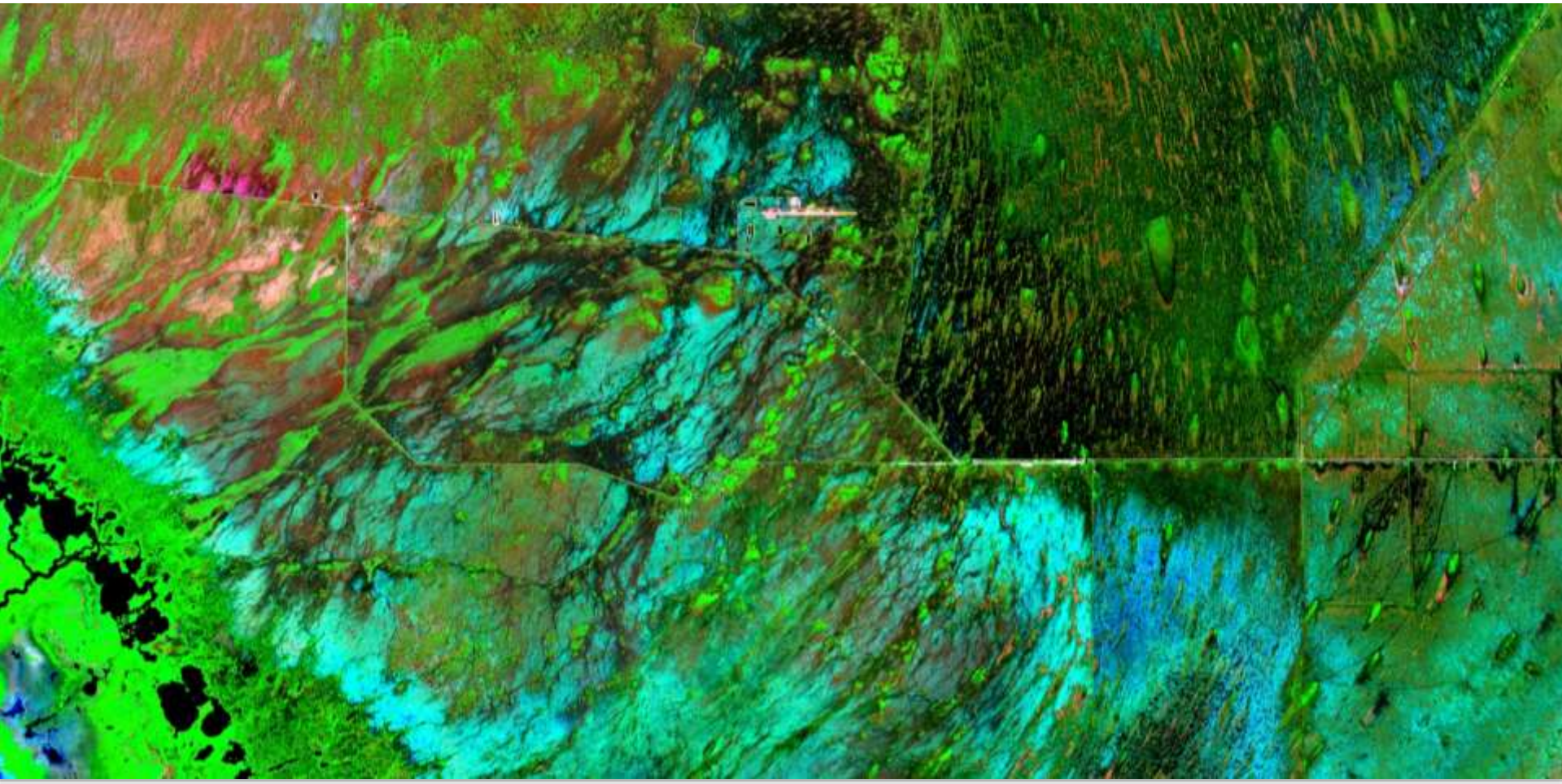


JS Rehage

Earth & Environment Department

FIU Institute of Water and Environment

Florida International University

As scientists, we often…

…face scarcity

limited resources & data

What if…

There was a **untapped resource** that could provide us with both

And what if….

1. Free & plentiful

And what if….

1. Free & plentiful
2. High-quality

And what if….

1. Free & plentiful
2. High-quality
3. Added benefits

Citizen science!

Citizen science

Involvement of the public in scientific research

…. *solving real world problems*

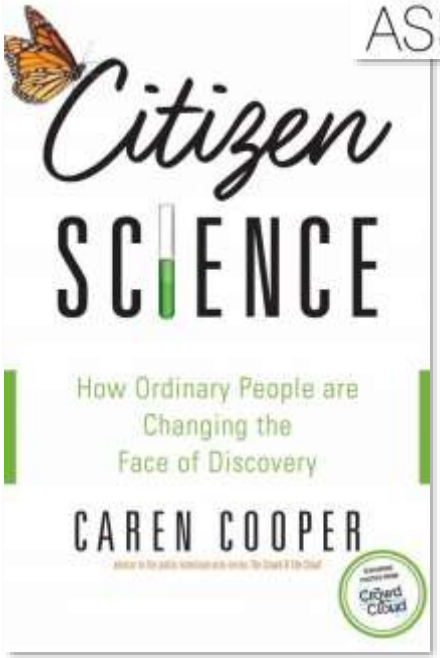
***Forest mapping in Congo**, Extreme Citizen Science*

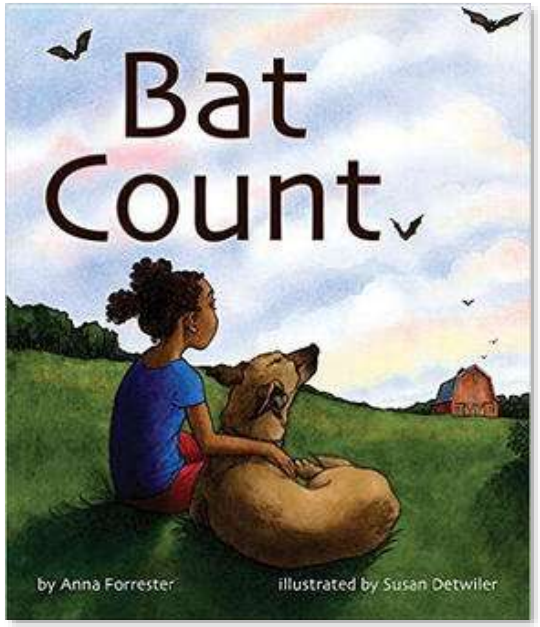
Appeals to innate curiosity

Increasing in popularity

CITIZEN SCIENCE ASSOCIATION

CITIZEN SCIENCE DAY





Crowdsourcing & Citizen Science Act of 2015

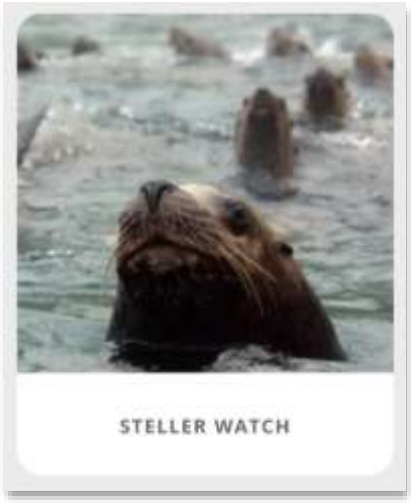
IN THE SENATE OF THE UNITED STATES

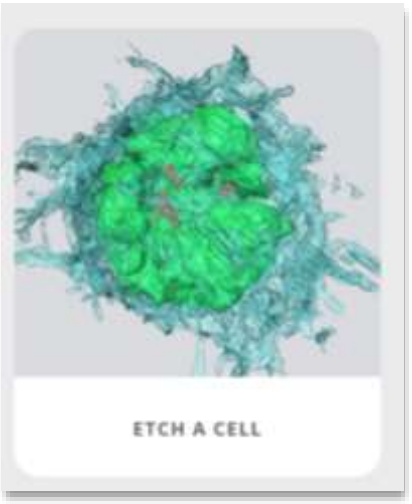
Mr. COONS introduced the following bill; which was read twice and referred to the Committee on _____

A BILL

To harness the expertise, ingenuity, and creativity of all people to contribute to innovation in the United States and to help solve problems or scientific questions by encouraging and increasing the use of crowdsourcing and citizen science methods within the Federal Government, as appropriate, and for other purposes.

