

Bat Activity Throughout the California Coast and Offshore Environment

Bethany Schulze

Gabriel Reyes, Austin Waag, and Dr. Brian Halstead

US Geological Survey, Western Ecological Research Center, Dixon, CA

Wind-Wildlife Webinar Series #2: BOEM Environmental Studies Program –
8/27/2025



bschulze@usgs.gov



Overview

- Why bats?
- Oceanic bat migration
- Pacific offshore wind energy
- USGS Pacific Offshore Bat Project
- Methods
- Preliminary findings
- Conclusion and additional research



Why are bats important?

- 2nd most diverse mammal group
- Pest control
- Pollination
- Seed dispersal
- Bioindicators



Lesser long-nosed bat
Leptonycteris yerbabuenae
Credit: Bruce D. Tubert

Background – Oceanic Bat Migration

- Historic ship records – bats landing on ships
- Various studies and accounts in Europe
- Island biogeography in Baja (Frick et al. 2007)
- Hoary bat migration on Farallon Islands, CA (Cryan 2006, 2008)
- Bats on the Channel Islands and Hawaii (Brown, Johnston, and others)
- Northeast studies (Stantec, Solick, and others)



D. Johnston

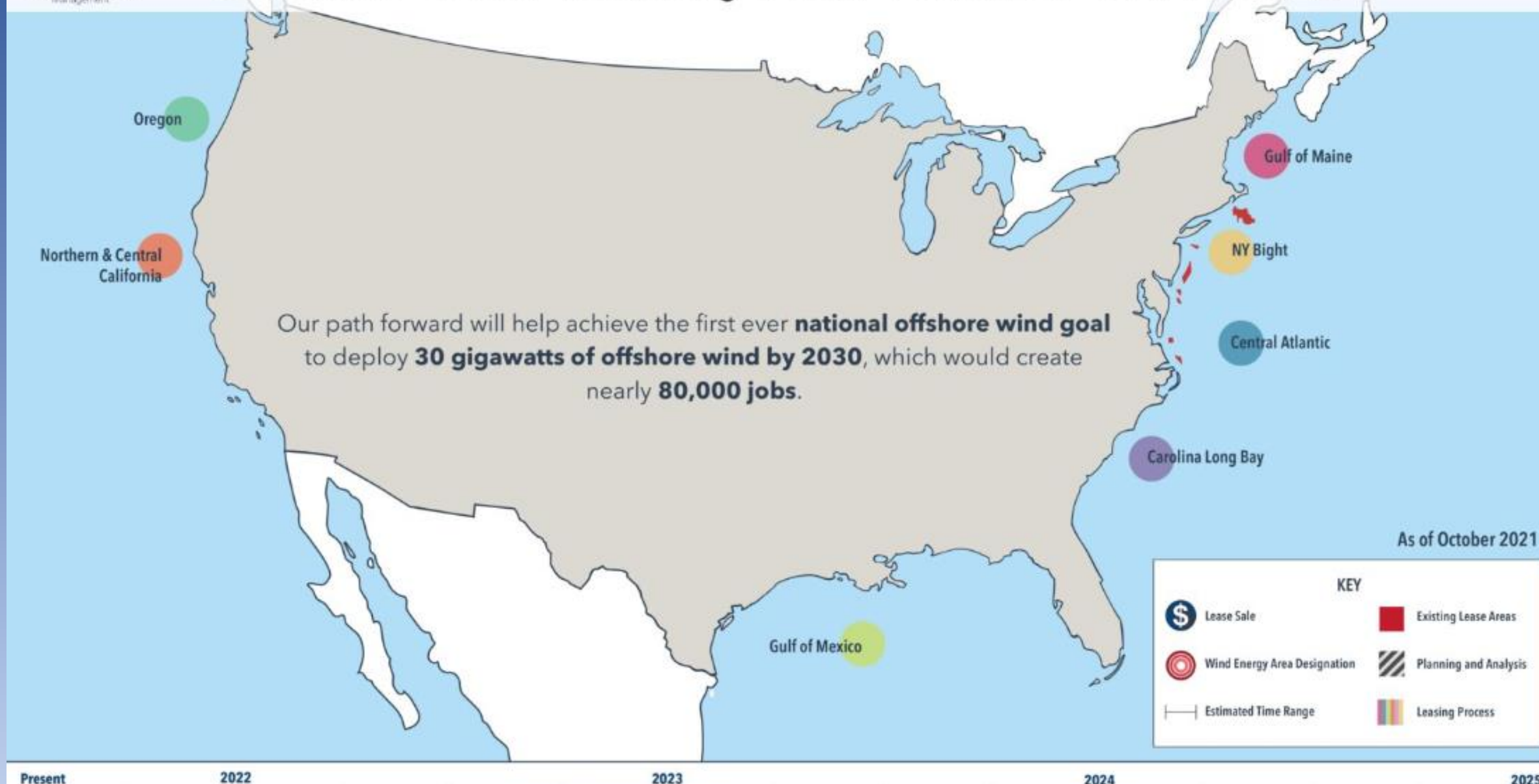
Wind Energy

- Migratory bats are killed by collisions with wind turbines
- Hoary bat populations could decline by 50% by 2028 if current fatality rates are not reduced (Frick et al. 2017)



