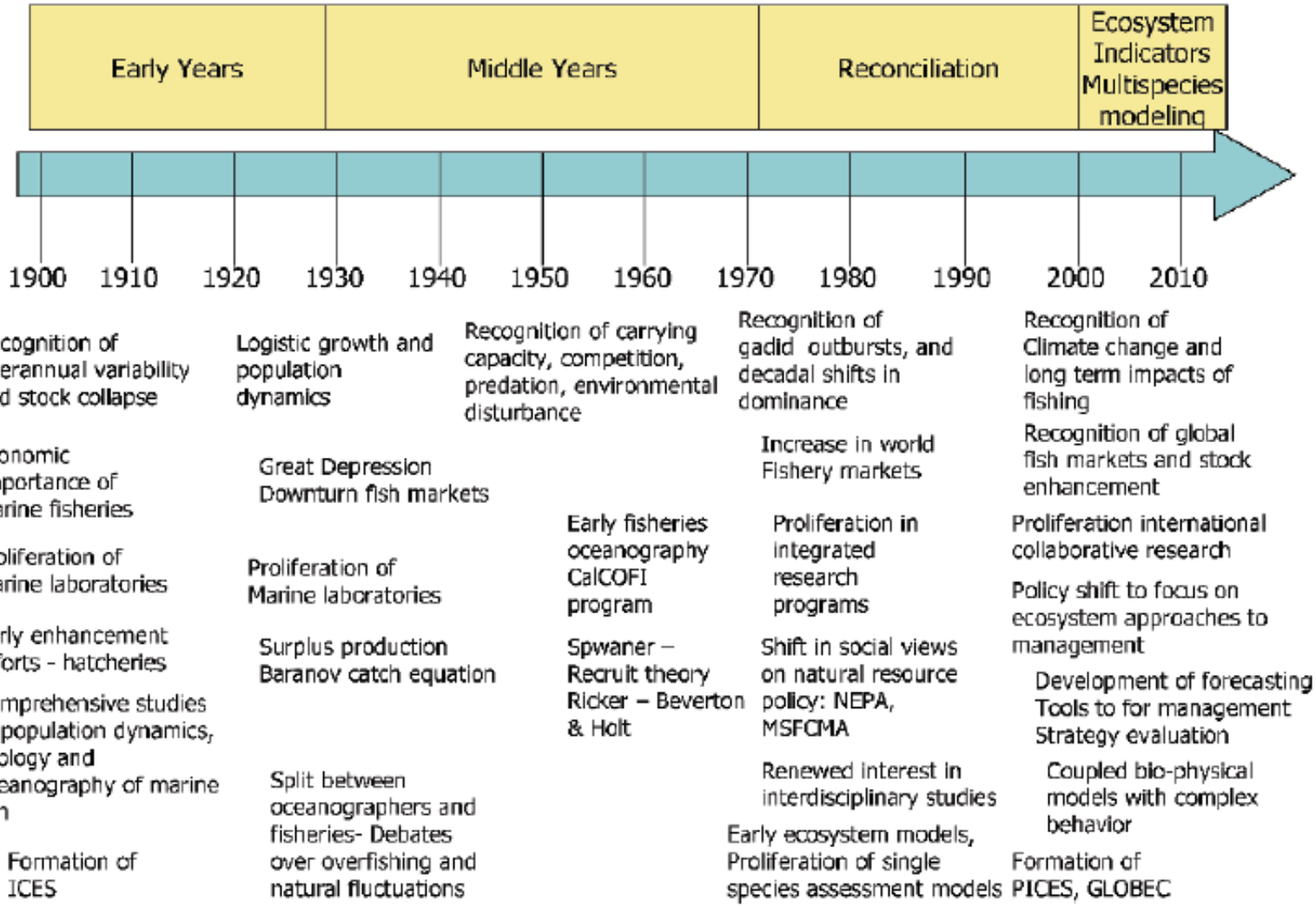
Coupling, Recruitment, Management

LO: connect bio-physical coupling to fish recruitment and resource management

Evolution of Fisheries Science



Hollowed & Bailey 2009

Magnuson-Stevens Fishery Conservation and Management Act

4 Key Research Areas:

- Research to support fishery conservation and management
- Conservation engineering research
- Research on the fisheries
- Information management research

