Variability in lower trophic levels on the Alaskan Shelf

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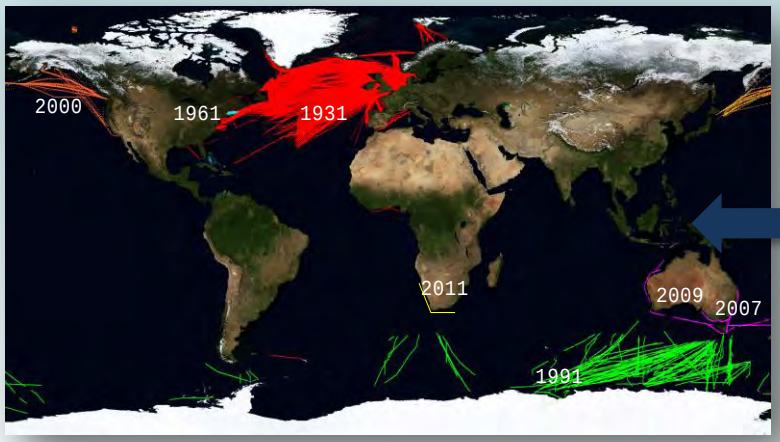
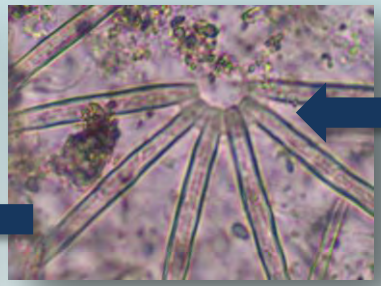
Exxon Valdez Oil Spill Trustee Council

