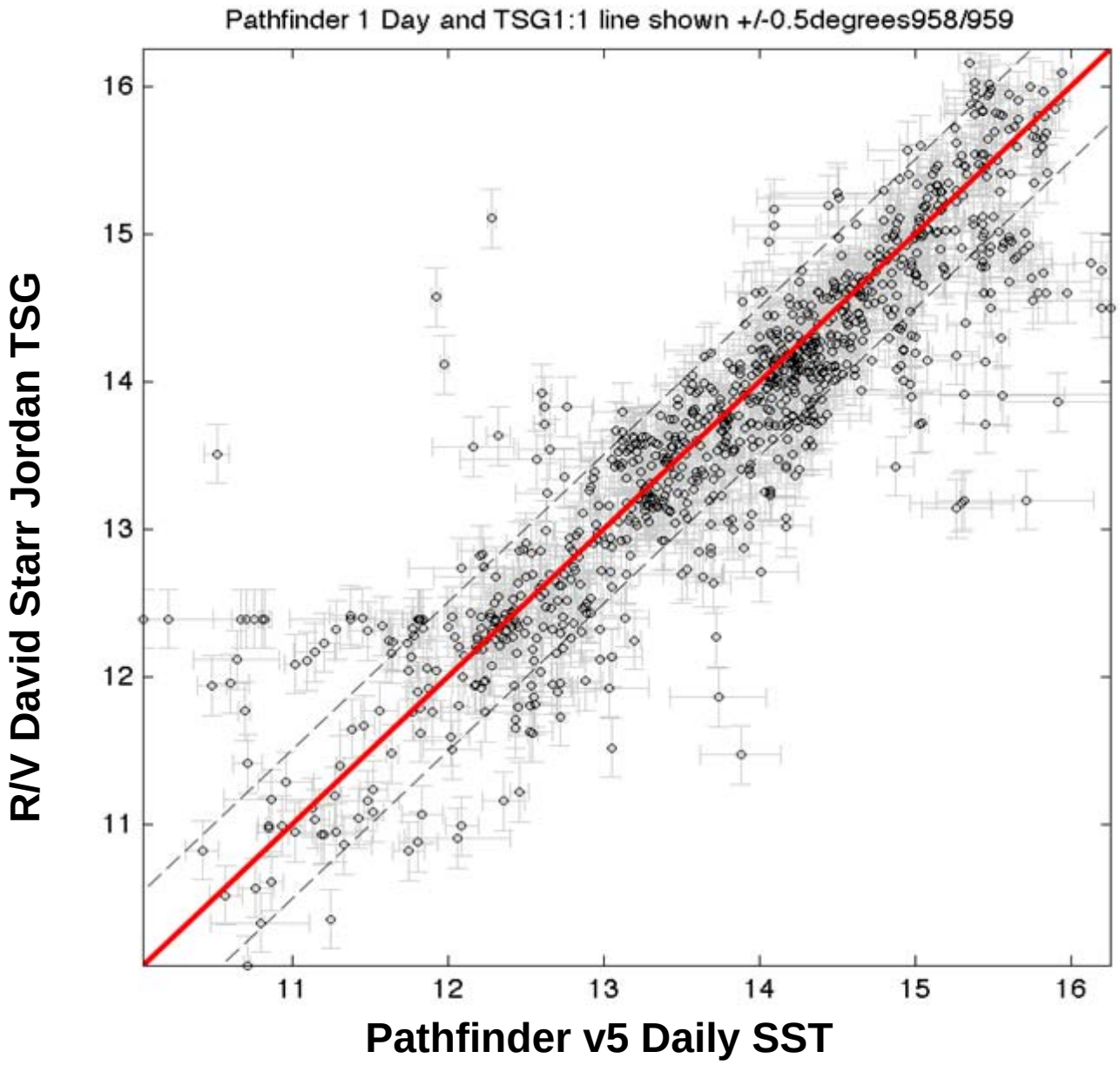


- Consistent cold bias in upwelling regions identified in CalCOFI cruise underway TSG
- Example from April 2007 shown here.
- Red line is 1:1 line.

