

# Preserving Our Oceans with People and Science

A close-up photograph of a dolphin's head and upper body as it swims through the ocean. The dolphin has a dark grey back and a lighter grey or white belly. Its eye is visible, and its mouth is slightly open. The background consists of the textured, light-colored water of the ocean.

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# Challenges of marine research

- Logistically difficult
- Expensive
- Need for monitoring
- Establishing MPA's

© Anne Schmidt

# Can we harness the power of the crowd?

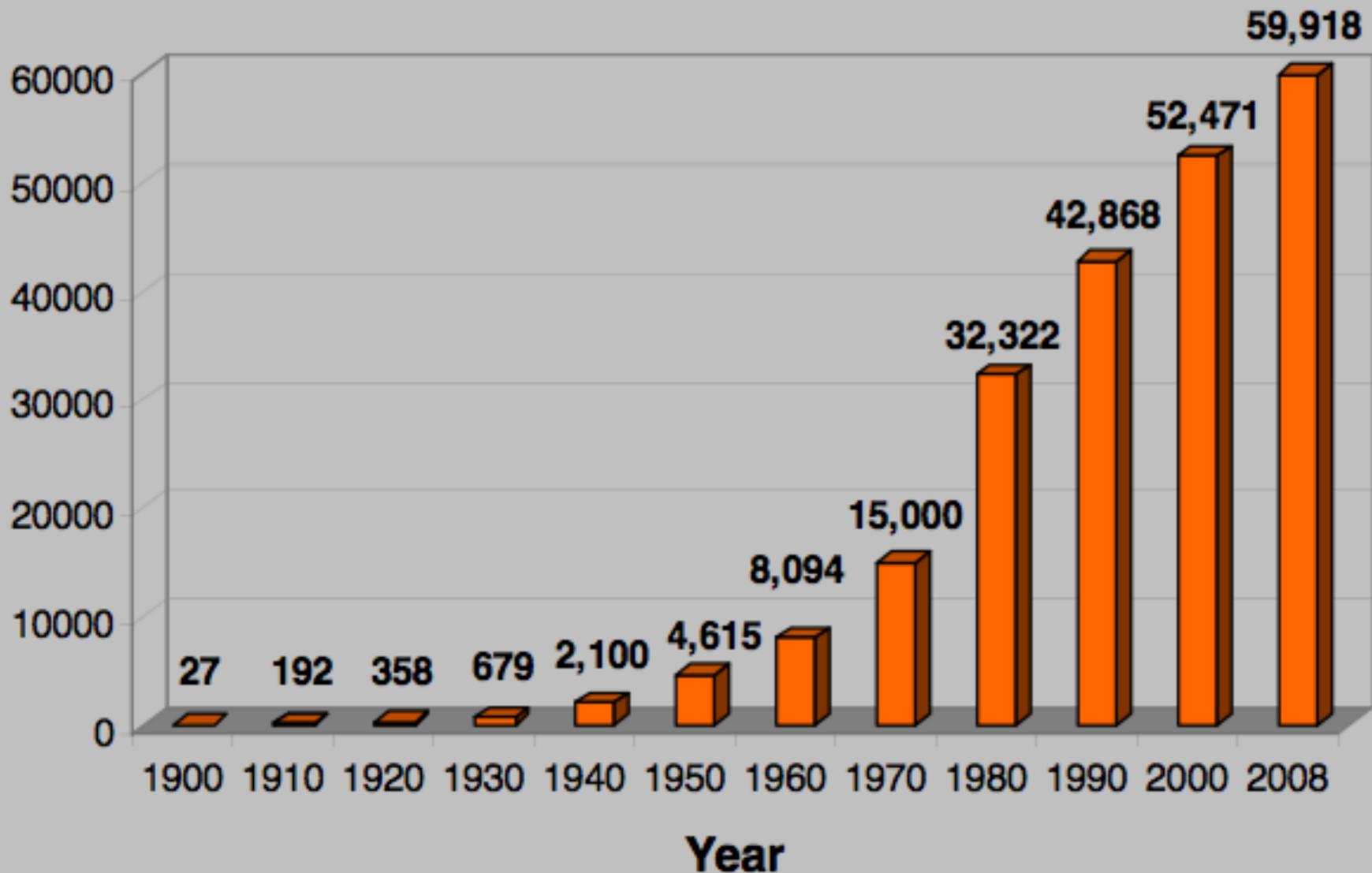
- Many hands make light work
- Technological advances



