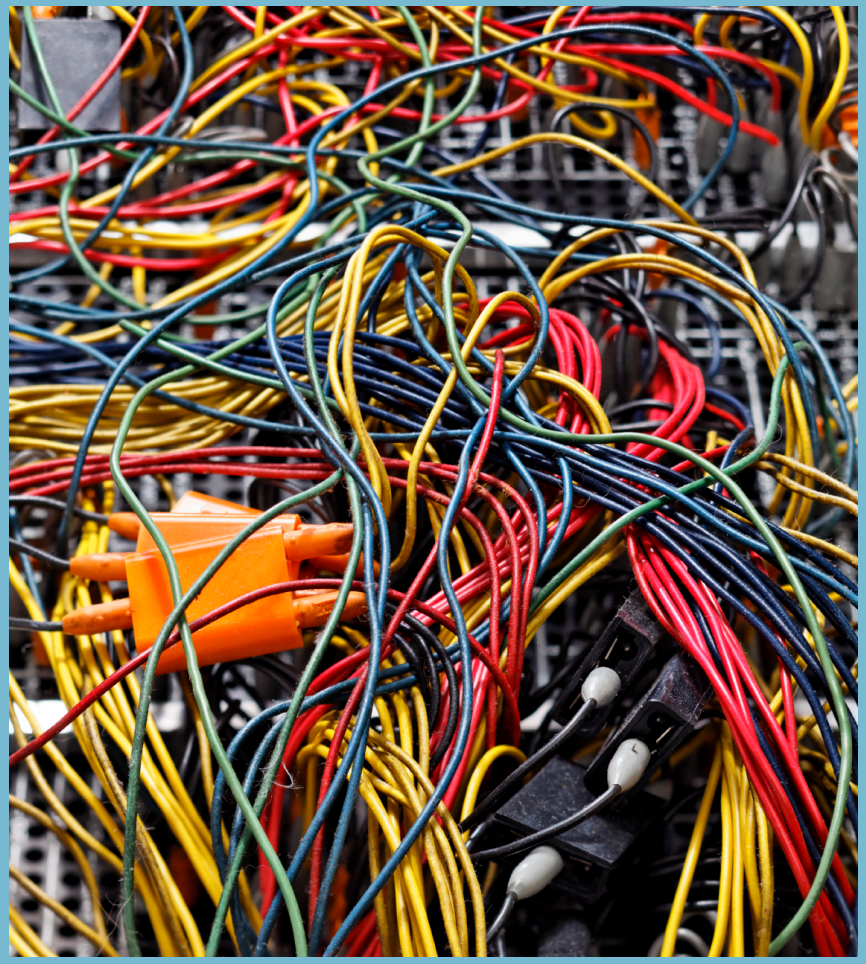
Barriers Between Principle and Practice – How can we foster EBFM in US Fisheries

Tim Essington
University of Washington
essing@uw.edu
@TimEssington
http://faculty.washington.edu/essing/

Ecosystems Are Complex



- Does EBFM also need to be complex?
- Can EBFM be more simple?

What is "In Scope"

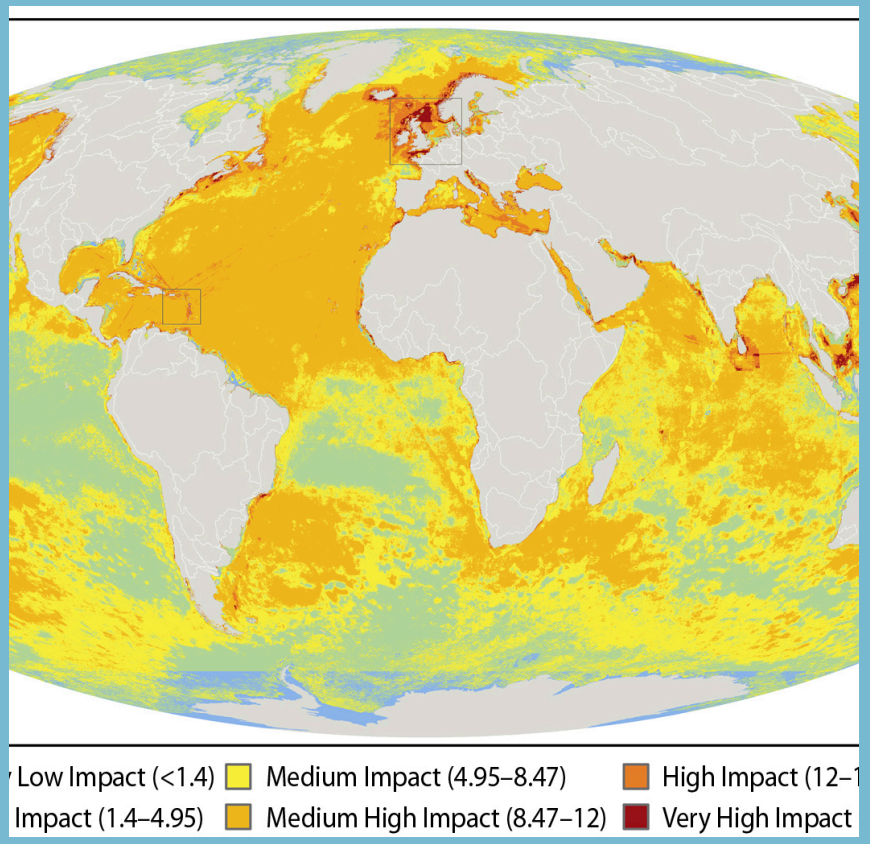
- Bycatch (especially threatened, endangered species)
- Achieve OY and end overfishing
- Manage stocks as a unit
- "Best available scientific information"
  - Habitat
  - Environmental forcing and prediction

Mostly "Out of Scope"