Diversity of citizen science programs

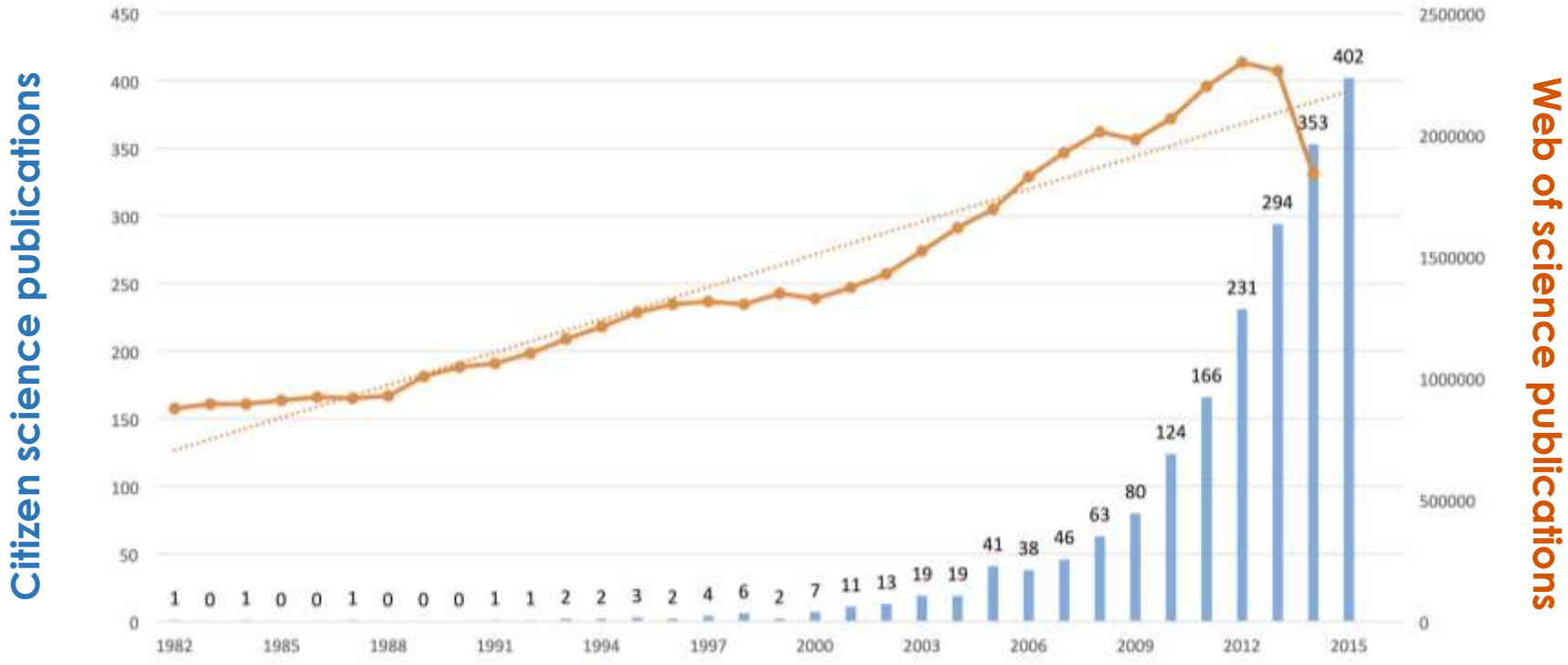




ZOONIVERSE.ORG

Increasingly being used in research

N = 1935 publications in 2015



Kullenberg & Kasperowski 2016 PLOS One

Why citizen science?

Monarch butterfly tagged by *Monarch Watch*

1. Free & plentiful

1. Free & plentiful

2017

Checklist submitted:
178,559

Species observed:
6,138

Birds counted:
29,160,231

Technology is making easier to gather data

Globe Observer program

2. High-quality

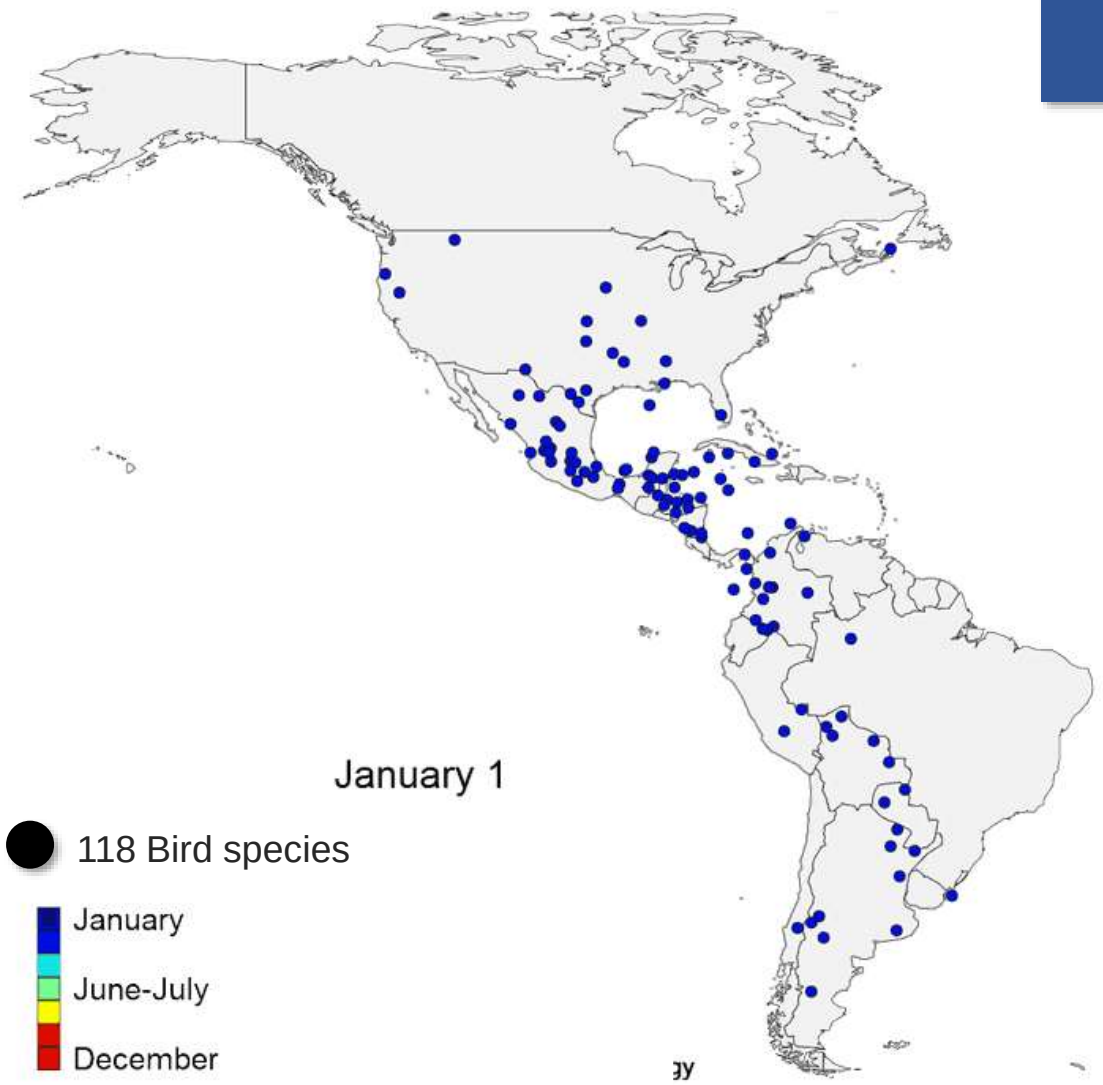
2. High-quality

eBird

90 peer-reviewed publications

2. High-quality

Species + date + location
x
6.1 million records
=
New understanding of
migration



Fall & spring migration differ:
Inland in spring
Over ocean in fall

La Sorte et al. 2016 *Proc R Soc B*

3. Added benefits

3. Added benefits


Two stories..

