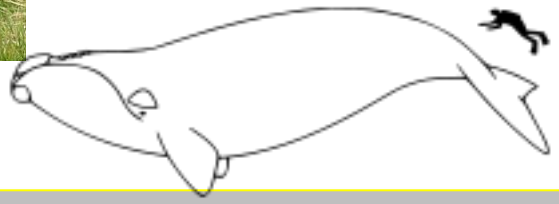
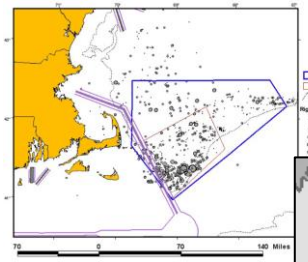
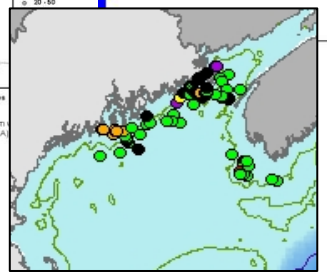
Acoustic zooplankton time series from the NERACOOS buoys

N. Record, Bigelow Laboratory for Ocean Sciences







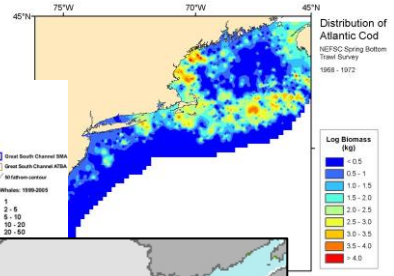
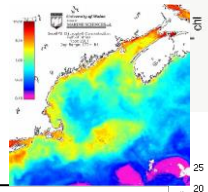


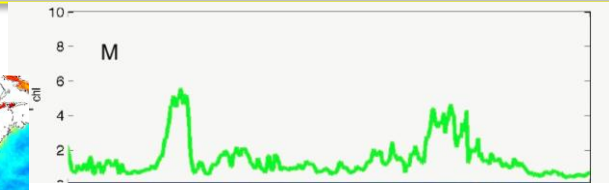
Figure 3. Northern right whale sightings during April–July, 1999–2005 shown
Channel Seasonal Management Area (SMA) and Area To Be Avoided (ATBA

Zooplankton

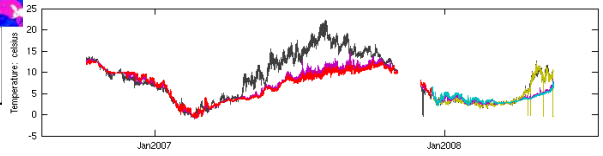
?

Phytoplankton (chlorophyll)