<https://www.batcon.org/press/seeking-answers-in-the-wind/>

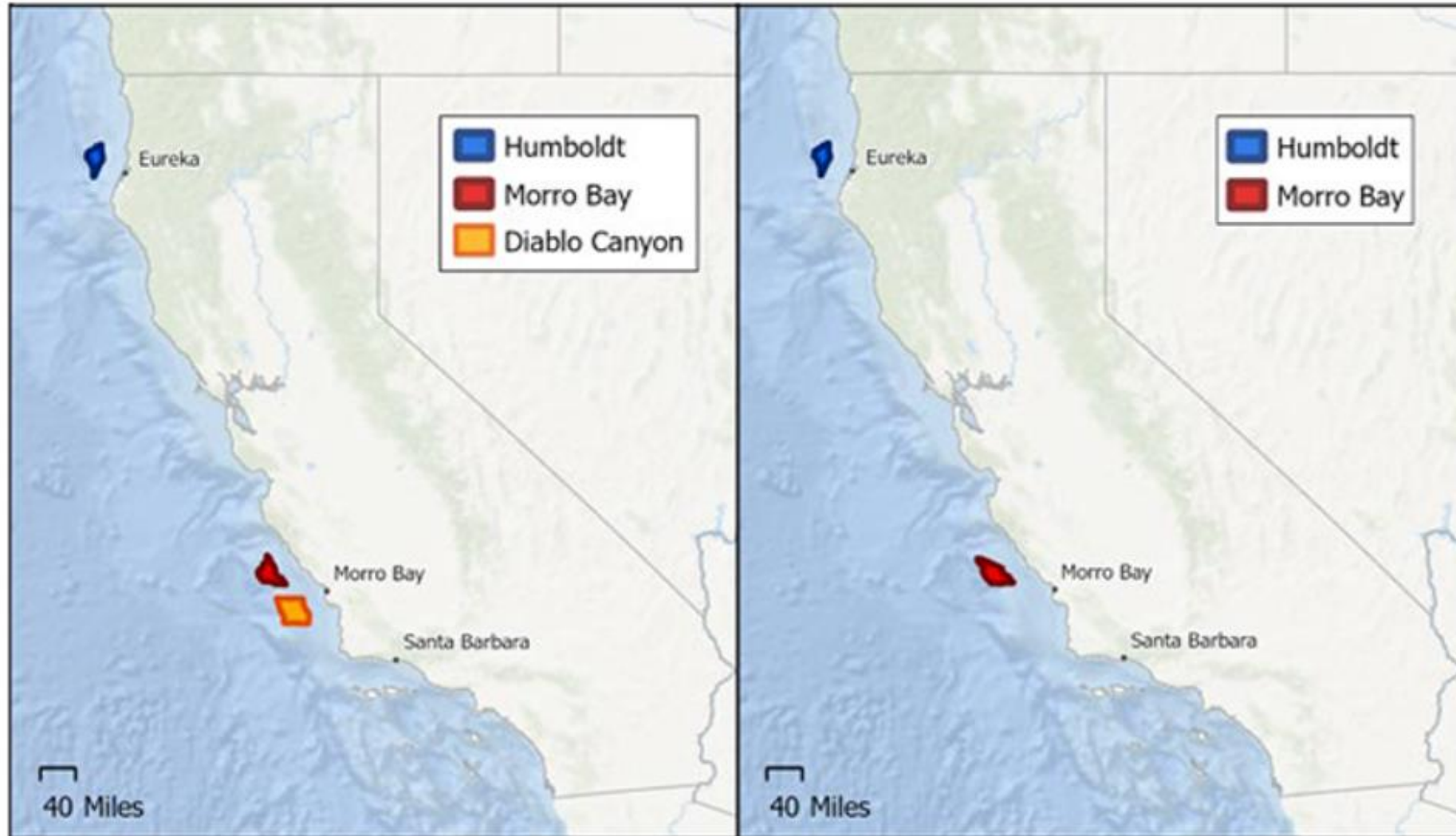
Offshore Wind Leasing Path Forward 2021-2025



California's Offshore Wind Call and Wind Energy Areas

BOEM Call Areas (2018)

BOEM Wind Energy Areas (2022)



Source: California Energy Commission

<https://www.naturalgasintel.com/california-adopts-offshore-wind-target-and-calls-for-significant-grid-investments/>

Key Questions

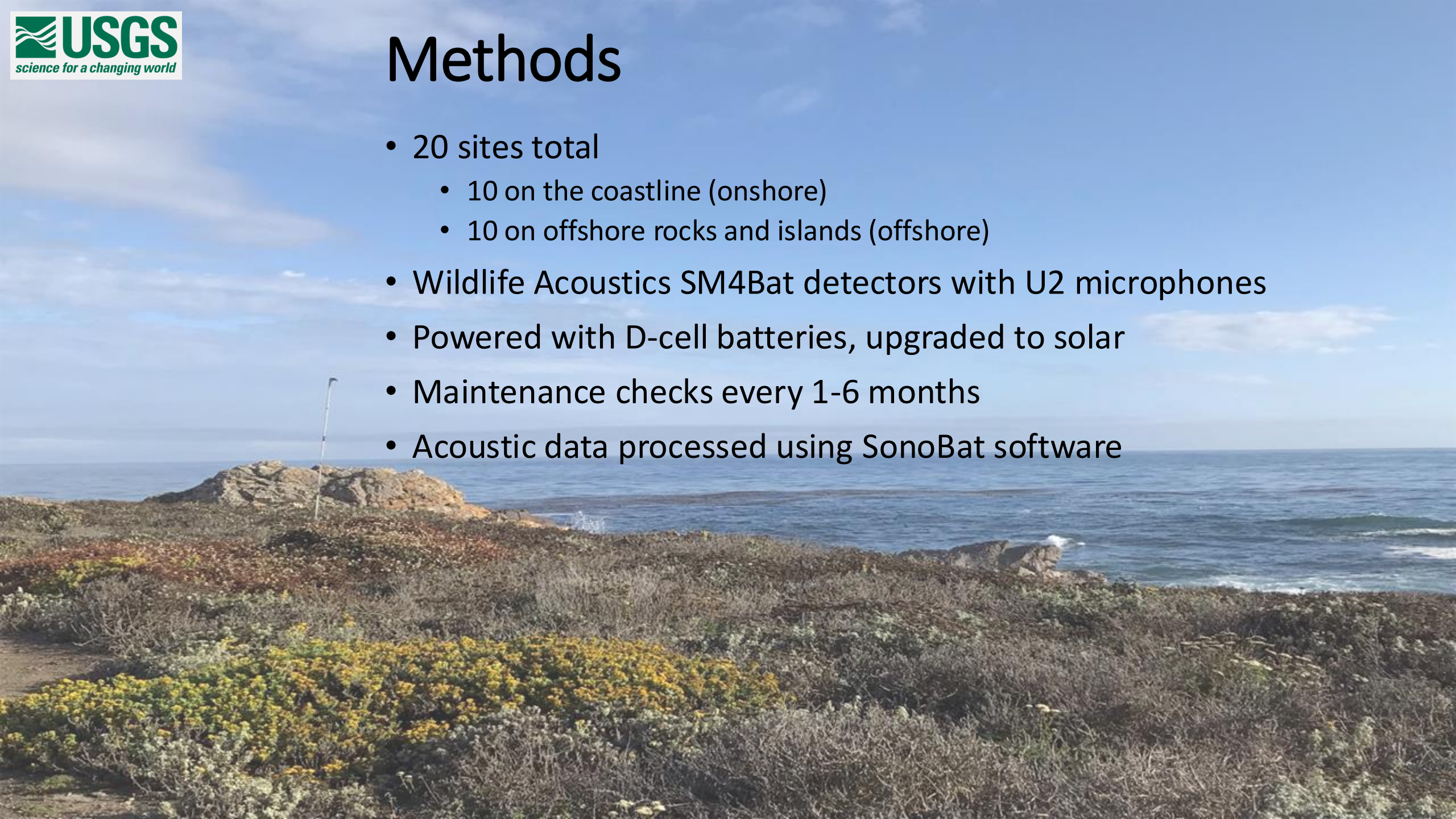
- How does offshore activity differ from coastal bat activity?
- Which bat species migrate offshore?
- How does species activity change seasonally in coastal and offshore environments?