# Harnessing the crowd

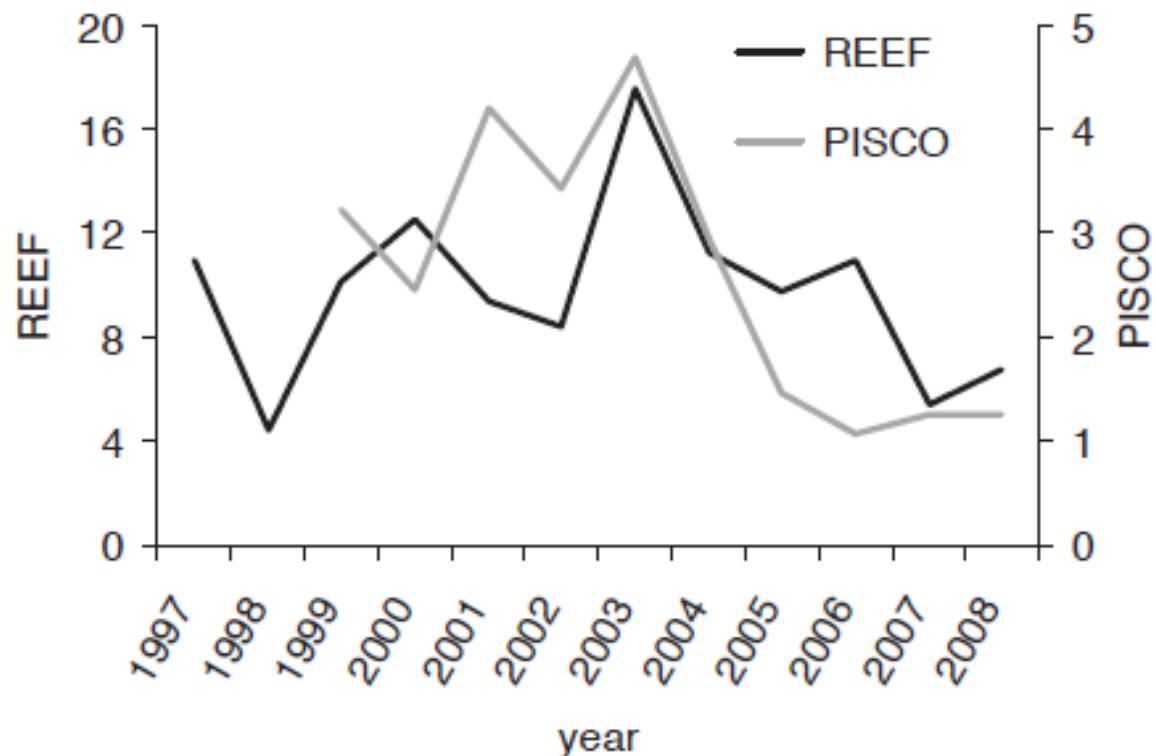
- Engages the public
  - Reef: 183,077 surveys and counting
  - Reef check: 8,307 surveys
  - Shore thing, UK: 3,000+ volunteers since 2006
- Increases coverage
  - Christmas bird count 114 years!
  - Great backyard bird count 110 countries