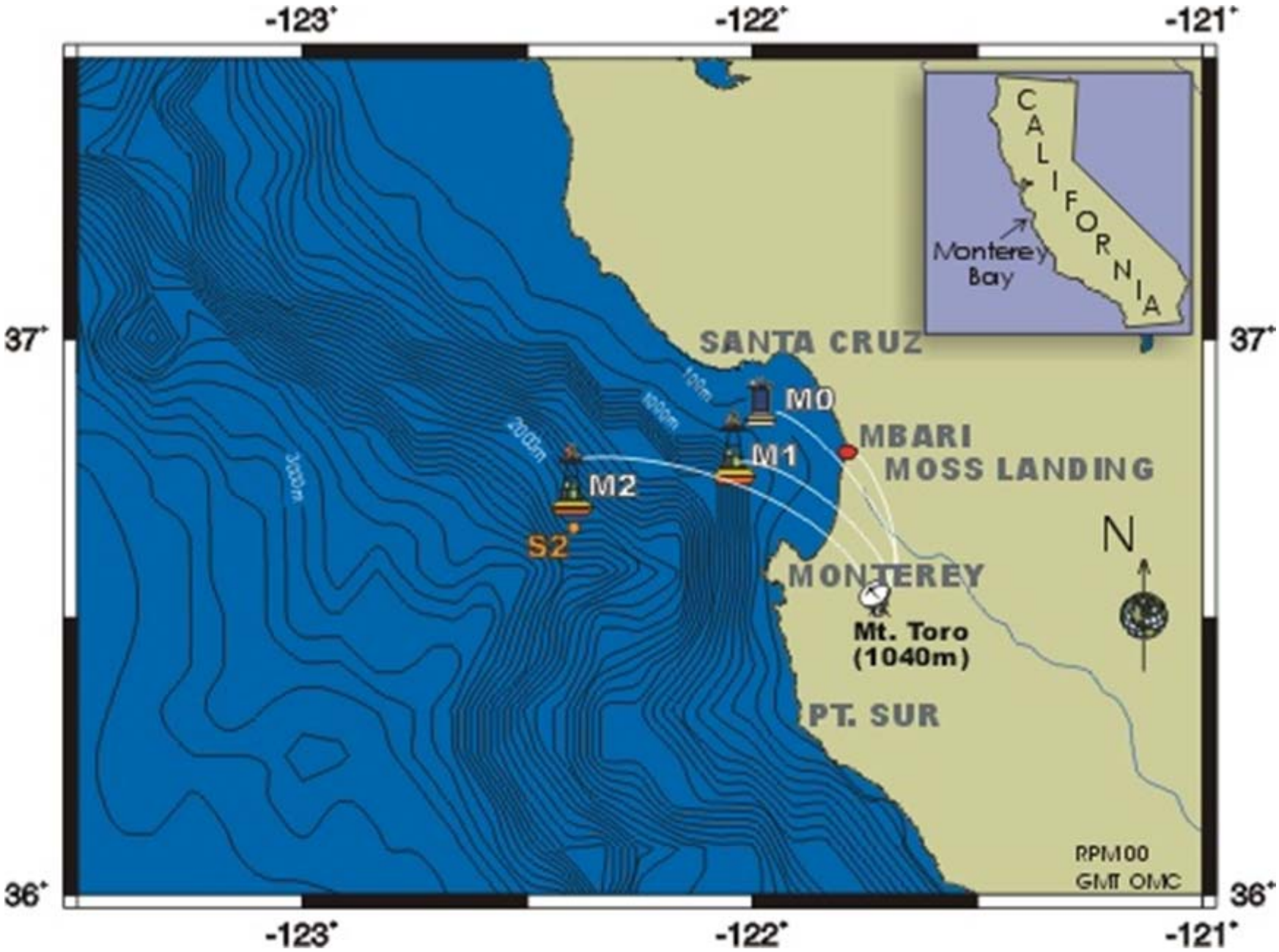
R/V David Starr Jordan TSG

GOES SST Daily Composite

