

What is the Ocean Health Index Toolbox and how can it help you?

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Helmholz Open Science Webinars
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HELMHOLTZ
Open Science



Without the OHI Toolbox



With the OHI Toolbox



The OHI Toolbox:

1. Why did we need it?

2. What is it?

3 How does it work?

4. How can it help you?

1. Why did we need the OHI Toolbox?

Ocean management is complicated

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Need for science- and data-driven methods to measure what people care about

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Need for science- and data-driven methods to measure what people care about

Need for standardized but flexible methods to assess different geographies

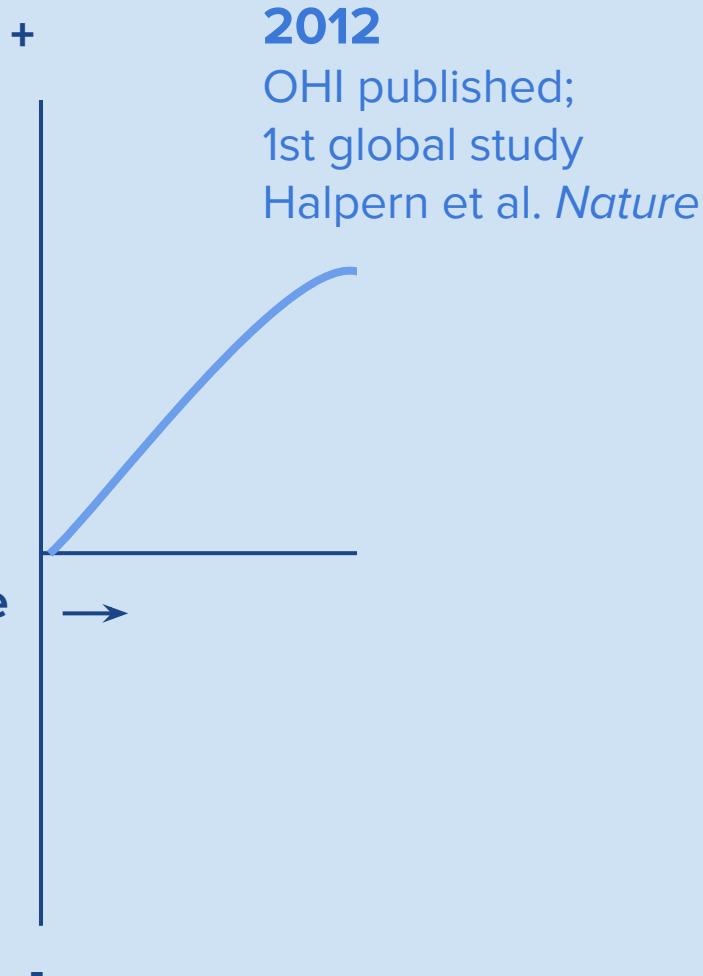
Ocean management is complicated

Need for science- and data-driven methods to measure what people care about

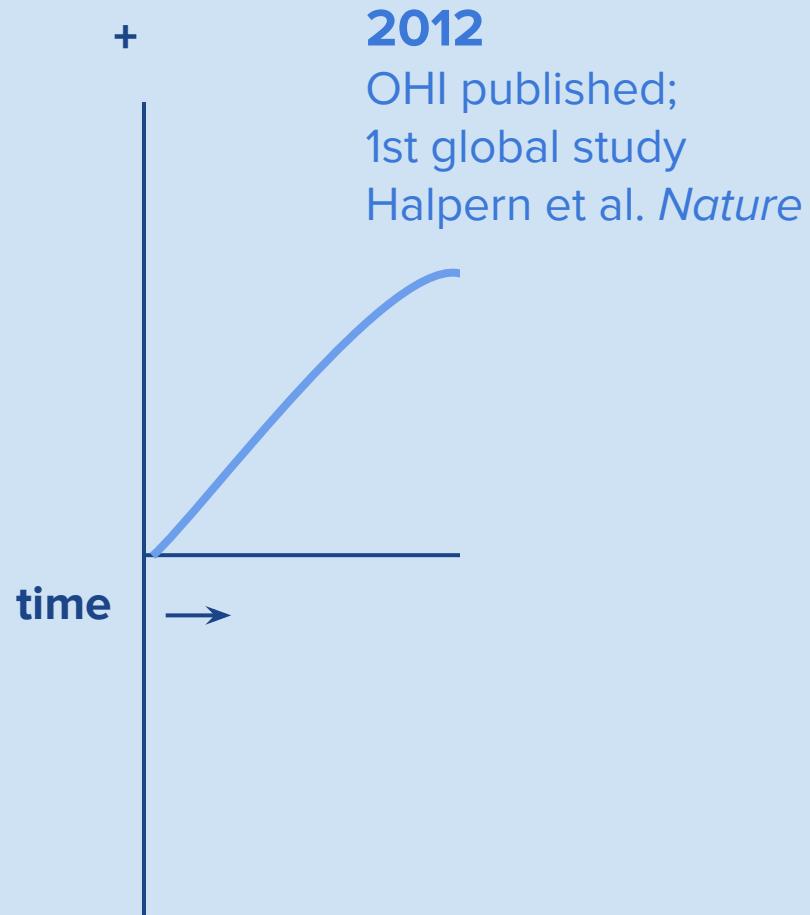
Need for standardized but flexible methods to assess different geographies

