Physical-chemical anomalies and associated ecological responses in southern California kelp forests

Landsat visualization of giant kelp forests off Santa Barbara

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Santa Barbara Coastal
Long Term Ecological Research Project

Established in 2000

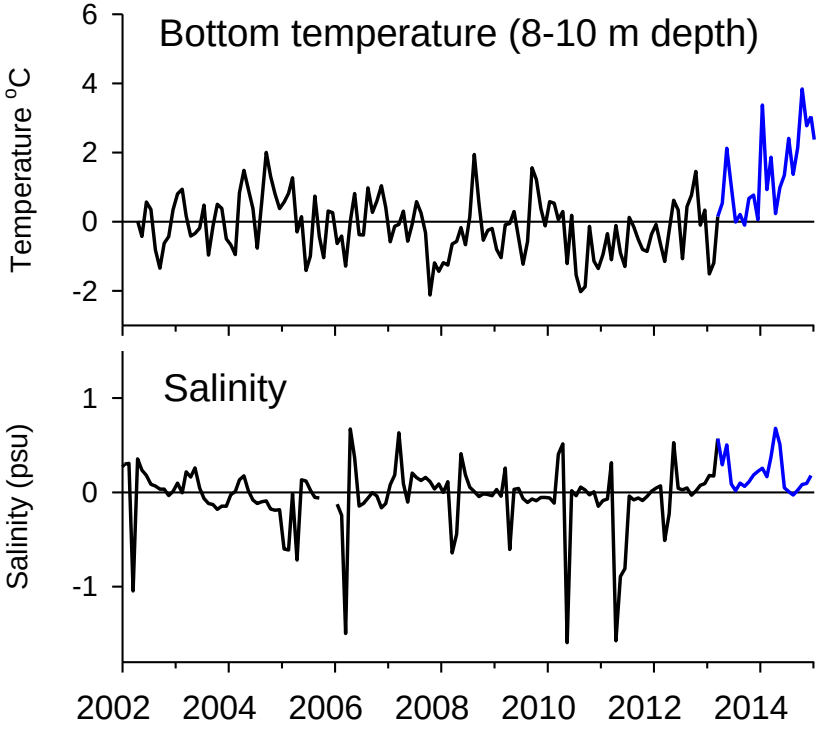
Research Focus: ***Role of land and ocean processes in structuring giant kelp forests under varying conditions of climate and levels of natural and anthropogenic disturbance***

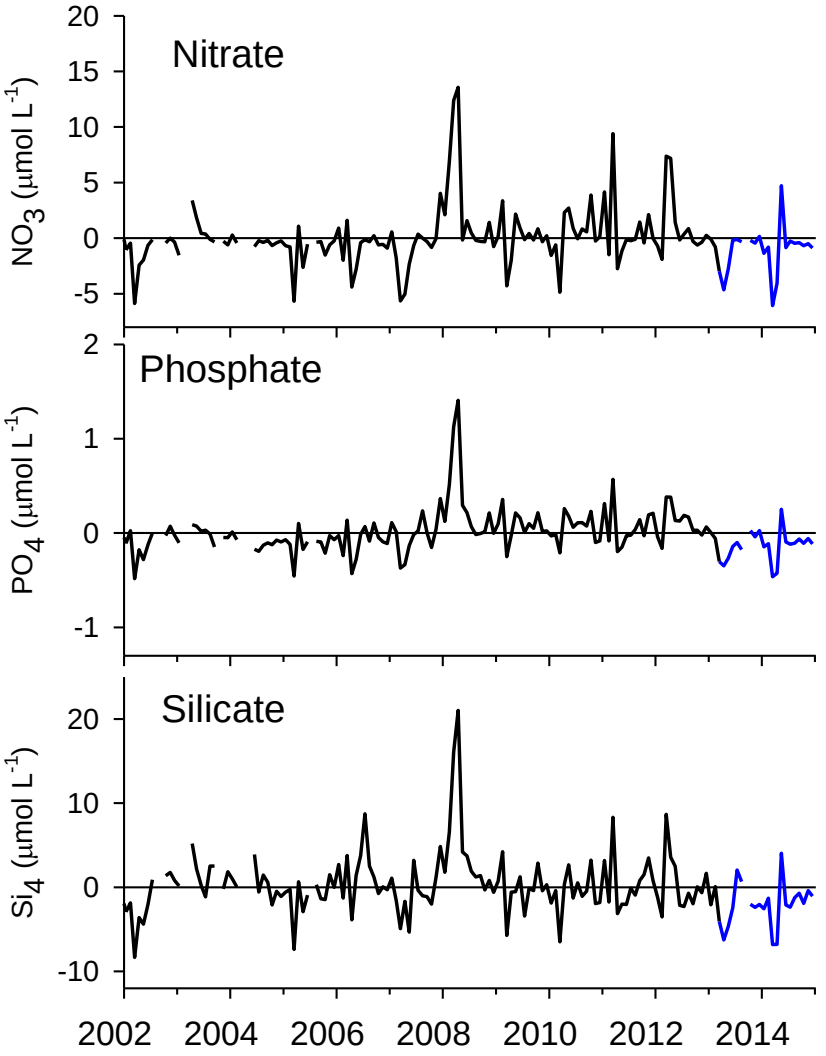
Objectives for evaluating Pacific anomalies

