

# Musings of a Meta-model

Testing Gadget – a stock assessment model –  
using Atlantis – an ecosystem model

Paul Frater <sup>1</sup>, Erla Sturladottir <sup>1</sup>,  
Bjarki Th. Elvarsson <sup>2</sup>, Gunnar Stefansson <sup>1</sup>

<sup>1</sup>University of Iceland

<sup>2</sup>Iceland Marine and Freshwater Research Institute

ICES Annual Science Conference  
September 19, 2017

## Background

# Atlantis as Operating Model Fit Gadget to Atlantis data

### Goals

1. Test how well Gadget can perform on a simulated ecosystem
2. Set up a platform for further testing
  - Error
  - Data-rich vs. data-poor

# A bit about the models

## Gadget - Estimation model

- Forward simulation age-length statistical model
- Uses likelihood components to match model to data

$$N_{a+1,t+1} = N_{a,t} e^{-(F_a + M_a)}$$

$$N_{0,t} = R_t$$

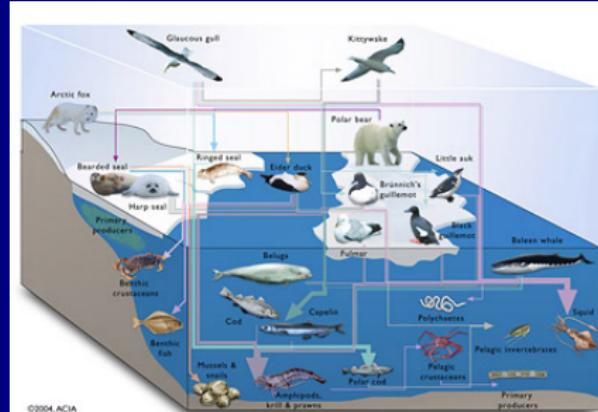
$$I_t = L_\infty(1 + e^{-K(t-t_0)})$$

$$w = \alpha I^\beta$$

# A bit about the models

## Atlantis - Operating model

- Whole-of-ecosystem model
- Spatially explicit model that tracks N through system

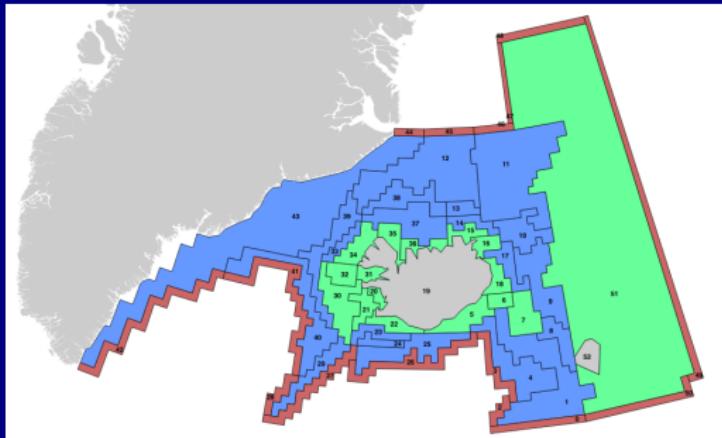


# Objectives

## Research Objectives

- Test Gadget's estimation abilities
- Understand what components of Gadget work well/poorly

# Atlantis - The Operating Model

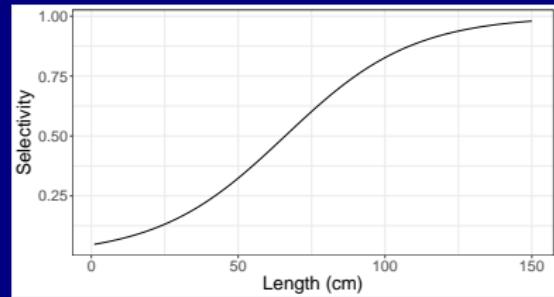


- 1948 - 2013
- 53 boxes,  
7 depth layers
- 53 functional groups

# Surveying Atlantis

## Simulated surveys

- Standardized surveys
  - Spring and autumn
  - Constant selection
  - Age and length
- Commercial catch surveys
  - Numbers at age/length
  - Selection from fishery



