Science, Service, Stewardship

Projecting U.S. west coast sablefish (*Anoplopoma fimbria*) recruitment under global climate change scenarios

Melissa A **Haltuch**[1], Nicholas A Bond[2], Ian J Stewart[1],Michael J Schirippa[3]

[1]NOAA-Fisheries, Northwest Fisheries Science Center, Seattle, WA, USA
[2] University of Washington, JISAO, Seattle, Washington, USA
[3] NOAA-Fisheries, Southeast Fisheries Science Center, Miami, FL, USA

July 24, 2012

NOAA FISHERIES SERVICE

NOAA FISHERIES SERVICE

Background

- Widely distributed across the NE Pacific
- US west coast treated as a single stock
- Winter deep water spawners
- Pelagic larvae inhabit offshore waters before migrating inshore to settle as demersal juveniles

Photo: Wade D. Smith

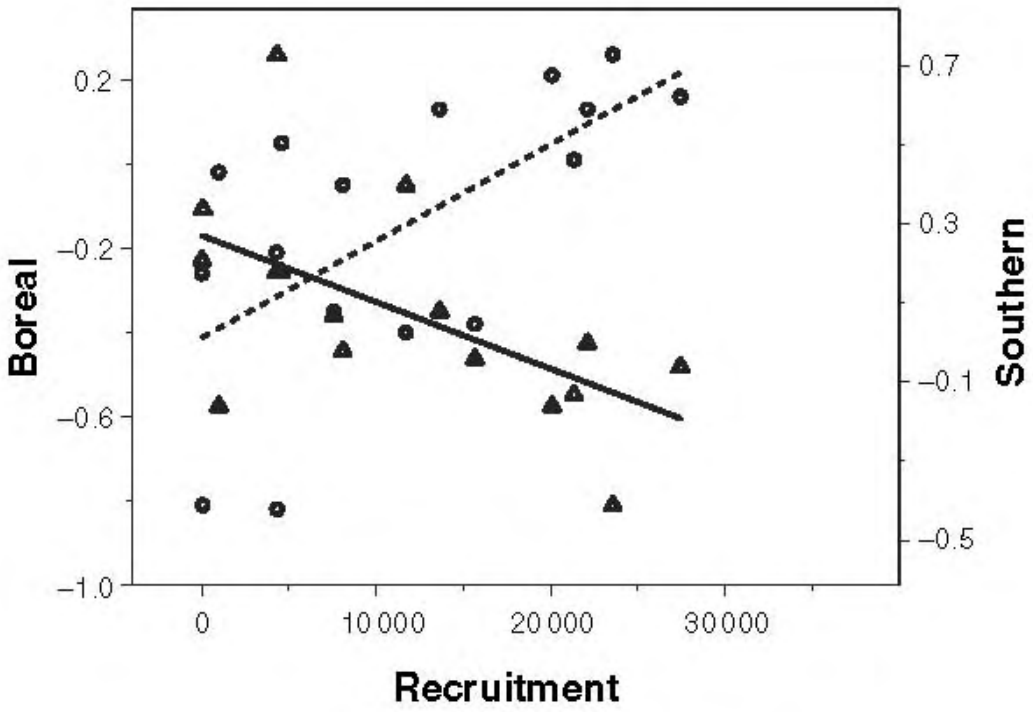
NOAA FISHERIES SERVICE

Environmental Drivers of Recruitment

- Zooplankton abundance
  (Schirripa and Colbert, 2006)

Mechanism:

- Sablefish recruitment is driven by feeding conditions during the pelagic life stages.
- Feeding conditions can be indexed by sea level.



