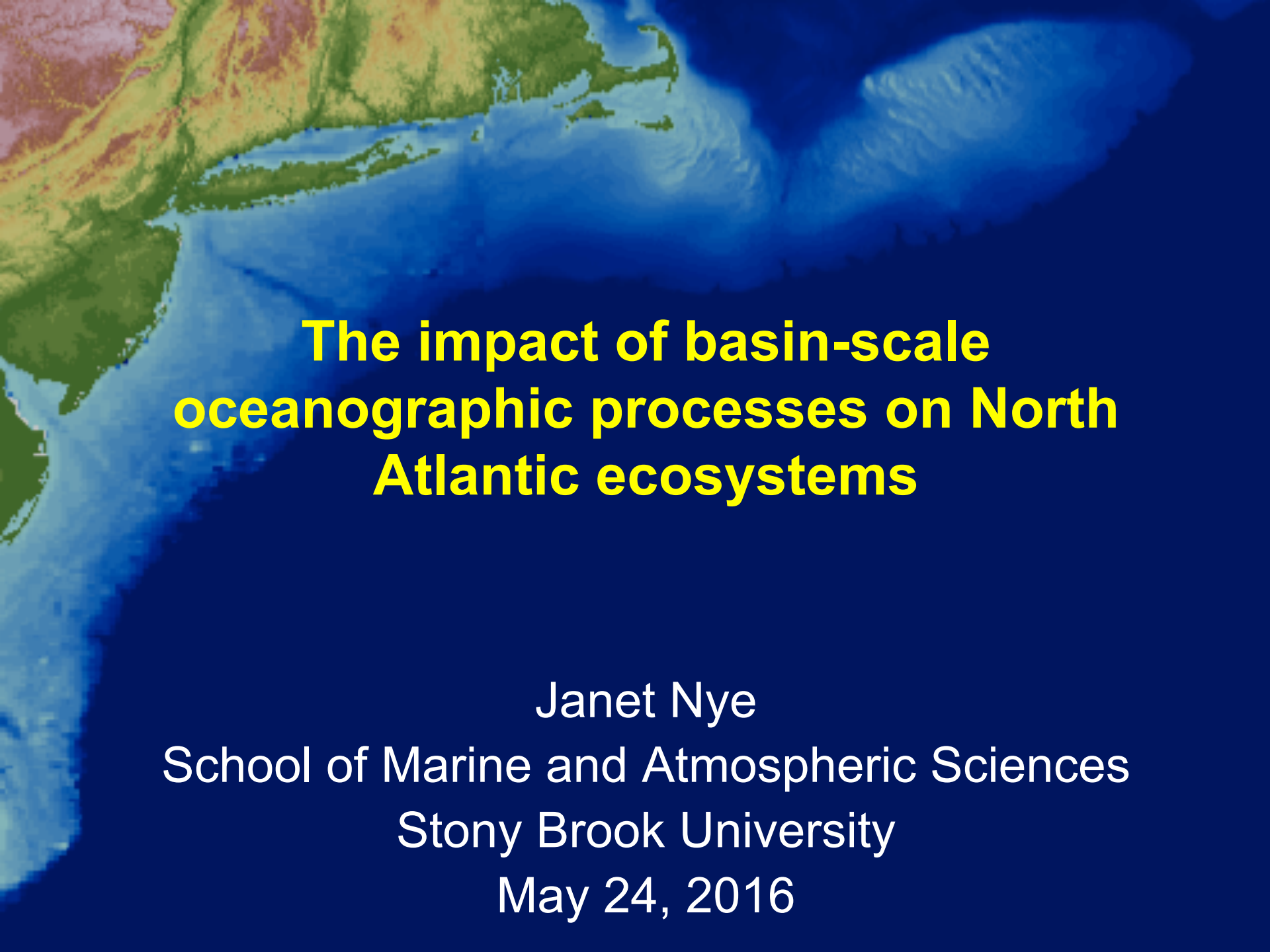
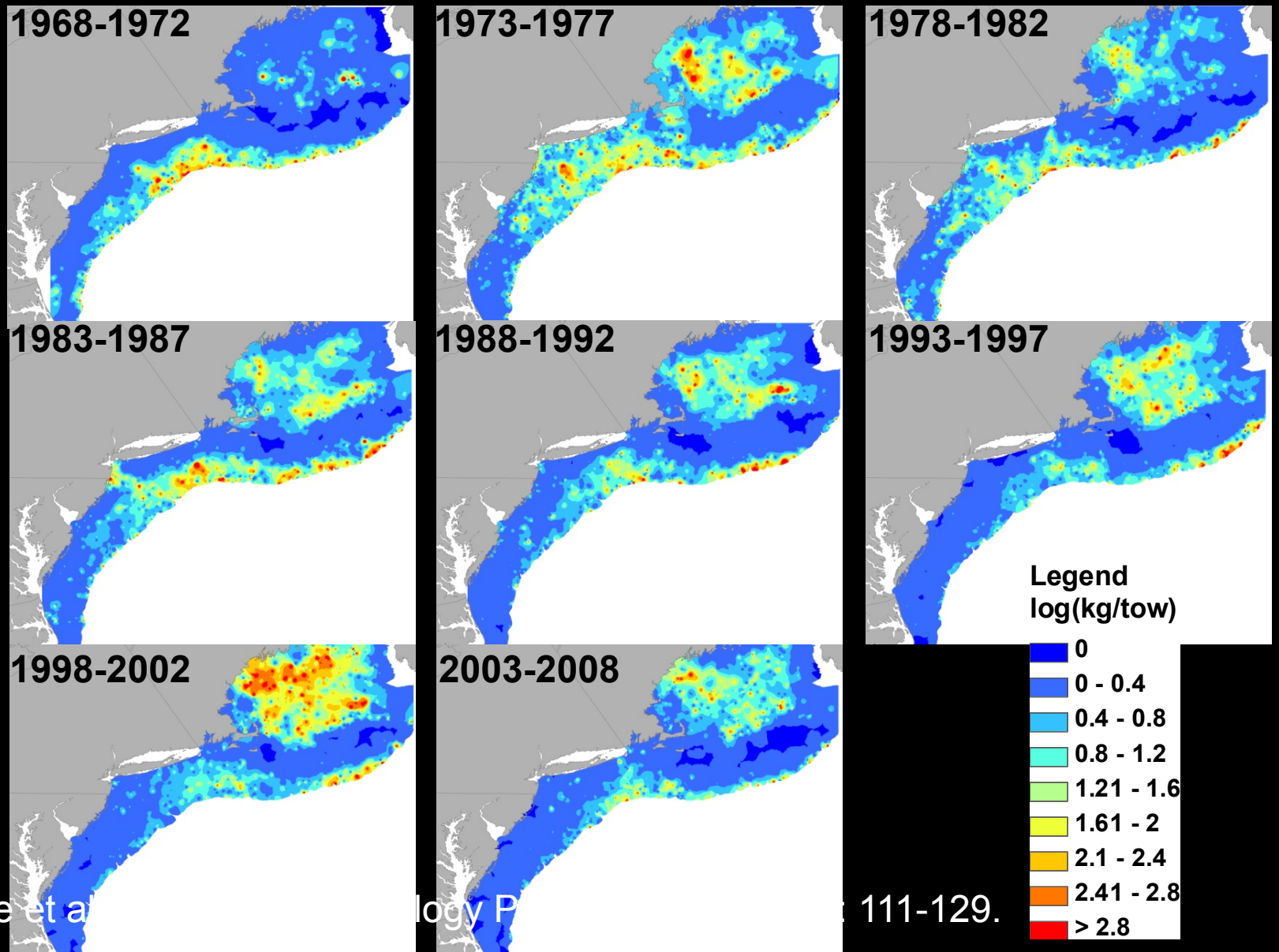