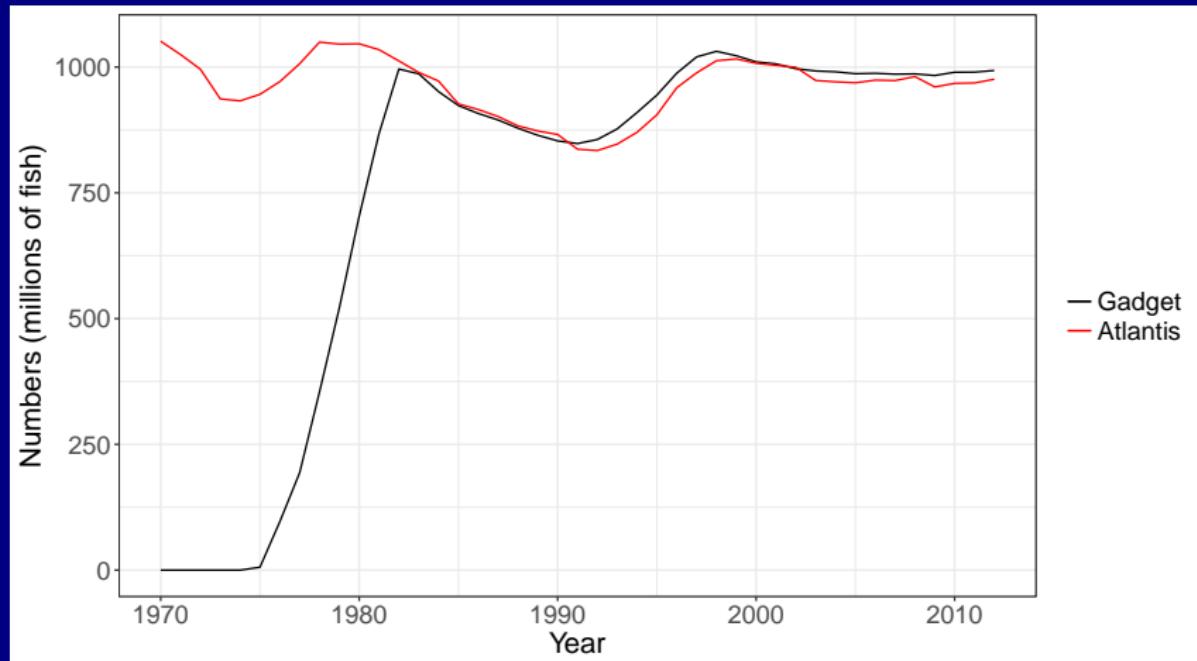
# Gadget - The Estimation Model

## Gadget Model

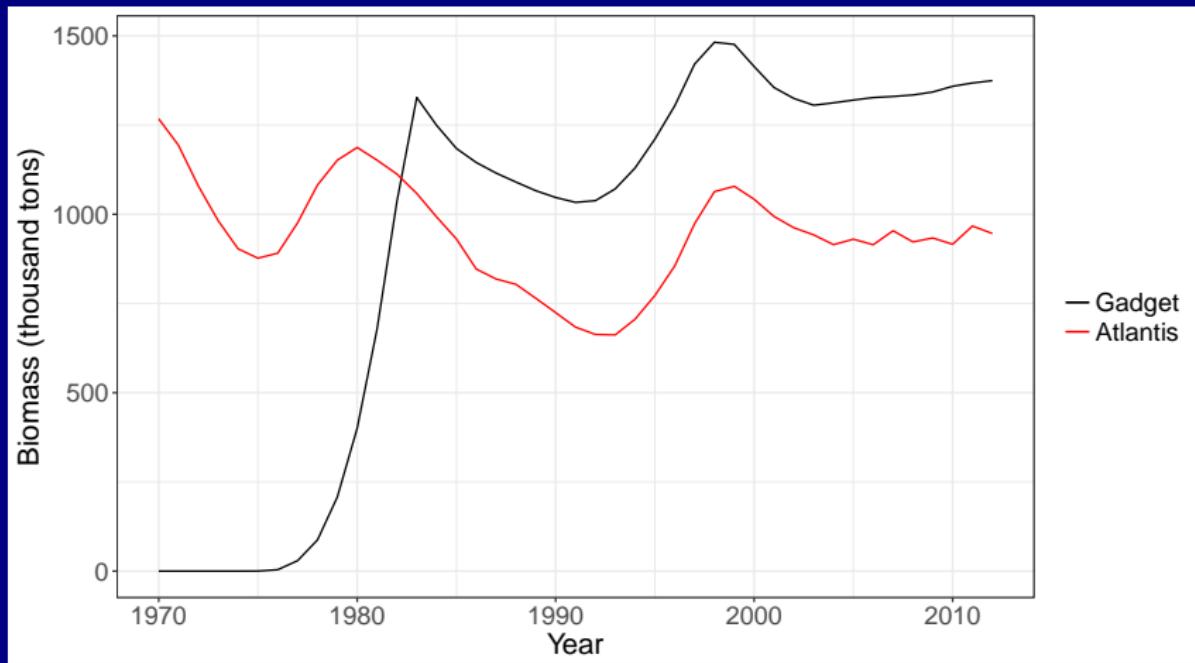
- Single area
- Single species (cod)
- Two stocks (age0-1 and age2+)
- Estimated:
  - Initial numbers
  - Annual recruitment
  - Natural mortality (M)