## Number of CBC Participants



# Approach #1: Pairs in Literature

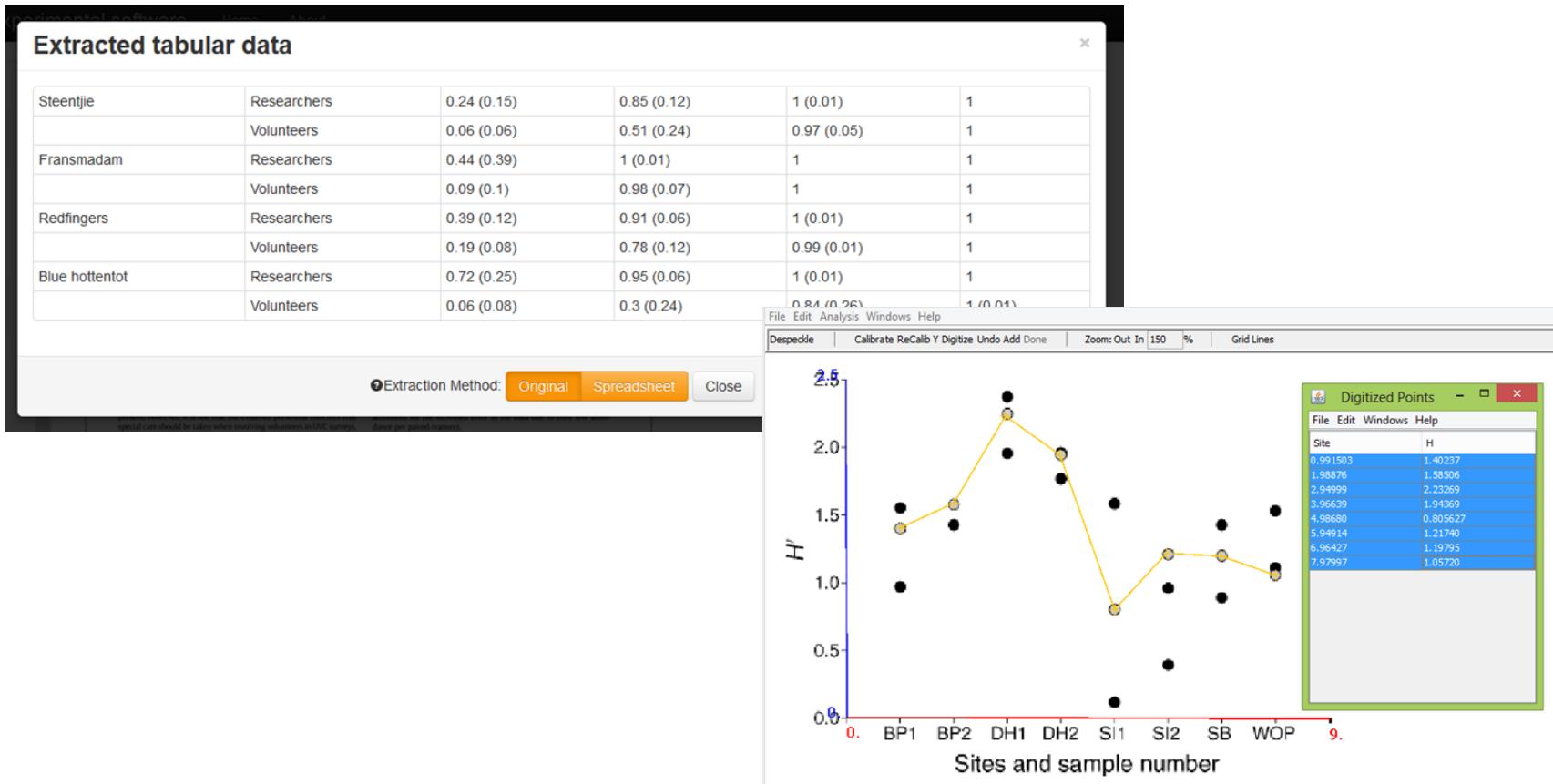
## 13 published pairs



c. Kelp Rockfish, *Sebastes atrovirens*, > 5 cm.

