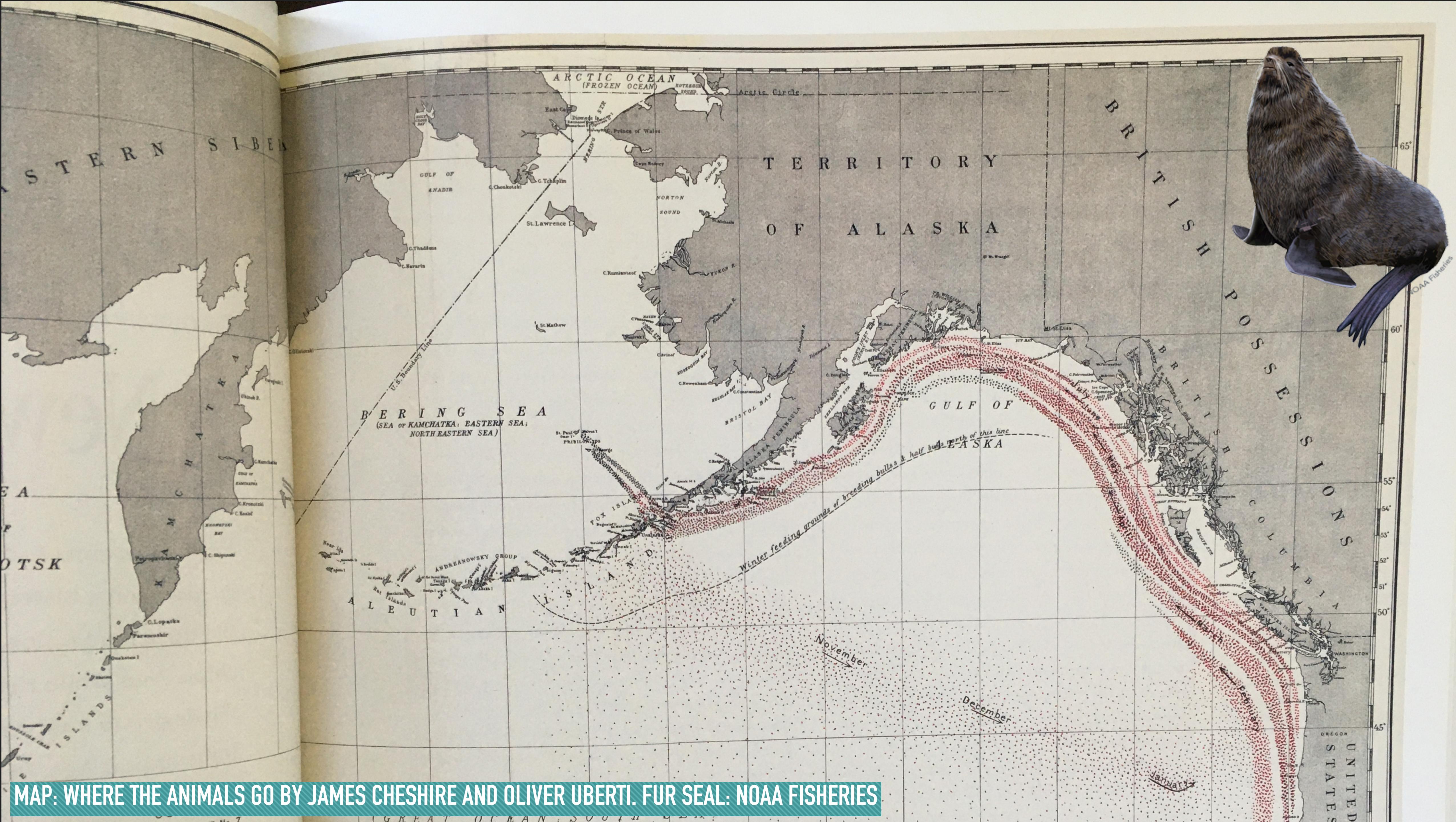




MARGARET SIPLE
NOAA ALASKA FISHERIES SCIENCE CENTER
RESOURCE ASSESSMENT AND CONSERVATION ENGINEERING DIVISION
ECOLOGICAL FORECASTING INITIATIVE — SHINY SEMINAR SERIES 2021

CREATIVE VISUALIZATION OF MODEL RESULTS AND UNCERTAINTY IN SHINY





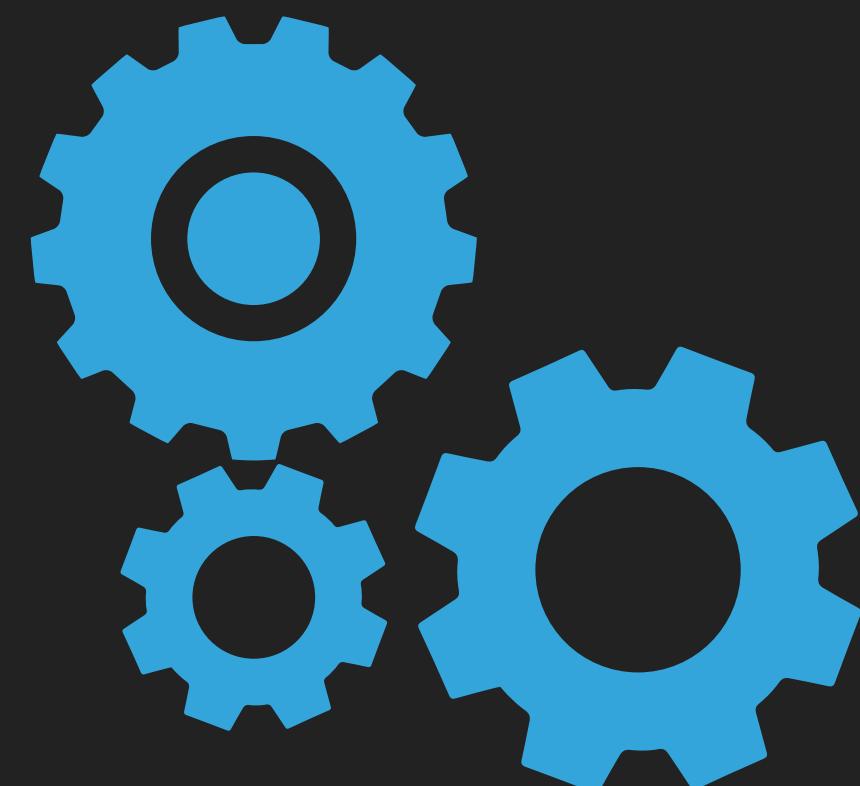
MAP: WHERE THE ANIMALS GO BY JAMES CHESHIRE AND OLIVER UBERTI. FUR SEAL: NOAA FISHERIES

UNCERTAINTY

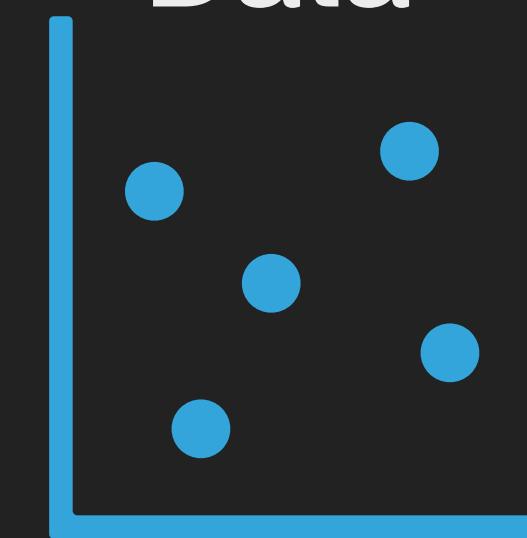
- Uncertainty conveys the degree to which something is known but all the resources I share will also be useful for sharing anything with a distribution
- Expressing uncertainty as a concrete range of possibilities increases trust; expressing uncertainty as unpredictable impacts can erode trust (Howe et al. 2019 Nature Climate Change)