Research Priorities for the next 5 Years

Fishery Conservation and Management

- Use a national process to expand fishery-dependent and – independent monitoring, including catch, abundance, and biological data collection to increase the number of stocks with adequate assessments;
- Use a national process to prioritize the frequency and analytical complexity of stock assessments based on objective criteria (e.g., fishery and ecosystem importance, stock status, biology and assessment history);
- Support the development and standardization, where possible, of stock assessment methods to deliver timely and efficient assessments;
- Incorporate ecosystem factors (e.g., climate, habitat and predator-prey dynamics) in key stock assessments;
- Employ advanced sampling technologies to facilitate sampling in inaccessible habitats, collecting multi-species data, and estimating the absolute abundance of certain stocks;
- Expand surveys of stocks experiencing climate-related distributional shifts. These efforts will support climate-ready fisheries management and ensure long-term sustainability of commercial and recreational fisheries, protected species, and the communities that depend on them; and
- Support enhanced decision analysis tools (e.g., management strategy evaluations[6]) to establish appropriate management decisions that consider and respond to socioeconomic and ecosystem-level dynamics.

Arctic Questions: Atlantic Perspective

How have changes in Arctic climate affected the supply of freshwater to the shelf ecosystems of the Northwest Atlantic?

Atmosphere Response to Climate: NAO altered atmospheric circulation; anthropogenic influences on cycles

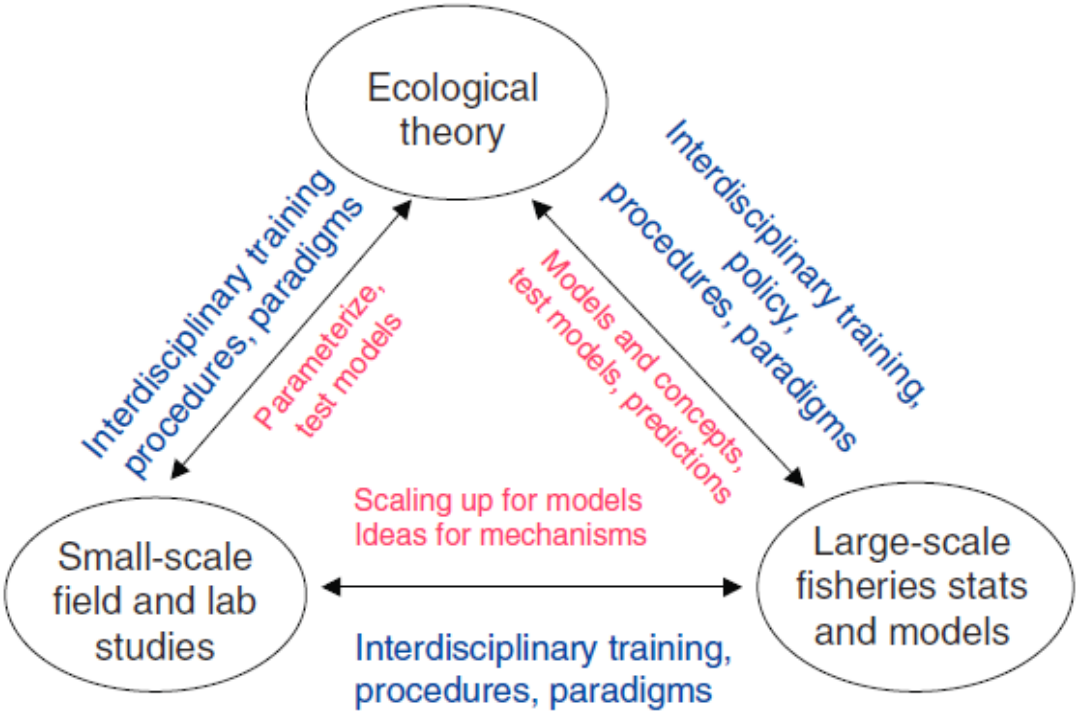
Ocean Response to Climate; ocean circulation respond to atmospheric circulation; Beaufort gyre changes; Atlantic water and freshwater input flows; salt budgets; connections to Pacific water

How does freshwater export from Arctic Ocean impact NW Atlantic Ecosystems?