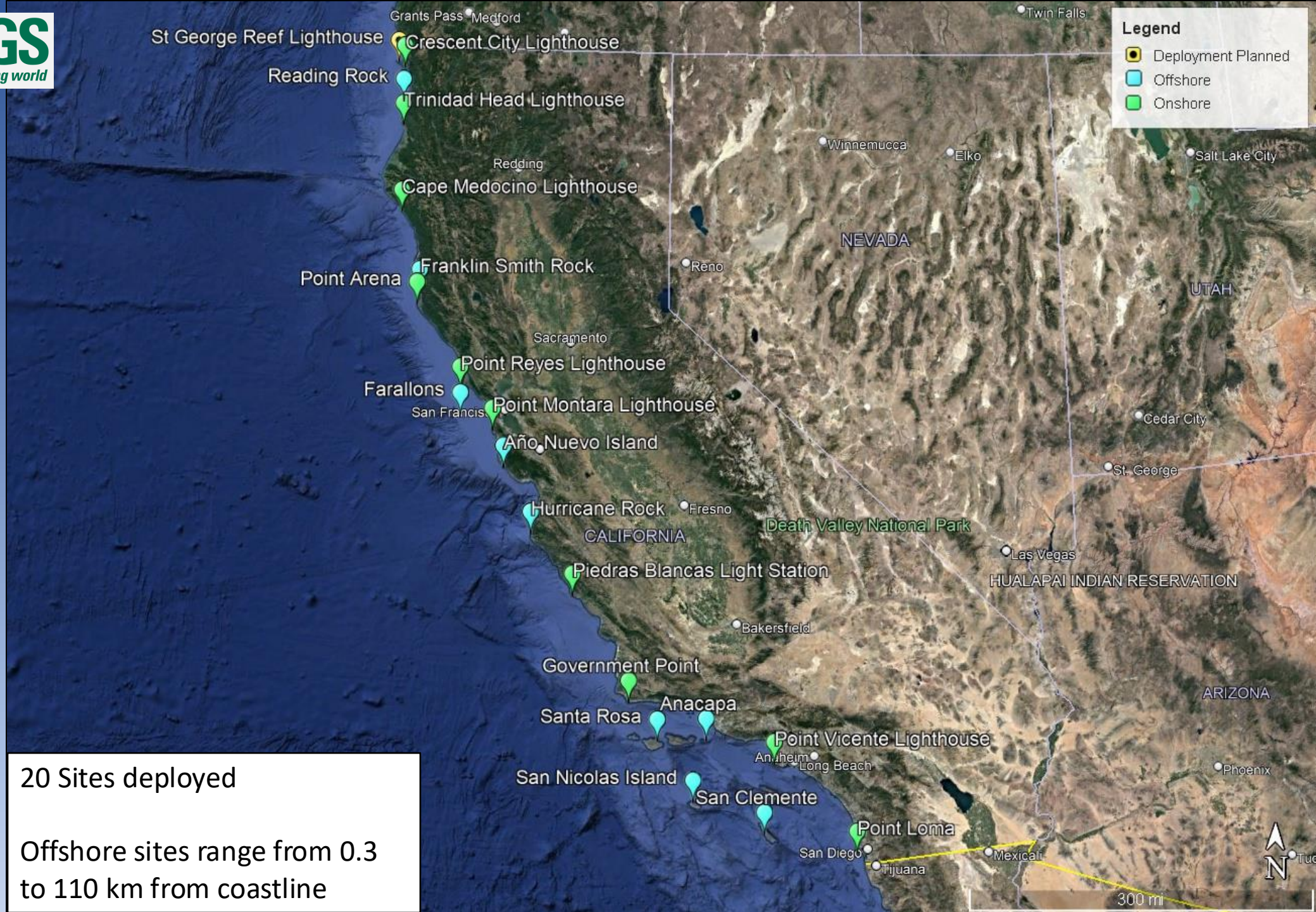
→ How might these species be affected by offshore wind turbines?



Methods

- 20 sites total
 - 10 on the coastline (onshore)
 - 10 on offshore rocks and islands (offshore)
- Wildlife Acoustics SM4Bat detectors with U2 microphones
- Powered with D-cell batteries, upgraded to solar
- Maintenance checks every 1-6 months
- Acoustic data processed using SonoBat software