Analyze SBC LTER time series data to:

1. Characterize the magnitude of “Blob-associated” changes in the physical and chemical properties of inner shelf waters of the Santa Barbara Channel.
2. Determine whether there have been corresponding changes in the ecological characteristics of giant kelp forest communities.

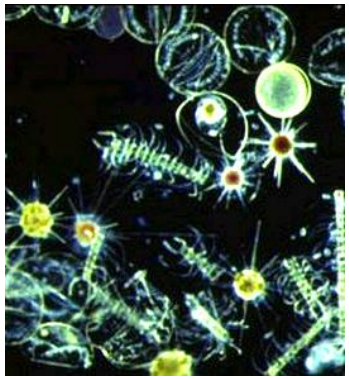
Anomalies in physical and chemical properties of the inner shelf of the Santa Barbara Channel

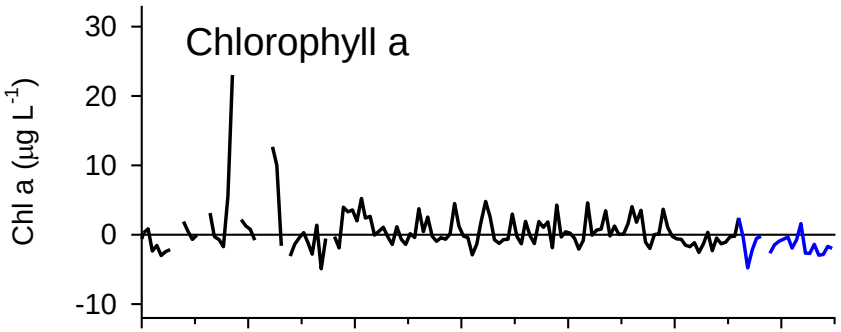


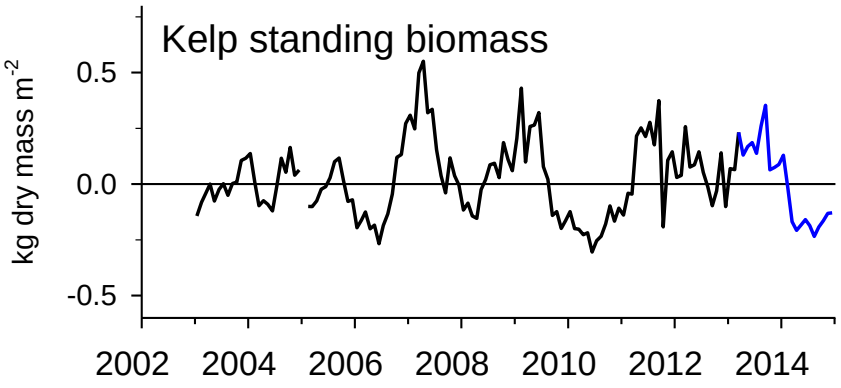


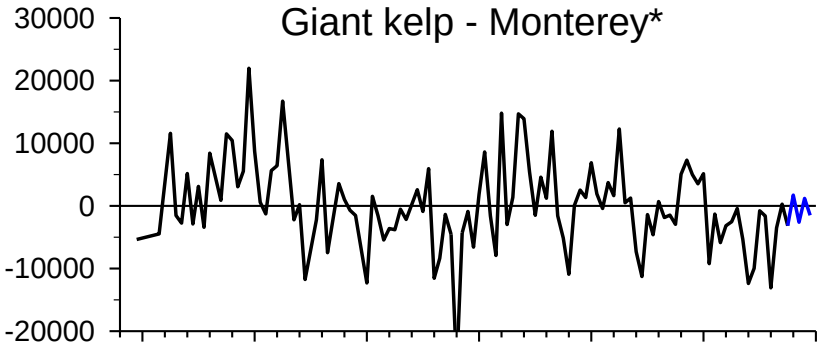
Data represent means averaged over 5 sites
Values since March 2013 shown in blue

