

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.

Georgina Adams
Mary Donovan
Suzanne Langridge
Rachael Orben
Annie Schmidt
Brian Stock
Lynn Waterhouse

Challenges of marine research

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

© Anne Schmidt

Can we harness the power of the crowd?

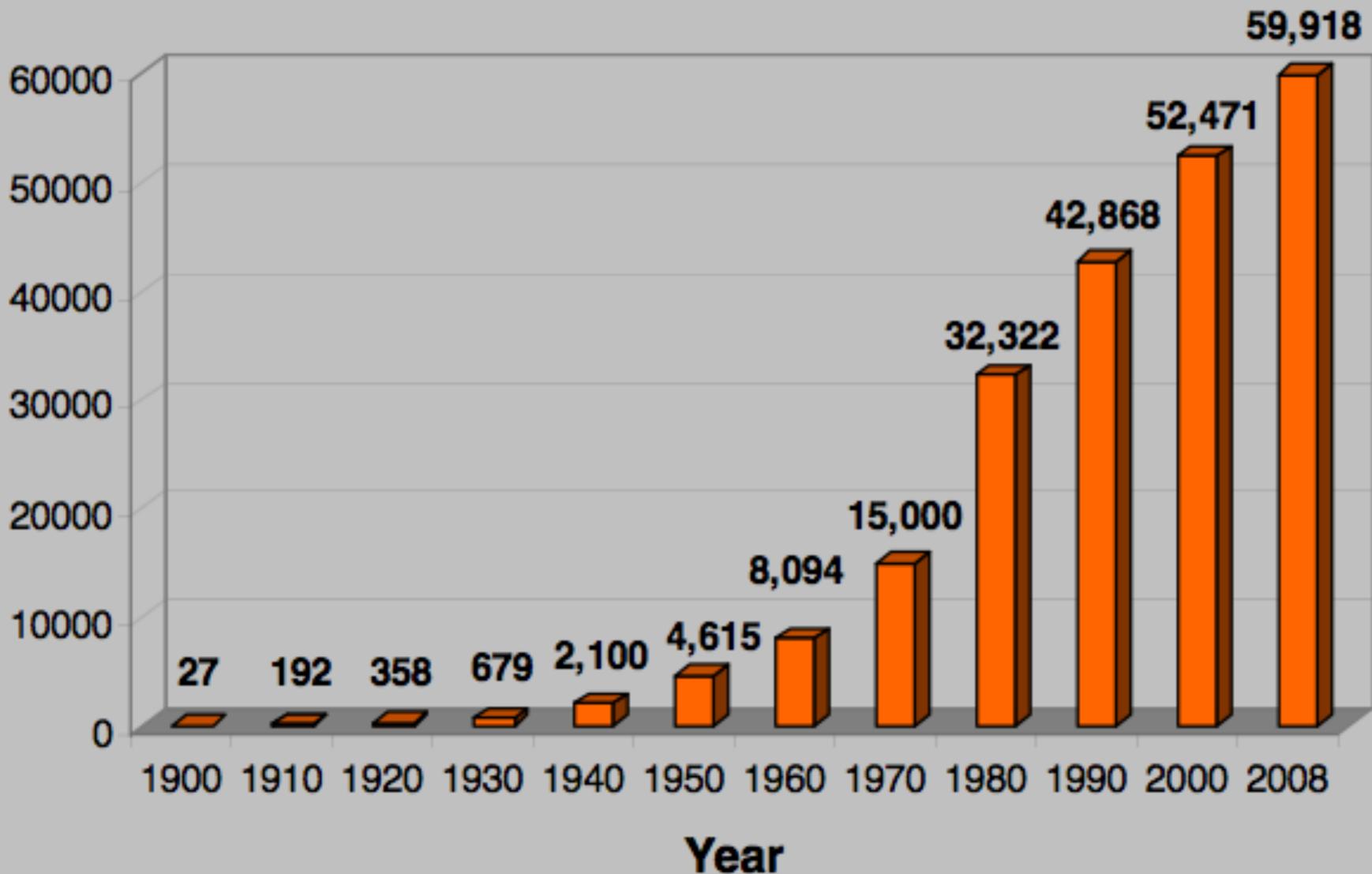
- Many hands make light work
- Technological advances