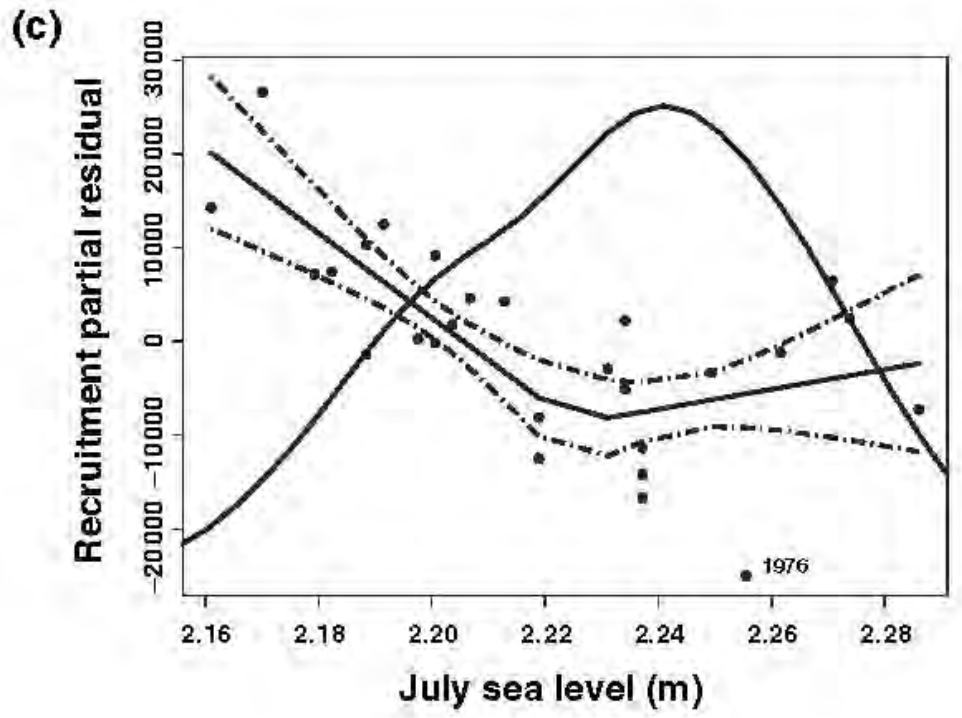
NOAA FISHERIES SERVICE

Environmental Drivers of Recruitment

- July sea level in Crescent City, CA (Schirripa and Colbert, 2006)

  —Tide Gauge

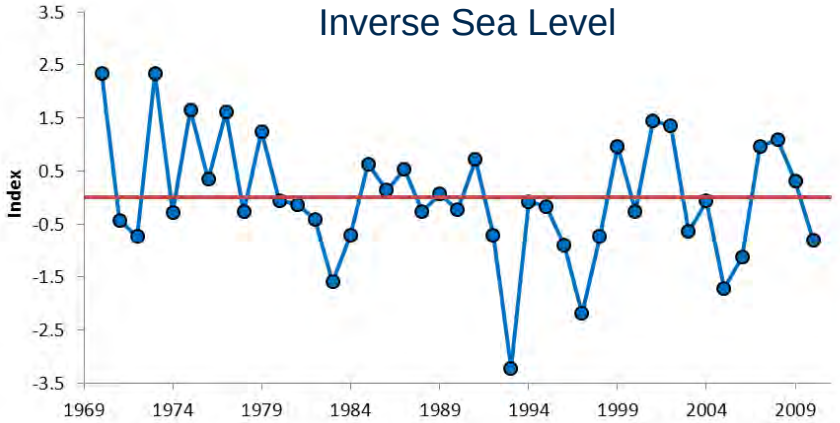
- Sea level integrates regional wind forcing, temperature anomalies, and coastally trapped phenomena