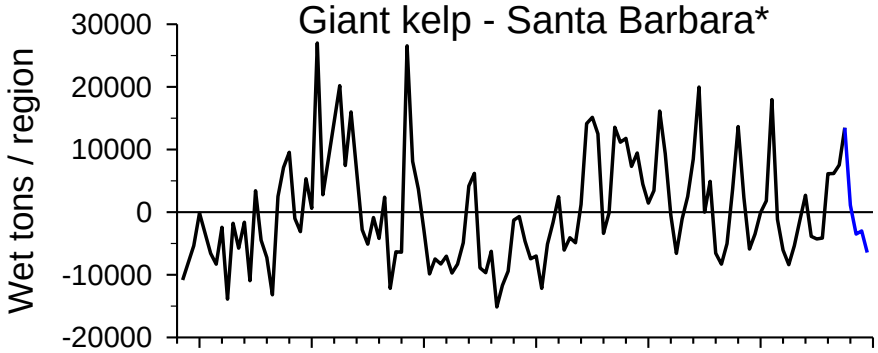
Anomalies in kelp forest primary producers

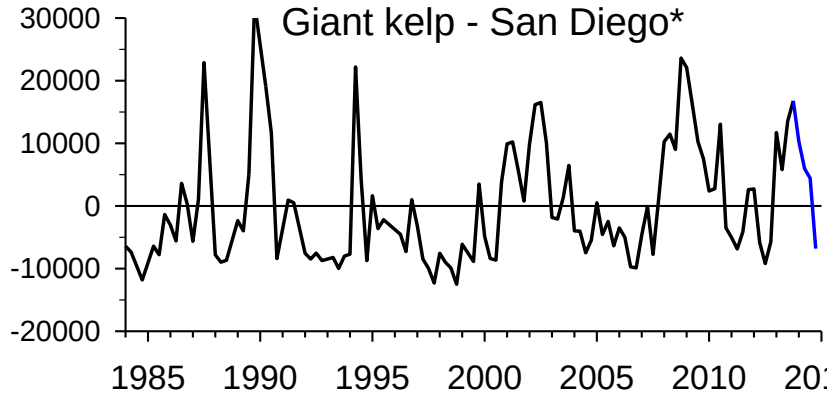






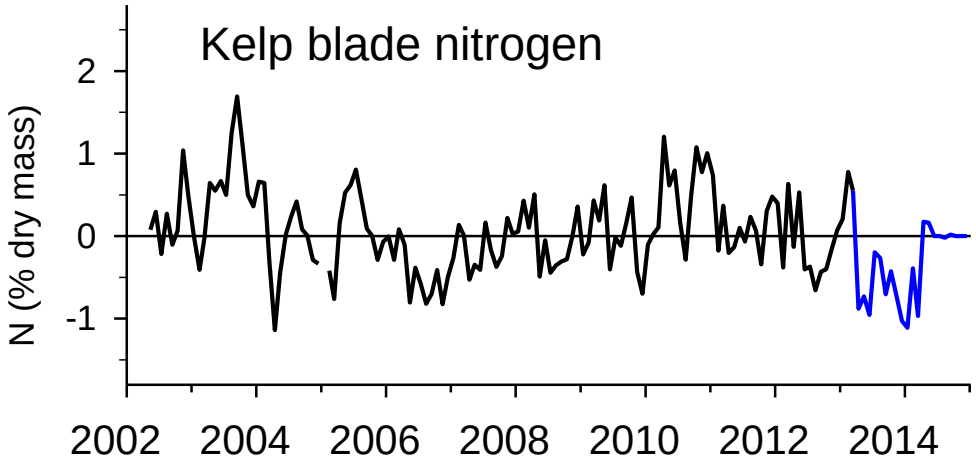