Need to streamline assessments from year-to-year to track change through time

Our Ocean Health Index story



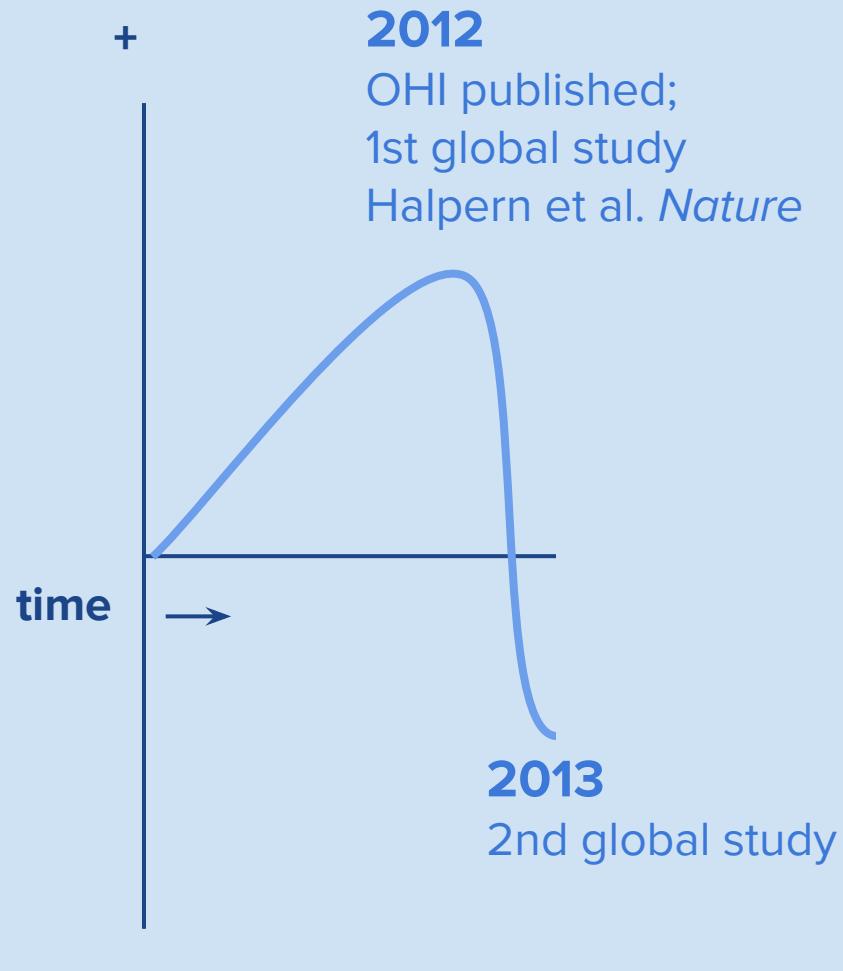
Our Ocean Health Index story



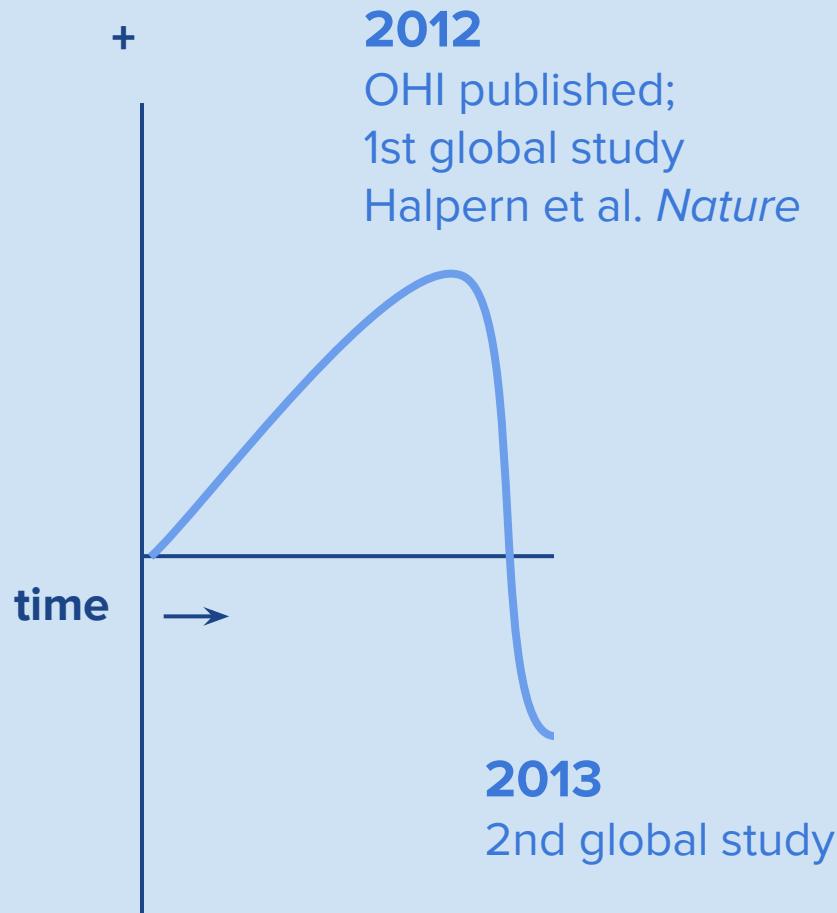
Repeatability was a priority

- Detailed notes on data processing
- Coded models
- Published 130 pages of SOM
- Shared modeled data on FTP

Our Ocean Health Index story



Our Ocean Health Index story



Our approaches were inadequate to efficiently reproduce our own work – because of data prep