# Grabbing data

- Tabula and plot digitizer



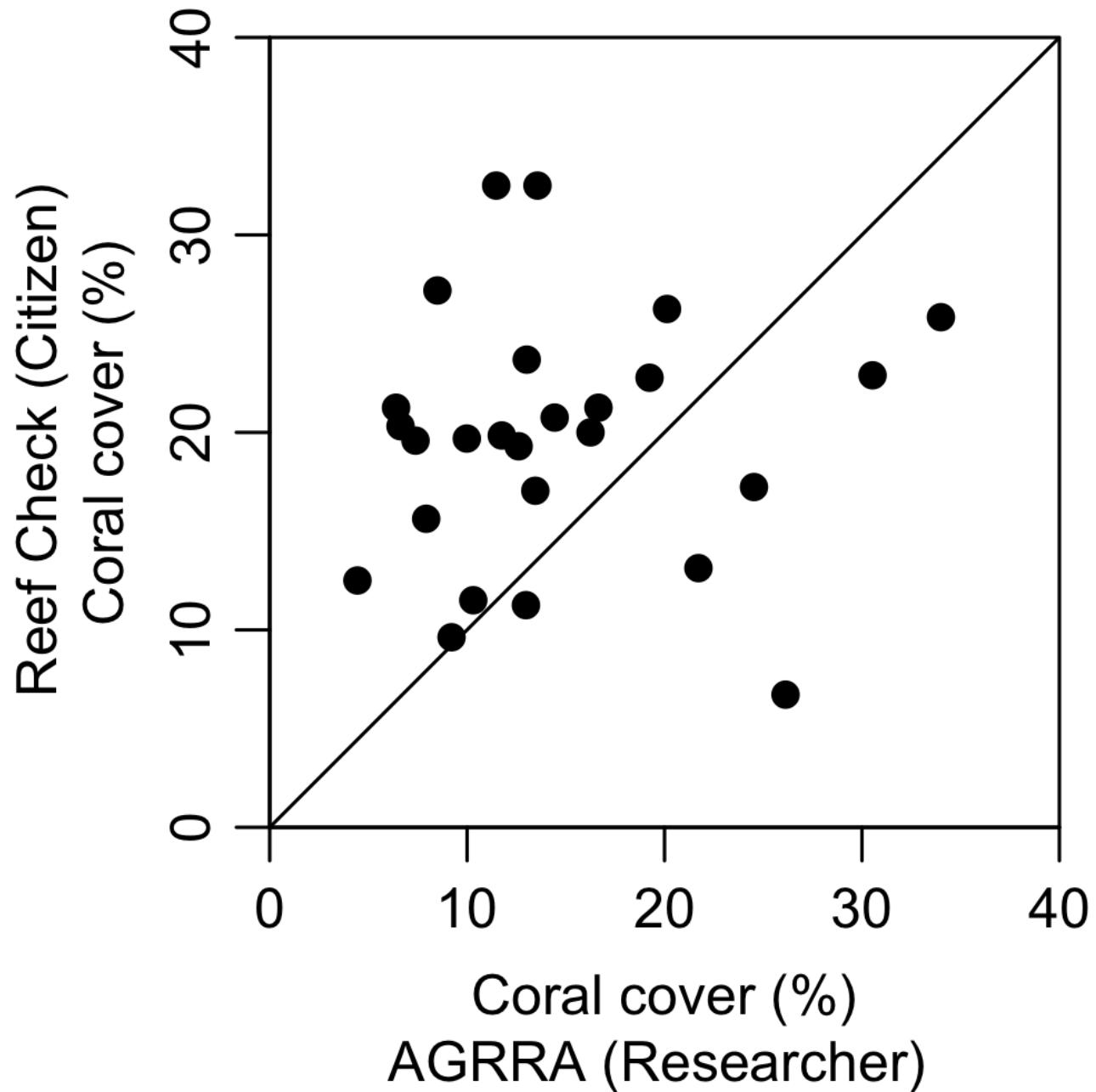
# Approach #2: Raw Data Pairs

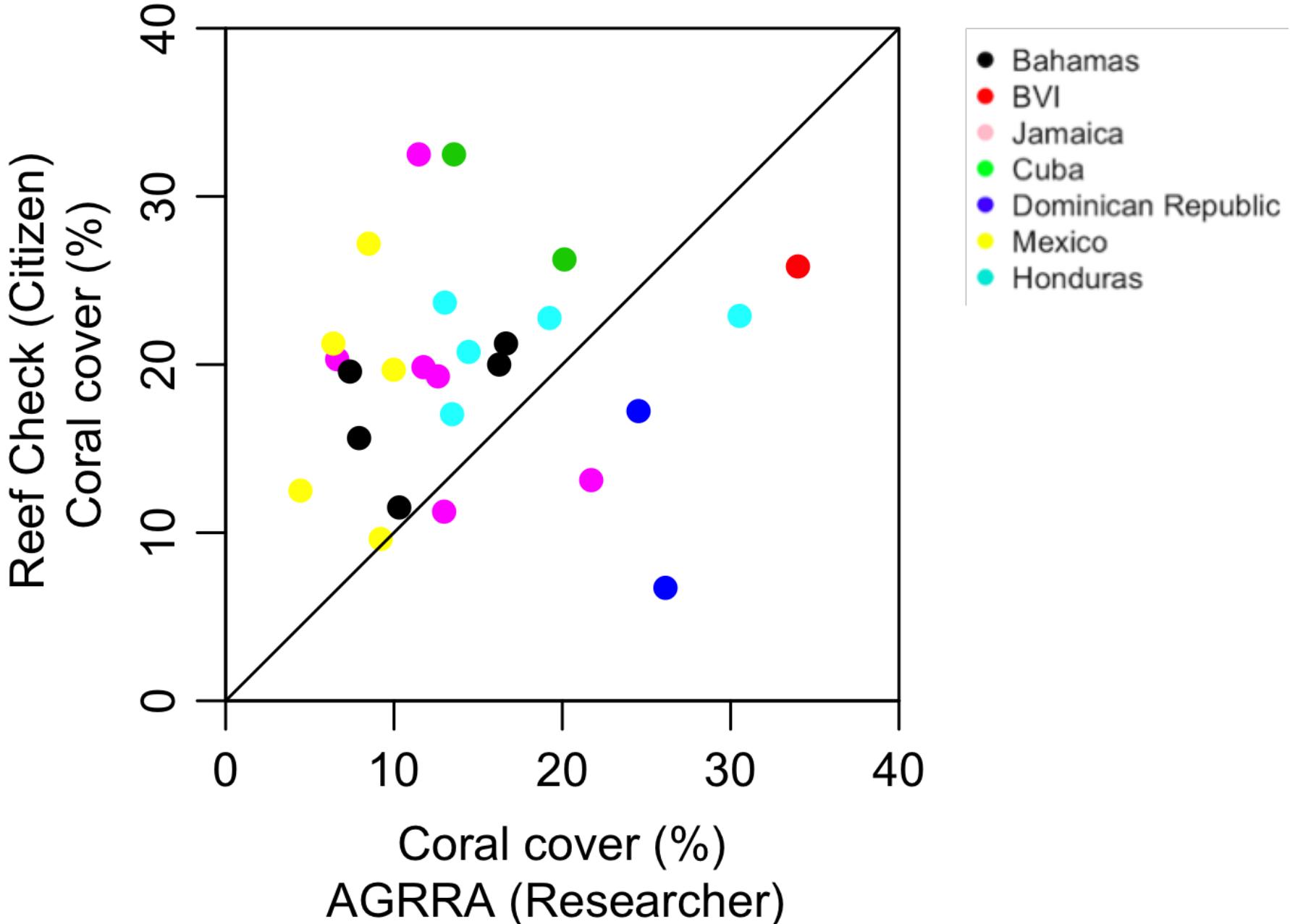
- Birds
- Intertidal
- Fish
- Coral



# Coral Reef Example

© Annie Schmidt





# Analytical Message Box

Question: What is relationship between marine citizen science & researcher data across taxa, region, scale of study, and program attributes?

## Statistical Questions:

- Is there relative bias?
- Is the magnitude of variation different?
- How do bias and variance change across taxa, region, scale, programs?

## Assumptions:

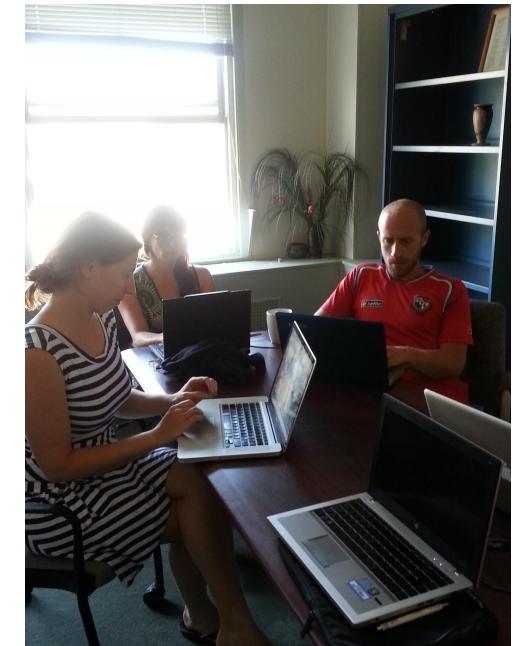
- Apples are apples (pairs)