The impact of basin-scale oceanographic processes on North Atlantic ecosystems

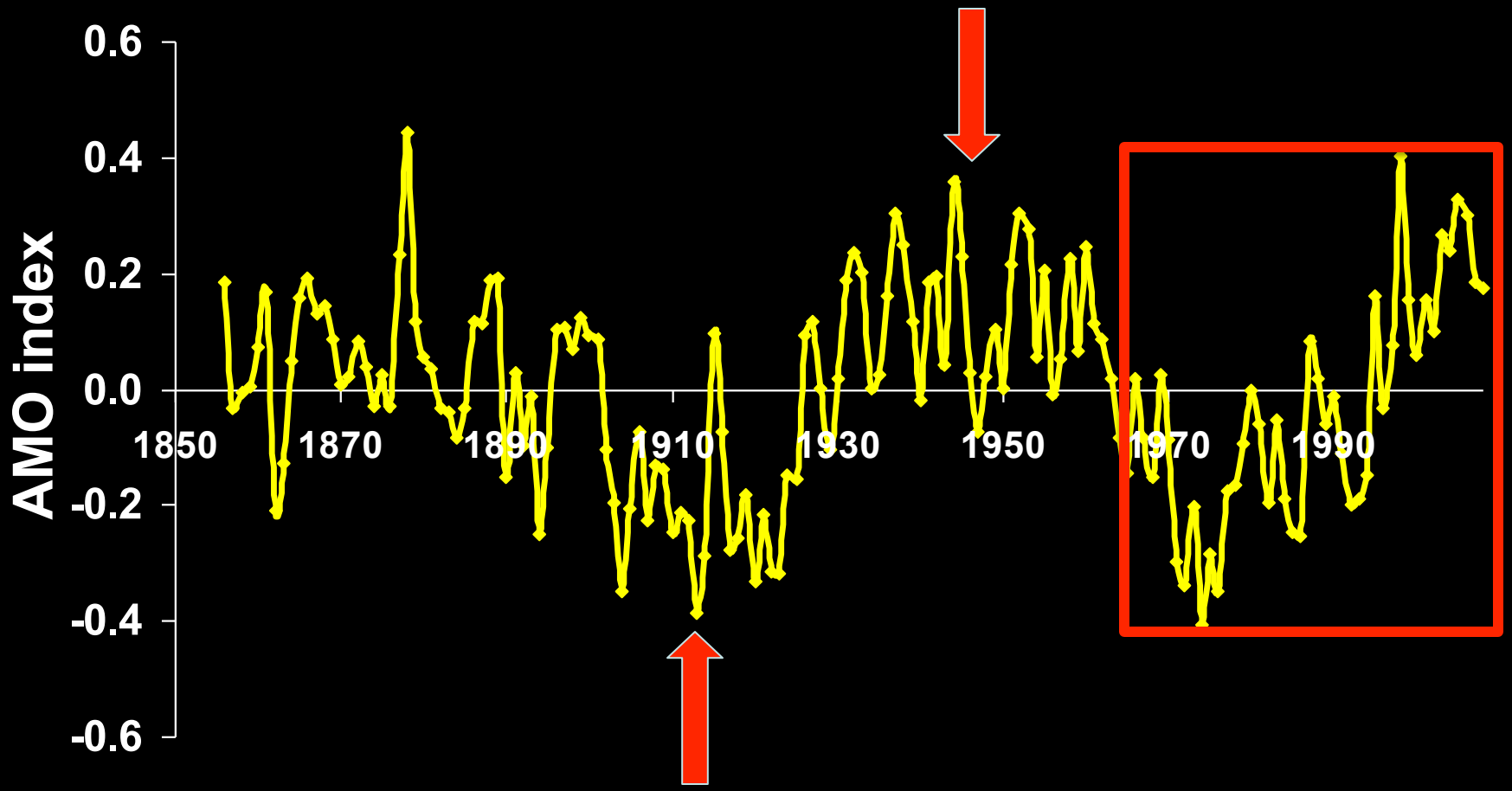
Janet Nye
School of Marine and Atmospheric Sciences
Stony Brook University
May 24, 2016

Shifts in silver hake distribution

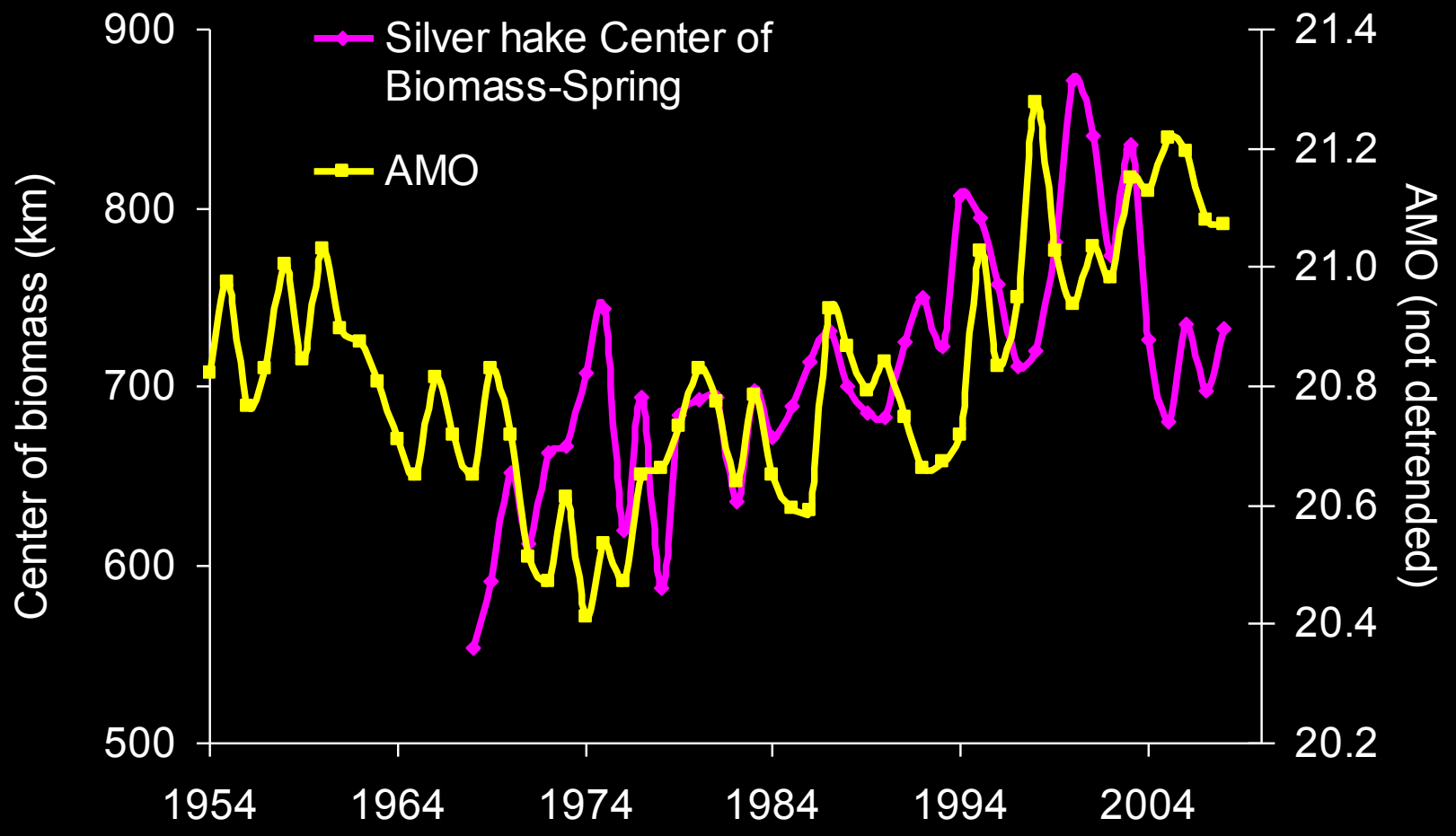


Nye et al. [illegible] logy P[illegible] 111-129.

