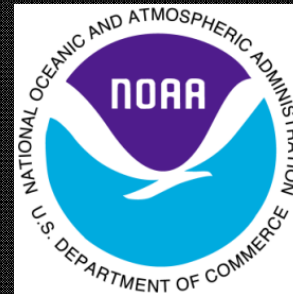


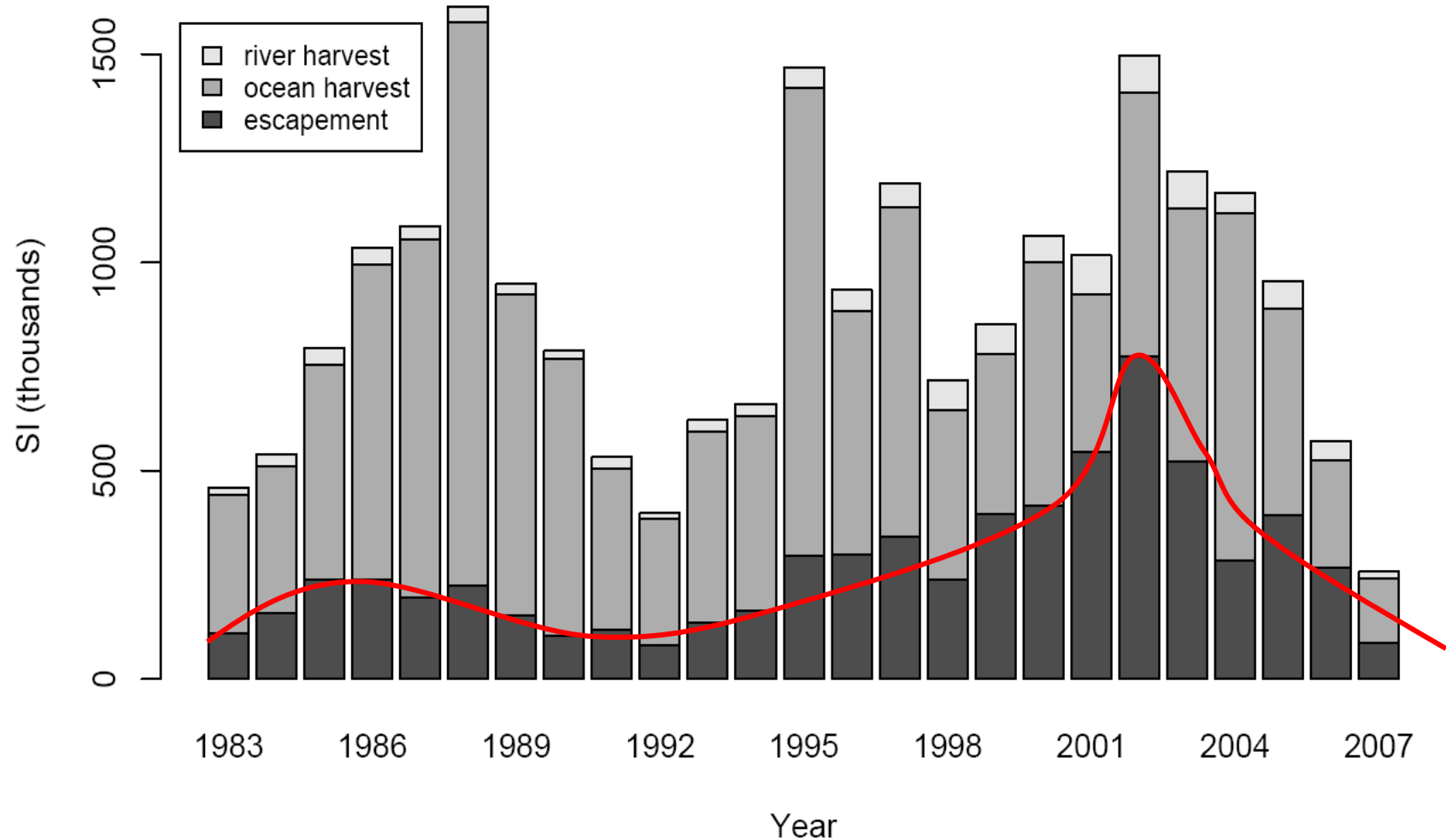
WRONG PLACE, WRONG TIME: **RECENT MISMATCHES IN FOOD** **AVAILABILITY TO SALMON AND** **SEABIRDS IN CALIFORNIA**