Harnessing the crowd

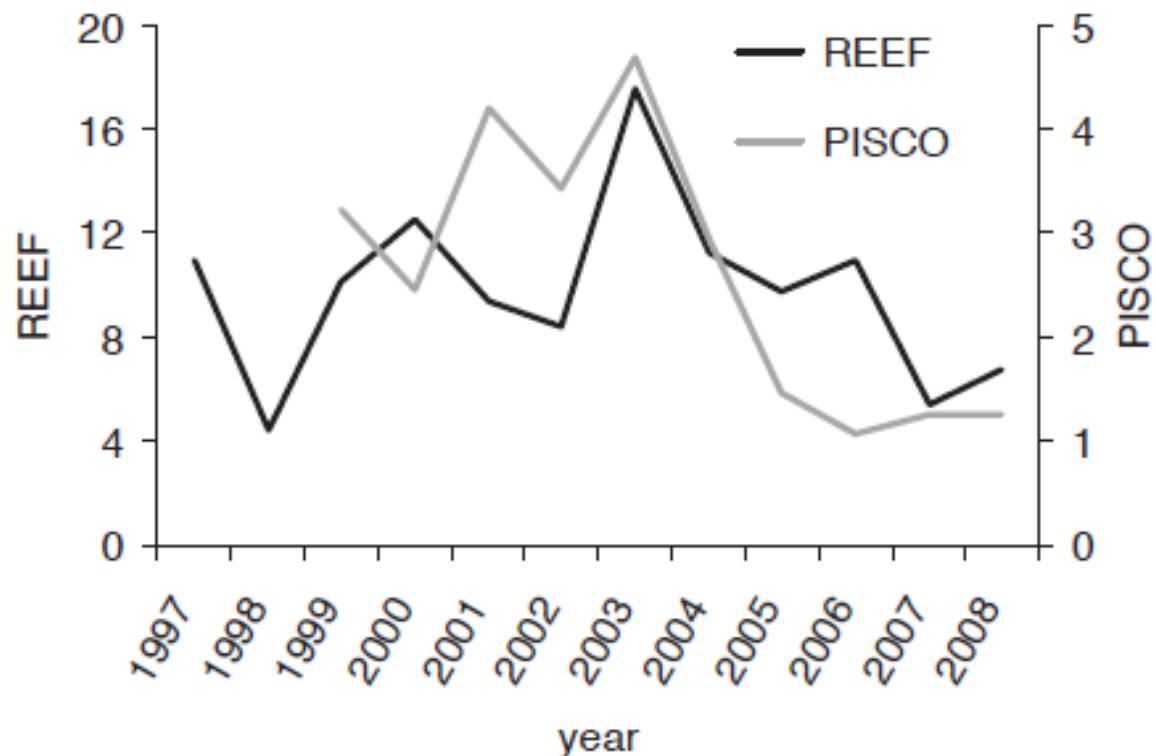
- Engages the public
 - Reef: 183,077 surveys and counting
 - Reef check: 8,307 surveys
 - Shore thing, UK: 3,000+ volunteers since 2006
- Increases coverage
 - Christmas bird count 114 years!
 - Great backyard bird count 110 countries

