Changes in the Mt. Hope Bay finfish community in relation to Brayton Point Power Station operations

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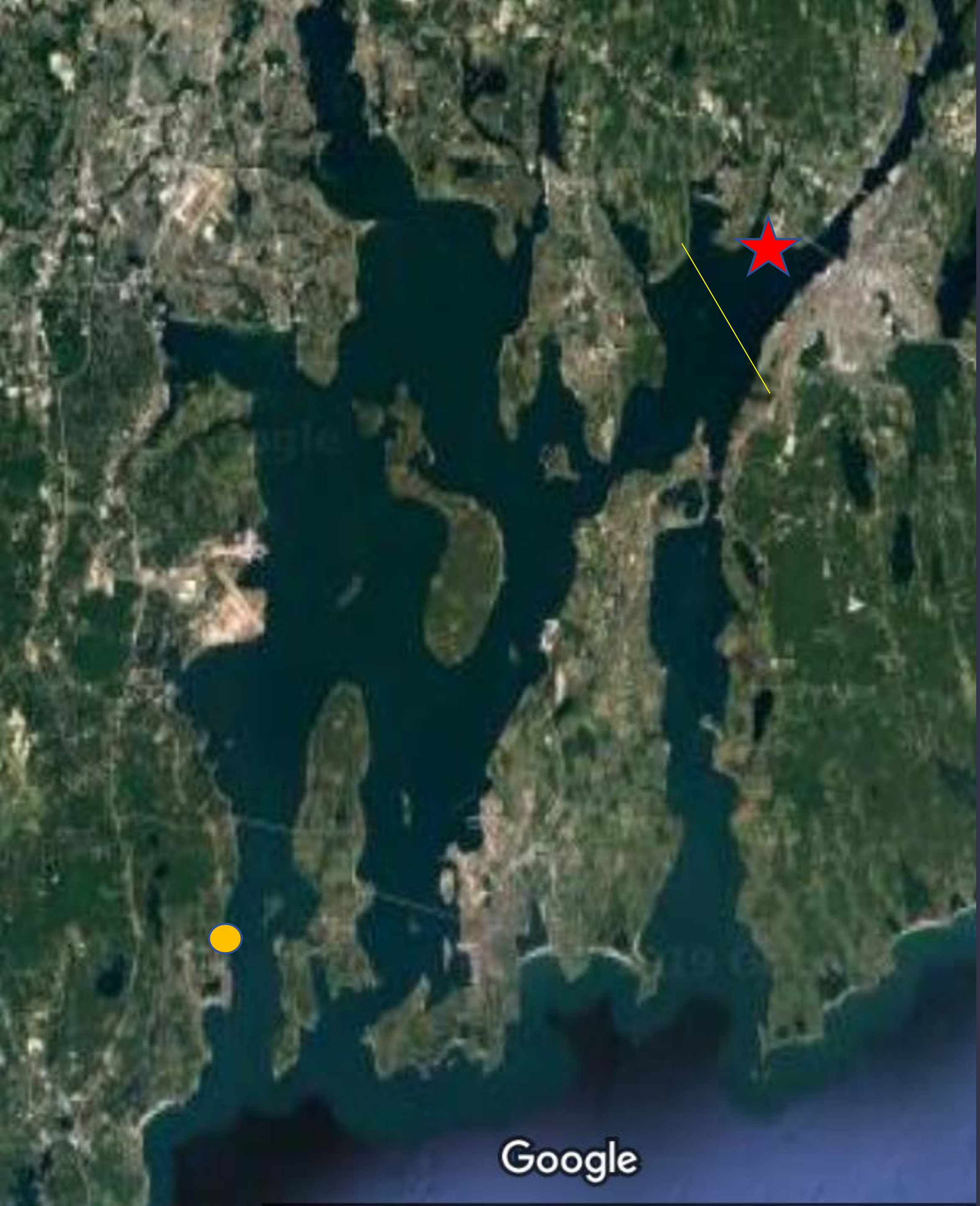
RIMFI

December 3, 2019



Brayton Power Power Station

- Somerset, MA
- Largest coal-fire generating station in New England
  - Powered by coal, natural gas, and oil
- Operational 1963-2017

1963-commissioned

1964-Unit 2

1969-Unit 3

1985-Unit 4 (open cycle)

1995-RI DEM report (Gibson)