Trade offs

Kutay Tanir

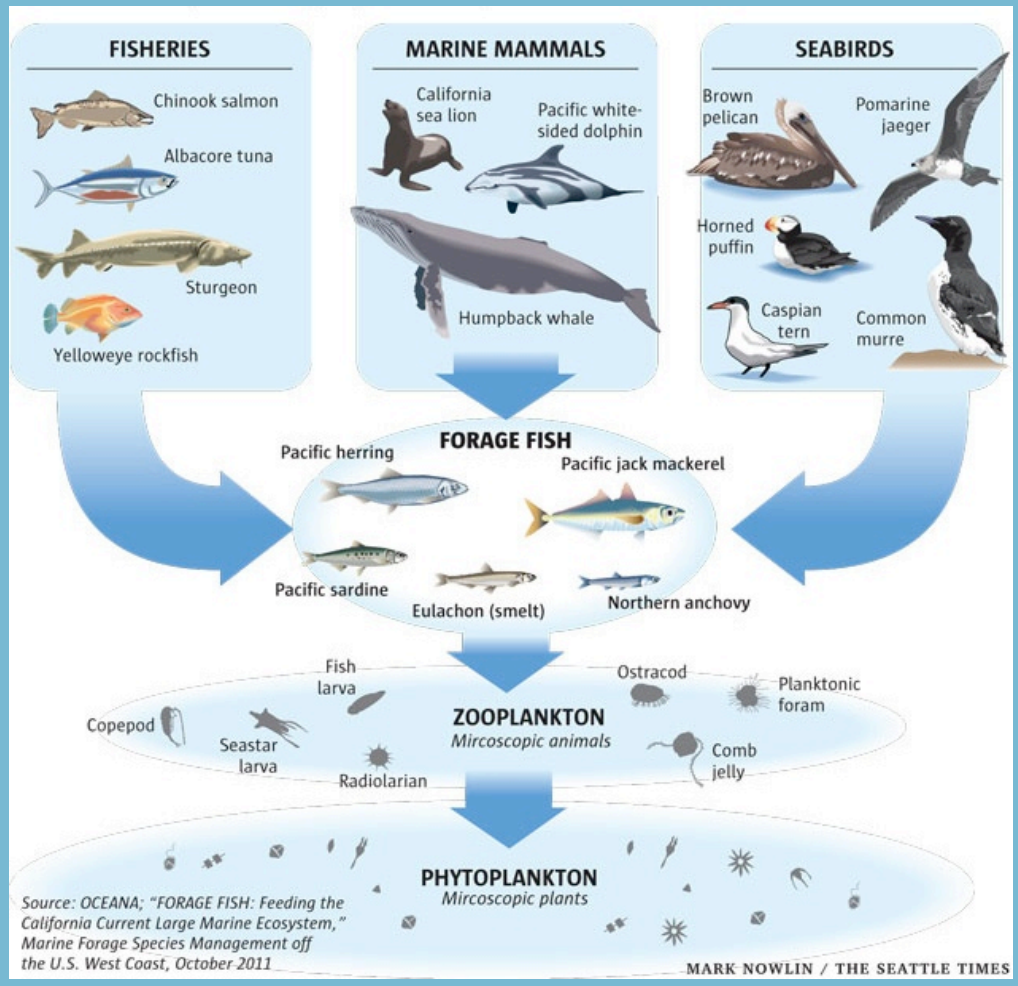
Cumulative Impacts



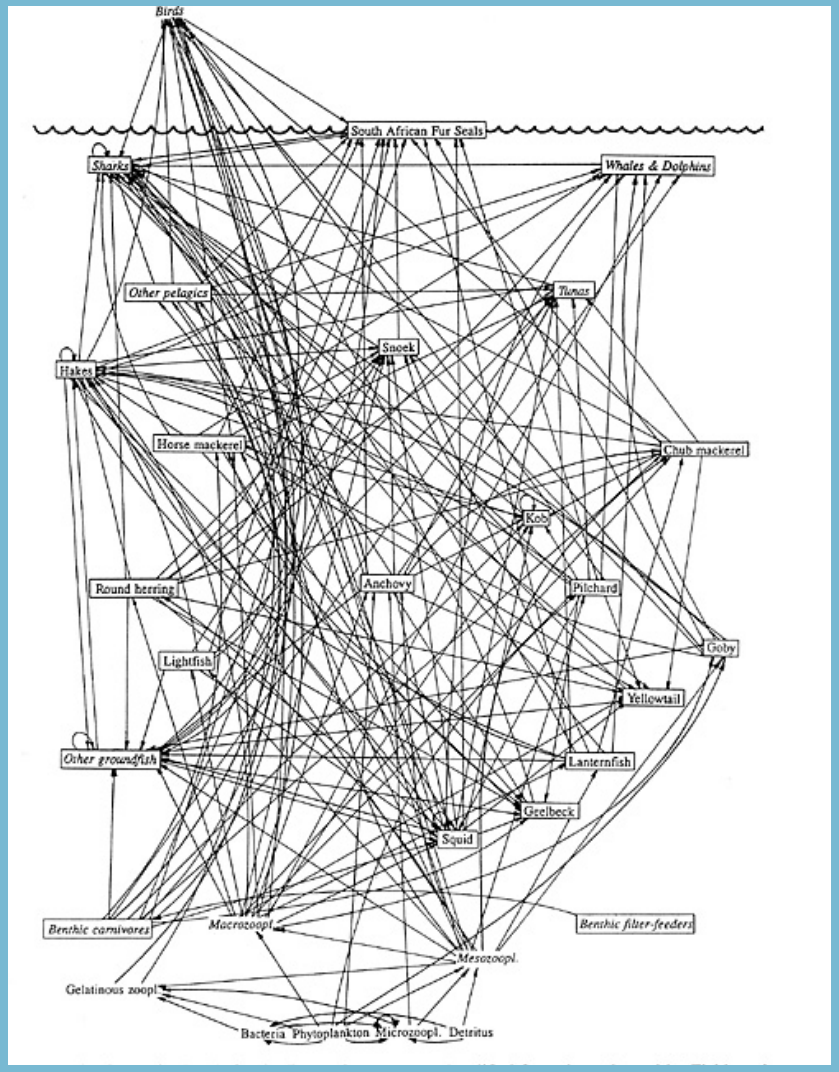
Halpern et al. 2008

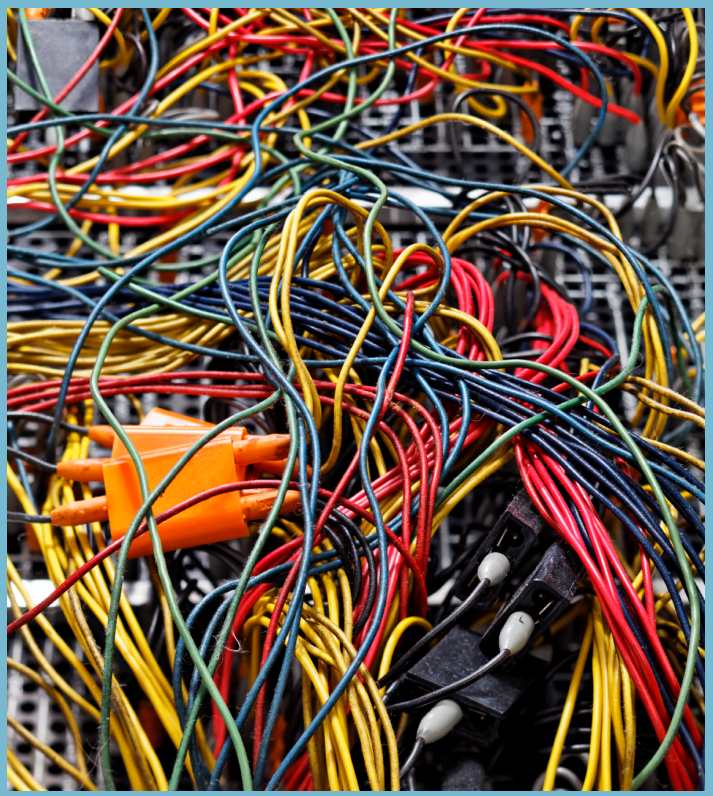
Forage Fish and Trade-offs

Common seal foraging for herring, Baltic Sea, © Wolfgang Poelzer/SeaPics.com.



Forage Fish a KEY linkage to Fisheries, Marine Mammals and Seabirds





