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

Julia Stewart Lowndes, PhD
NCEAS, Univ. California at Santa Barbara, USA

Helmholz Open Science Webinars
Webinar 46 – 12 / 17 July 2018

NCEAS OCEAN HEALTH INDEX

HELMHOLTZ Open Science

Without the OHI Toolbox

Alexson 2015

With the OHI Toolbox

J. Payne

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 standardized but flexible methods to assess different geographies

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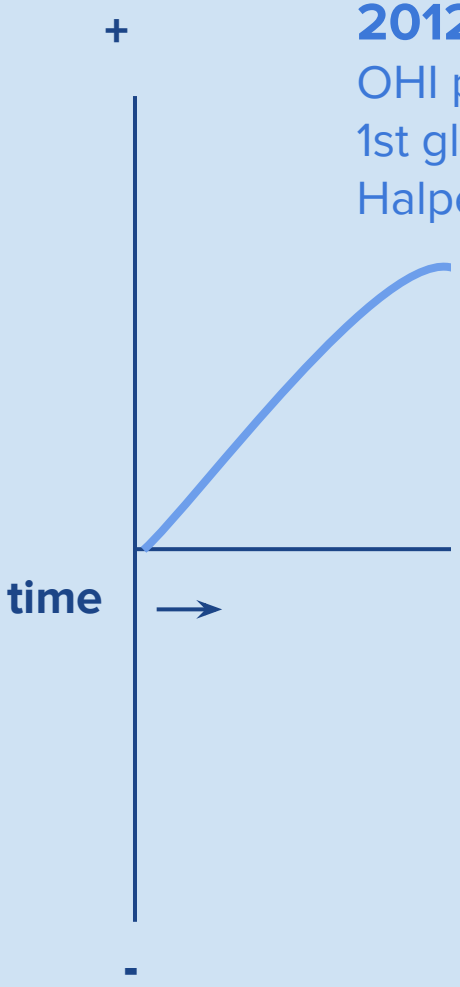
Need for science- and data-driven methods to measure what people care about

Need for standardized but flexible methods to assess different geographies

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

Our Ocean Health Index story



2012

OHI published;
1st global study
Halpern et al. *Nature*

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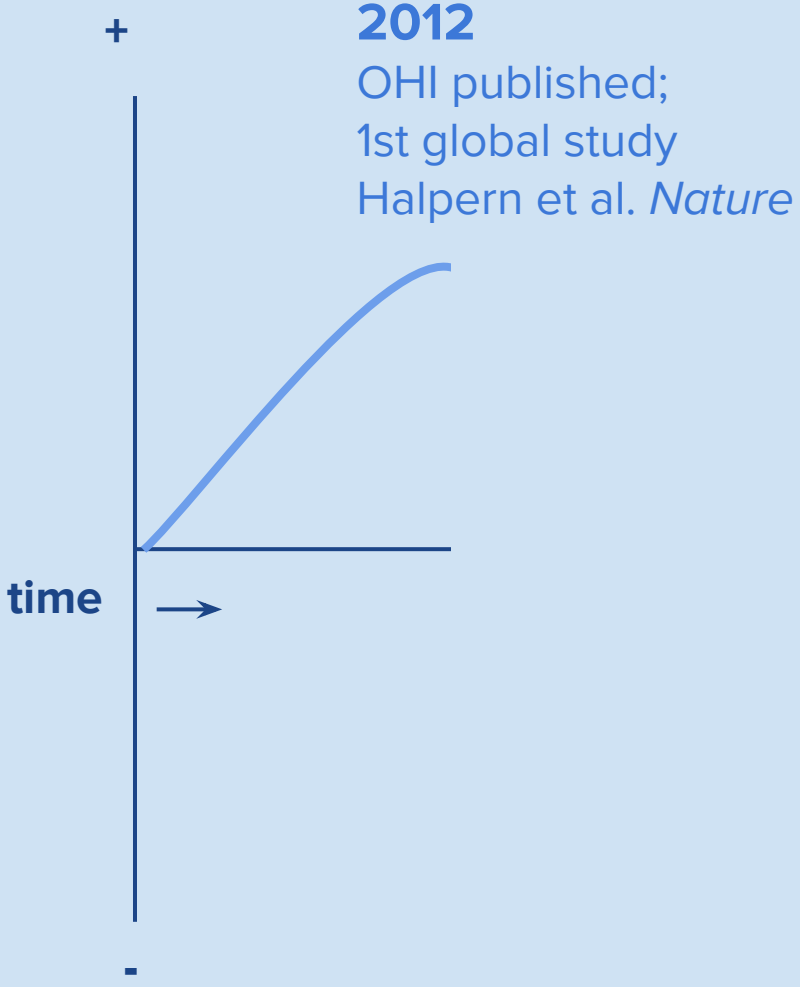

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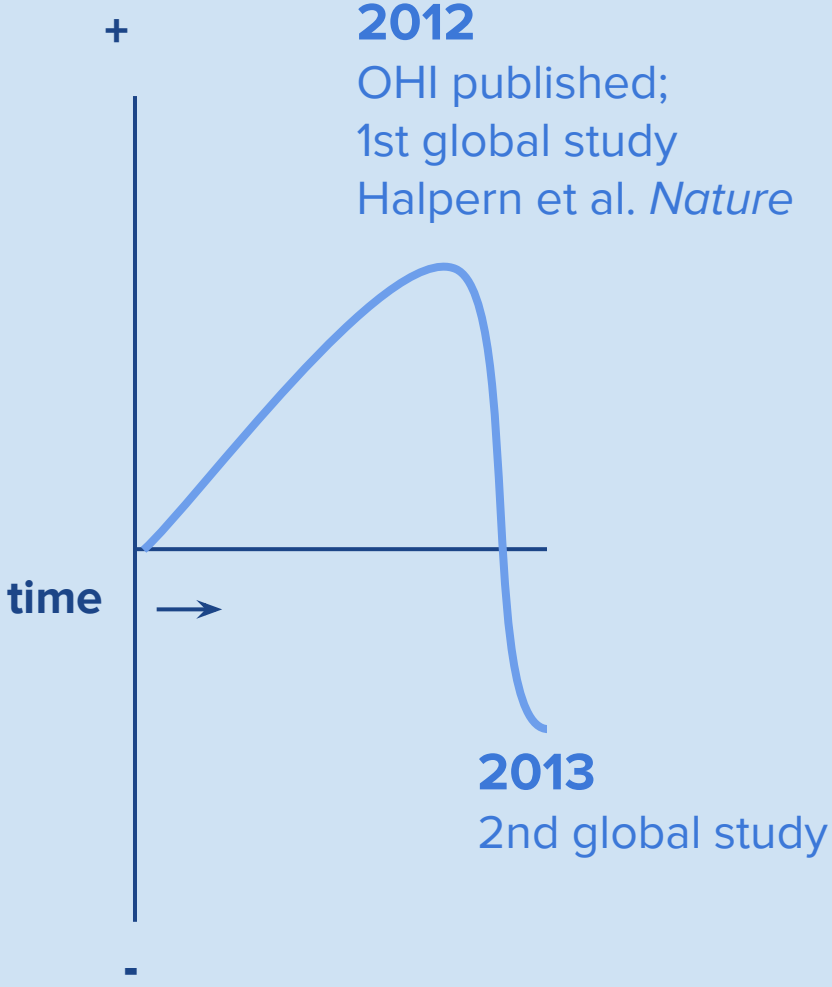
Repeatability was a priority

