

# How Citizen Scientists are Contributing to Science

Matthew Boone  
Biologist/Data Manager  
UF/IFAS Ft. Lauderdale, FL



@birderboone  
github/birderboone  
Mablab.org



**UF IFAS**  
UNIVERSITY of FLORIDA



# The rise of Citizen Science (CS)

“Collection of data by members of the general public in collaboration with professional scientists”

- monitoring
- surveys
- incidental reports, etc...

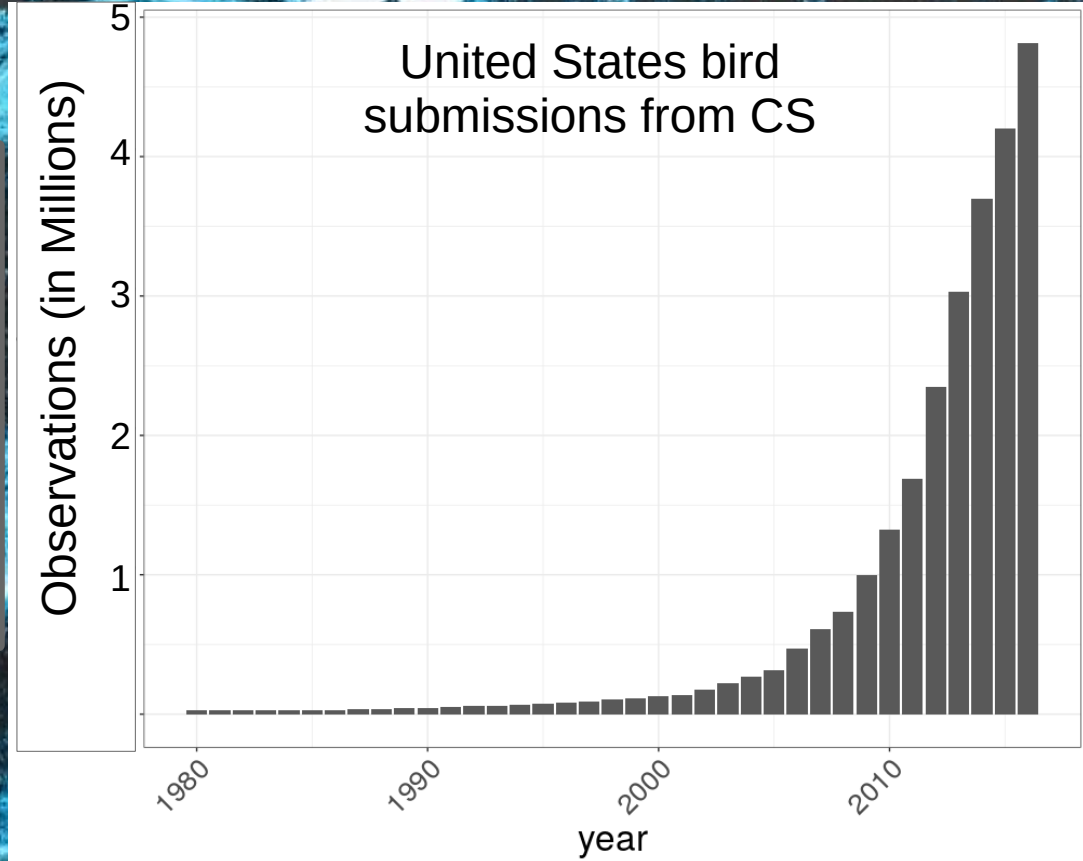


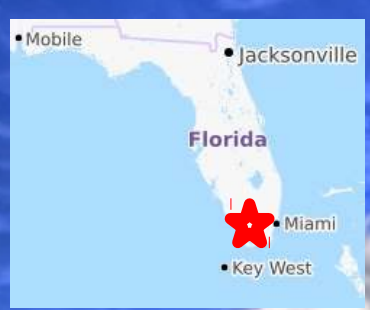


# The rise of Citizen Science (CS)

## Global Biodiversity Information Facility (GBIF)

- 1.3 billion observations
- At least 700 million from Citizen Science data sources





Scientist









10 million birders  
X  
365 days





Snail Kite

(cc) - Andy Morffew

- Began in 2002 between Cornell University and the National Audubon Society
- Currently over 500 million sightings.
- Largest CS project in the world.
- Publicly available data
- Two data sets: Research one and Raw data.





Users input checklists with details on their trips  
- Distance, time, observers, type of survey, etc..

CHECKLIST S61522374



Sun 17 Nov 2019 10:16 AM [Edit date and effort](#)

Markham Park Broward County, Florida, United States [Edit location](#)

[Checklist tools](#) ▾

Matt Boone



Traveling Complete

1 person 1 hr, 23 min 1.75 mi



eBird Mobile Tracks [+ Large map](#)

Submitted from eBird Android, version 2.0.6

[Edit comments](#)

SUBMIT ANOTHER FOR...

Same location and date  
Markham Park, Broward County, Florida, US on Sun Nov 17, 2019

Same location  
Markham Park, Broward County, Florida, US

Same area and date  
Another location near Markham Park, Broward County, Florida, US on Sun Nov 17, 2019

Same area  
Another location near Markham Park, Broward County, Florida, US

Same date  
Sun Nov 17, 2019

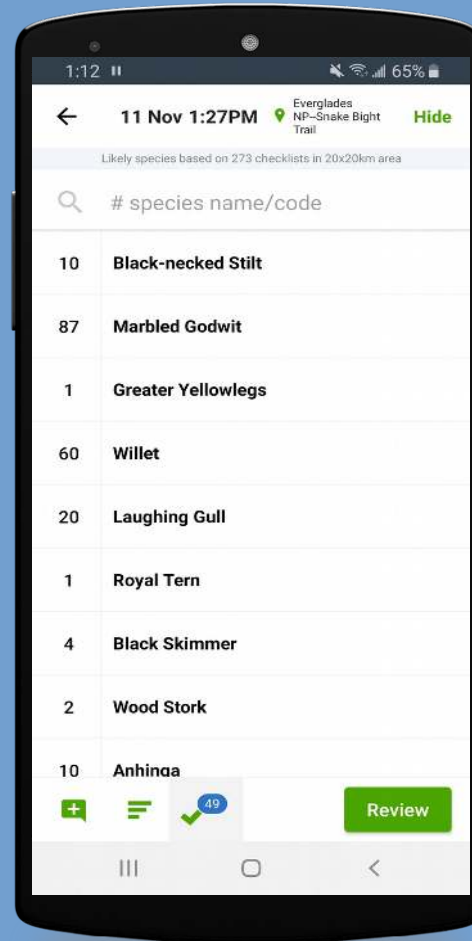
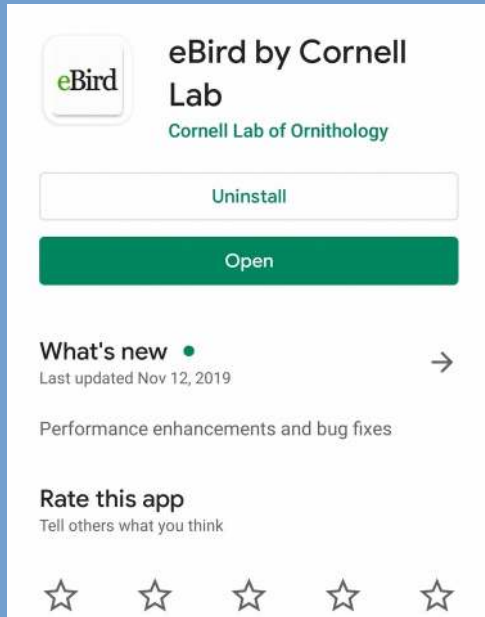
Different location and date

36 Species observed 119 individuals

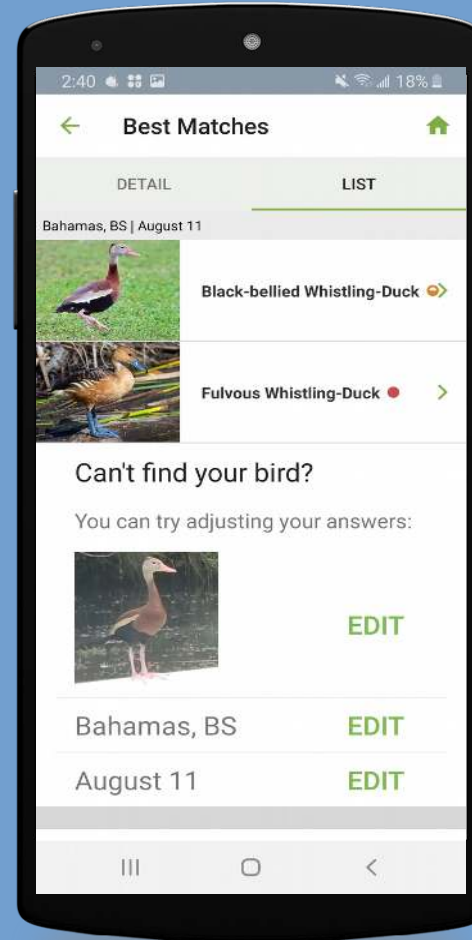
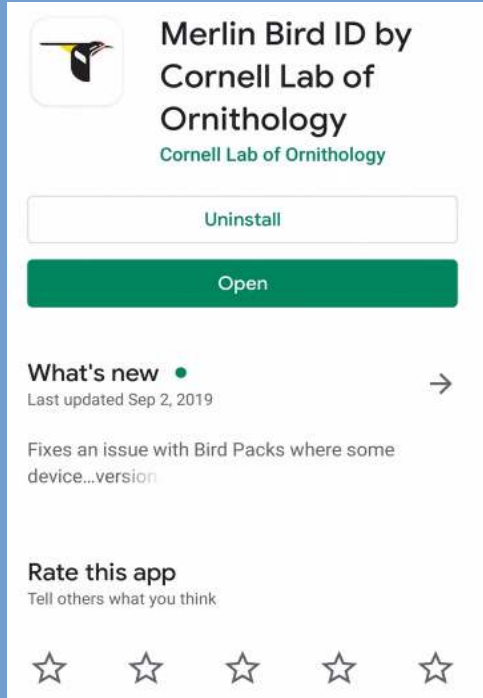
[Add media](#) [Edit species](#)