www.gulfwatchalaska.org

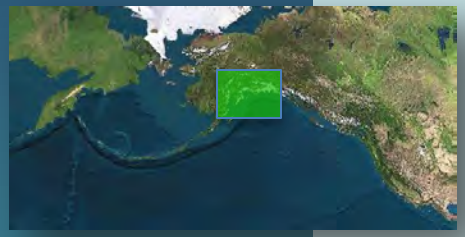
GULFWATCH ALASKA

The CPR survey

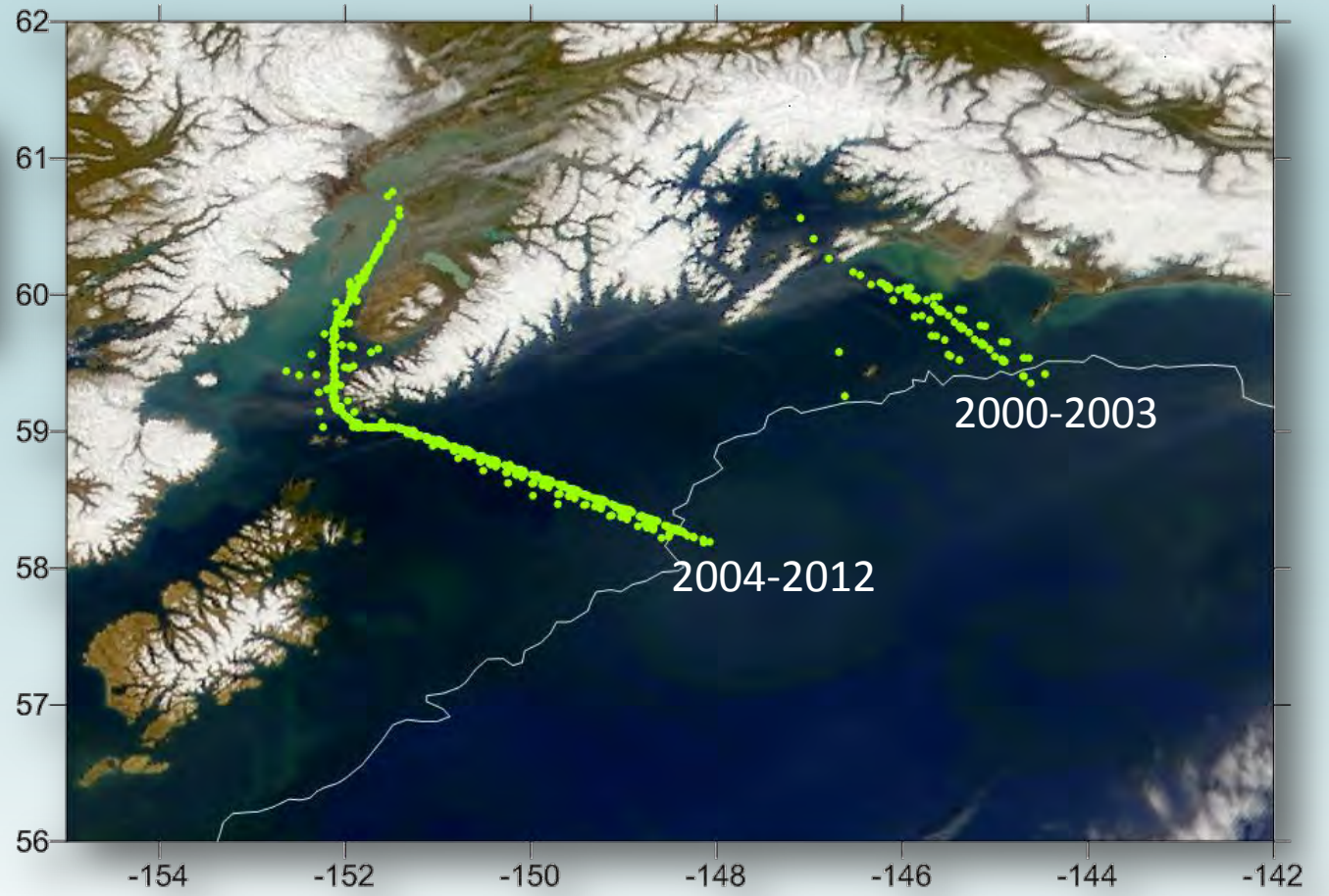




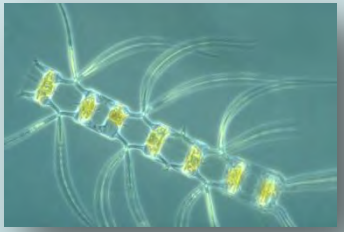
CPR sampling on the shelf in the Gulf of Alaska



Qs:
How much?
When?
What?



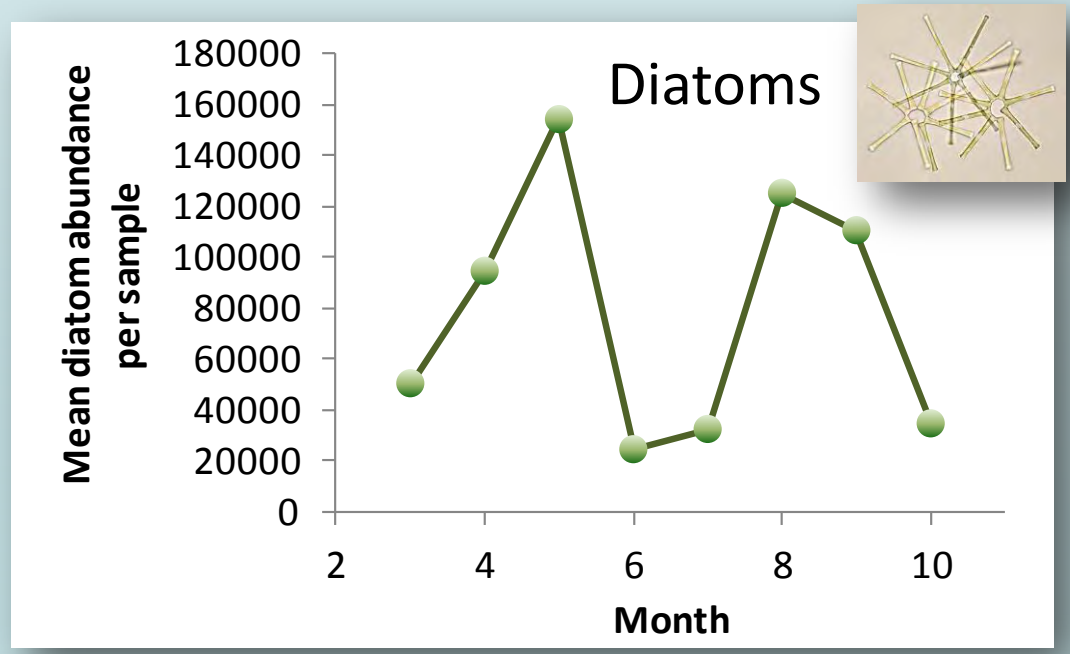
Caveats

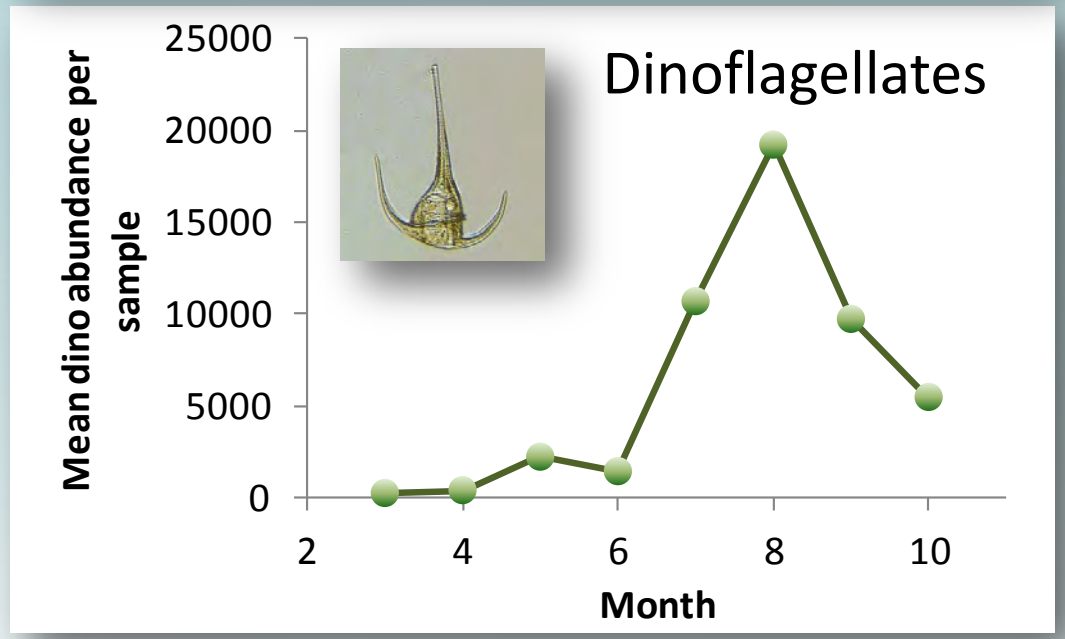


- Mesh size is large, aimed at zooplankton (270µm)
- Preservative only preserves hard shelled forms
- Surface sampling (~7m)
- Monthly sampling, spring to fall not year round
- Transect changed in 2004