INTRODUCTION

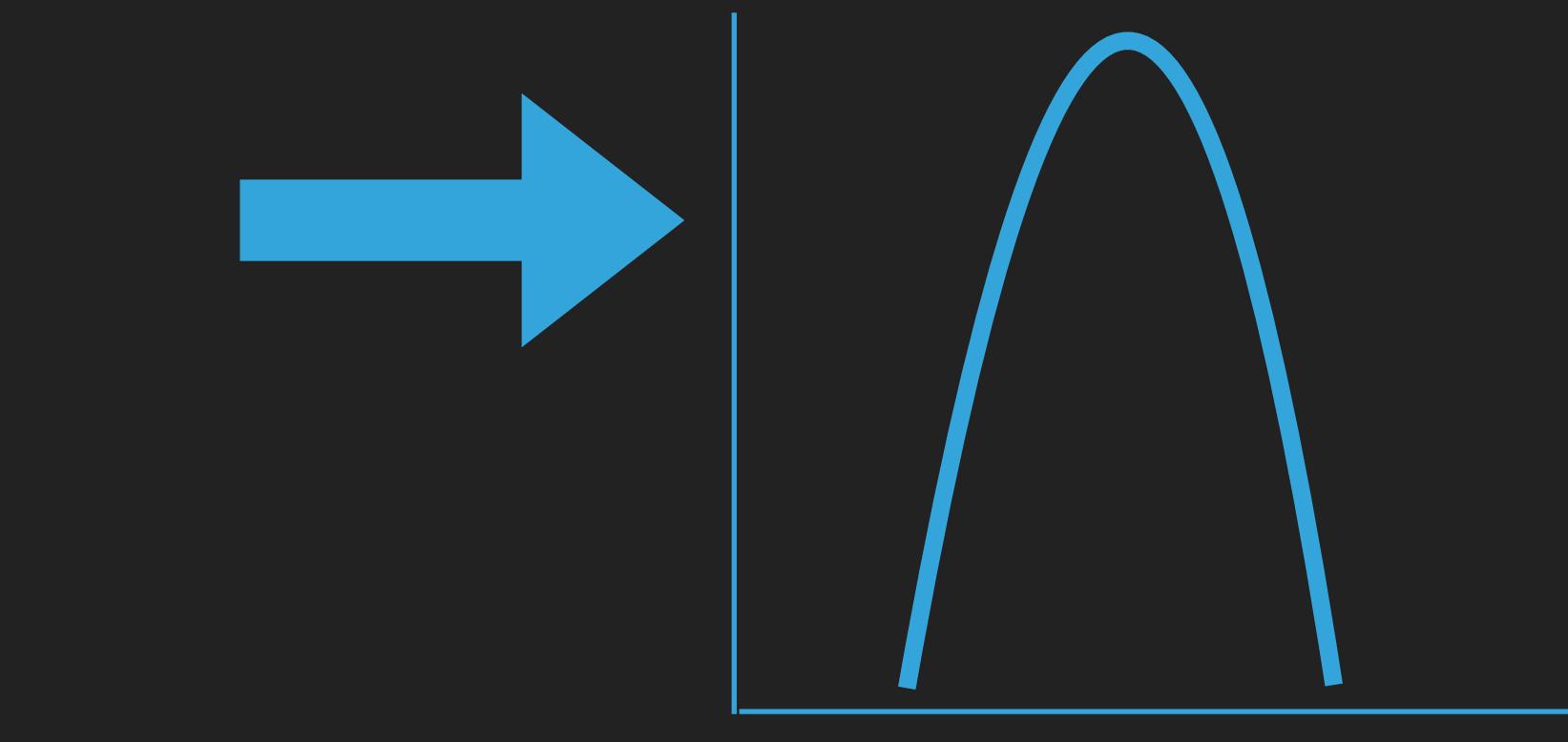
Models



Data



Distribution of
possible values



Reference point
for management

X (SINGLE VALUE)



Management decisions

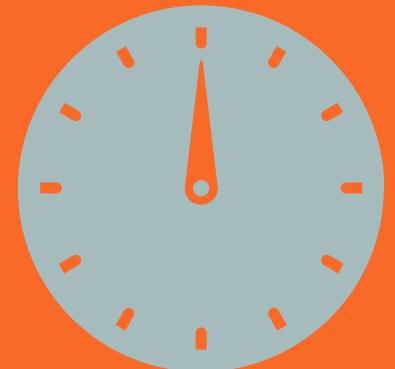
COMMUNICATING UNCERTAINTY IS AN ESSENTIAL STEP IN THE MANAGEMENT PROCESS

- PRECAUTIONARY APPROACH TO MANAGEMENT
- CONFIDENCE IN SCIENTIFIC CREDIBILITY
- RISK LEVELS

INTERACTIVE COMMUNICATION TOOLS IN R

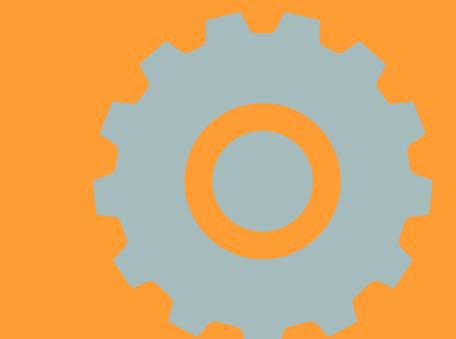


MARKDOWN
REPORTS AND WEBSITES



DASHBOARDS

Display
information



HTMLWIDGETS

React to
user inputs



Displays
information AND
executes code
based on user
actions

OUTLINE

USING SHINY TO COMMUNICATE UNCERTAINTY

1. Case study: An introduction to the Marine Mammal Bycatch Impacts Exploration Tool (MMBIET)
2. Visual tools for communicating uncertainty in R + demo
3. Using Shiny to make simulation outputs comprehensible
4. Struggles and pitfalls, gems of wisdom + demos

CASE STUDY: LONG-TERM IMPACTS OF BYCATCH ON MARINE MAMMAL POPULATIONS

CATCHES OF NON-TARGET SPECIES



CASE STUDY

BYCATCH BY DEFINITION

bycatch:“Discarded catch of marine species and unobserved mortality due to a direct encounter with fishing vessels and gear.”