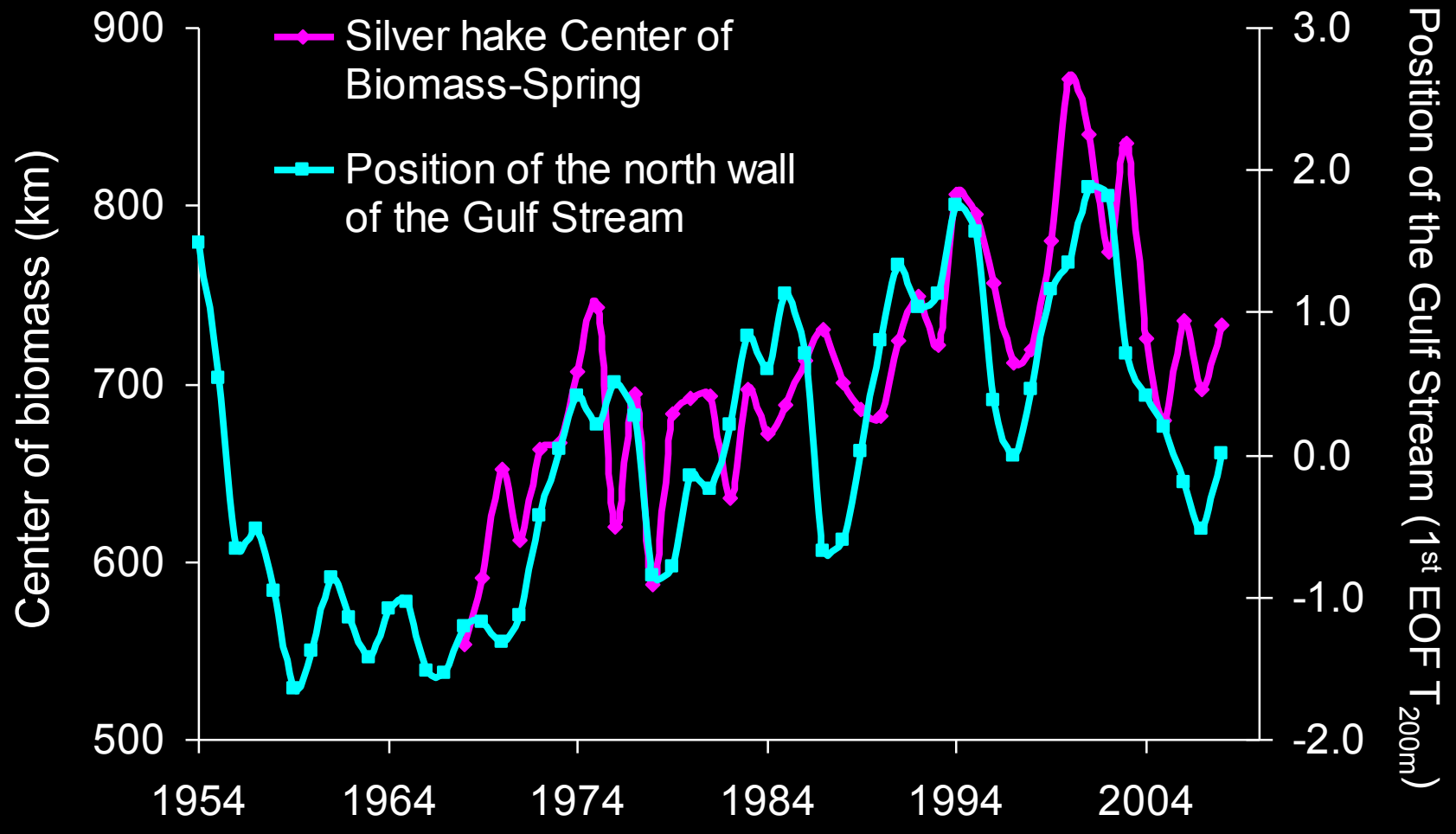
Atlantic Multidecadal Oscillation



Silver hake and the AMO

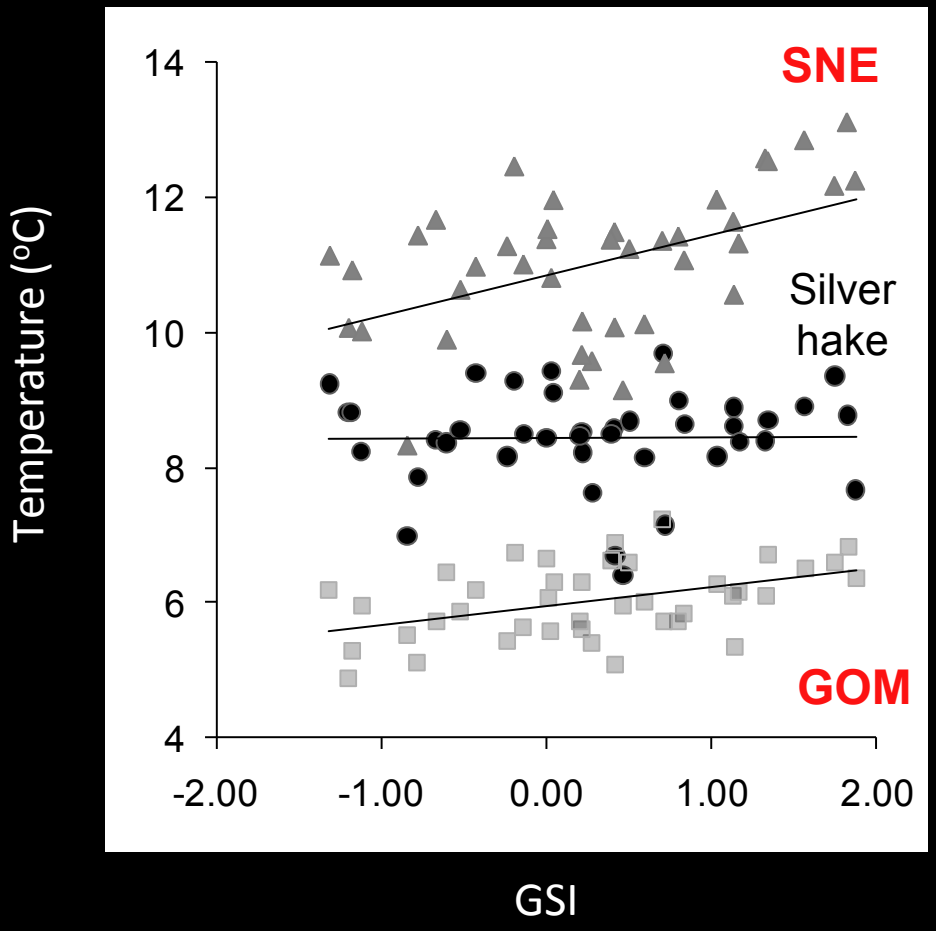


Silver hake and the Gulf Stream

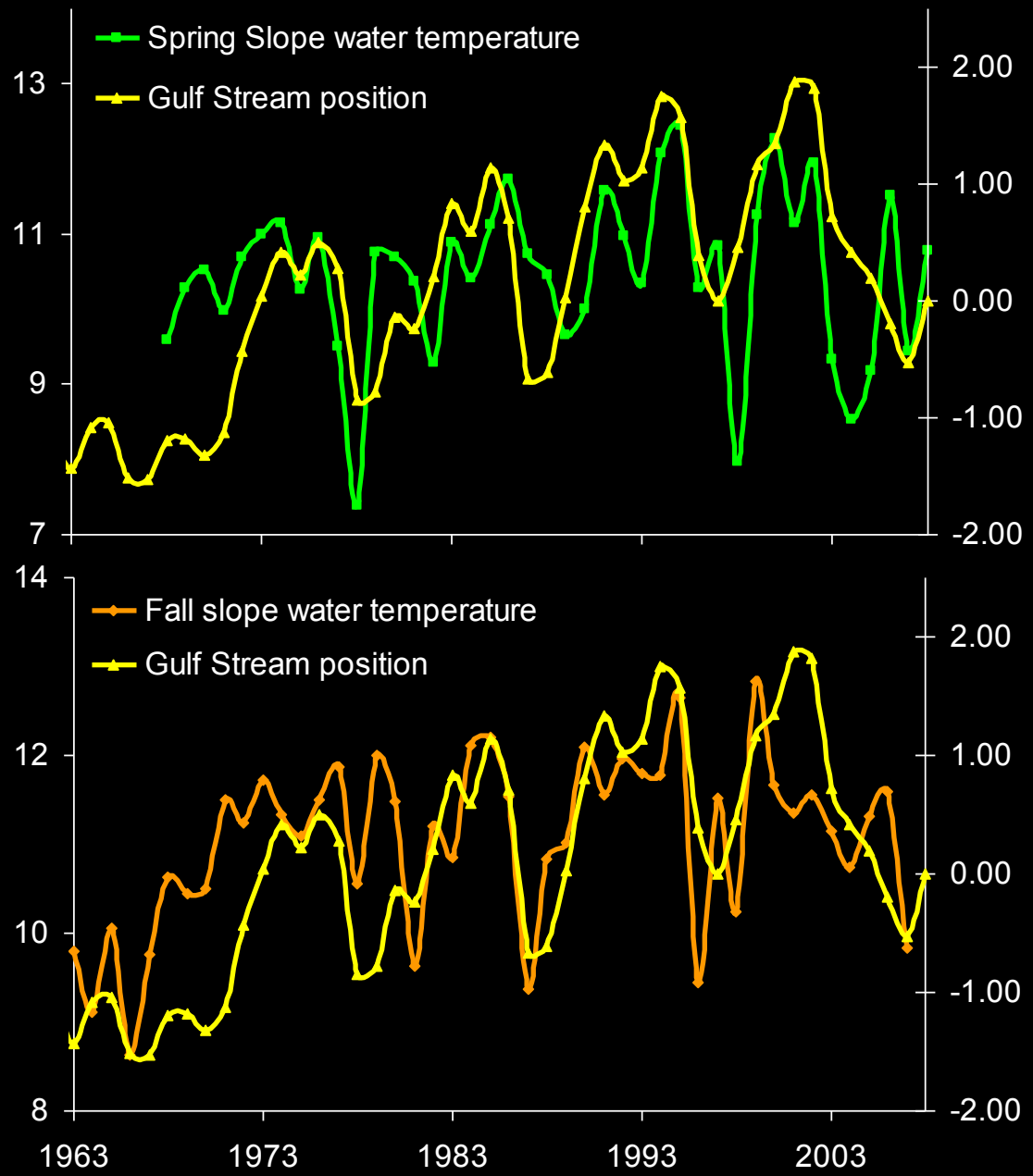


Nye JA, Joyce TM, Kwon Y-O, Link JS 2011 Nature Communications 2: 412.

