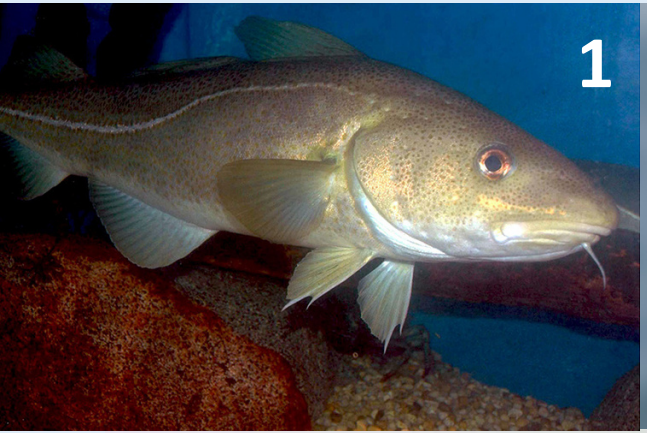
Integrating CPR Data with Upper Trophic Levels: A Brief Review and Some Thoughts

William J. Sydeman

FARALLON INSTITUTE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2 stories
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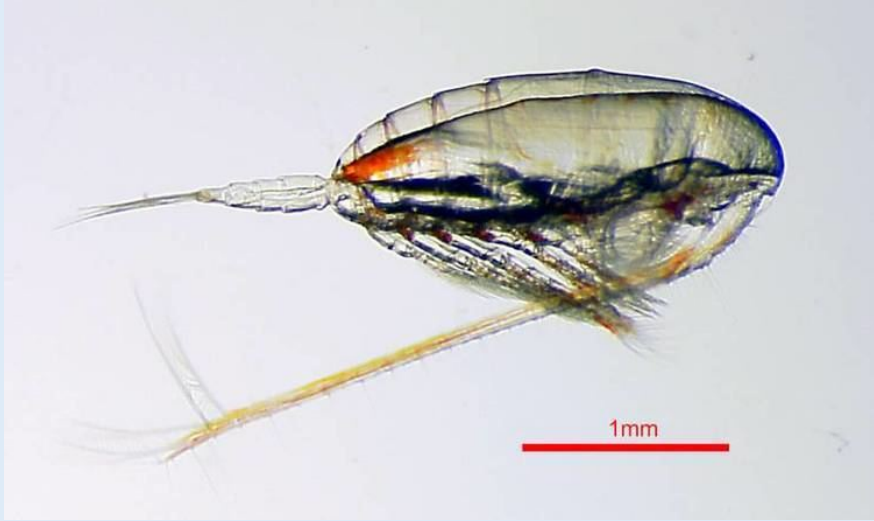
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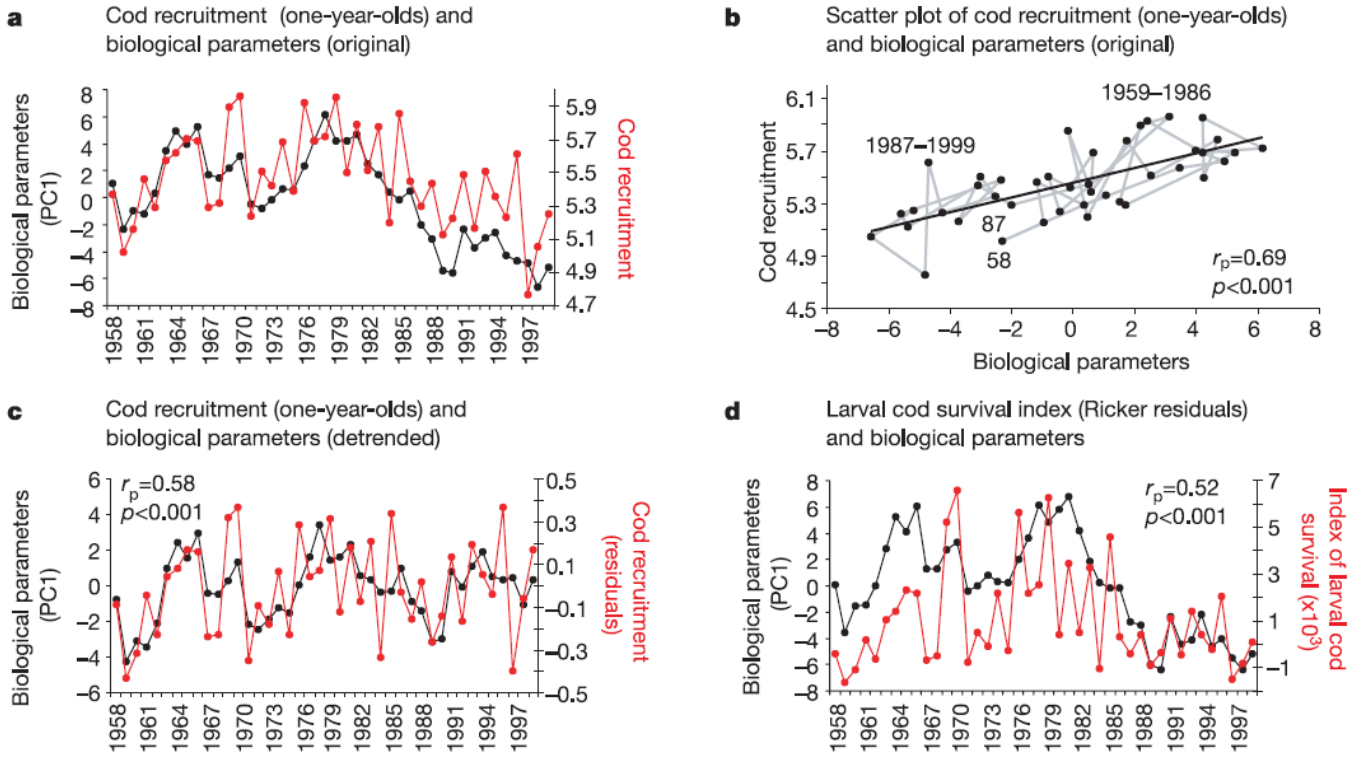
Plankton effect on cod recruitment in the North Sea