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

Our Ocean Health Index story



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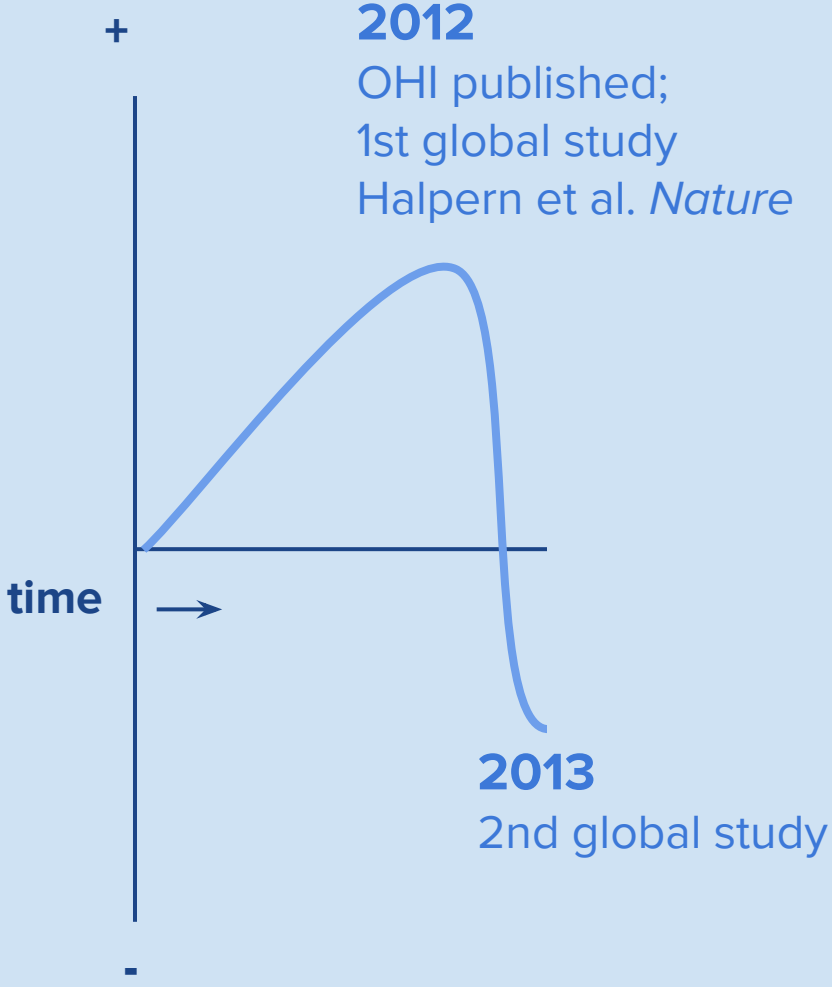
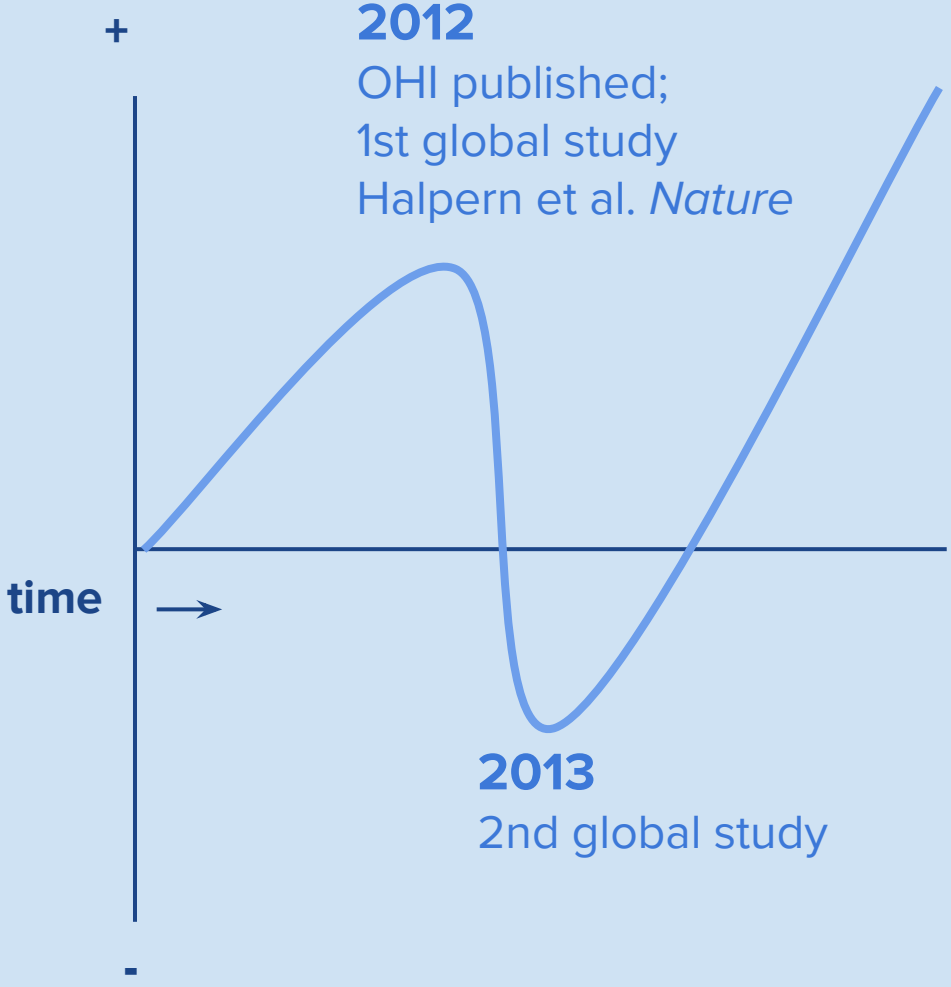


Our approaches were inadequate to efficiently reproduce our own work – because of data prep