Hoary bat



**Silver-haired
bat**



**Mexican free-
tailed bat**



Western red bat



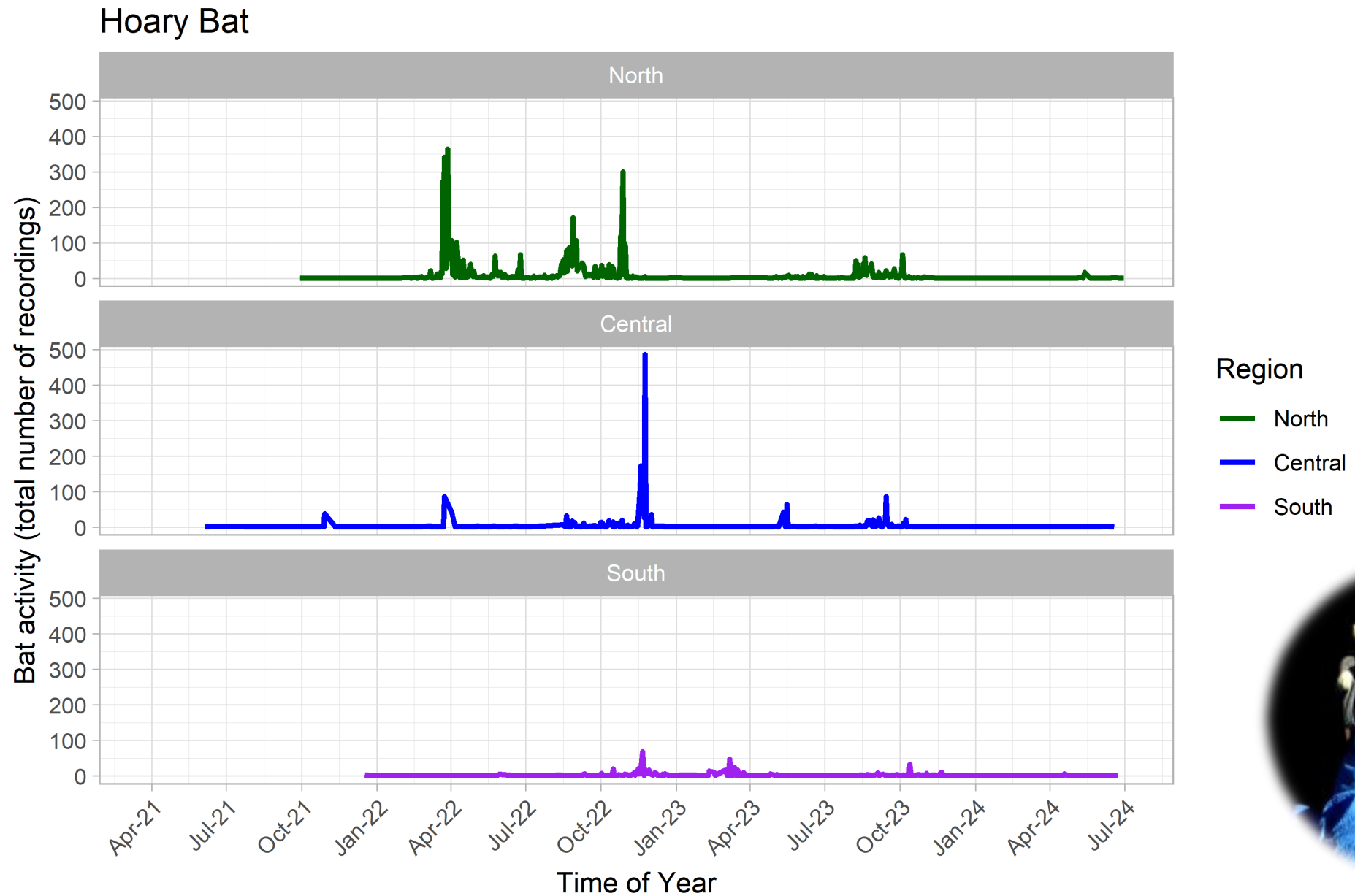
Townsend's big-eared bat



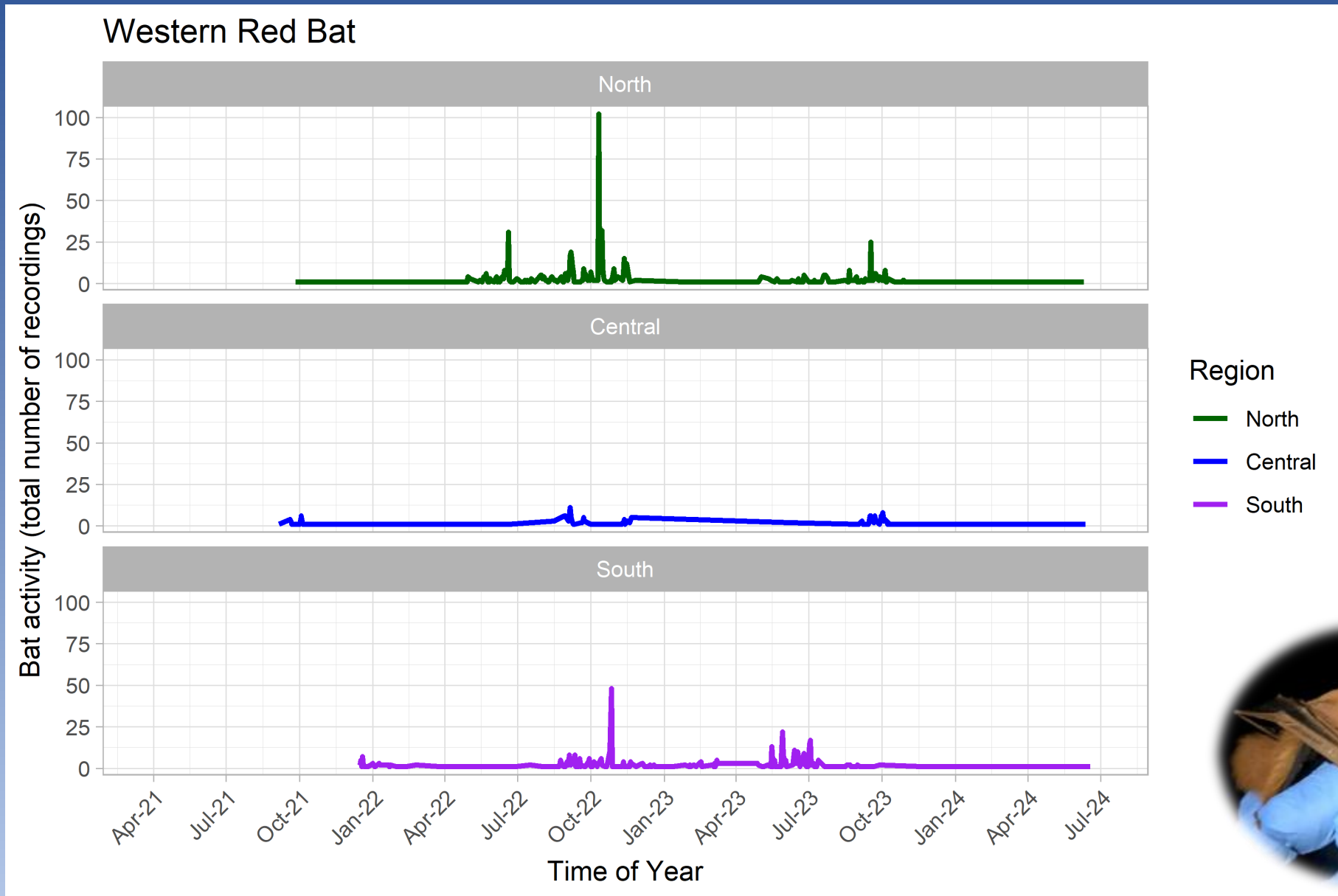
Big brown bat



Yuma myotis

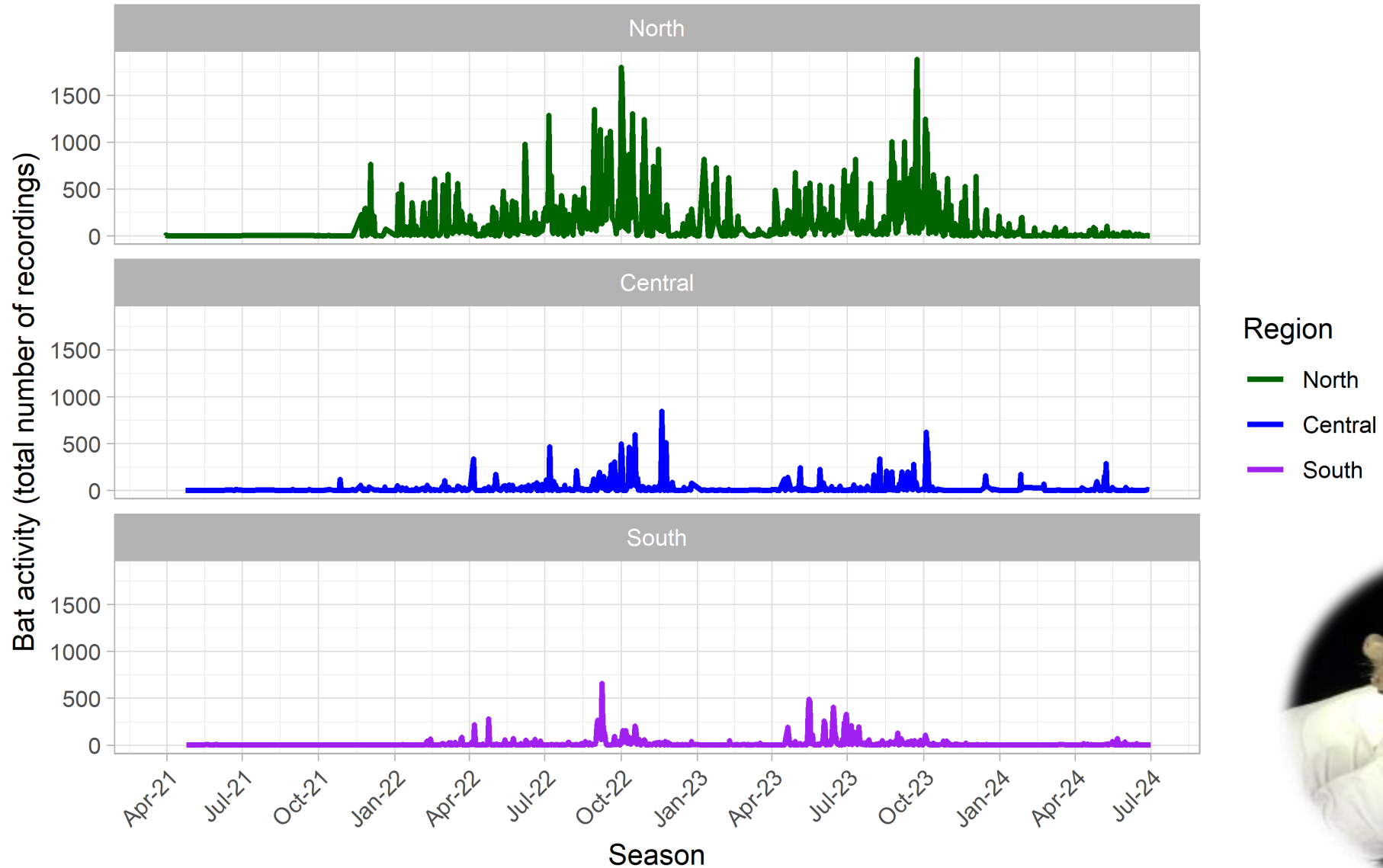


These data are preliminary and are subject to revision. They are being provided to meet the need for timely best science. The data are provided on the condition that neither the U.S. Geological Survey nor the