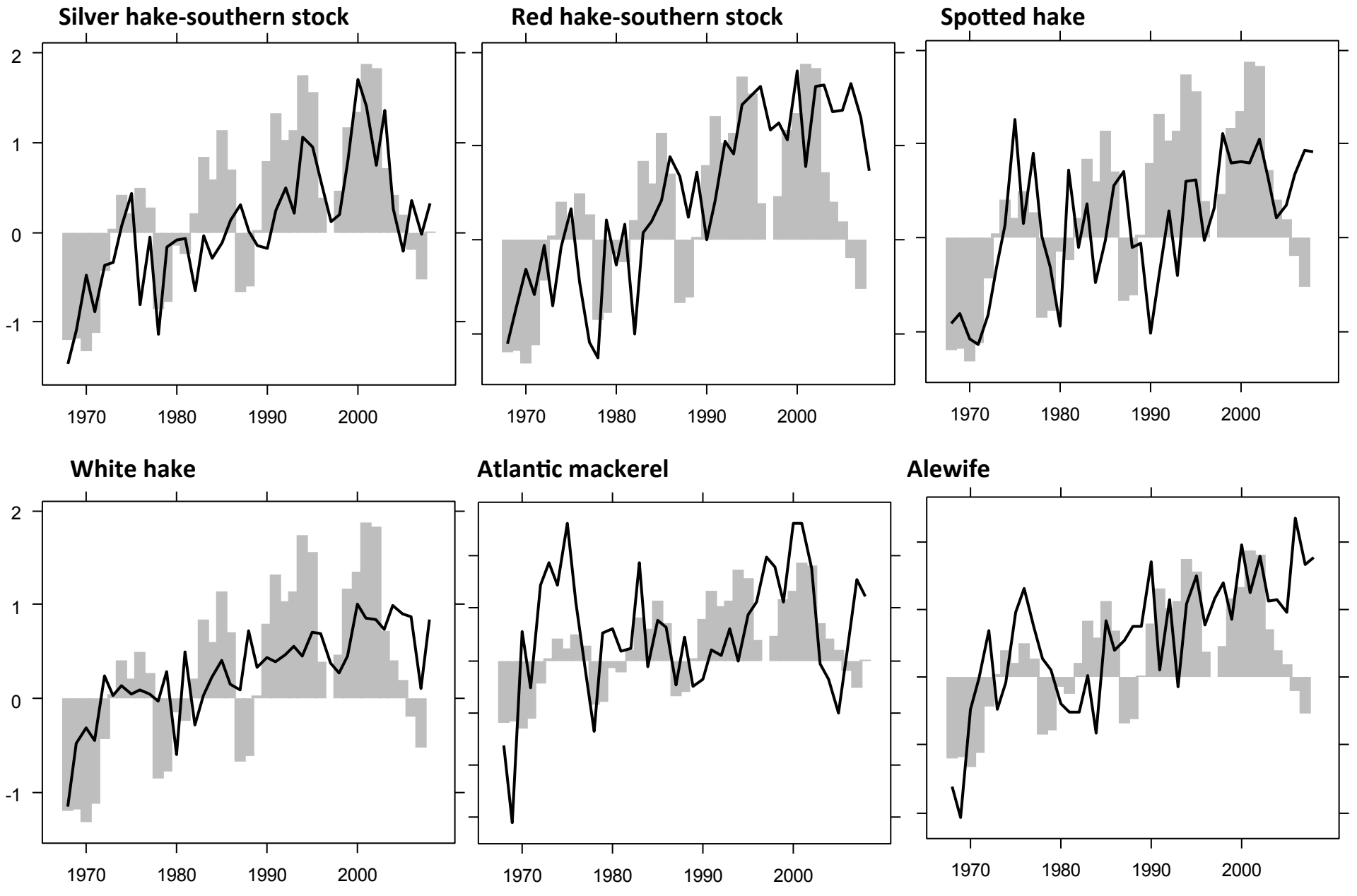
Temperature induced shift



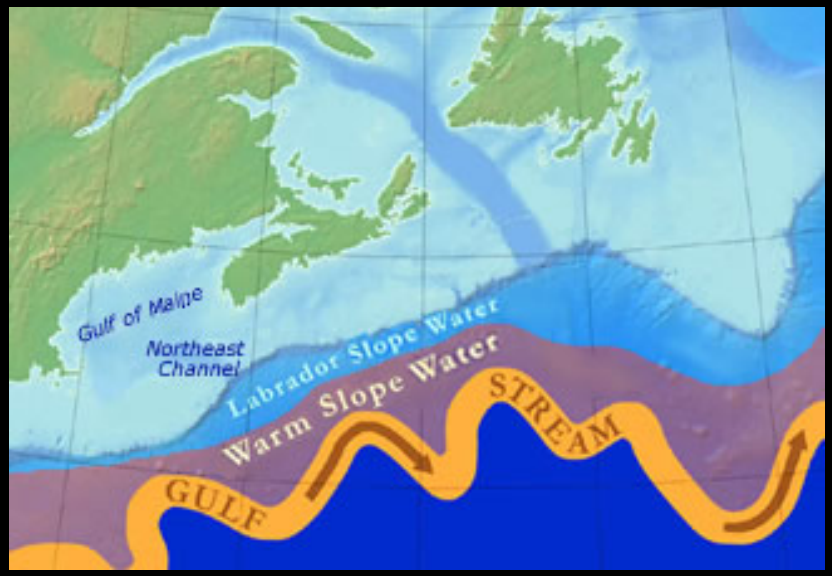
Nye JA, Joyce TM, Kwon Y-O, Link JS 2011 Nature Communications 2: 412.


Spring Slope water temperature
Gulf Stream position
13
11
9
7
2.00
1.00
0.00
-1.00
-2.00
Fall slope water temperature
Gulf Stream position