`data_final_final.xls`

`Re: FWD: data question`

Our Ocean Health Index story



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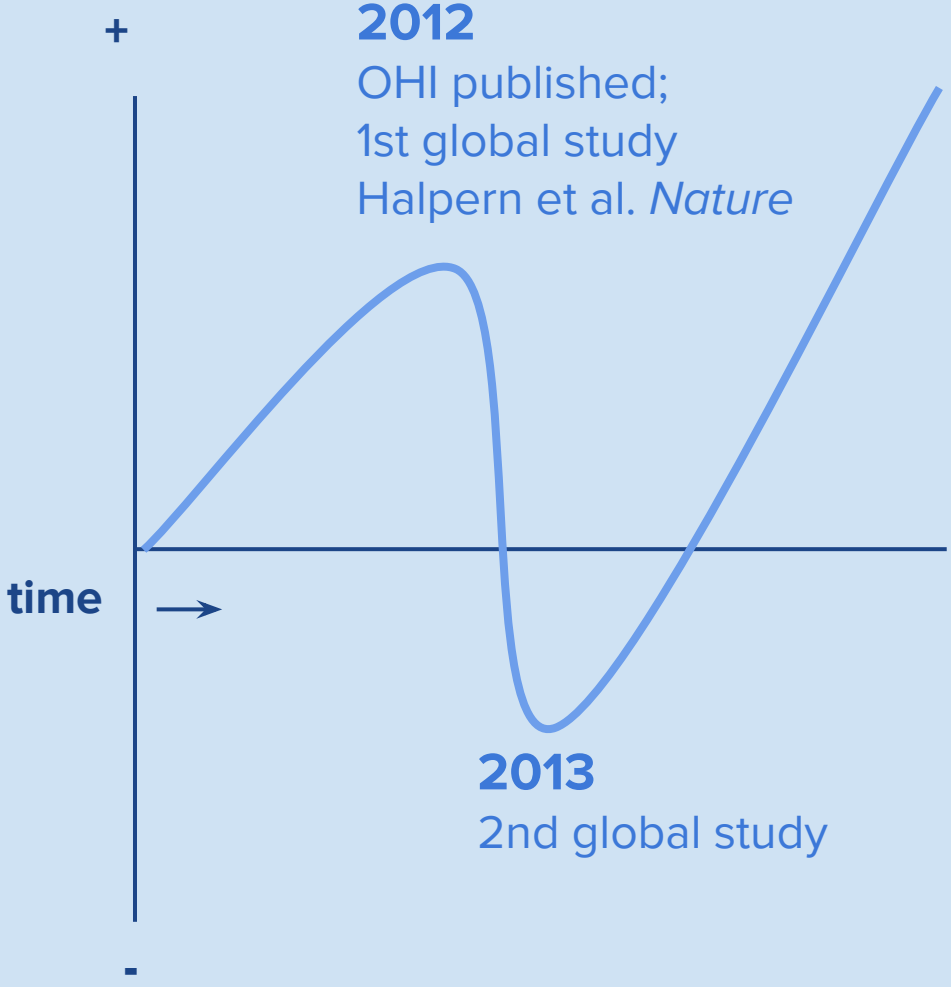
Today
transparent and repeatable workflow,
7th global study underway,
20+ independent studies underway

Our Ocean Health Index story



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Reproducibility in science requires reproducibility with data – and open, collaborative tools

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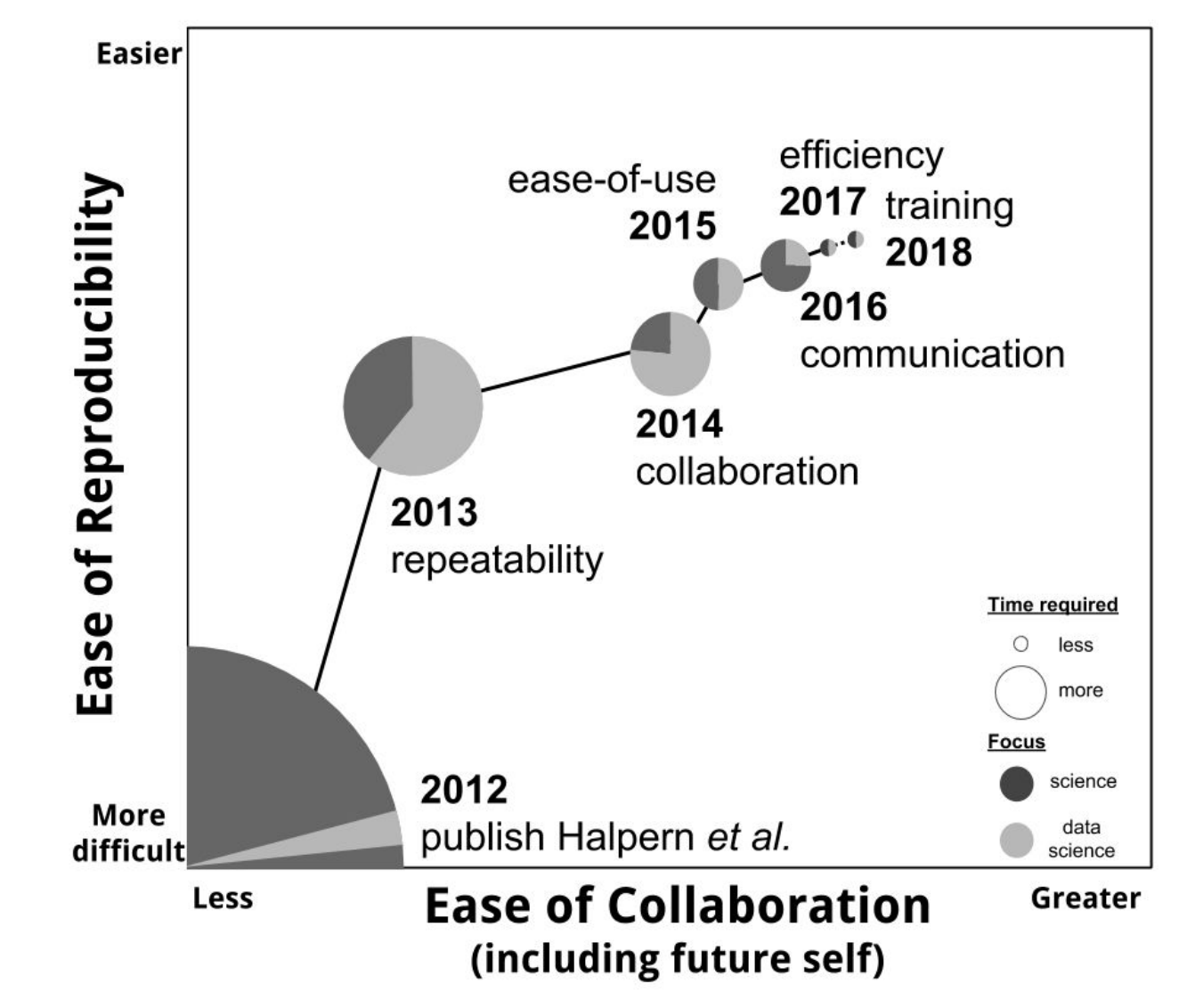
nature ecology & evolution
PERSPECTIVE
PUBLISHED: 23 MAY 2017 | VOLUME: 1 | ARTICLE NUMBER: 0160

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

Julia S. Stewart Lowndes[1*], Benjamin D. Best[2], Courtney Scarborough[1], Jamie C. Afflerbach[1], Melanie R. Frazier[1], Casey C. O'Hara[1], Ning Jiang[1] and Benjamin S. Halpern[1,3,4]

Lowndes et al. 2017 *Nature Ecology & Evolution*

Our Ocean Health Index story



Lowndes et al. 2017 *Nature Ecology & Evolution*

2. What is the OHI Toolbox?

OHI Toolbox = Software + Workflow

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open source, cross-platform
download & learn online

used by software development teams!!