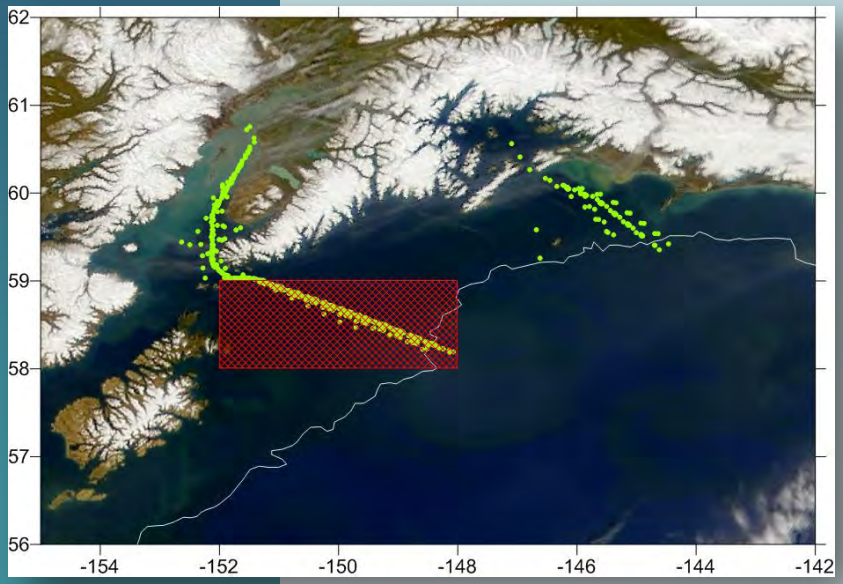
Seasonal Cycles

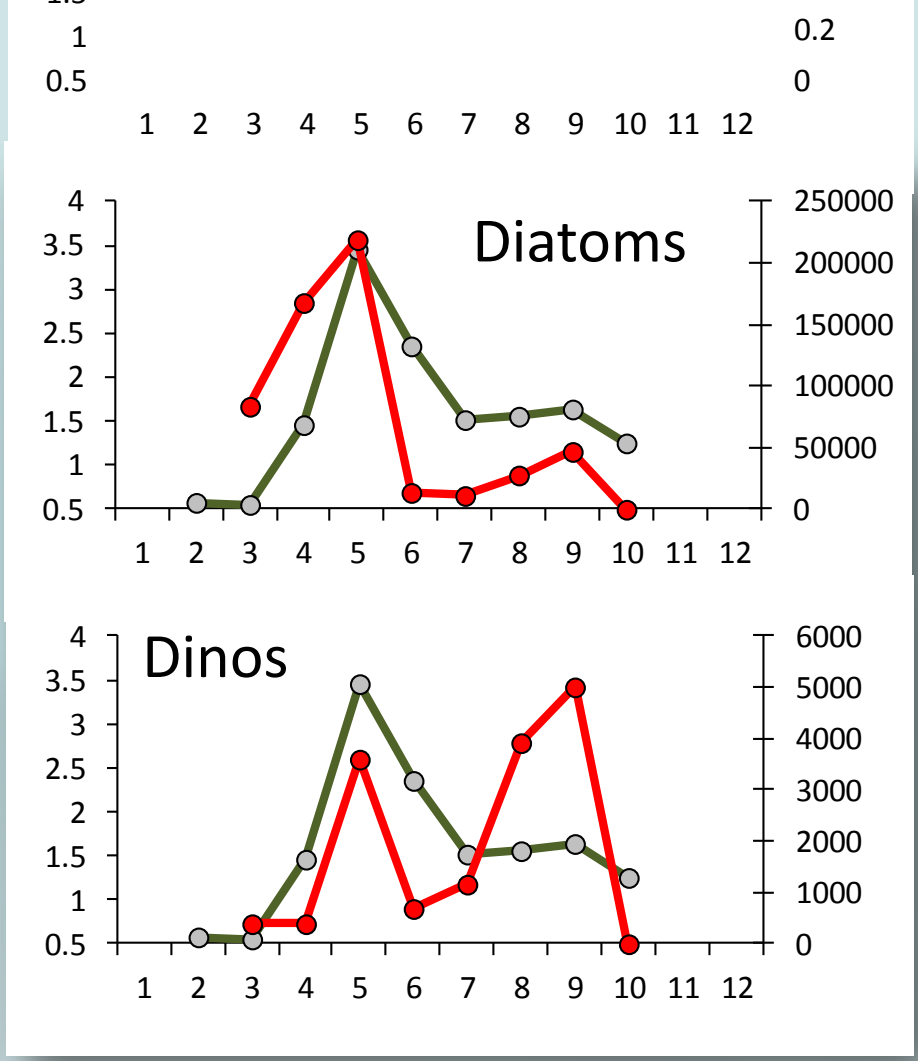
Mean monthly values, 2000-2012





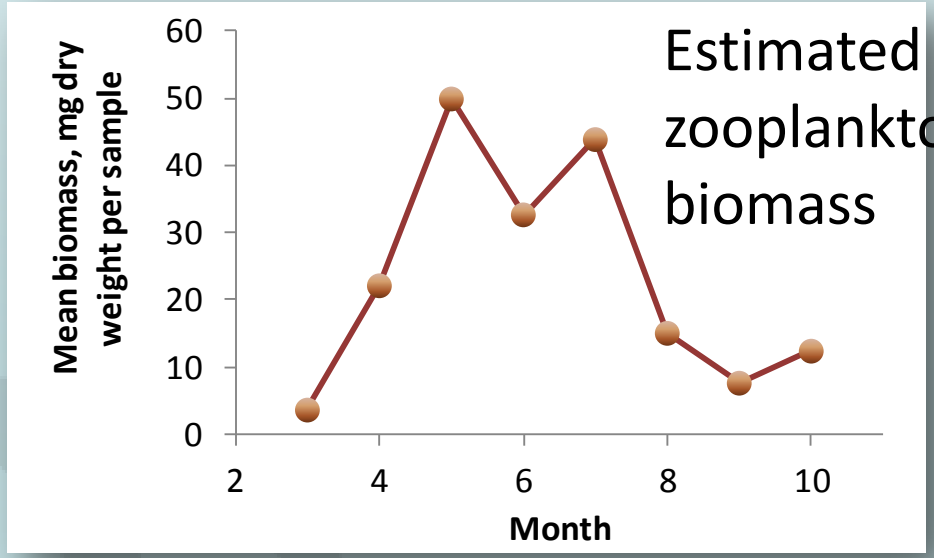
Satellite data (Modis) v CPR for the shelf region:

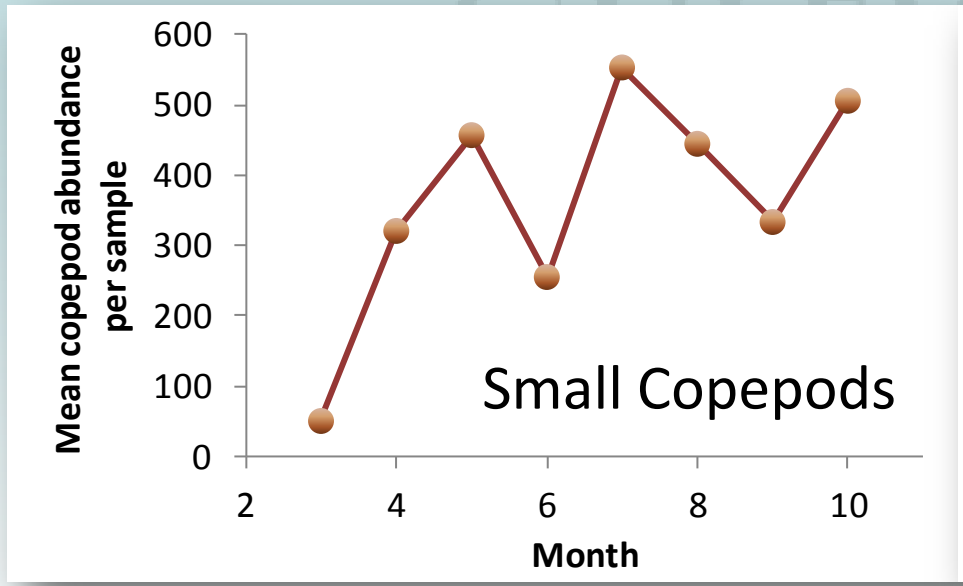


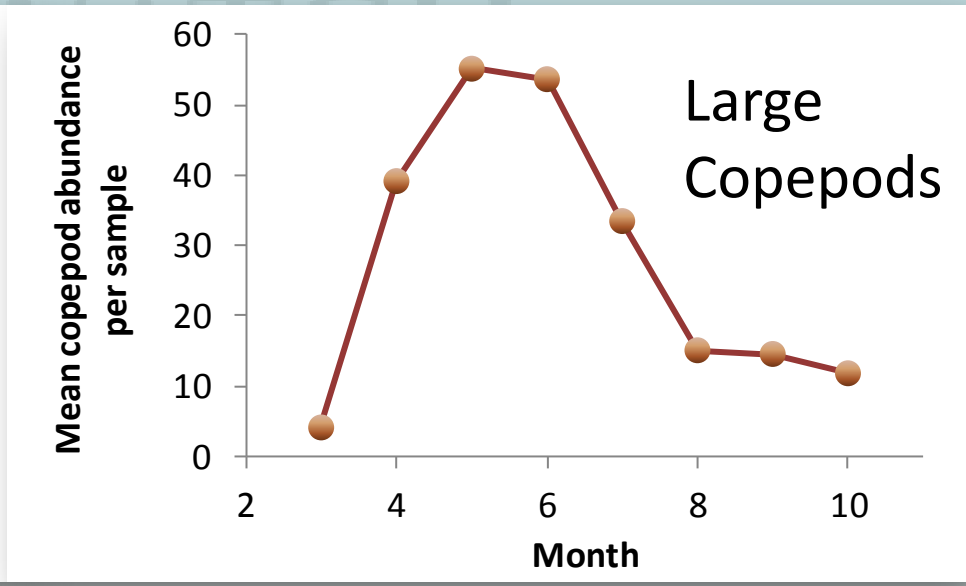


Seasonal Cycles, Zooplankton

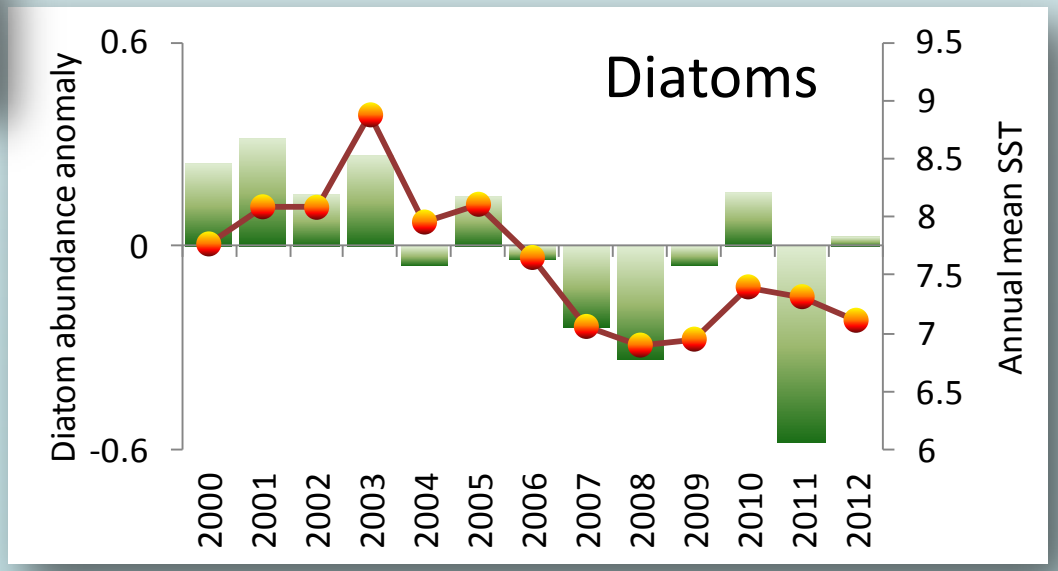
Mean monthly values, 2000-2012