14
12
10
8
2.00
1.00
0.00
-1.00
-2.00
1963
1973
1983
1993
2003

Gulf Stream index related to distribution of other fish stocks



GS position and Labrador slope water

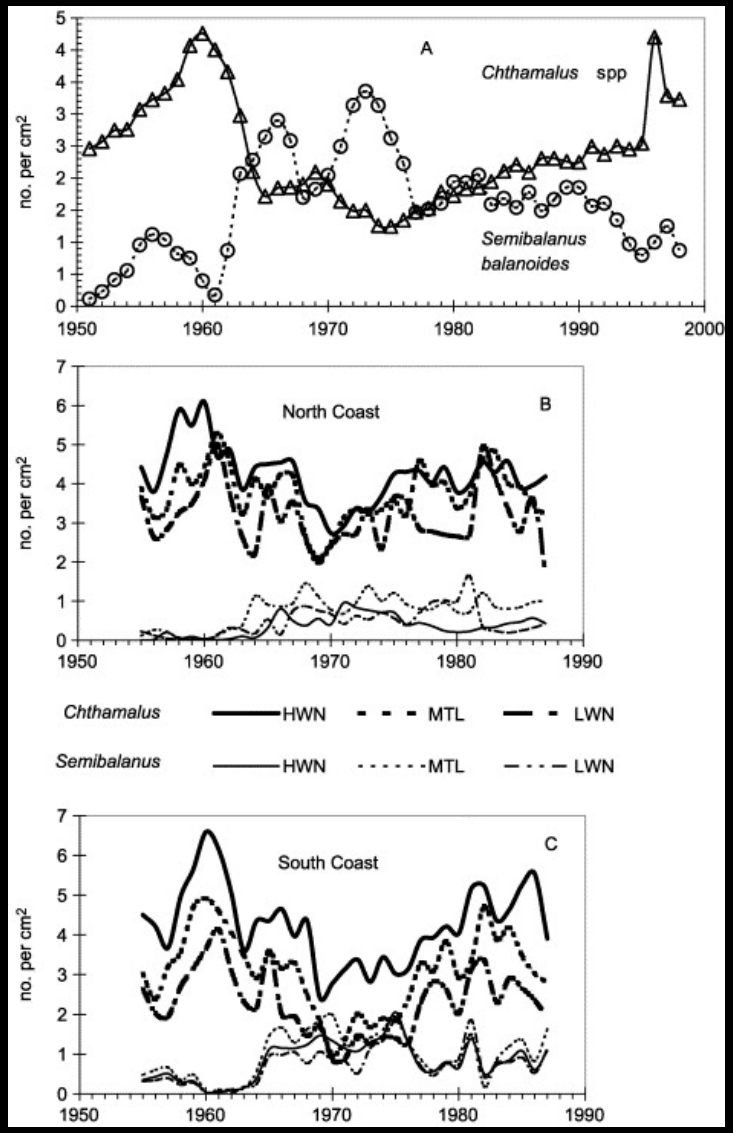


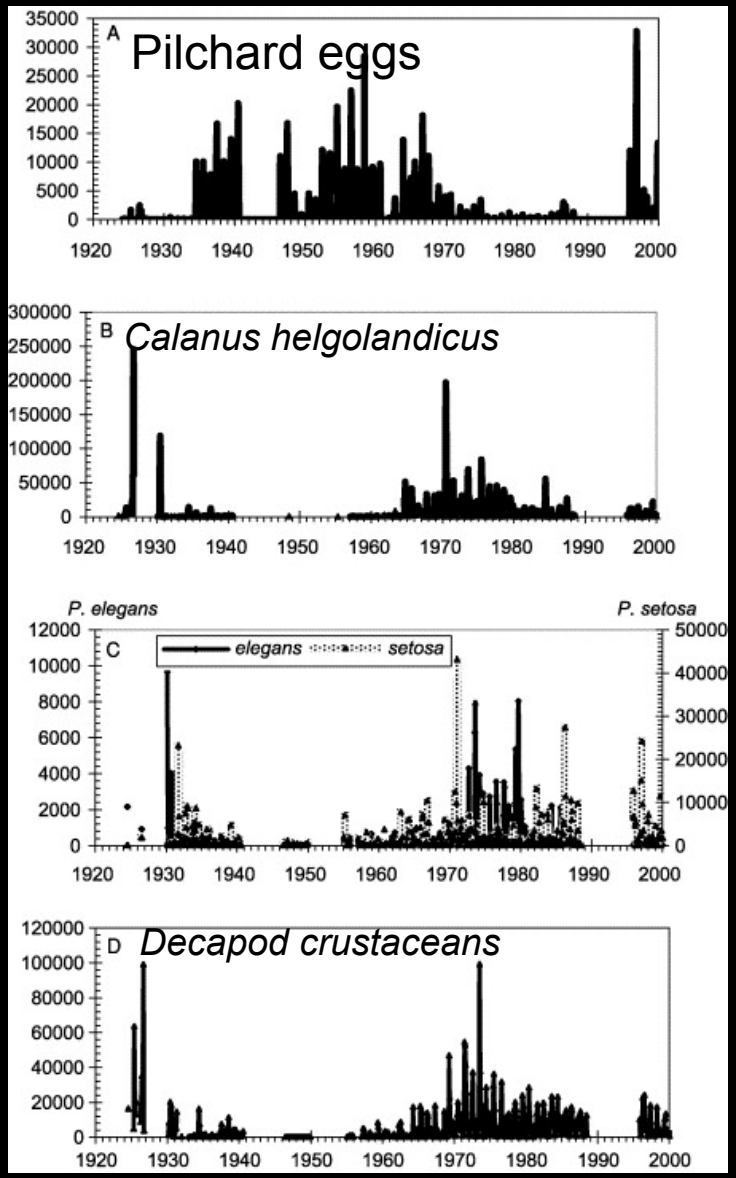
GS index low (pushed southerly)

GS index high (pushed northerly)