William J. Sydeman and Steven J. Bograd



BACKGROUND

CHINOOK SALMON POPULATION



RETURNS (NO. FISH)

2002 - 800,000

...

2007 - 90,000

2008 - 60,000

2009 - ? (better)

2010 - ?

**SIMILAR PATTERNS ACROSS SALMON
POPULATIONS, AND WITH SEABIRDS...**

**...SUGGEST LARGE-SCALE
(CLIMATE-OCEAN)
FACTORS AT PLAY**



Black-footed Albatross

**(GIVEN LONG-STANDING RIVER DEGRADATION,
DECREASE IN STOCK RESILIENCY)**

TACKLING CLIMATE CHANGE AND ECOLOGICAL COMPLEXITY (OPC ENV-07)

WJ Sydeman and SJ Bograd - Principle Investigators

JA Santora, ID Schroeder – Post-Doctoral Research Associates
(Farallon Inst. and NOAA-ERD)

JD Dorman (Z Powell, prof) – PhD Trainee (UCB)

KL Mills, SA Thompson – Staff Biologists (Farallon)

B Black and RM Suryan – Collaborators (OSU)

JC Field, S Ralston – Collaborators (NMFS)

**WHAT HAVE WE
LEARNED?**

**PREDATORS NEED FOOD AT THE RIGHT
PLACE AND TIME TO THRIVE AND
SURVIVE**

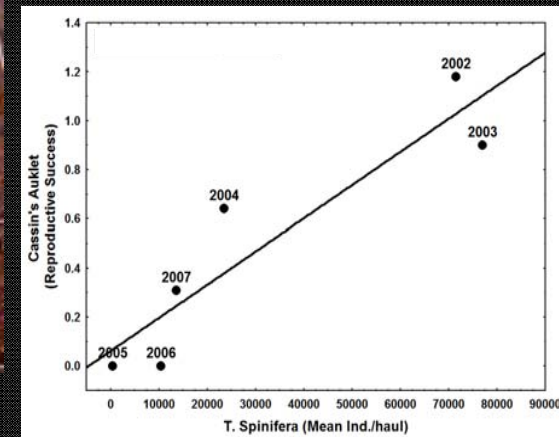
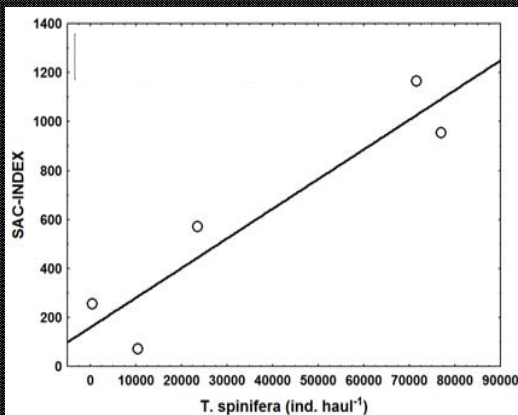


BLUE WHALE/KRILL

KRILL - RIGHT PLACE AND RIGHT TIME= BETTER SURVIVAL AND REPRODUCTIVE SUCCESS..