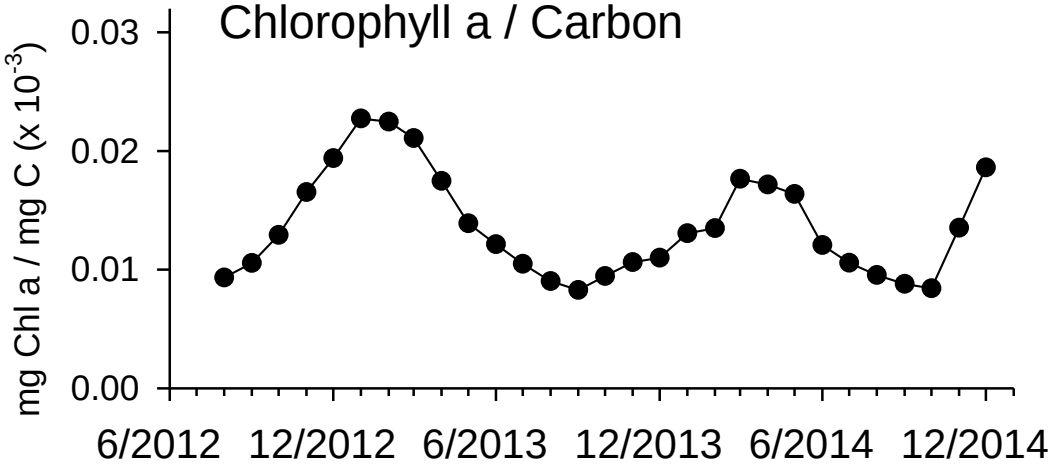




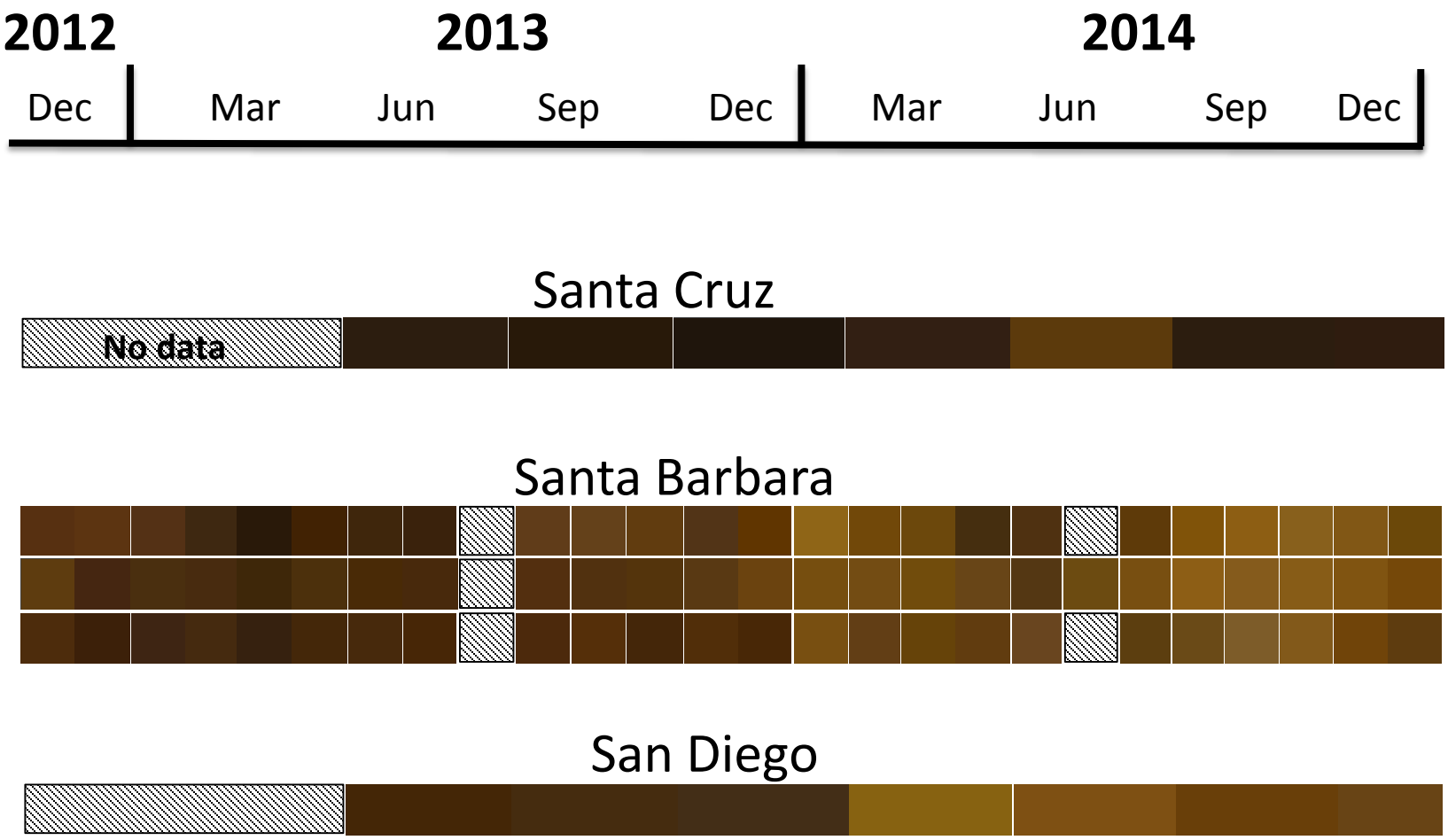
** Regional data from Landsat*

Anomalies in kelp physiology