## Limitations:

- Messy, data poor, apples to apples

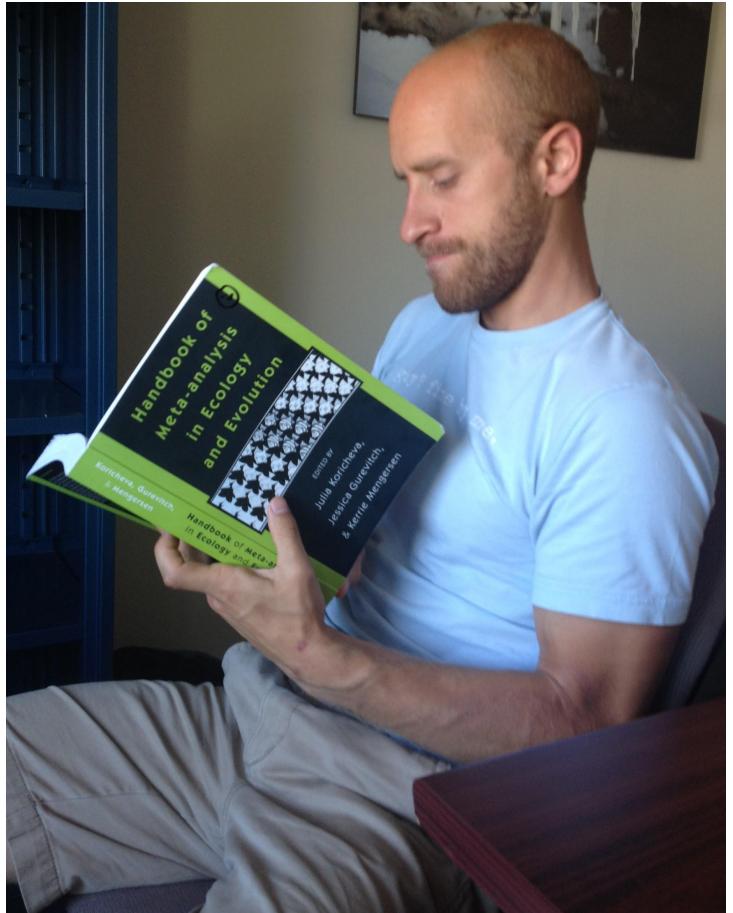
## Methods:

- Meta-analysis



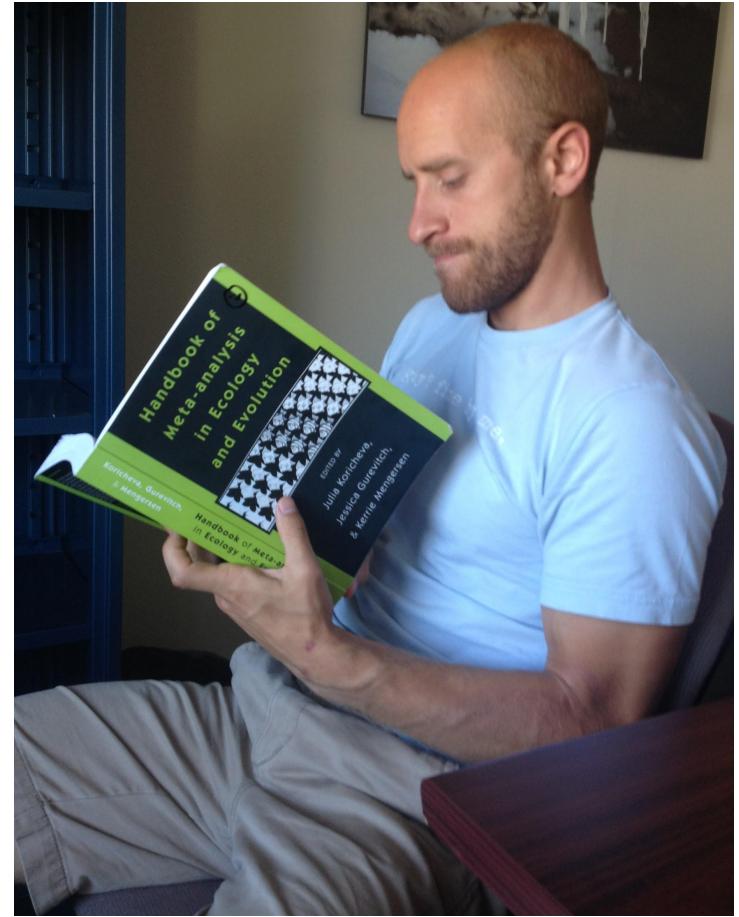
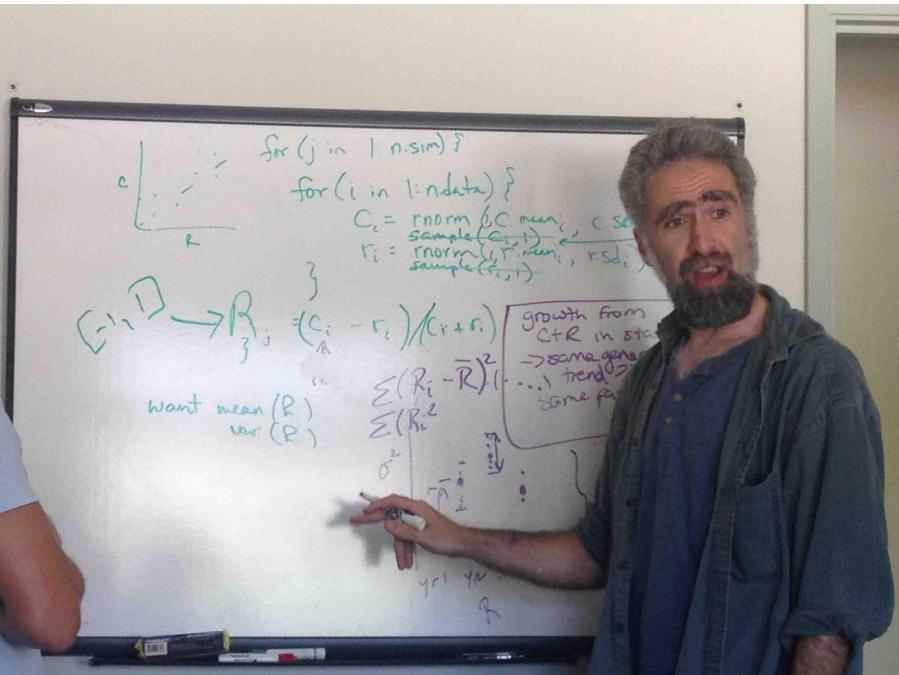
# Meta-analysis