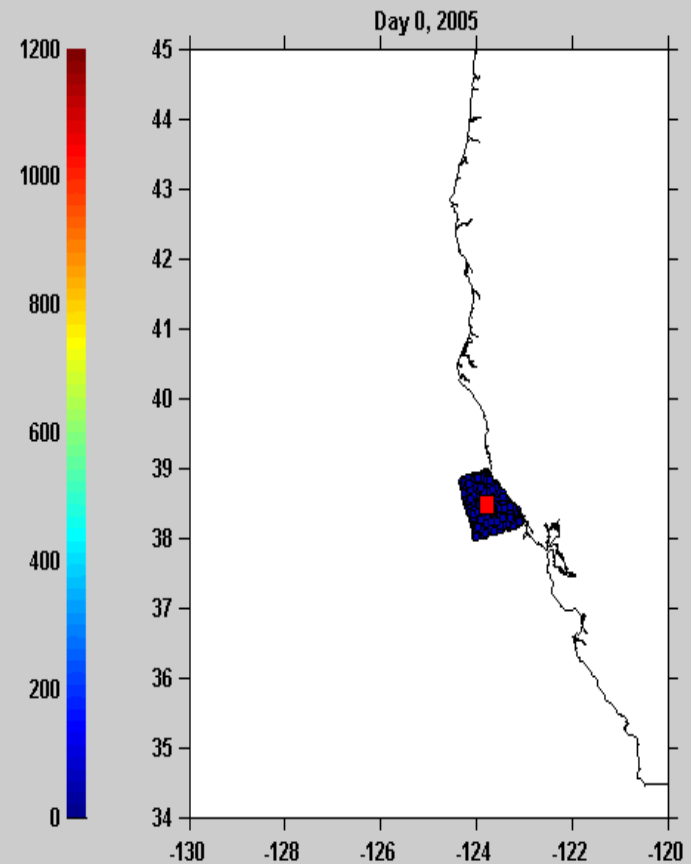
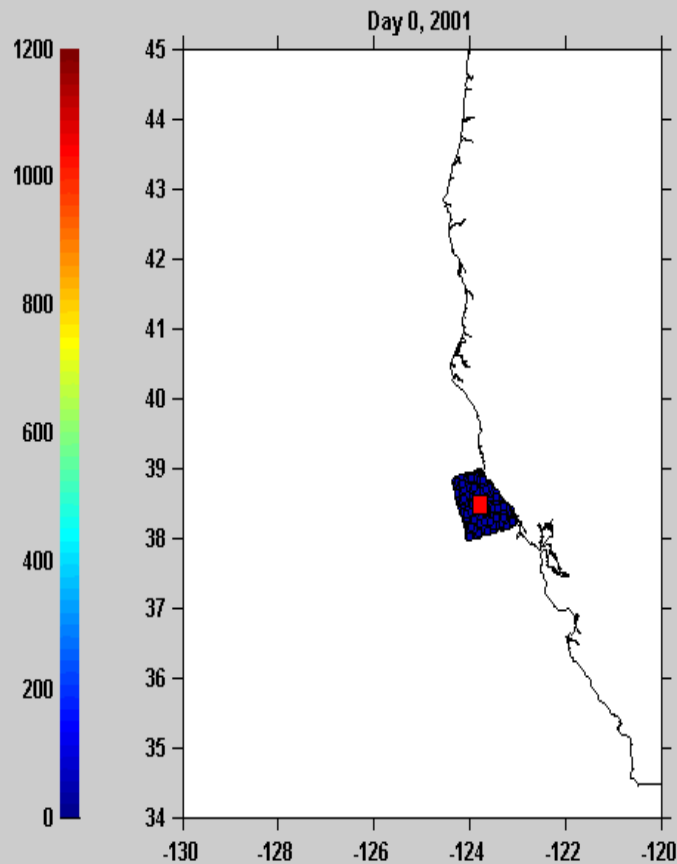
Chinook Salmon