Number of CBC Participants



Approach #1: Pairs in Literature

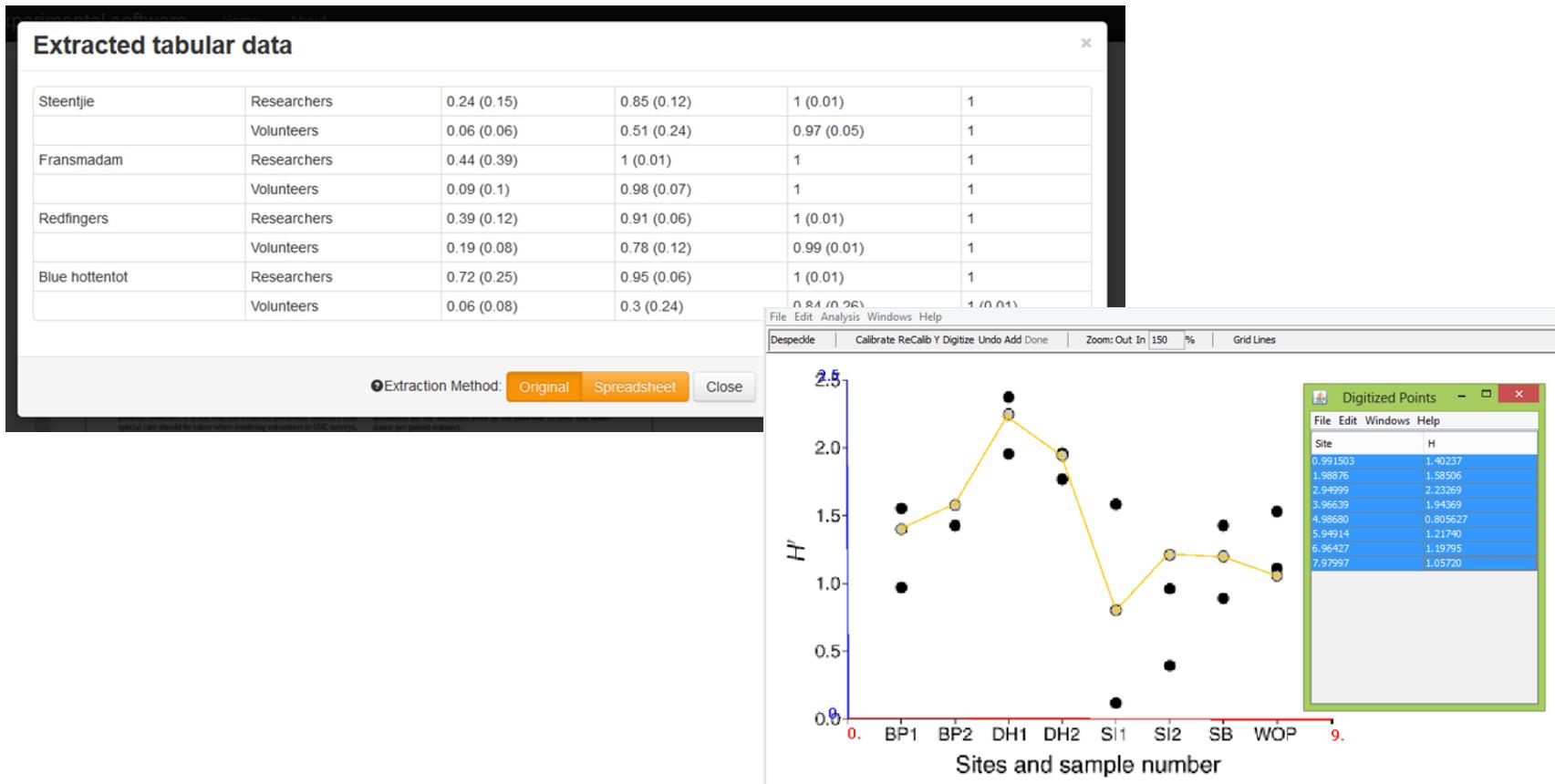
13 published pairs



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

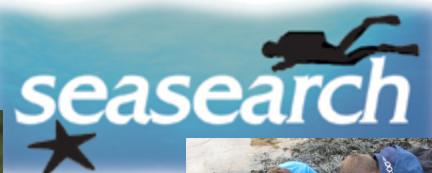
Grabbing data