Image: Corey Arnold

CASE STUDY

MARINE MAMMAL BYCATCH



Made with Gifox



Mark Girardeau



Jasmine Stavenow

MARINE MAMMAL PROTECTION: THE POTENTIAL BIOLOGICAL REMOVAL (PBR) APPROACH

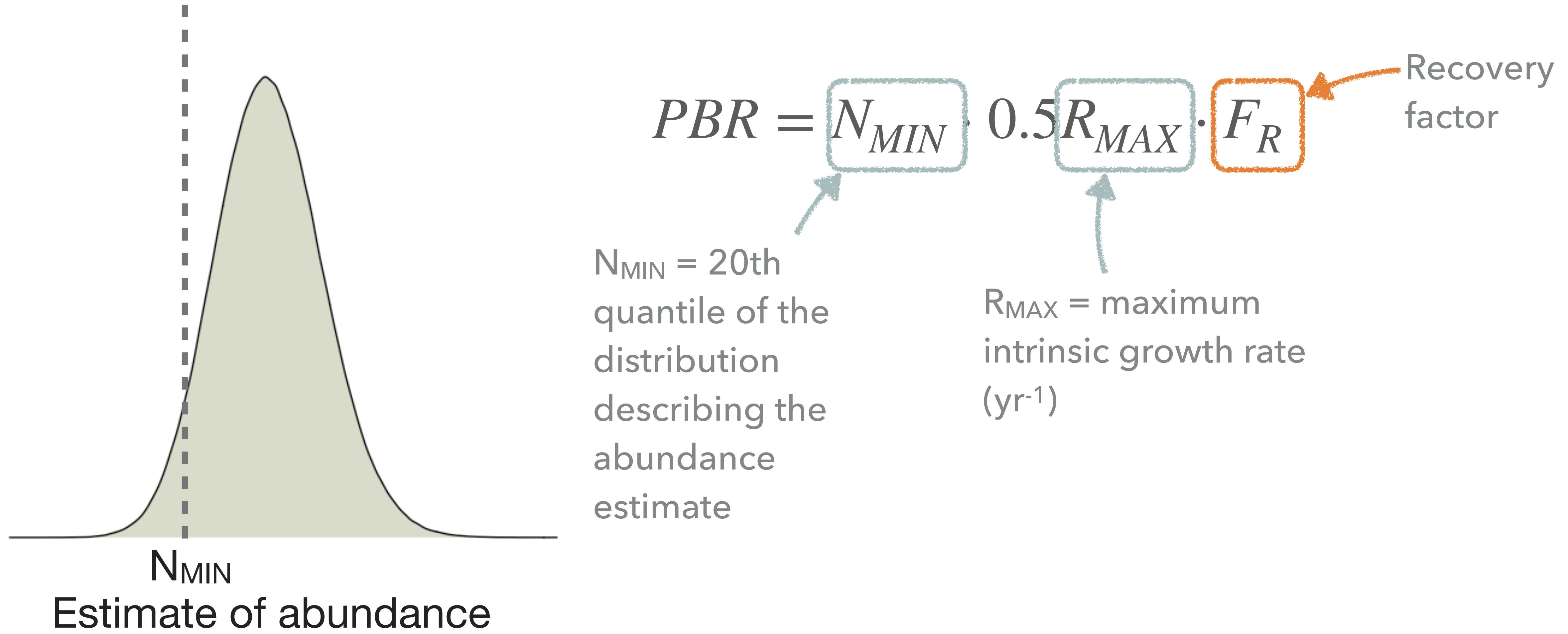




Image: Doug Perrine/NPL/Minden Pictures

THE CHALLENGE

- Make the PBR approach accessible to managers and stakeholders in places with less data and/or no population model.

CASE STUDY

MARINE MAMMAL BYCATCH IMPACTS EXPLORATION TOOL

Bycatch impacts exploration tool

Home Simple Advanced PBR & PBR calculator Solve for Bycatch About the Model

Welcome to the marine mammal bycatch impacts exploration tool

This tool shows population projections under different bycatch mortality levels, based on information you provide. You can also use it to calculate the parameters for Potential Biological Removal (PBR).

Simple Projections

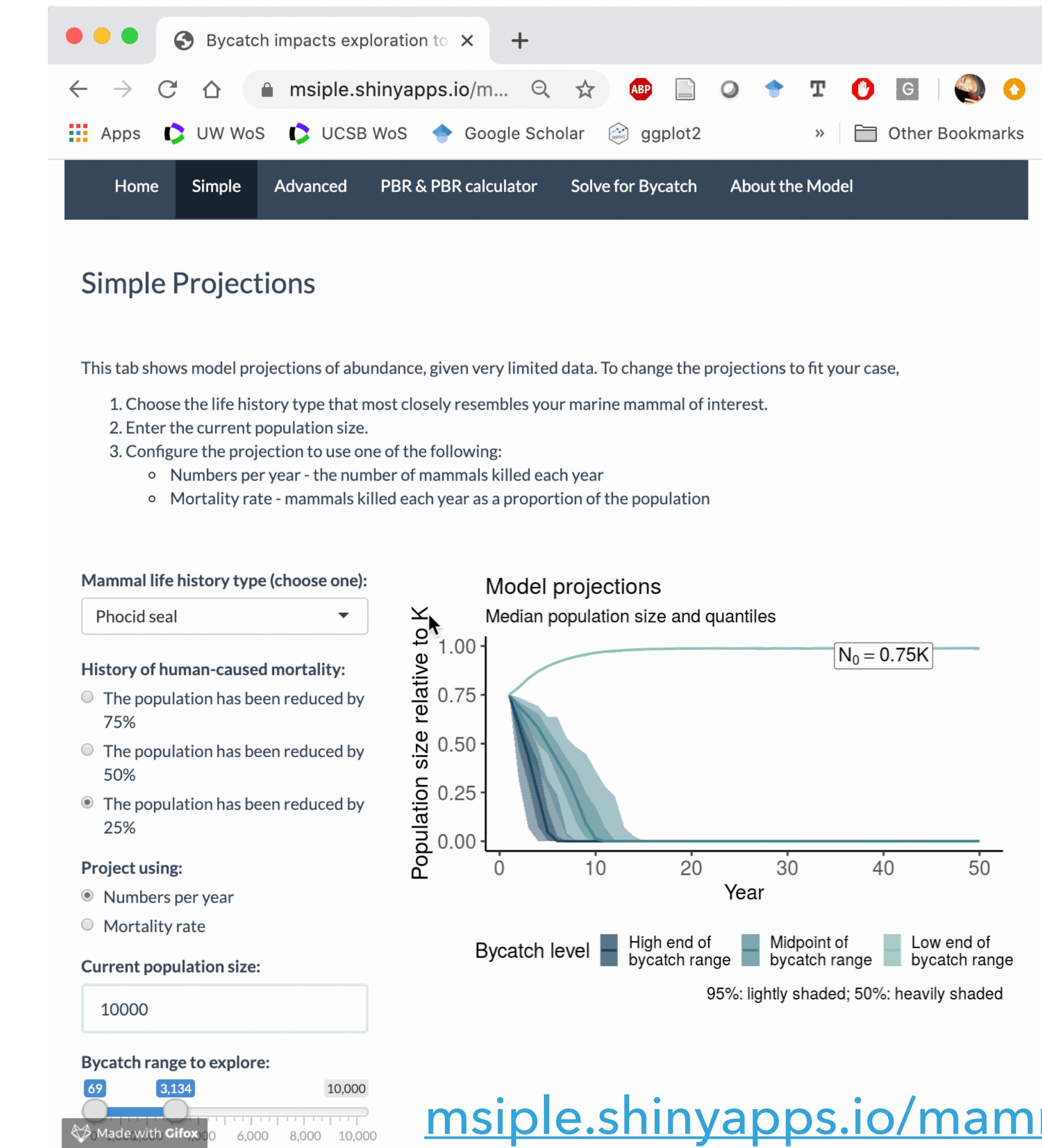
If you have minimal information about abundance and bycatch, go here.