Cassin's Auklet



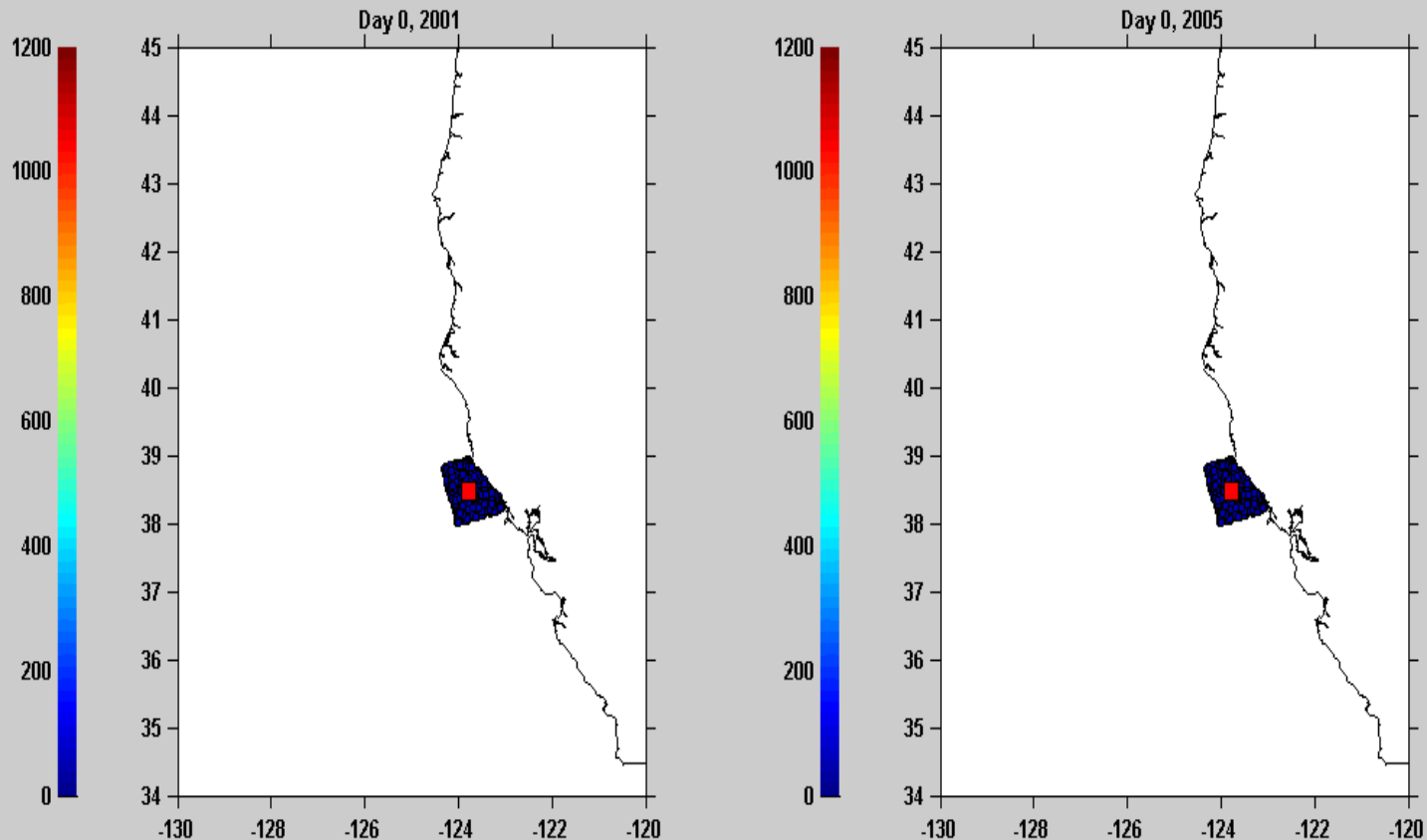
WHAT HAVE WE LEARNED? THE CLIMATE CONNECTION

CLIMATE IMPACTS VIA CURRENTS?