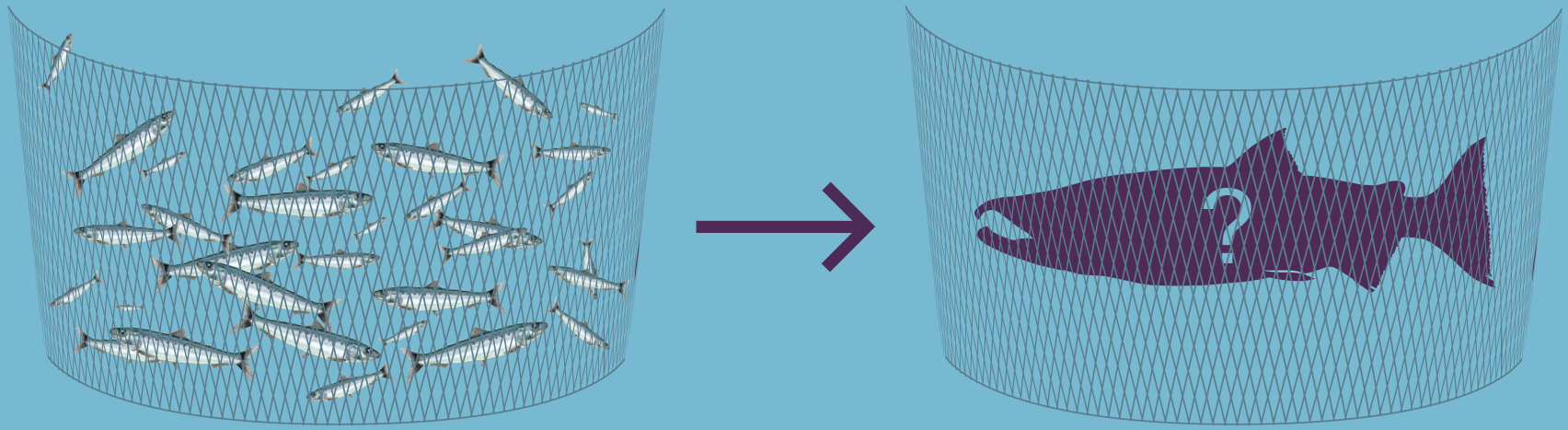
FOOD WEBS ARE A JUMBLED MESS

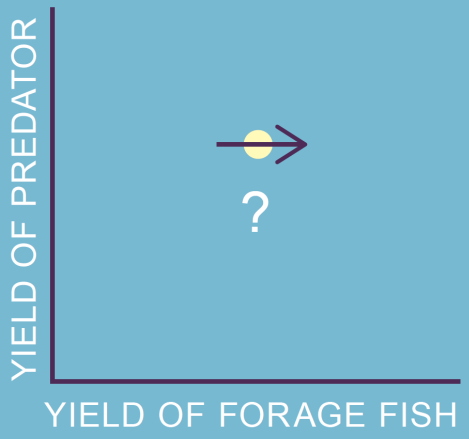
Summary

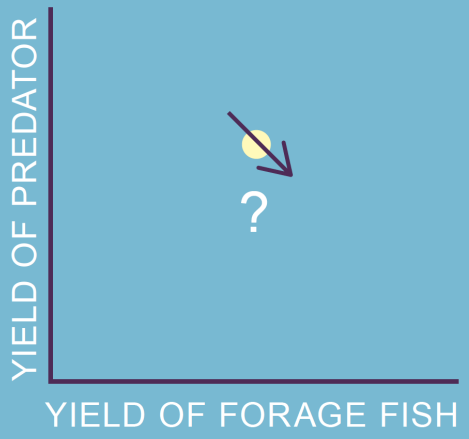
- Rules of thumb to minimize trade-offs
- Screening tools to identify “key” forage
- Avoiding really BAD outcomes

THE BIG QUESTION

If you incrementally change forage fish yield, what does this do to the yield of other species?