Shark River: Southernmost Bass Anglers

Rookery Branch
Everglades National Park

L Oberhofer

Dave Rose

Dave Rose

First fishing trip:
March 14, 1982

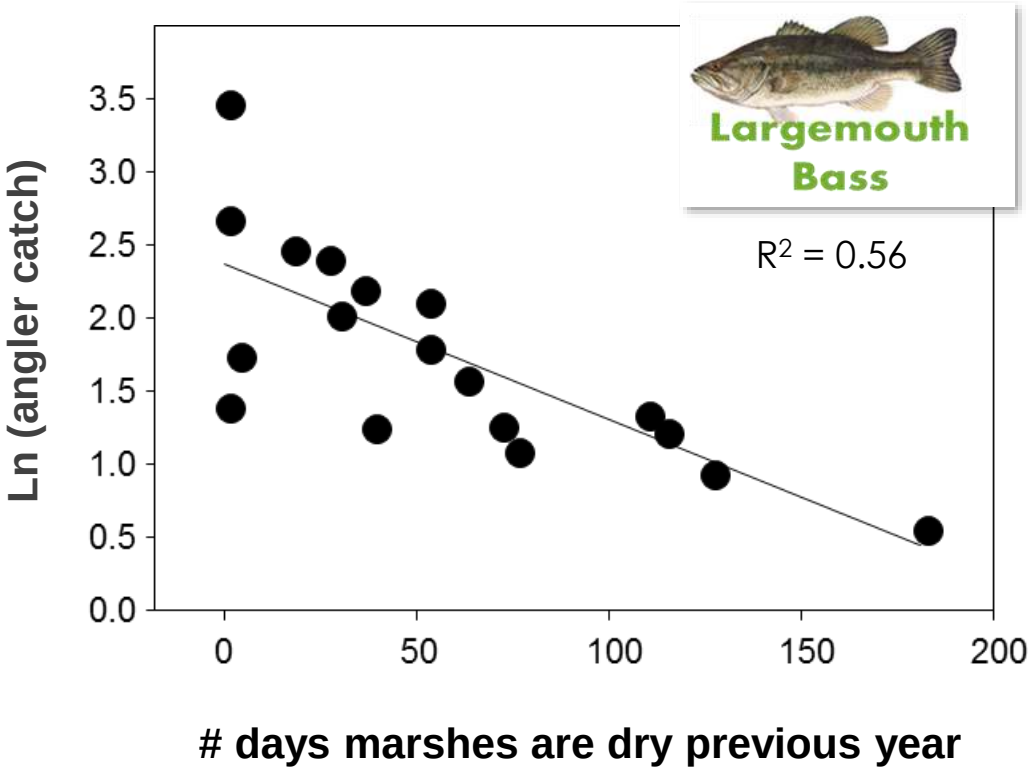
# of total bass:
17,595

# of bass caught in Shark River:
2,321

..he's counted them!

Severe drying reduces catches next year

208 fishing trips (1993-2012): 5,176 Largemouth Bass



Boucek & Rehage 2014 Estuaries & Coasts

FIU

Coastal Angler Science Team

Fish, recapture and win. Join us today.

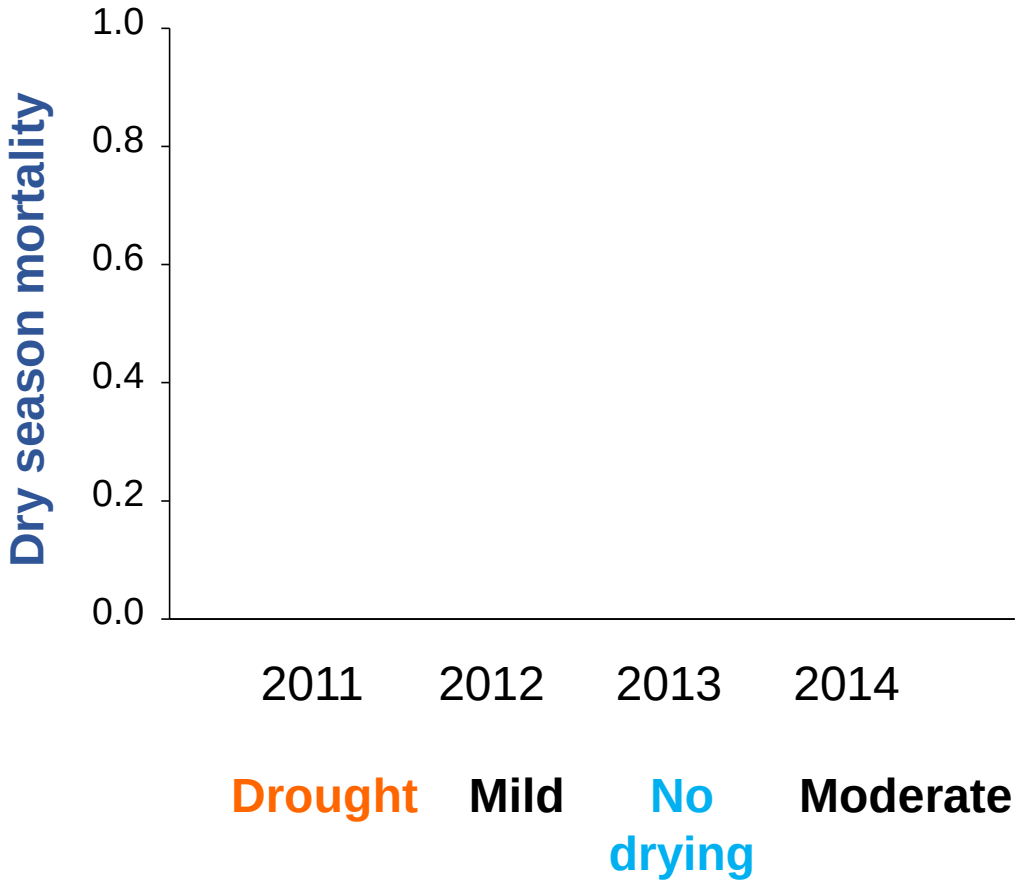
How does hydrological variation affect bass mortality?

Largemouth Bass

Mark-recapture study & survival model

2,108 Bass tagged

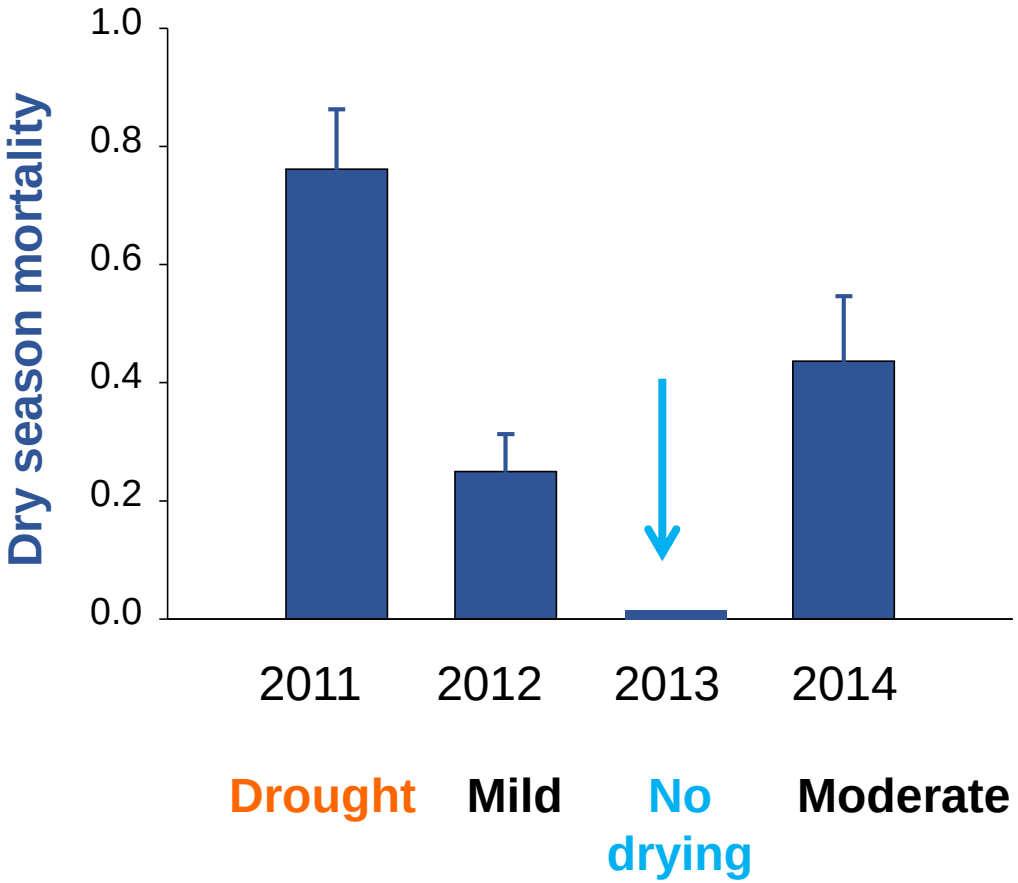
Mortality across wet/dry years

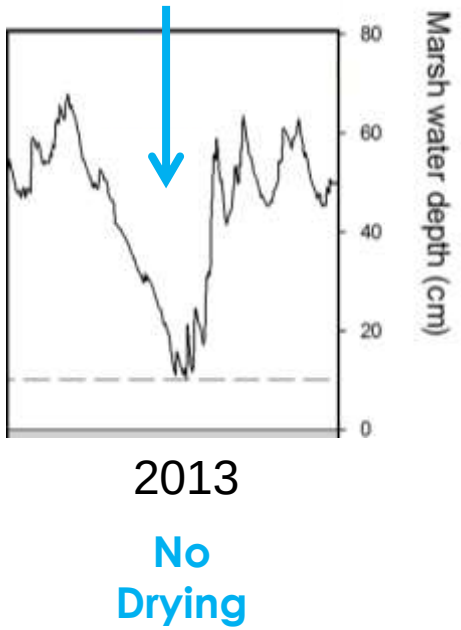


Lee, Rehage & Lauretta *In review* CJFAS

Drying severity affects mortality rate

75% with drought, but zero if no marsh drying (~ 10 cm depth)





Lee, Rehage & Lauretta *In review* CJFAS

Shark River: Southernmost Bass Anglers

Partners in data collection

- 30% of recaptures in model were from anglers!