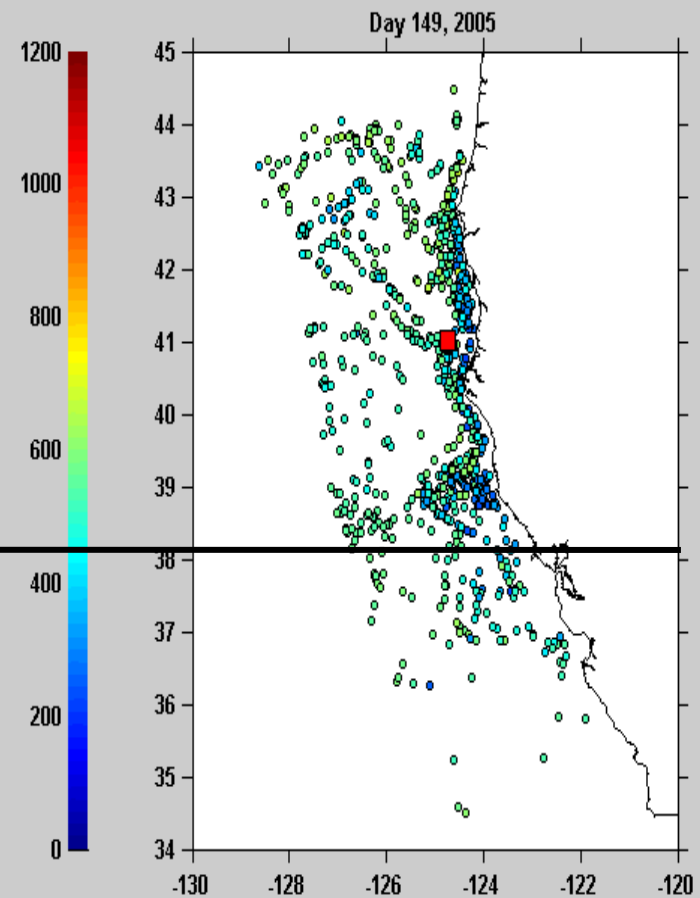
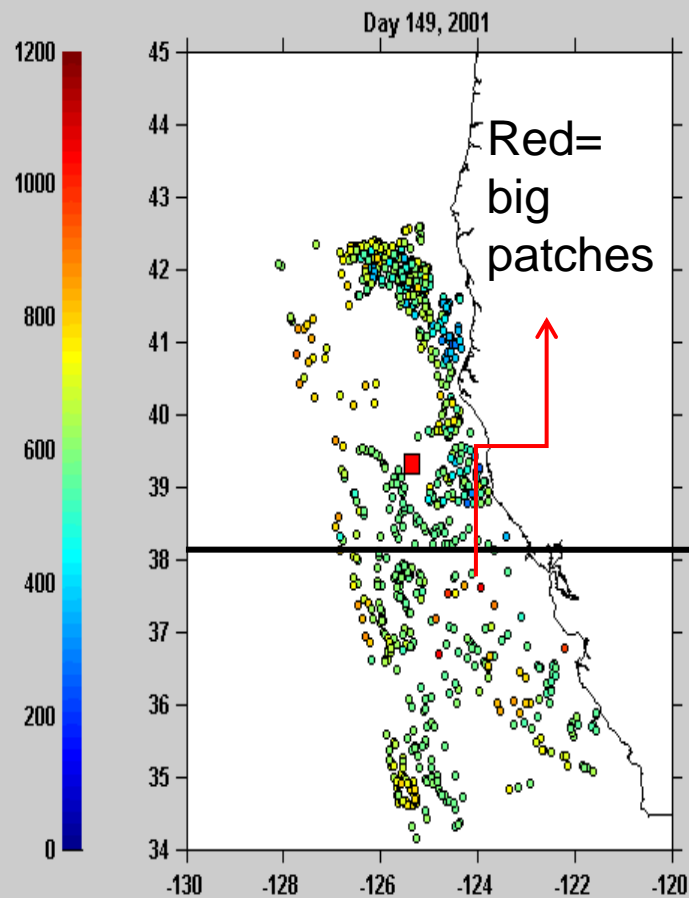
Jeff Dorman et al. unpublished

HOW? COUPLE REGIONAL OCEAN MODEL WITH KRILL POPULATION MODEL (WINDS – CIRCULATION – PRIMARY PRODUCTIVITY – KRILL DIST'N)



Jeff Dorman et al. unpublished

MODEL RESULTS: GOOD VS. BAD YEAR..