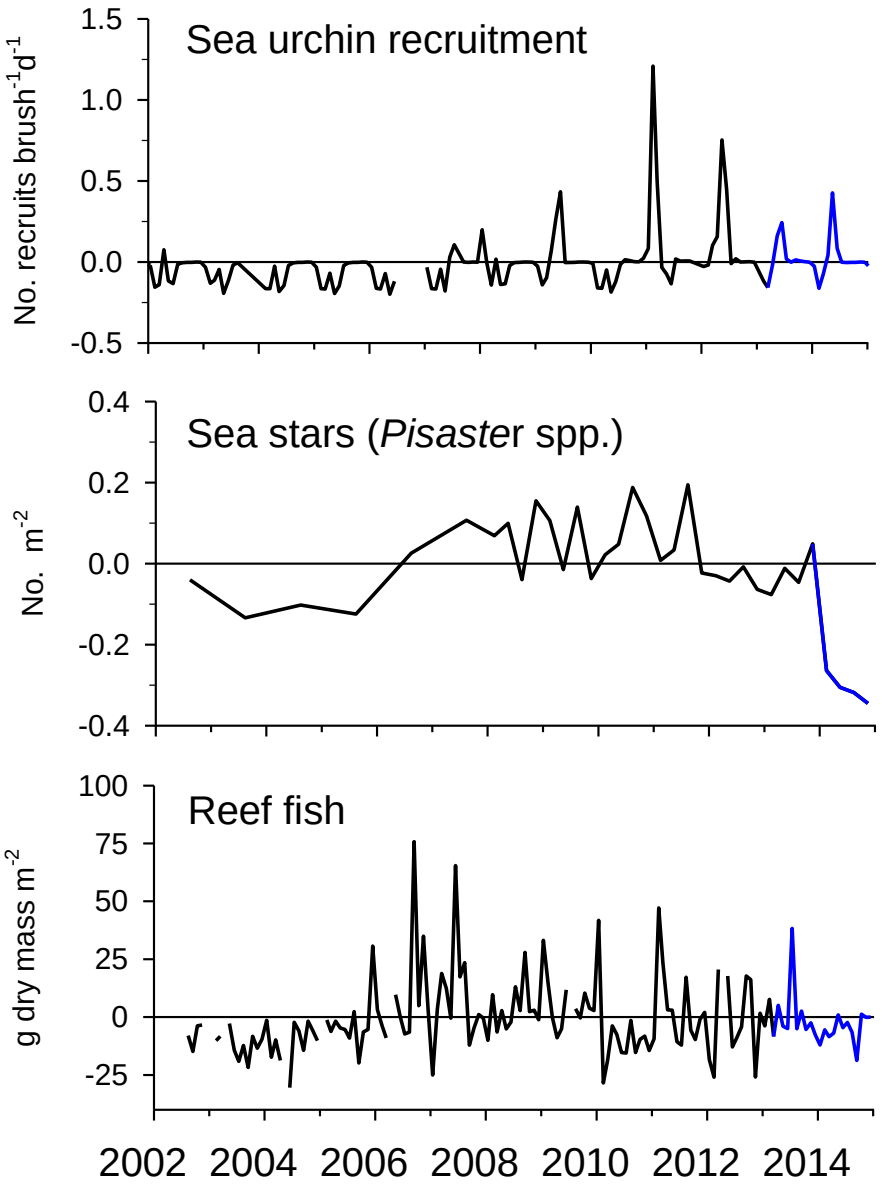


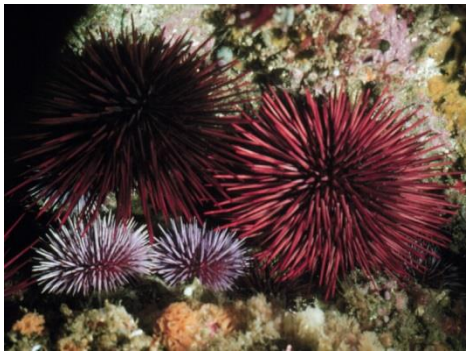


The decrease in pigment concentrations has been greater in southern CA than central CA