Physical Oceanography: route and effect of freshwater from Fram Strait; salinity anomaly movements

Biological Oceanography: remote forcing influence spatiotemporal patterns of blooms; biological responses to temperature changes; NAO effects on temp, nutrient, and light conditions

Climate & Fisheries Approaches



- recognition of scale differences
- can be conducted independently
- catalysts for advances:

interdisciplinary training,

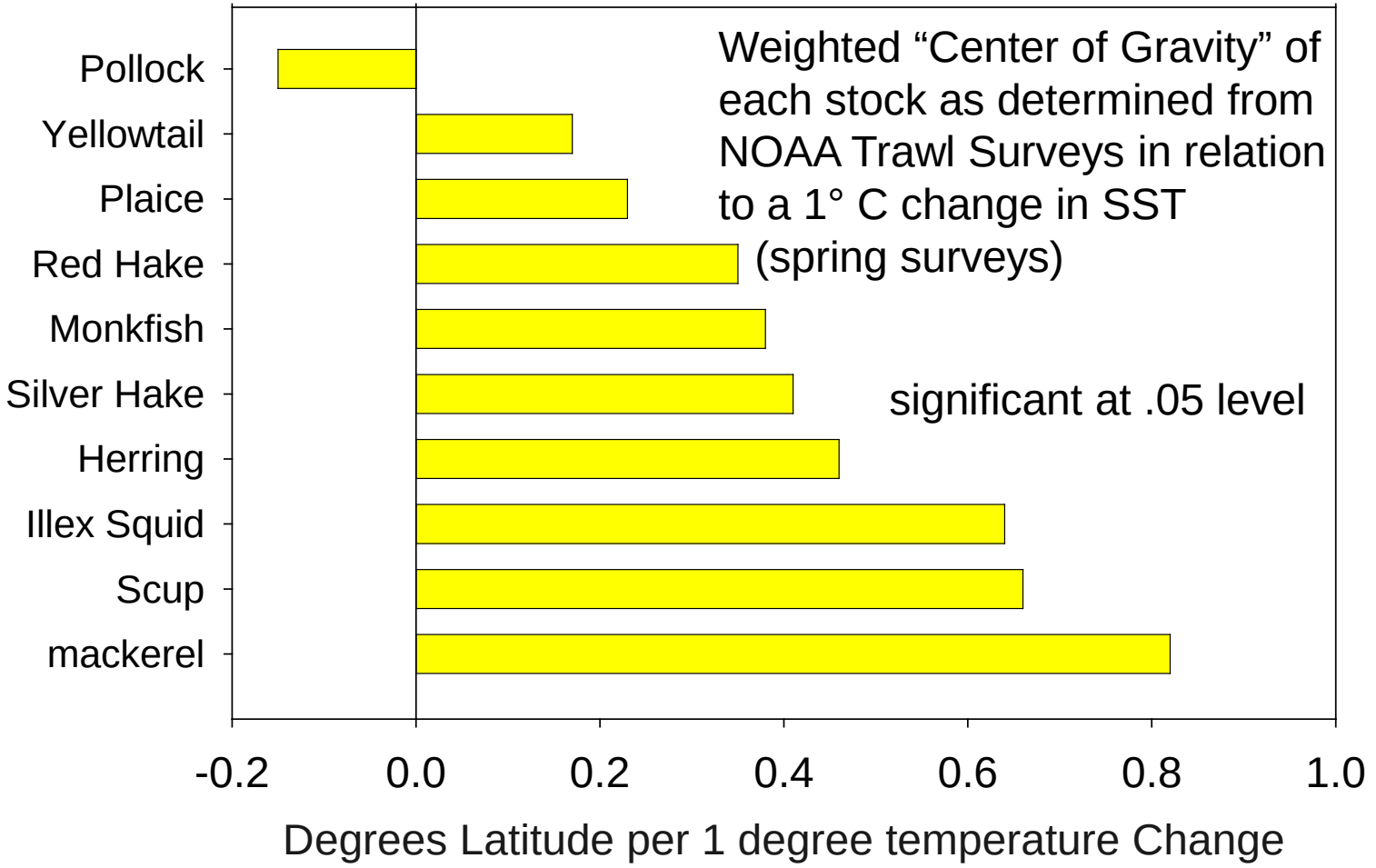
changes in marine policy,