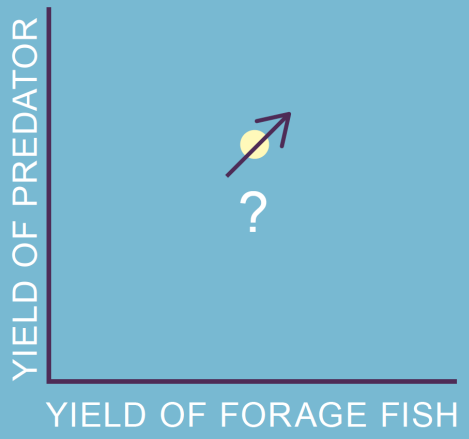
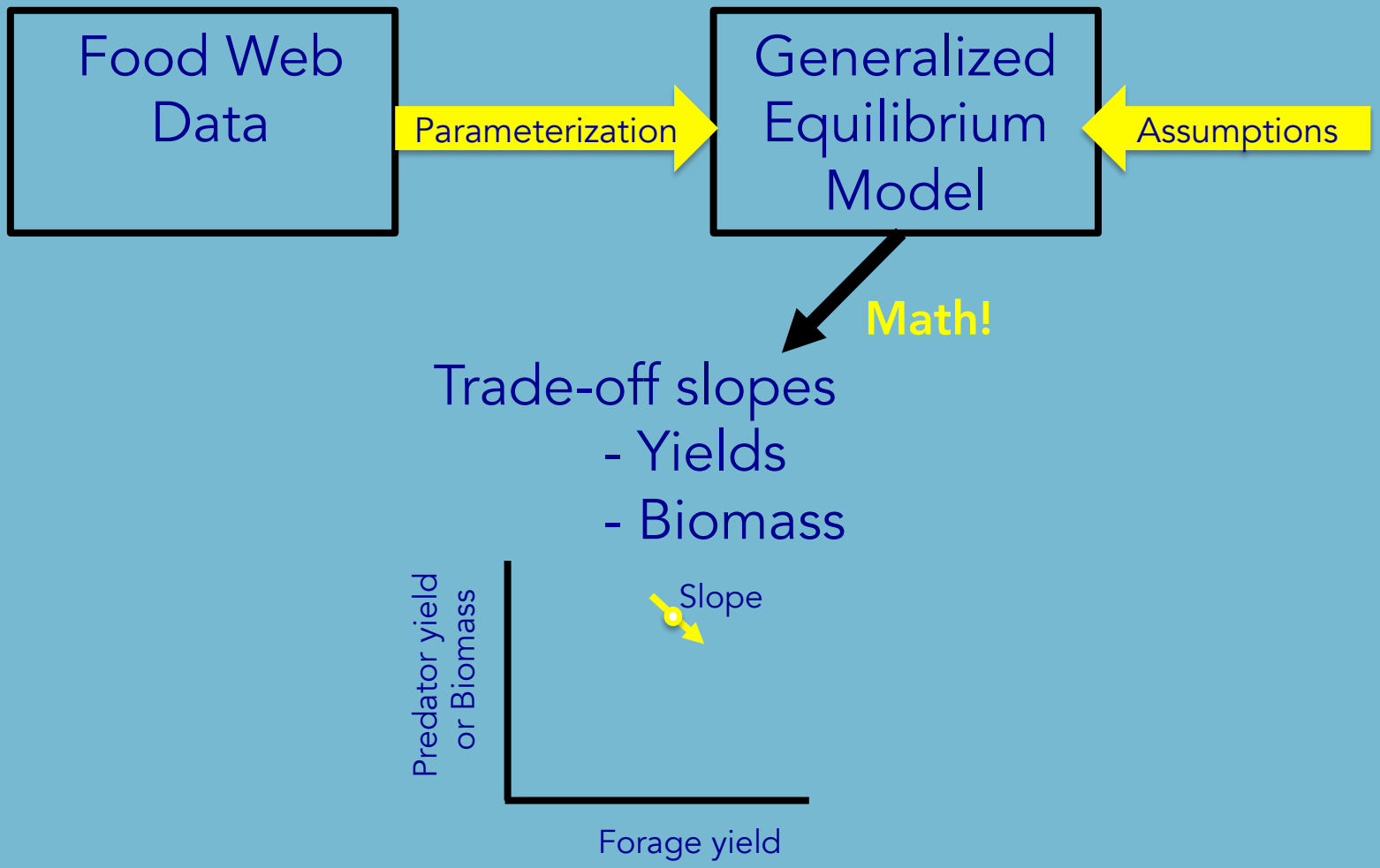
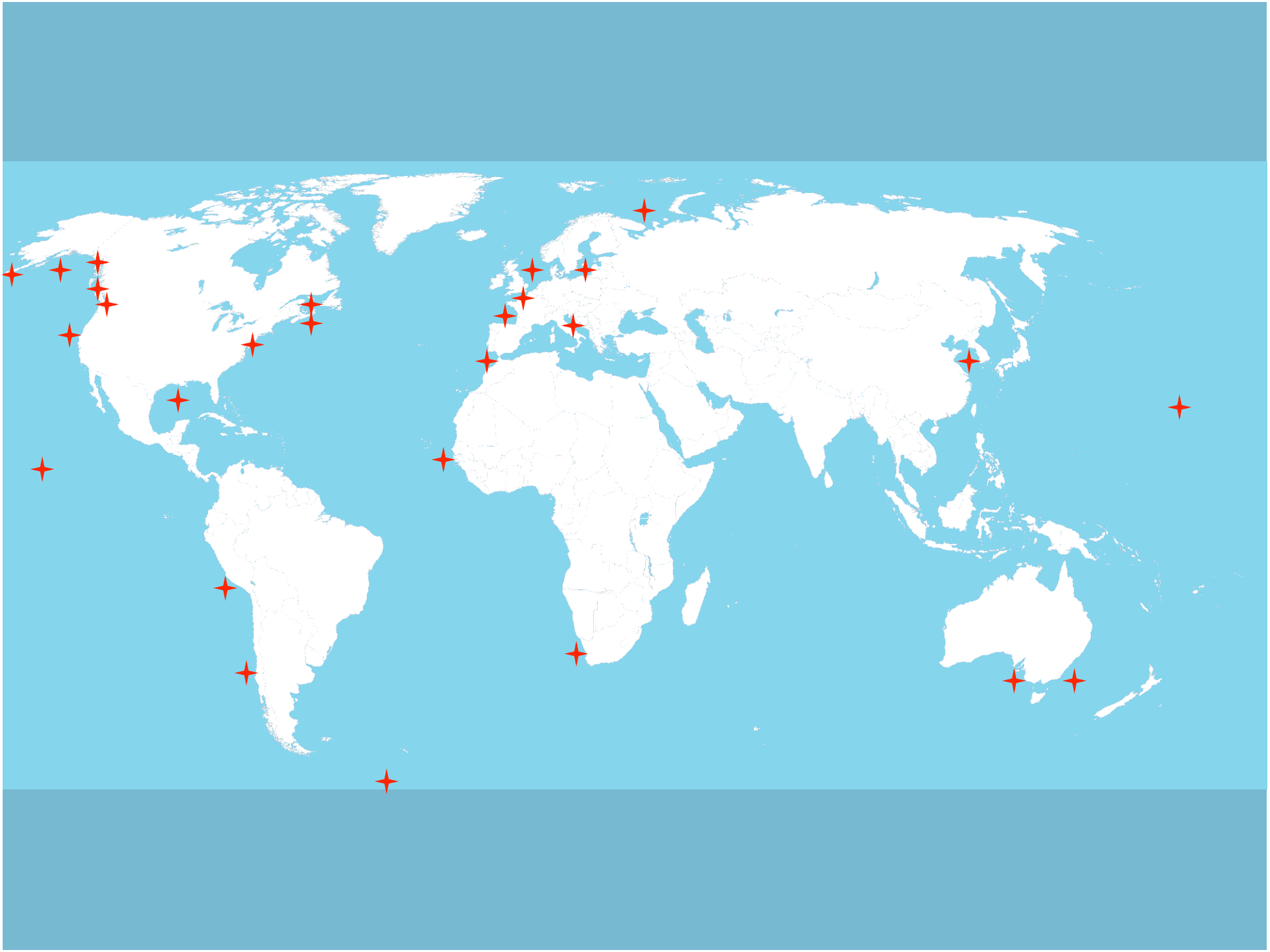