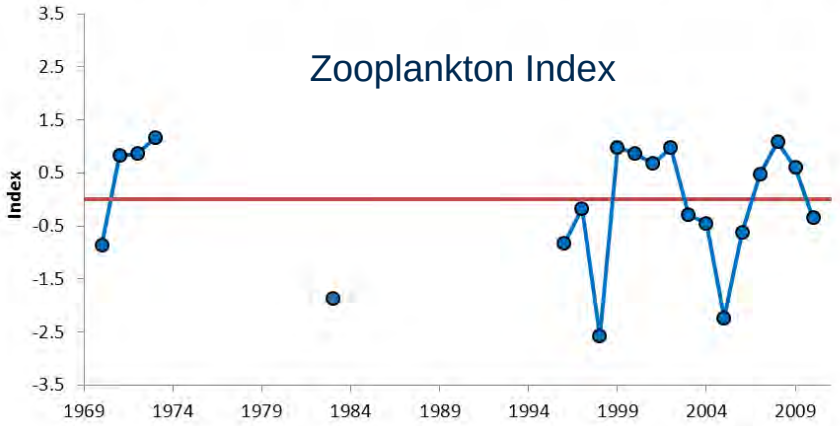


NOAA FISHERIES SERVICE

Stock Assessment Applications

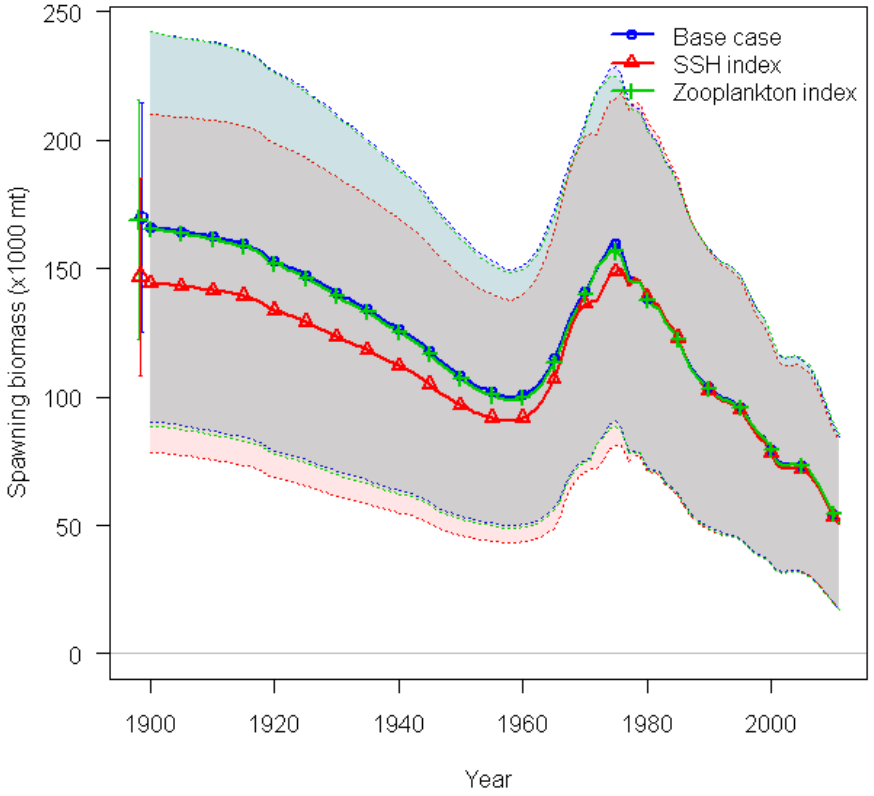
- 2005, 2007, 2011 applications
- Continuing validation
  - Bootstrap, jackknife, and removal of recent values (Schirripa and Colbert 2006, Schirripa 2007).
  - Randomization tests (Stewart et al., 2011).
- 2007, 2011 stock assessments considered the April-June average sea level between Newport, OR and Neah Bay, WA.
- ~35% of the variance in recruitment explained