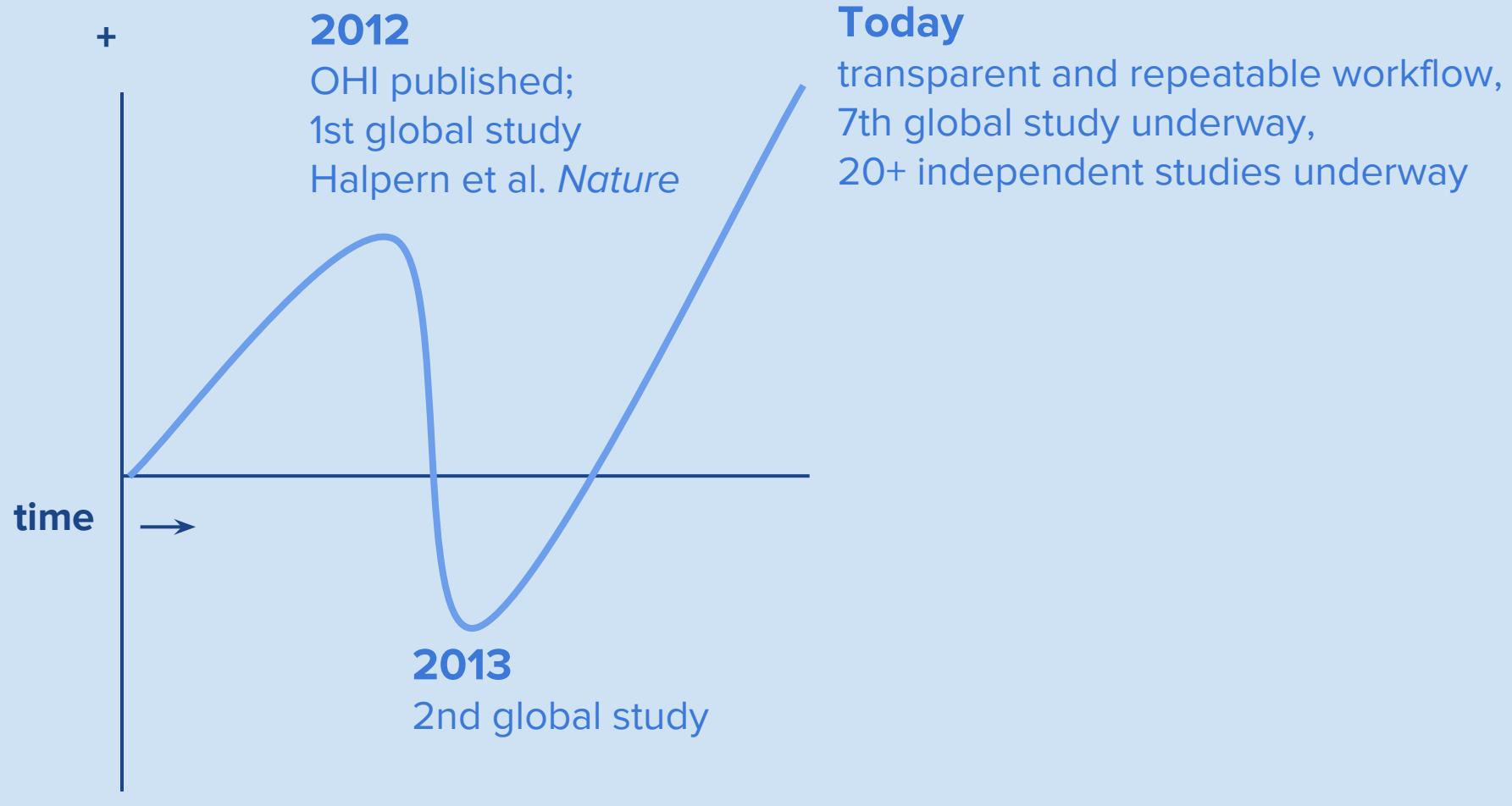


data_final_final.xls

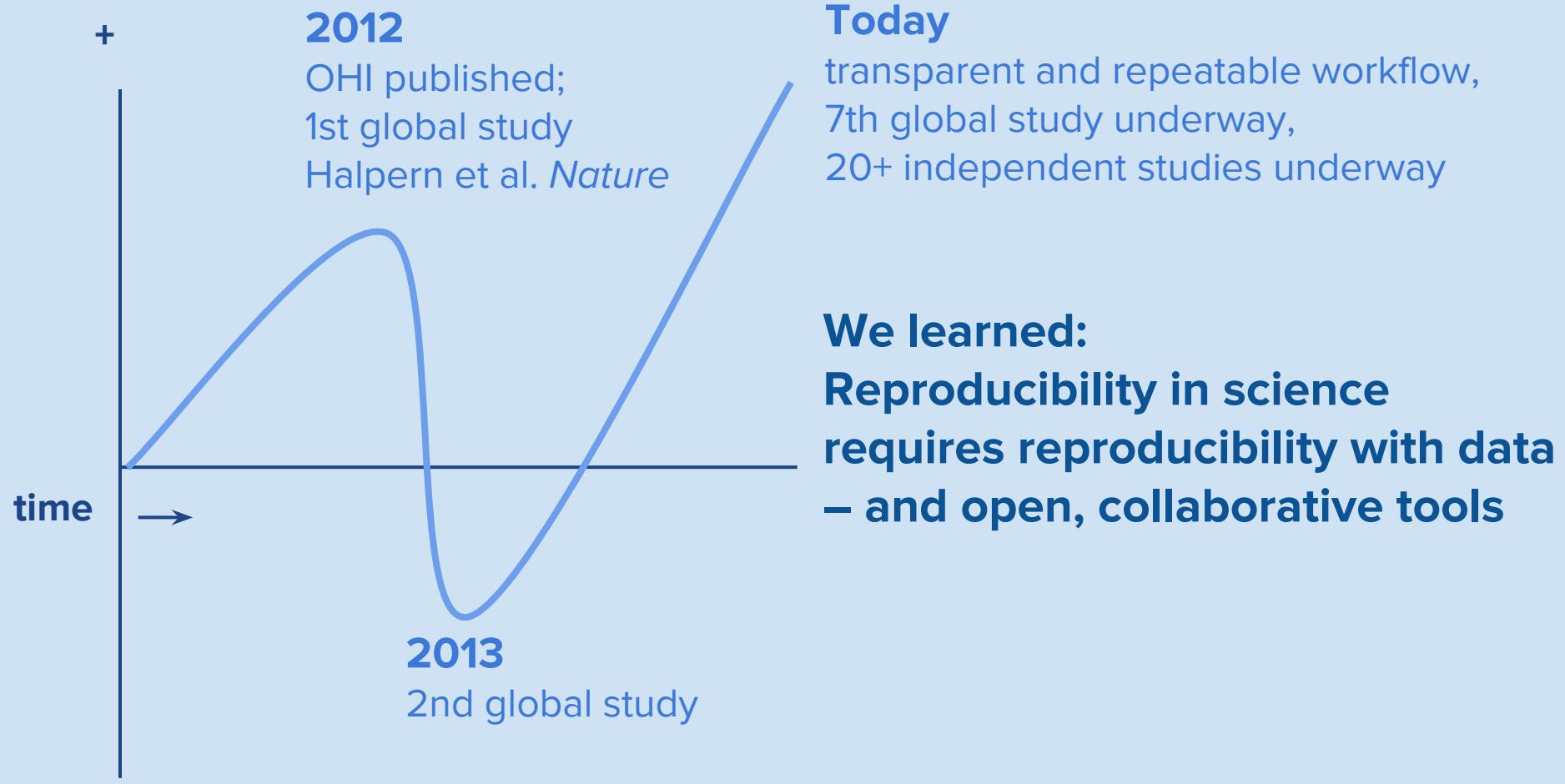


Re: FWD: data question

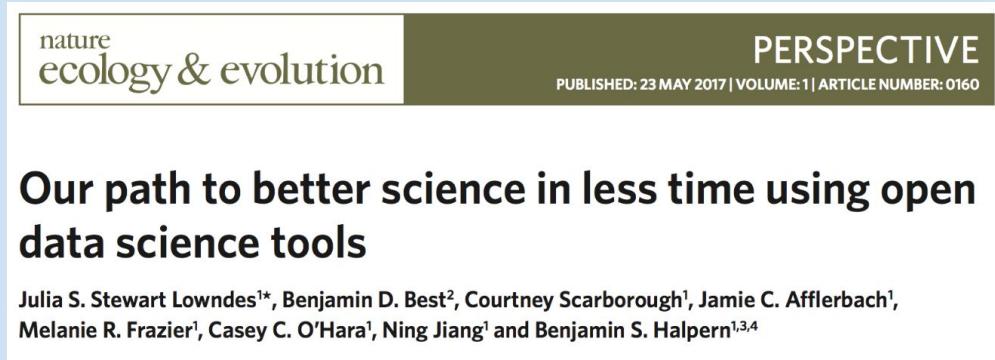
Our Ocean Health Index story



Our Ocean Health Index story

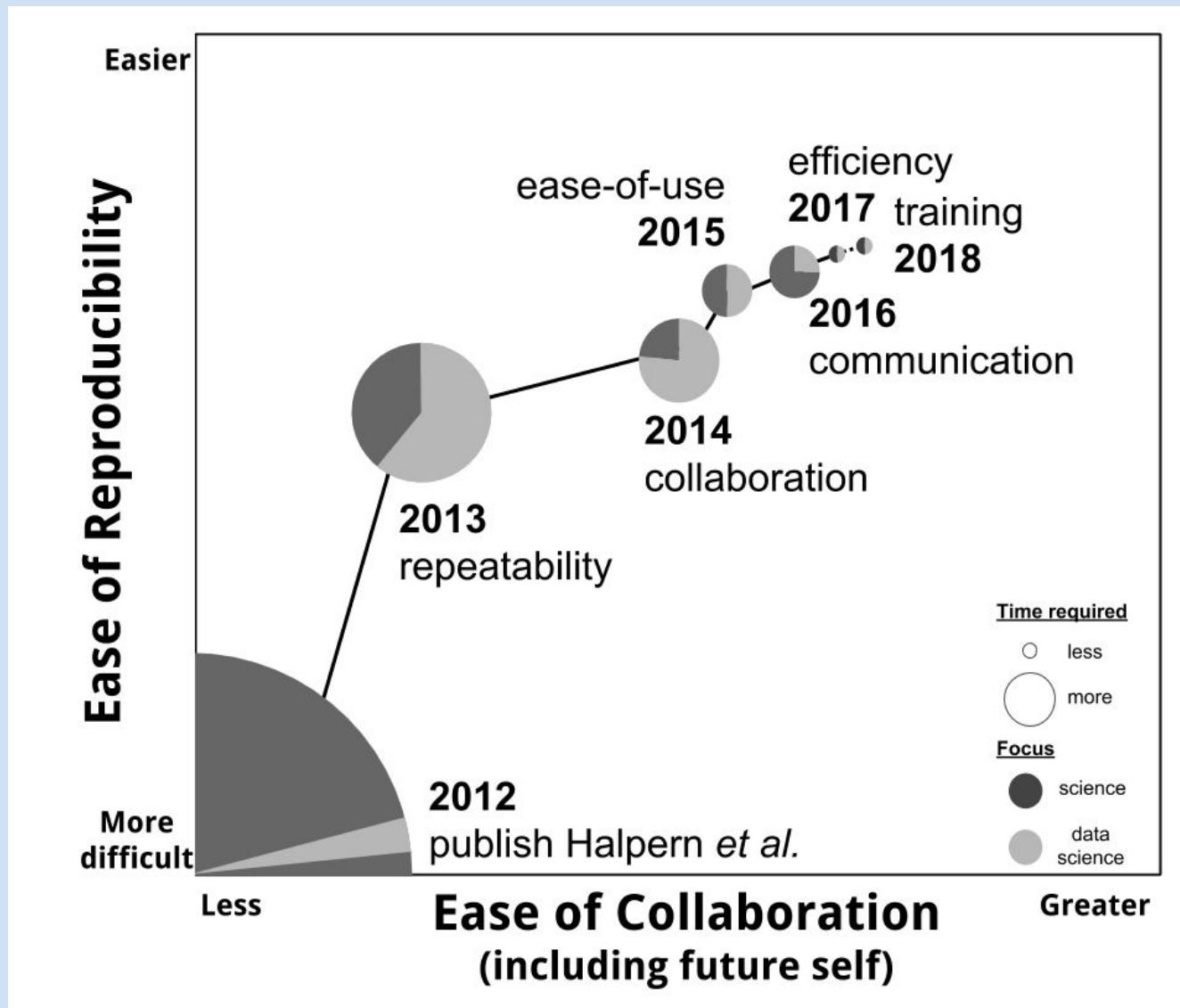


Our Ocean Health Index story



Lowndes et al. 2017 *Nature Ecology & Evolution*

Our Ocean Health Index story



2. What is the OHI Toolbox?

OHI Toolbox  **Software + Workflow**

OHI Toolbox = Software + Workflow



open source, cross-platform
download & learn online

used by software development
teams!!



OHI Toolbox = Software + Workflow

open source, cross-platform
download & learn online

used by software development
teams!!

OHI Toolbox
Software = GitHub repositories



+ R code



**OHI Toolbox
Software**

= **GitHub repositories**
open shared online folders



+ R code



**OHI Toolbox
Software**

= **GitHub repositories**



open shared online folders

bookkeeping
version control



+ **R code**



OHI Toolbox Software

= GitHub repositories



open shared online folders

bookkeeping
version control



+ R code



open data science language

OHI Toolbox Software

= GitHub repositories



open shared online folders

bookkeeping

version control



git

+ R code



open data science language

integrated development

environment (IDE)

packages & tools

best practices & tutorials



**OHI Toolbox
Workflow**

=  R Studio[®] +  GitHub 

OHI Toolbox Workflow