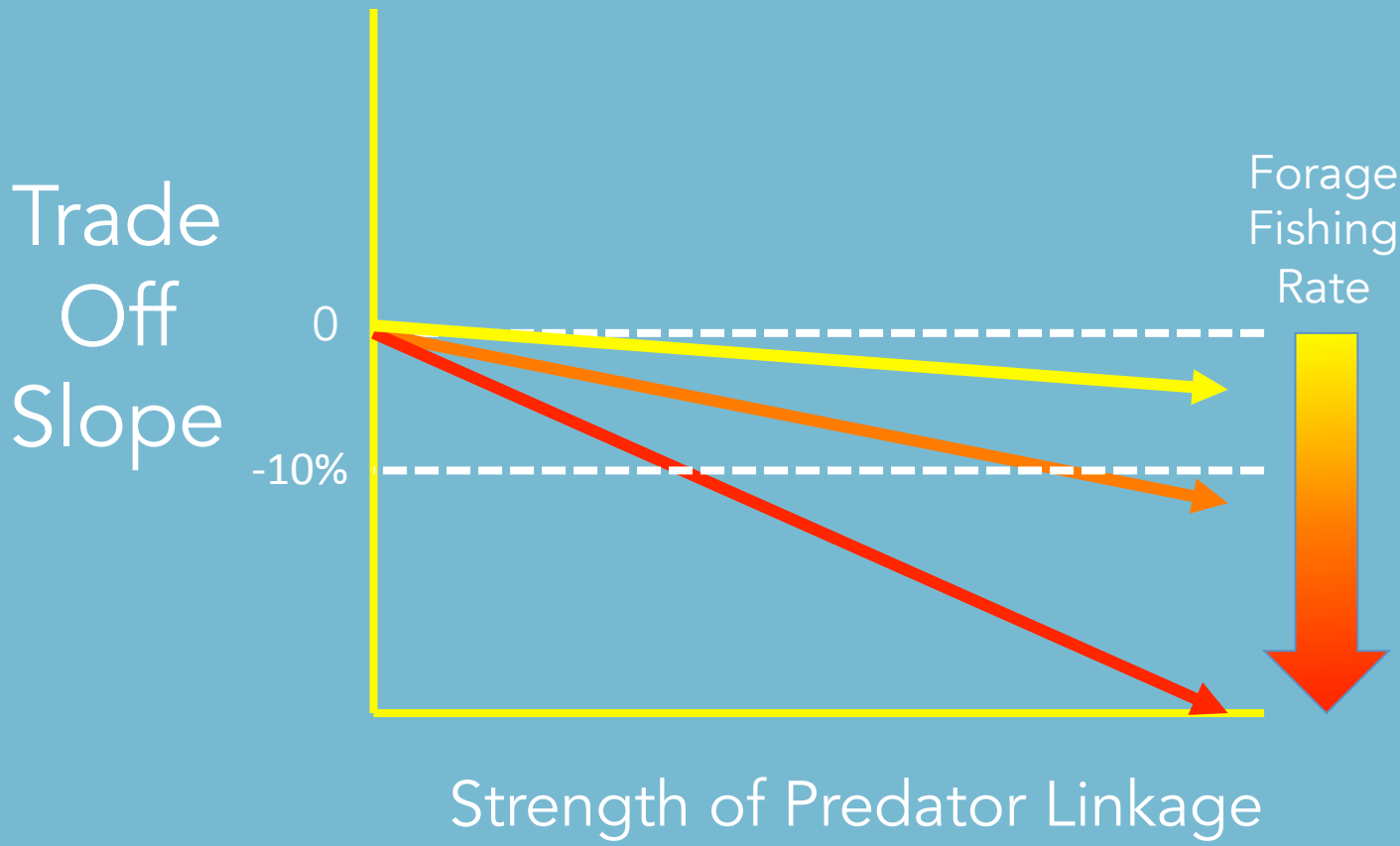
Figure 35.6. A food web for the Benguela ecosystem (modified from the web used by Field et al. (1991)).