- Tabula and plot digitizer



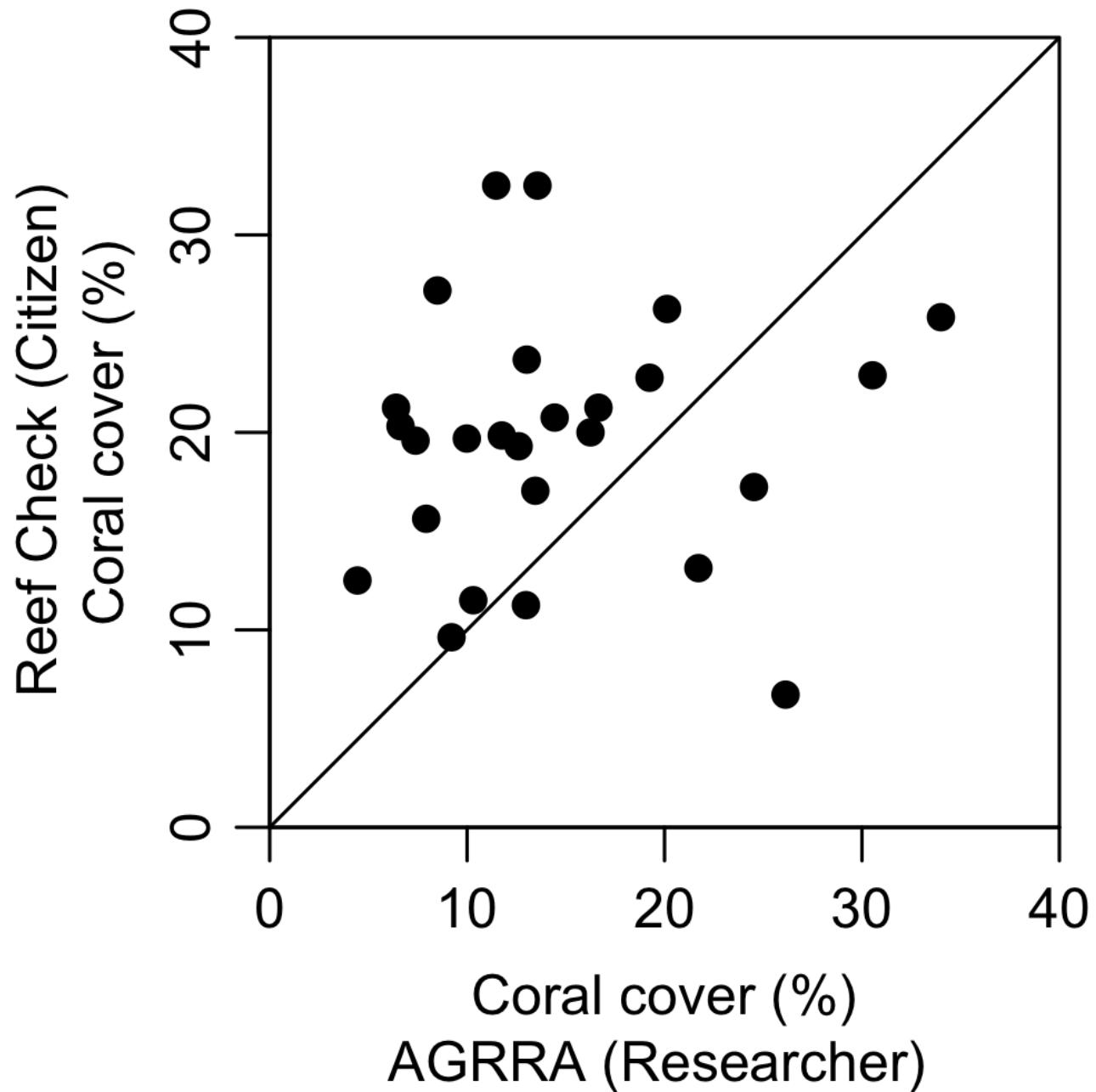
Approach #2: Raw Data Pairs

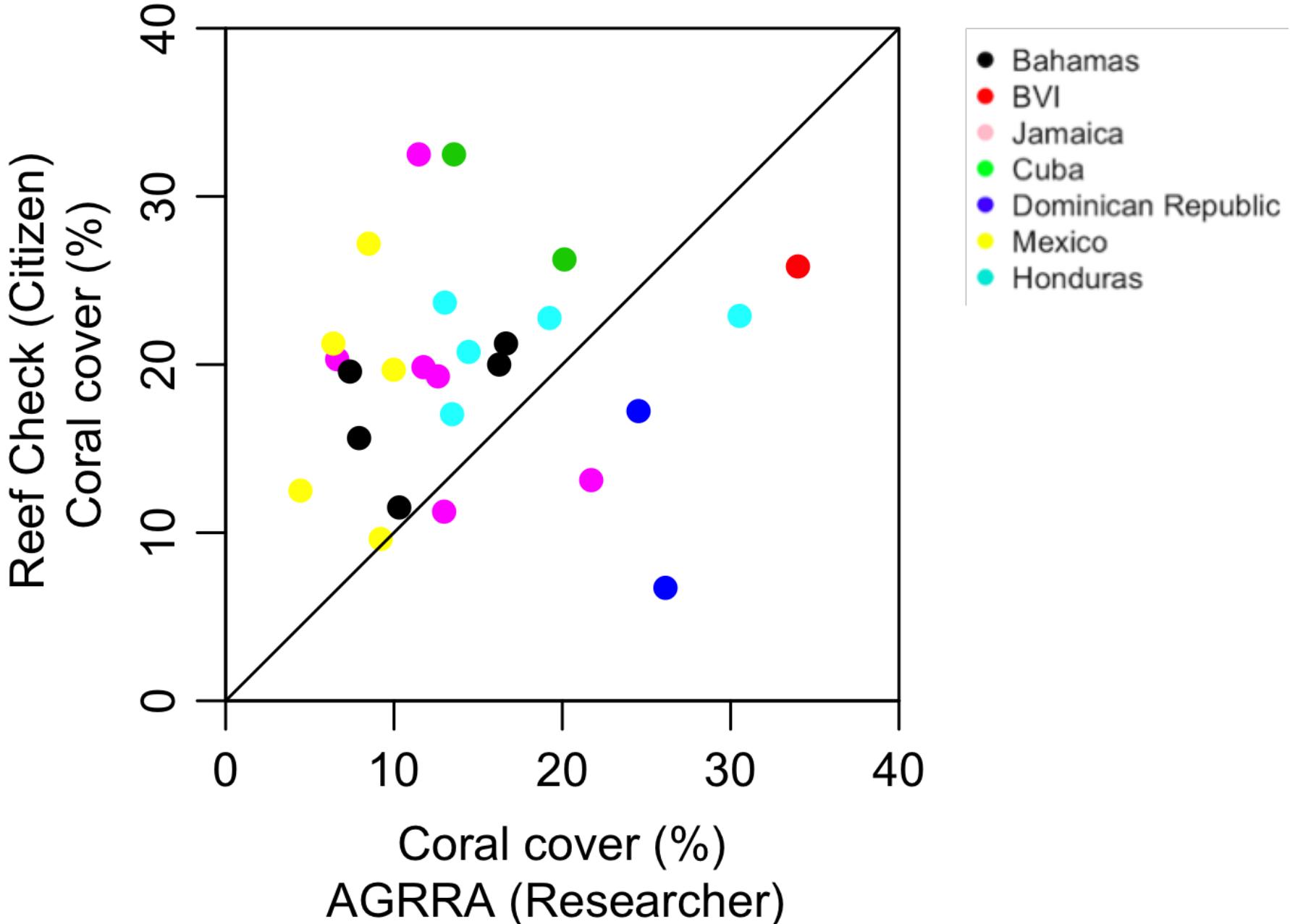
- Birds
- Intertidal
- Fish
- Coral



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:

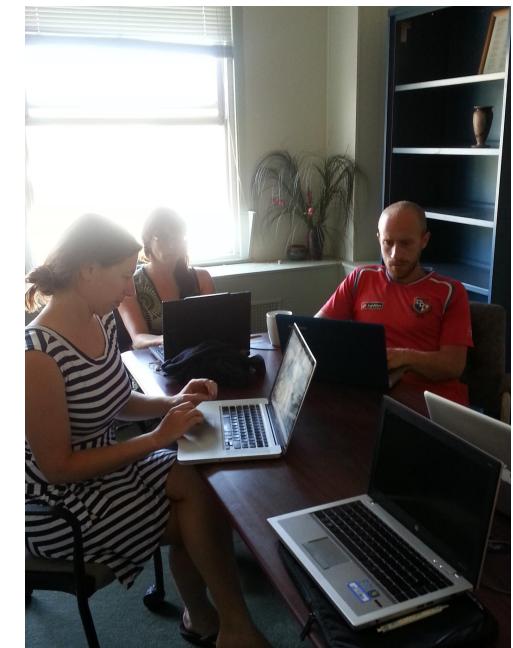
- Apples are apples (pairs)

Limitations:

- Messy, data poor, apples to apples

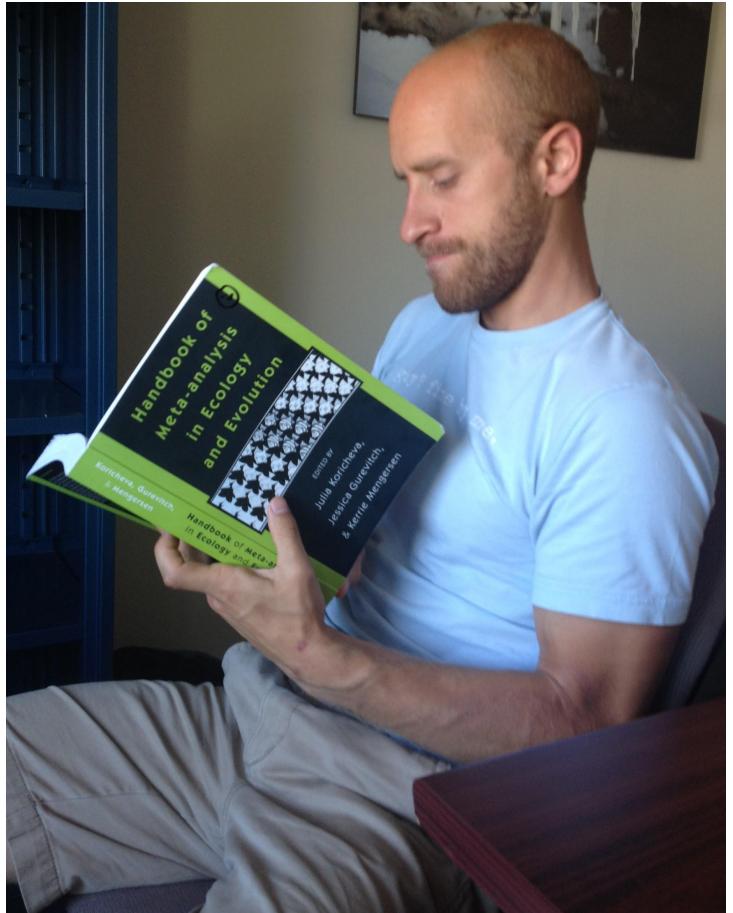
Methods:

- Meta-analysis



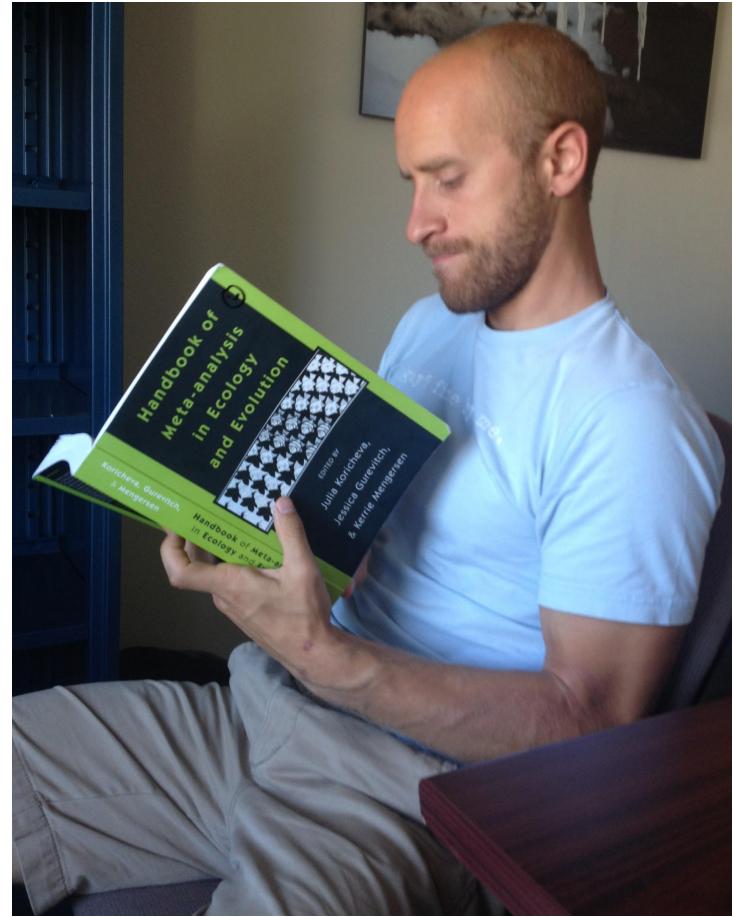
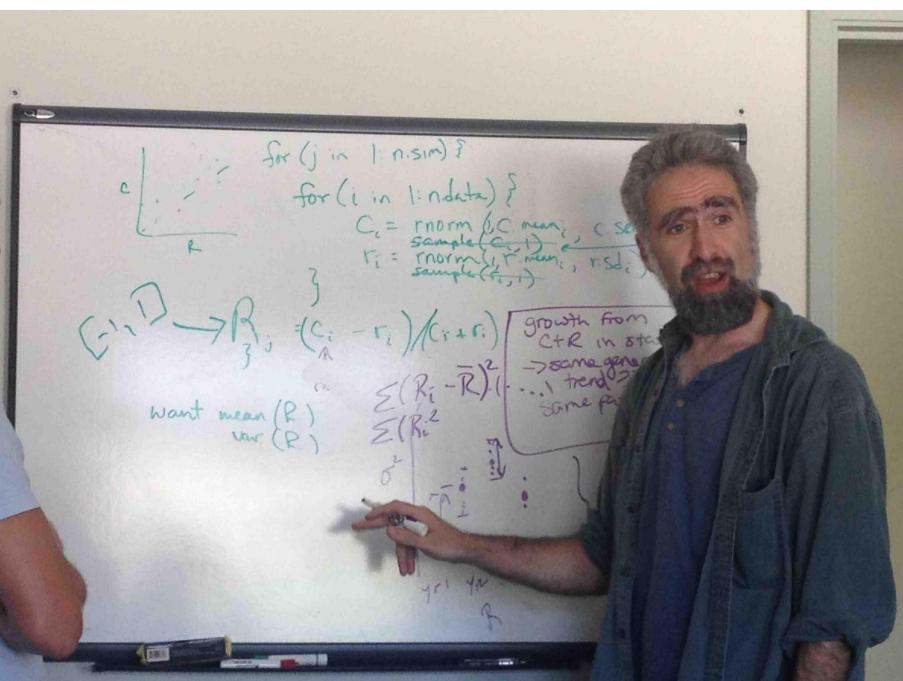
Meta-analysis

