

## Abstract

Studies indicate that a variety of plant and animal life react to the environmental changes caused by a total solar eclipse when a decrease in temperature and light can cause conditions similar to dusk even at midday. The August 21, 2017 total solar eclipse presented the opportunity to design a community science project to gather observations of plant and animal response to the eclipse on the widest geographic scale yet: the entire continental United States. With millions of people expected to observe this eclipse, we asked them to take a moment to witness firsthand other forms of life being influenced by a celestial event. With extensive outreach and media coverage, over 600 participants submitted more than 2,500 observations of plant and animal behavior during the eclipse, **creating the largest collection of non-human response to a solar eclipse to date.**



## Project Design and Set-Up

The community science app, iNaturalist, is designed to record and share observations of species. Observations made via the app automatically tag geolocation, date, and time, with an option for photos and sound. Observations can also be made from photos uploaded directly to the iNaturalist website. For this project, participants were asked to:

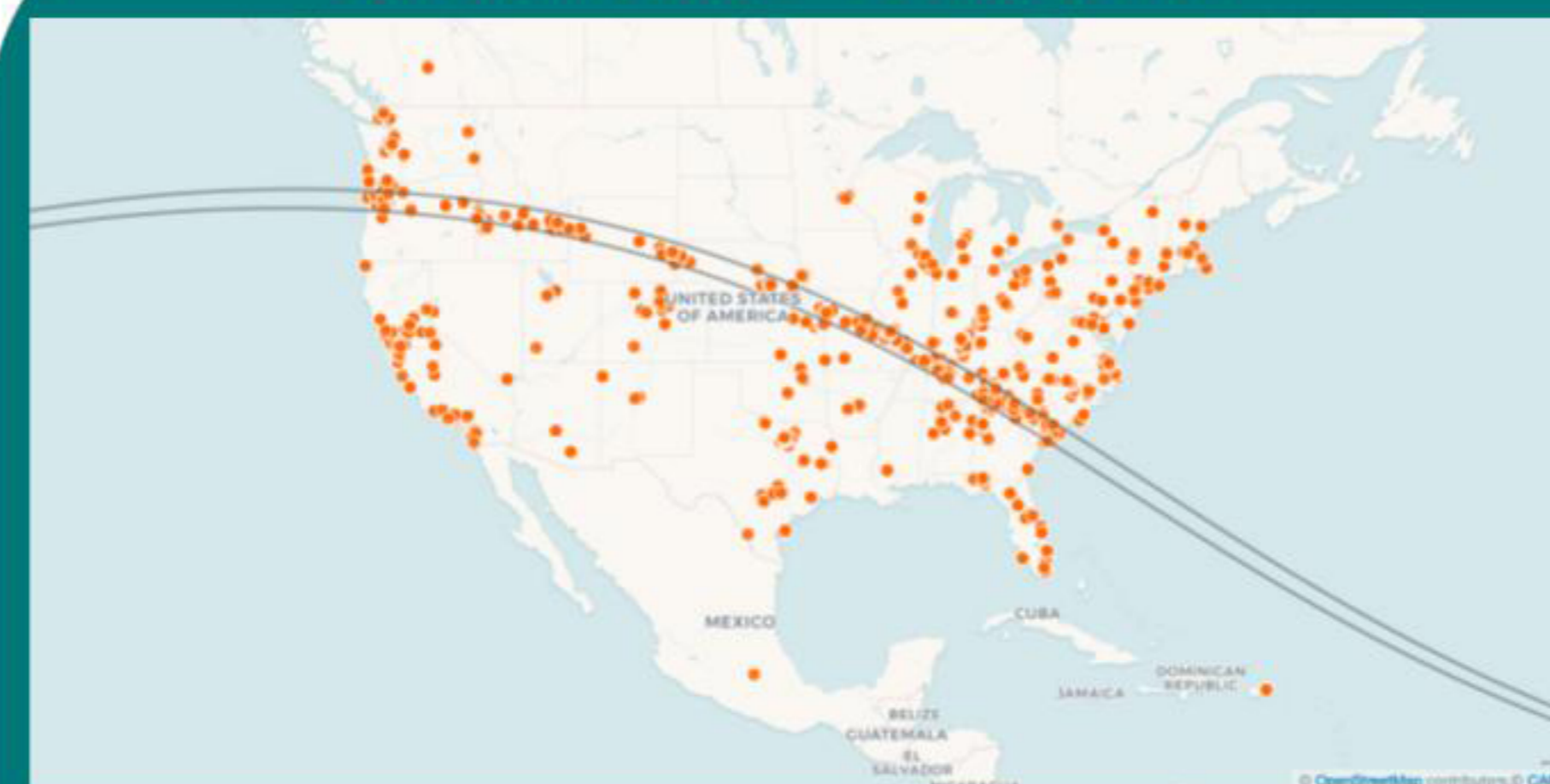
1. Download the app, create an account and join the *Life Responds* project.
2. Practice making observations using iNaturalist and, if possible, visit the location where they will be during the eclipse and “scout out” possible animals or plants to observe.
3. On eclipse day, make and upload observations of plants and animals to *Life Responds*. Include the timing of the observation: a) more than 30 minutes before totality (or maximum sun coverage in your location) b) less than 30 minutes before totality, c) during or close to totality, between totality d) 30 minutes after totality e) longer than 30 minutes after totality. This timing informs how much of the Sun was blocked at the time and therefore the degree of environmental change.