2003- new EPA permit: must reduce water intake

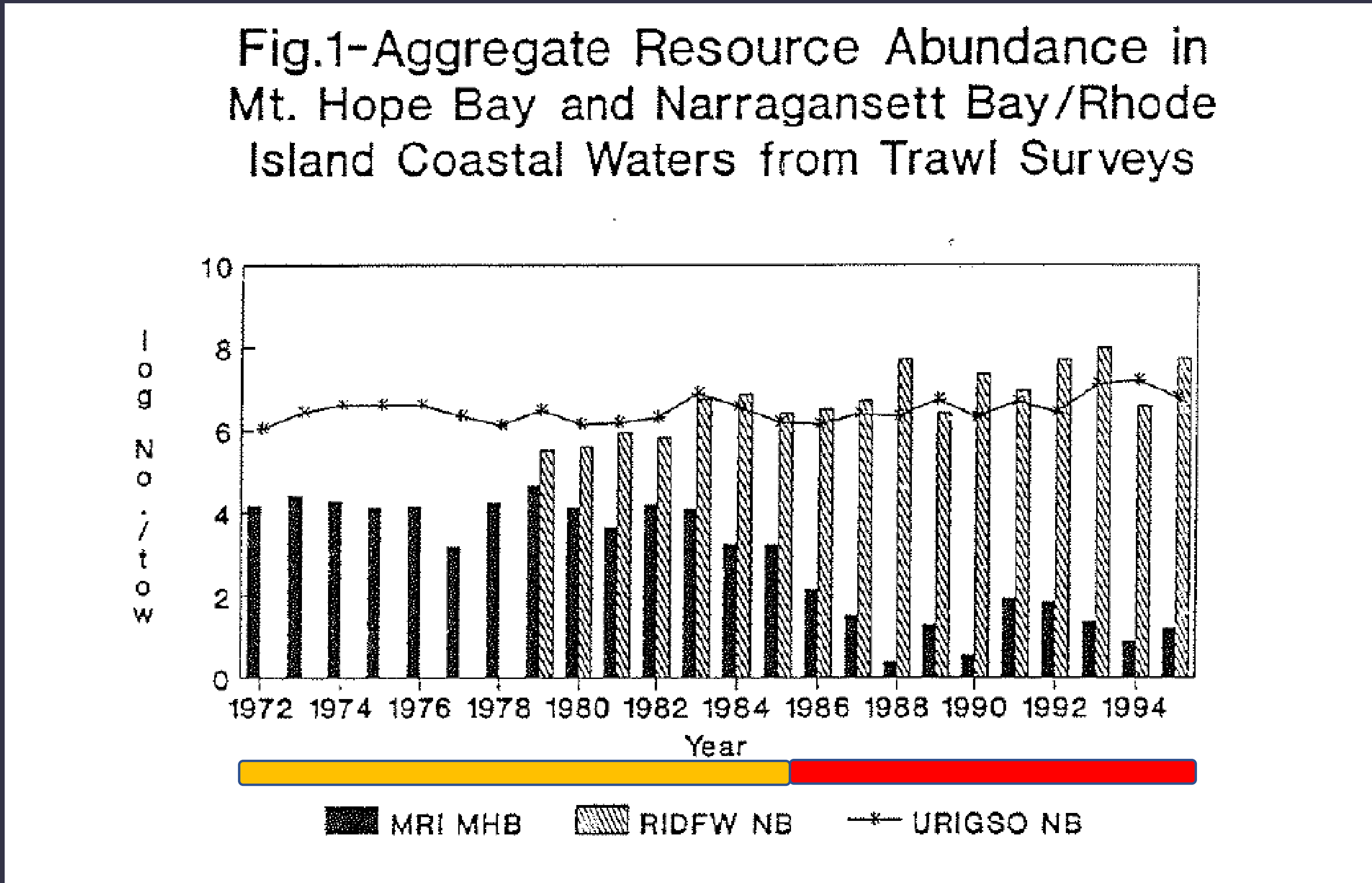
2011-2012- conversion to closed-loop system