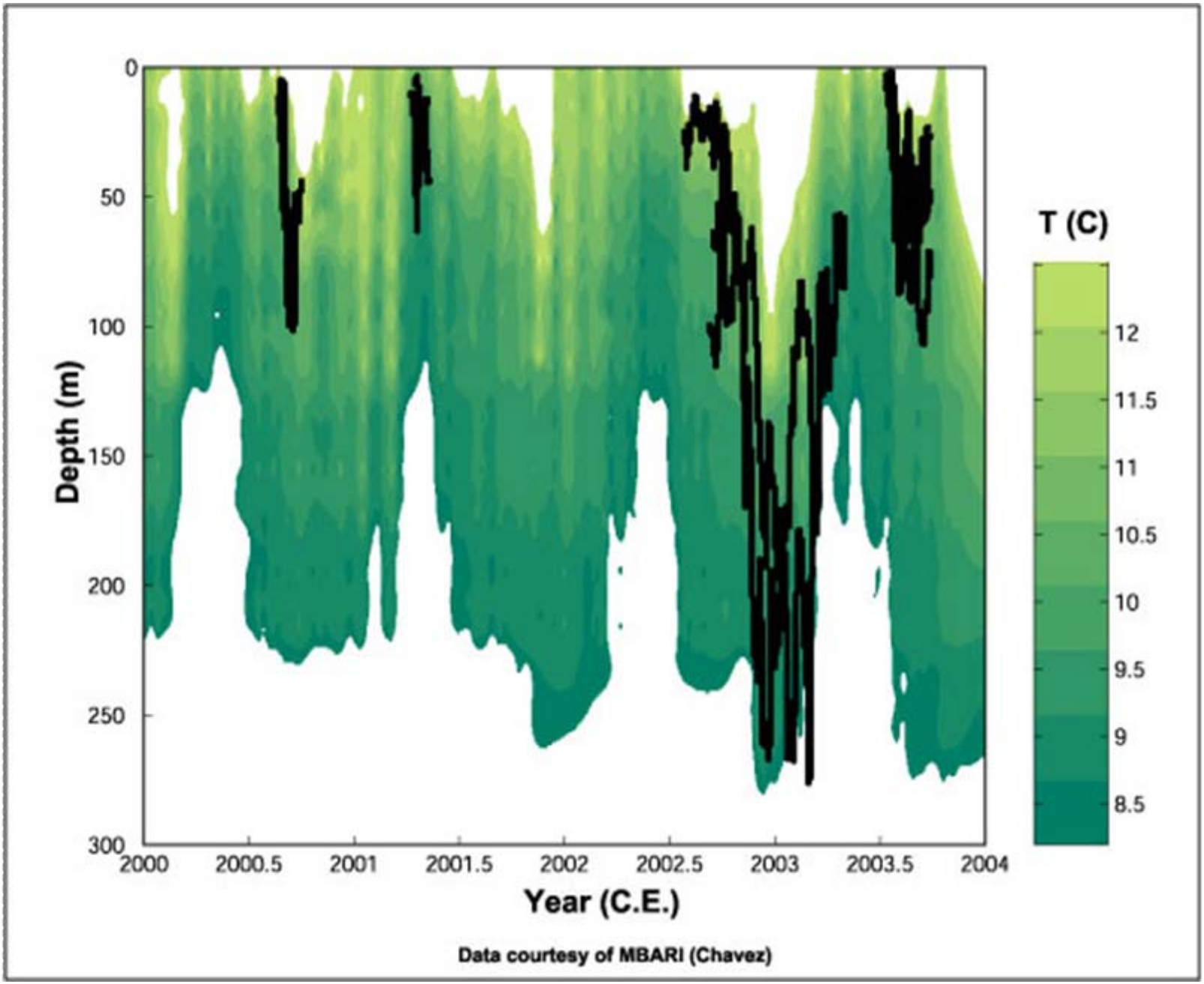
GOES Bias: Pathfinder for same period



Time Series View



Seasonal Changes (M1 Mooring)