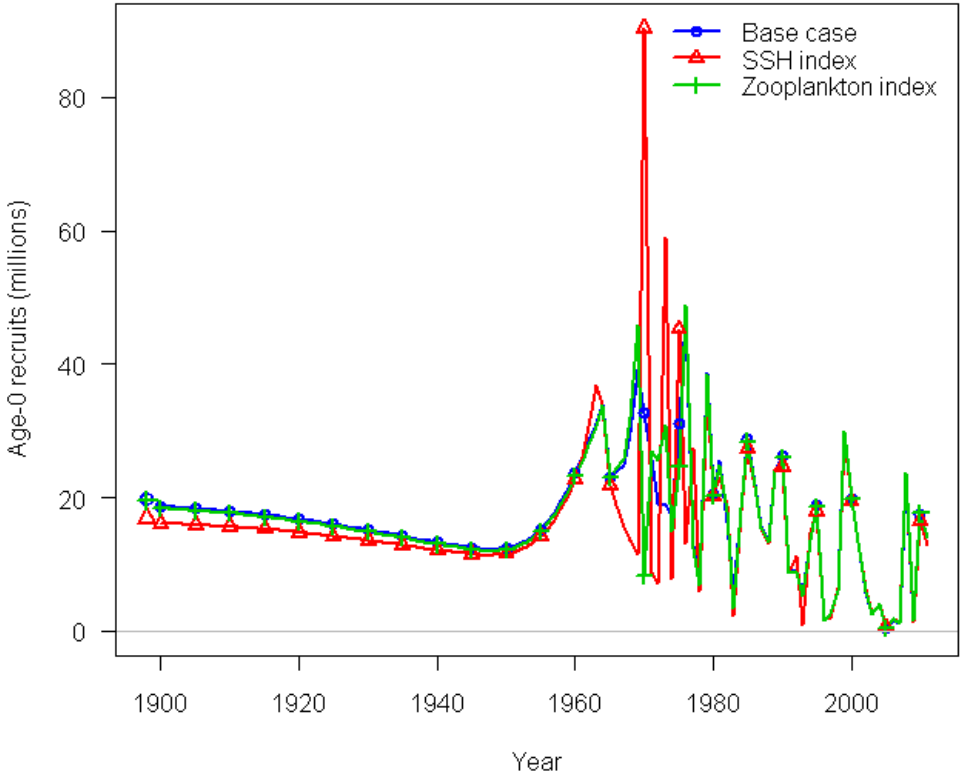




NOAA FISHERIES SERVICE

2011 Stock Assessment Results: Sea level as a Survey Index of Recruitment





NOAA FISHERIES SERVICE

Motivation

- Uncertainty in future environmental conditions of the California current ecosystem should be considered a significant source of uncertainty in all projections of stock status.
- IPCC GCMs can provide projections of future environmental conditions that are relevant to sablefish.
- Identifying changes in productivity before they occur can allow for improved management/industry planning.