**Image credits** Observations and photos by iNaturalist users owensdc (okra), woodchip (dog), doodlebug130513 (chicken), Zion (bees), freddyandmonty (cat), edwardlisowski (Mt Bog Gentian), ksgirl (horse), LynnSeman (prairie dog), gyrrlfalcon (squirrel), yburch (humming bird) some rights reserved (CC-BY-NC). Eclipse sequence by Gary O'Brien - Own work, CC BY 4.0, <https://commons.wikimedia.org/w/index.php?curid=64033526>

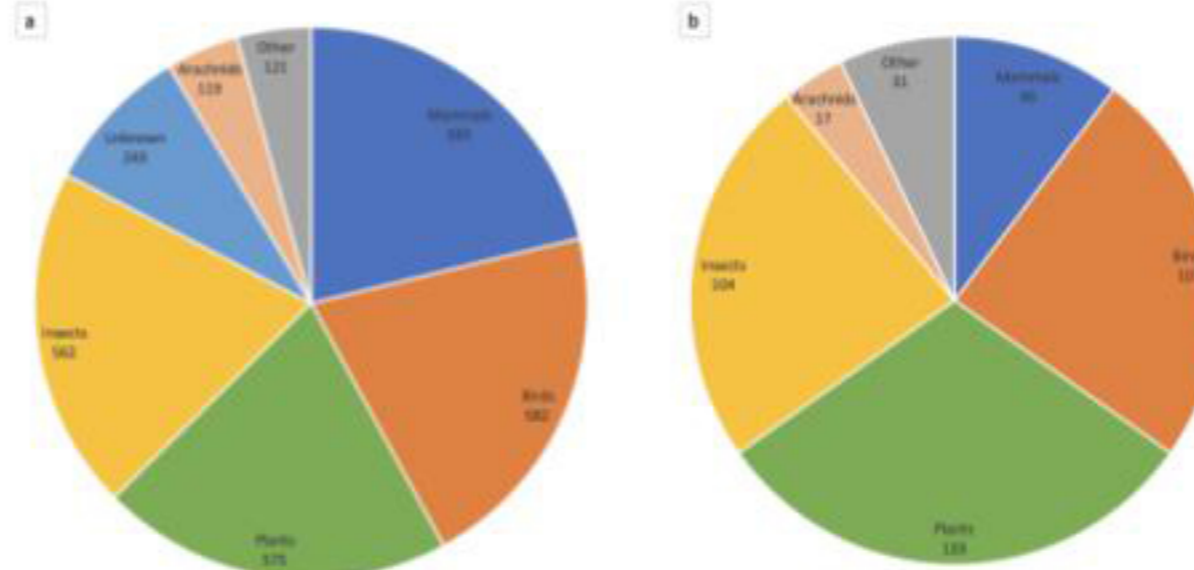
## Results

2795 observations of 437 species were made by 645 people across 40 U.S. states and territories (as well as 3 from Canada and Mexico) were submitted.