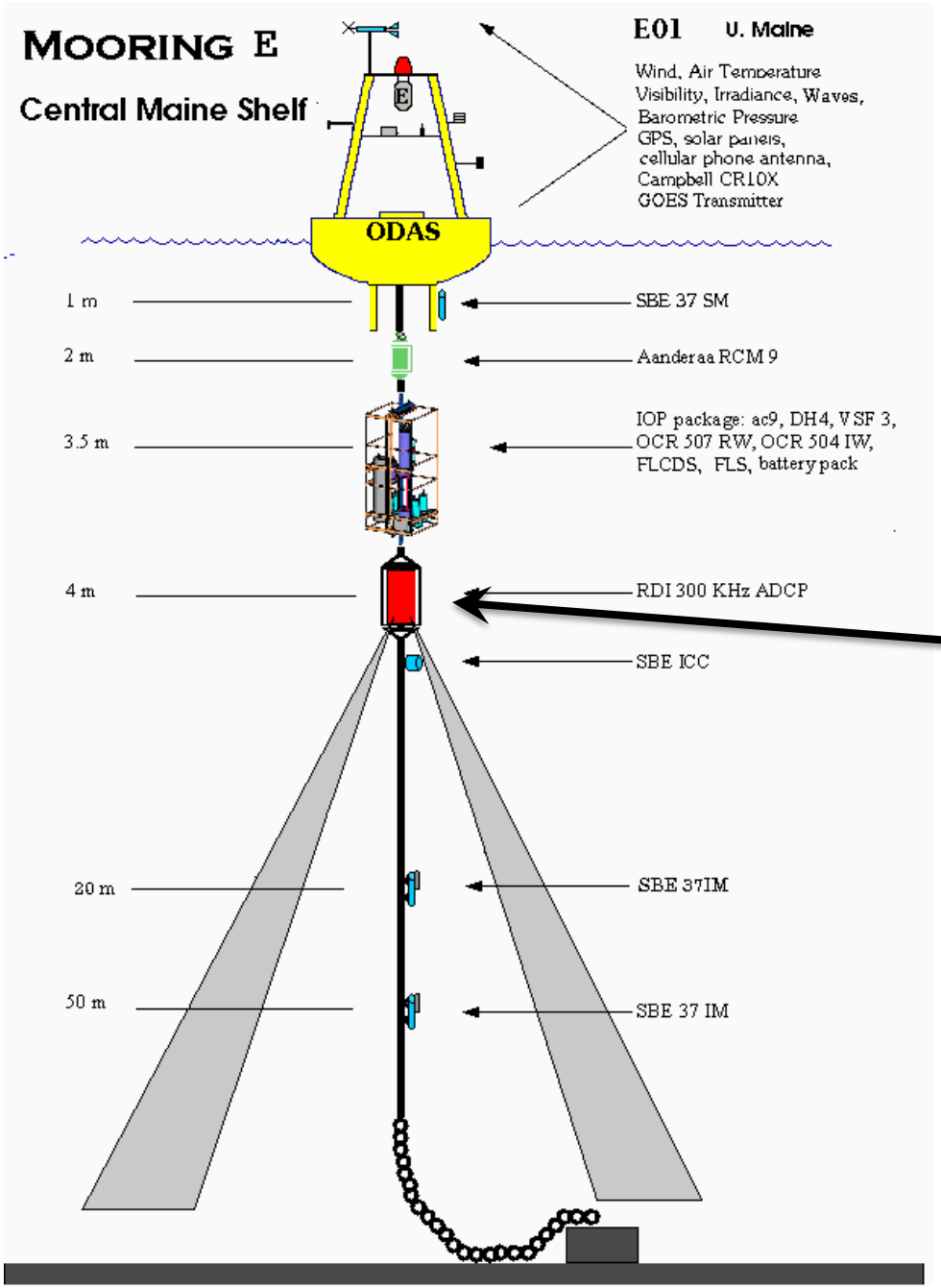




Physics (temperature, salinity, currents, rainfall, light, …)



Conventional zooplankton sampling

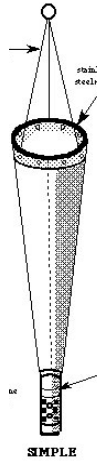


ADCP uses the Doppler shift in acoustic backscatter to measure ocean currents

The backscatter strength itself contains potentially useful information

Example 1: daily time scale

- Multiple migrating groups of zooplankton at multiple depths
- Consistent behavior
- Difficult to sample with nets