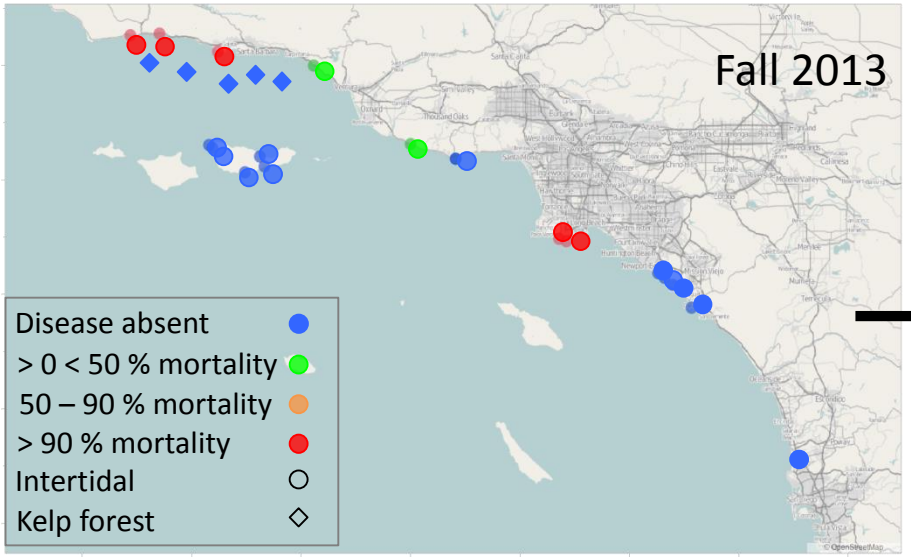


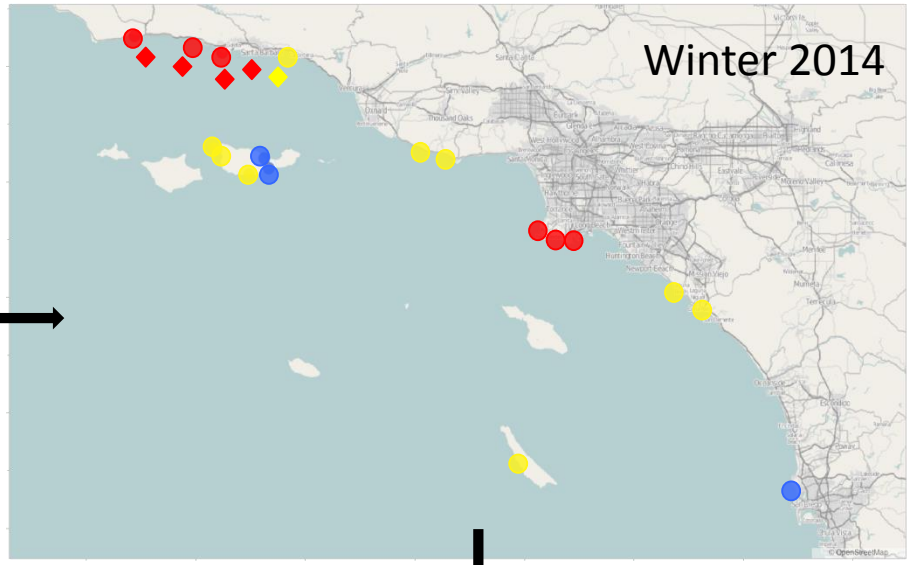
Anomalies in kelp forest consumers

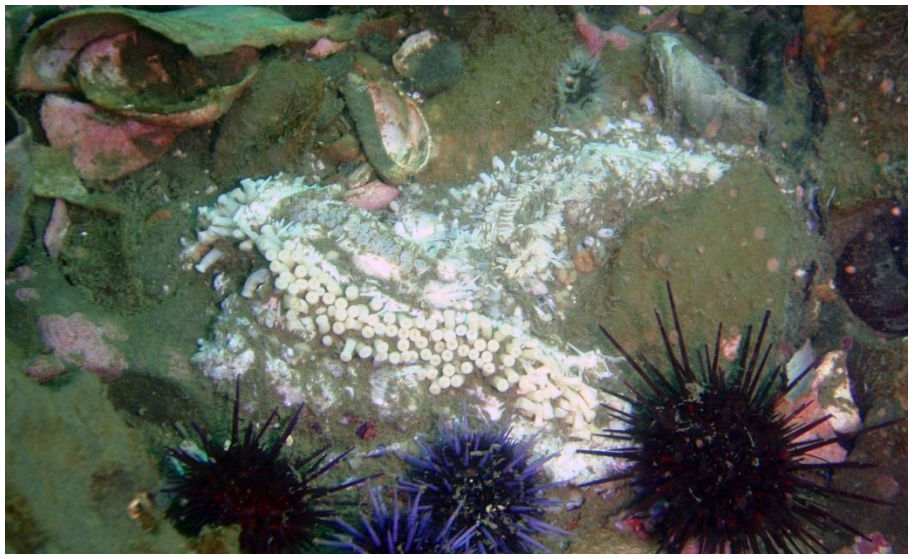


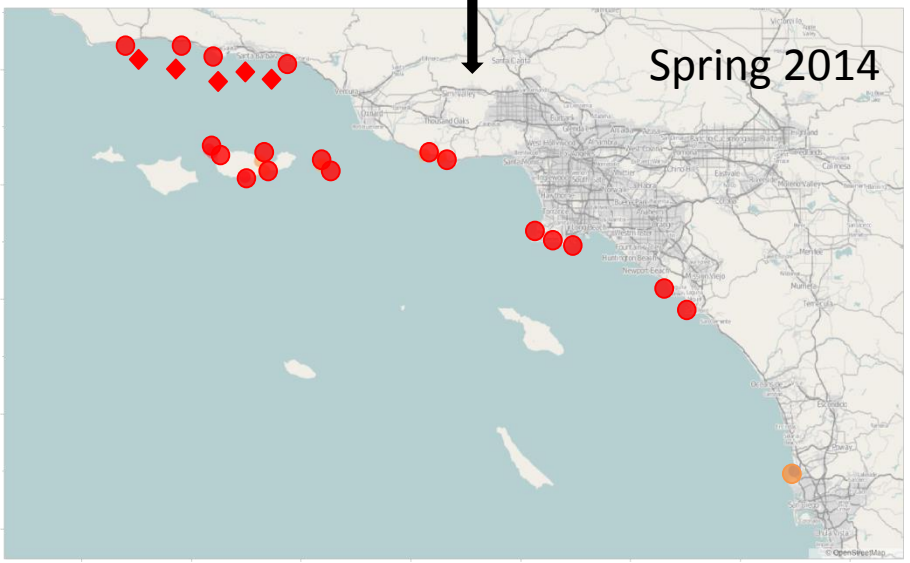


Progression of Sea Star Wasting Disease









Intertidal data provided by PISCO

Possible Future Directions

- Examine time series of ocean currents to identify anomalies in near-shore transport (SBC LTER, SCCOOS).
- Investigate source waters responsible for physical and chemical anomalies (CalCOFI, SBC LTER, PnB, PISCO).
- Examine regional environmental factors such as cloud cover and fog to quantify solar heating effects.
- Examine other ecological response variables (e.g. diversity, species composition) and biological time series from the Santa Barbara Channel (PISCO, CINPS).