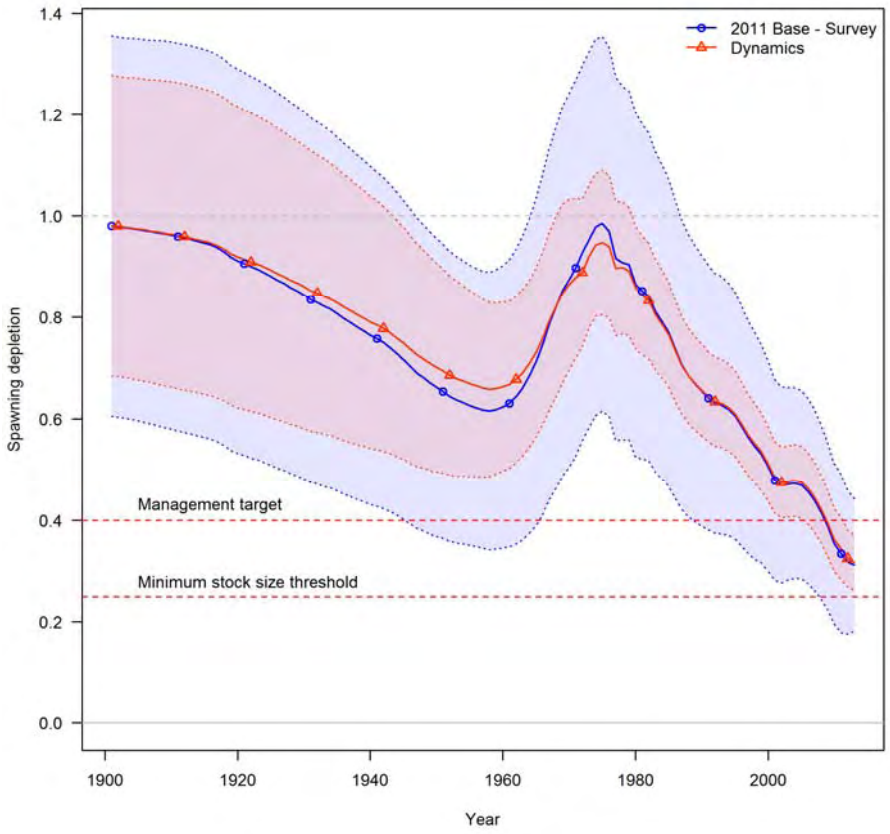
NOAA FISHERIES SERVICE

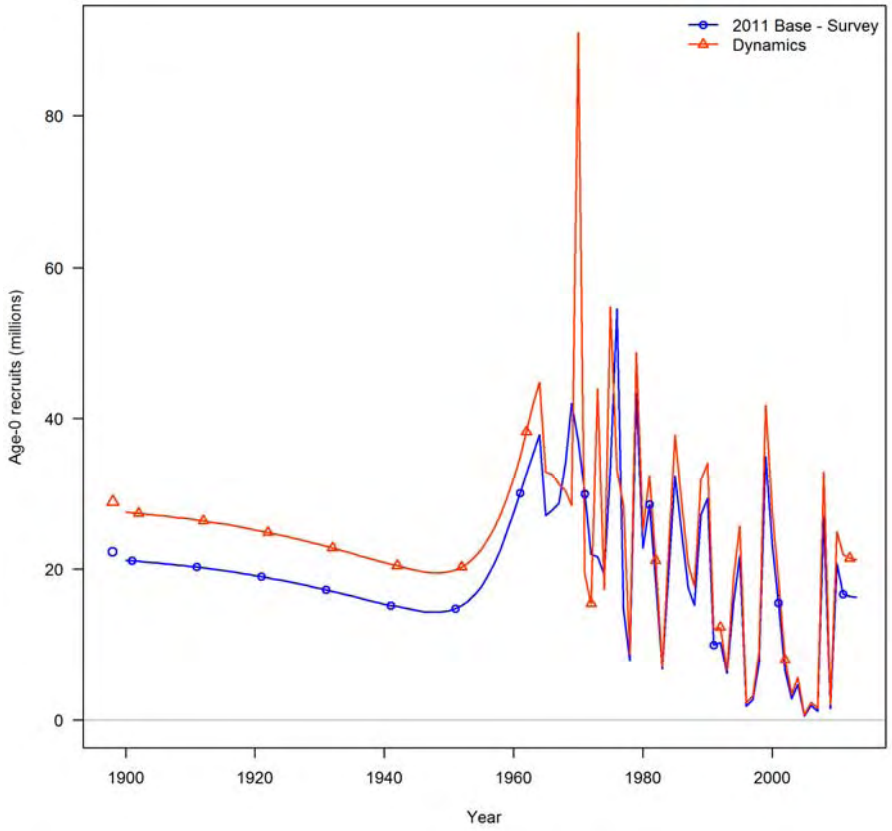
Goals

1. Investigate the ability to move from the currently used local environmental covariate and larger scale sources of sea level information such as those produced by SODA for past conditions and IPCC-class climate models for future conditions.
2. Produce long term projections of the sablefish population under alternative global climate change scenarios using the 2011 stock assessment to assess possible directional changes in sablefish recruitment on multi-decadal time scales.