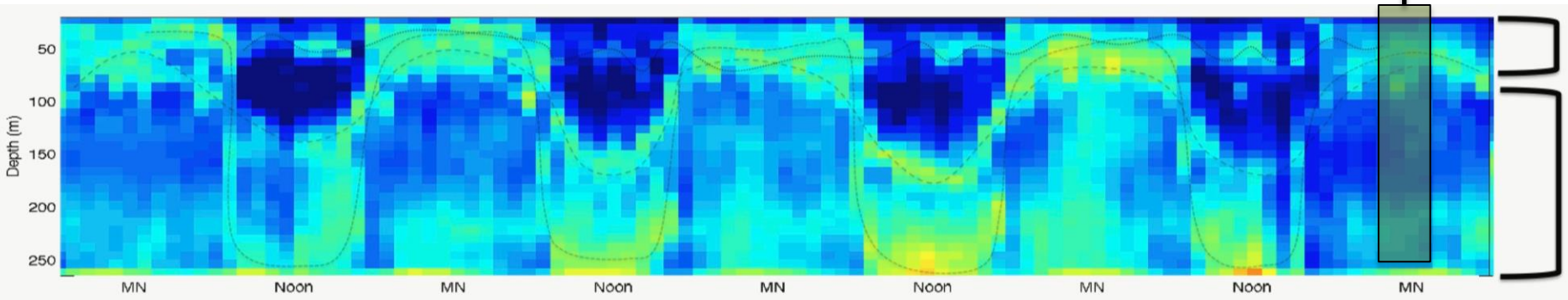
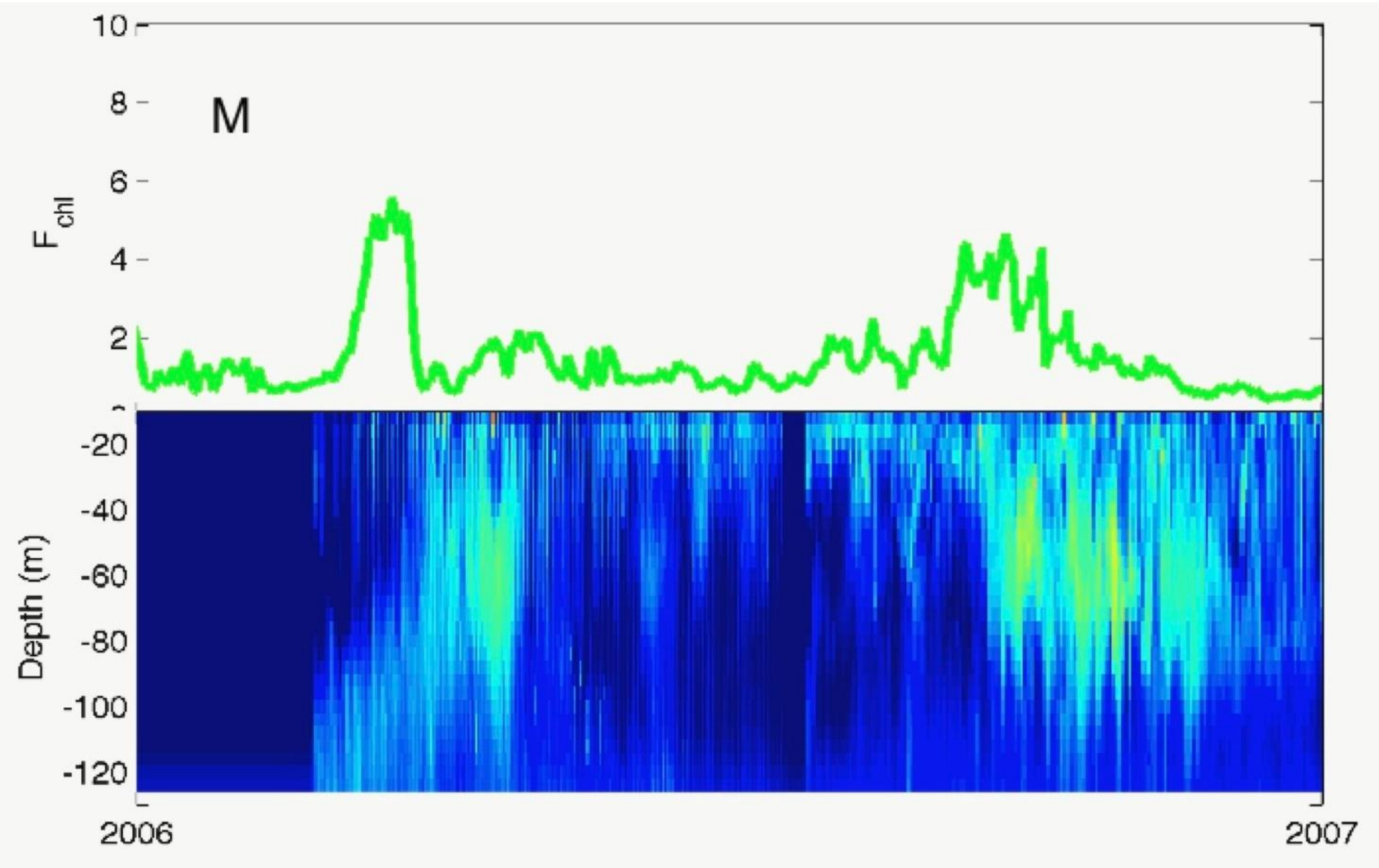