2017- decommissioned

Operations timeline

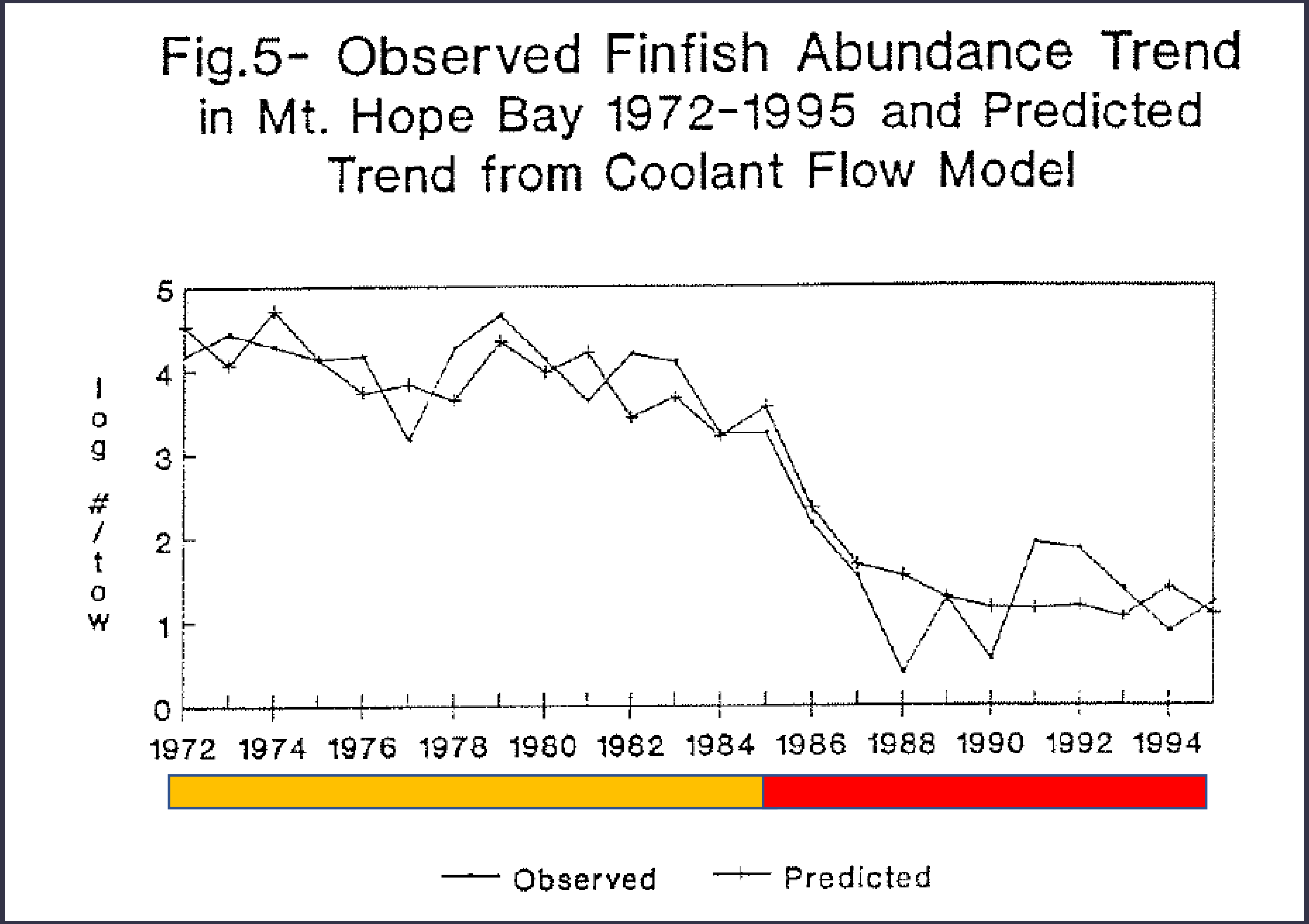
1995 DEM report

- Are finfish abundance trends different between Mt. Hope Bay and the rest of the Narragansett Bay system?
  - Comparison of trawl survey data



DEM 1995 report: time series analysis

- Aggregate abundance time series interrupted in 1985 (year of increased effluent)
- Cooling water intake used as predictor in time series model of abundance



ARMA(1,1), coolant as external regressor

23 years later: our objectives

- Update the analyses described in the 1995 report:
- How have plant operations related to fish abundance and community structure?

Approach:

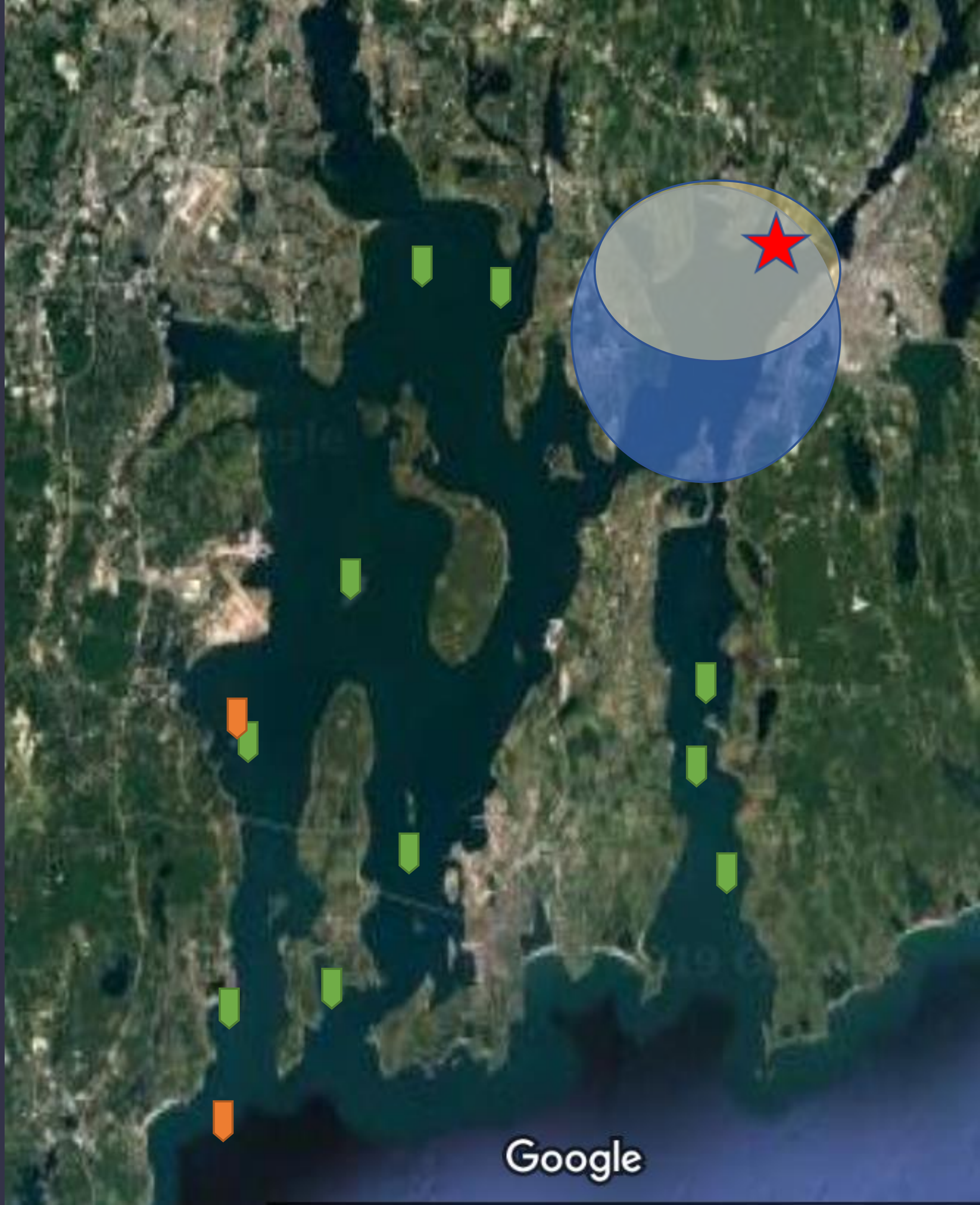
- Where feasible, replicate the analyses previously performed with updated data
- As appropriate, use additional data sets and techniques to compare Mt. Hope Bay with the greater Narragansett Bay ecosystem