Source of quantitative data

- Link to drivers to improve ecosystem understanding

Path for linking drivers to ecosystem services

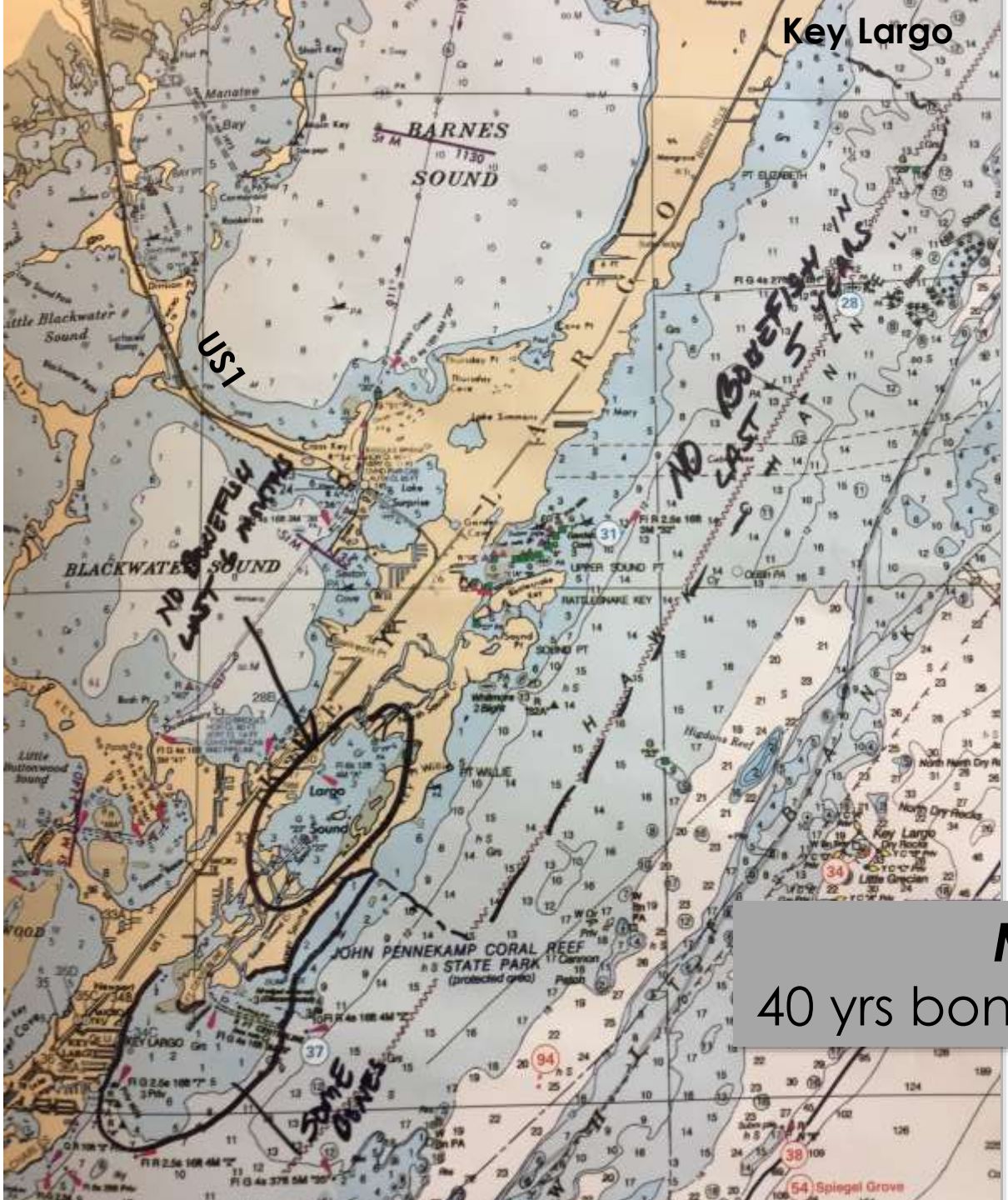
Upper Shark River
L. Oberhofer

Florida Bay: angler knowledge

Central Florida Bay

P Hall

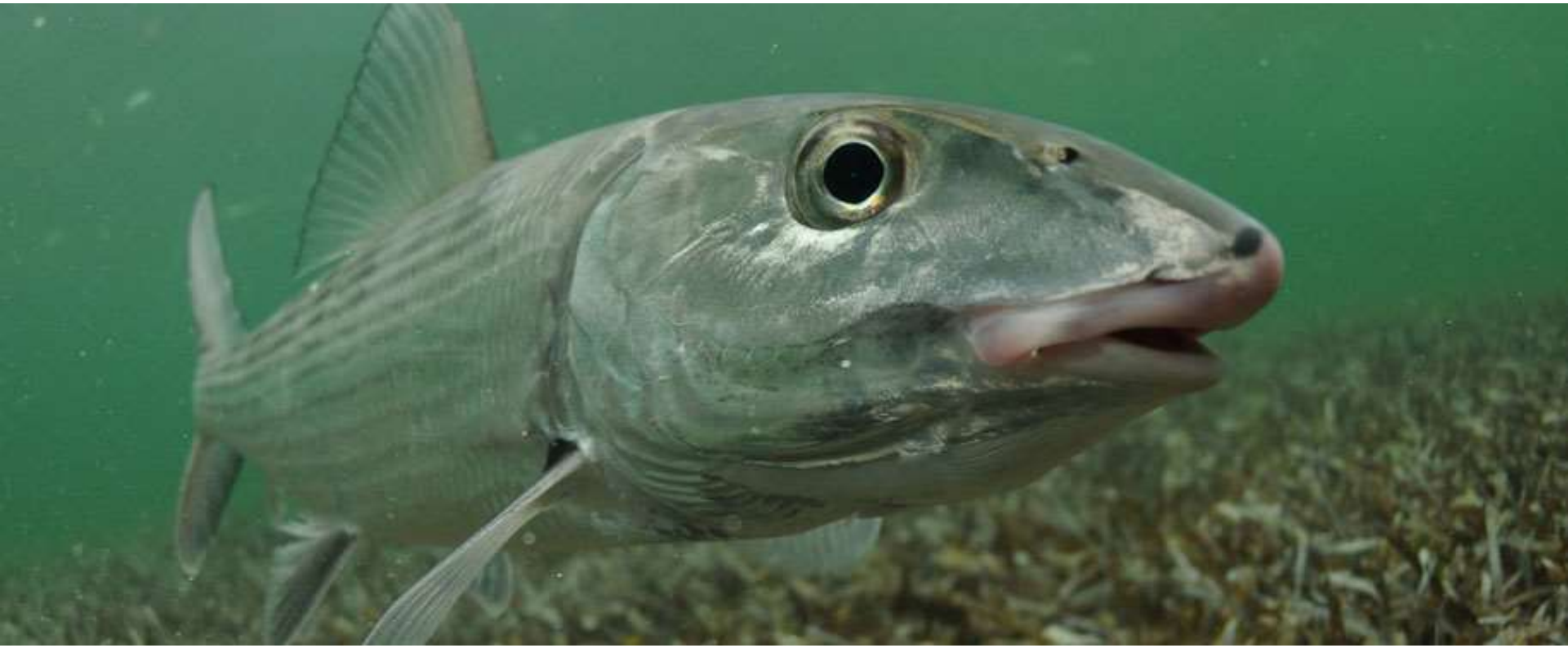
$ 466 million Florida Keys Flats Fishery (Fedler 2013)