2	Ruddy Duck		Remove
1	Pied-billed Grebe		Remove
1	White-winged Dove		Remove
3	Ruby-throated Hummingbird		Remove
20	Common Gallinule		Remove
1	American Coot		Remove
3	Gray-headed Swamphen		Remove
3	Killdeer		Remove
5	Anhinga		Remove
3	Double-crested Cormorant		Remove
1	Great Blue Heron		Remove
1	Great Egret		Remove
1	Green Heron		Remove
5	White Ibis		Remove
1	Black Vulture		Remove
5	Turkey Vulture		Remove
1	Osprey		Remove
3	Northern Harrier		Remove
2	Red-bellied Woodpecker		Remove
1	American Kestrel		Remove









## Your Stats

	Life	Year	Month	
Total Species	737	304	106	
Total Checklists	1881	108	14	
ABA Area Total Ticks	4159	480	106	

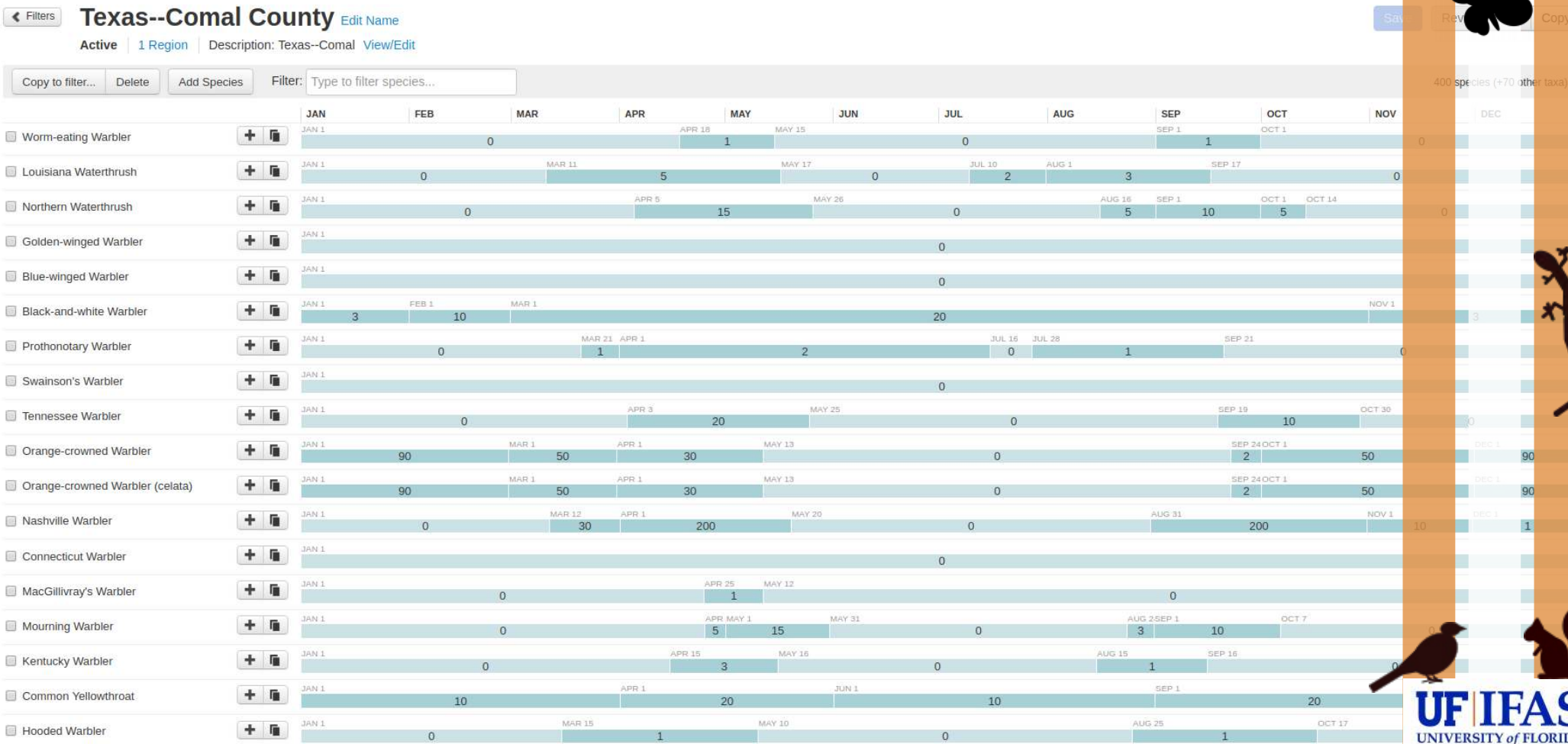
## Your Lists

Major Regions	Country	State/Province	County	
	Life	Year	Total County Ticks	
Texas	<a href="#">424</a>	<a href="#">0</a>	3164	
Oregon	<a href="#">269</a>	<a href="#">0</a>	1397	
Delaware	<a href="#">258</a>	<a href="#">0</a>	527	
Florida	<a href="#">249</a>	<a href="#">223</a>	1263	
Arizona	<a href="#">225</a>	<a href="#">0</a>	506	
California	<a href="#">215</a>	<a href="#">0</a>	410	
New Jersey	<a href="#">194</a>	<a href="#">0</a>	367	
Nevada	<a href="#">182</a>	<a href="#">0</a>	353	
Mississippi	<a href="#">179</a>	<a href="#">0</a>	320	
Missouri	<a href="#">134</a>	<a href="#">0</a>	261	
Alabama	<a href="#">126</a>	<a href="#">0</a>	142	
Hawaii	<a href="#">117</a>	<a href="#">0</a>	185	
Louisiana	<a href="#">116</a>	<a href="#">0</a>	167	
Maryland	<a href="#">115</a>	<a href="#">0</a>	201	
Pennsylvania	<a href="#">110</a>	<a href="#">0</a>	168	
North Carolina	<a href="#">107</a>	<a href="#">31</a>	125	
Nova Scotia	<a href="#">101</a>	<a href="#">0</a>	218	
Tennessee	<a href="#">100</a>	<a href="#">0</a>	133	





- Review process of over 500 volunteer reviewers
- Process is about DATA QUALITY not what you did or not see.



- Review process of over 500 volunteer reviewers
- Process is about DATA QUALITY not what you did or not see.



← Filters

**Texas--Comal County** [Edit Name](#)

Active | [1 Region](#) | Description: Texas--Comal [View/Edit](#)

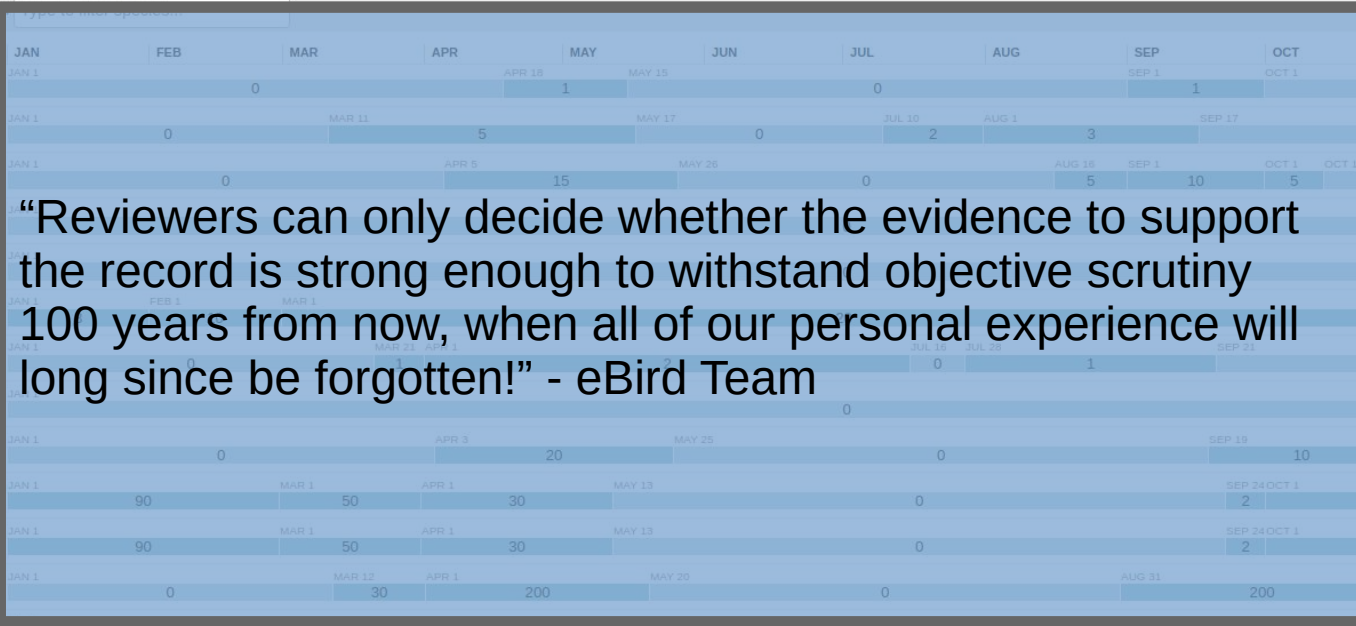
Copy to filter...