U.S. Government may be held liable for any damages resulting from the authorized or unauthorized use of the data.



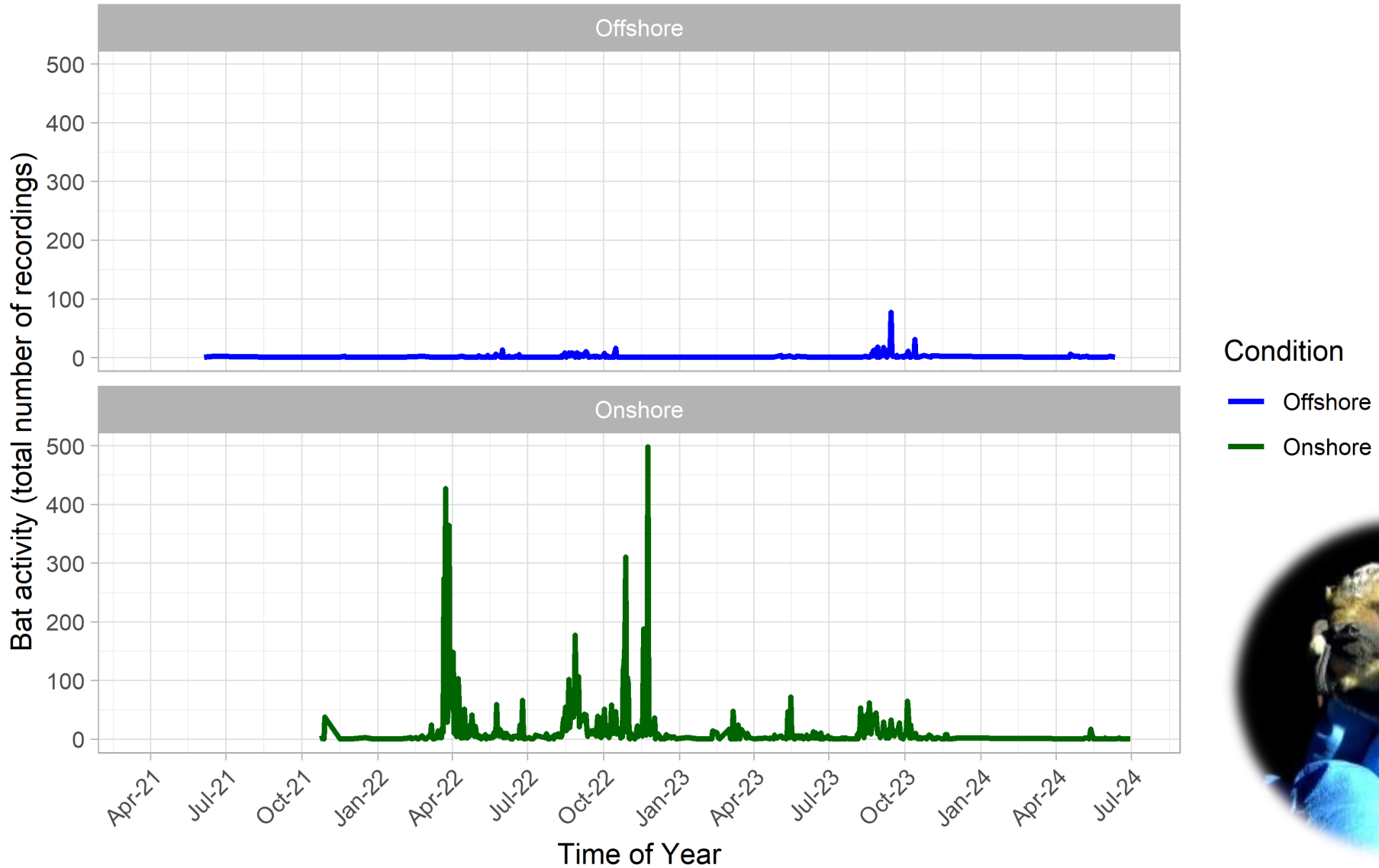
These data are preliminary and are subject to revision. They are being provided to meet the need for timely best science. The data are provided on the condition that neither the U.S. Geological Survey nor the U.S. Government may be held liable for any damages resulting from the authorized or unauthorized use of the data.