Mitch's map

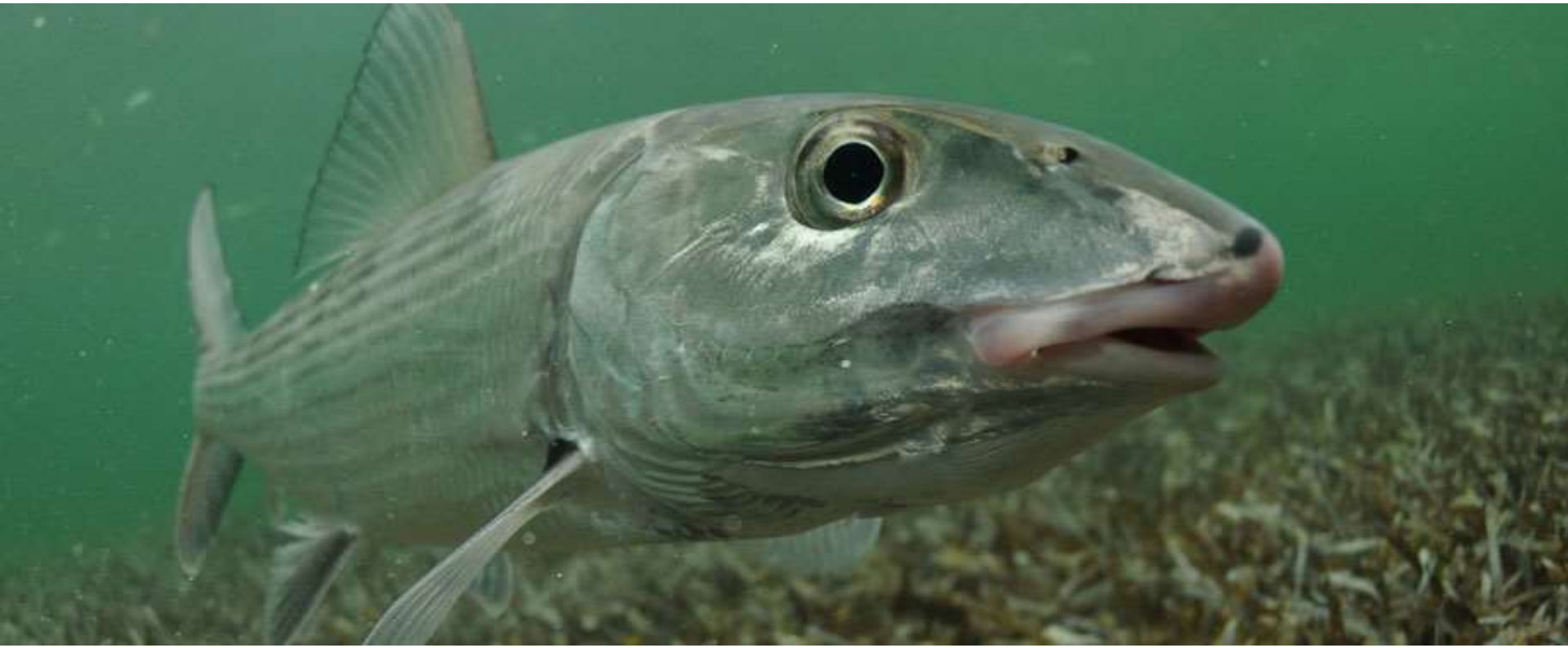
40 yrs bonefish angler

What is happening to South Florida bonefish?

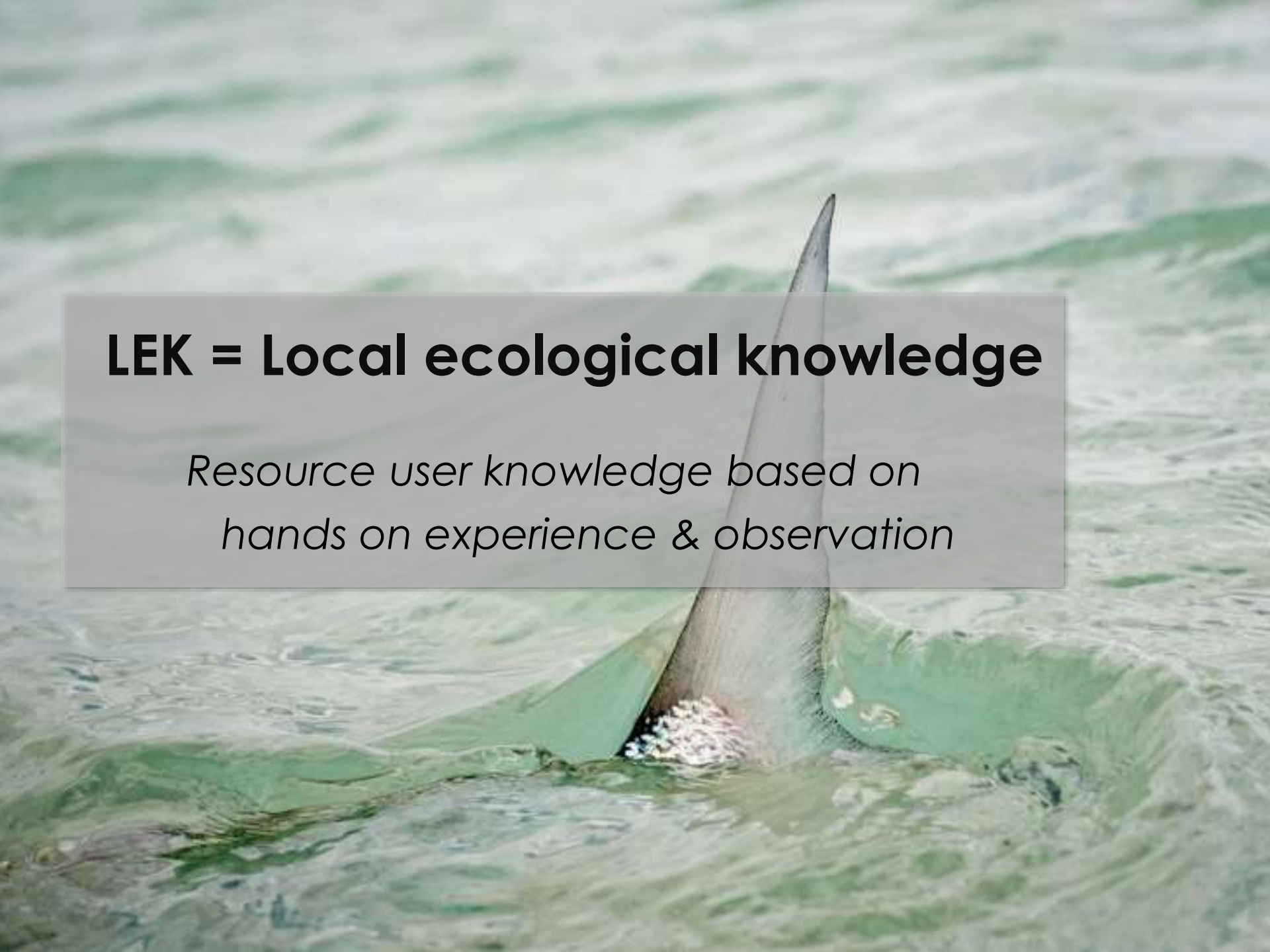


A **data-poor** fishery

1. No population studies
2. No landings: *recreational catch & release*




How do we get past & present information?