advances in technology and philosophy

Hollowed & Bailey 2009

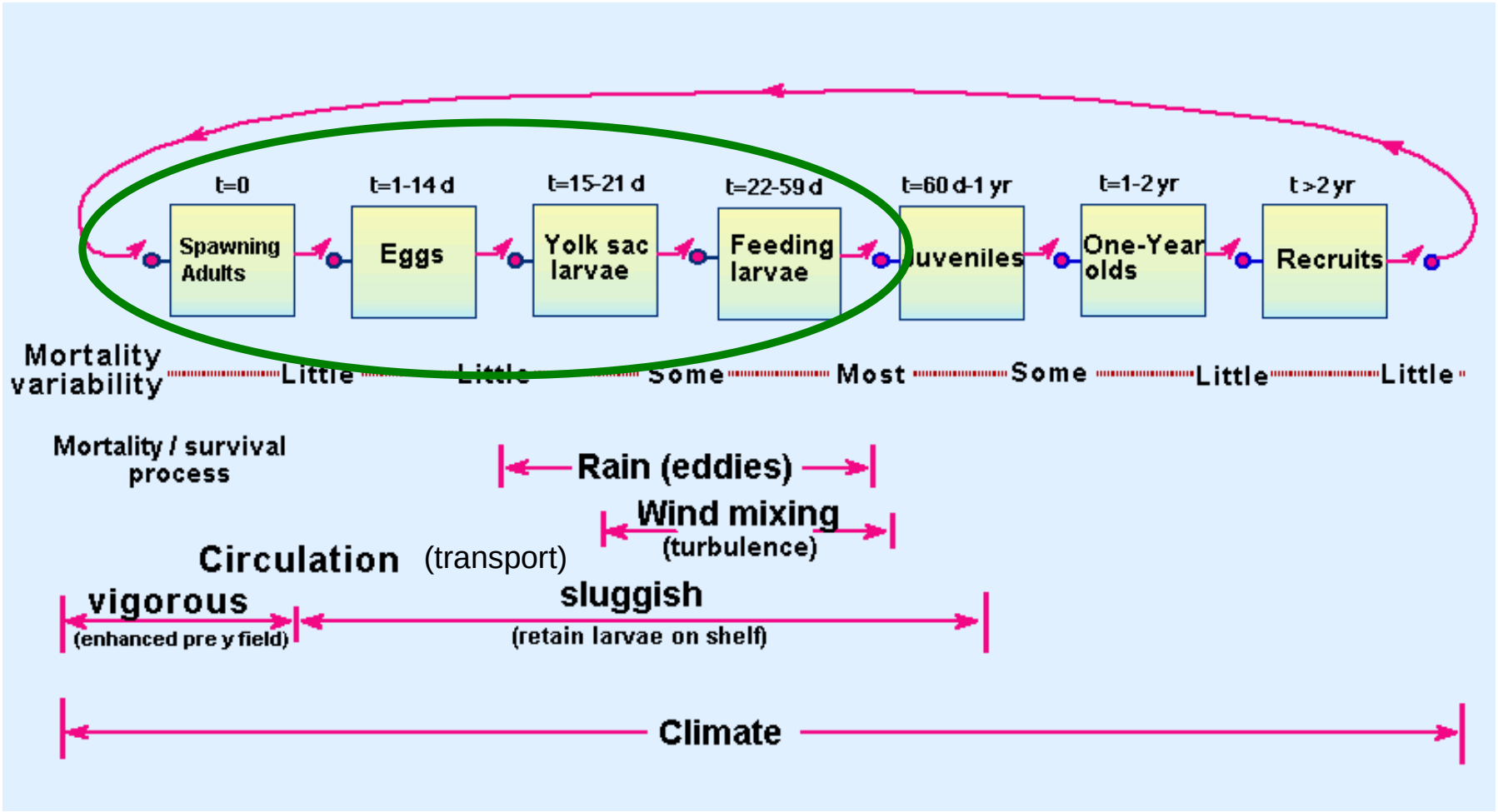
Warming Seas: Changing Distributions

Atlantic Ocean



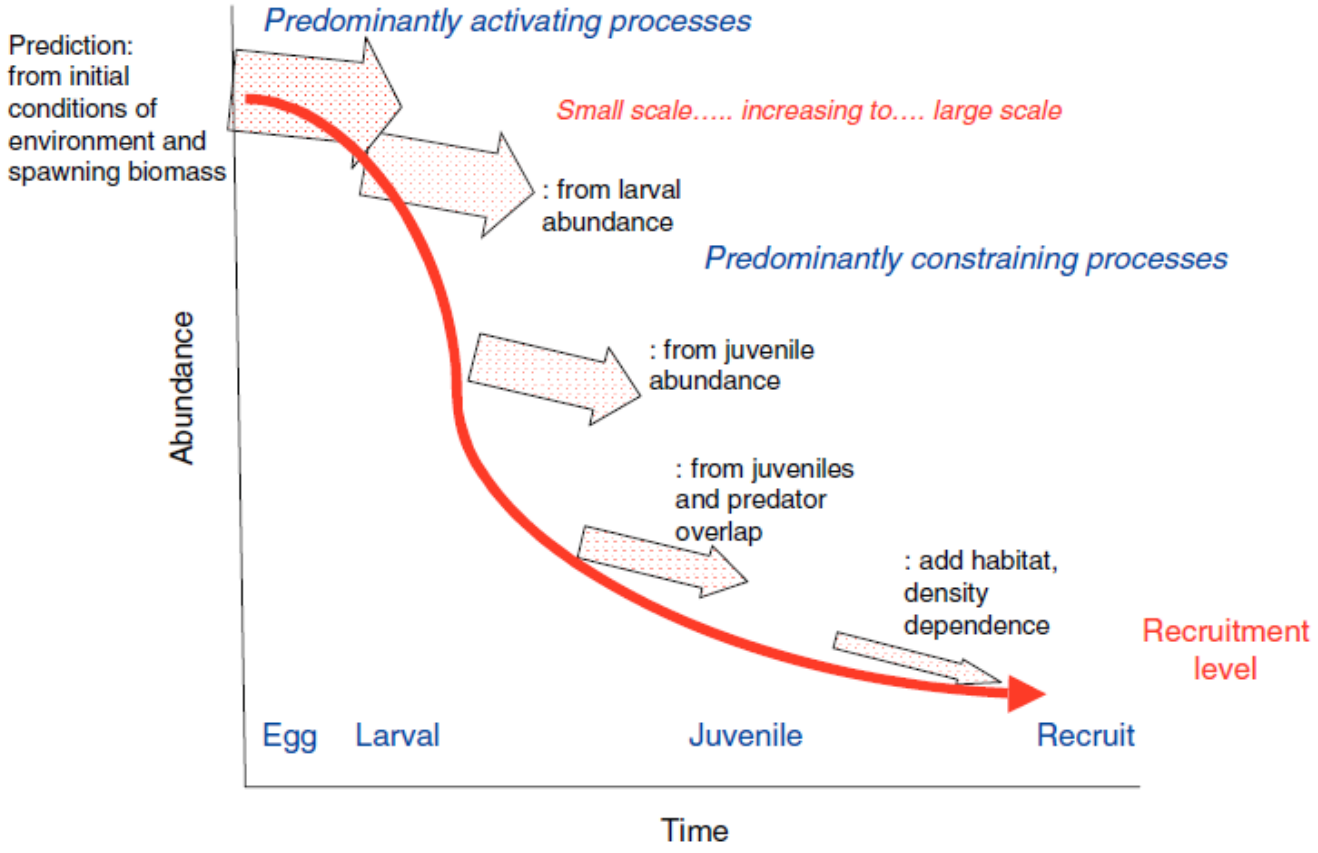
Murawski 1993

Switch model



Megrey and Macklin, 2007