Figure 4 Volume backscatter (dB re $(4\pi m)^{-1}$) for ~5 days at Buoy M.

Example 2: seasonal time scale

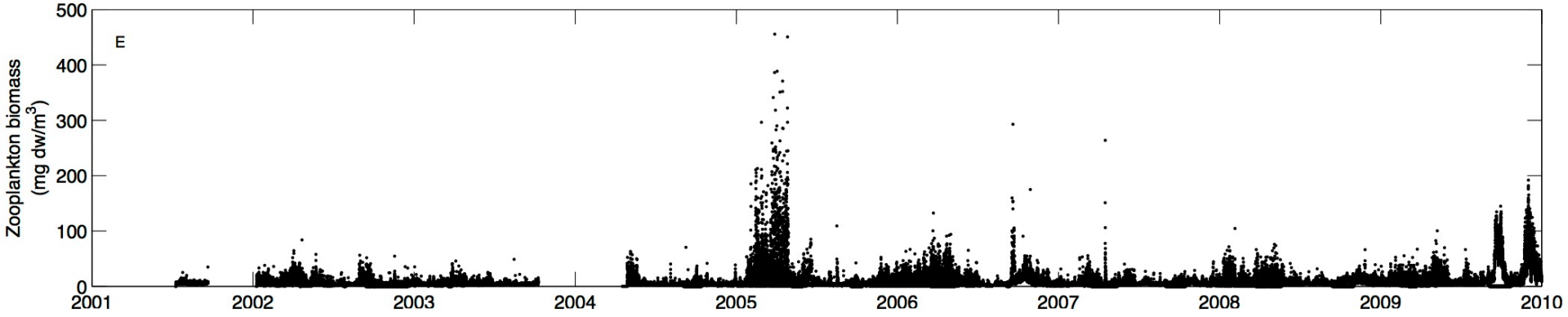
- Seasonal bloom dynamics follow phytoplankton blooms



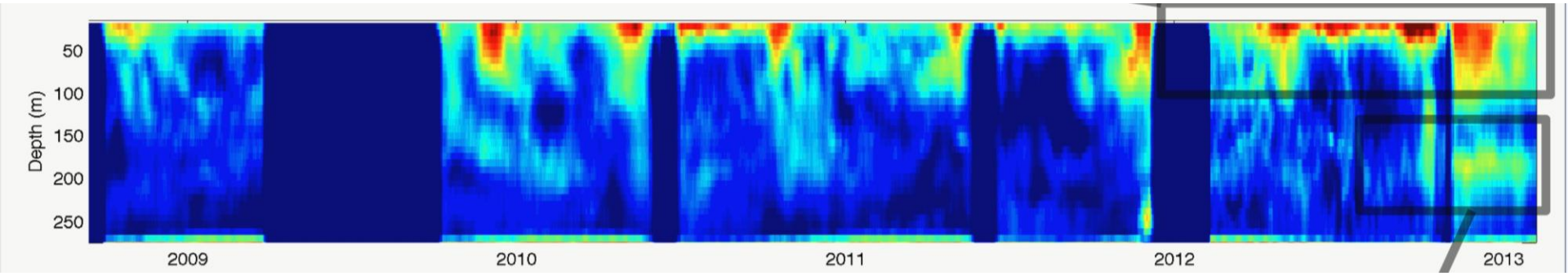
Example 3: inter-annual time scale

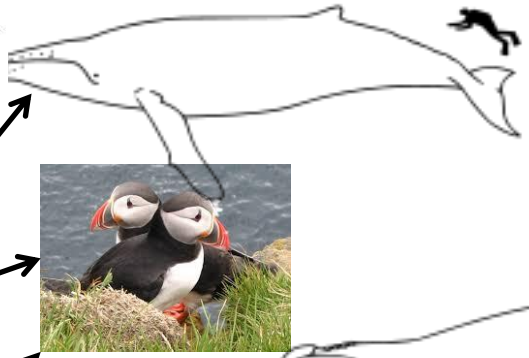
- Detect long-term shifts or anomalous years