Simple Projections

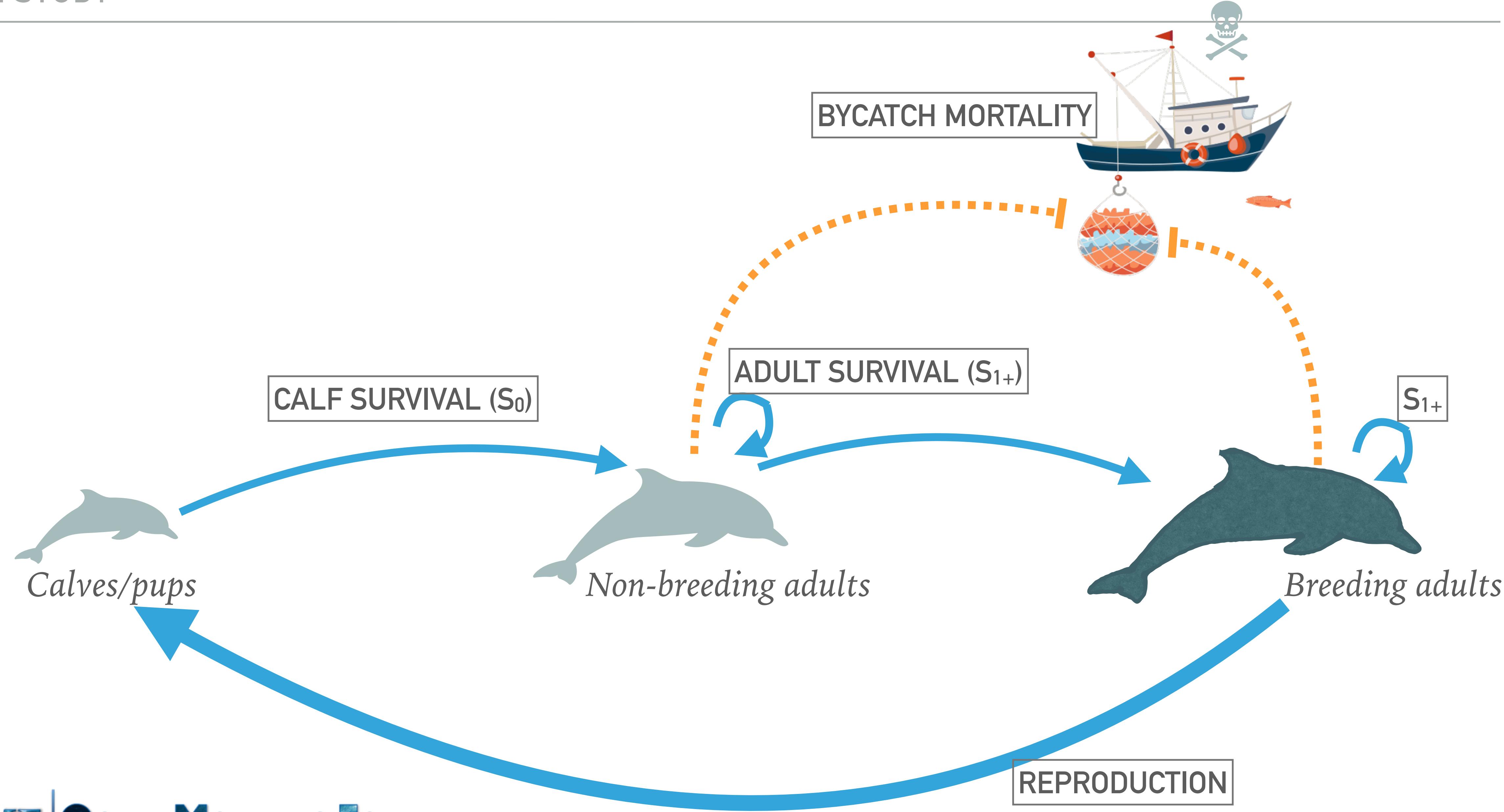
Advanced Projections

If you have information about abundance and bycatch, and want to evaluate performance or calculate PBR, go here.

Advanced Projections



CASE STUDY



SWITCH TO APP

MARINE MAMMAL BYCATCH IMPACTS EXPLORATION TOOL

Search or jump to... / Pull requests Issues Marketplace Explore

mcsiple / mmrefpoints

Unwatch 1 Star 1 Fork 1

Code Issues 2 Pull requests Actions Projects Wiki Security Insights Settings

master 1 branch 1 tag Go to file Add file Code

mcsiple small edits to setup bfe2873 on Jun 17 245 commits

R	small edits to setup	2 months ago
data	remove non-ASCII characters from dat.rda	3 months ago
dev	remove reshape2 as depend	2 months ago
inst	Add section to documentation about bycatch variation	2 months ago
man	clean up documentation	3 months ago
tests	take out app launch test, which doesn't work currently (the app launc...	3 months ago
vignettes	Add section to documentation about bycatch variation	2 months ago
.Rbuildignore	add buildVignettes	2 months ago

About

A package for simulating marine mammal abundance and calculating reference points.

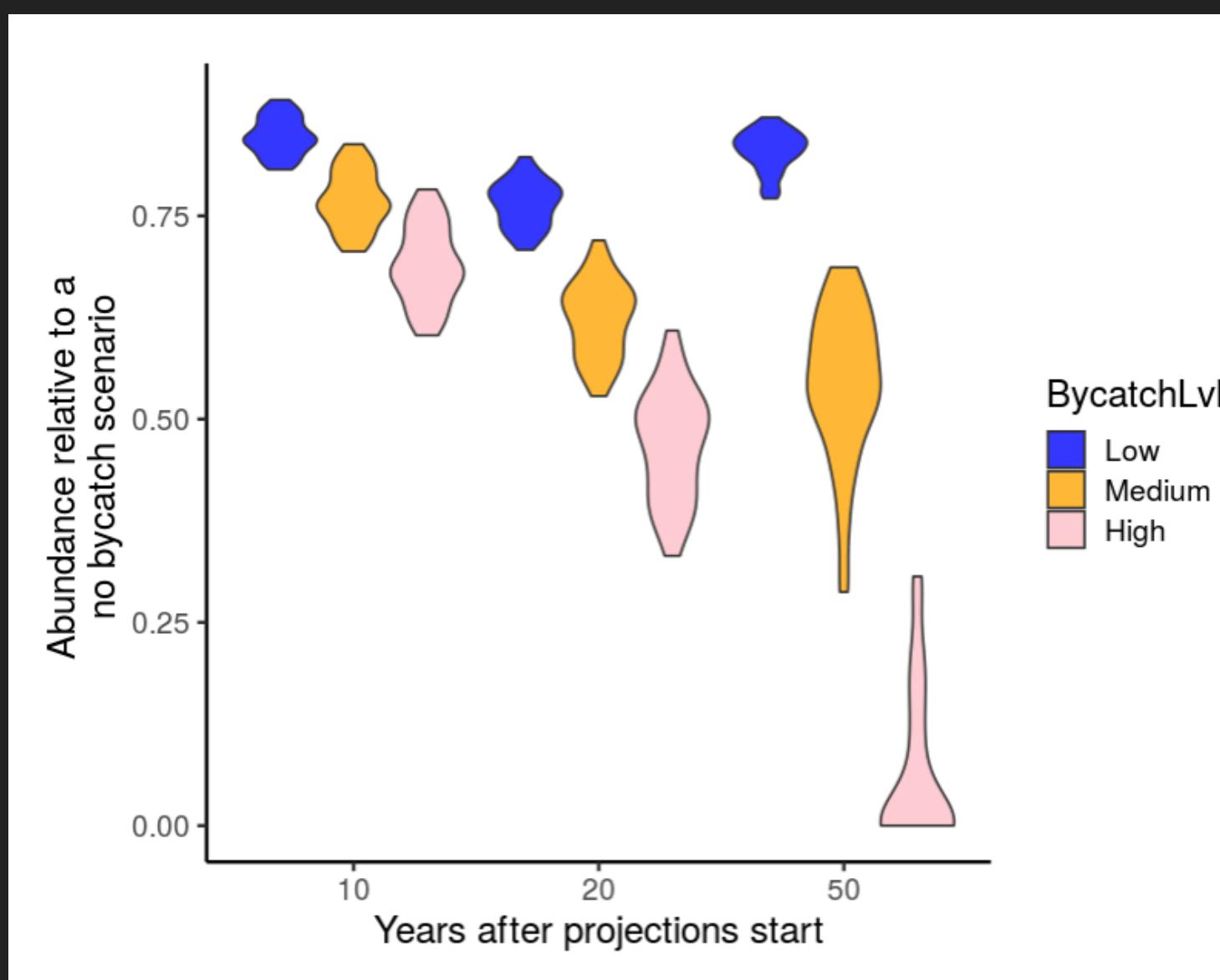
fisheries-management marine-mammals bycatch