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OHI Toolbox Software = GitHub repositories 

\+ R code 

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bookkeeping
version control

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+ R code

open data science language

OHI Toolbox Software

= GitHub repositories

open shared online folders

bookkeeping
version control

+ R code

open data science language

integrated development environment (IDE)
packages & tools
best practices & tutorials

OHI Toolbox Workflow

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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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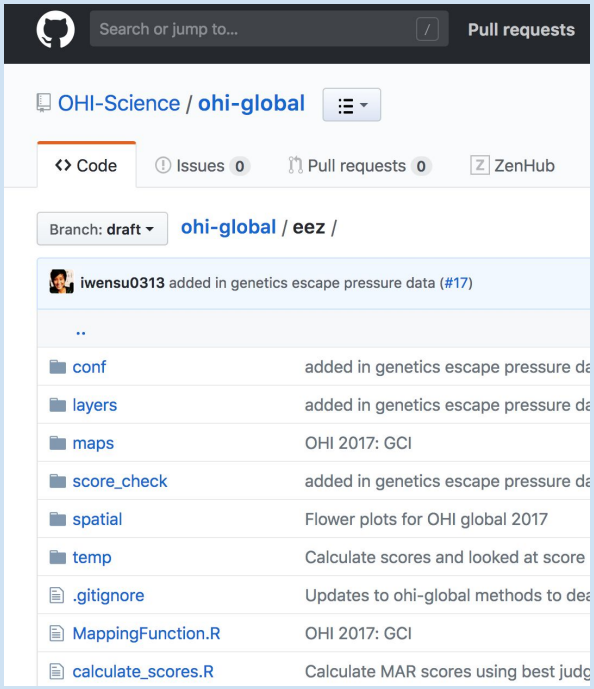
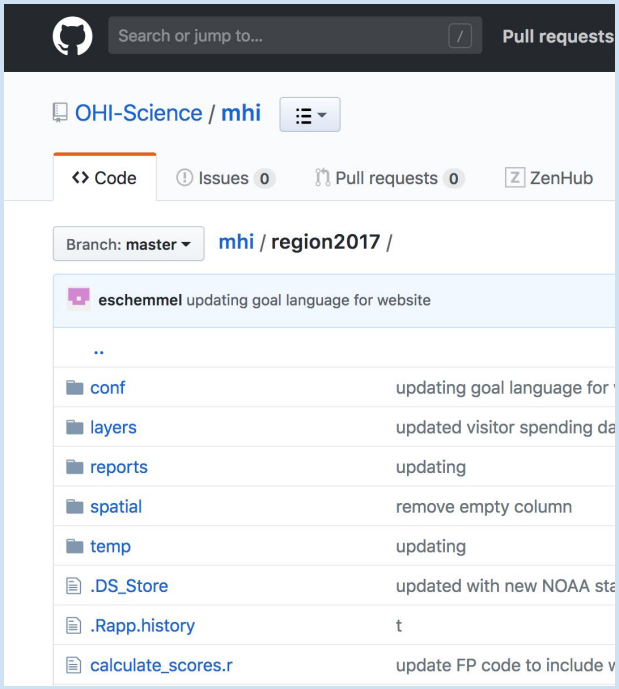
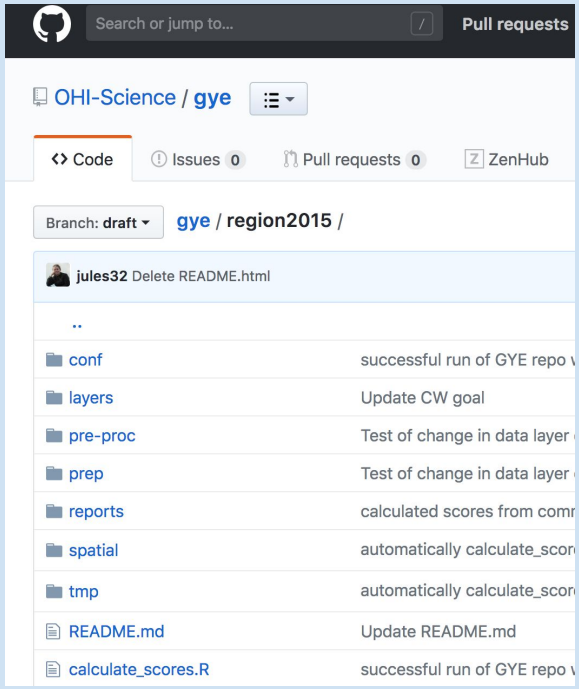


Global



Hawaii

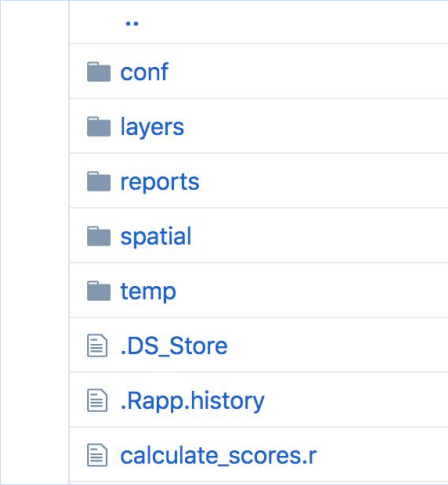


Ecuador

Each OHI assessment has its own GitHub repository

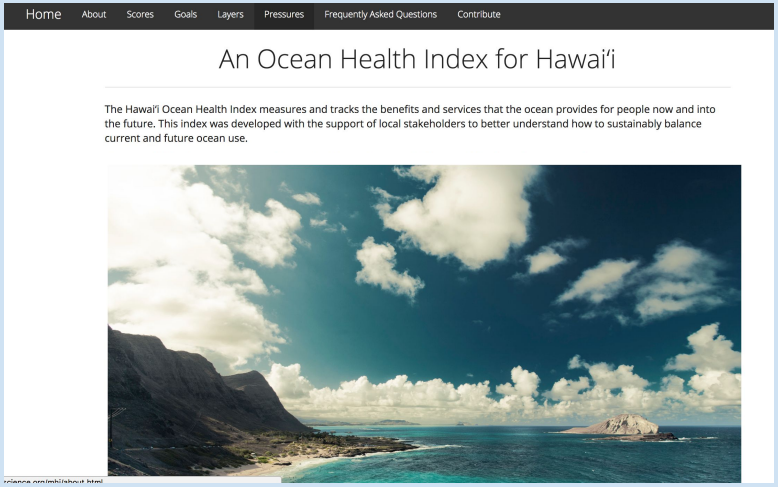
Each repo has:

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

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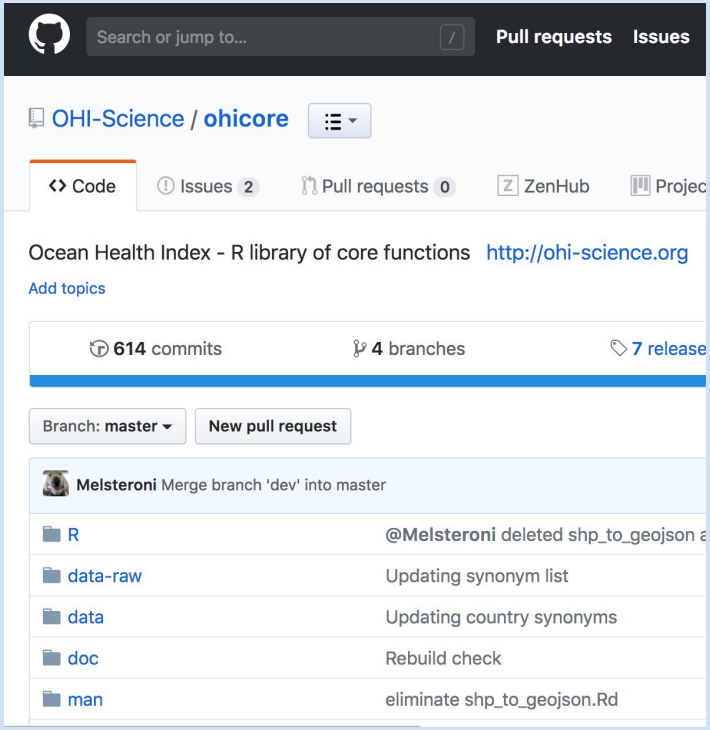
`ohicore` is its own GitHub repository !



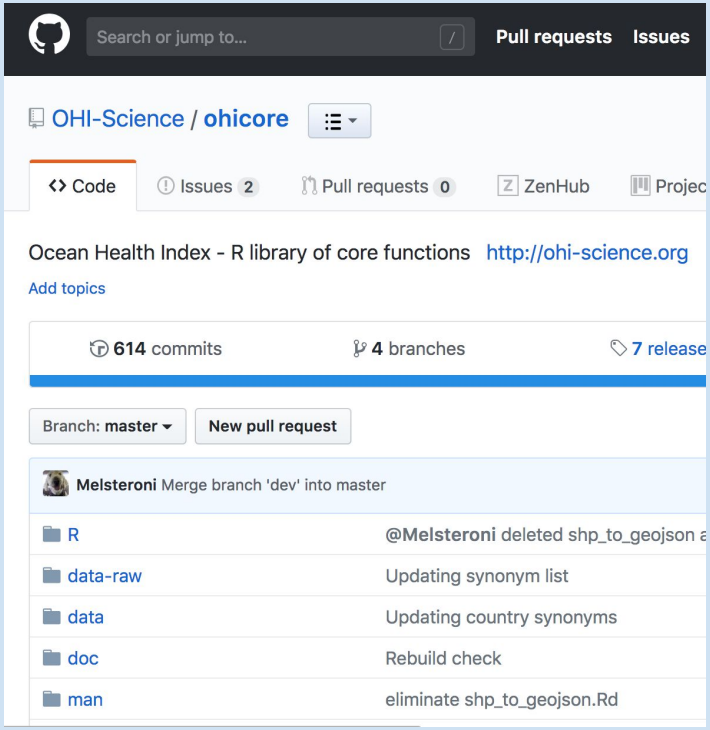
OHI repositories use our `ohicore` R package to calculate scores