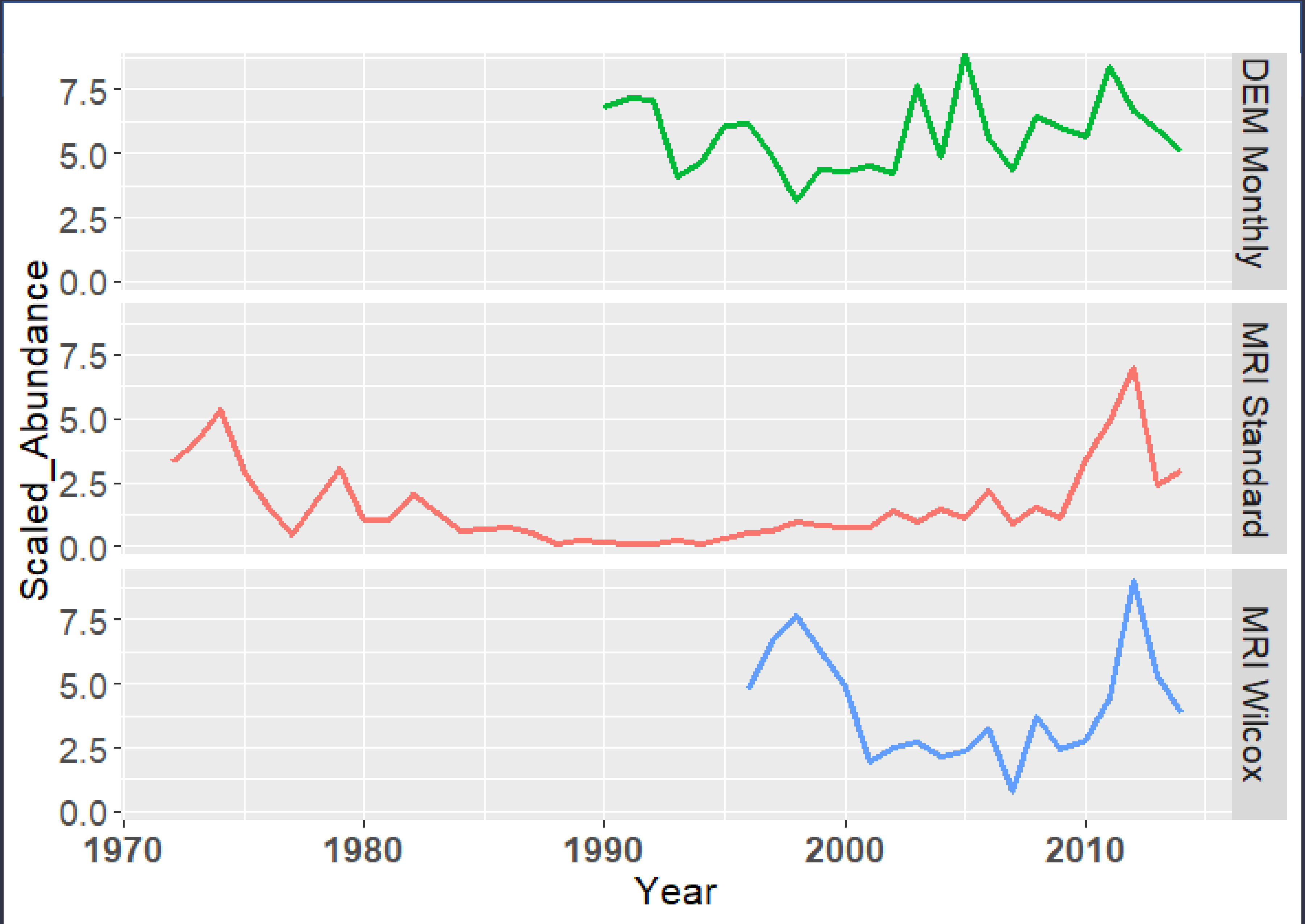
Data

Trawl surveys:

- RI DEM monthly trawl survey (1990-present, 10 stations)
- MRI trawl surveys
  - Standard (1972-2014, 6 fixed sta.)
  - Wilcox (1996-2016, 12 stratified random sta.)
- GSO trawl survey