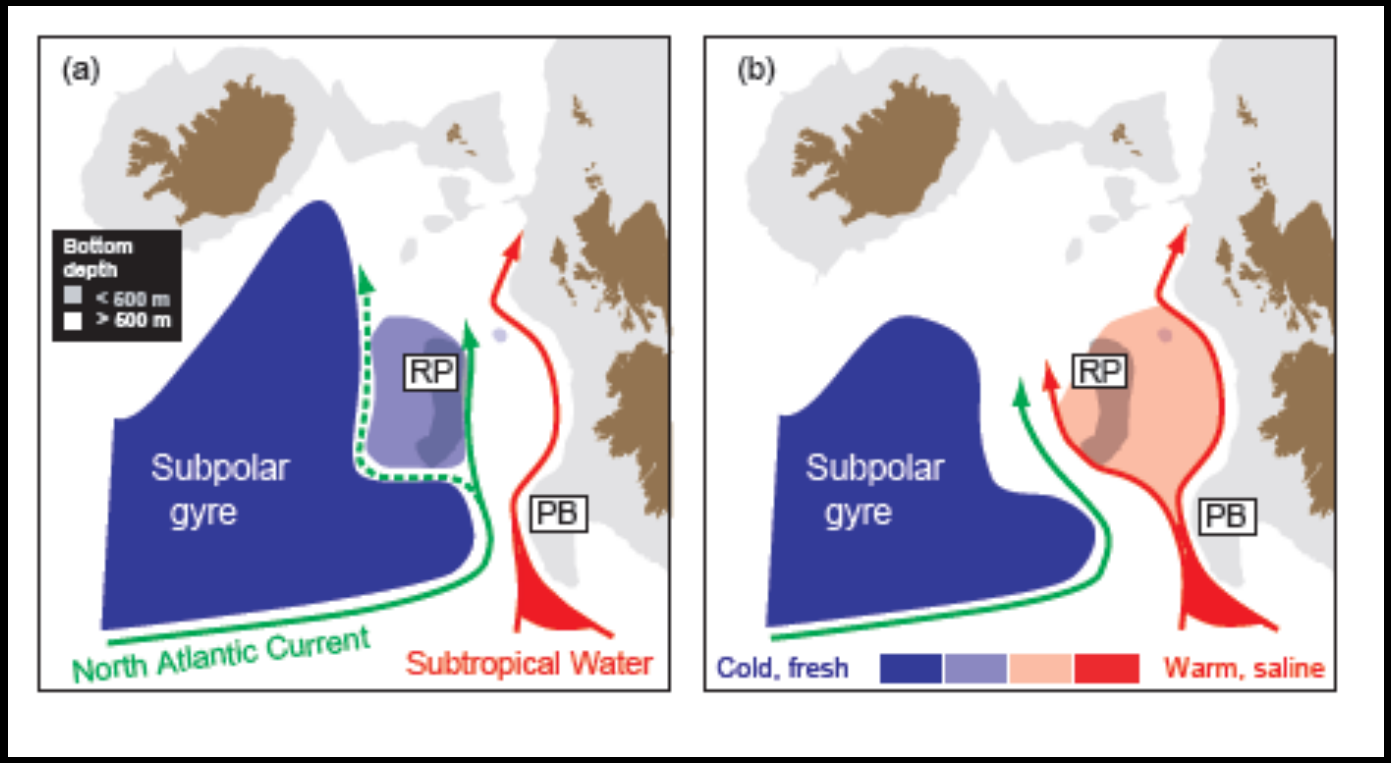
http://www.gomoos.org/environmentalprediction/step1.html