NATURE | VOL 426 | 11 DECEMBER 2003 | www.nature.com/nature

Grégory Beaugrand[1,2], Keith M. Brander[3], J. Alistair Lindley[2], Sami Souissi[1] & Philip C. Reid[2]

principal component, 33.78% of the total variability), resulting from analysis of the table years–months × biological indicators. The main variables related to this first principal component were, in order of importance, mean abundance (as mean number of individuals per CPR sample) of *C. finmarchicus* (normalized first eigenvector $C_m = 0.84$), euphausiids ($C_m = 0.72$), mean size of calanoid copepod ($C_m = 0.72$), *C. helgolandicus* ($C_m = -0.41$), calanoid copepod biomass ($C_m = 0.34$) and the genus

> 1200 citations

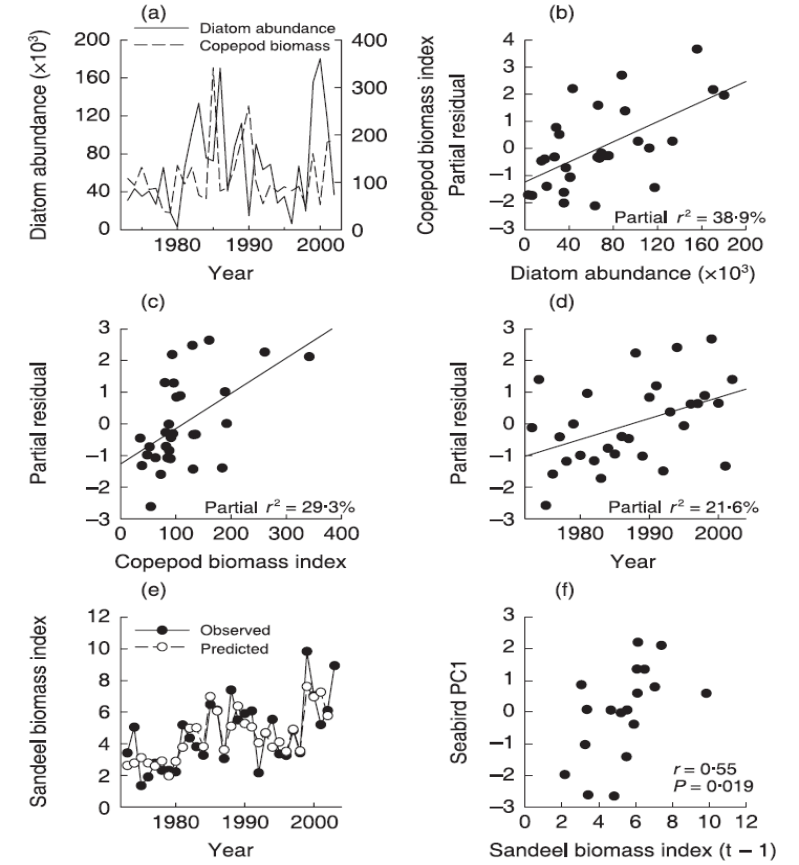


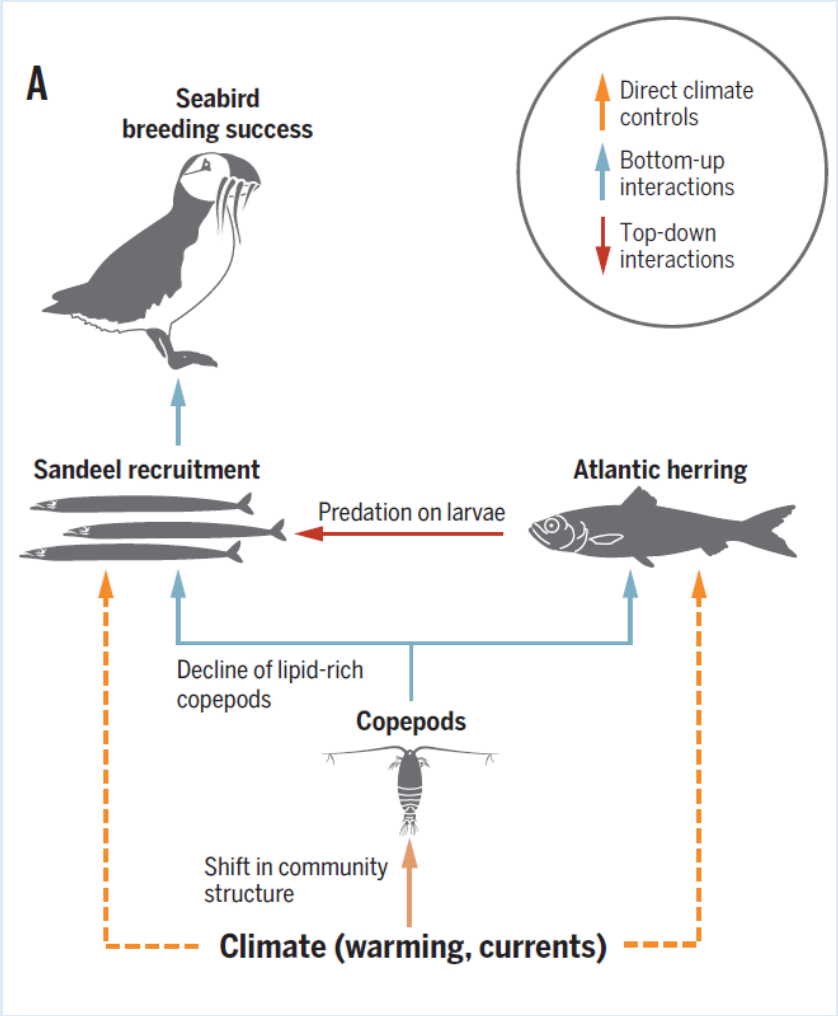
Journal of Animal Ecology 2006
75, 1259–1268