Readme View license

Releases 1 tags Create a new release

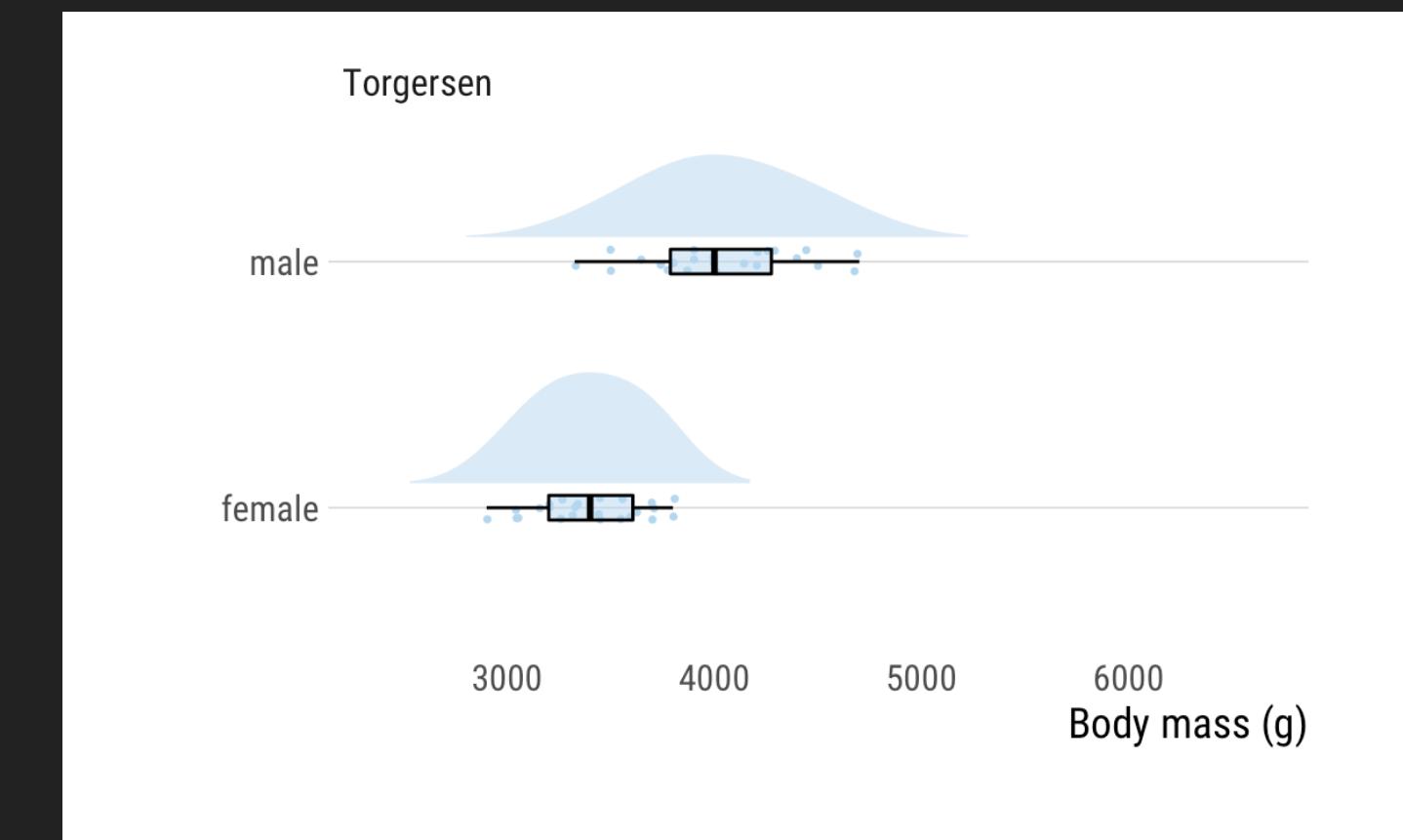
ONE VALUE OR VARIABLE

Violin plots



```
ggplot() +  
  geom_violin()
```

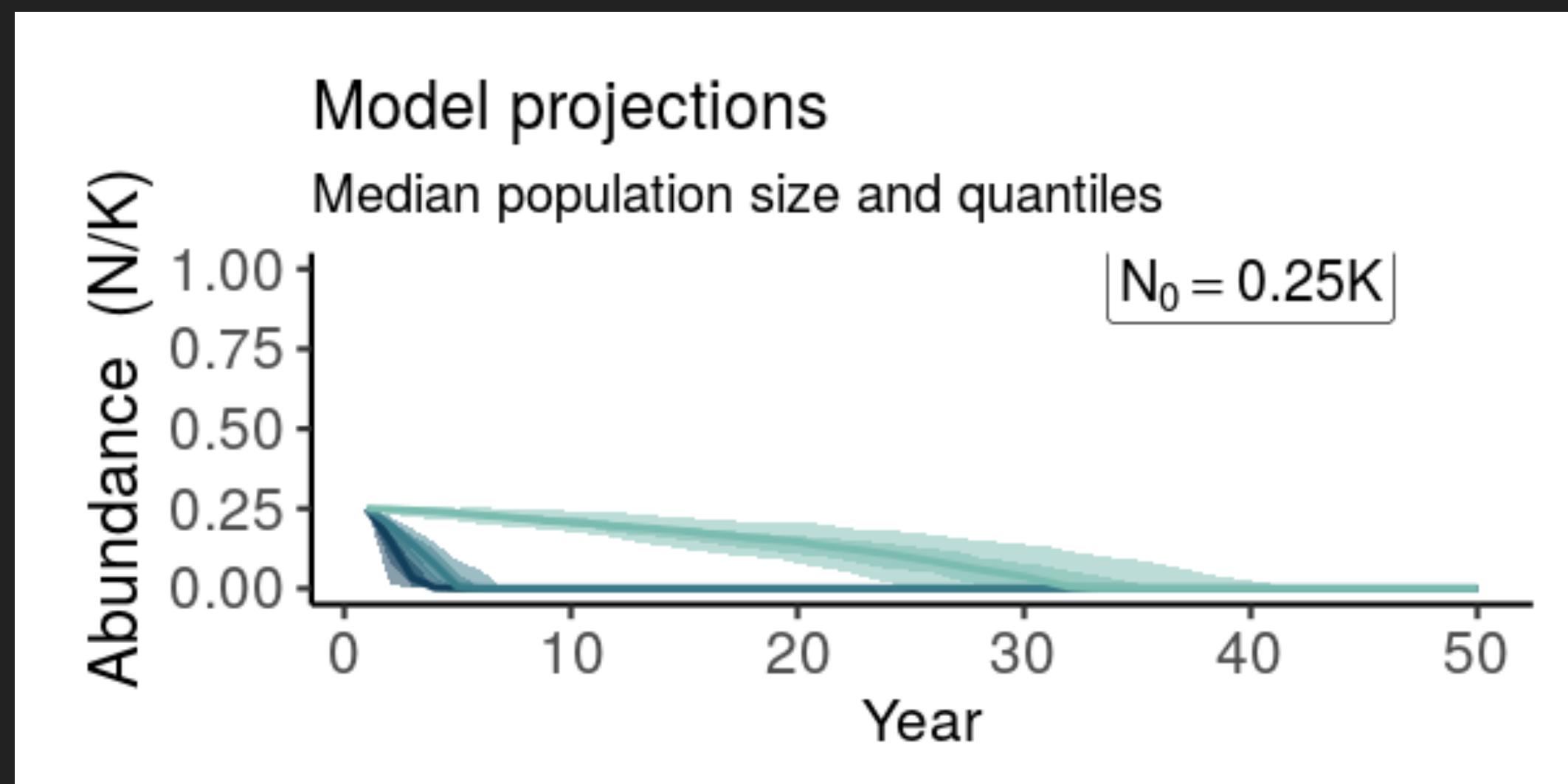
Raincloud plots



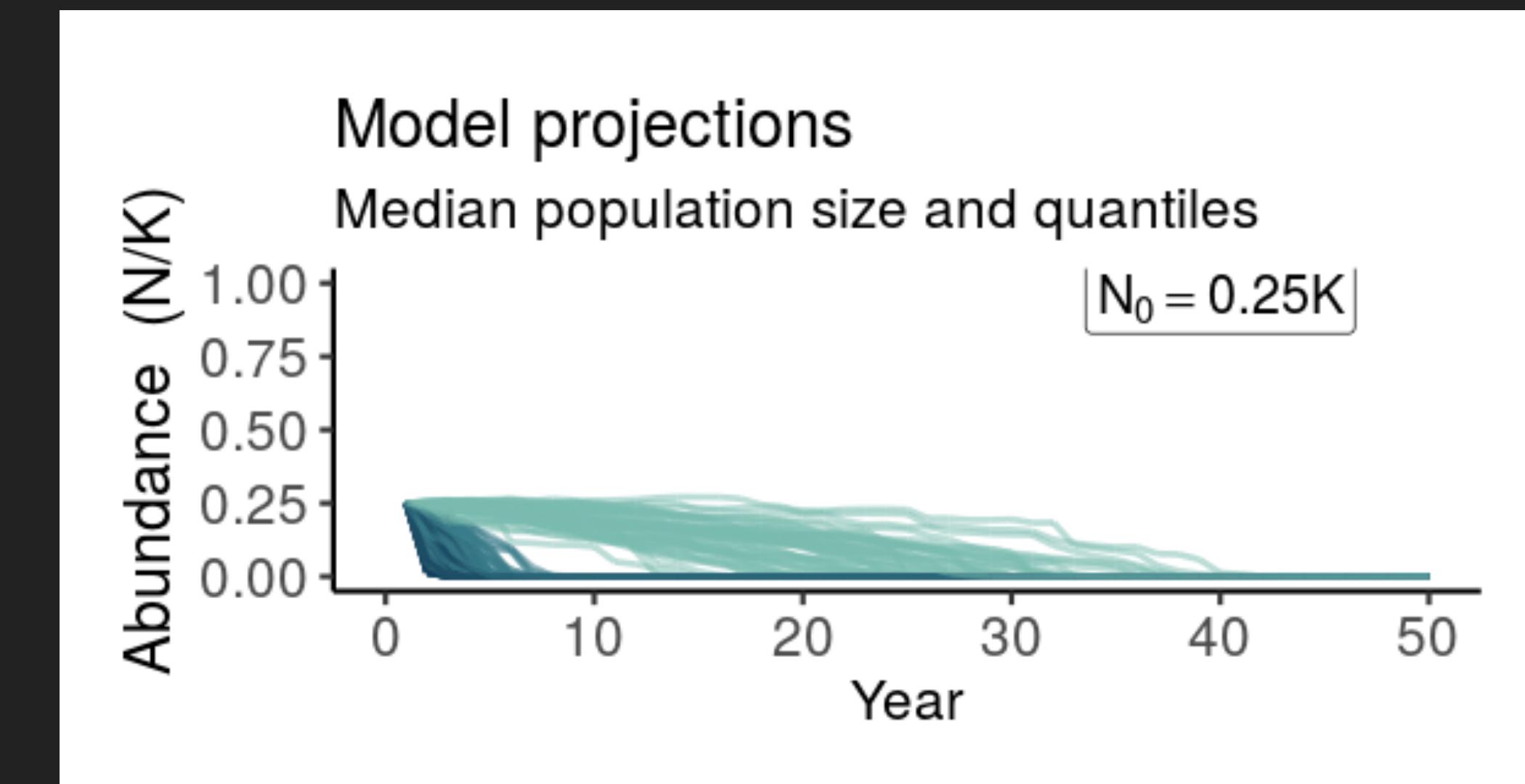
```
ggplot() +  
  geom_flat_violin() +  
  geom_point() +  
  geom_boxplot()
```

ONE VALUE OR VARIABLE OVER TIME

Ribbon plots



Spaghetti plots



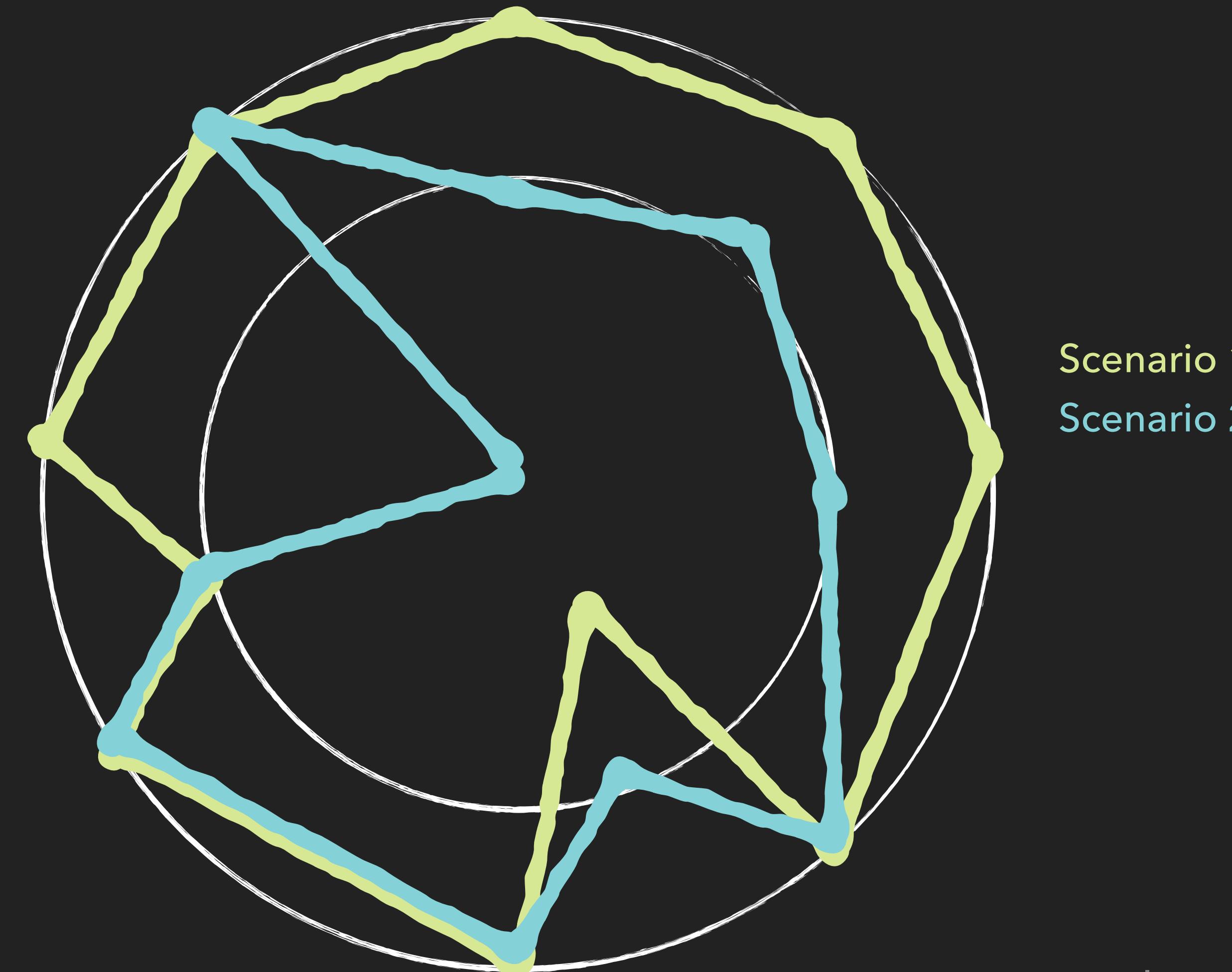
`ggplot() + geom_ribbon()`

`ggplot() + geom_path()`

TWO OR MORE VALUES OR VARIABLES

- kite plots/spider plots
- traffic light plots
- decision tables

KITE OR SPIDER PLOTS