Meanwhile in the Northeast Atlantic…





Meanwhile in the Northeast Atlantic

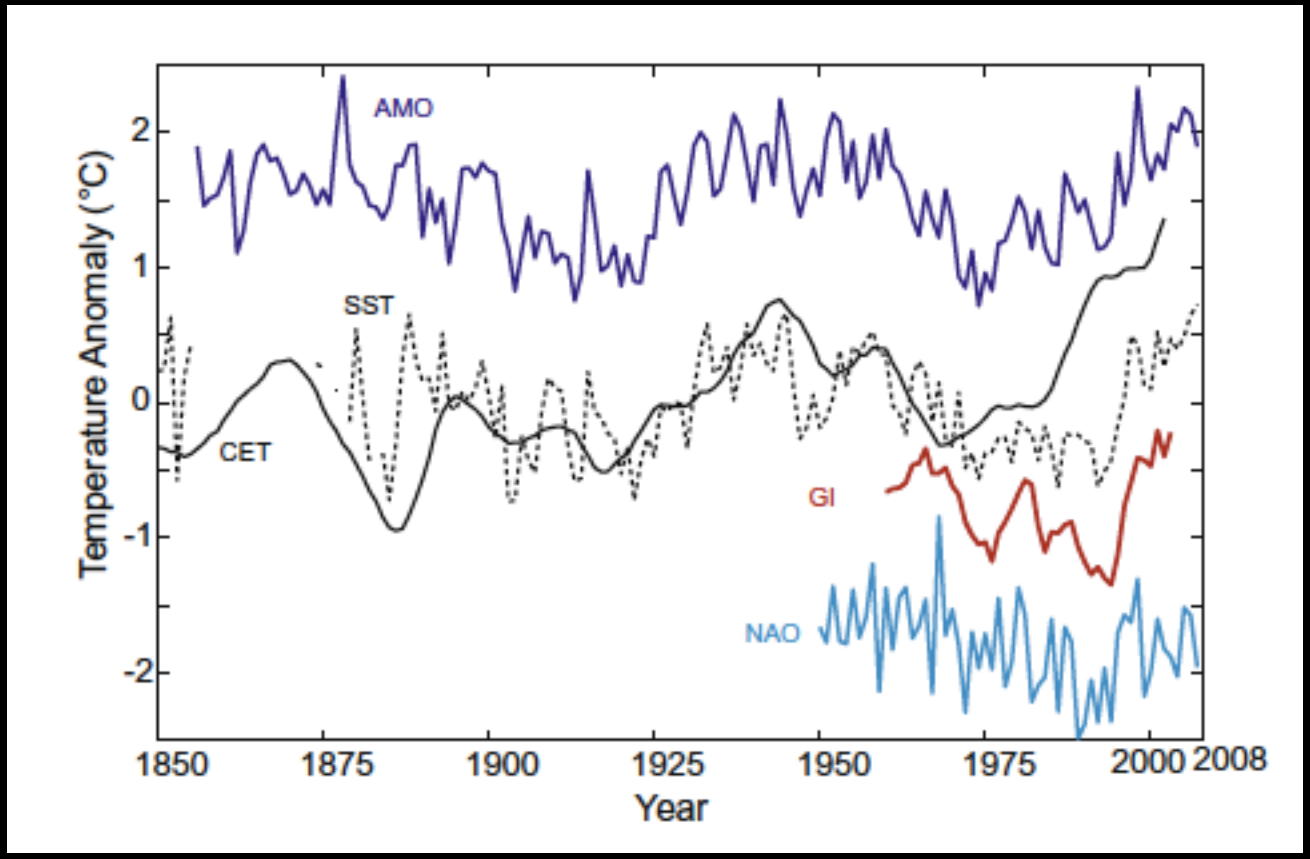


Strong subpolar gyre

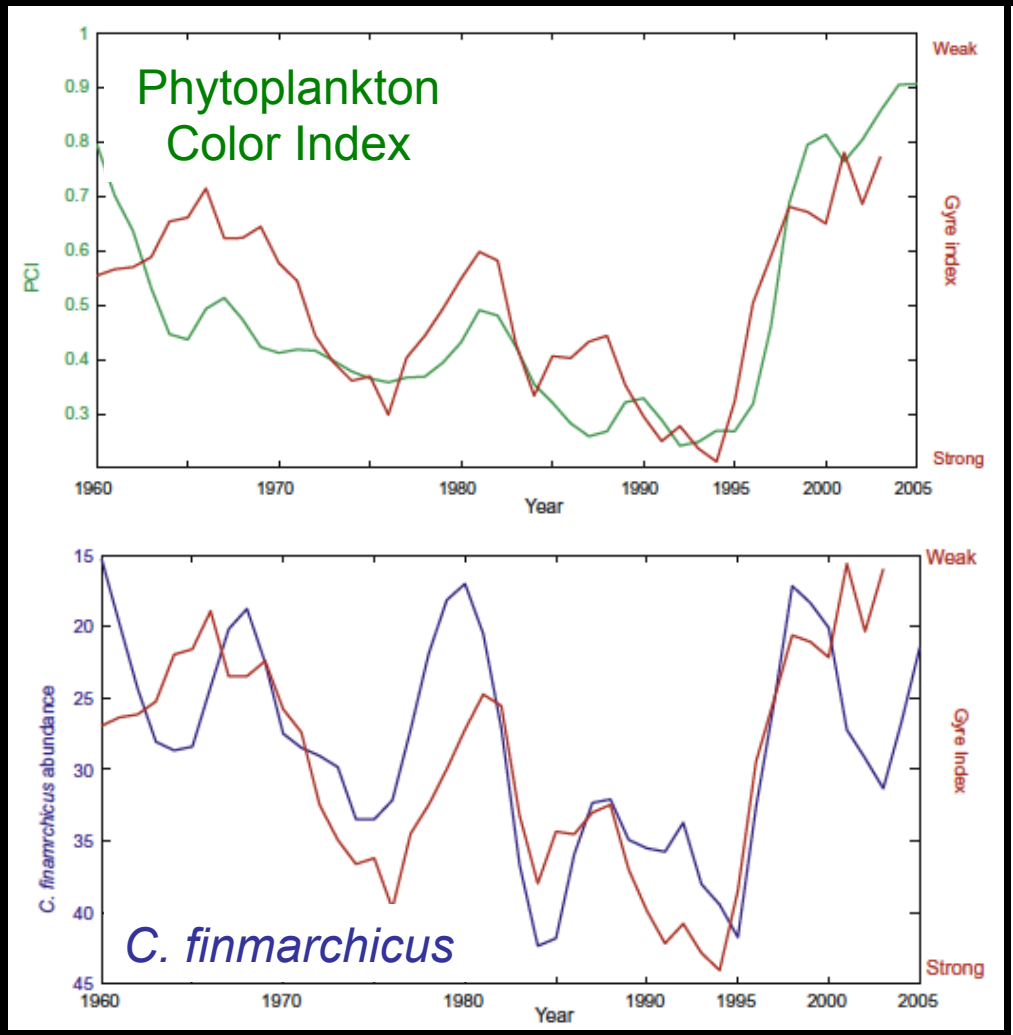
Weak subpolar gyre

Hatun et al. 2008

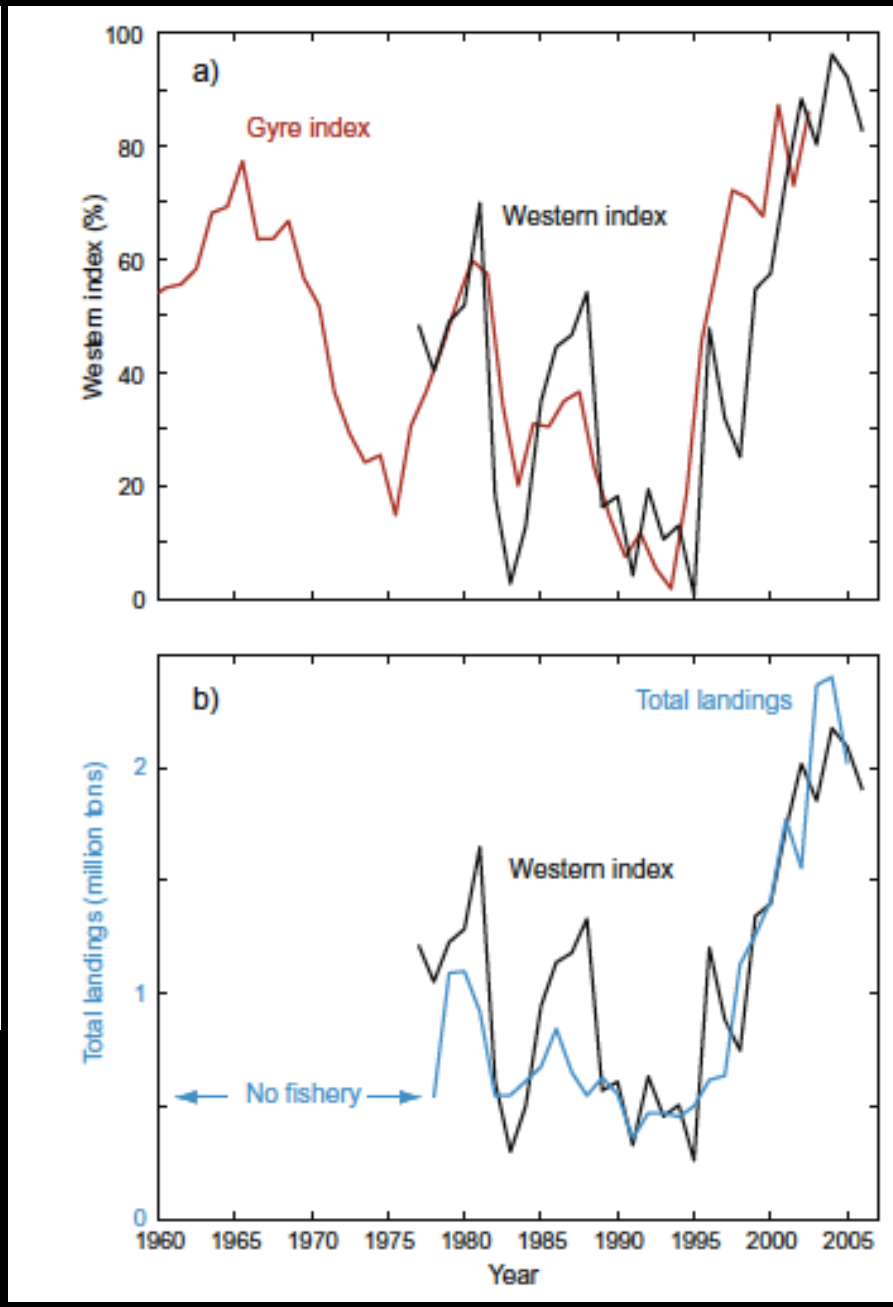
Hatun's Gyre Index



Hatun et al. 2009. Large bio-geographical shifts in the north-eastern Atlantic Ocean... Progress in Oceanography **80**:149-162.c



