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

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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
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
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

2012
OHI published;
1st global study
Halpern et al. *Nature*
Our Ocean Health Index story

- Detailed notes on data processing
- Coded models
- Published 130 pages of SOM
- Shared modeled data on FTP
Our Ocean Health Index story

- 2012
  OHI published;
  1st global study
  Halpern et al. *Nature*

- 2013
  2nd global study
Our Ocean Health Index story

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2013
2nd global study

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

<data_final_final_final.xls
Re: FWD: data question>
Our Ocean Health Index story

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2nd global study

Today
transparent and repeatable workflow, 7th global study underway, 20+ independent studies underway
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We learned:
Reproducibility in science requires reproducibility with data – and open, collaborative tools
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We learned:
Reproducibility in science
requires reproducibility with data
– and open, collaborative tools

Our path to better science in less time using open data science tools
Julia S. Stewart Lowndes1*, Benjamin D. Best2, Courtney Scarborough1, Jamie C. Afflerbach1, Melanie R. Frazier1, Casey C. O’Hara1, Ning Jiang1 and Benjamin S. Halpern14

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

open source, cross-platform
download & learn online

used by software development
teams!!
OH! Toolbox = Software + Workflow

open source, cross-platform
download & learn online

used by software development teams!!
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

R code
- open data science language
- integrated development environment (IDE)
- packages & tools
- best practices & tutorials
OHI Toolbox Workflow = RStudio + GitHub
OHI Toolbox Workflow = RStudio + GitHub

Coding collaboratively, openly, with shared practices

Emphasizing documentation + communication
Coding collaboratively, openly, with shared practices

Emphasizing documentation + communication

Leveraging best practices from the open community

(#rstats @RStudio @rOpenSci @RLadiesGlobal @thecarpentries ...)

OHI Toolbox Workflow = RStudio + GitHub
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.
Each OHI assessment has its own GitHub repository

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Each OHI assessment has its own GitHub repository

Each repo has:

- Strict folder architecture for data and code
- RStudio/GitHub website for communication

ex: github.com/ohi-science/mhi
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!
OH! 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(oji-science/ohicore)`
Workflow

Archive

Collaborate

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 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

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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Reproducible, repeatable, iterative & transparent methods

Tracking change through time

Independent assessments at smaller spatial scales

6+ years of global scores

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

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

Julia S. Stewart Lowndes¹*, Benjamin D. Best², Courtney Scarborough¹, Jamie C. Afflerbach¹, Melanie R. Frazier¹, Casey C. O’Hara¹, Ning Jiang¹ and Benjamin S. Halpern¹,³,⁴

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

[Link to article](https://doi.org/10.1038/s41559-017-0016)

[Link to OHI science](https://ohi-science.org/betterscienceinlesstime)

[@OHIscience](https://twitter.com/OHIscience)

[@OceanHealthIndx](https://twitter.com/OceanHealthIndx)
Collaborative, open coding

Workflow

OHI Toolbox ≅ GitHub + RStudio

Import → Tidy → Transform → Visualise → Model → Communicate → Understand

Wickham & Grolemund 2016
Workflow

OHI Toolbox == GitHub + RStudio

Collaborative, open coding

Focus on documentation + communication

Ocean Health Index
open data science tools and resources for marine science and management

Website
OHI-Science.org