Delete

Add Species

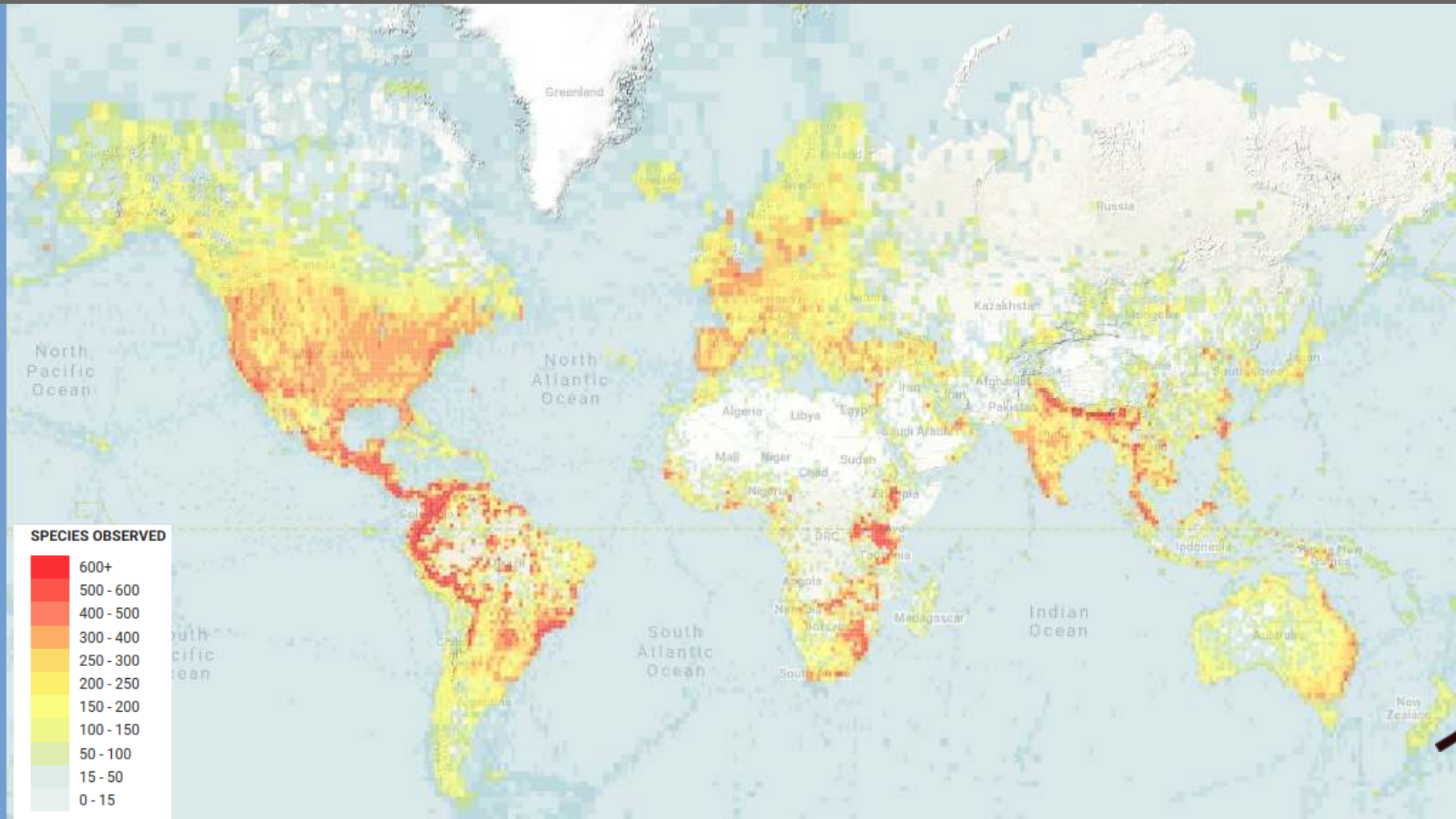
Filter

- ☐ Worm-eating Warbler
- ☐ Louisiana Waterthrush
- ☐ Northern Waterthrush
- ☐ Golden-winged Warbler
- ☐ Blue-winged Warbler
- ☐ Black-and-white Warbler
- ☐ Prothonotary Warbler
- ☐ Swainson's Warbler
- ☐ Tennessee Warbler
- ☐ Orange-crowned Warbler
- ☐ Orange-crowned Warbler (celata)
- ☐ Nashville Warbler
- ☐ Connecticut Warbler
- ☐ MacGillivray's Warbler
- ☐ Mourning Warbler
- ☐ Kentucky Warbler
- ☐ Common Yellowthroat
- ☐ Hooded Warbler





- Over 500 million observations
- Nearly complete and continuous coverage in the United States, Europe, and India.



### Canada Warbler Abundance



#### RELATIVE ABUNDANCE

**Breeding season** Jun 14 - Jul 20



**Non-breeding season** Nov 2 - Mar 15



**Pre-breeding migratory season** Mar 22 - Jun 7



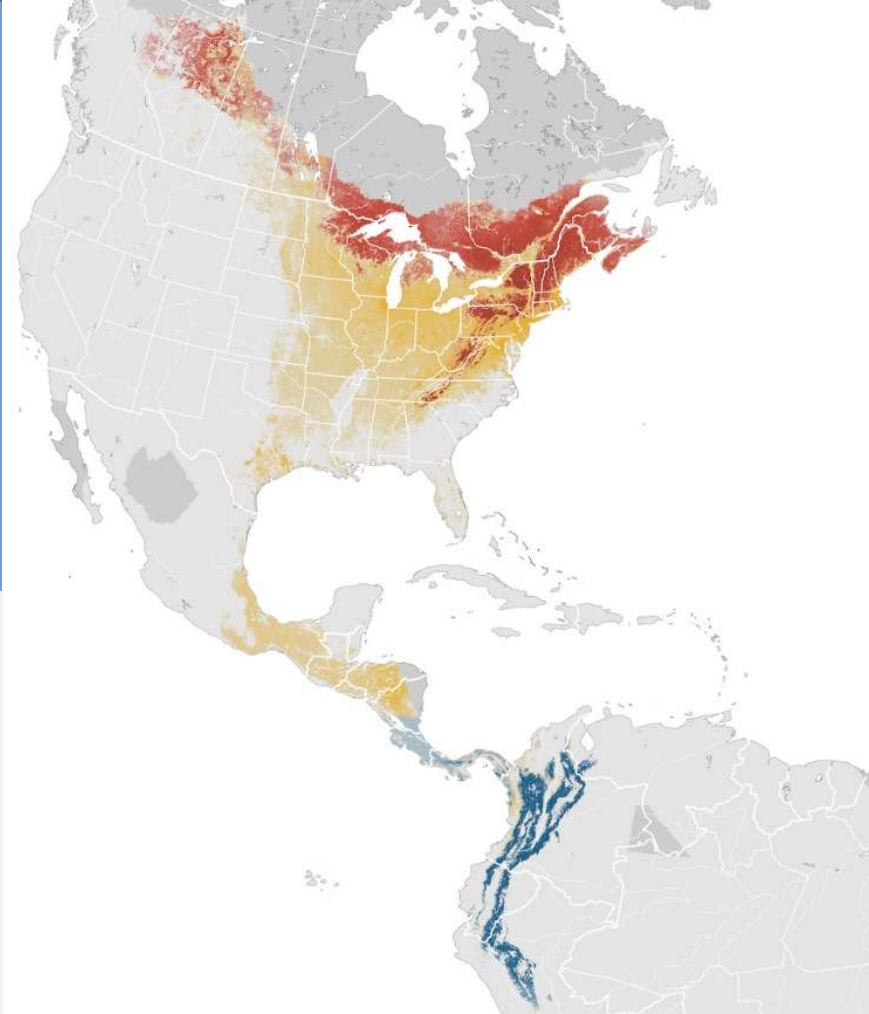
**Post-breeding migratory season** Jul 27 - Oct 26



0 0.29 7.39

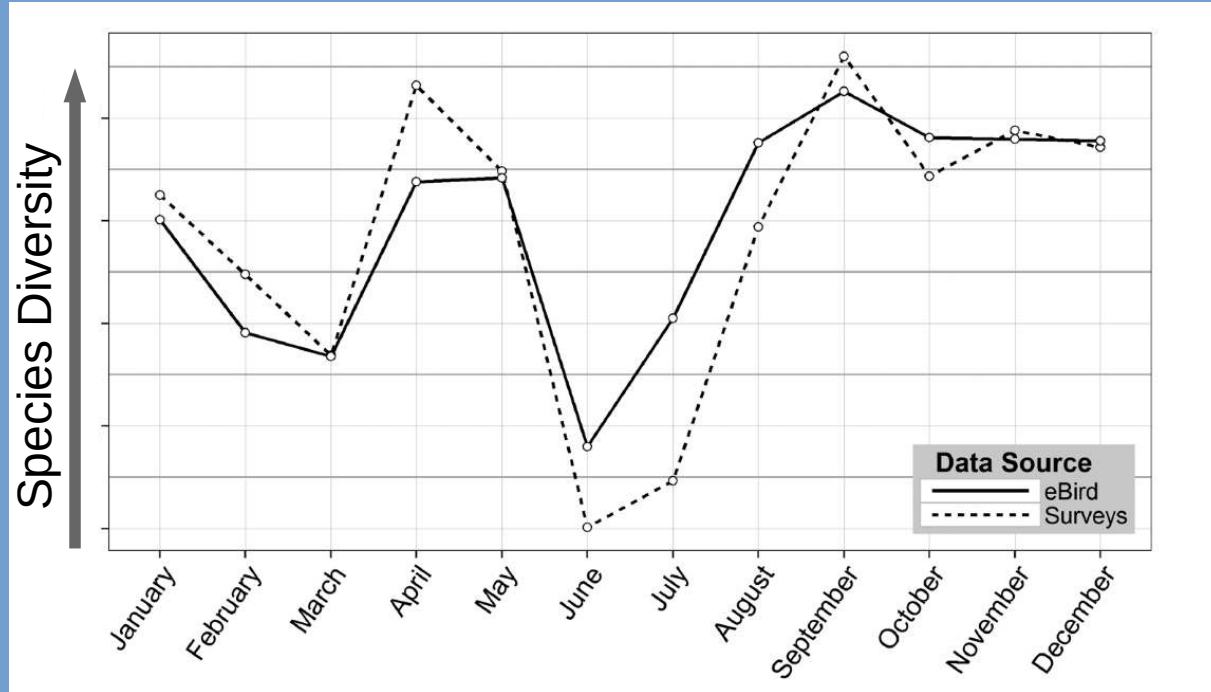
Note: Seasonal ranges overlap and are stacked in the order above; view full range in season maps.