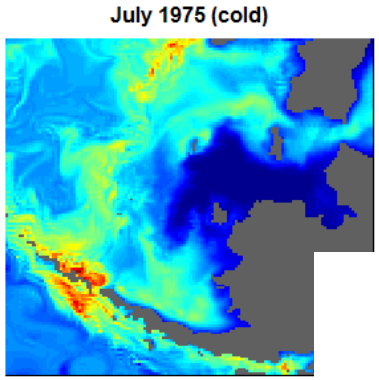
Refinement of Recruitment Indices

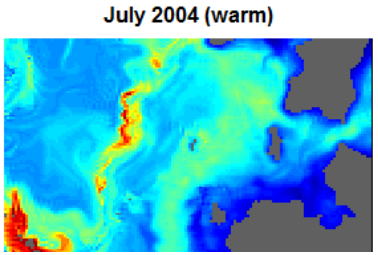


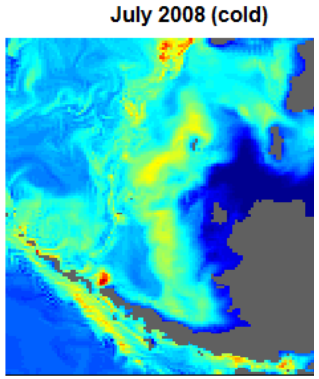
- adjust index at each life stage

Hollowed & Bailey 2009

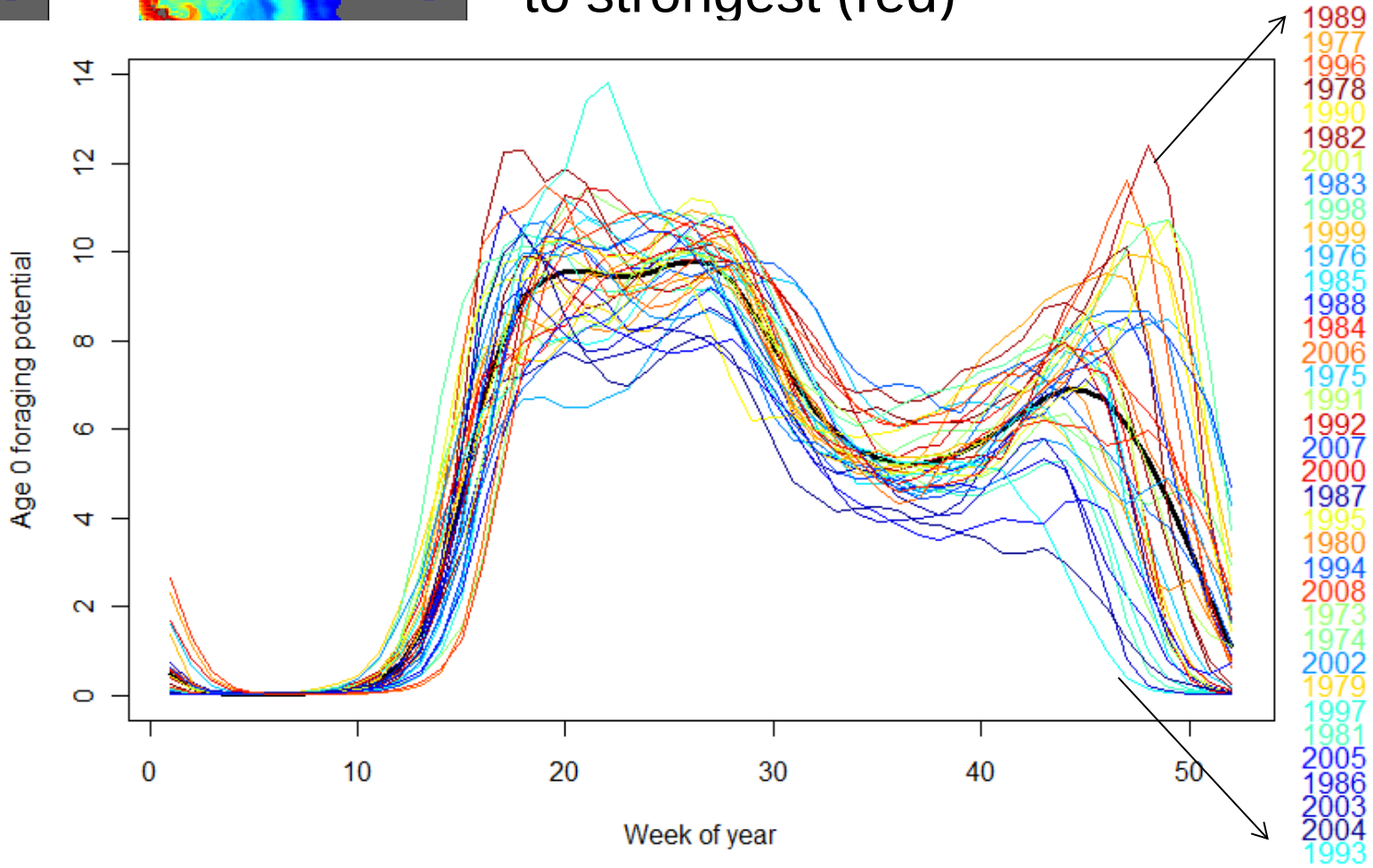