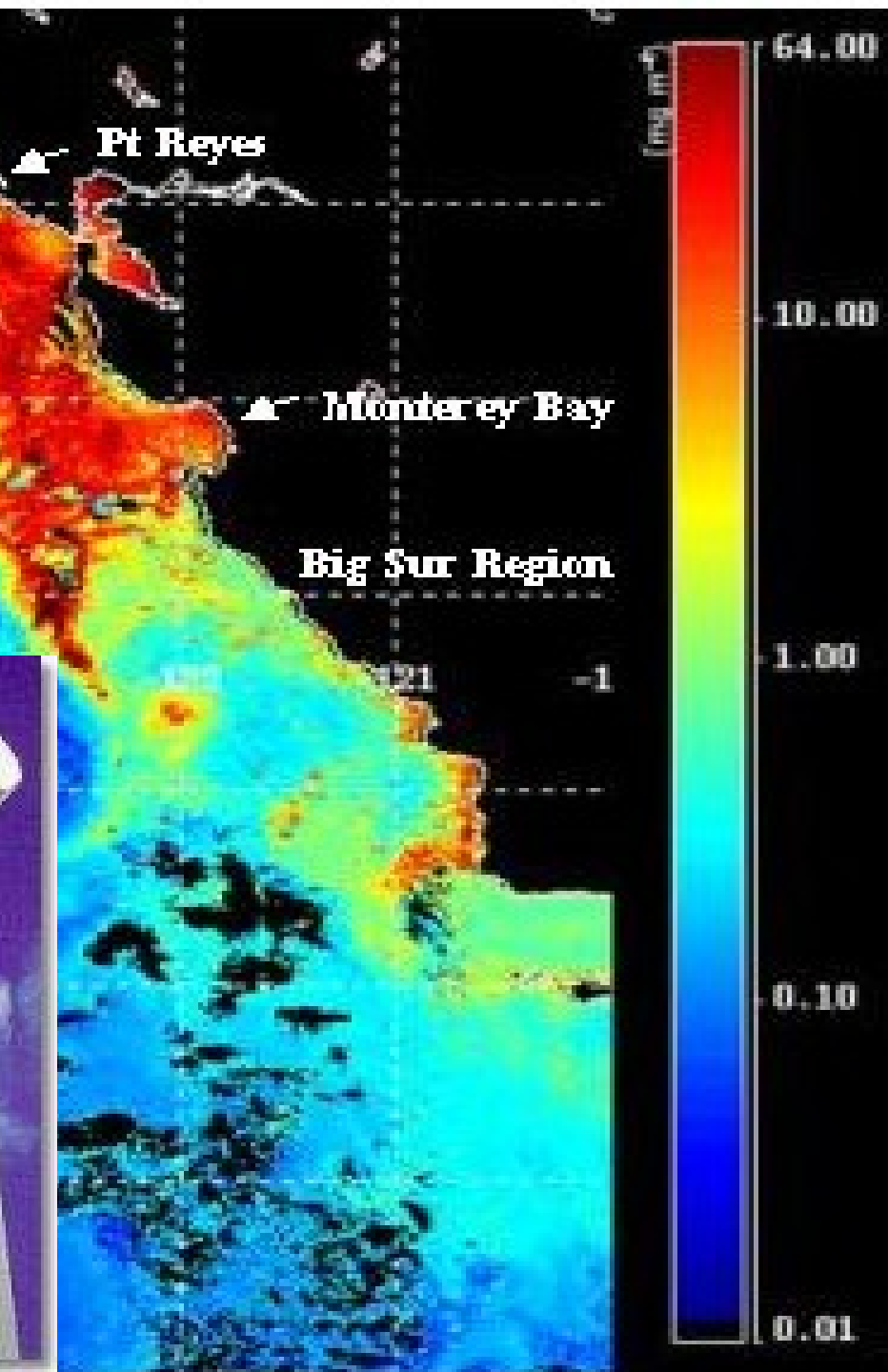


A large school of small, silver fish, possibly bluegills, swimming in clear water. The fish are densely packed, filling the frame. They have a silvery, iridescent sheen and are oriented in various directions, some facing the viewer and others away. The background is a light blue, slightly hazy water surface.

CONCLUSIONS

First, a small fish story...

**SECOND,
“LOCATION,
LOCATION,
LOCATION...”**

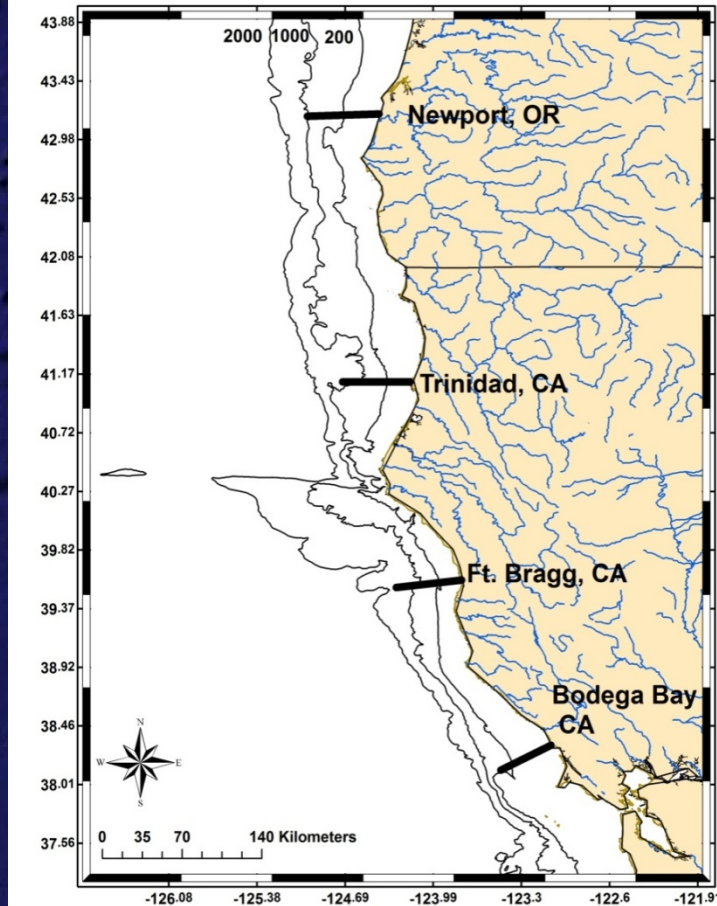


THIRD, MANAGEMENT/POLICY IMPLICATIONS

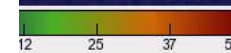
- OCEAN CLIMATE IMPACTS HERE AND NOW
- FOOD (RIGHT PLACE, RIGHT TIME) IMPORTANT TO JUVENILE SALMON SURVIVAL = RUN HEALTH YEARS
LATER
- ~30M SMOLTS PRODUCED IN CALIFORNIA'S
HATCHERIES...
- CAN WE RELEASE AT DIFFERENT TIMES OF YEAR TO
INCREASE RESILIENCY?

INTEGRATED OCEAN OBSERVING (PHYSICS AND BIOLOGY)

North Coast Program - Plankton



WEST COAST SURFACE CURRENTS MAPPING PROGRAM (COCMP)





THANK YOU!



CALIFORNIA OCEAN
PROTECTION COUNCIL