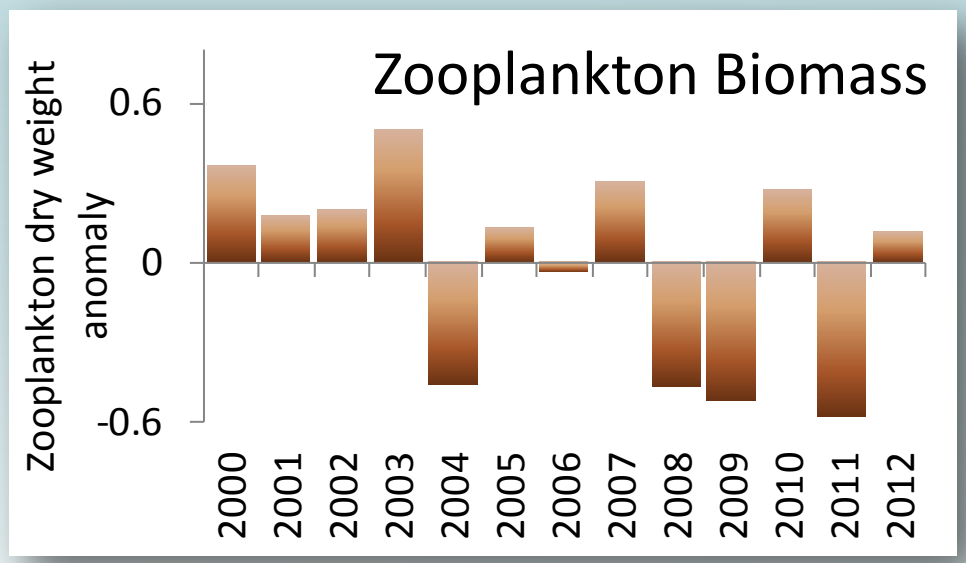




Annual abundance anomalies, the "how much?"



positive correlation (r^2=0.42, p<0.02)



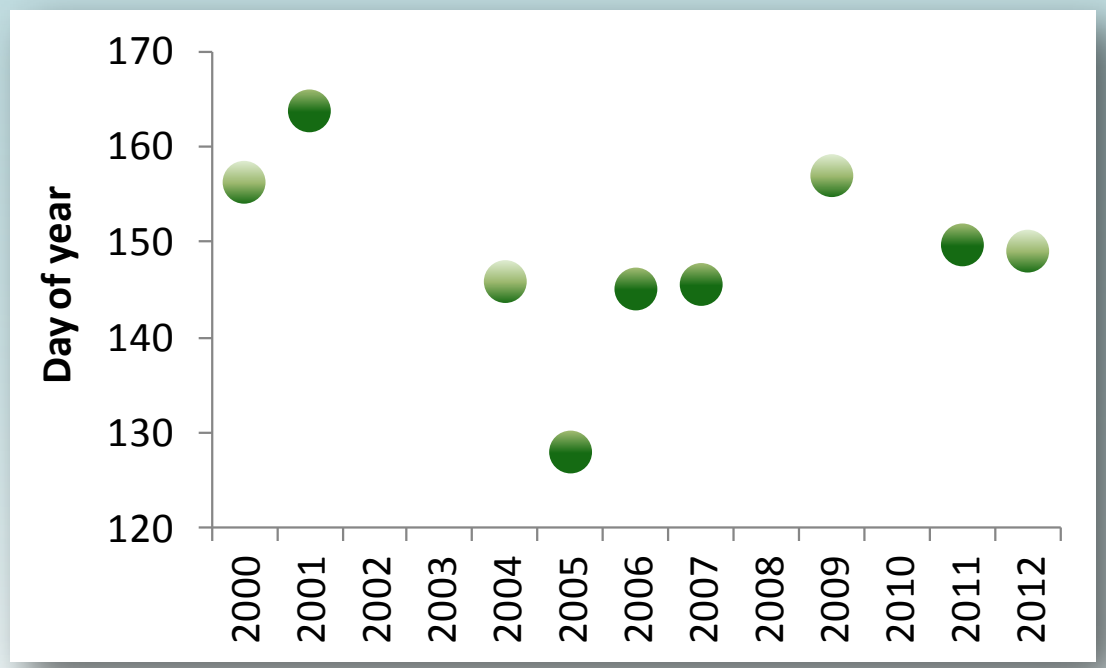
SST data courtesy of
http://las.pfeg.noaa.gov