1. Decide on effect size metric



Meta-analysis

1. Decide on effect size metric



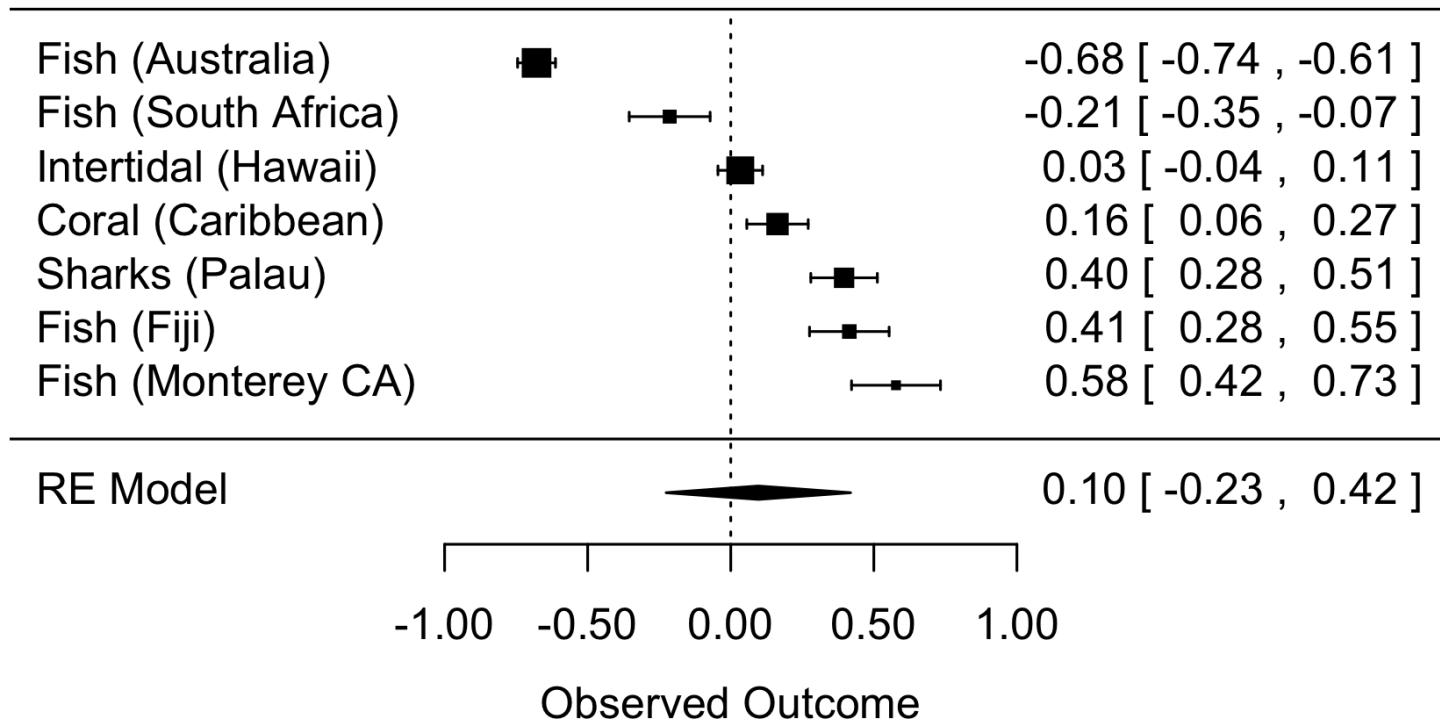
Meta-analysis

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

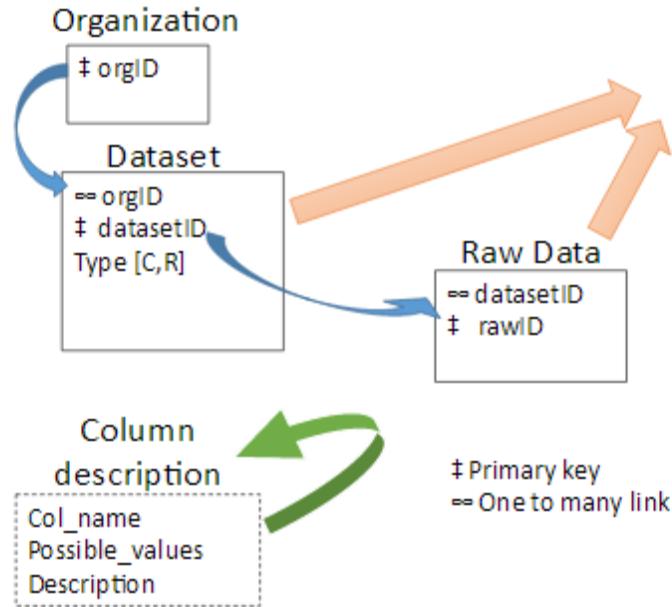
Meta-analysis

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

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



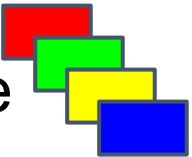
Technical Collaborative Tools



Isis	Data repository (database)
Github 	Metadata R code Working manuscript Citations (bibtex) Group task lists/discussions
Google Drive	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

MORE DATA NEEDED:

Systematic data search

Systematic search for data from papers - Extract data

Citizen Science Literature Review

Future Work Plan: Stage II

PARKING LOT IDEAS

Consider effect size of terrestrial R vs. C pairs?

Comparative cost analysis of pairs

**Resultify - - > Write Paper
Timeline?**



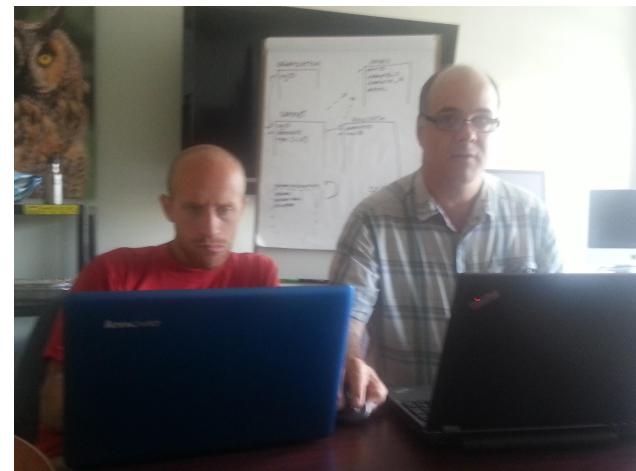
Protecting Our Oceans with People and Science!