1. Decide on effect size metric



# Meta-analysis

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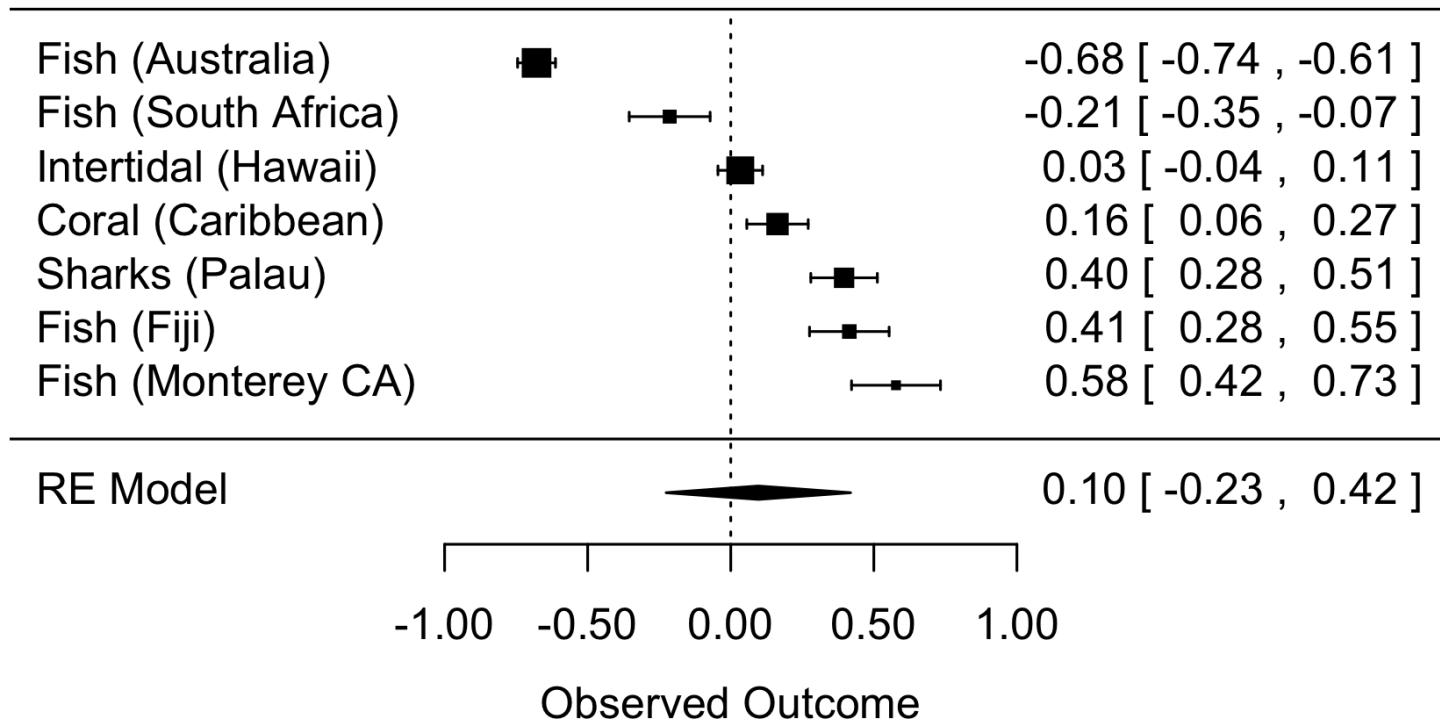
# Meta-analysis