Strong positive correlation btwn diatoms and zoopl (r^2=0.53, p<0.01)

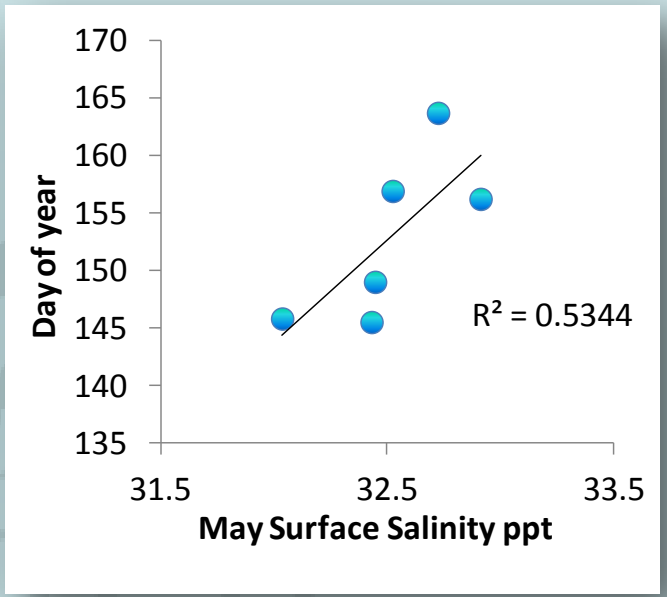
Phenology – the "when?"

We cannot define spring bloom timing

But, can define an index of Diatom timing for most years, based on March-June data:



Spring diatom timing determined by large scale circulation/salinity variability



Early years coincide with lower values of the NPGO (r^2=0.77, p<0.001)

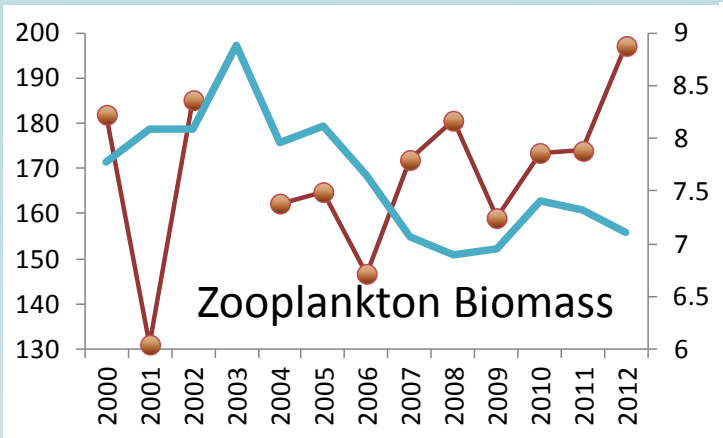
NPGO index, DiLorenzo et al., 2008, http://www.o3d.org/npgo/

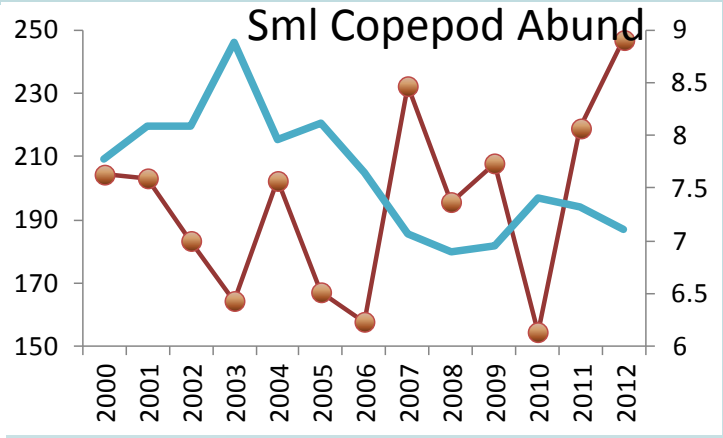
Early years coincide with reduced salinity in May (r^2=0.53, p<0.05)

Salinity data courtesy of Russ Hopcroft and the Seward Line program.