Mexican Free-tail Bat



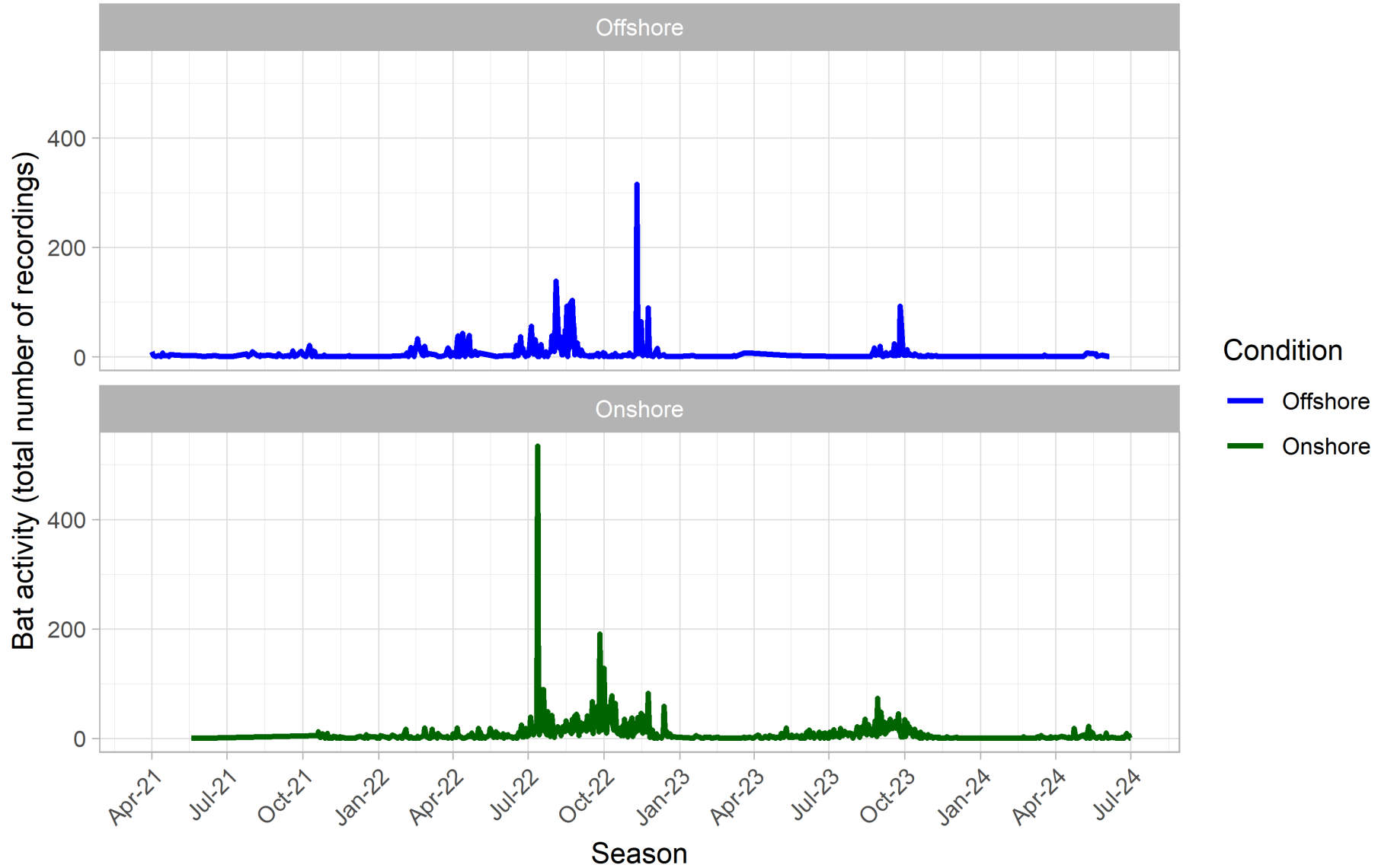
These data are preliminary and are subject to revision. They are being provided to meet the need for timely best science. The data are provided on the condition that neither the U.S. Geological Survey nor the U.S. Government may be held liable for any damages resulting from the authorized or unauthorized use of the data.

Hoary Bat



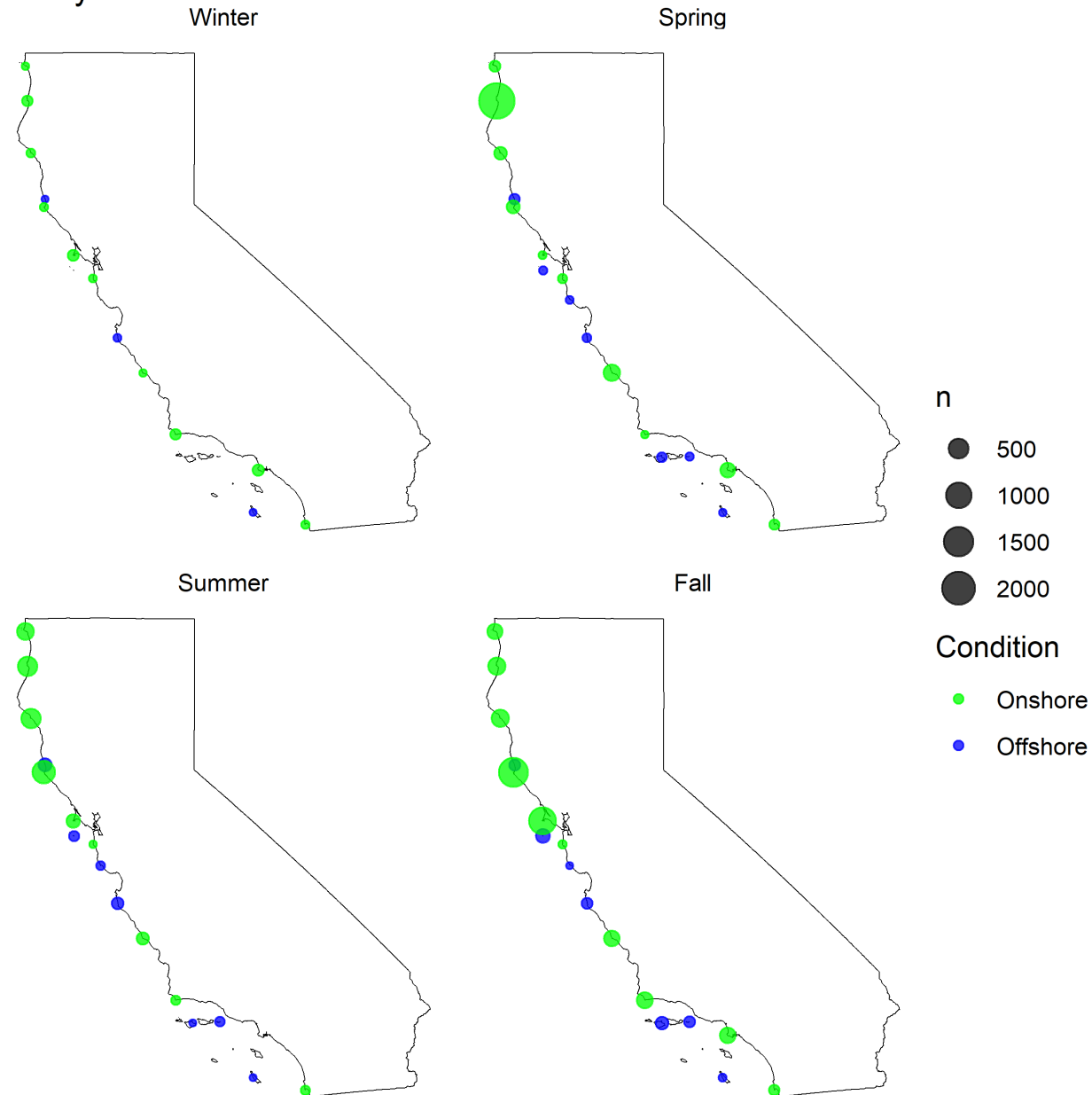
These data are preliminary and are subject to revision. They are being provided to meet the need for timely best science. The data are provided on the condition that neither the U.S. Geological Survey nor the U.S. Government may be held liable for any damages resulting from the authorized or unauthorized use of the data.

Yuma myotis



These data are preliminary and are subject to revision. They are being provided to meet the need for timely best science. The data are provided on the condition that neither the U.S. Geological Survey nor the U.S. Government may be held liable for any damages resulting from the authorized or unauthorized use of the data.