Coding collaboratively, openly, with shared practices

Emphasizing documentation + communication

OHI Toolbox Workflow



Coding collaboratively, openly, with shared practices

Emphasizing documentation + communication



**Leveraging best practices from the open community
(#rstats @RStudio @rOpenSci @RLadiesGlobal
@thecarpentries ...)**

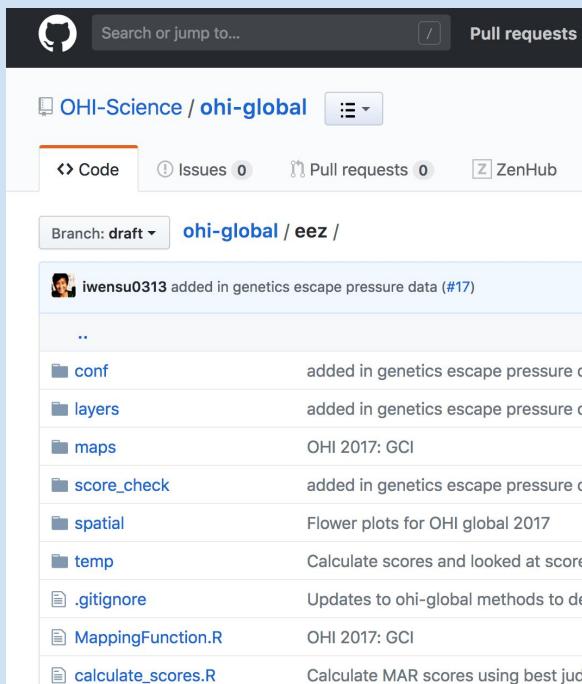
3. How does it work?

Each OHI assessment has its own GitHub repository

Purpose: has info specific to the assessment: code, data, models, management targets, etc.

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Purpose: has info specific to the assessment: code, data, models, management targets, etc.



Search or jump to... Pull requests

Code Issues 0 Pull requests 0 ZenHub

Branch: draft / ohi-global / eez /

iwensu0313 added in genetics escape pressure data (#17)

..

conf added in genetics escape pressure data

layers added in genetics escape pressure data

maps OHI 2017: GCI

score_check added in genetics escape pressure data

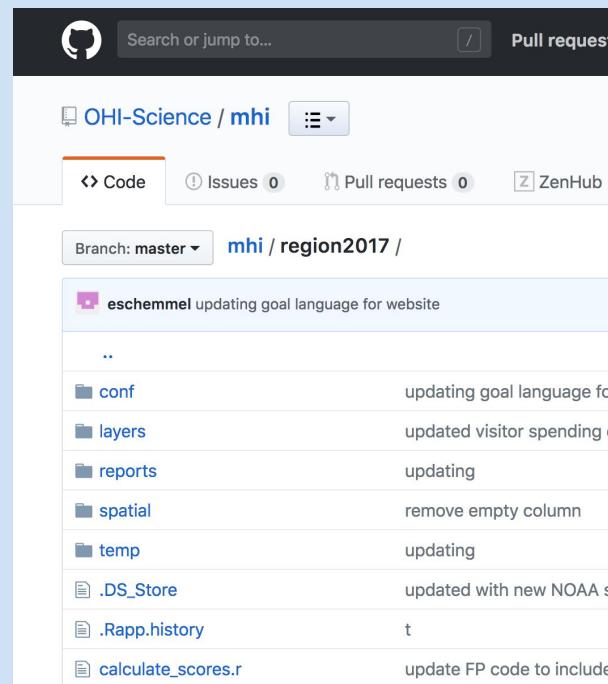
spatial Flower plots for OHI global 2017

temp Calculate scores and looked at score

.gitignore Updates to ohi-global methods to deal

MappingFunction.R OHI 2017: GCI

calculate_scores.R Calculate MAR scores using best judge



Search or jump to... Pull requests

Code Issues 0 Pull requests 0 ZenHub

Branch: master / mhi / region2017 /

eschommel updating goal language for website

..