NOAA FISHERIES SERVICE

Modeling stock-recruitment-sea level: Population dynamics

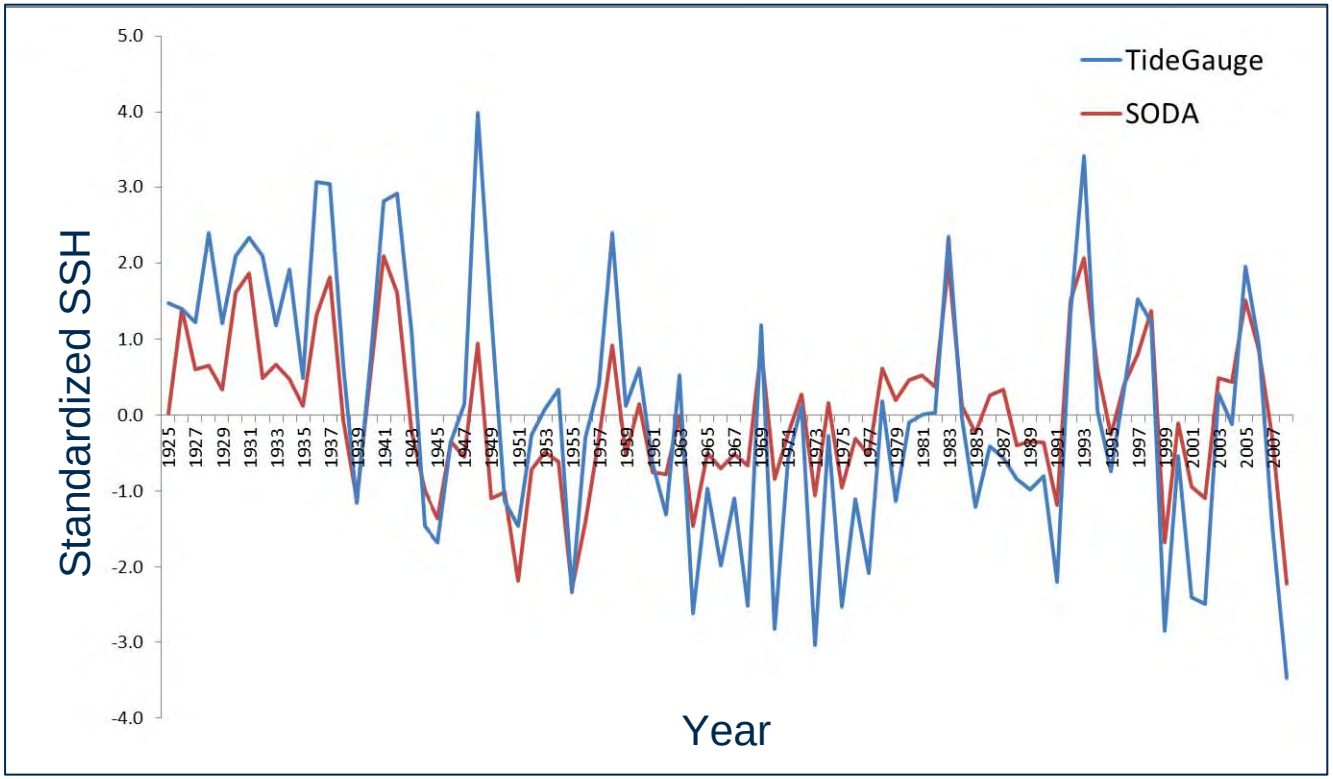




NOAA FISHERIES SERVICE