Hatun et al. 2009. Progress in Oceanography **80**:149-162



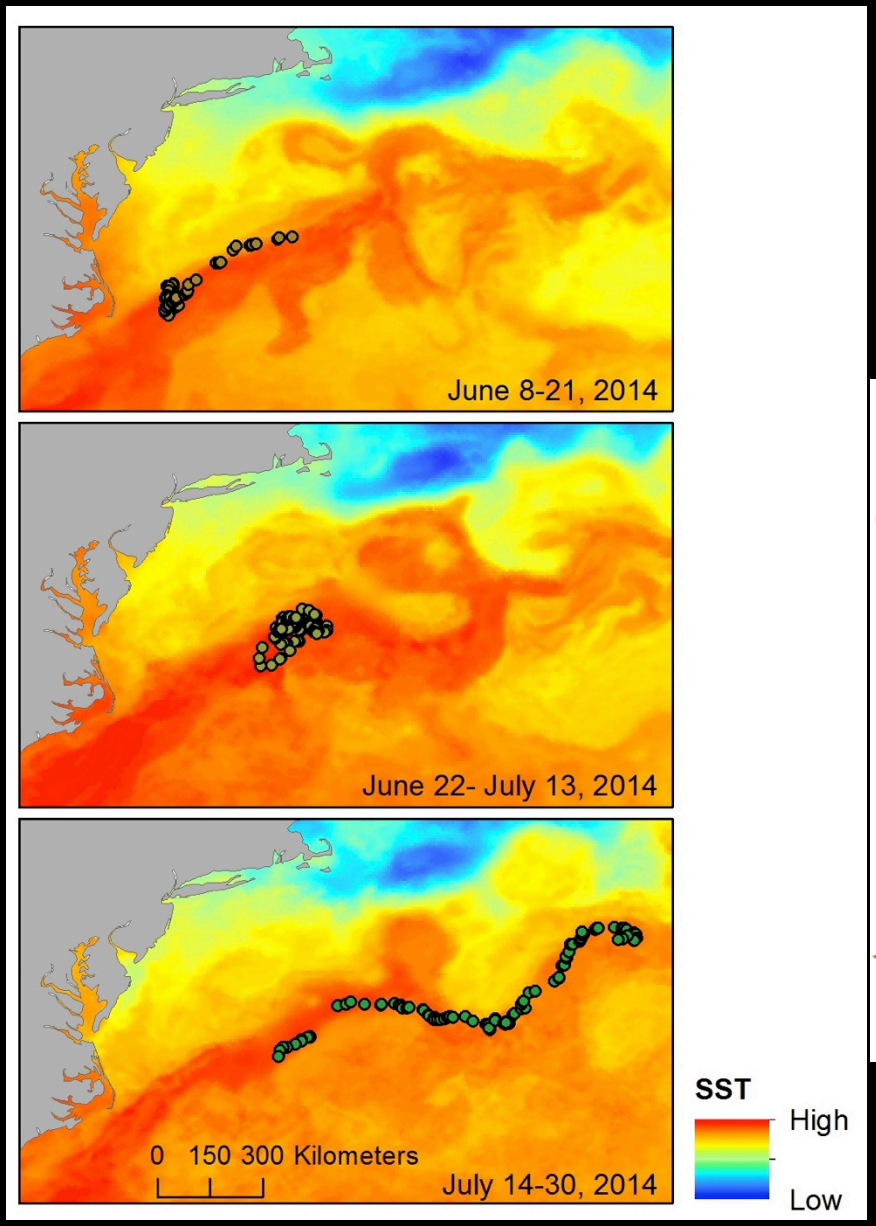
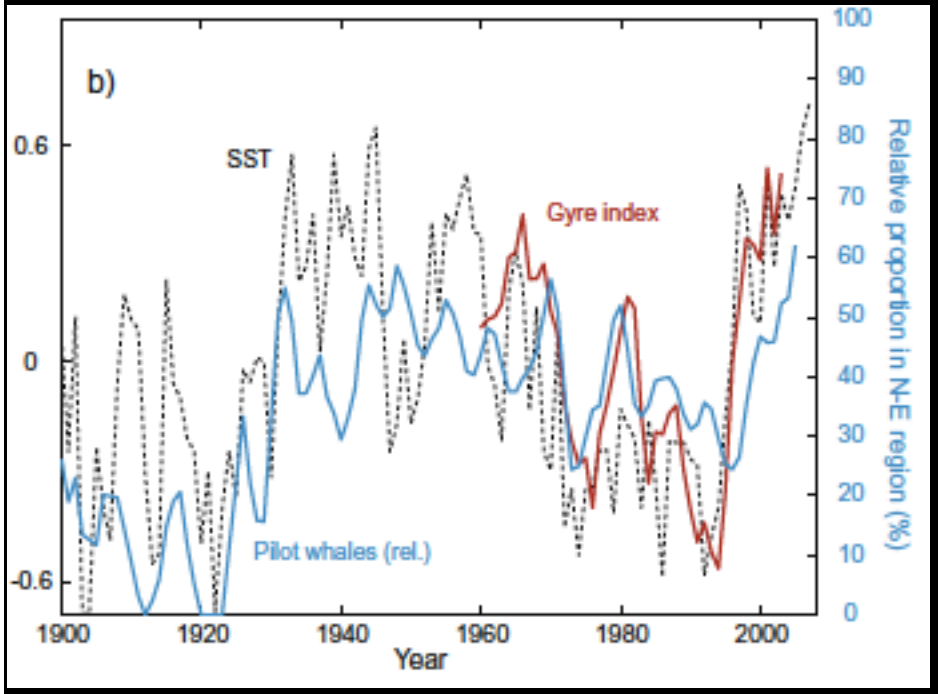


Photo credit: Lesley Thorne

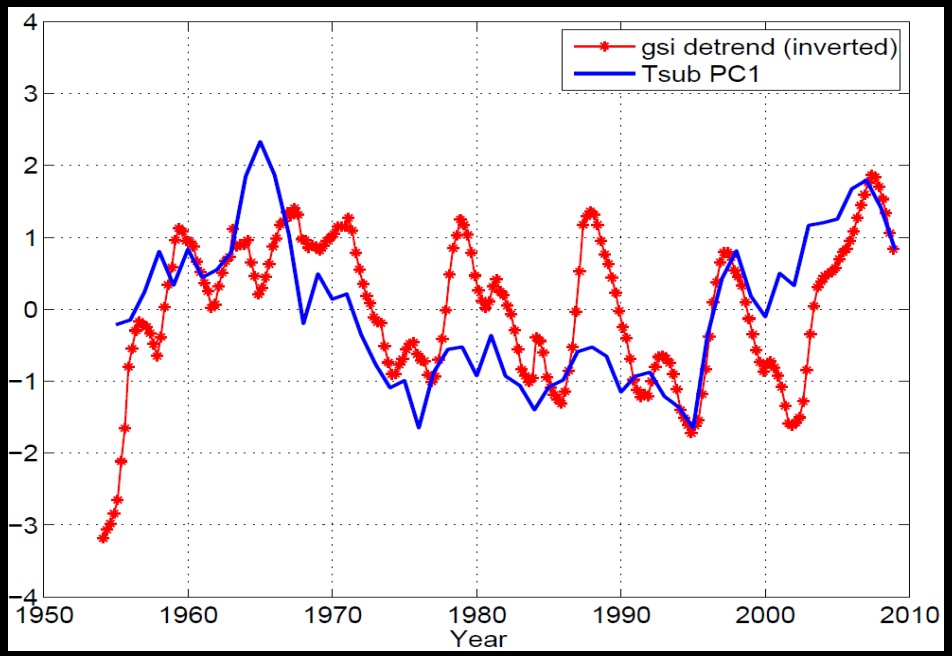


Hatun et al. 2009. Progress in Oceanography **80**:149-162

Mechanisms of water mass exchange is critical to understand ecosystem dynamics

GS path and AMOC

- T_{400} is significantly negatively correlated (r= -0.62) at 95% with the observed GS path index (*Joyce & Zhang, JCli, June 2010).*
- Most climate models predict that AMOC will weaken with climate change
- In the future, we can expect these ecological changes to persist or become more common



We can perhaps project and predict the abundance and distribution of many ecological phenomena relevant to management.

Concluding thoughts

- Mechanisms ~ credibility
- Predictability → tactical management at 3-5 year time scales
- Climate change → strategic management on decadal to multidecadal timescales