conf updating goal language for website

layers updated visitor spending data

reports updating

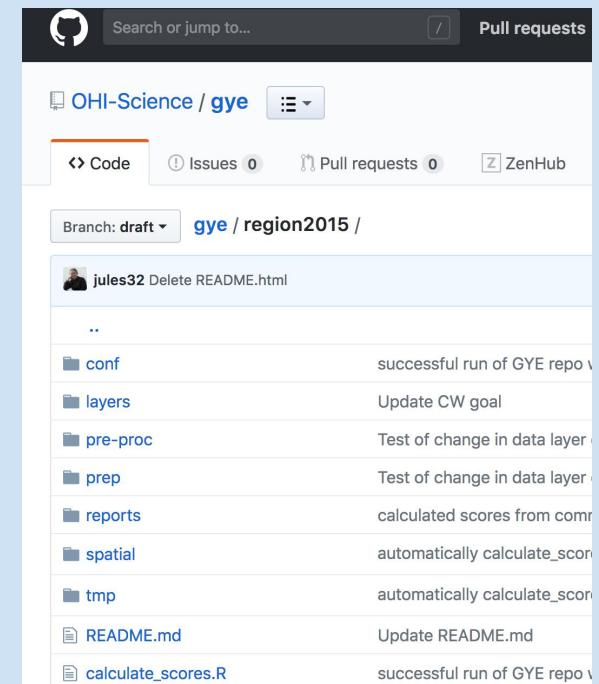
spatial remove empty column

temp updating

.DS_Store updated with new NOAA stations

.Rapp.history t

calculate_scores.r update FP code to include v



Search or jump to... Pull requests

Code Issues 0 Pull requests 0 ZenHub

Branch: draft / gye / region2015 /

jules32 Delete README.html

..

conf successful run of GYE repository

layers Update CW goal

pre-proc Test of change in data layer

prep Test of change in data layer

reports calculated scores from command line

spatial automatically calculate_scores

tmp automatically calculate_scores

README.md Update README.md

calculate_scores.R successful run of GYE repository

Global

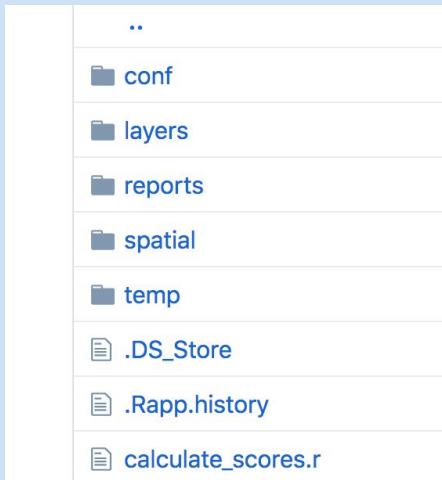
Hawaii

Ecuador

Each OHI assessment has its own GitHub repository

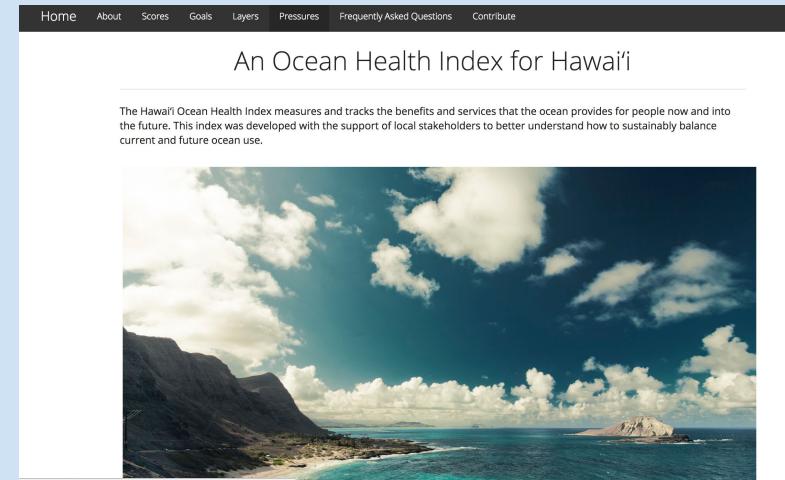
Each repo has:

Strict folder architecture for data and code



ex: github.com/ohi-science/mhi

RStudio/GitHub website for communication



ex: ohi-science.org/mhi

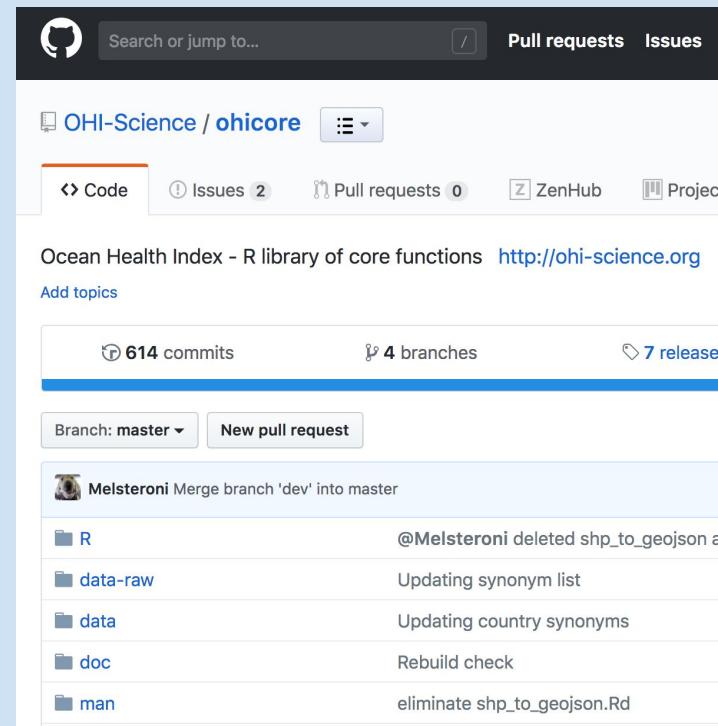
OHI repositories use our `ohicore` R package to calculate scores

Purpose: `ohicore` combines models + data architecture into OHI framework

OHI repositories use our ohicore R package to calculate scores

Purpose: ohicore combines models + data architecture into OHI framework

ohicore is its own GitHub repository !