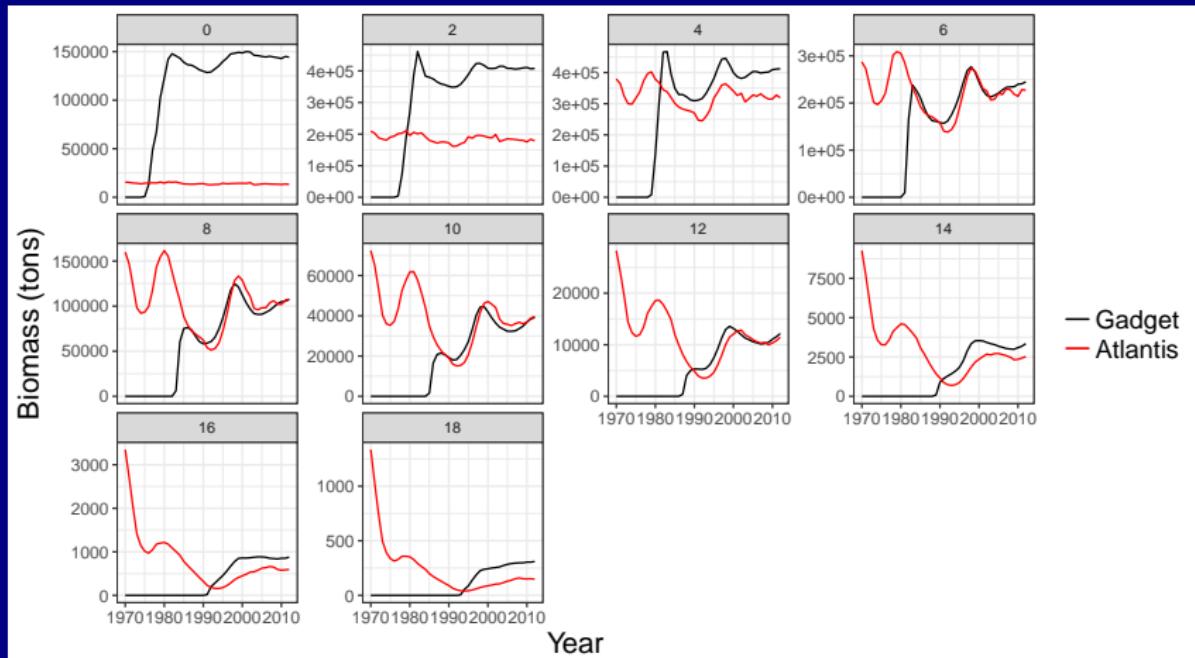
# Numbers Comparison



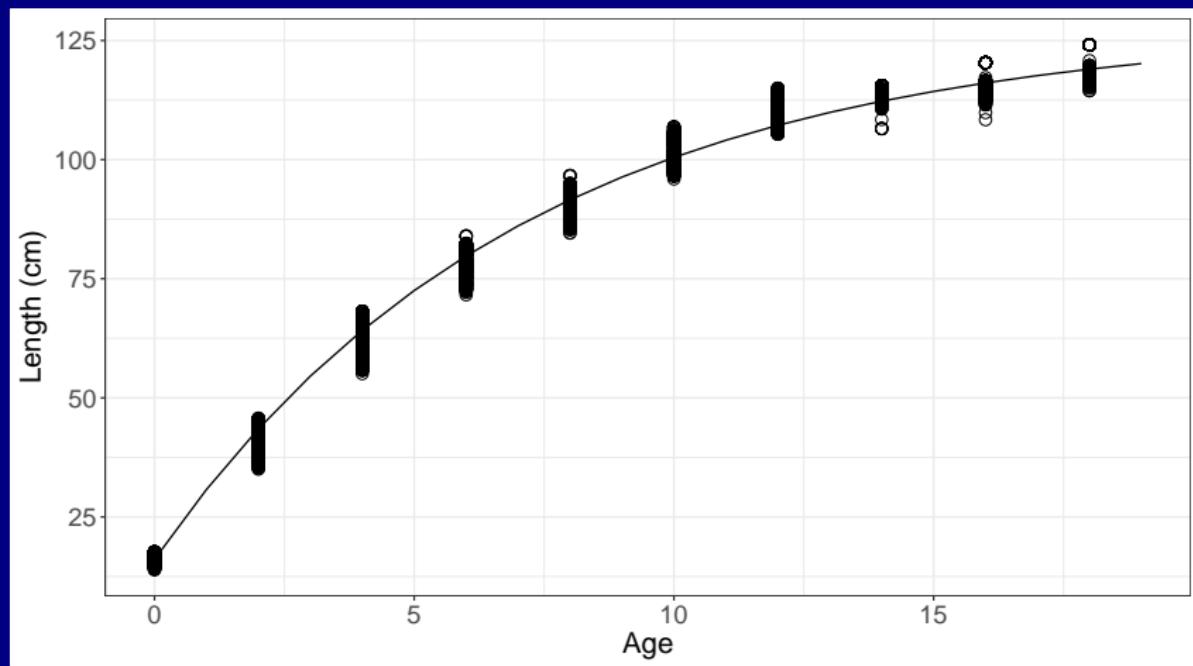
# Biomass Comparison



# Biomass by Age



# Growth



## Future Directions

- Compare performance across life-history strategies
- Test uncertainty measures (e.g. bootstrap)
- Model “real-world” fishing scenarios

# Acknowledgements



MareFrame

rannís

MINOUW  
Creating a positive change in the sea

# Questions