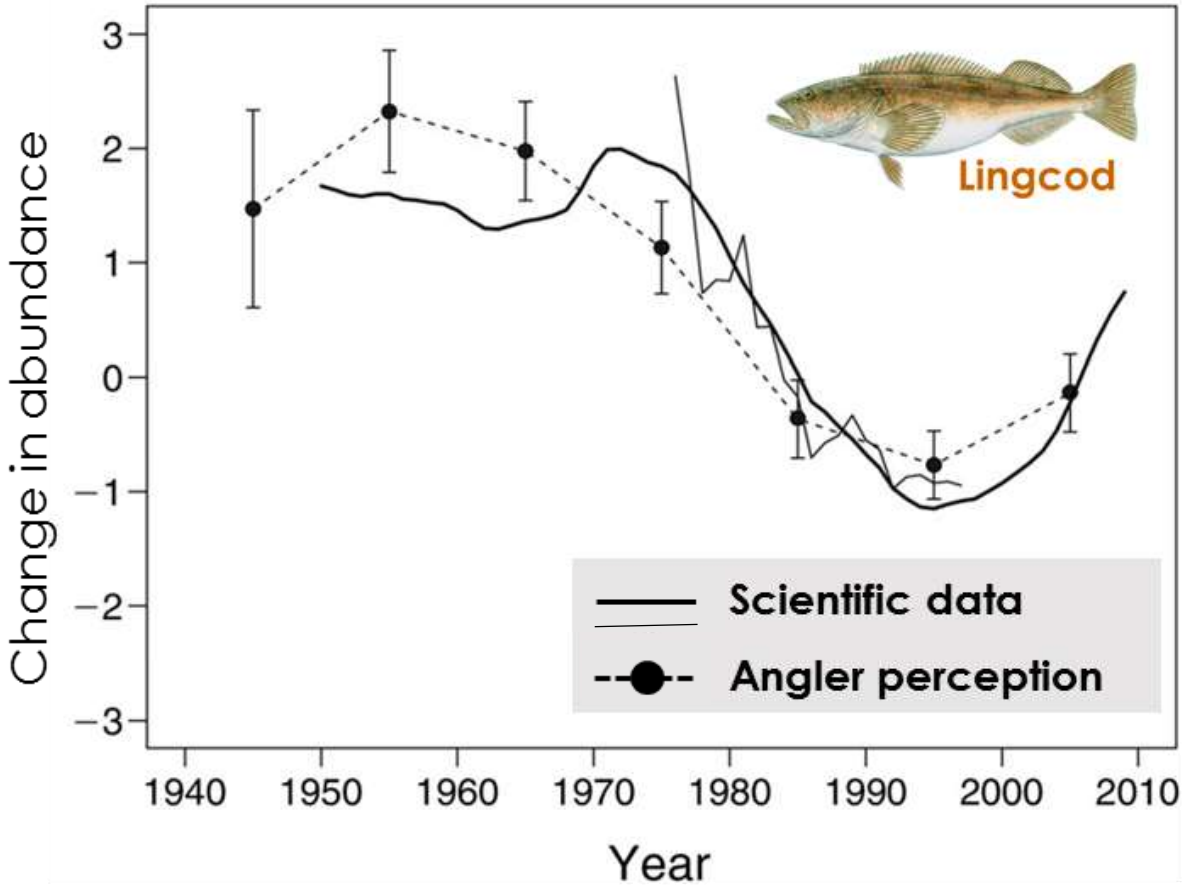


LEK = Local ecological knowledge

Resource user knowledge based on hands on experience & observation

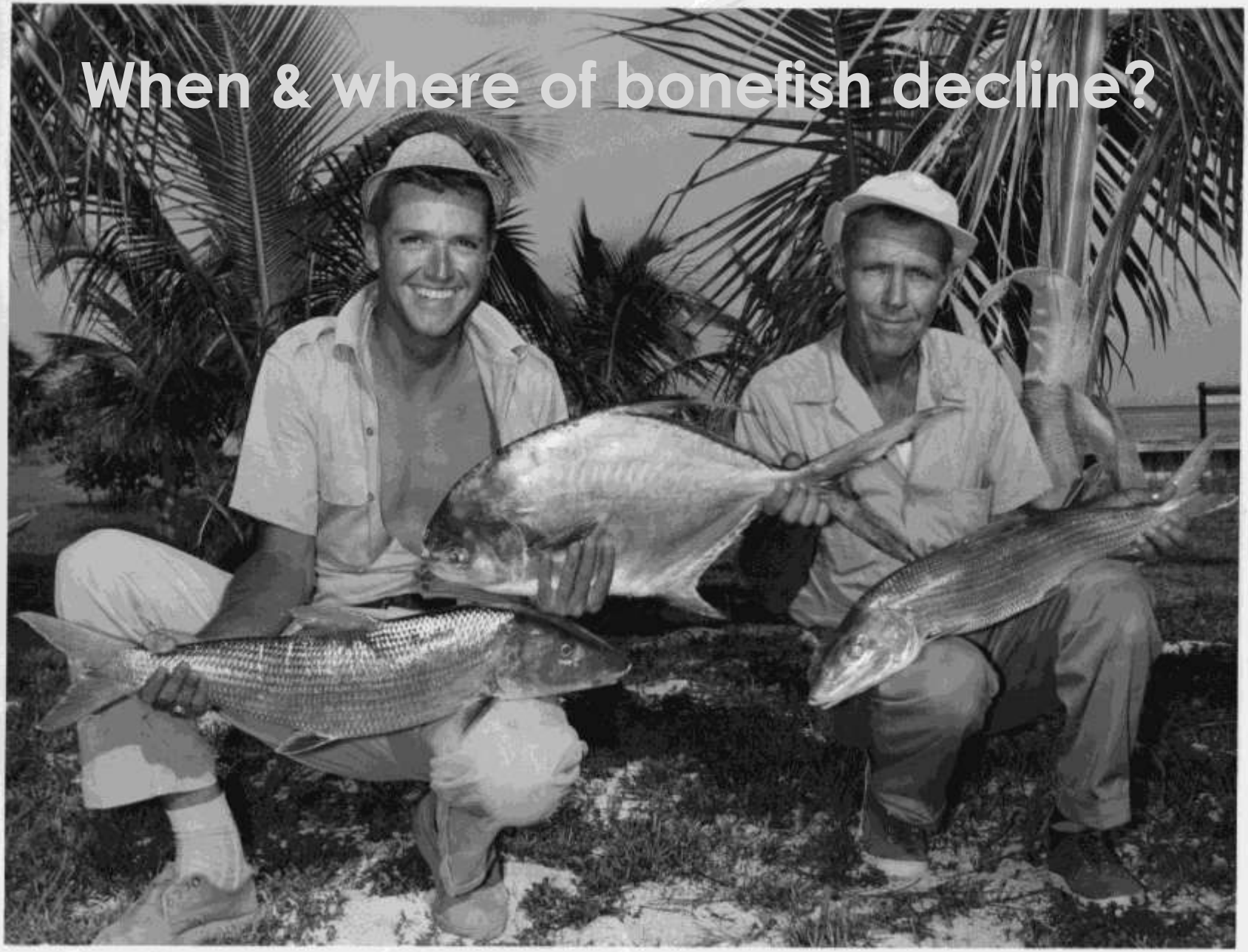
LEK is high quality data

Match scientific findings



Beaudreau & Levin 2014 Ecol Appl

When & where of bonefish decline?



Capt E Gentry & W Gorton, 1958

Key informant interviews

Captain Bill Curtis interviewed by graduate student E Kroloff

Fishing guide 1958-2016

Online survey: 278 respondents

How long have you fished & where?

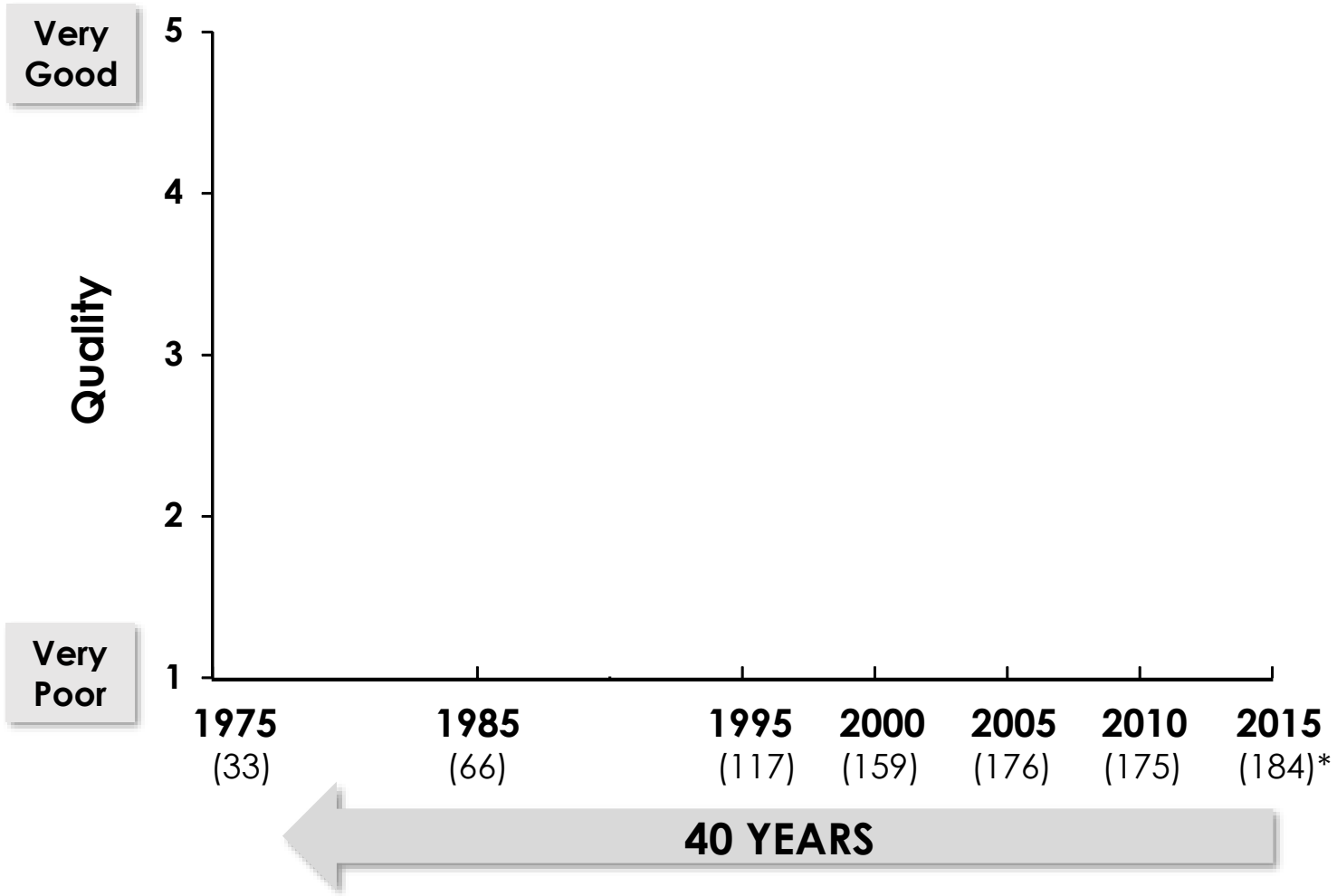
How has your bonefishing changed?