Forecasting Recruitment



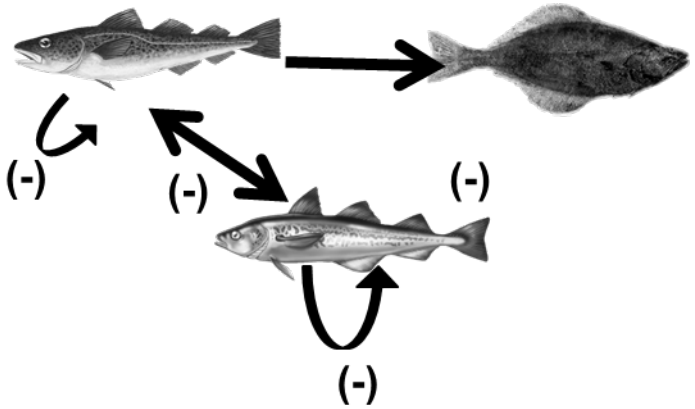


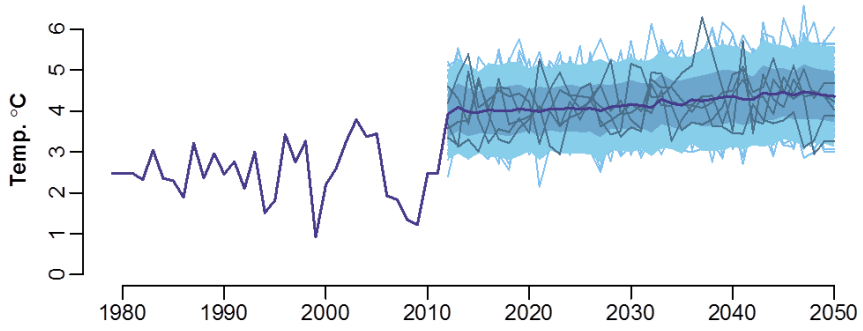


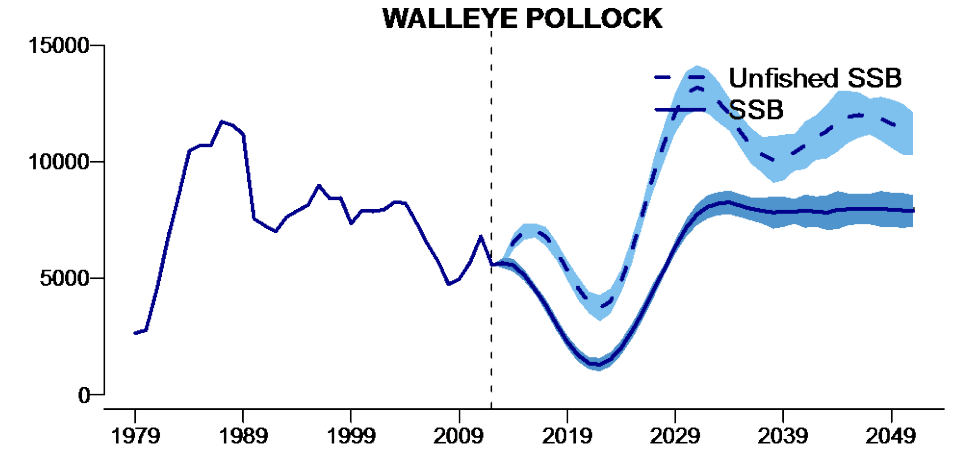
Colors: ranked stock-assessment year-class strength from weakest (blue) to strongest (red)