Scenario 1
Scenario 2

Examples:
Siple et al. 2018 Fish & Fisheries
Koehn et al. 2021 Ecological Applications

STOPLIGHT AND DECISION TABLES

“Stoplight” tables

	Management options		
	Option 1	Option 2	Option 3
Indicator 1 (e.g., biomass)	Yellow	Green	Orange
Indicator 2	Green	Red	Red
Indicator 3	Orange	Green	Green

Decision tables

	Management options		
	Option 1	Option 2	Option 3
Indicator 1	Green	Yellow	Dark Green
Indicator 2	Dark Green	Green	Yellow
Indicator 3	Dark Green	Dark Green	Yellow

Examples:

Smith et al. 2021 Frontiers in Marine Science

Plaganyi et al. 2013 PNAS

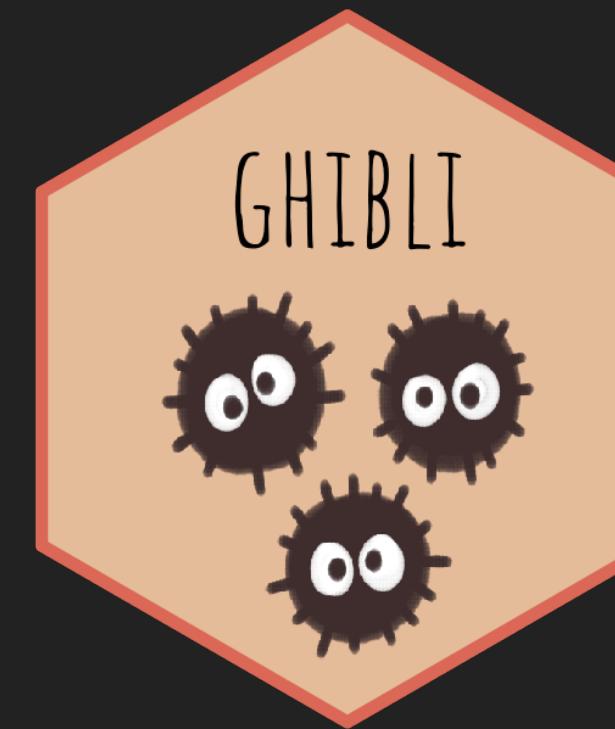
Examples:

NEFSC Atlantic Herring Fishery Management Plan, 2019

CHALLENGES FOR SIMULATION RESULTS

- Clarity is key, but volume of outputs can be high
- Scaling issues with tradeoffs
- Usefulness of presentation depends on shared understanding of objectives and ability to understand the figures

DEMO 1: DISPLAYING UNCERTAINTY & TRADEOFFS



 **plotly**
+ {hrbrthemes}

DEMO 1

The screenshot shows a GitHub repository page for 'mcsiple/siple-efi'. The repository has 1 branch and 0 tags. The 'Code' tab is selected. A context menu is open over the repository name, showing options like 'Clone' (HTTPS, SSH, GitHub CLI), 'Open with GitHub Desktop', and 'Download ZIP'. The 'About' section describes the repository as 'Code for a "bare bones" shiny app for the Ecological Forecasting Initiative (EFI)'. It also includes links for 'Readme', 'Releases' (no releases published), and 'Packages' (no packages published). The main content area features a large heading 'Showing distributions and uncertainty in R and Shiny'.

github.com/mcsiple/siple-efi

Search or jump to... / Pull requests Issues Marketplace Explore

mcsiple / siple-efi

Code Issues Pull requests Actions Projects Wiki Security Insights Settings

main · 1 branch · 0 tags

Go to file Add file Code

Clone

HTTPS SSH GitHub CLI

<https://github.com/mcsiple/siple-efi.git>

Use Git or checkout with SVN using the web URL.

Open with GitHub Desktop

Download ZIP

About

Code for a "bare bones" shiny app for the Ecological Forecasting Initiative (EFI)

Readme

Releases

No releases published

Create a new release

Packages

No packages published

Publish your first package

Showing distributions and uncertainty in R and Shiny

Code for a "bare bones" shiny app for the Ecological Forecasting Initiative (EFI). This talk is intended to give you a

WAYS TO COMMUNICATE UNCERTAINTY IN SHINY

- observe() statements for modifying parameters
- live plots using {plotly} to select parameter values
- gifs to show the estimation process?

STRUGGLES

PREVIOUS STRUGGLES

SHINY ISN'T ALWAYS THE TOOL YOU NEED 😞

Storing large amounts of data

Storing information about
how people use the app

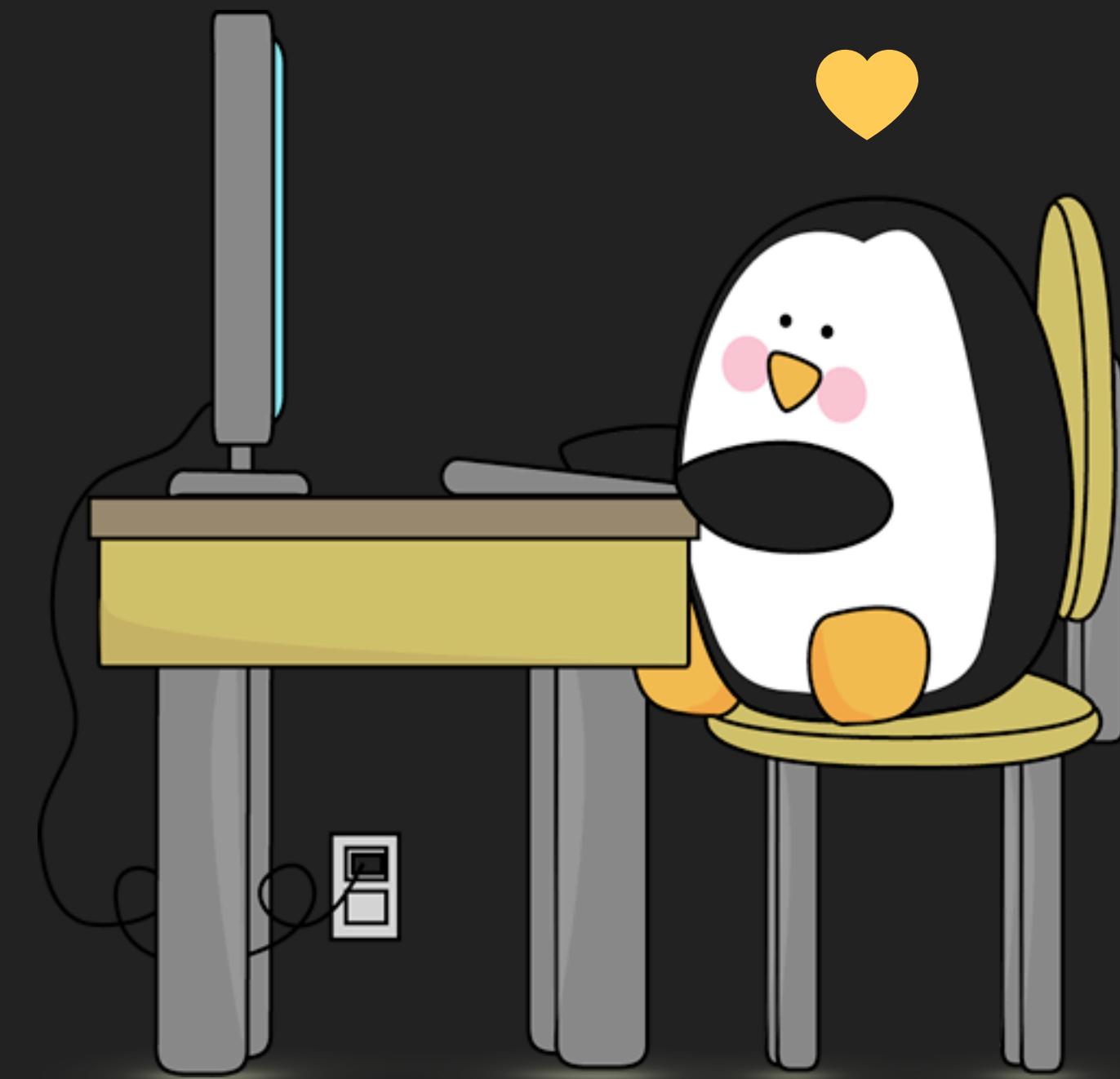
Authentication

Polished custom
websites with many
features



PREVIOUS STRUGGLES

USER EXPERIENCE



USER EXPERIENCE

- Define **user goals**
- Use **missions** to see how people use the app
 - e.g., “create a density plot of penguin weight.”
- For **online-only pilot testing**, online apps like Maze and UsabilityHub allow you to test how users interact with software and ask them questions about how they’re using it
- A list of guidelines for user testing from 18F Methods: <https://methods.18f.gov/validate/usability-testing/>

WRITING TESTS

- When outcomes are not deterministic, `expect_equal()` and some other testing functions make less sense
 - Solution: you can set a seed in the testing environment!
- Other Shiny test tools:
 - Test server functions with `testServer()`
 - Use snapshot-based tests
 - Test Shiny server/ui and functions separately

DEMO 2: WRITING TESTS FOR SHINY APPLICATIONS

MAKE IT ACCESSIBLE

- Check out accessibility guidelines and make your Shiny app accessible!

- Emulators
- Automated tools
- Checklists

NOAA Central Library / LibGuides / Section 508 Compliance / Home

Section 508 Compliance: Home

A selection of resources and information on Section 508 Compliance.

[Home](#) [Quick Start Guide: 508 Compliance For NOAA IR Submissions](#) [Section 508 Library Seminars](#) [Creating Accessible Documents](#)

[Web Page Accessibility](#) [Tools for Testing Accessibility](#)

This guide provides specific guidance on Section 508 compliance requirements for NOAA IR Submissions, as well as resources for general Section 508 issues. For questions on NOAA 508 Policy, please contact the NOAA Coordinator [Natalie Smith](#).