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)
```

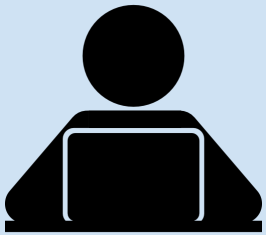


Workflow

Code **Organize**

Workflow

Archive

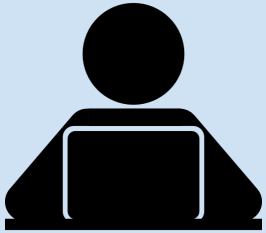


Code Organize

Workflow

Archive

Collaborate



Code

Organize

Workflow

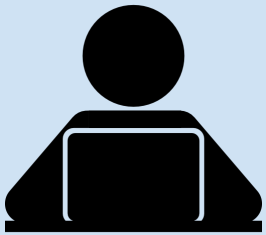
Distribute

Publish

Communicate

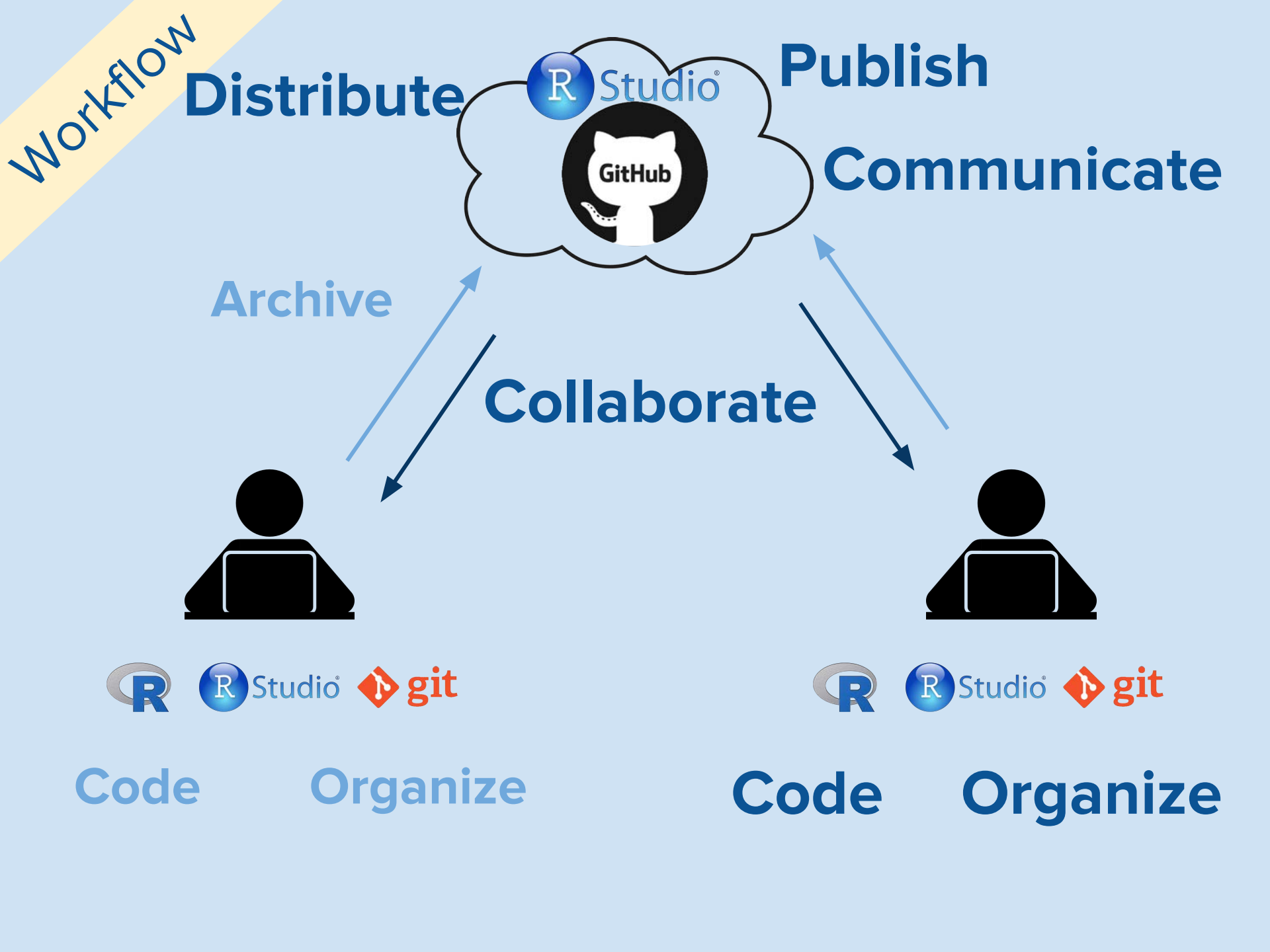
Archive

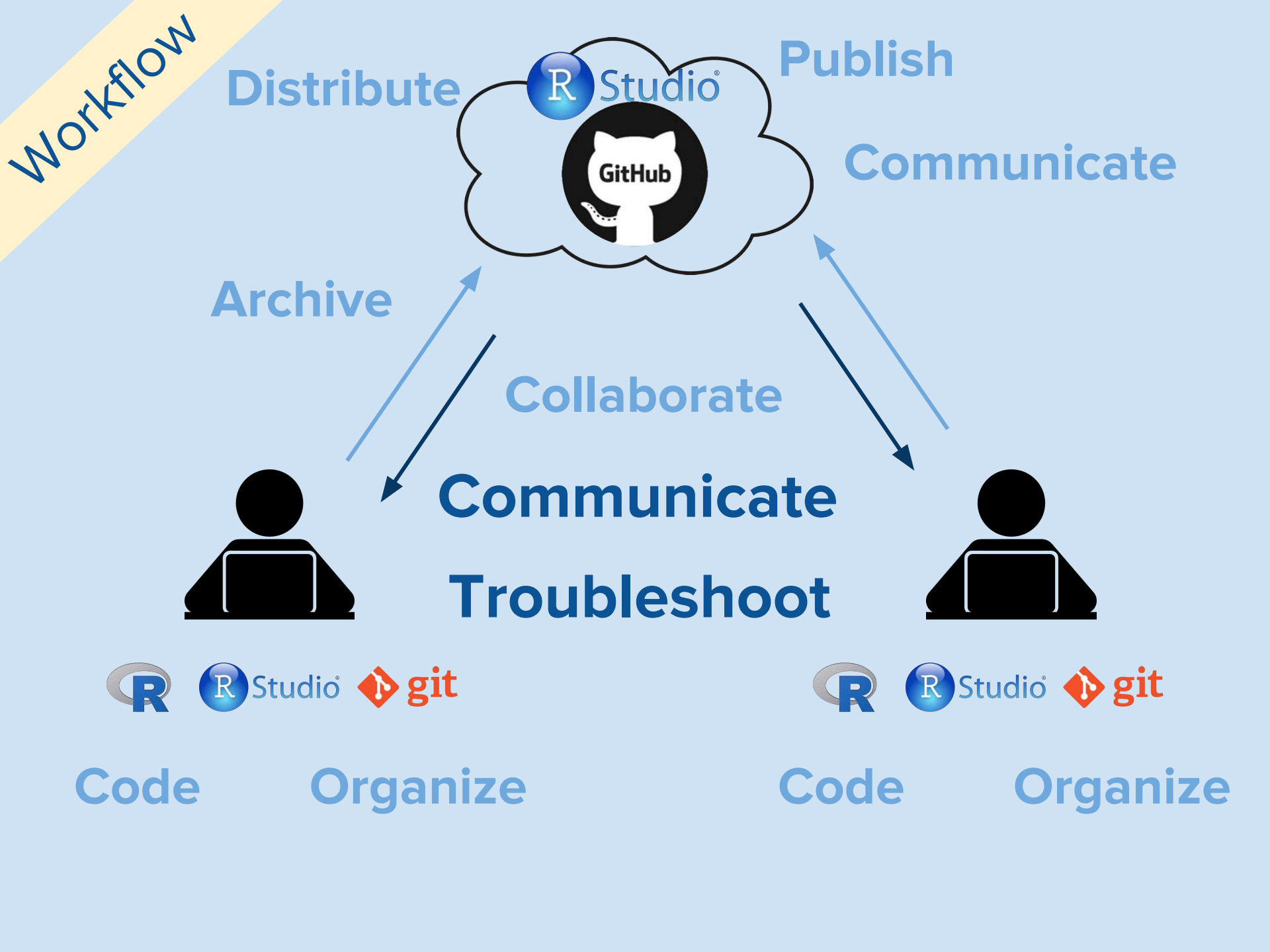
Collaborate



Code

Organize


Workflow
Distribute
RStudio
GitHub
Publish
Communicate
Archive
Collaborate
RStudio
git
RStudio
git
Code
Organize
Code
Organize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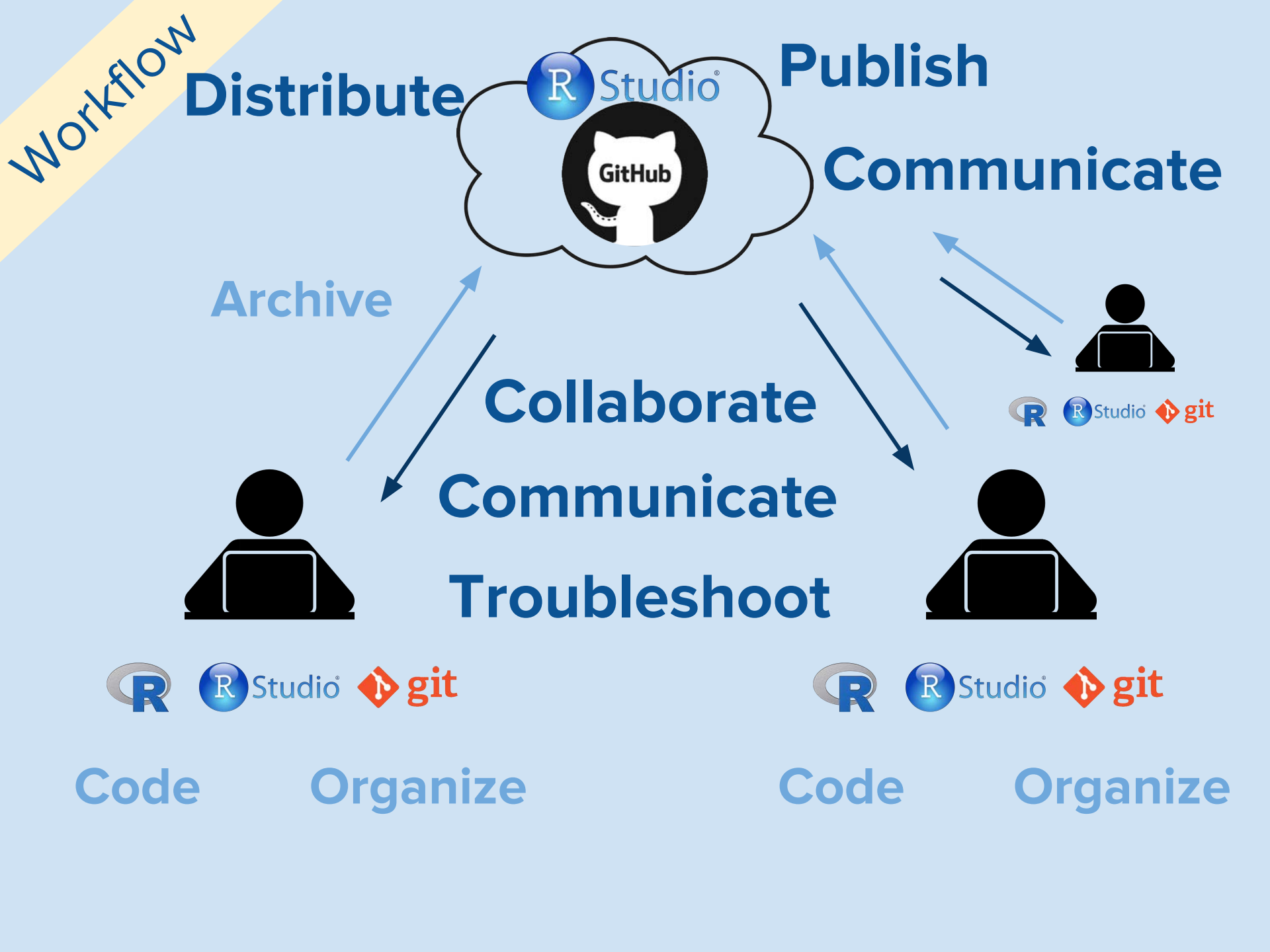