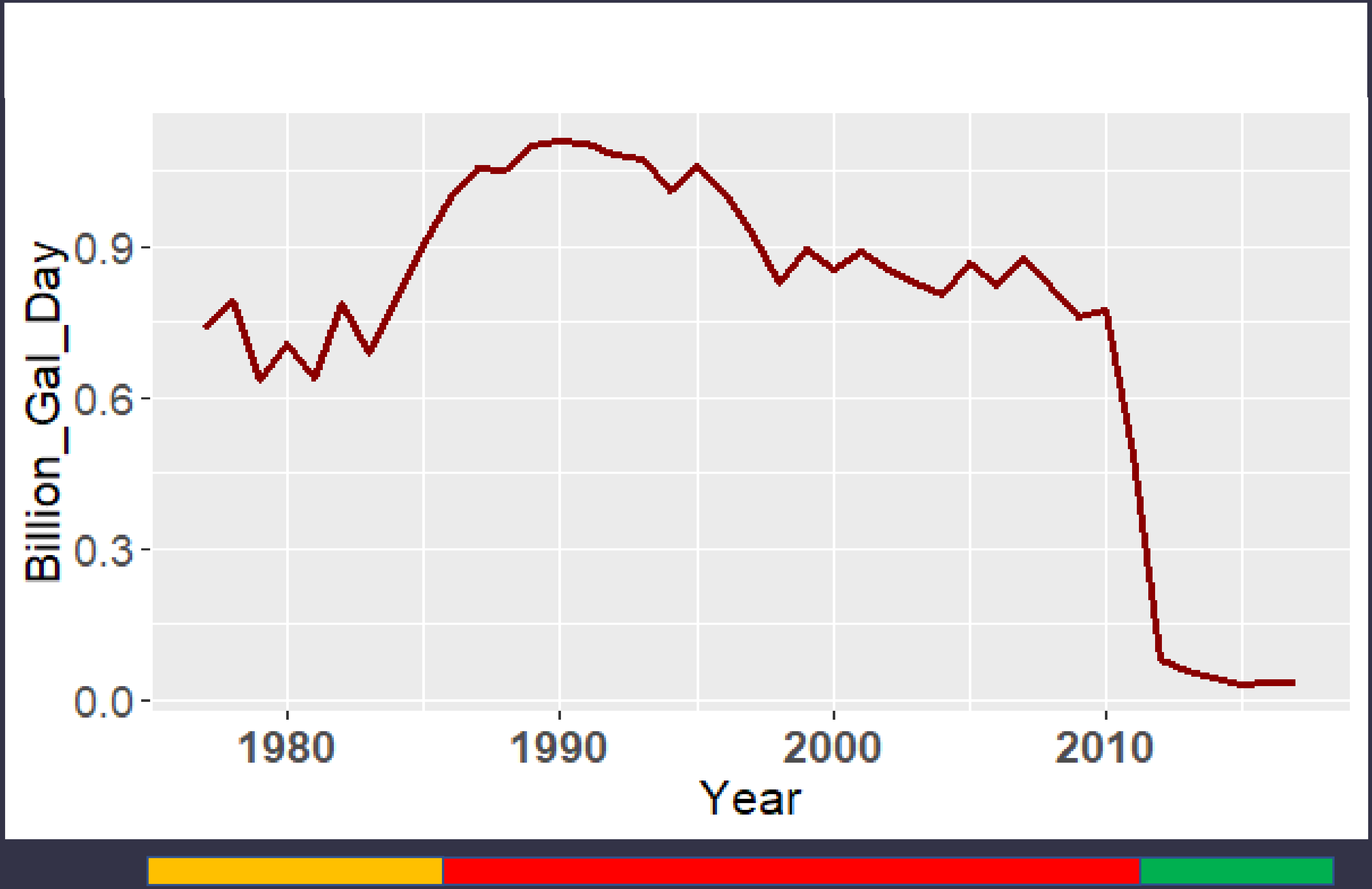
- Coolant water discharge (volume)
- Heat output from Brayton Point