Use of Oceanic Circulation Models

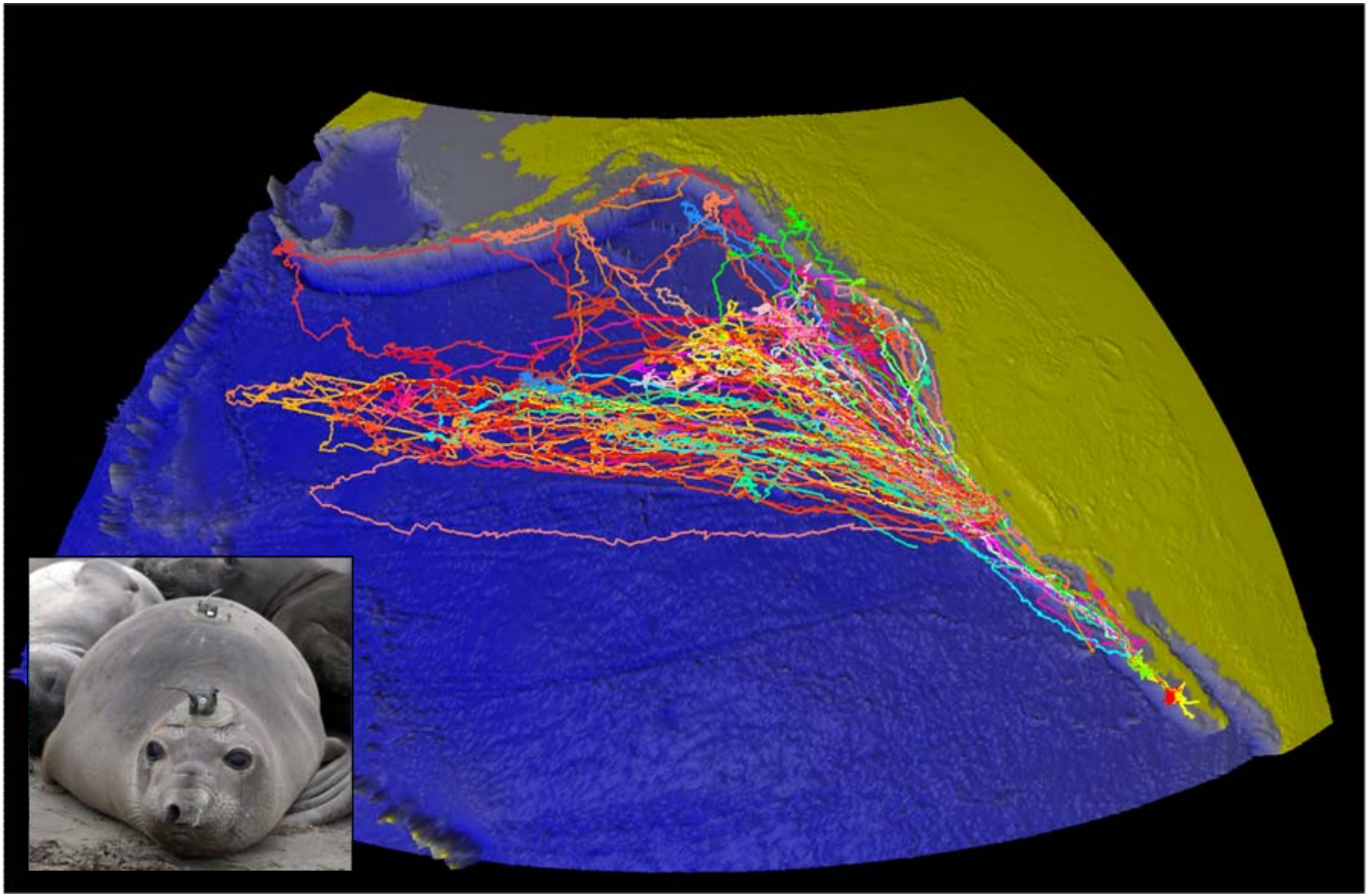
- Rapidly improving spatial resolution appropriate for coastal regimes
- Improving reproduction of actual conditions
- Data readily available in near real time
- Some serious caveats remain
  - problems with near shore areas inhabited by salmon
  - Problems with resolving the bottom boundary layer