1. Decide on effect size metric  $\text{RII} = \frac{B_w - B_o}{B_w + B_o}$ .

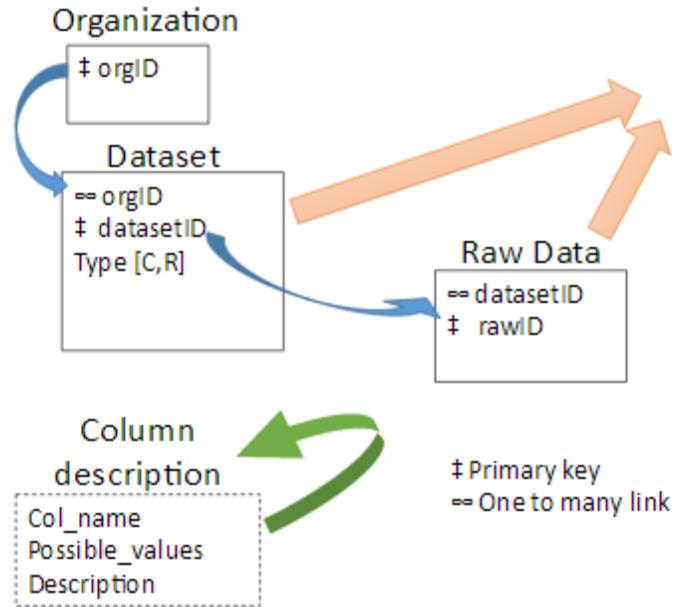
# Meta-analysis

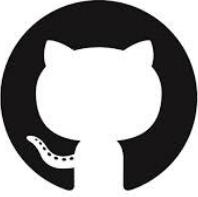
1. Decide on effect size metric
2. Use “metafor” package in R

$$RII = \frac{B_w - B_o}{B_w + B_o}.$$



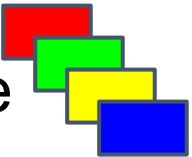
# Technical Collaborative Tools



<b>Isis</b>	Data repository (database)
<b>Github</b> 	Metadata R code Working manuscript Citations (bibtex) Group task lists/discussions
<b>Google Drive</b>	Shared papers (copyright)

# Social Collaborative Tools

Brain diversity game



Round robin - hearing everyone's voice

Message box - clarify thoughts

Policy documents - discuss authorship

Task workflow - delegate

Discuss future plans and manage expectations



# Future Work Plan: Stage I

- Detailed work flow
- Populate database
- Refine analytical approach
- Monthly check-in emails

## MORE DATA NEEDED

Systematic data search

Systematic search for data from papers - Extract data

Citizen Science Literature Review

## EVALUATE PARKING LOT IDEAS

Consider effect size of terrestrial R vs. C pairs

Comparative cost analysis of pairs and tradeoffs

# Future Work Plan: Stage II

- Face-to-face meeting
- Use systematically populated database to conduct refined meta-analysis
- Visualization of results
- Delegating paper writing



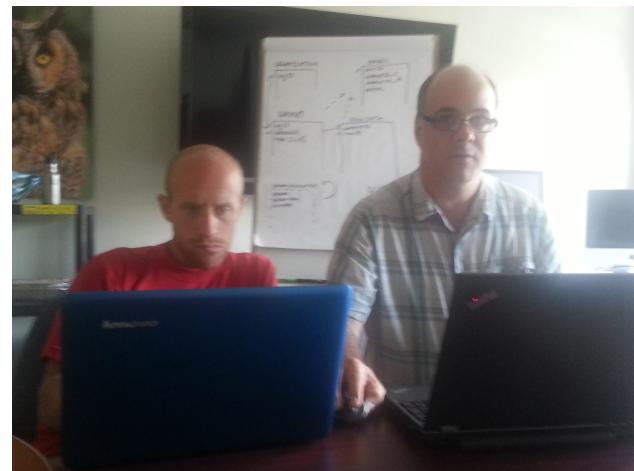
Protecting Our Oceans with People and Science!

# Questions/Comments?



# Next Steps/Challenges

- Finish cleaning/formatting data we have
- Populate database
- Gather more paired data
  - Expand geography, taxa, and biomes
- Refine our analytical approach
  - How do we approach different types of data sets?