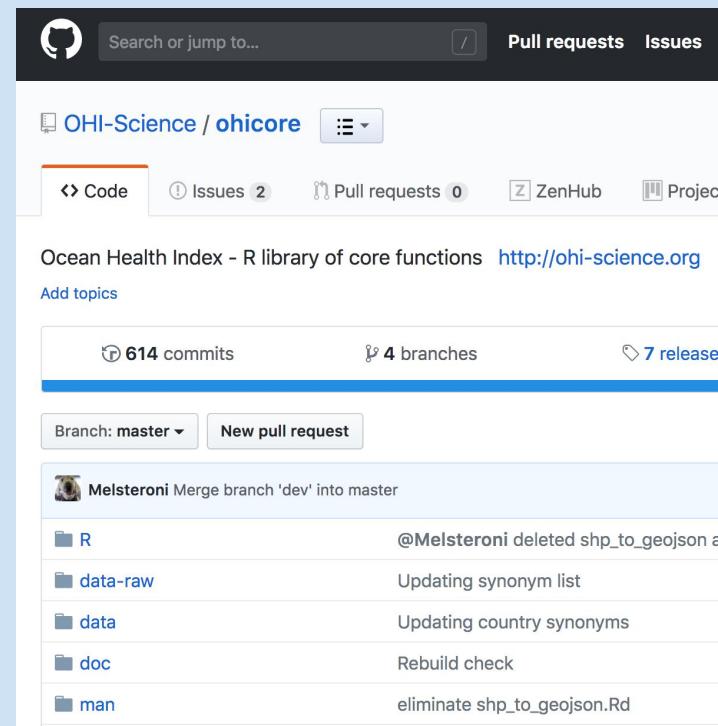
OHI repositories use our ohicore R package to calculate scores

Purpose: ohicore combines models + data architecture into OHI framework

ohicore is its own GitHub repository !

and it is installed directly from GitHub !

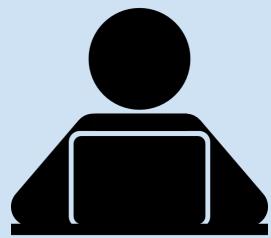
```
devtools::install_github(  
  ohi-science/ohicore)
```



The screenshot shows the GitHub repository page for 'ohicore' owned by 'OHI-Science'. The repository has 614 commits, 4 branches, and 7 releases. The 'Code' tab is selected. A pull request from 'Melsteroni' to merge 'dev' into 'master' is visible, along with commits for 'R', 'data', 'data-raw', 'doc', and 'man' files.

File	Description
R	@Melsteroni deleted shp_to_geojson.a
data-raw	Updating synonym list
data	Updating country synonyms
doc	Rebuild check
man	eliminate shp_to_geojson.Rd

Workflow

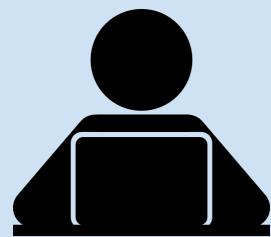


Code Organize

Workflow



Archive



Code

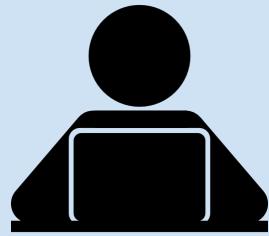
Organize

Workflow



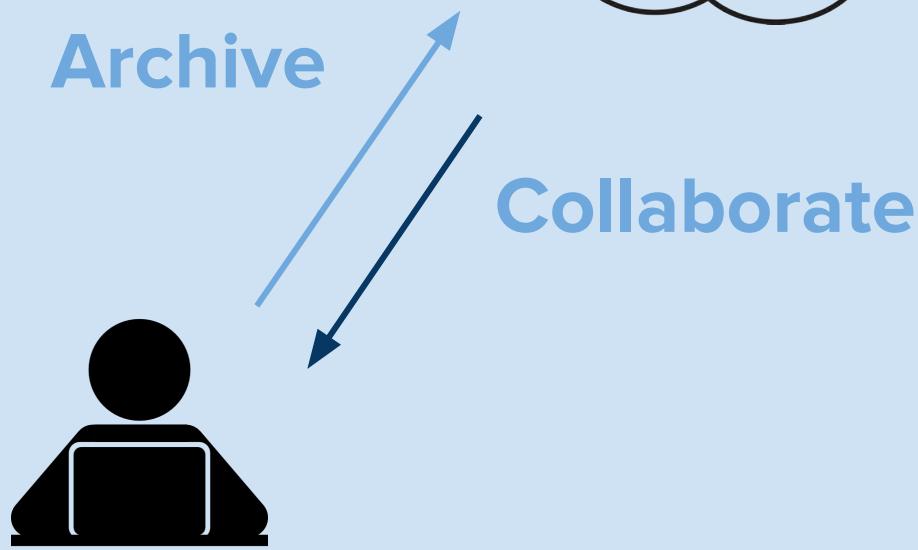
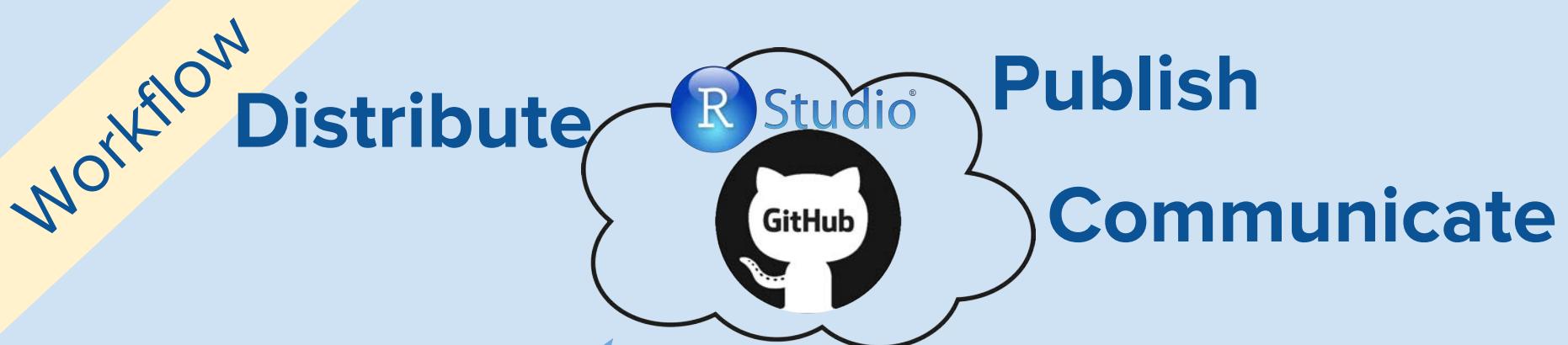
Archive

Collaborate



Code

Organize



Code Organize

Workflow

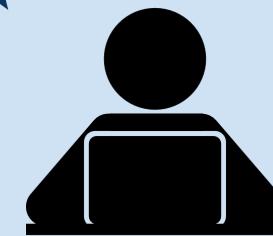
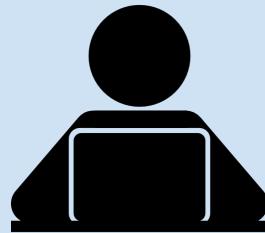
Distribute

Publish

Communicate

Archive

Collaborate



Code

Organize



Code

Organize

Workflow

Distribute

Publish

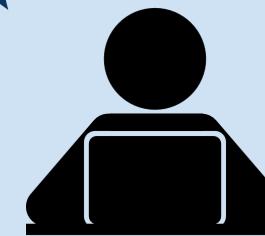
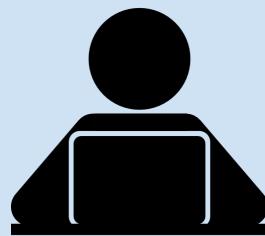
Communicate

Archive

Collaborate

Communicate

Troubleshoot



Code

Organize



Code

Organize

Workflow

Distribute



Publish

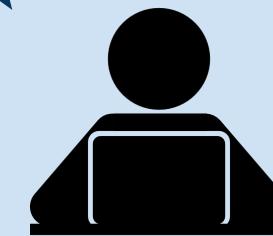
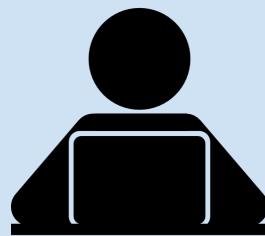
Communicate

Archive

Collaborate

Communicate

Troubleshoot



Code

Organize

Code

Organize

4. How can it help you?

1. You can use it as a blueprint for how to set up your own projects

Software and workflow are not unique to OH!