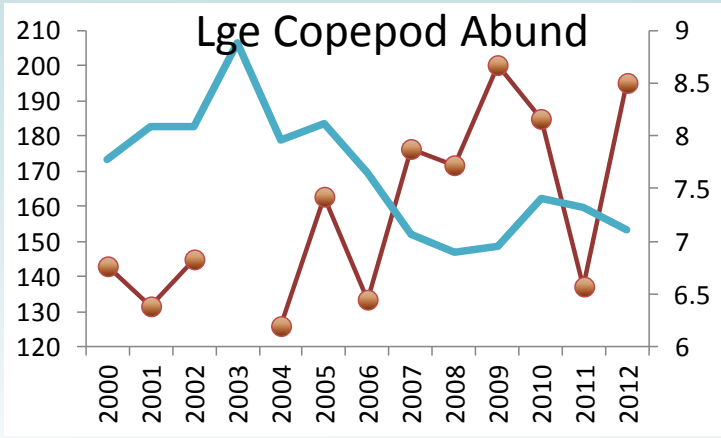
Zooplankton phenology

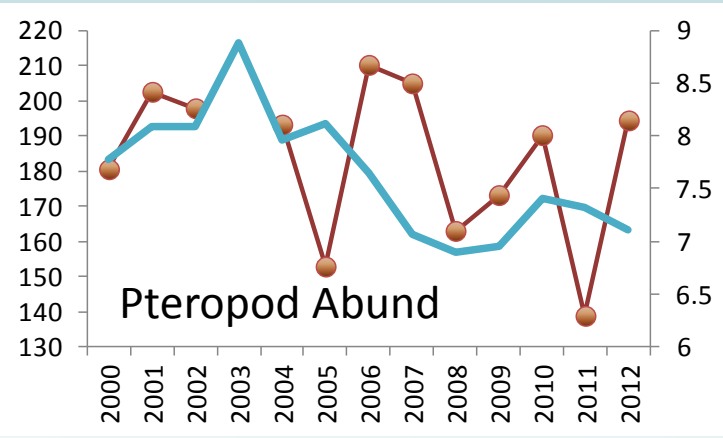
Day of year when 50% of abundance/biomass reached *versus* SST





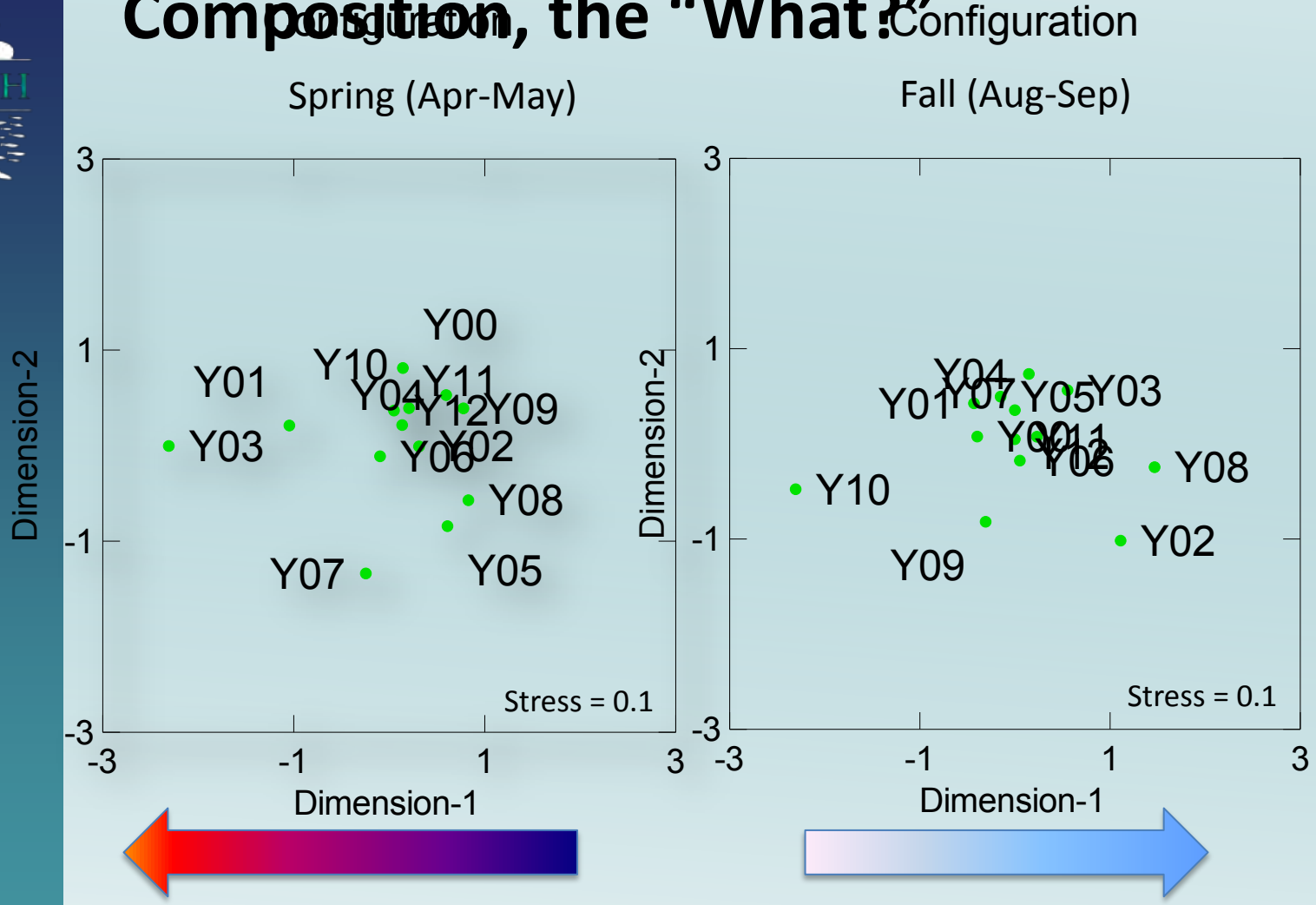
r^2=0.28
p<0.05





r^2=0.50
p<0.01

Phytoplankton Community Composition, the "What?"