#### SEASONS TIMELINE [Learn more](#)

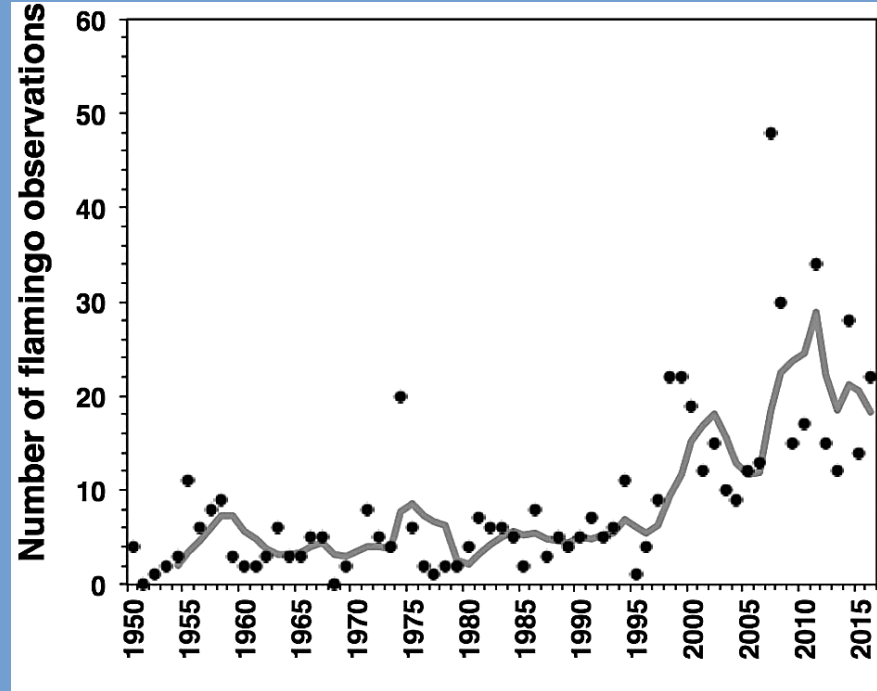




## Shorebird Diversity









# Background



Coral Snake

(cc) – pponchum81 (iNaturalist)

- Began in 2008 as joint Masters Project at UC Berkley by Nathan Agrin, Jessica Kline, and Ken-ichi Ueada
- Currently funded by California Academy of Science and National Geographic Society.
- Nearly 30 million observations





# Community Driven

- Everyone takes part in IDing observations



## Observations



Mangrove Cuckoo

Location

Go

Filters

The World

291  
OBSERVATIONS

1  
SPECIES

157  
IDENTIFIERS

183  
OBSERVERS

Map

Grid

List

Places of Interest

Redo search in map

+

-

Map

Map

Mexico

San Luis Potosí

Guanajuato

Michoacán

Veracruz

Dallas

Austin

Houston

San Antonio

New Orleans

Mississippi

Alabama

Georgia

South Carolina

Jacksonville

Orlando

Tampa

Miami

Havana

Cuba

Cayman Islands

Jamaica

Port-au-Prince

Tennessee

North Carolina

Florida

Louisiana

Alabama

Georgia

South Carolina

Florida

Georgia

South Carolina

Florida

Georgia

South Carolina

Florida

Georgia

South Carolina

Florida

Georgia

South Carolina

Florida

Georgia

South Carolina

Florida



Mangrove Cuckoo

(*Coccyzus minor*)

El Rincon, Panama • Jun 15, 2013

Research Grade 2



4h



Mangrove Cuckoo

(*Coccyzus minor*)

Villa Hermosa, La... • Nov 15, 2019

Research Grade 1



3d



Mangrove Cuckoo

(*Coccyzus minor*)

Old State Rd 4a, F... • May 6, 2014

Research Grade 1



3d



Mangrove Cuckoo

(*Coccyzus minor*)

Atlántida Departme... • Feb 24, 2008

Research Grade 1



7d



Mangrove Cuckoo



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# Community Driven

- Learning is part of the process



birderboone suggested an ID

🏆 Improving 1y ▼



Watersnakes

Genus *Nerodia*

👉 Compare



bobbyfingers suggested an ID

1y ▼



Watersnakes

Genus *Nerodia*



bobbyfingers commented

1y ▼

Looks to potentially be a hybrid *N. c. compressicauda* X *N. f. pictiventris*. @floridensis @petekleinhenz - thoughts?



petekleinhenz commented

1y ▼

Definitely not your standard floridensis. What a neat looking snake!



birderboone commented

1y ▼

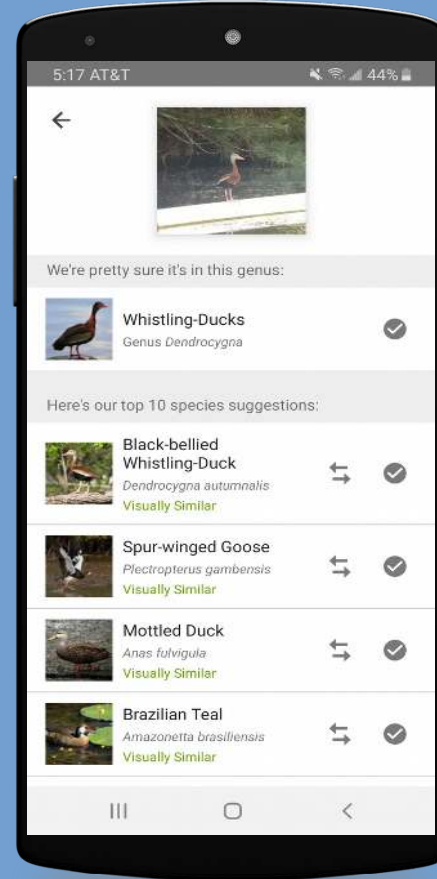
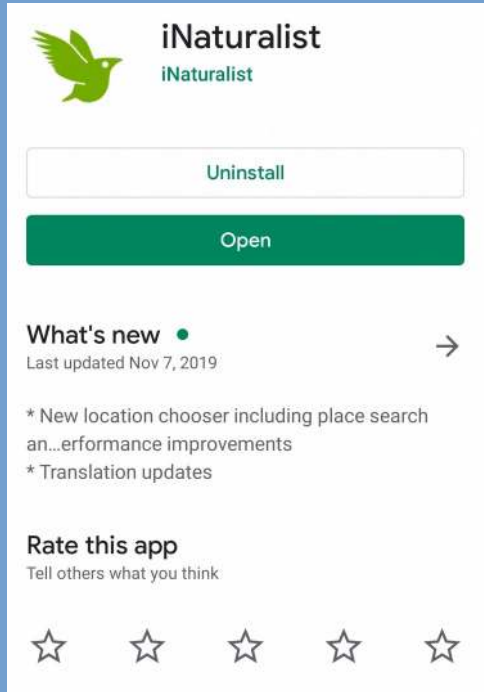
For what it helps this is a park surrounded by mangroves, so its fairly salty.





# Mobile Apps – iNaturalist

- Core interface for submitting observations
- Great how to guides at [inaturalist.org/pages/help](https://www.inaturalist.org/pages/help)

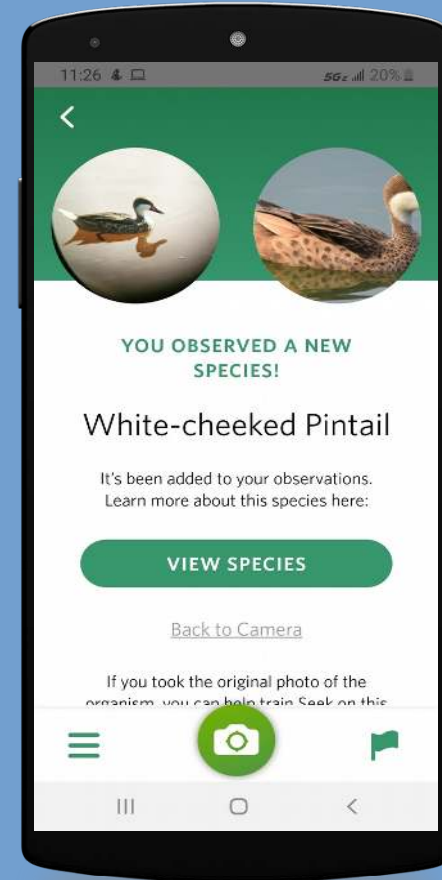
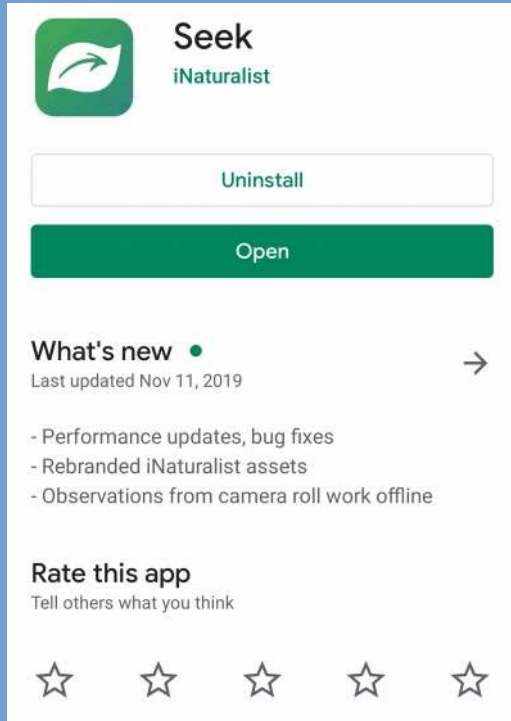






# Mobile Apps – Seek (new)

- More accessible
- Showcases their new image recognition engine.