- 1. You can use it as a blueprint for how to set up your own projects**
- 2. You can benefit from becoming a part of this open science community**



And others!

see ohi-science.org/betterscienceinlesstime

- 1. You can use it as a blueprint for how to set up your own projects**
- 2. You can benefit from becoming a part of this open science community**
- 3. You can value, promote, + enable the culture of open science – even if you don't code**

The OHI Toolbox:

1. Why did we need it?

2. What is it?

3 How does it work?

4. How can it help you?

Summary

“Using the OHI Toolbox” means:

- Calculating repeated scores for ocean mgmt

Summary

“Using the OHI Toolbox” means:

- Calculating repeated scores for ocean mgmt

But, importantly, it also means:

- Practicing + promoting open science
- Coding openly + collaboratively
- Working efficiently + deliberately with data
- Building an open community of practice



Thank you!

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slides: jules32.github.io



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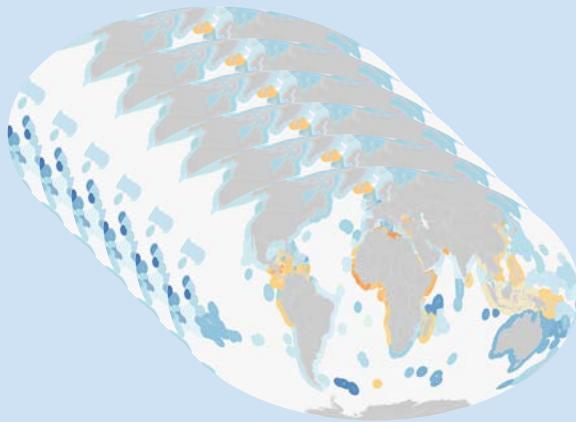


J. Payne

Reproducible, repeatable, iterative & transparent methods

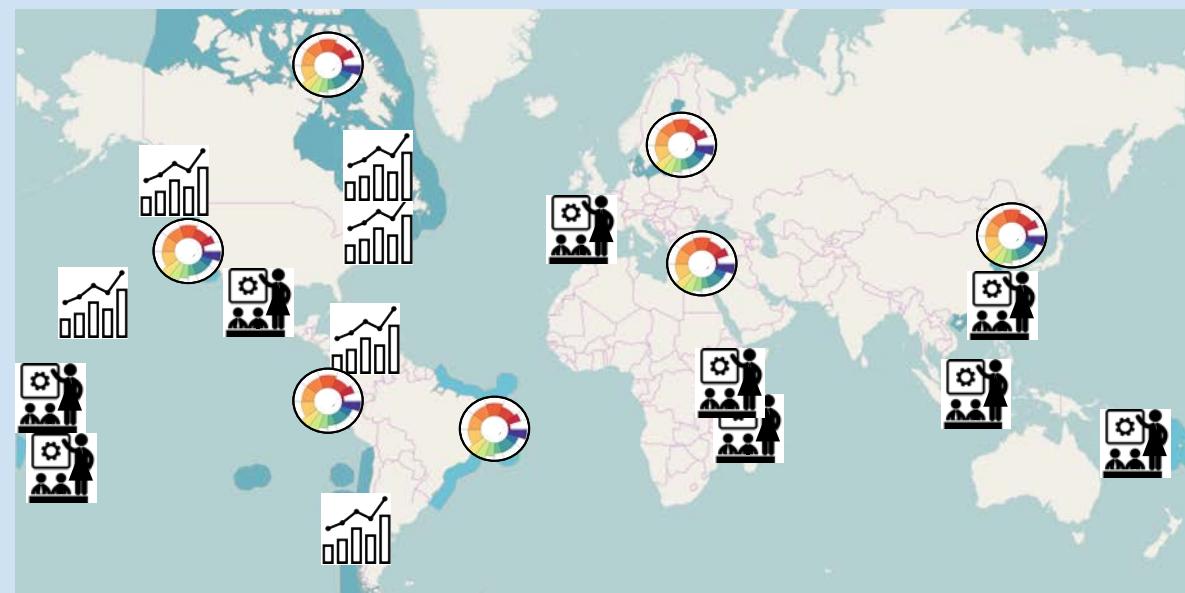


Tracking change
through time



6+ years of global scores

Independent assessments
at smaller spatial scales



 Planning

 Analysis

 Complete

Halpern et al. 2012, *Nature*

Halpern et al. 2015, *PLOS One*

Halpern et al. 2017, *PLOS One*

Lowndes et al. 2015, *PeerJ*
Daigle et al. 2017, *PLOS One*

Visible example of open science in action



**nature
ecology & evolution**

PERSPECTIVE
PUBLISHED: 23 MAY 2017 | VOLUME: 1 | ARTICLE NUMBER: 0160

Our path to better science in less time using open data science tools

Julia S. Stewart Lowndes^{1*}, Benjamin D. Best², Courtney Scarborough¹, Jamie C. Afflerbach¹, Melanie R. Frazier¹, Casey C. O'Hara¹, Ning Jiang¹ and Benjamin S. Halpern^{1,3,4}

Reproducibility has long been a tenet of science but has been challenging to achieve—we learned this the hard way when our old approaches proved inadequate to efficiently reproduce our own work. Here we describe how several free software tools have fundamentally upgraded our approach to collaborative research, making our entire workflow more transparent and streamlined. By describing specific tools and how we incrementally began using them for the Ocean Health Index project, we hope to encourage others in the scientific community to do the same—so we can all produce better science in less time.