From plankton to top predators: bottom-up control of a marine food web across four trophic levels

MORTEN FREDERIKSEN*, MARTIN EDWARDS†, ANTHONY J. RICHARDSON‡§, NICHOLAS C. HALLIDAY¶ and SARAH WANLESS*

> 300 citations





- **Climate-mediated top-down effects**
- **Simultaneous bottom-up and top-down effects**

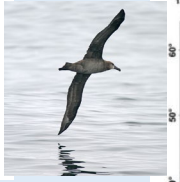
Sydeman et al. 2015

JOURNAL OF PLANKTON RESEARCH | VOLUME 32 | NUMBER 12 | PAGES 1697–1713 | 2010

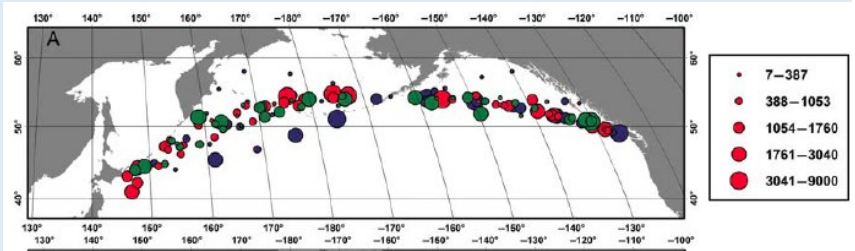
➢ Models of seabird densities relative to potential prey densities

Macro-ecology of plankton–seabird associations in the North Pacific Ocean

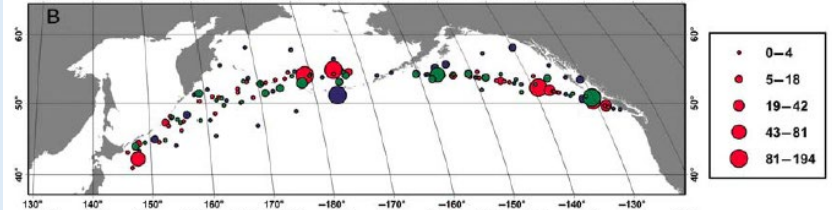
WILLIAM J. SYDEMAN[1]*, SARAH ANN THOMPSON[1], JARROD A. SANTORA[1], MICHAEL F. HENRY[1], KEN H. MORGAN[2] AND SONIA D. BATTEN[3]