# Grabbing data: Plot Digitizer / Graph Click

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T. E. COX

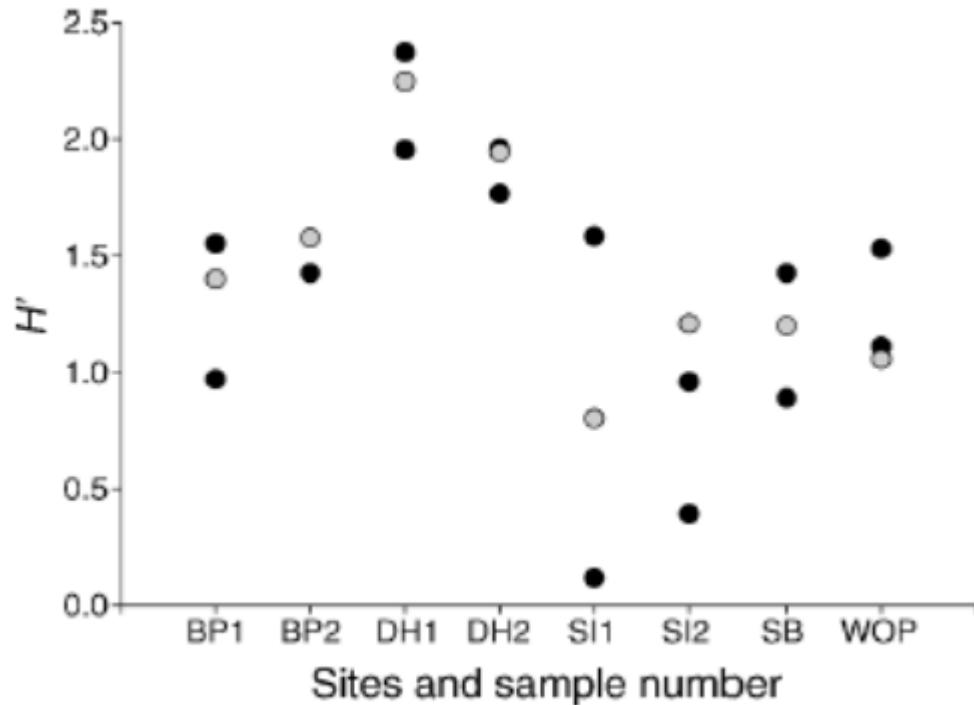
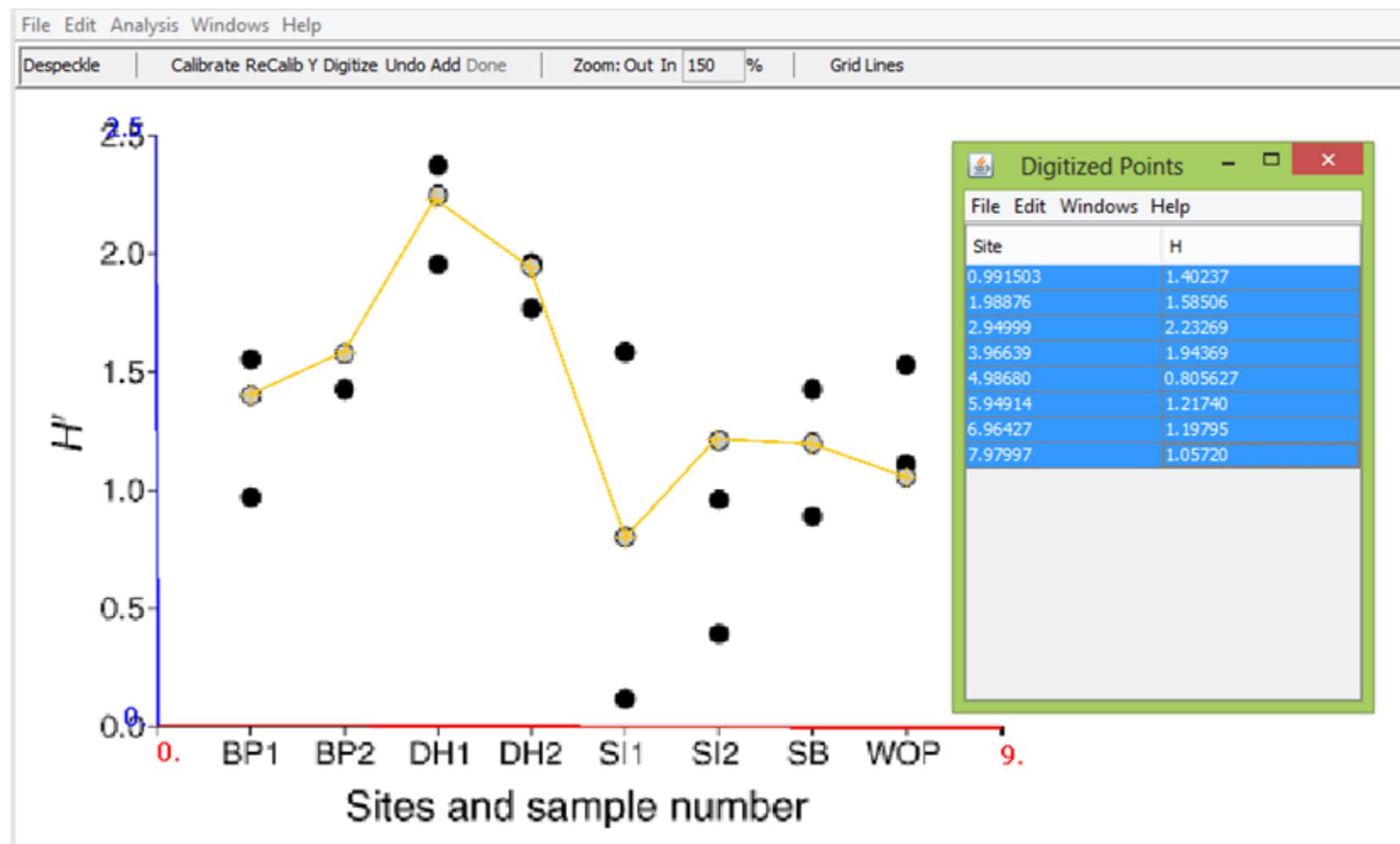


FIG. 3. Researchers' (black circles) and students' (gray circles) Shannon diversity values ( $H'$ ) for site comparisons.  $H'$  for the site is determined from data collected by researcher and

# Grabbing data: Plot Digitizer / Graph Click





# Approach #2: Data Pairs



Citizen	Research	Biome	Location	Taxa	Abundance	Diversity	Presence/Absence
Reef	PISCO	temperate	West coast US	fish	y	y	y
Reef	PISCO	temperate	West coast US	inverts	y	y	y
Reef	RecFin	temperate	West coast US	fish	y	y	y
eBird	CalCOFI	temperate	S. CA	birds	y	y	y
CBC	CalCOFI	temperate	S. CA	birds	y	y	y
Breeding Bird Survey	Nest Counts (multiple researchers)	temperate / sub-arctic	S. Carolina / Alaska	birds	y	n	n
ReefCheck	AGRRA	tropical	Caribbean	coral	y	n	y

# Grabbing data: Tabula



<http://tabula.nerdpower.org/>