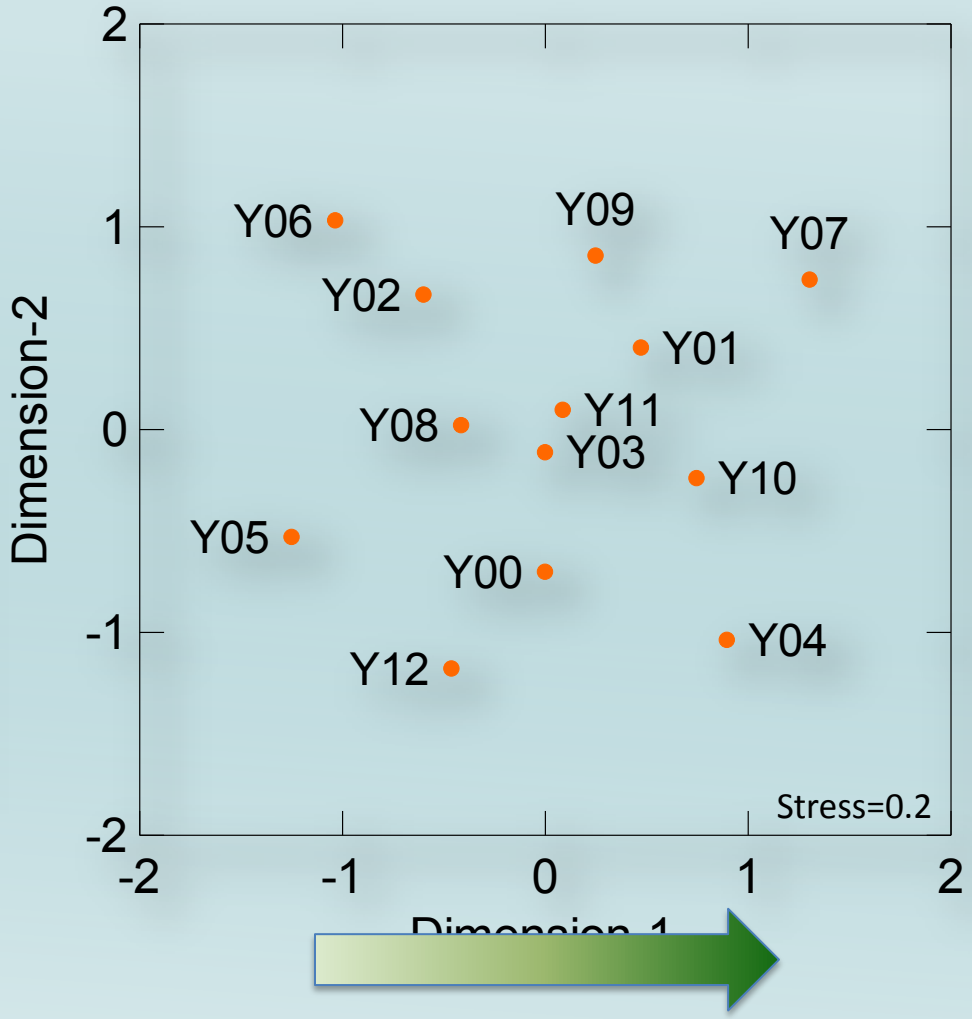


Temperature
r^2=0.41, p<0.01

May thermocline, r^2=0.24, p<0.05

Thermocline depth data courtesy of Russ Hopcroft and Ken Coyle and the Seward line sampling.

Zooplankton Community Composition

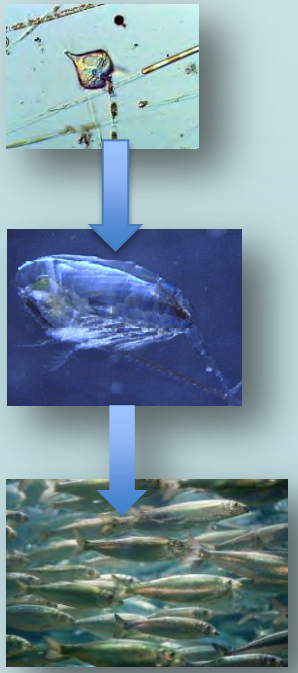


May Salinity, r^2=0.48, p<0.001

Diatom Timing r^2=0.22, p<0.1

Summary

- This 13 year time series shows considerable interannual variability
- Phytoplankton abundance, spring timing and community composition are strongly determined by physical factors
- Zooplankton biomass related to diatom abundance
- Copepod timing related to SST
- Zooplankton community possibly related to physical properties and diatom timing.
- This region shows strong evidence of bottom-up forcing → Likely consequences for HTL.



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SAHFOS

Exxon Valdez Oil Spill Trustee Council

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