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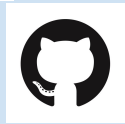
4. How can it help you?

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

Software and workflow are not unique to OHI!

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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@juliesquid
slides: jules32.github.io

OCEAN HEALTH INDEX

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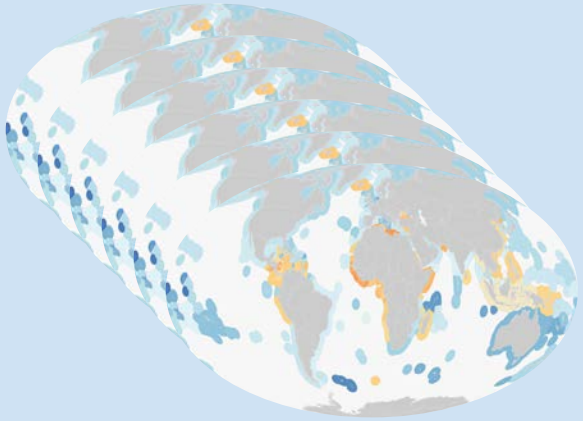
HELMHOLTZ
Open Science

J. Payne

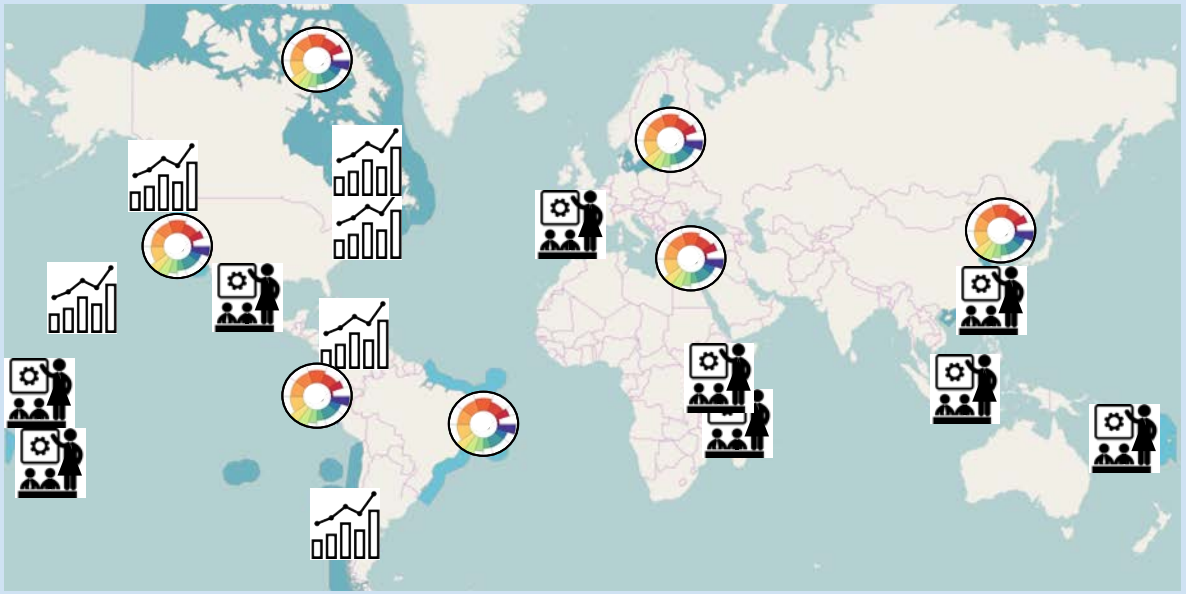
Reproducible, repeatable, iterative & transparent methods

Tracking change through time



6+ years of global scores