Overview

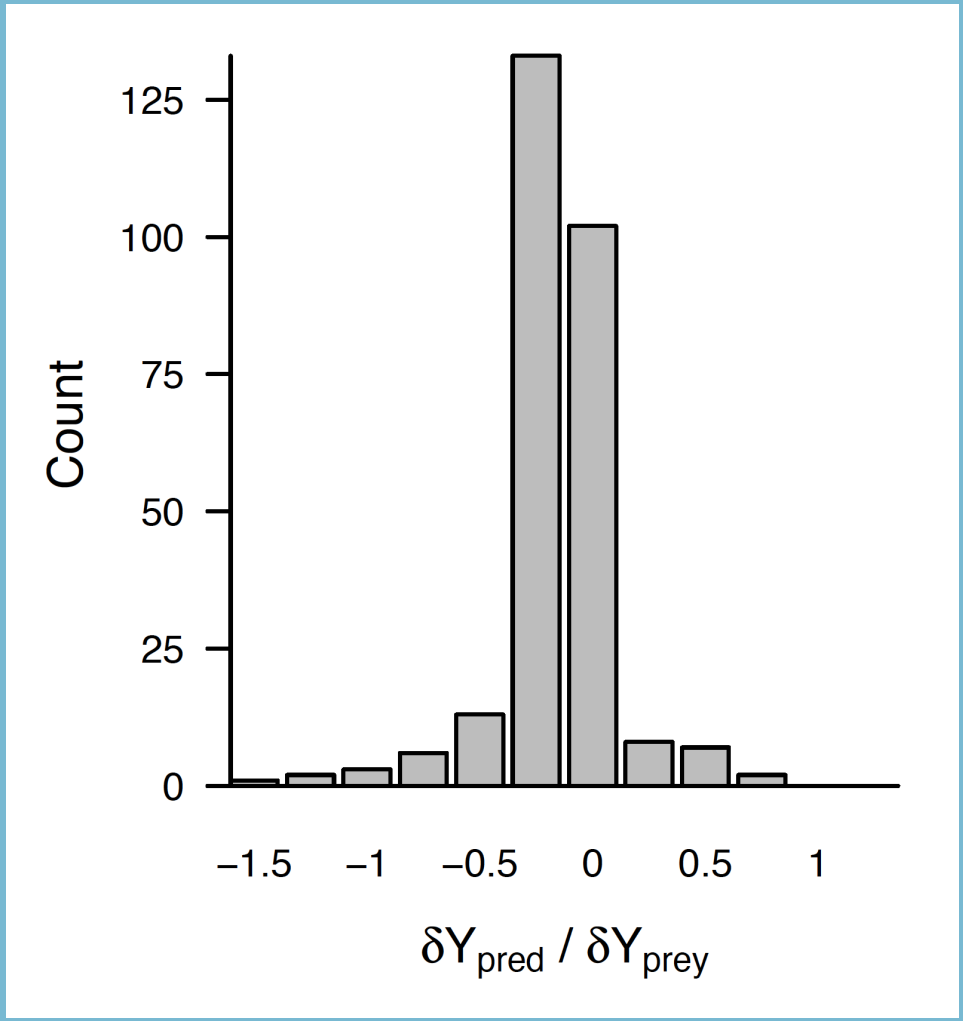

Food Web Data
Parameterization
Generalized Equilibrium Model
Assumptions
Math!
Trade-off slopes
- Yields
- Biomass
Slope
Predator yield or Biomass
Forage yield



Trade-offs Strengthen With Increased Fishing Intensity



But a lot of variability



Centered around 0

Not many HUGE trade-offs

Many POSITIVE trade-offs

Simplifying Management

- Lower target exploitation rates avoids the worst trade-offs
- Would also prevent against accidental overfishing
- Loss of yield is relatively small (25%)
  - Dynamic rules would make yield losses even smaller

Summary

- Rules of thumb to minimize trade-offs
- Screening tools to identify “key” forage
- Avoiding really BAD outcomes

WHICH SPECIES ARE "KEY"?

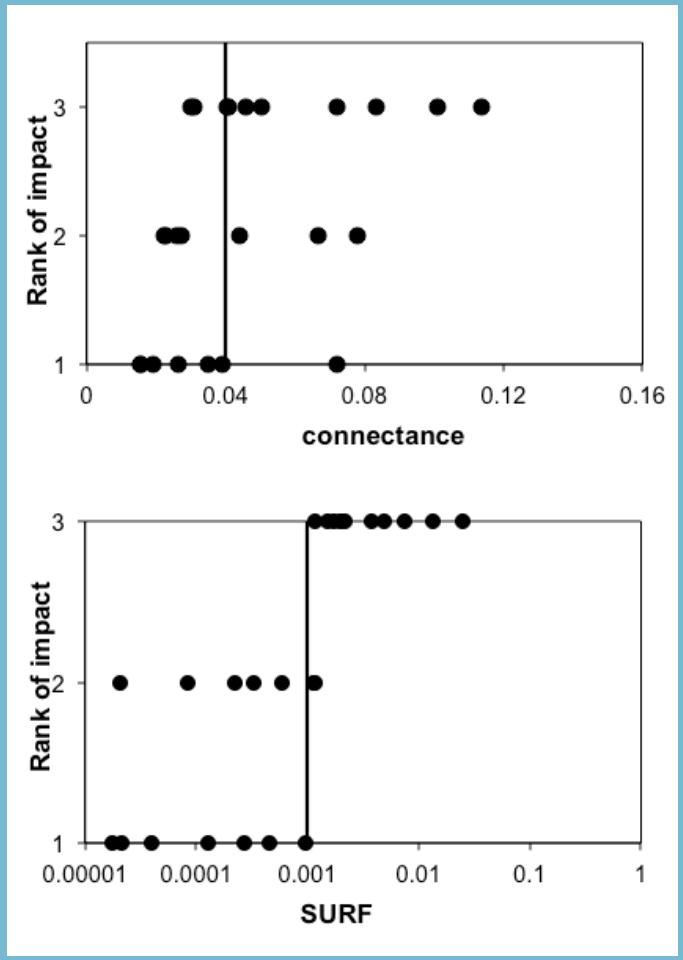
Impacts of Fishing Low–Trophic Level Species on Marine Ecosystems