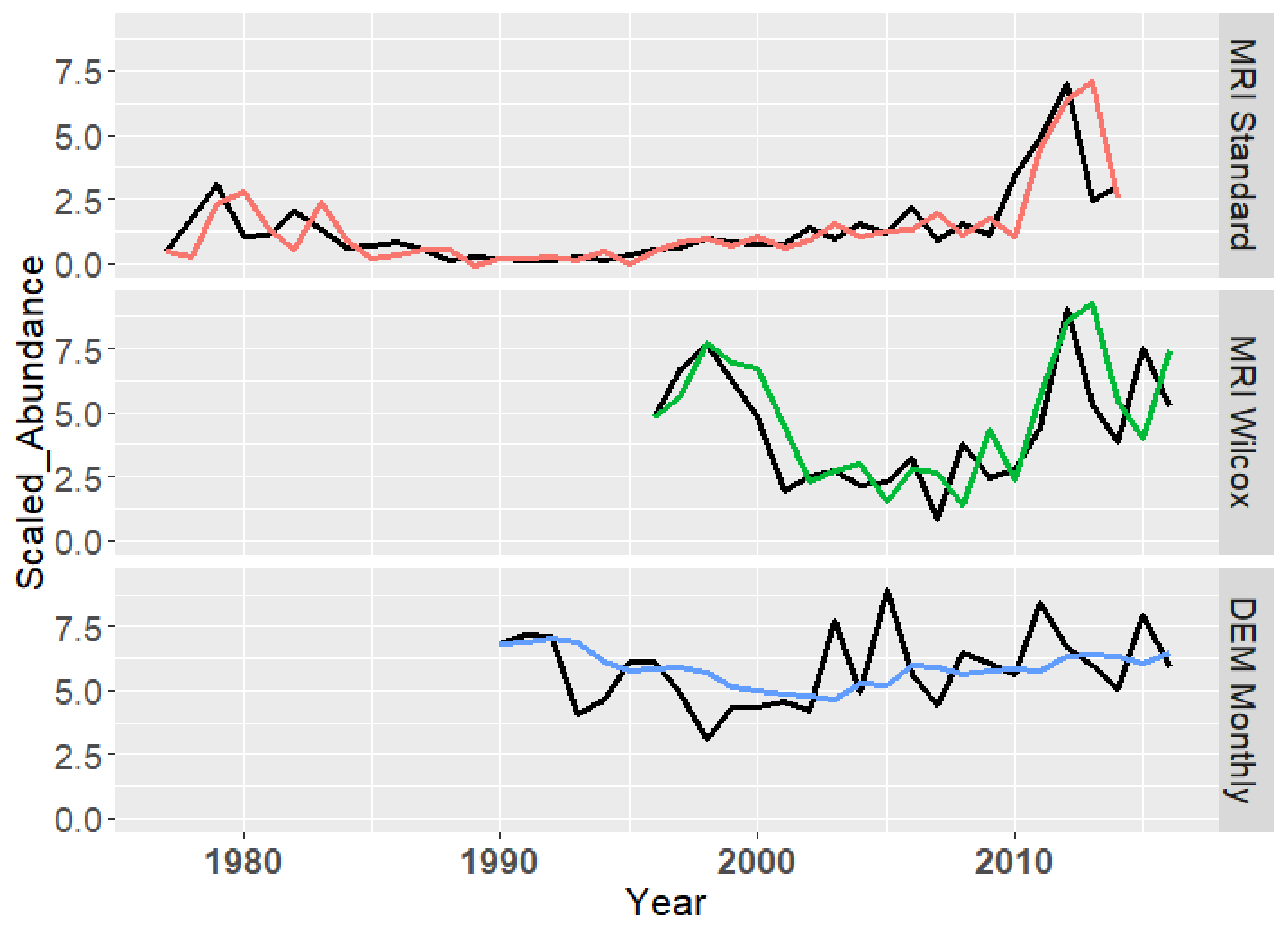
Aggregate finfish abundance time series analysis (scaled)

21 commercially/ recreationally/ ecologically important species



Coolant water flow time series, Brayton Point

ARIMA models:



ARIMAX(0,1,0)

Coolant flow significant predictor of abundance for both Mt. Hope Bay surveys…

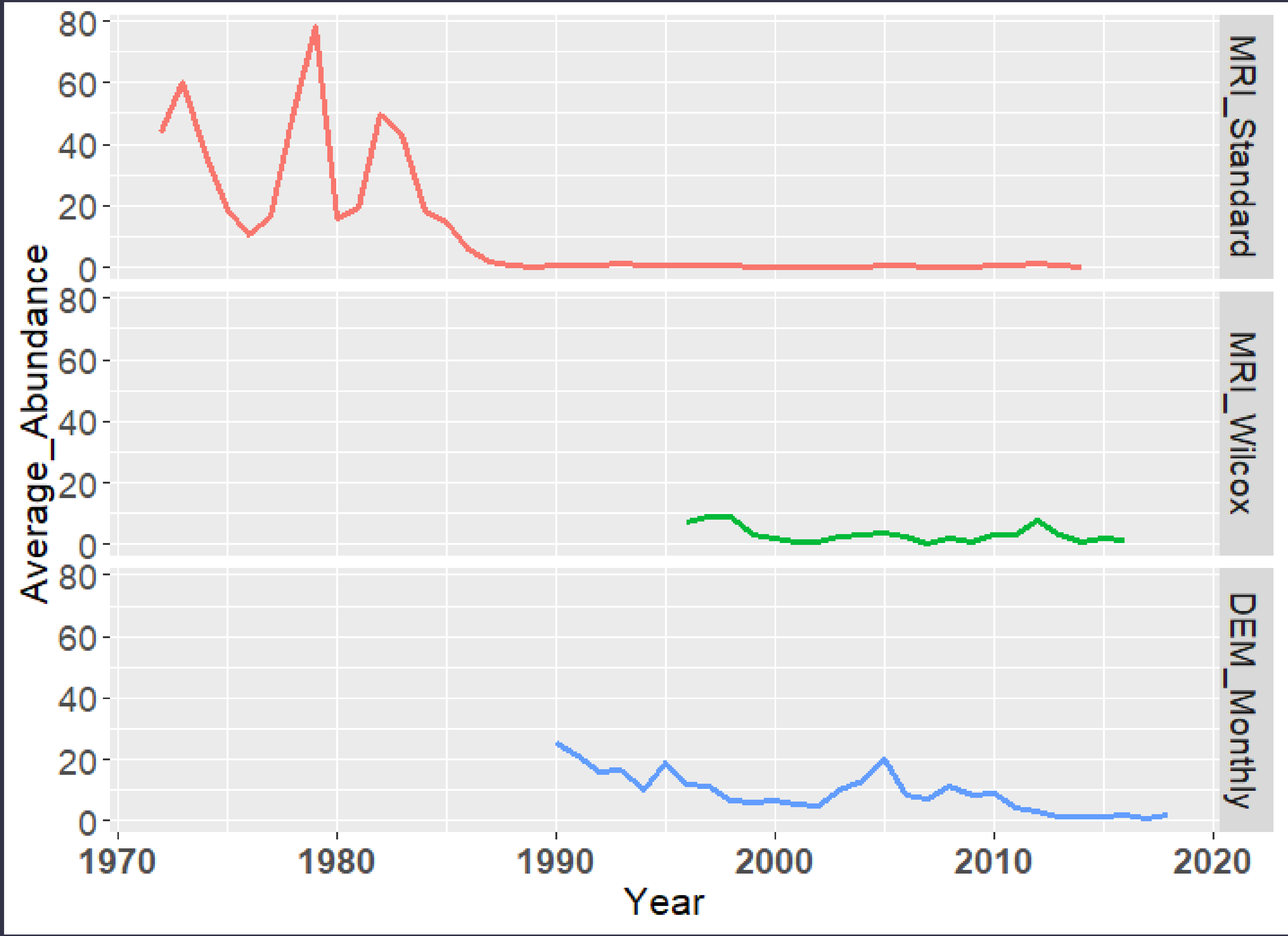
ARIMAX(0,1,0)