# BioBlitzes

- Great way to have citizens contribute to Biodiversity knowledge



bioblitz

2016  
National Park Service  
CENTENNIAL

NATIONAL  
GEOGRAPHIC

See Results

2016 National Parks BioBlitz  
NPS Servicewide

January 1, 2016 to December 31, 2016

## Event Stats

### Totals

135213

Observations »

13416

Species »

6462

People »

### Most Observations



realifeecology

3979 observations



rcurtis

2408 observations



terrydaz2

1402 observations



jolne

1405 observations



treegrow

1335 observations

### Most Species



rcurtis

1226 species



realifeecology

926 species



dnom

661 species



silversia\_starsong

614 species



flosi

529 species

### Most Observed Species



Western Fence Lizard

1508 observations



Common Side-blotched Lizard

403 observations



American Robin

388 observations



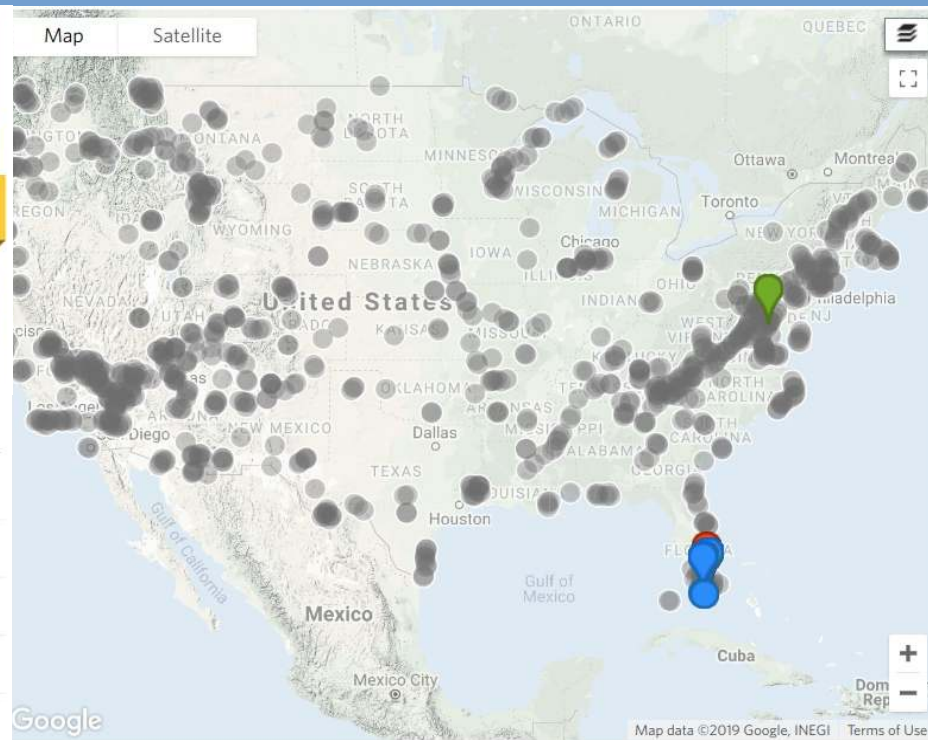
Mallard

365 observations



Great Blue Heron

357 observations



# New, rare, and novel sightings



## Citizen science leads to snail rediscovery in Vietnam

by Mike Gaworecki on 8 July 2016



A Rare Moth is Found in Chile - Observation of the Week, 2/10/19



## 'Strangest Fish I've Ever Seen': Rare Giant Sunfish Found in California

By Merritt Kennedy, NPR | Feb 28



## A new species of Andean poison frog, *Andinobates* (Anura: Dendrobatidae), from the northwestern Andes of Colombia

ADOLFO AMÉZQUITA<sup>1,5</sup>, ROBERTO MÁRQUEZ<sup>2</sup>, RICARDO MEDINA<sup>2</sup>, DANIEL MEJÍA-VARGAS<sup>1</sup>, TED R. KAHN<sup>3</sup>, GUSTAVO SUÁREZ<sup>4</sup> & LUIS MAZARIEGOS<sup>4</sup>

<sup>1</sup>Department of Biological Sciences, Universidad de los Andes, AA 4976, Bogotá, Colombia. E-mails: aamezqui@uniandes.edu.co, r.marquez96@uniandes.edu.co, pyrrhura@gmail.com

<sup>2</sup>Department of Biology, Universidad del Tolima, Ibagué, Colombia. E-mail: ramedinar@ut.edu.co

<sup>3</sup>Neotropical Conservation Foundation, Washington, DC, USA. E-mail: tedr.kahn@gmail.com

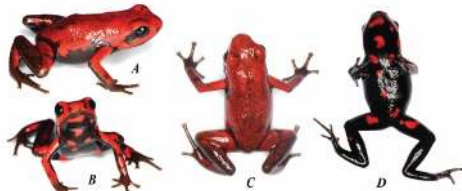
<sup>4</sup>Fundación THC, Calle 17A No. 121-11, Cali, Colombia. Email: lamh@thc-fc.org

<sup>5</sup>Corresponding author

## New data on the distribution of *Leptoglossus occidentalis* Heidemann (Heteroptera: Coreidae: Coreinae: Anisoscelini), including the first record of the species in Georgia

Nuevos datos sobre la distribución de *Leptoglossus occidentalis* Heidemann (Heteroptera: Coreidae: Coreinae: Anisoscelini), incluyendo la primera cita de la especie en Georgia

Torsten van der Heyden<sup>1</sup>



## Species New for Vermont Discovered by iNaturalist

2019 by Kent McFarland | no responses yet





### Observations

The World

 Map  Grid  List

Media Name



- Show**
- ☐ Wild
  - ☐ Captive
  - ☒ Verifiable
  - ☐ Research Grade
  - ☐ Needs ID
  - ☐ Threatened
  - ☐ Introduced
  - ☐ Popular
  - ☐ Has Sounds
  - ☐ Has Photos
  - ☐ Your Observations

Description / Tags

blue, butterfly, etc.

More Filters

Update Search

Reset Search Filters

Categories



Rank

High

Low

Sort By

Date Added

Desc

Date Observed

☒ Any

☐ Exact Date YYYY-MM-DD

☐ Range

Start

End

☐ Months

Select Options

Identify

Atom

 Download



# Background



Statira Sulphur  
(CC) karen33317 (iNaturalist/eButterfly)

- Started in 2011 by Maxim Larrivee and Jeremy Jerr during their PhD at the University of Ottawa
- Scientific experts validate reports.
- Over 230,000 observations and 5500 users (2017)





Home Discover eButterfly Submit Observations Explore data Photos My eButterfly Help

Home / Submit Observations / Step 3

## Step 3: What did you see ?

Click on a species name to view a profile

### Hesperiidae

- ☐ [Hoary Edge](#) *Achalarus lyciades* [Hespérie frangée](#)
- ☐ [Lace-winged Roadside-Skipper](#) *Amblyscirtes aesculapius*
- ☐ [Dusky Roadside-Skipper](#) *Amblyscirtes alternata*
- ☐ [Pepper and Salt Skipper](#) *Amblyscirtes hegon* [Hespérie poivrée](#)
- ☐ [Reversed Roadside-skipper](#) *Amblyscirtes reversa* [Reversa](#)
- ☐ [Common Roadside-Skipper](#) *Amblyscirtes vialis* [Hespérie violacée](#)
- ☐ [Delaware Skipper](#) *Anatrytone logan* [Hespérie de Logan](#)
- ☐ [Least Skipper](#) *Ancyloxypha numitor* [Hespérie délicate](#)
- ☐ [Monk Skipper](#) *Asbolis capucinus*
- ☐ [Sachem Skipper](#) *Atalopedes campestris* [Hespérie vagabonde](#)
- ☐ [Arogos Skipper](#) *Atrytone arogos*
- ☐ [Loammi Skipper](#) *Atrytonopsis loammi*

#### Species name

English

French

Latin

Type to search

Search

#### Location

Anne Kolb Nature  
Center, 26.034928, -80.130416, Florida

Date

2019-11-19

I am submitting a checklist of all  
butterflies I observed at this  
location, date and time.

☐ Yes

☒ No

Finish



# Integration with iNaturalist



## Stats

### Totals

902274

Observations »

2884

Species »

92762

People »