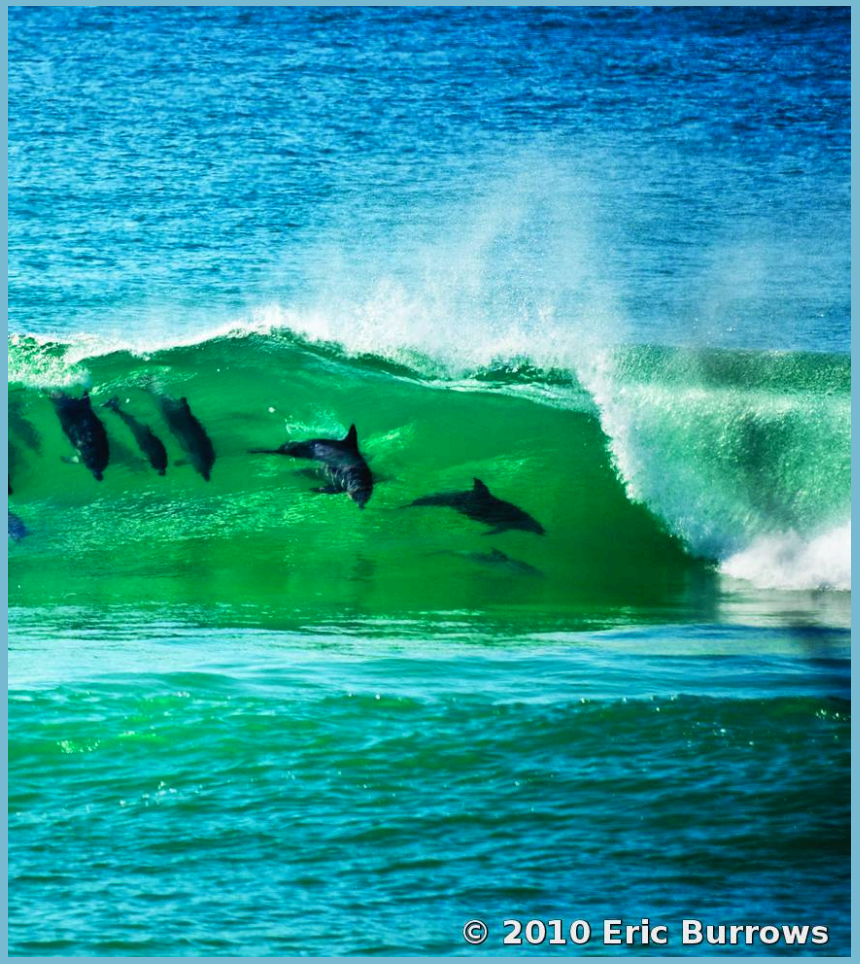
Anthony D. M. Smith,[1*] Christopher J. Brown,[2,3] Catherine M. Bulman,[1] Elizabeth A. Fulton,[1] Penny Johnson,[1] Isaac C. Kaplan,[4] Hector Lozano-Montes,[5] Steven Mackinson,[6] Martin Marzloff,[1,7] Lynne J. Shannon,[8] Yunne-Jai Shin,[8,9] Jorge Tam[10]

"When the SURF is Up, the Forage is Key"

- New index, SURF (SUpportive Role to Fisheries)
- Scales food web linkages by strength
  - "diet fraction"
  - Non linear : a few high linkages > lots of weak linkages

SURF's Up!


Rank of impact
3
2
1
0
0.04
0.08
0.12
0.16
connectance
Rank of impact
3
2
1
0.00001
0.0001
0.001
0.01
0.1
1
SURF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Summary

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- Screening tools to identify “key” forage
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1/3 FOR THE BIRDS

Global Seabird Response to Forage Fish Depletion—One-Third for the Birds

Philippe M. Cury,[1*] Ian L. Boyd,[2*] Sylvain Bonhommeau,[3] Tycho Anker-Nilssen,[4] Robert J. M. Crawford,[5] Robert W. Furness,[6] James A. Mills,[7] Eugene J. Murphy,[8] Henrik Österblom,[9] Michelle Paleczny,[10] John F. Piatt,[11] Jean-Paul Roux,[12,13] Lynne Shannon,[14] William J. Sydeman[15]