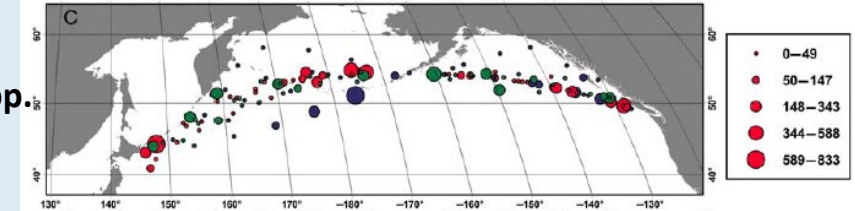
Total zooplankton

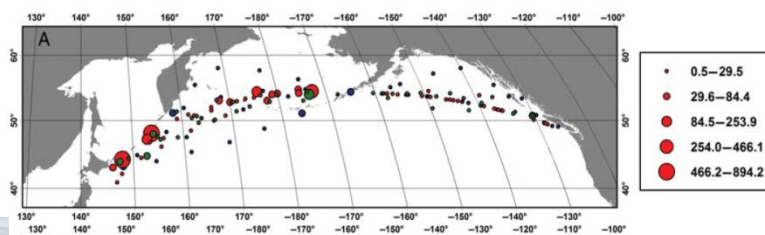


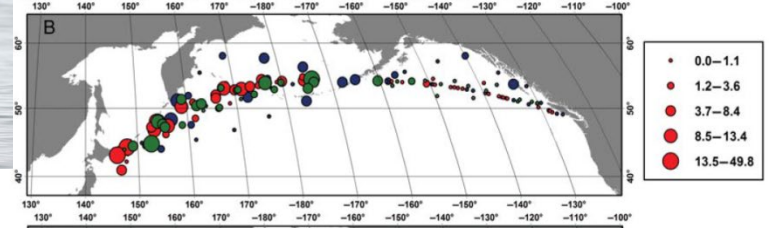
Euphausiids

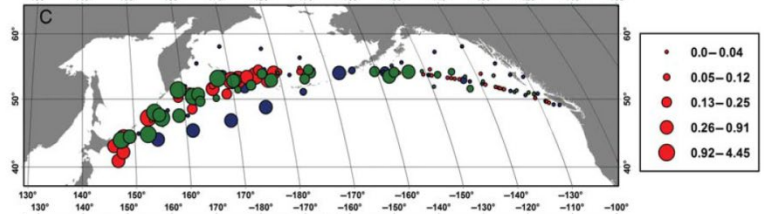


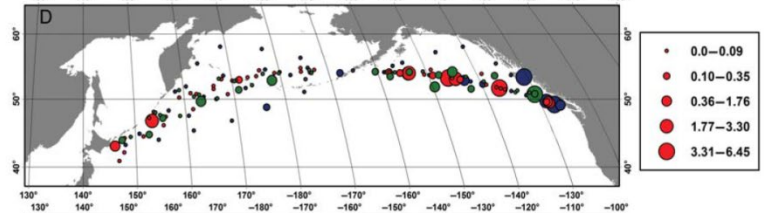
***Pseudocalanus* spp.**

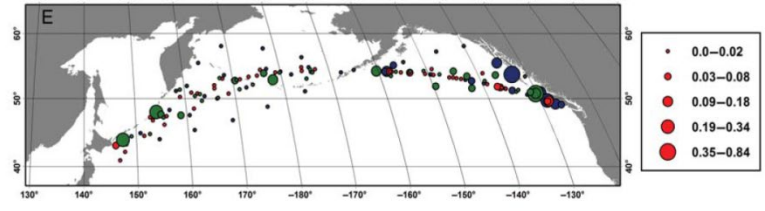












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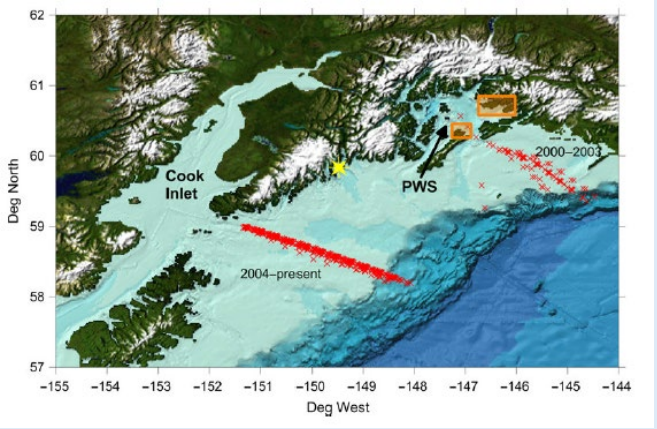
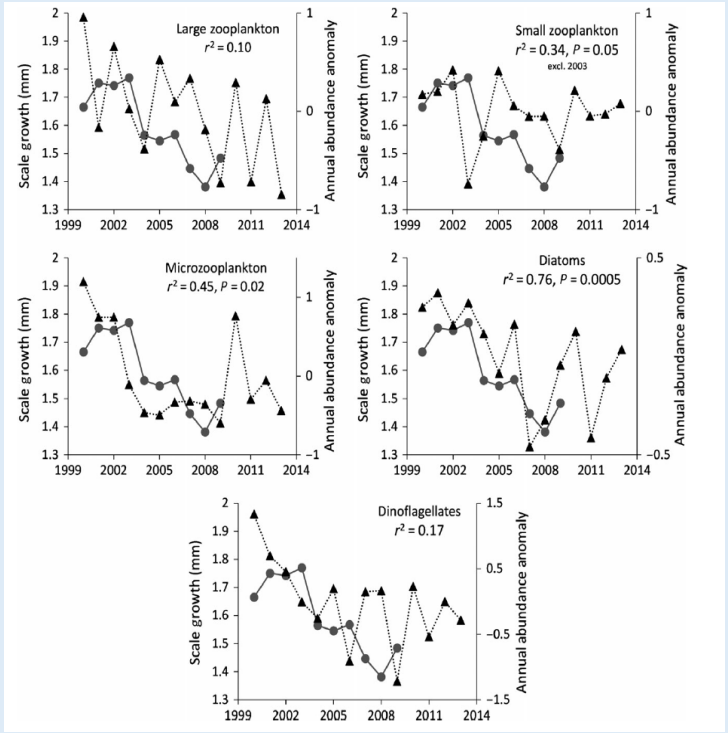
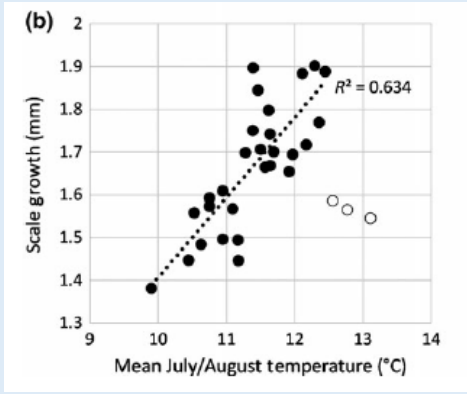
Fish. Oceanogr. 25:4, 420–432, 2016

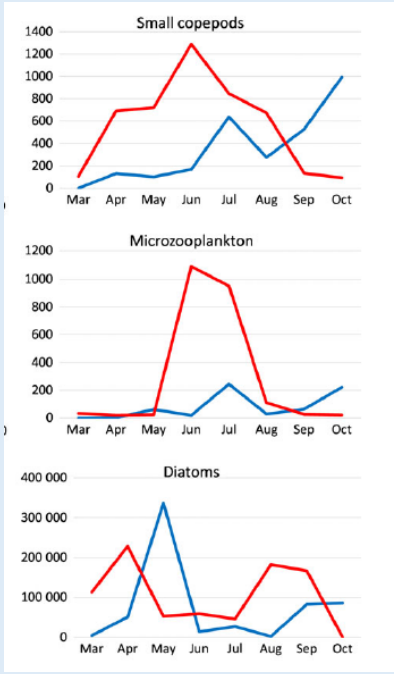
Plankton indices explain interannual variability in Prince William Sound herring first year growth

Batten et al. 2016









Pros and cons of integrative work to date

Pros:

- Large spatial scale
- Long-term data/relevant time series
- These data are needed:
  - Trophic ecology
  - Species to community resolution
  - ➢ Ecosystem-Approach to Management

Cons:

Data usability (complex datasets, difficult integrations)

CPR often not analyzed continuously (predator-prey patchines

Large scale analyses may miss key small-scale dynamics (e.g., fronts and eddies)

“If tens of thousands of them are dying, it's because there's no fish out there, anywhere, over a very large area” --- John Piatt, USGS

FILE – In this Thursday, Jan. 7, 2016 file photo, dead common murres lie washed up on a rocky beach in Whittier, Alaska. In August 2018, federal wildlife officials are asking Alaska coastal communities to report dead and dying seabirds that have appear along beaches since May. The latest bird die-off is not as extensive as one two years earlier but continues a trend of avian mortality over five years that may be tied to warming water in the Bering Sea and Gulf of Alaska. (AP Photo/Mark Thiessen, File)