Hoary Bat

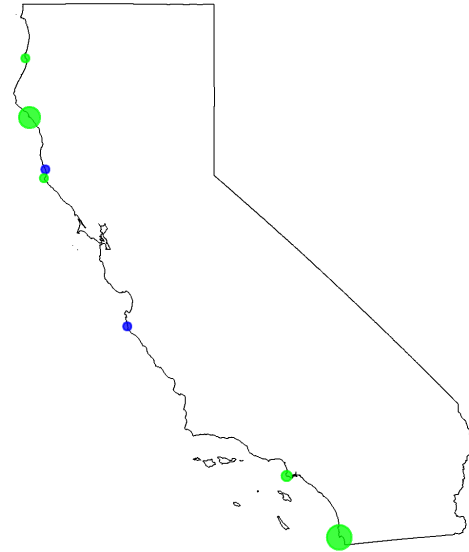
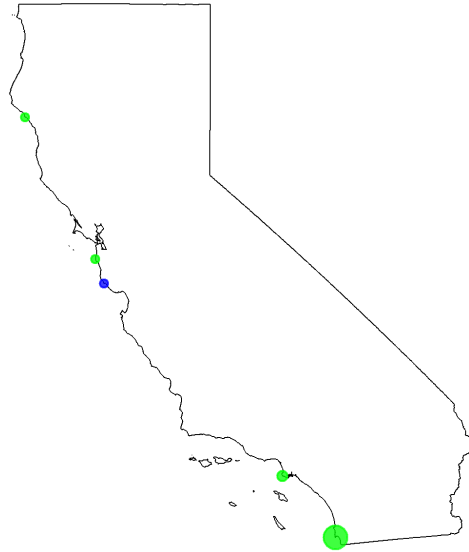


These data are preliminary and are subject to revision. They are being provided to meet the need for timely best science. The data are provided on the condition that neither the U.S. Geological Survey nor the U.S. Government may be held liable for any damages resulting from the authorized or unauthorized use of the data.

Western Red bat

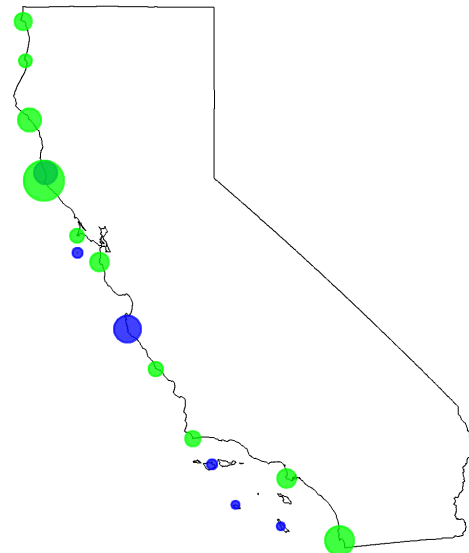
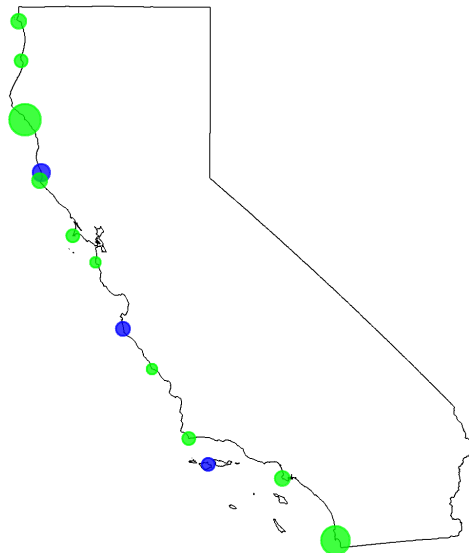
Winter

Spring



Summer

Fall



n

100

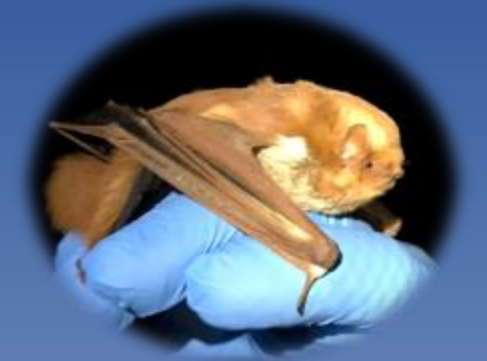
200

300

Condition

Offshore

Onshore

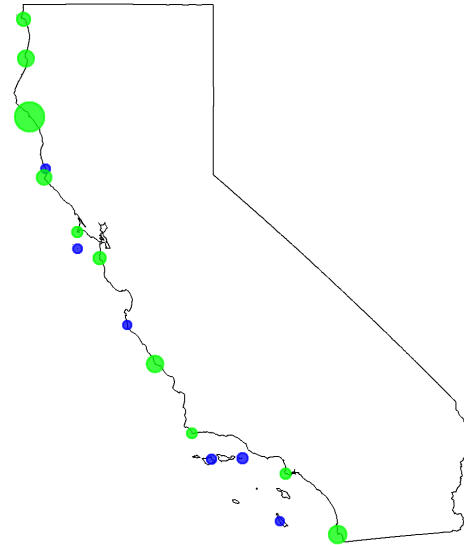
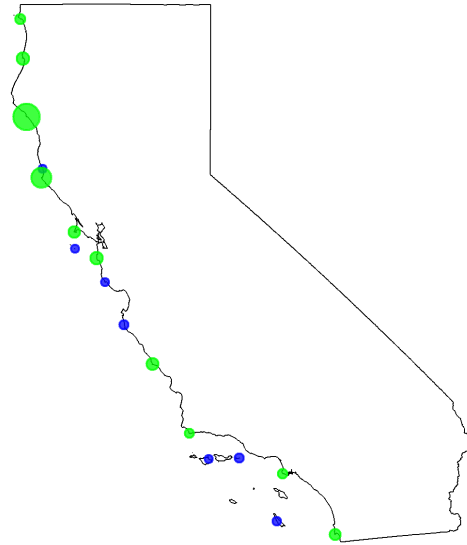


These data are preliminary and are subject to revision. They are being provided to meet the need for timely best science. The data are provided on the condition that neither the U.S. Geological Survey nor the U.S. Government may be held liable for any damages resulting from the authorized or unauthorized use of the data.