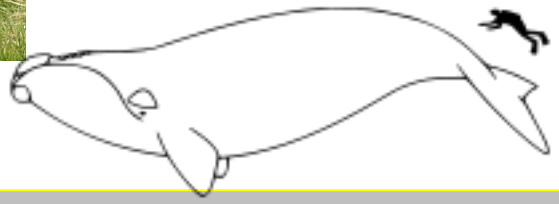
Buoy E

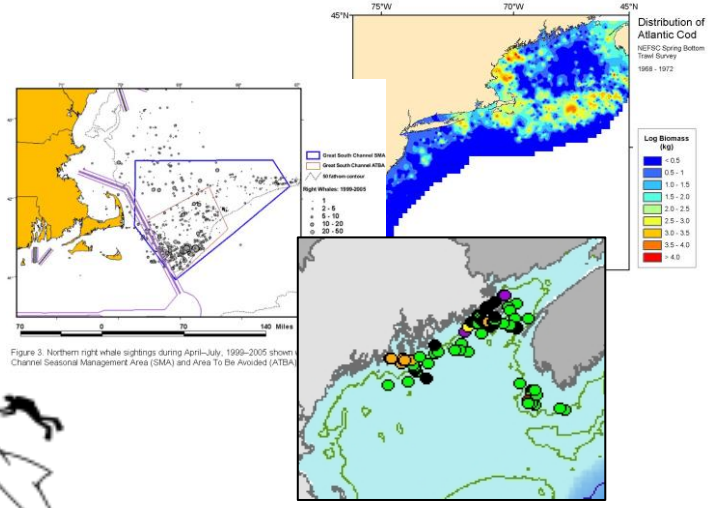


Buoy M









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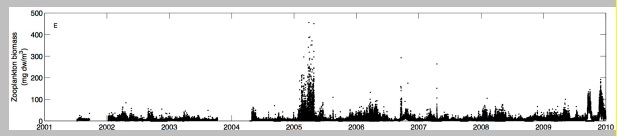
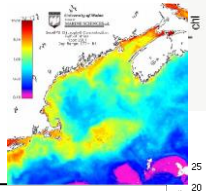
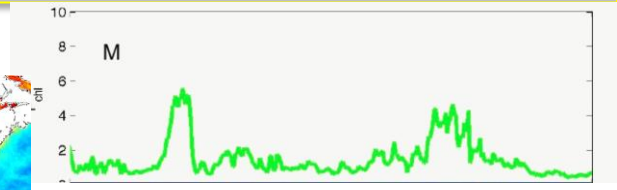
Zooplankton (acoustic?)



Phytoplankton (chlorophyll)





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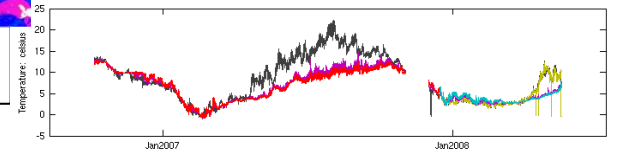

Advantages:
-Buoys already collecting data
-High temporal resolution
-High vertical resolution
-Measurements coincident will other types of NERACOOS data

Disadvantages:
-ADCPs not designed for biology
-We don't know what species we're seeing
-Changes in settings between deployments can confound estimates
-Different ADCPs not always comparable

What's needed:
-Calibration studies with nets on buoy sites
-Analysis converting backscatter to zooplankton
→ ***Index*** of abundance/biomass