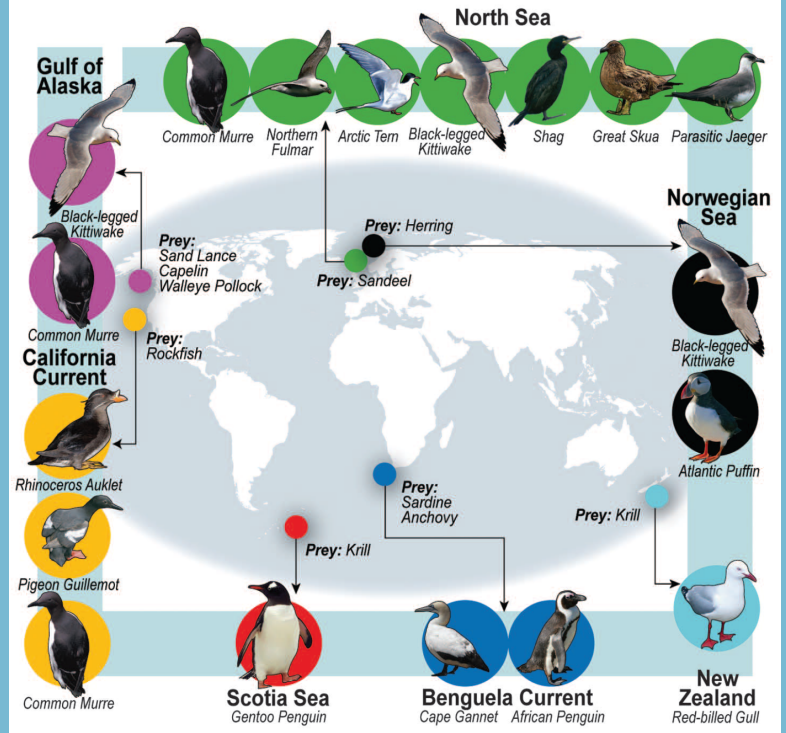
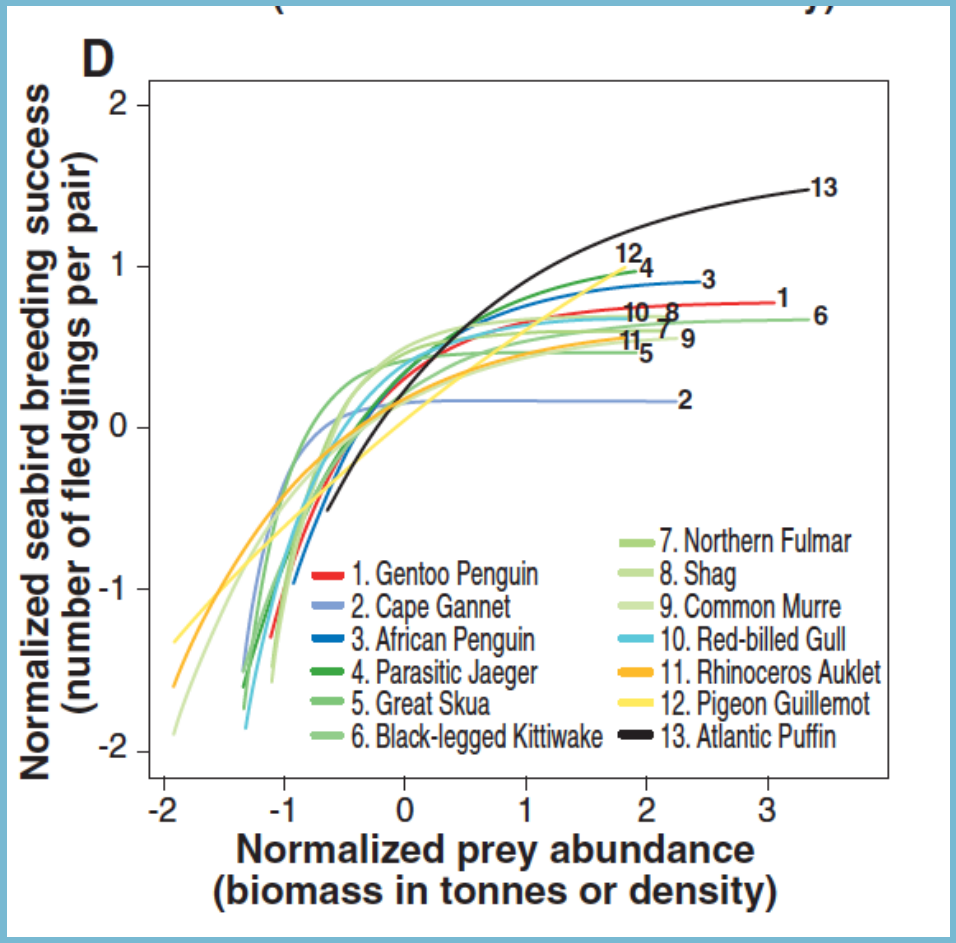
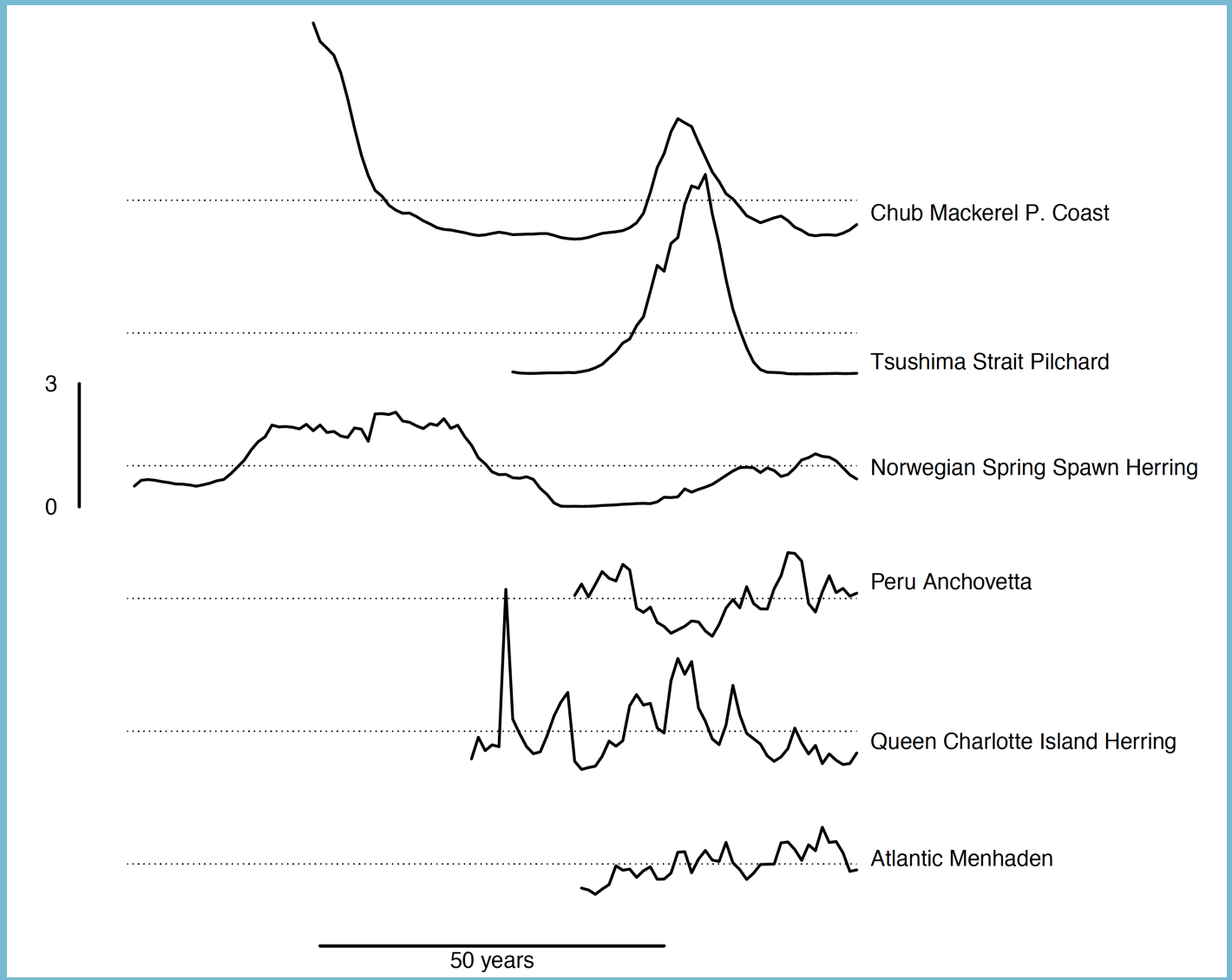


Fig. 1. Map of the distribution of seabird and prey species considered in our analysis.



...BUT FORAGE FISH ARE VARIABLE



Rules of Thumb

- During productivity peaks, business as usual
- During intermediate periods, add precaution
- Reduce harvest pressure when productivity is declining

Barriers Between Principle and Practice – How can we foster EBFM in US Fisheries

- Applying EBFM generally provides for other goals of management
- Many cases where little effect on yield
- Translation is key
  - Complexity to simplicity

Lenfest Fishery Ecosystem Plan Task Force

- "the task force will provide a blueprint for fisheries management councils in the United States to develop and implement ecosystem based fisheries management… "

Announcement Coming May 2014! http://www.lenfestocean.org/