### Most Observations



juancarlosgarciamorales1  
6918 observations



francisco3\_tutor  
6917 observations



jmmaes  
5264 observations



treichard  
4524 observations



robberfly  
4219 observations

### Most Species



stevendaniel  
568 species



juancarlosgarciamorales1  
497 species



rogerritt  
489 species



mcandrews  
460 species



robberfly  
453 species

### Most Observed Species



Monarch  
76948 observations



Painted Lady  
26143 observations



Common Buckeye  
22755 observations



Eastern Tiger Swallowtail  
22444 observations

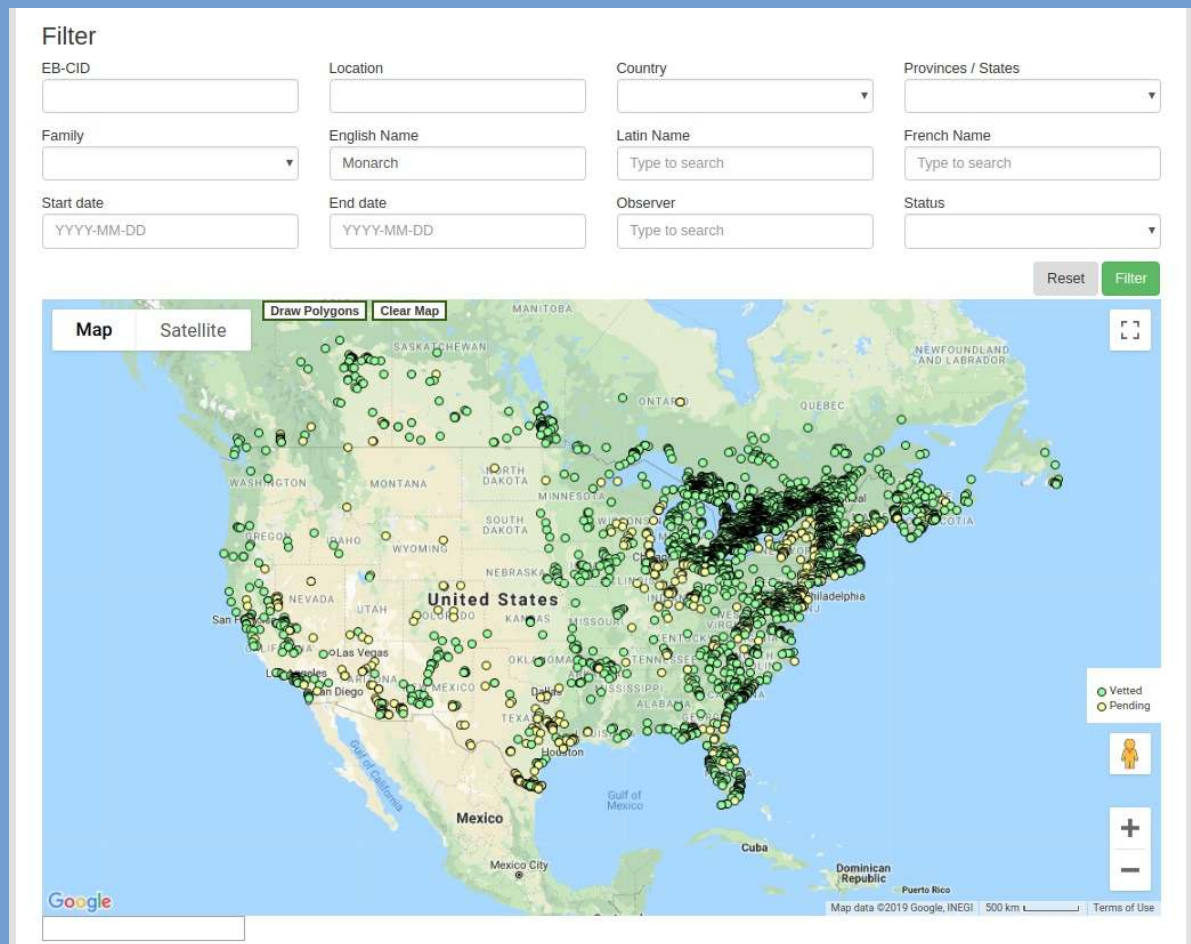


Gulf Fritillary  
21043 observations



# Explore Data

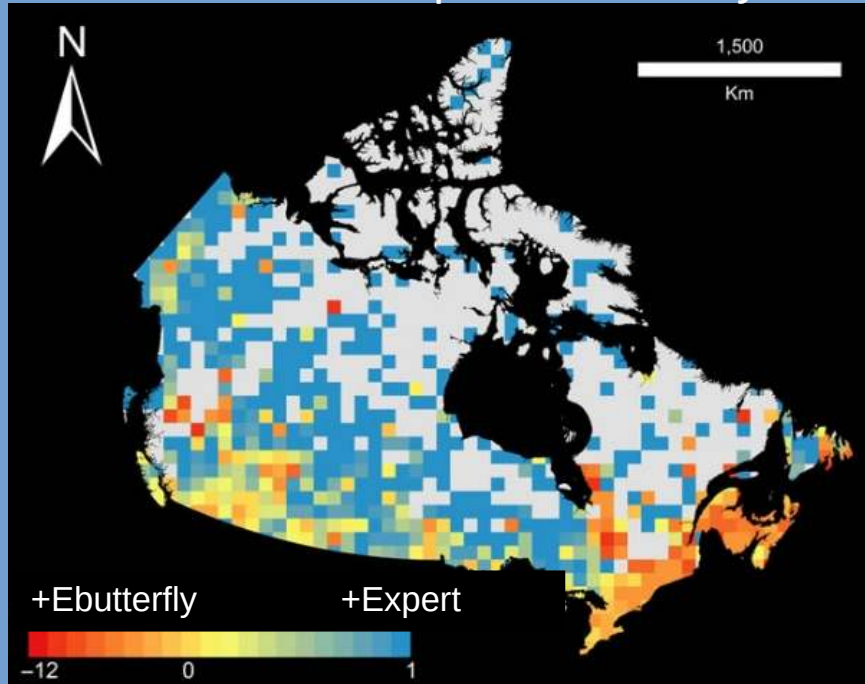
- e-butterfly.org - > Explore Data



# Benefits of Citizen Science

- Soroye et al. 2018

## Contribution to species diversity



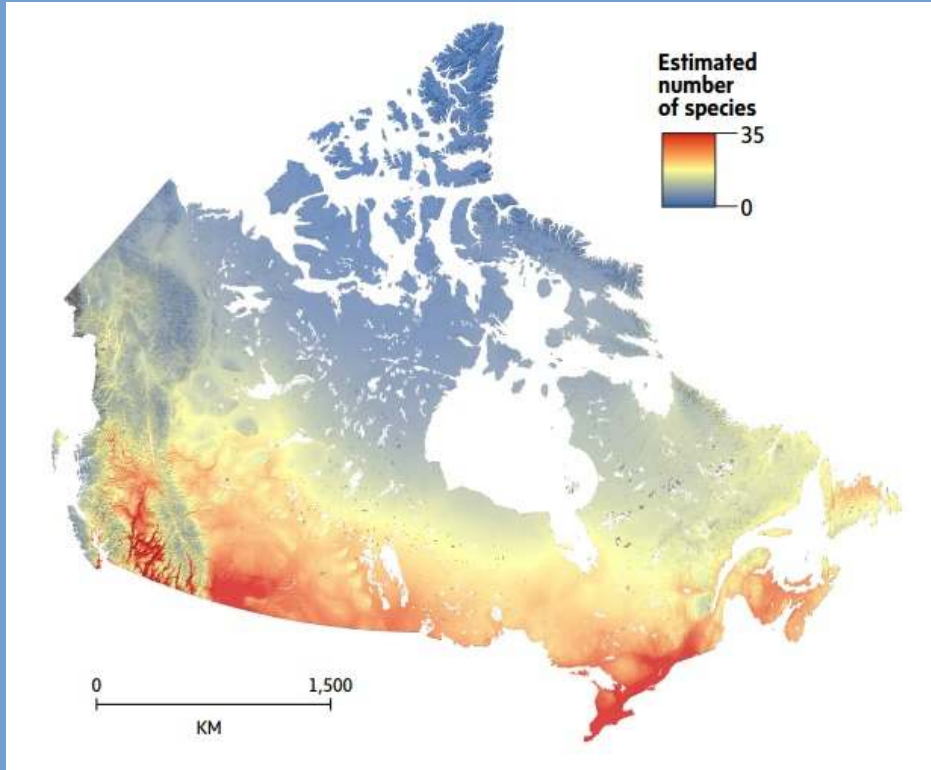
- Earliest date recorded was 34 days earlier
- 80% of species had novel range expansions from CS data
- Combining CS and expert data sets increased knowledge substantially





# Climate Change

- Lewthwaite et al. 2017
- Crewer et al. 2019



- Butterflies are capable of rapidly reacting to temperatures changes to change their distribution

- This change has already begun in altering species diversity across canada

- These factors effect yearly Monarch populations and distribution as well.

Lewthwaite, J. M. M., Debinski, D. M., & Kerr, J. T. (2017). High community turnover and dispersal limitation relative to rapid climate change, 459–471.

Crewe, T. L., Mitchell, G. W., Larrivée, M., & Taylor, C. (2019). Size of the Canadian Breeding Population of Monarch Butterflies Is Driven by Factors Acting During Spring Migration and Recolonization, 7(August), 1–12



(CC) Kenneth Dwain Harrelson



# Background



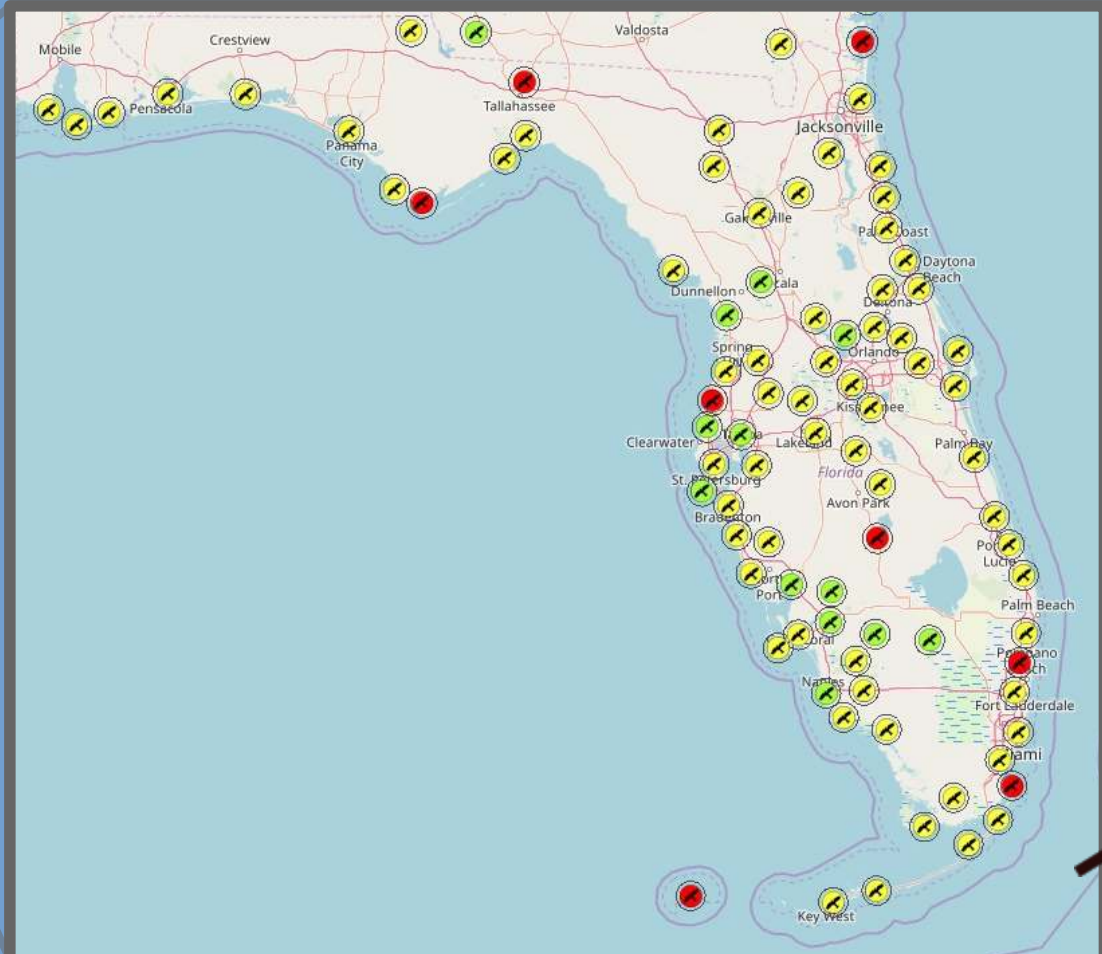
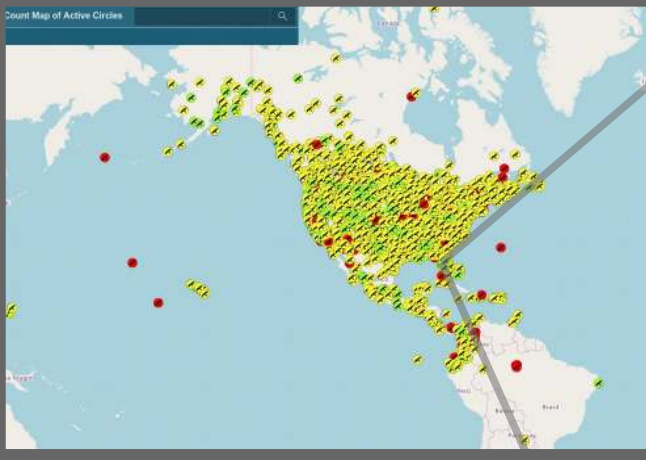
- Christmas Bird count began in 1900 by Frank Chapman
- 15 mile radius
- December 14 – Jan 5
- All skill levels