2. How would you rate your overall bonefishing experience (number of fish seen, opportunites to cast and fish caught, size of schools and fish) across regions and years you fished in South Florida on a scale from 1-5?

5	4	3	2	1
Very Good	Good	Fair	Poor	Very Poor

The map shows all regions for reference (leave regions and years you did not fish blank). Click map to enlarge as needed.

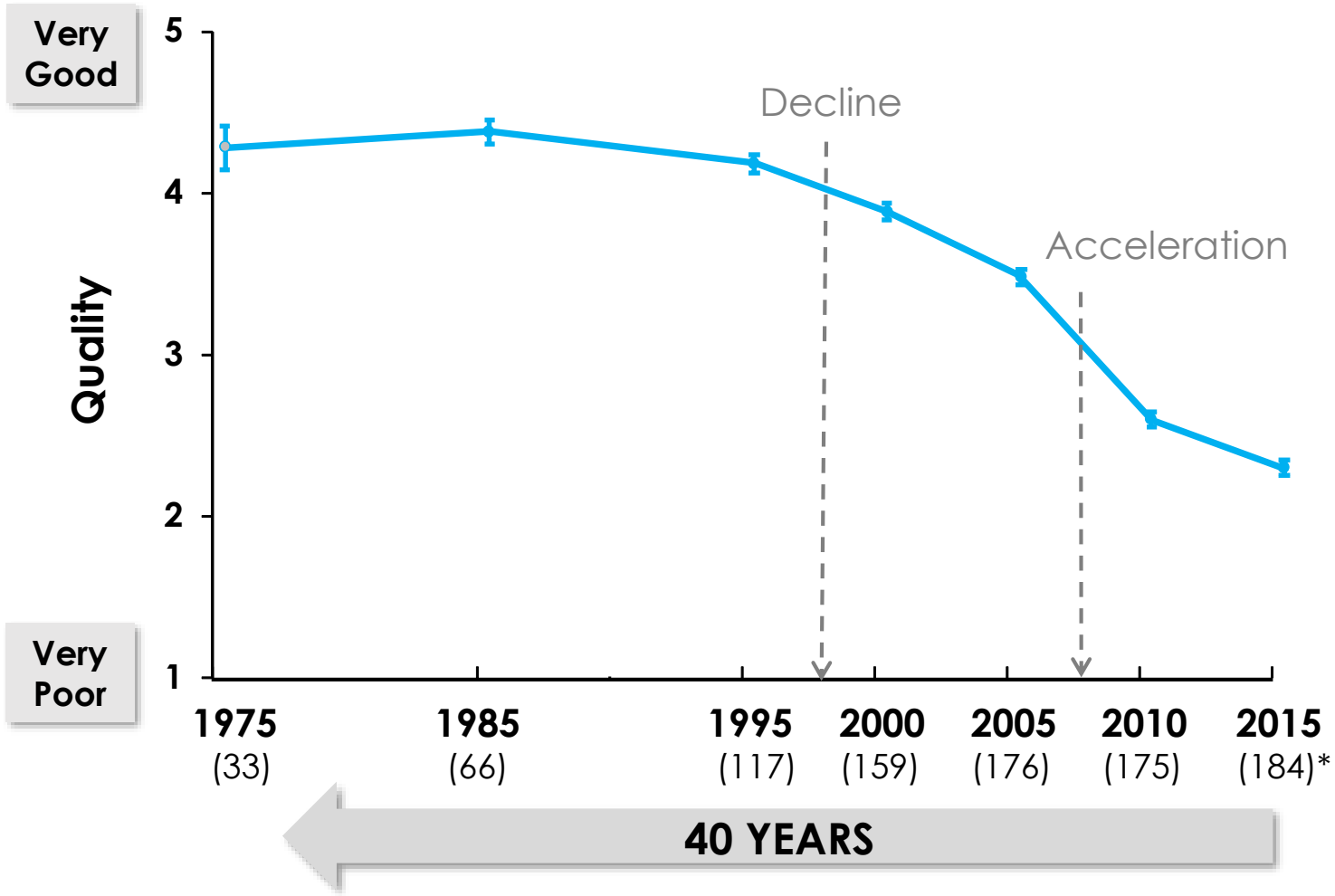
	Today (2014/2015)	5 years ago	10 years ago	15 years ago
Region 1: Biscayne Bay				
Region 2a: NW FL Bay				
Region 2b: NE FL Bay				
Region 2c: SW FL Bay				
Region 2d: SE FL Bay				
Region 3: Upper Keys				
Region 4: Middle Keys				
Region 5: Lower Keys				



* (sample sizes)

Santos, Rehage et al. *In revision* Plos ONE

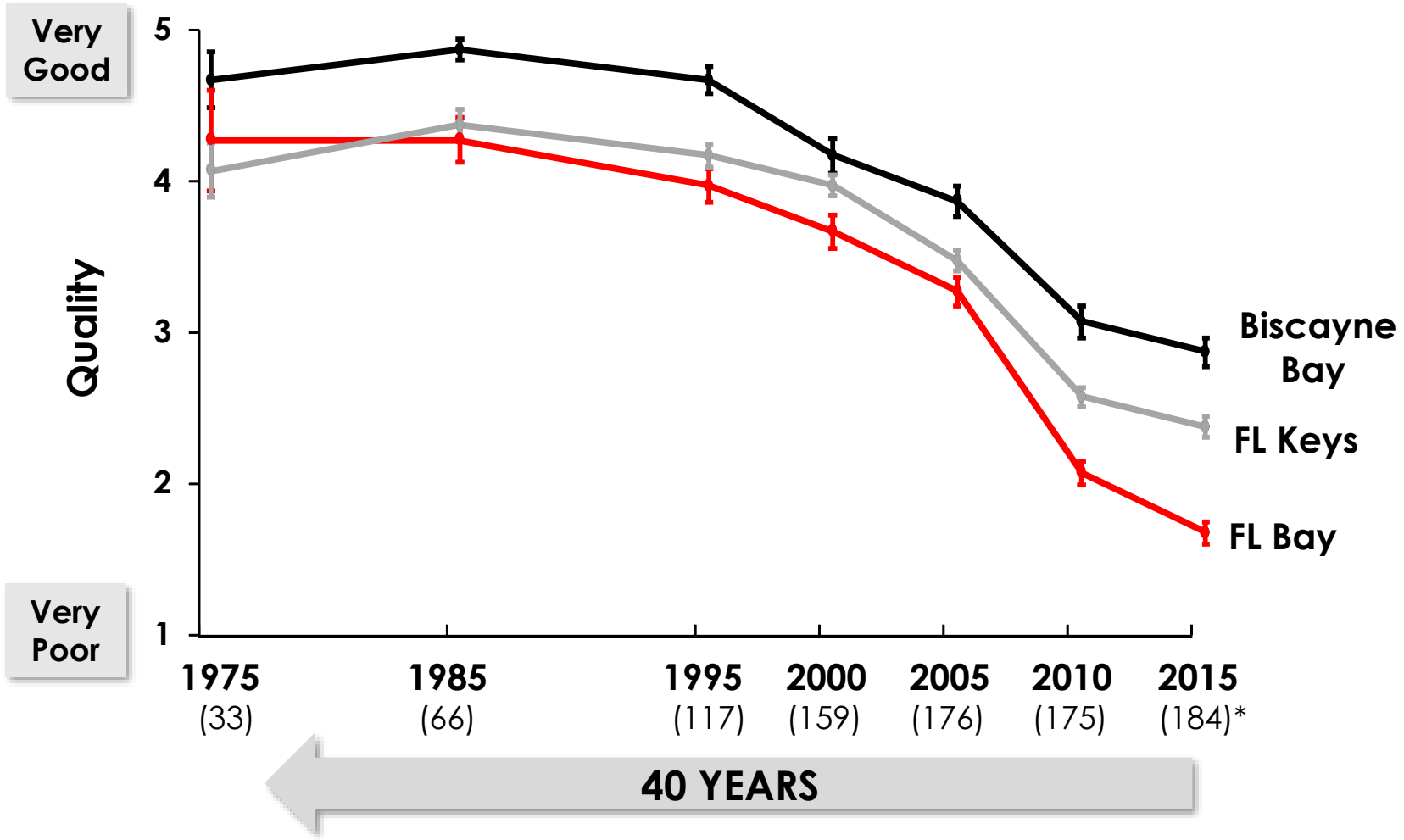
Quality of bonefishing declines in late 1990s