Plans for the Future: New Tags

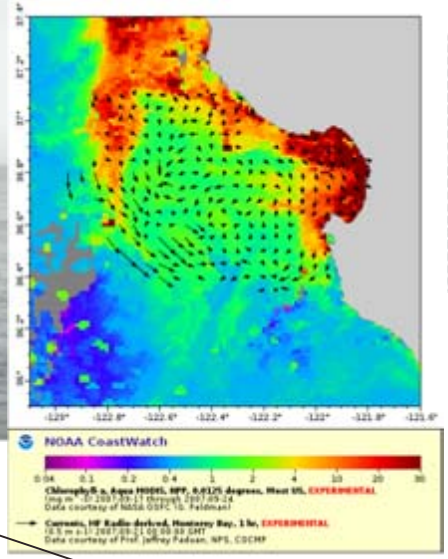
Temperature/Pressure Tag

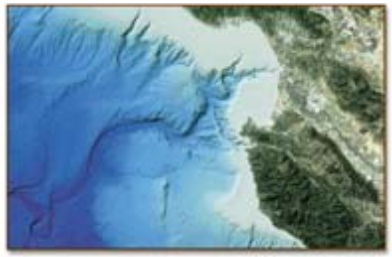
Geolocation Tag

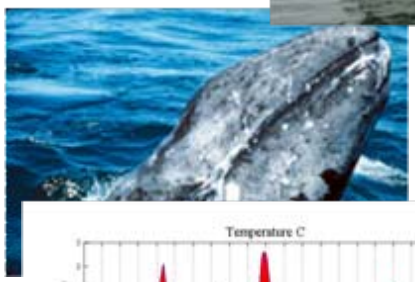
Plans for the Future – New Platforms

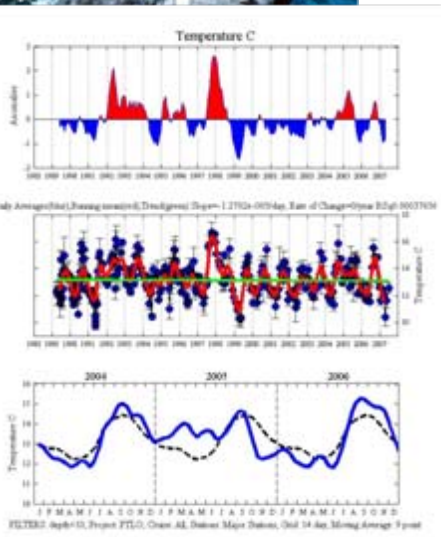


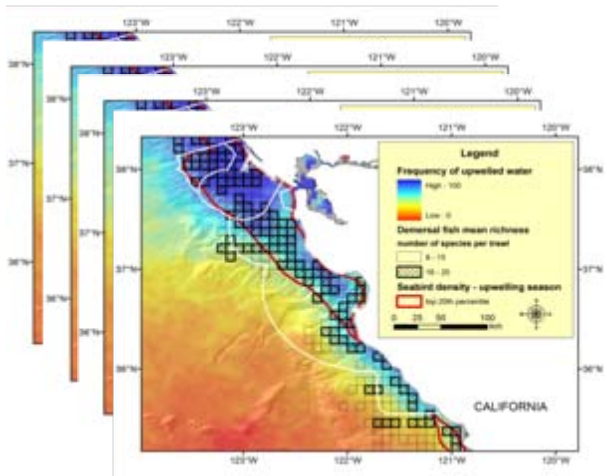
Data Integration for Monitoring











Conclusions

- While the current management strategy does not incorporate oceanic conditions beyond those at initial entry, we can monitor this
- Advances in technology will allow for:
  - improved tagging efforts
  - Better satellite data
  - Better models