Local v. large scale sea level

Historical Time Series



NOAA FISHERIES SERVICE

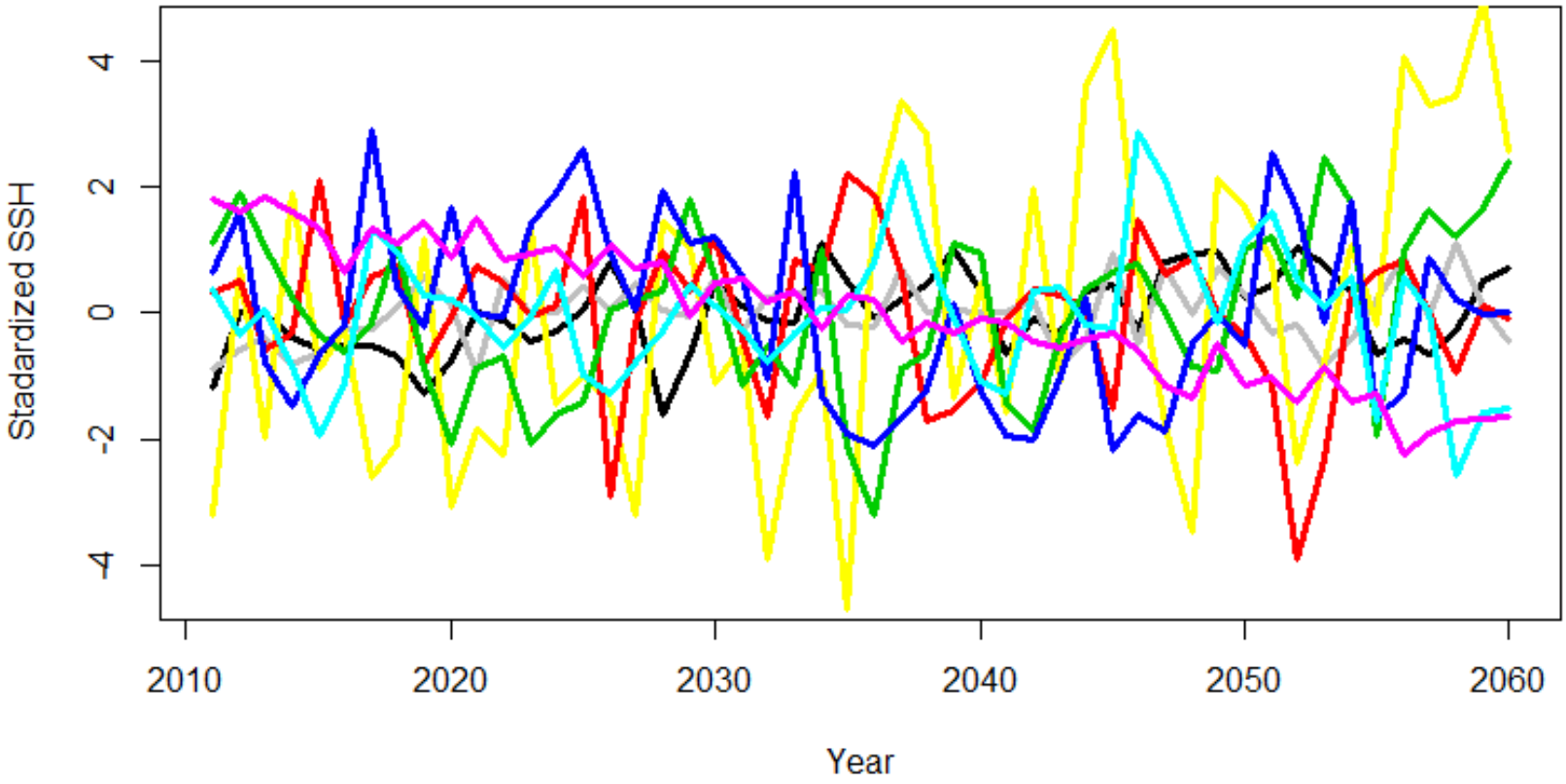
GCMs with Monthly Sea Level

Overland and Wang (2007)