ARIMA(0,1,1)

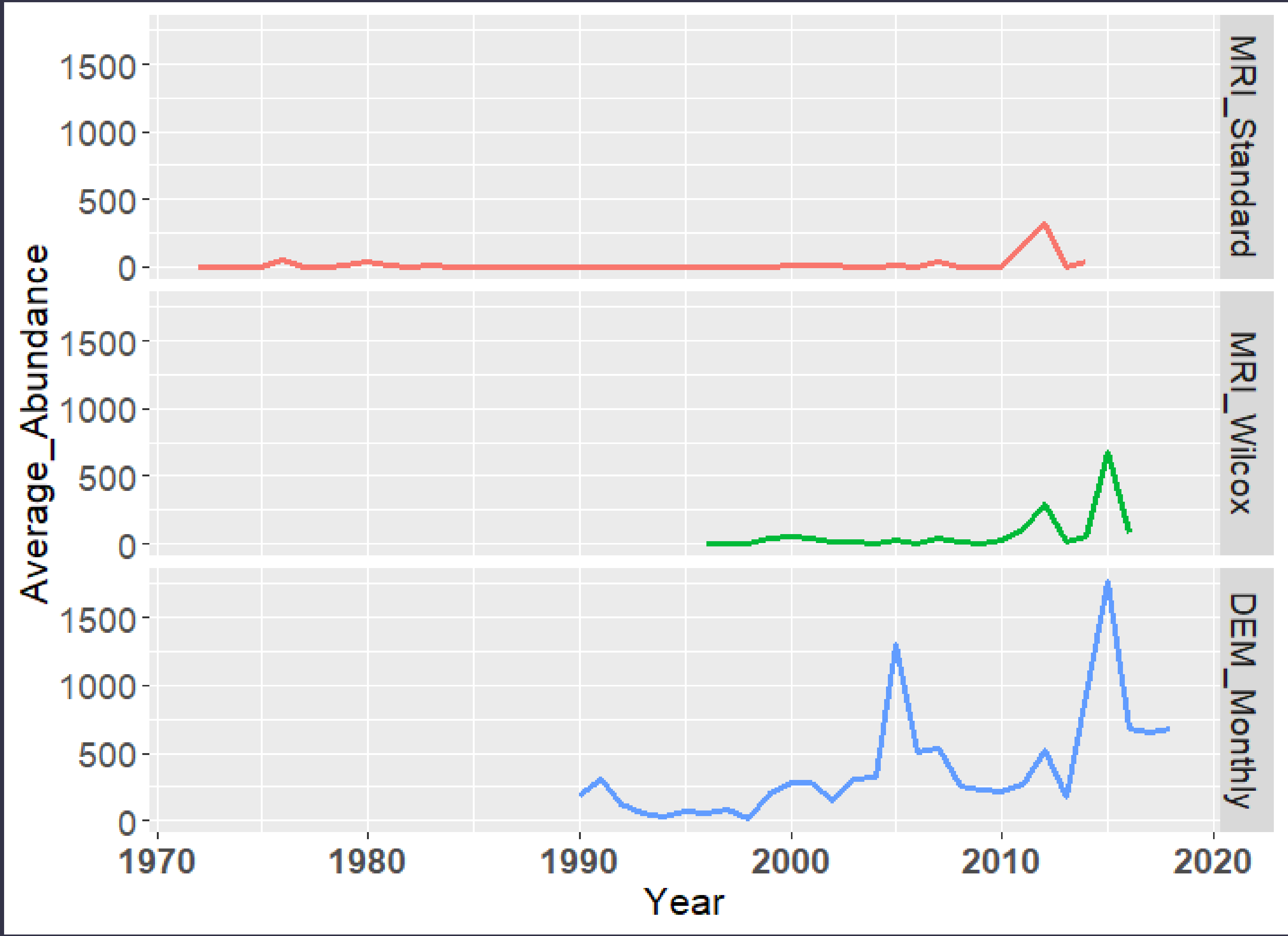
…but not for Narragansett Bay DEM trawl survey