Lowndes et al. 2017 *Nature Ecology & Evolution*



ohi-science.org/betterscienceinlesstime

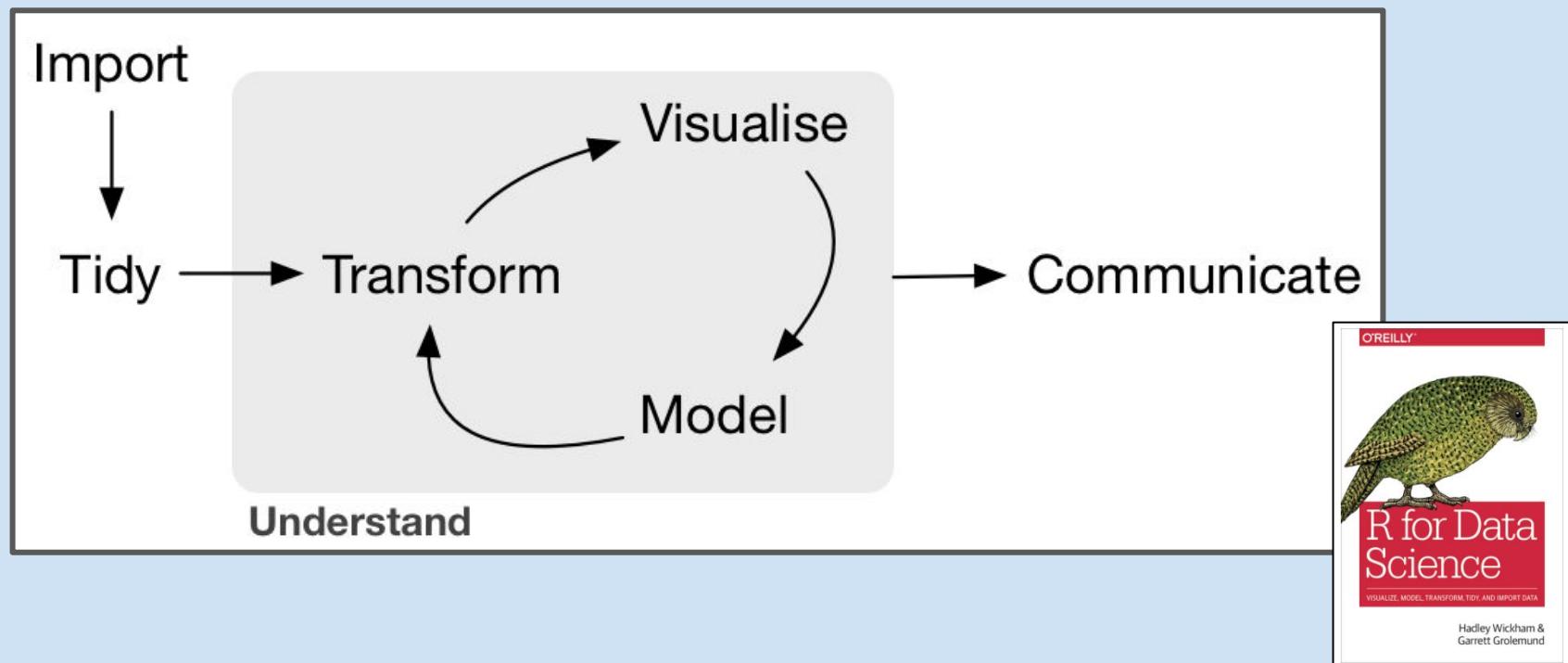


@OHIscience, @OceanHealthIdx



OHI Toolbox = GitHub + RStudio

Collaborative, open coding



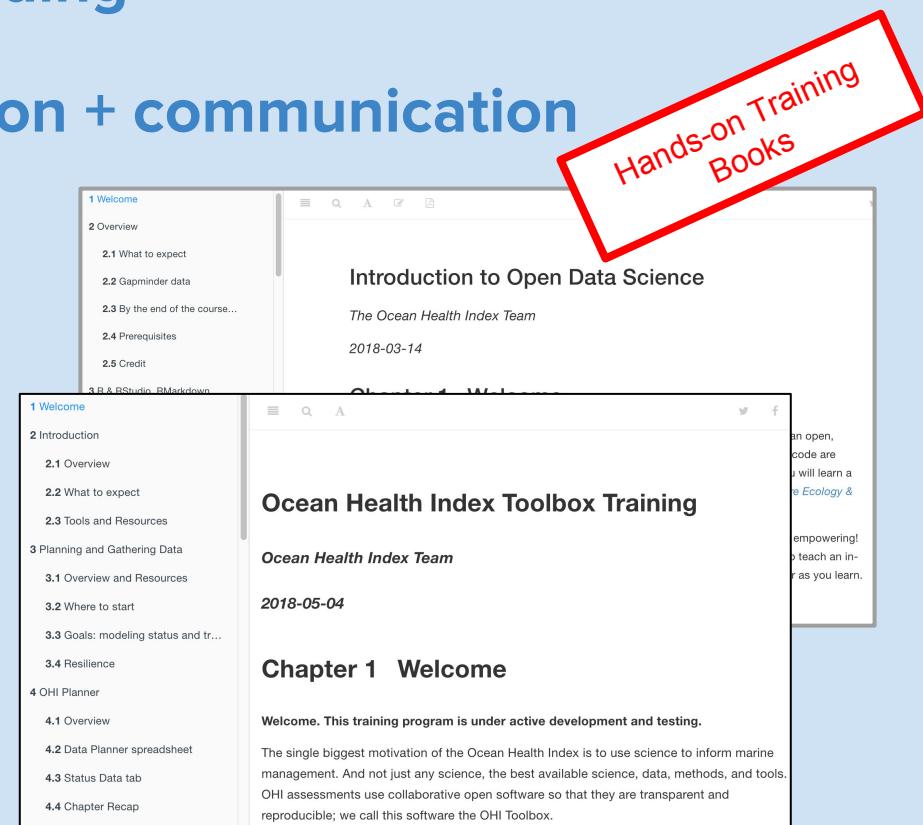
Workflow



OHI Toolbox = GitHub + RStudio

Collaborative, open coding

Focus on documentation + communication



Hands-on Training Books

The image shows a screenshot of the Ocean Health Index Toolbox Training documentation. The top section is titled "Introduction to Open Data Science" and includes the subtitle "The Ocean Health Index Team", the date "2018-03-14", and a "B & RStudio RMarkdown" link. The bottom section is titled "Ocean Health Index Toolbox Training" and includes the subtitle "Ocean Health Index Team", the date "2018-05-04", and a "Chapter 1 Welcome" link. Both sections have a sidebar with a table of contents. A red box with the text "Hands-on Training Books" is overlaid on the top right of the image.

1 Welcome

- 2 Overview
- 2.1 What to expect
- 2.2 Gapminder data
- 2.3 By the end of the course...
- 2.4 Prerequisites
- 2.5 Credit

3 B & RStudio RMarkdown

Introduction to Open Data Science

The Ocean Health Index Team

2018-03-14

1 Welcome

- 2 Introduction
- 2.1 Overview
- 2.2 What to expect
- 2.3 Tools and Resources

3 Planning and Gathering Data

- 3.1 Overview and Resources
- 3.2 Where to start
- 3.3 Goals: modeling status and tr...
- 3.4 Resilience

4 OHI Planner

- 4.1 Overview
- 4.2 Data Planner spreadsheet
- 4.3 Status Data tab
- 4.4 Chapter Recap

Ocean Health Index Toolbox Training

Ocean Health Index Team

2018-05-04

Chapter 1 Welcome

Welcome. This training program is under active development and testing.

The single biggest motivation of the Ocean Health Index is to use science to inform marine management. And not just any science, the best available science, data, methods, and tools. OHI assessments use collaborative open software so that they are transparent and reproducible; we call this software the OHI Toolbox.