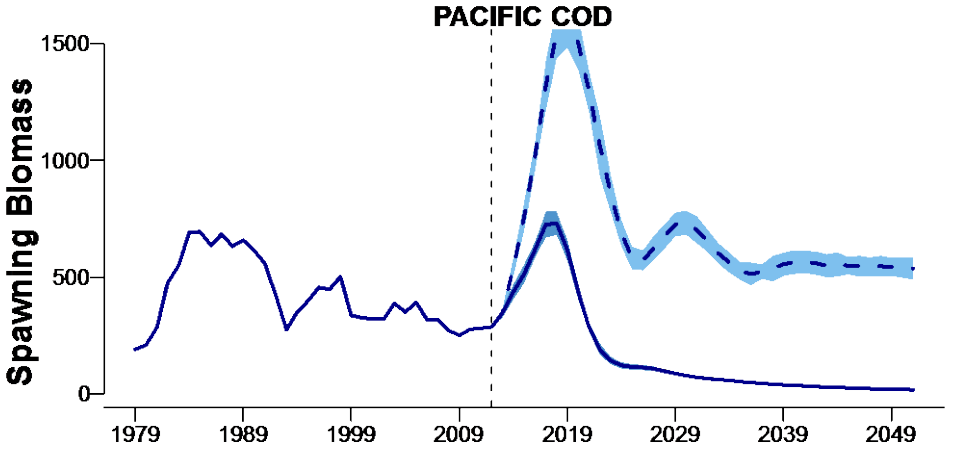


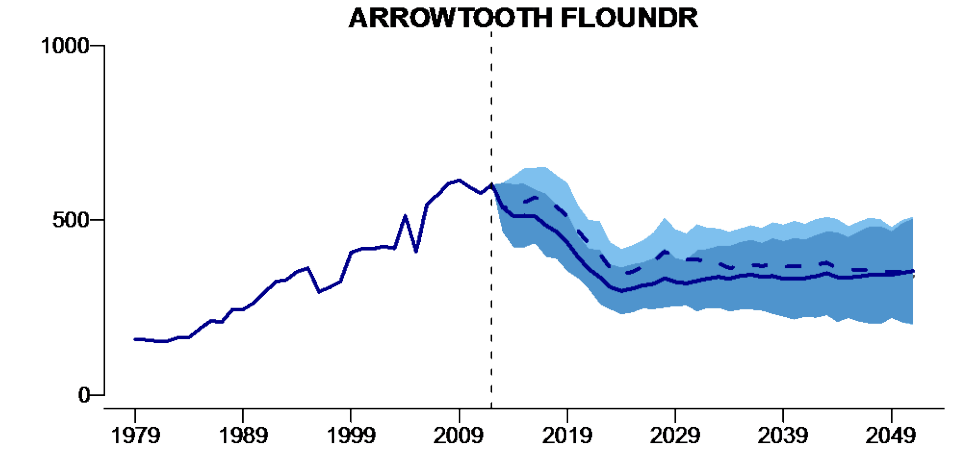
Fisheries Forecasts











What Have We Seen?

Scale
Ocean Dynamics
Processes: fecundity, spawning, feeding, growth, mortality, kinematics
Biological-Physical Coupling
Recruitment
Population Abundance Indices
Technology

Multispecies Modeling
Ocean Acidification
Climate Change

Field and Lab Equipment Costs

Estimated costs of field and laboratory gear		
Item	Cost	Comments
Boat 60'	6,000 /day	day trips from a port in Alaska
Boat 90'	10,000 /day	live aboard 3 scientists, 2 or 3 deckhands
Boat 120'	12,000 /day	live aboard 6 scientists, 3 deckhands
Midwater trawl	10,000	includes rigging and liner
Bottom trawl	12,000	includes rigging and liner
Doors for net	8,000	boat may have suitable doors
Zooplankton bongo	3,300	includes 333 mesh, codend, flowmeter
Zooplankton multinet	125,000	estimate with deck box and flowmeter
Tucker trawl	6,700	3 nets, 333 mesh
CTD	12,000	includes cage
CTD + Chlor A	14,000	includes cage + fluorometry
Rosette water sampling	25,000	would need to add CTD
Acoustic echosounder	125,000	2 frequency system
Acoustic echosounder	250,000	4 frequency system
Lab Space (FHL)	200 /week	doesn't include housing costs