### Observation Locations

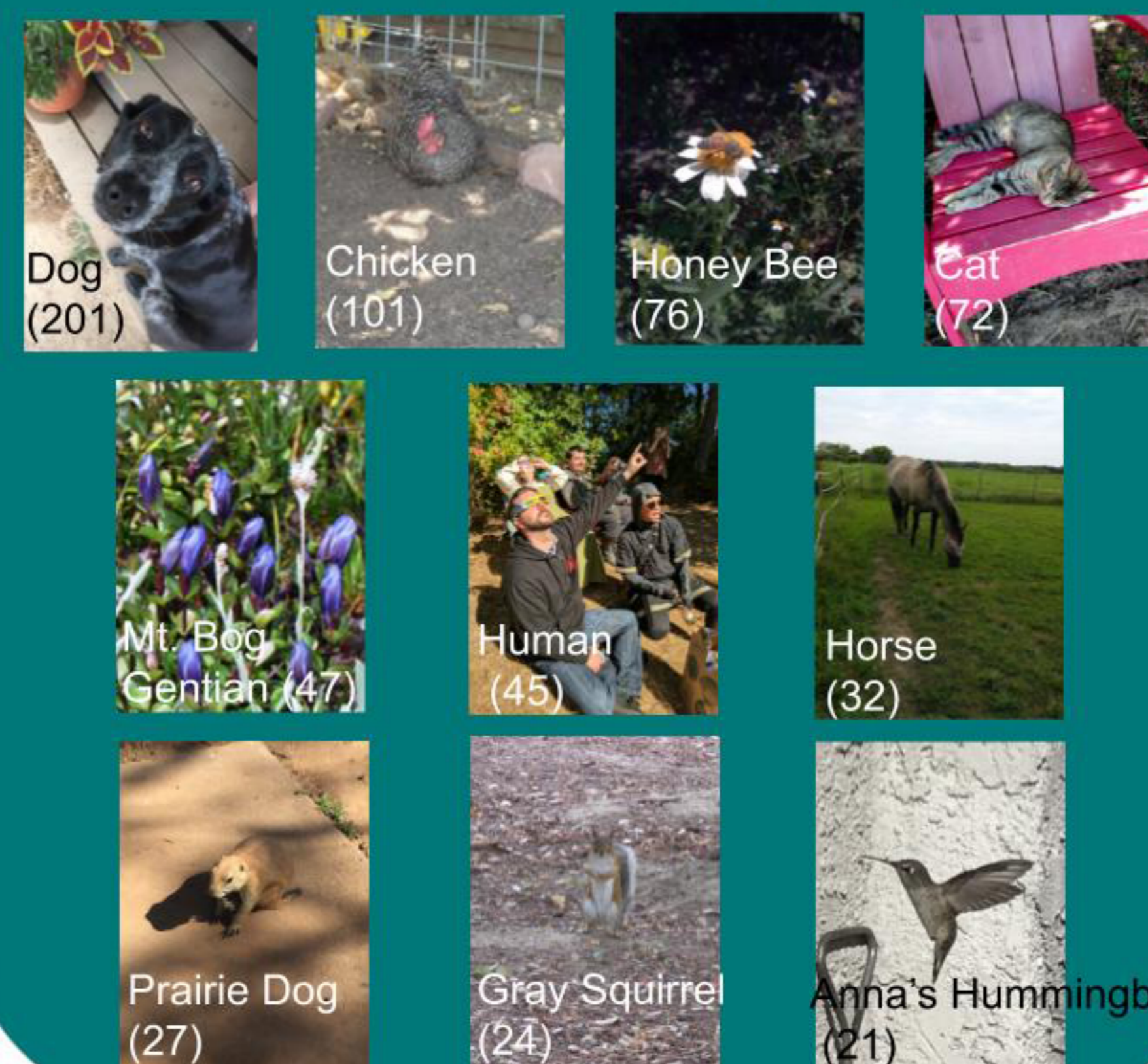


Orange dots indicate the locations of the submitted observations. The double lines indicate the eclipse's path of totality (where the view of the Sun from Earth was completely obstructed by the Moon, causing maximum environmental changes that life might respond to).