* (sample sizes)

Santos, Rehage et al. *In revision* Plos ONE

Decline is regional, highest in Florida Bay



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Santos, Rehage et al. *In revision* Plos ONE

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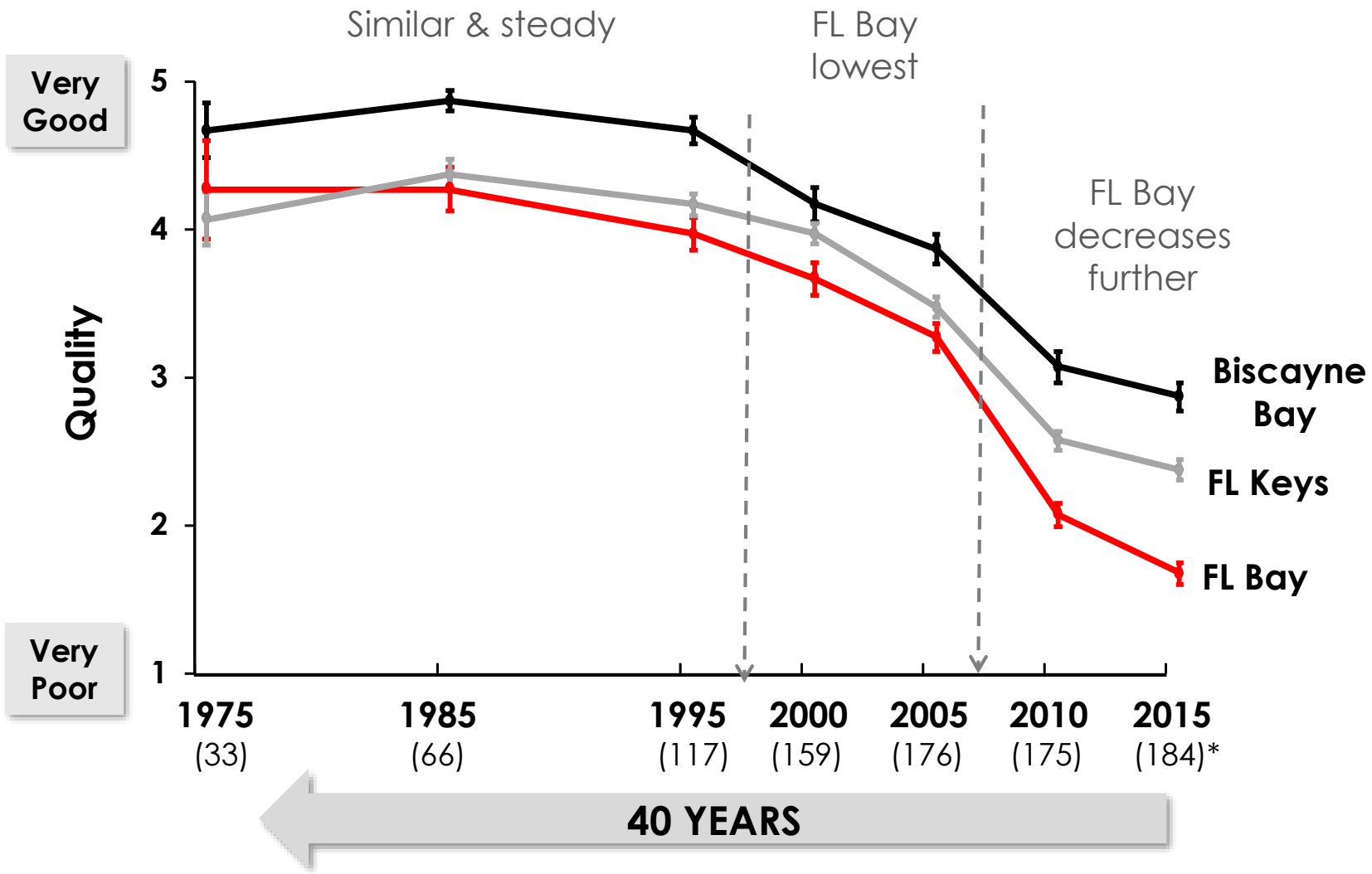
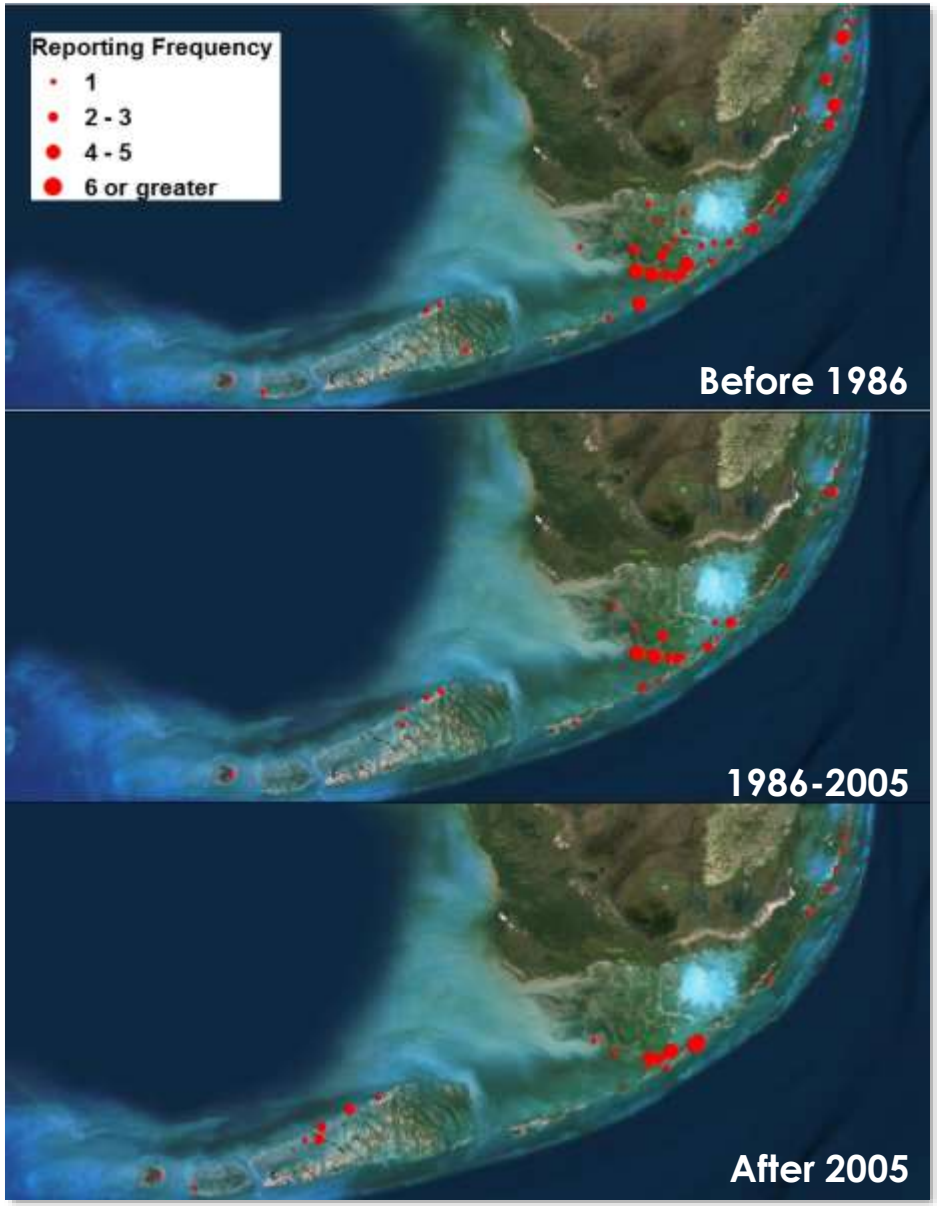


* (sample sizes)

Santos, Rehage et al. *In review* Plos ONE

Contraction of bonefishing areas over time



Santos et al. *In prep*

Florida Bay: local angler knowledge

Fill in knowledge gaps for 'data poor' systems

- Build time series
- Hint at spatial patterns
- Hypothesize at mechanisms

Florida Bay

P Hall

BONEFISH & TARPON TRUST

Citizen science can be a powerful ally

Citizen science can be a powerful ally

Scientific impact: Reliable source of data

Social impact: Strengthen our science-society relationship

What is your citizen science program?