Camilia Cerea (Audubon)

# CBC circles

- Last year over 2585 circles
- [www.audubon.org/conservation/join-christmas-bird-count](http://www.audubon.org/conservation/join-christmas-bird-count)





# By the Numbers



Green Heron  
Simona Picardi

Highest US Count ever 250 :  
Mad Island Marsh, Matagorda County, TX

## In 2018

- 2673 species recorded
- 79 count circles in Florida
- Highest participants in Florida :  
Sanibel Island (150)

Highest counts in Florida :  
Tampa Bay – 171  
St.Petersburg – 161  
Gainesville – 157  
Sarasota – 157  
St. Marks – 155

# Climate Change

- <https://www.audubon.org/climate/survivalbydegrees>

“Nearly half of birds will lose half of their range”



(CC) bmajoros (wikipedia)

Langham, G. M., Schuetz, J. G., Distler, T., Soykan, C. U., & Wilsey, C. (2015). Conservation Status of North American Birds in the Face of Future Climate Change. PloS One, 1–16.

Warming scenario:

Current +1.5 °C +2.0 °C +3.0 °C

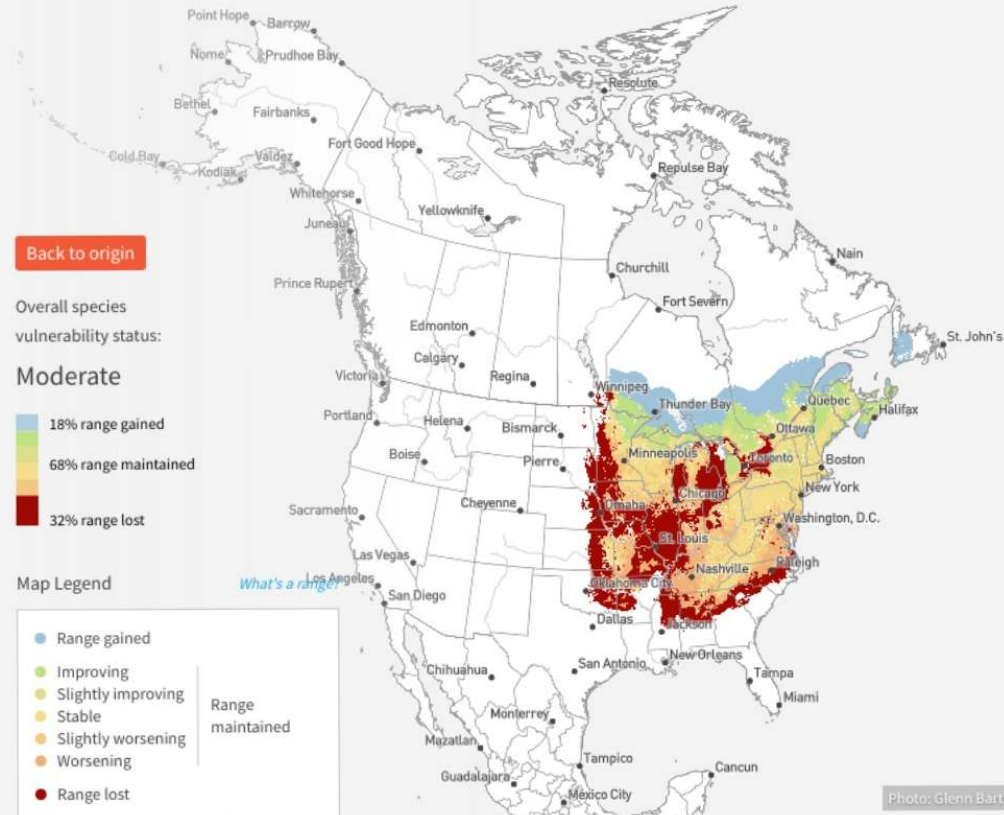
[Why these temperatures?](#)

Season:

Summer

[What is a season?](#)