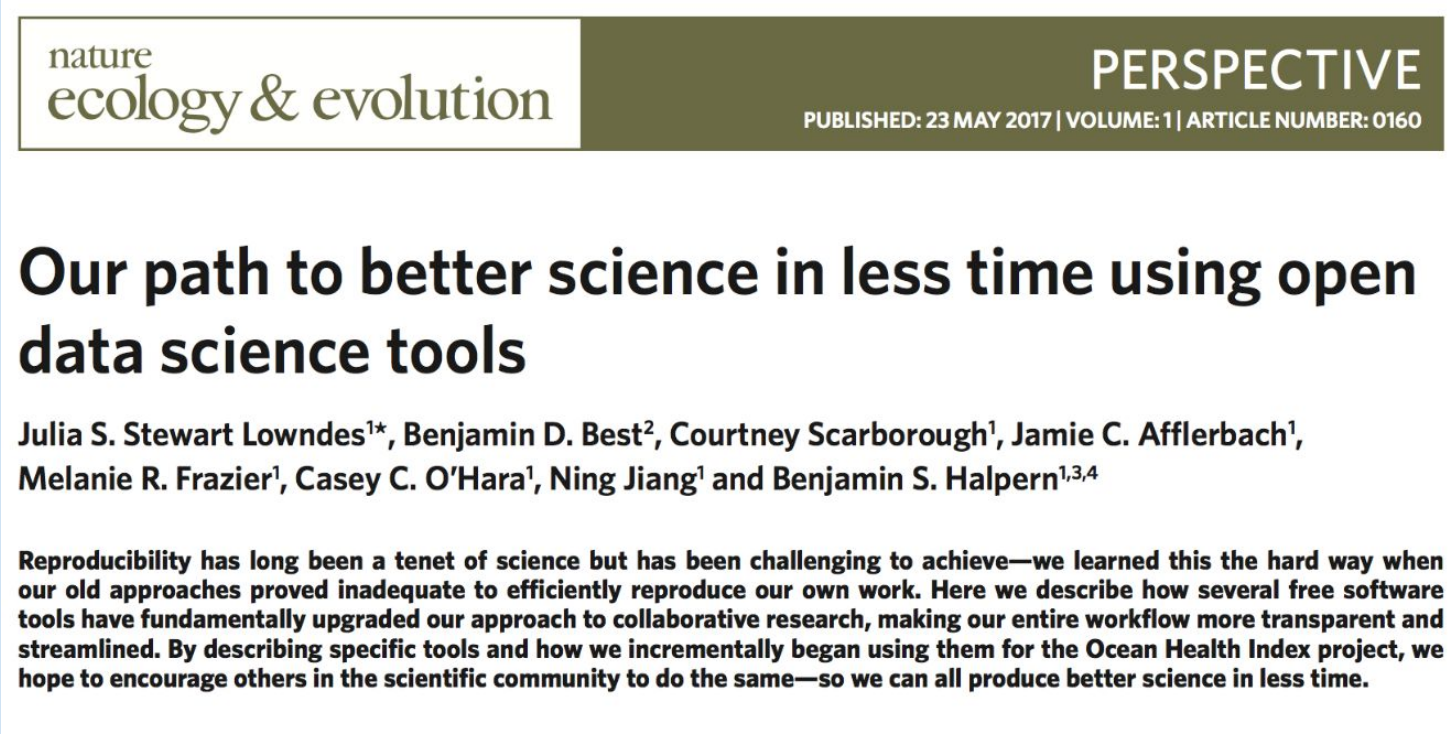
Independent assessments at smaller spatial scales



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

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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*

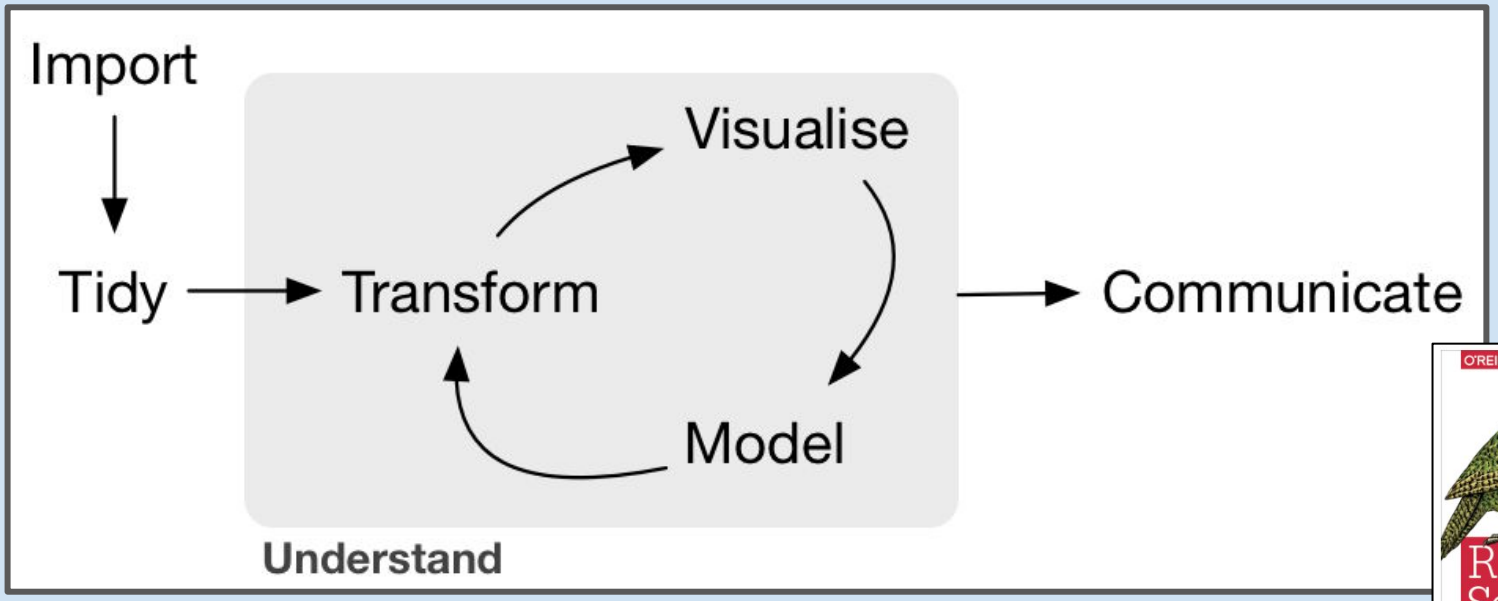
ohi-science.org/betterscienceinlesstime

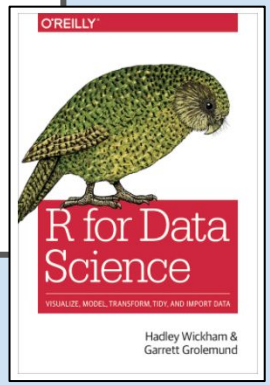
@OHIscience, @OceanHealthIndx

Workflow

OHI Toolbox = GitHub + RStudio

Collaborative, open coding





Wickham & Grolemund 2016

Workflow

OHI Toolbox = GitHub + RStudio

Collaborative, open coding

Focus on documentation + communication

Website
OHI-Science.org

Hands-on Training
Books