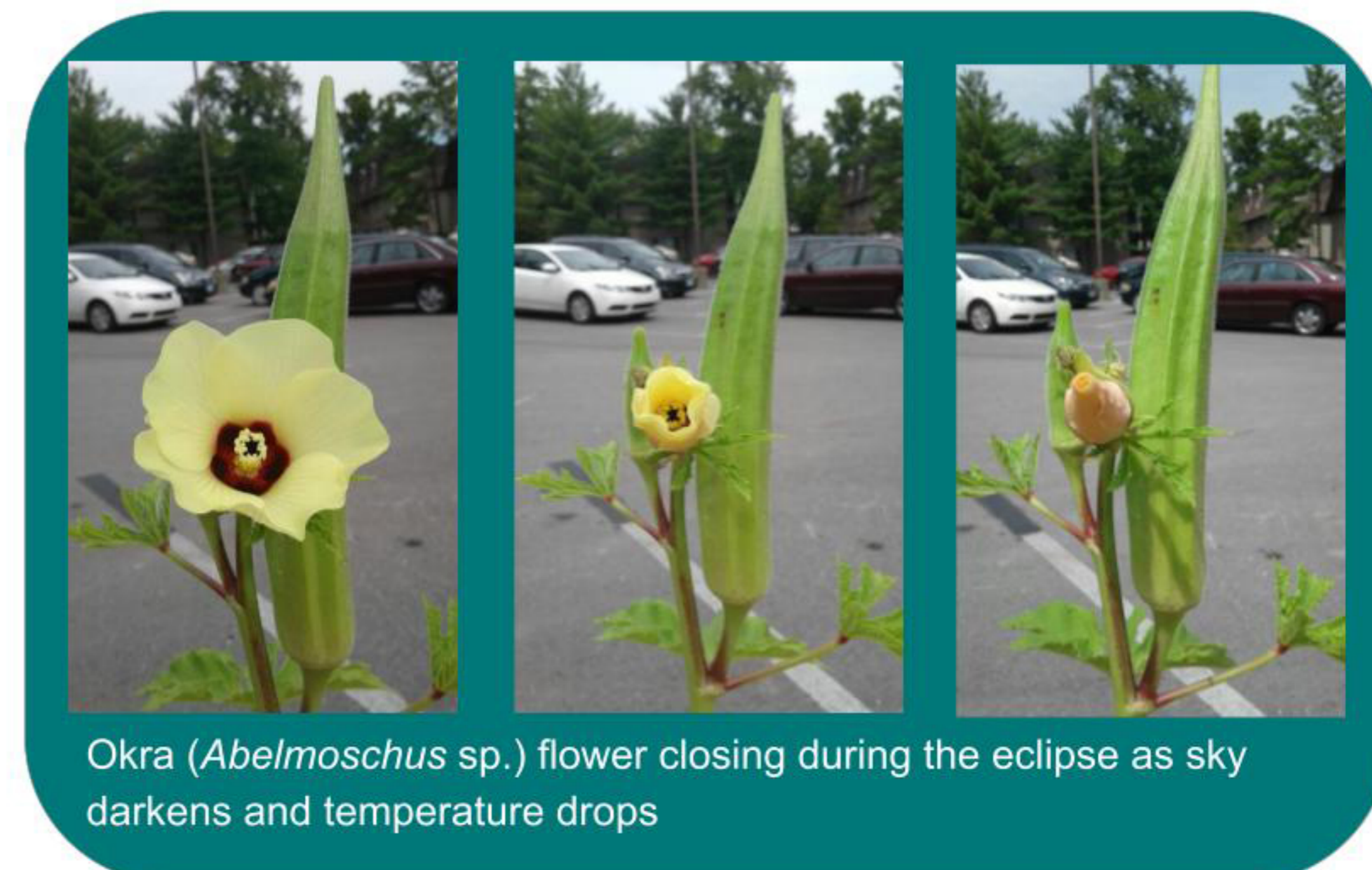
(a) Breakdown of the 2,795 observations by taxon. (b) Breakdown of the 437 species documented by the observations, by taxon.

## Most Observed Species



## Notable observations

- Swallows or swifts starting to flock and fly as skies darkened
- Ants slowing down or stopping movement entirely
- Domestic hens gathering together or roosting and getting quiet during the eclipse, and roosters starting to crow during the eclipse
- At active bird feeders in yards, birds, especially hummingbirds, stopped feeding for the entirety of totality
- Frogs starting to call during the eclipse
- Flowers closing up or partially closing
- Cicada and crickets starting or stopping their calls during the eclipse: often cicadas stopped their singing and crickets started, which then reversed once totality/maximum coverage was over
- Cows and horses moving towards feeding stations or stables as skies darkened, then away as eclipse concluded



## Looking Forward to 2024

- Next total solar eclipse to cross the US is in April 8th, 2024
- Try to partner with researchers and other AZA facilities who would like data, especially of certain organisms.
- Focus of “suggested” animals and plants, both captive and wild, while still allowing any observation to be submitted.
- Explore better options to record sound and include other types data.
- Offer “train the trainer” opportunities for citizen science best practices. Hopefully this will increase the number of “complete” observations and increase the usefulness of the data collected.

## Selected Citations

Dickinson, J. L., B. Zuckerberg, and D. N. Bonter. 2010. Citizen Science as an Ecological Research Tool: Challenges and Benefits. *Annu. Rev. Ecol. Evol. Syst.* 41:149-172.  
 Mousley, H. 1933. Bird Actions During the Total Eclipse of the Sun, August 31, 1932. *Auk* 50(1):125-126.  
 Wheeler, W. M., C. V. MacCoy, L. Griscom, G. M. Allen, and H. J. Coolidge Jr. 1935. Observations on the Behavior of Animals during the Total Solar Eclipse of August 31, 1932. *Proceedings of the American Academy of Arts and Sciences* 70(2):33-70.  
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