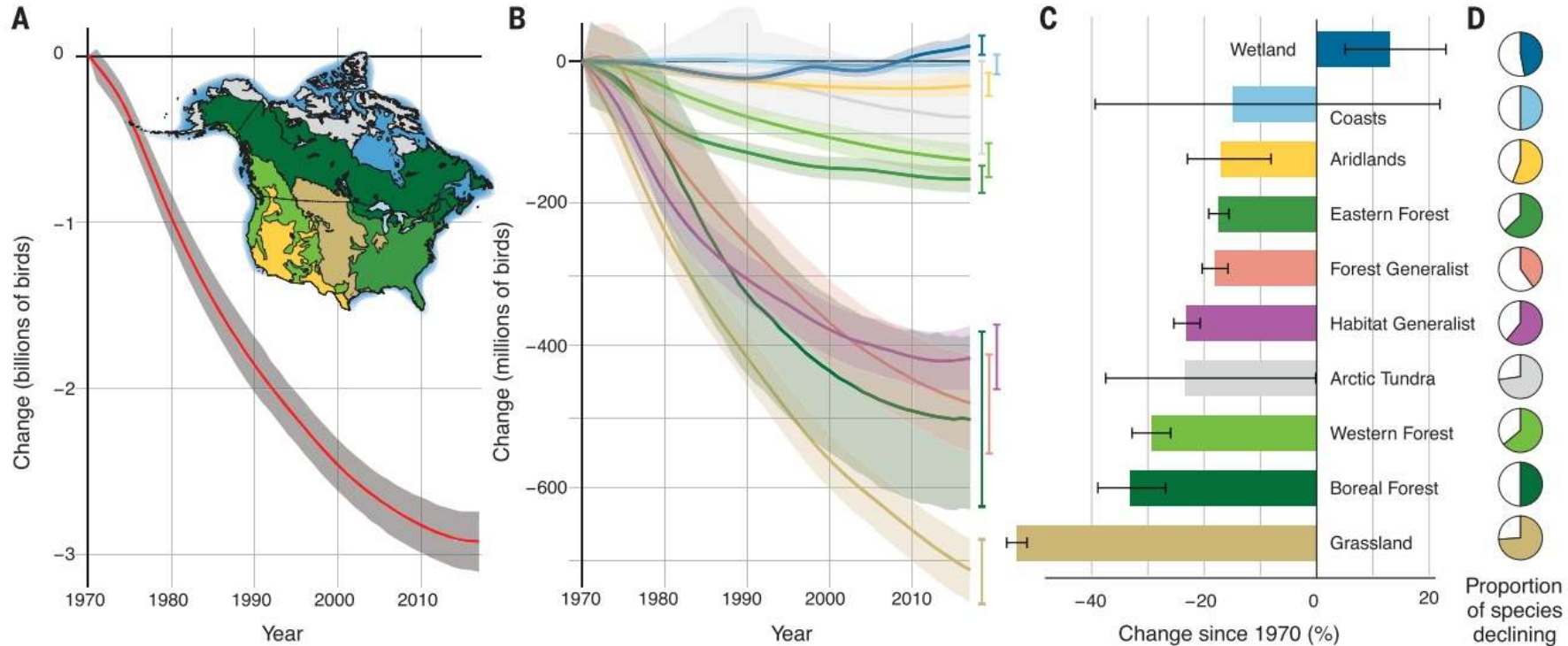
## Scarlet Tanager



# Tracking massive declines

- Rosenberg et al. 2019

3 Billion birds already lost, 1/3 of the entire bird population since 1970





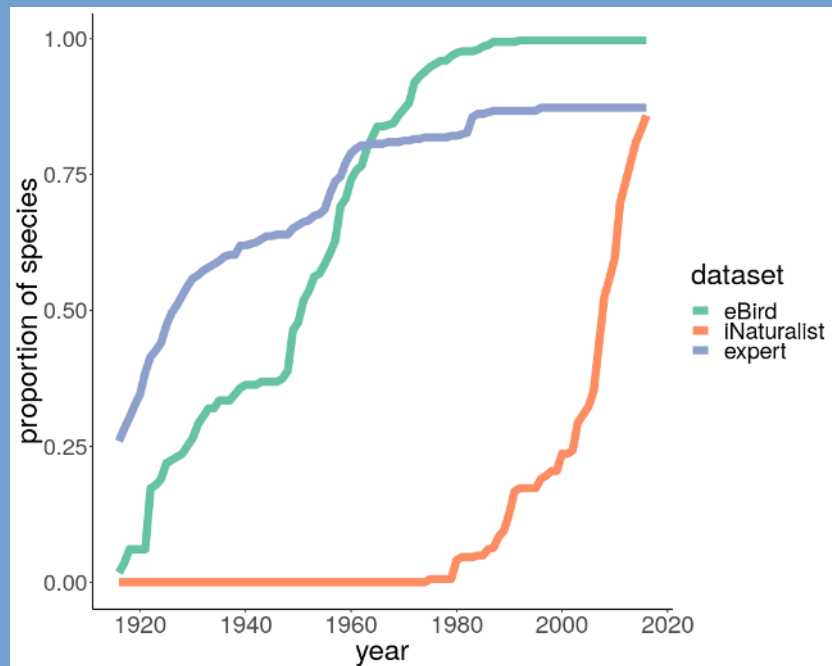


# Mab Lab current work

- Understanding value of CS to biodiversity research

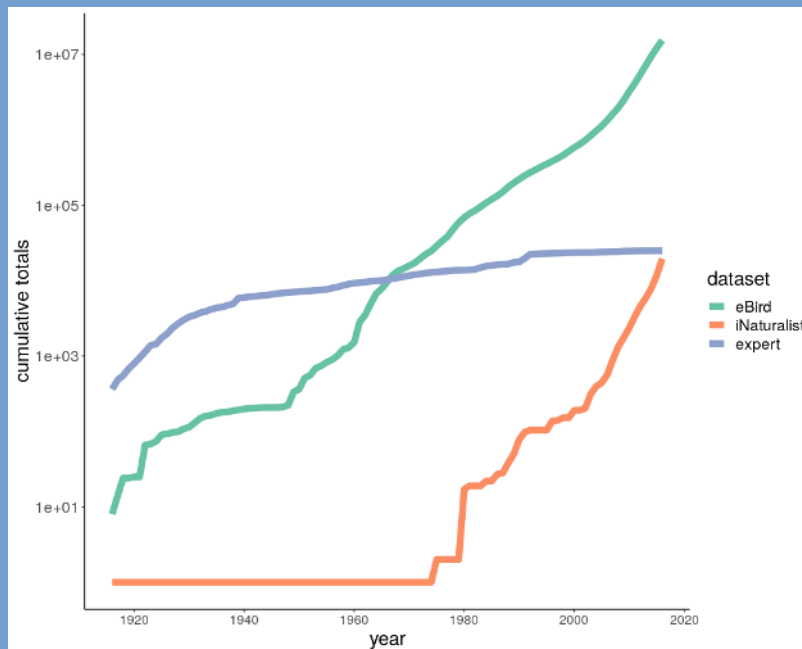


Common Florida birds reported



CS data can be studied through time

Bird submissions to GBIF in Florida



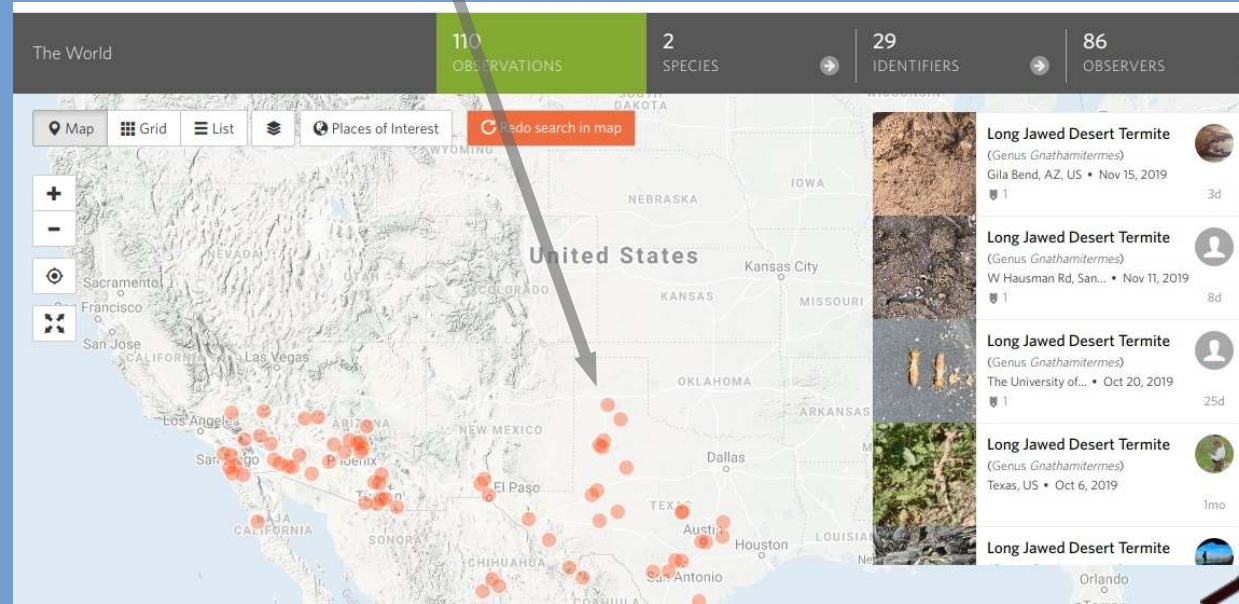
...and can effectively mitigate decline in Museum Collections across the world.

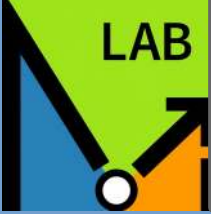


# Mab Lab current work

## -CS in hard to ID species (Termites)

A black Incisitermes from east Texas that looks like a new record  
Furthest north record of the Genus Gnathamitermes, near Amarillo, TX  
New TX record attached. Previously, K. approximatus known from FL, GA,  
SC, NC, MS, and LA. - Dr. Rudy Scheffrahn



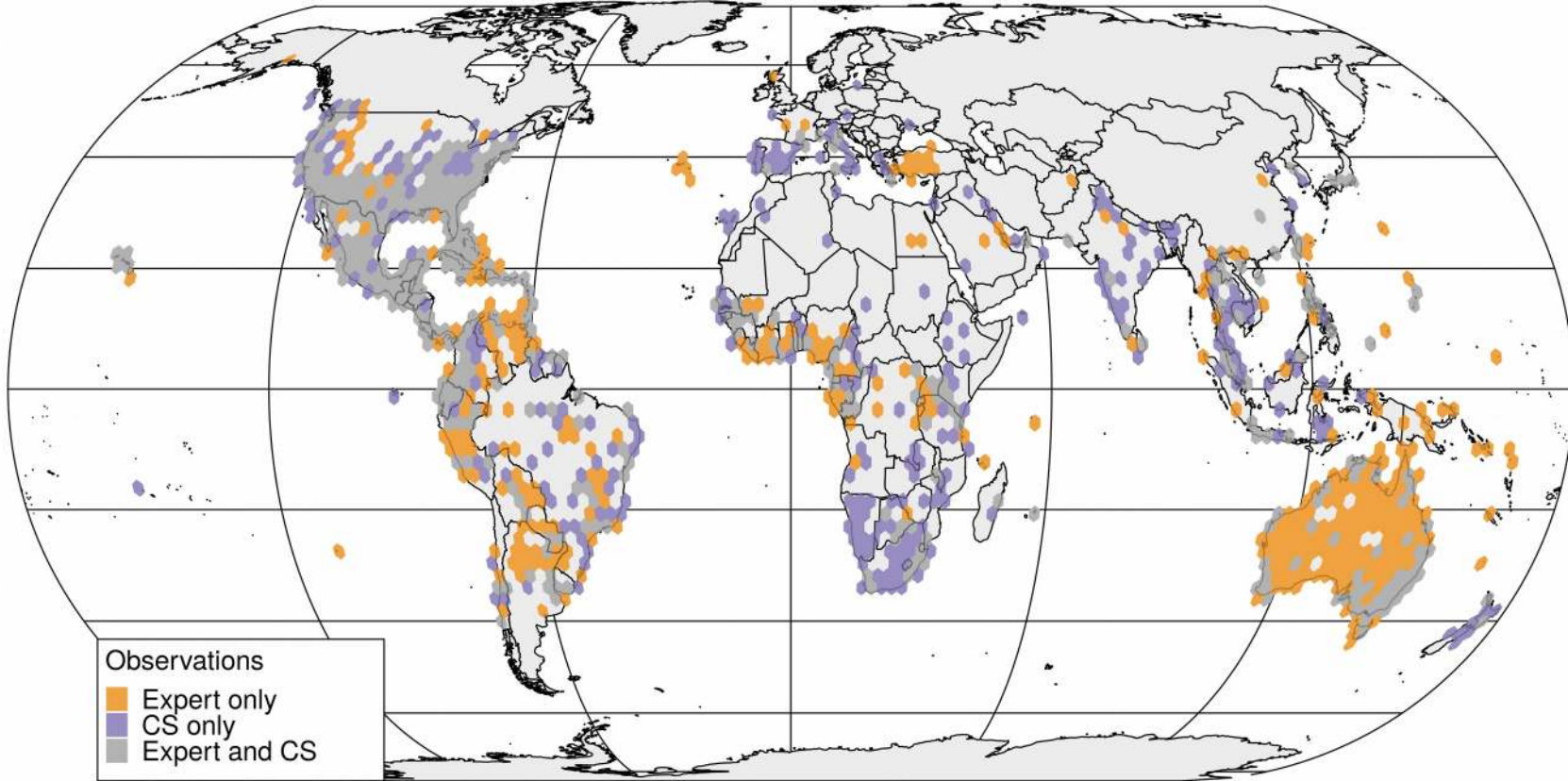


# Mab Lab current work

## -CS in hard to ID species (Termites)



Coverage of Expert versus CS observations










# Thank You!



 @birderboone  
 github/birderboone  
 Mablab.org



**UF IFAS**  
UNIVERSITY of FLORIDA