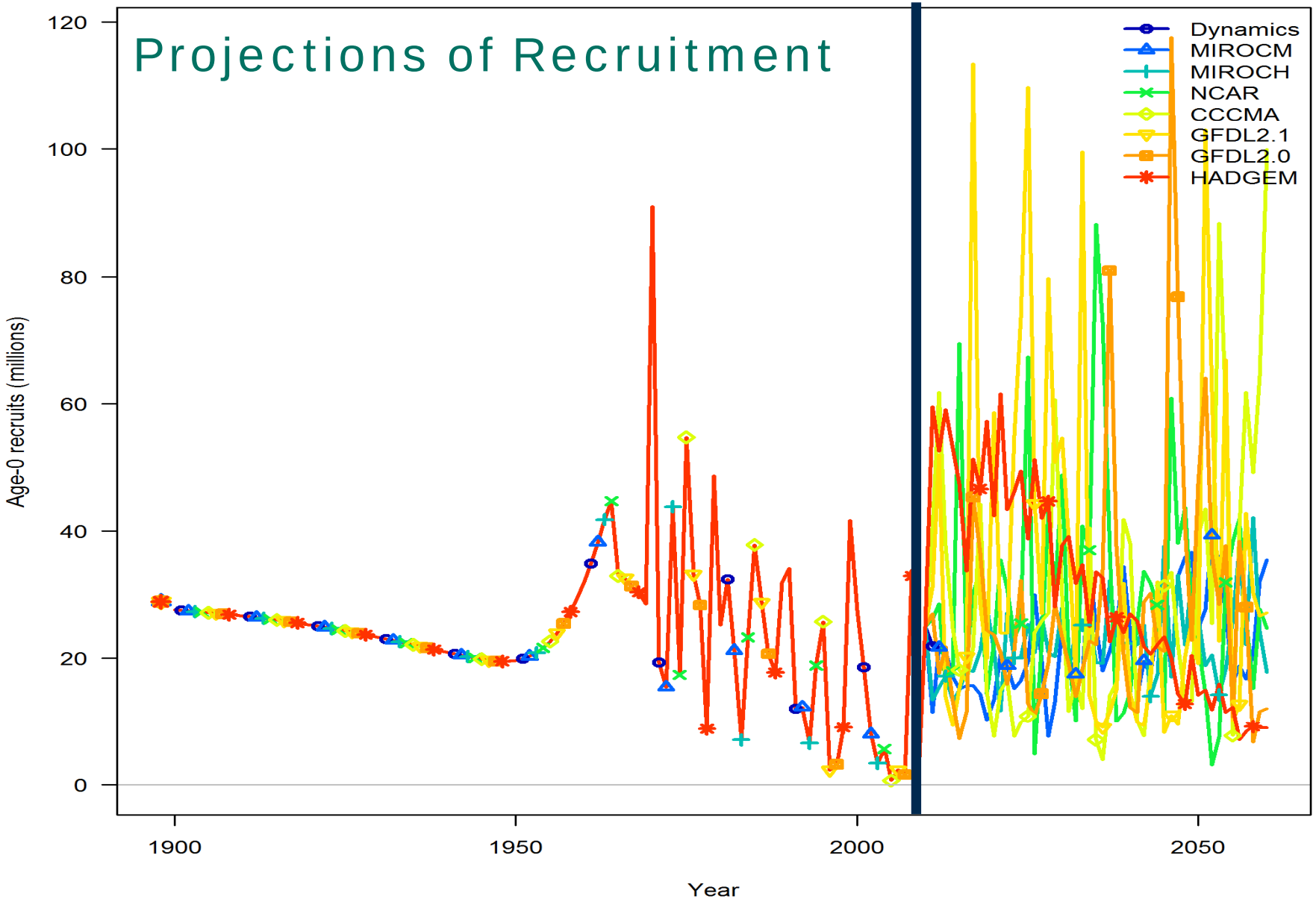
Model	A1B	1B
NCAR CCSM3	x	x
CCCMA-T47	x	x
GFDL2.0	x	x
GFDL2.1	x	x
Miroc-H	x	x
MRI	x	x
HADGEM1	x	
Miroc-M	x	x
CCCMA-T63		
Echo-G		

NOAA FISHERIES SERVICE

IPCC sea level: A1B



Projections of Recruitment



NOAA FISHERIES SERVICE

Conclusions

- Projections assumption of stationary in sea level-recruitment relationship
- Single species stock assessments have the ability to incorporate environmental relationships.
- Utility of the relationship is in the application to long term strategic projections
- Sablefish recruitment under a1b scenario likely to be variable but does not generally show strong trends