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

1208

T. E. COX

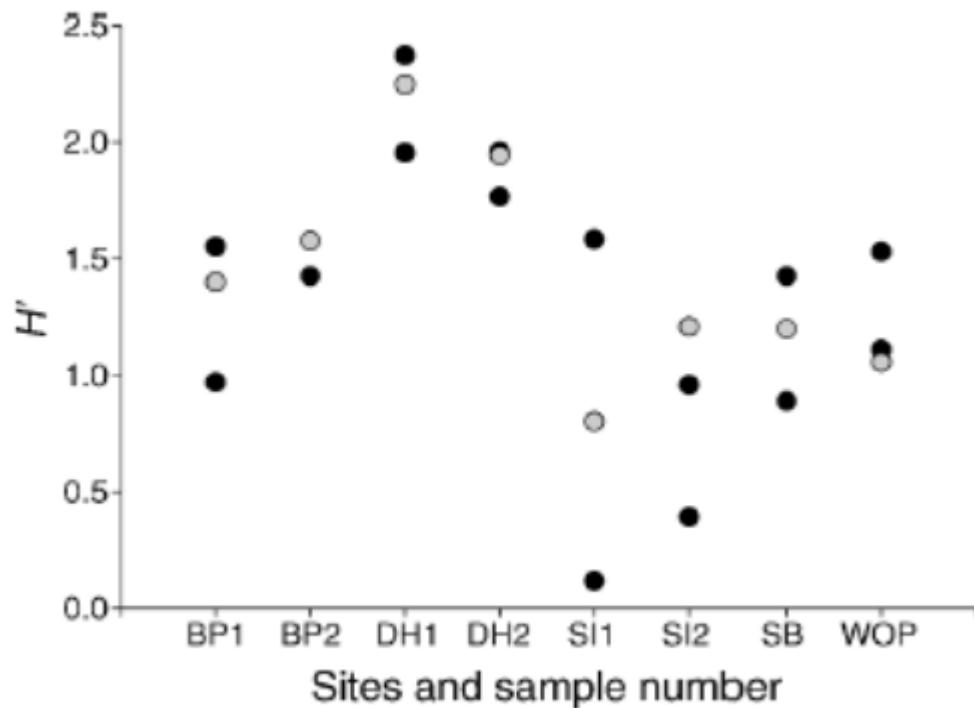
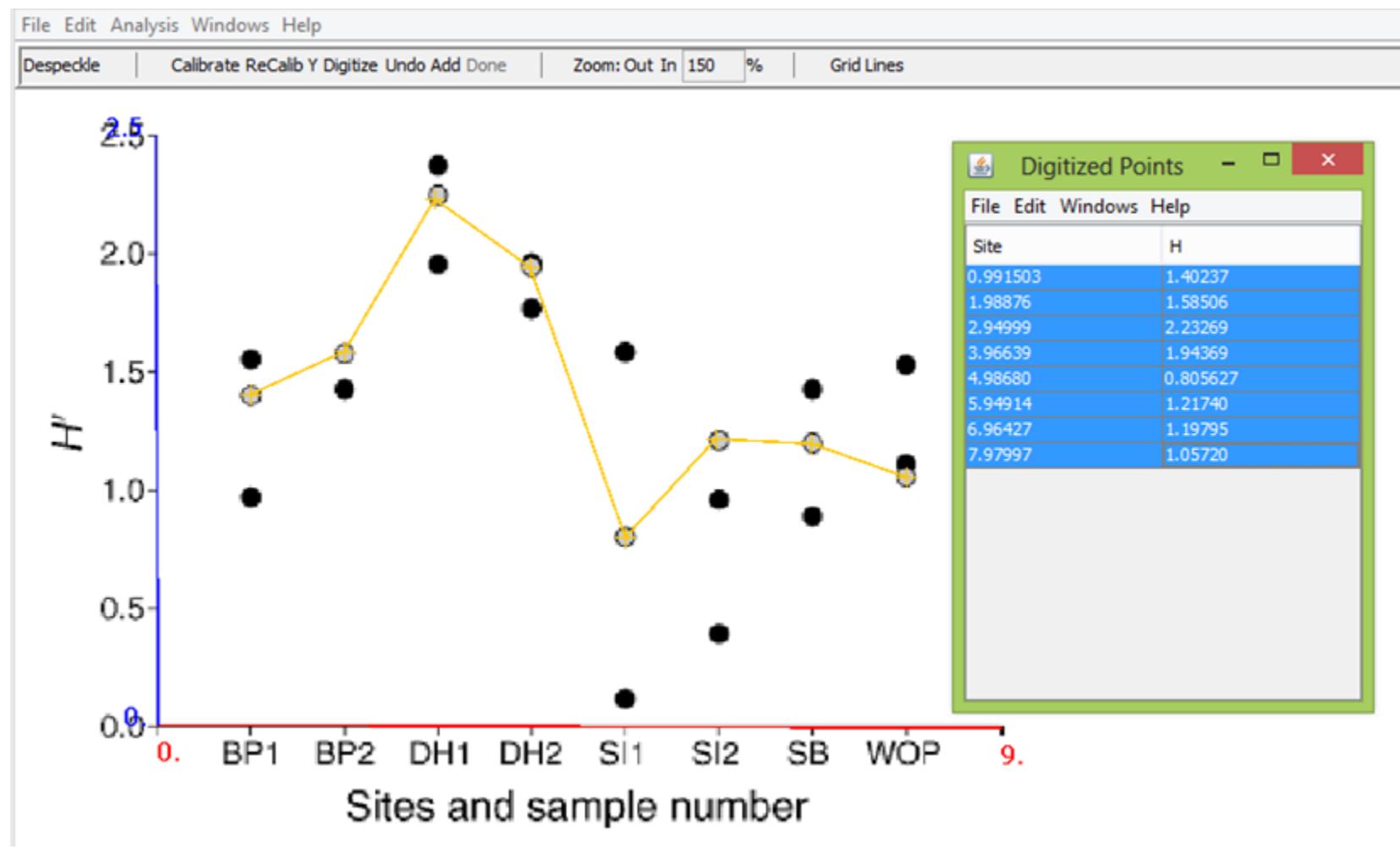


FIG. 3. Researchers' (black circles) and students' (gray circles) Shannon diversity values (H') for site comparisons. H' for the site is determined from data collected by researcher and

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/>