Next: DEM seasonal data, GSO trawl data, DEM survey stations in MHB

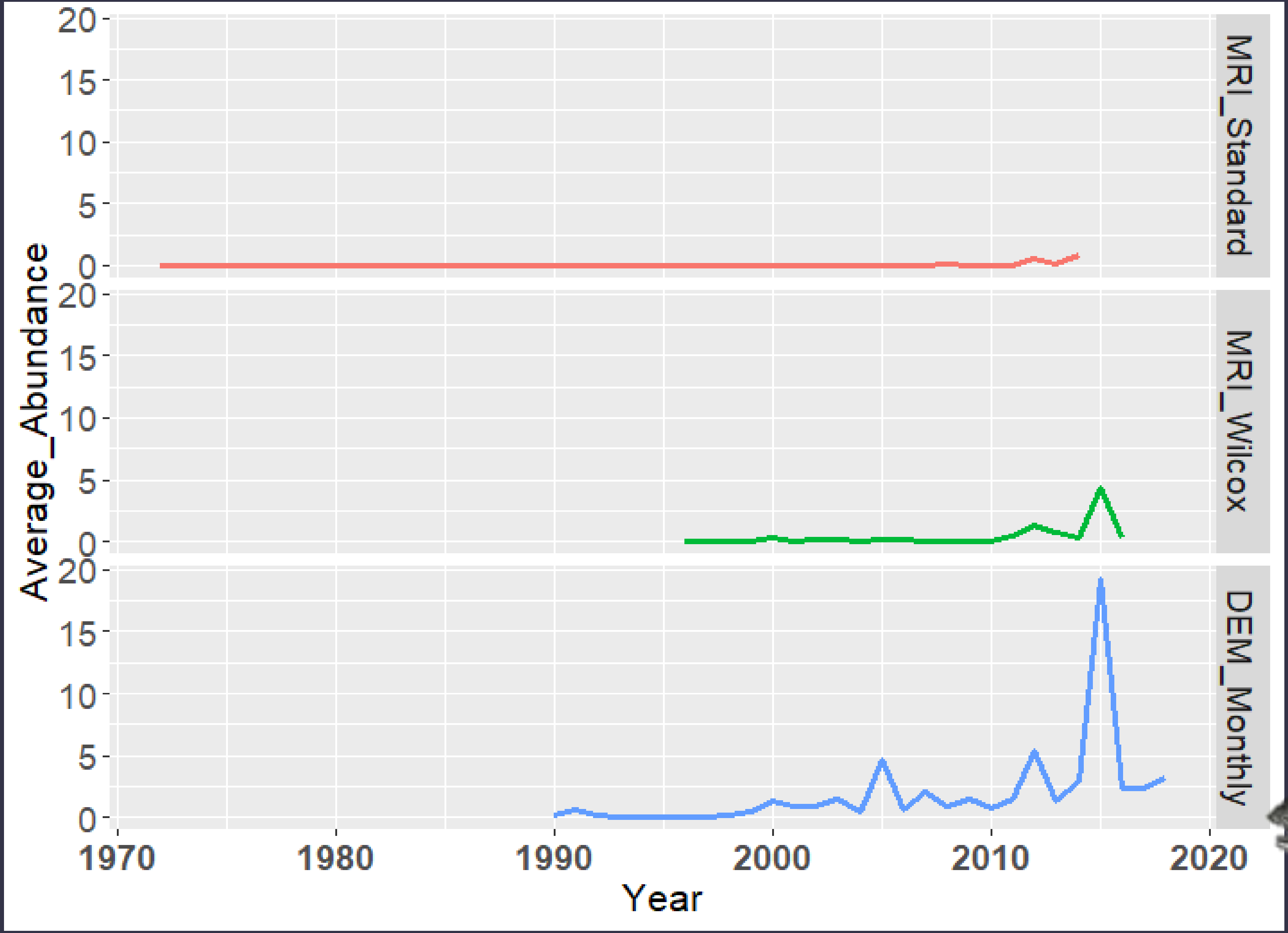
Winter Flounder



Scup


MRI_Standard
MRI_Wilcox
DEM_Monthly
Average_Abundance
0
500
1000
1500
Year
1970
1980
1990
2000
2010
2020

Black Sea Bass



Overview

- Main driver(s) of abundance in Mt. Hope Bay appear different from Narragansett Bay as a whole
  - Brayton Point operations correlate with aggregate abundance in MHB

Next Steps

- Inclusion of DEM seasonal trawl and GSO trawl survey in analysis
- Comparison of individual species' abundance trends and community dynamics between regions
  - Potential use of temperature time series to contextualize trends for individual species
- Diversity Indices

Thanks!

RI DEM: Conor McManus, Jason McNamee, Chris Parkins
URI GSO: Jeremy Collie, Nina Santos, Joe Langan, Candace Oviatt, Heather Stoffel
Normandeau Associates: Mike Scherer

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