Shiny App Accessibility, Part 2: Accessible Design

November 25, 2020 by Kelly Hondula

Go back to part 1 of our series on Shiny App Accessibility

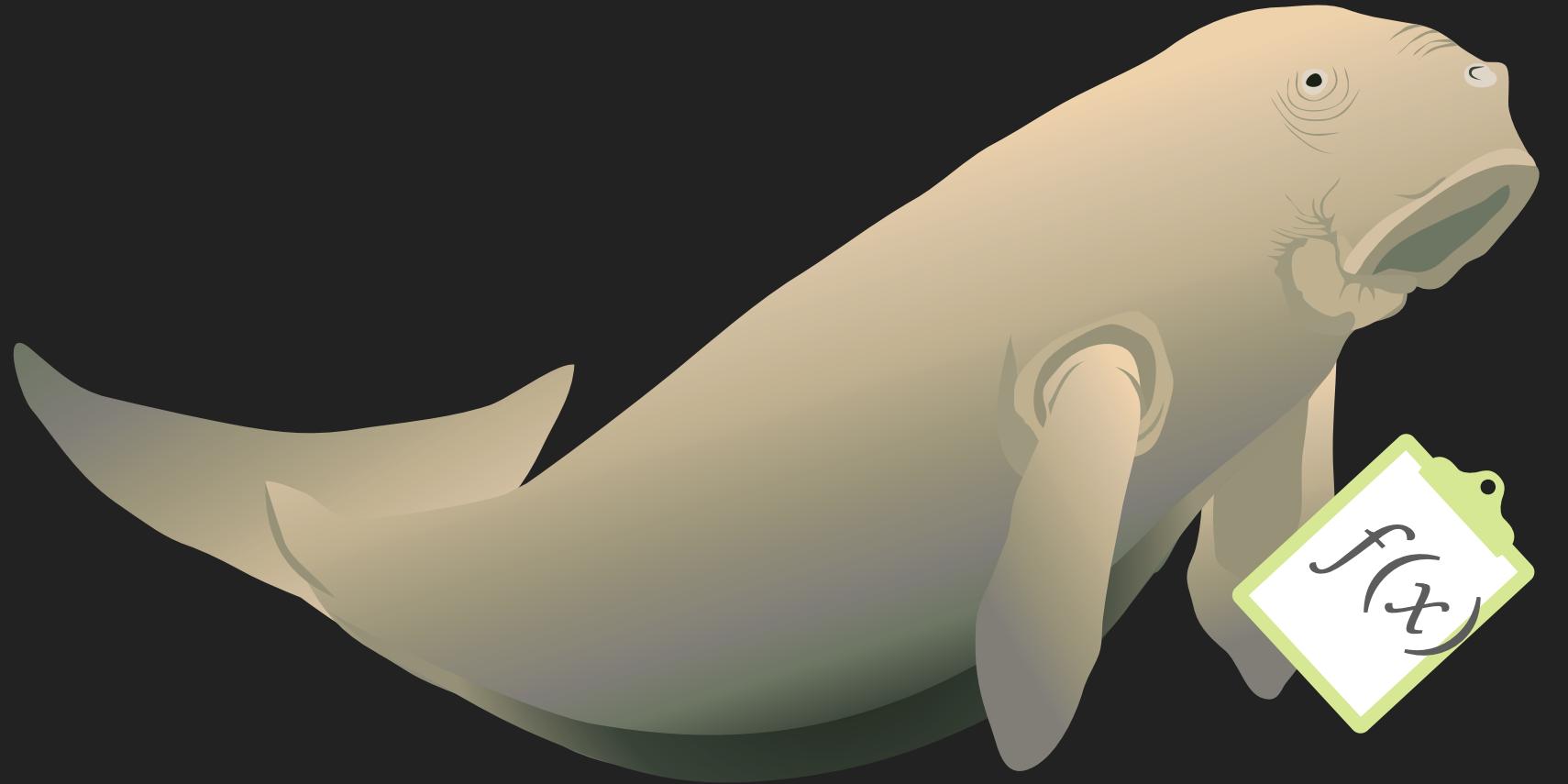
This year marks the 30th anniversary of the [Americans with Disabilities Act](#), a transformative civil rights law that followed decades of action by disability activists. It

<https://cyberhelp.sesync.org/blog/shiny-accessibility.html>

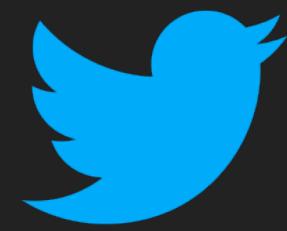
TAKE HOME MESSAGES

- Users don't see your app the same way you do - always test your app
- Don't help people use your app! Encourage them to explore
- Use and test modules - and write good tests
- Accessibility is key

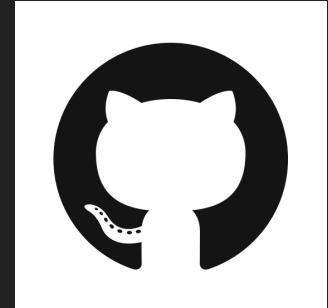
THANK YOU



mcsiple@gmail.com



@margaretsiple



mcsiple

margaretsiple-NOAA

More on the mmrefpoints package and MMBIET:

Link to MMBIET app online: <https://msiple.shinyapps.io/mammaltool/>

mmrefpoints: <https://github.com/mcsiple/mmrefpoints>

More Shiny code, slides, and tutorials:

<https://github.com/mcsiple/shinyoverview>



ADDITIONAL RESOURCES

ADDITIONAL RESOURCES

USEFUL GUIDES FOR DIFFERENT PHASES OF SHINY DEVELOPMENT

- If you're already a **Shiny developer** and think you might want to make a “production-grade” app, see **Engineering Shiny** by Colin Fay, Sébastien Rochette, Vincent Guyader, and Cervan Girard <https://engineering-shiny.org/>
 - the authors wrote the “golemverse” for prototyping and testing



- If you're a “beginner” and want to get better at the basic structure and function of Shiny apps, check out **Mastering Shiny** by Hadley Wickham (to be published soon) <https://mastering-shiny.org/>

ADDITIONAL RESOURCES

ADDITIONAL RESOURCES

- Displaying data: <https://www.data-to-viz.com/>
- **Saving data from a Shiny app**
 - “Persistent data storage in Shiny apps” also by Dean Attali <https://deanattali.com/blog/shiny-persistent-data-storage/> (includes link to source code for 10 different types of data storage)
 - An app where you can check out all the data storage types: <https://daattali.com/shiny/persistent-data-storage/>
 - **Building a package for an app and vice versa** <https://rtask.thinkr.fr/building-a-shiny-app-as-a-package/>

ADDITIONAL RESOURCES

TESTING

- Shiny testing “basics”: <https://mastering-shiny.org/scaling-testing.html>
- Shiny testing overview:

PAPERS/FURTHER RESOURCES

Feeney, R.G., Boelke, D.V., Deroba, J.J., Gaichas, S.K., Irwin, B.J. & Lee, M.-Y. (2018). Integrating Management Strategy Evaluation into fisheries management: advancing best practices for stakeholder inclusion based on an MSE for Northeast U.S. Atlantic herring. *Can. J. Fish. Aquat. Sci.*

Miller, S.K., Anganuzzi, A., Butterworth, D.S., Davies, C.R., Donovan, G.P., Nickson, A., et al. (2018). Improving communication: the key to more effective MSE processes. *Can. J. Fish. Aquat. Sci.*, 76, 643-656.

And... keep an eye out for Amanda Hart's paper (same topic as her quantitative seminar)!

SUGGESTIONS FROM THE PROS: AN “ESSENTIAL LIST”

- From Appendix B of “Improving communication: the key to more effective MSE processes” (Miller et al. 2019),
 - Projections for catch and/or effort and some measure of abundance
 - central tendency and probability envelope
 - a measure of inter annual catch variability
 - some output to make it clear that a central tendency does not reflect behavior in practice (e.g., spaghetti plots)
 - results for reference case or an average over a reference set of OMs
 - trade-off plots and Zeh plots