Mexican Free-tail Bat

Winter

Spring

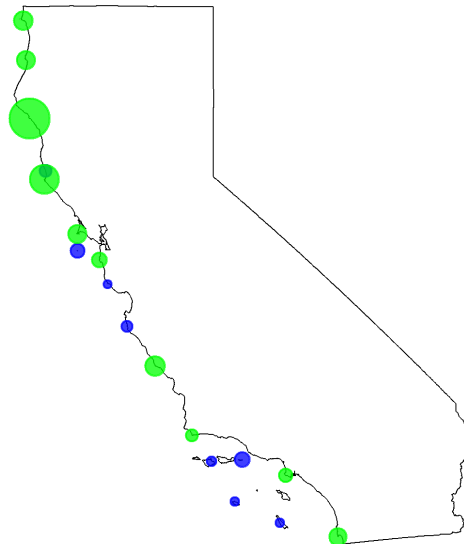
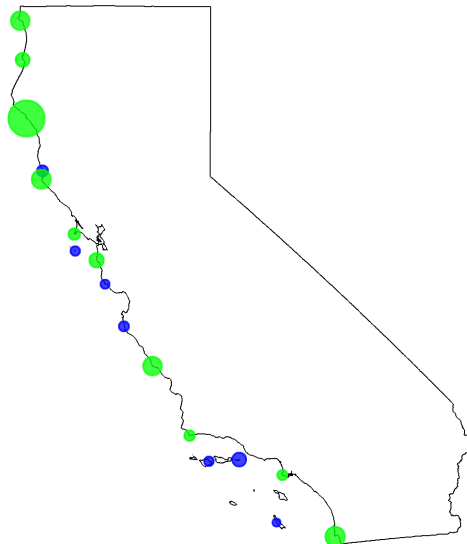


Condition

- Offshore
- Onshore

Summer

Fall



n

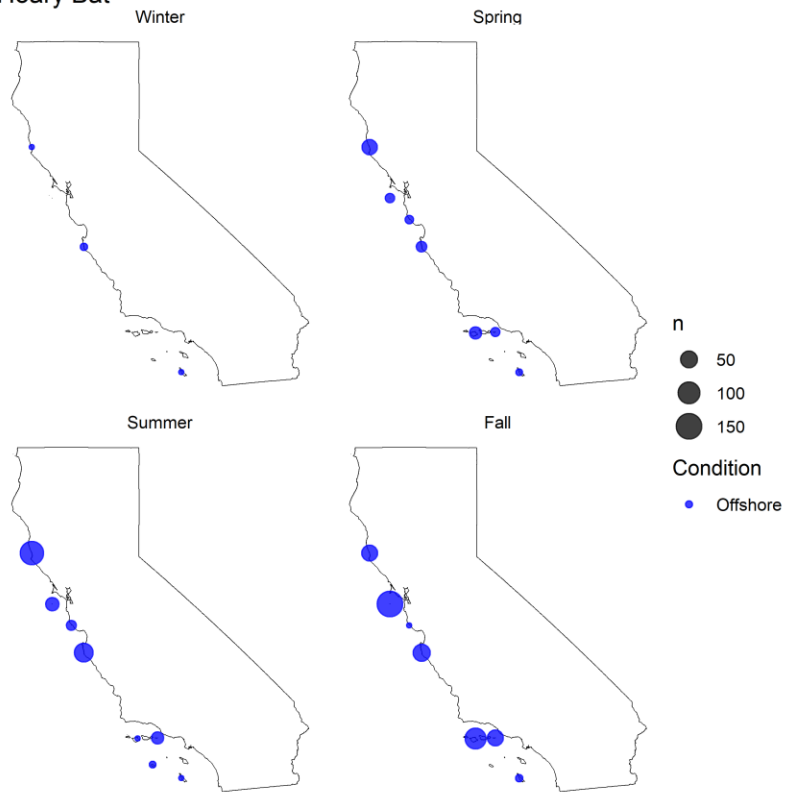
- 10000
- 20000
- 30000



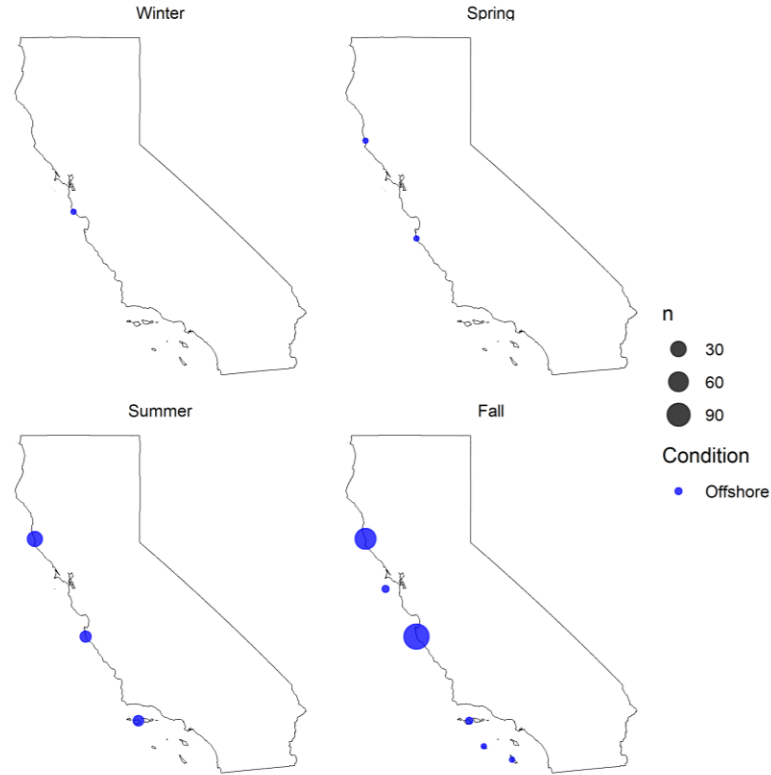
These data are preliminary and are subject to revision. They are being provided to meet the need for timely best science. The data are provided on the condition that neither the U.S. Geological Survey nor the U.S. Government may be held liable for any damages resulting from the authorized or unauthorized use of the data.



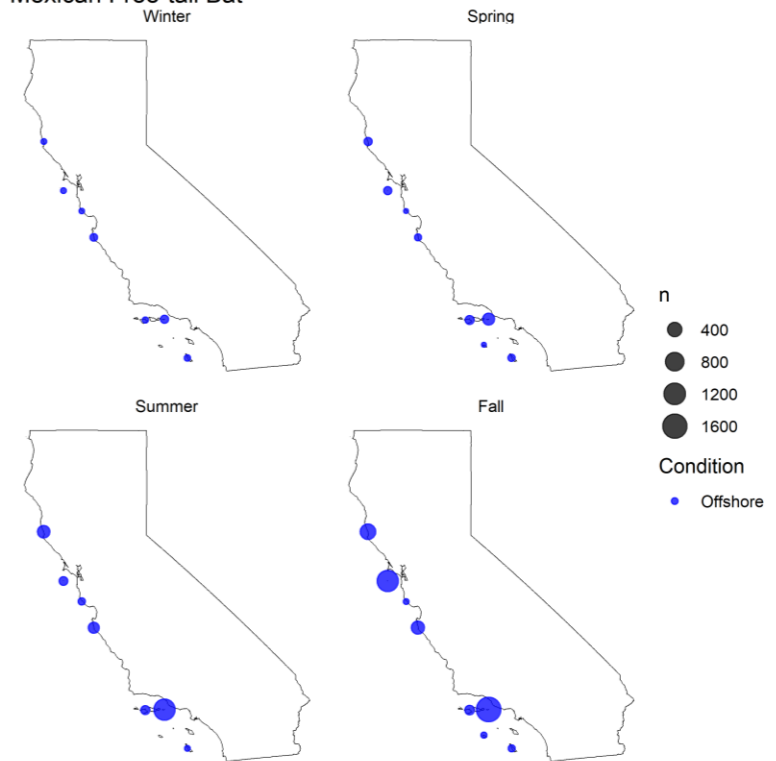
Hoary Bat



Western Red bat



Mexican Free-tail Bat



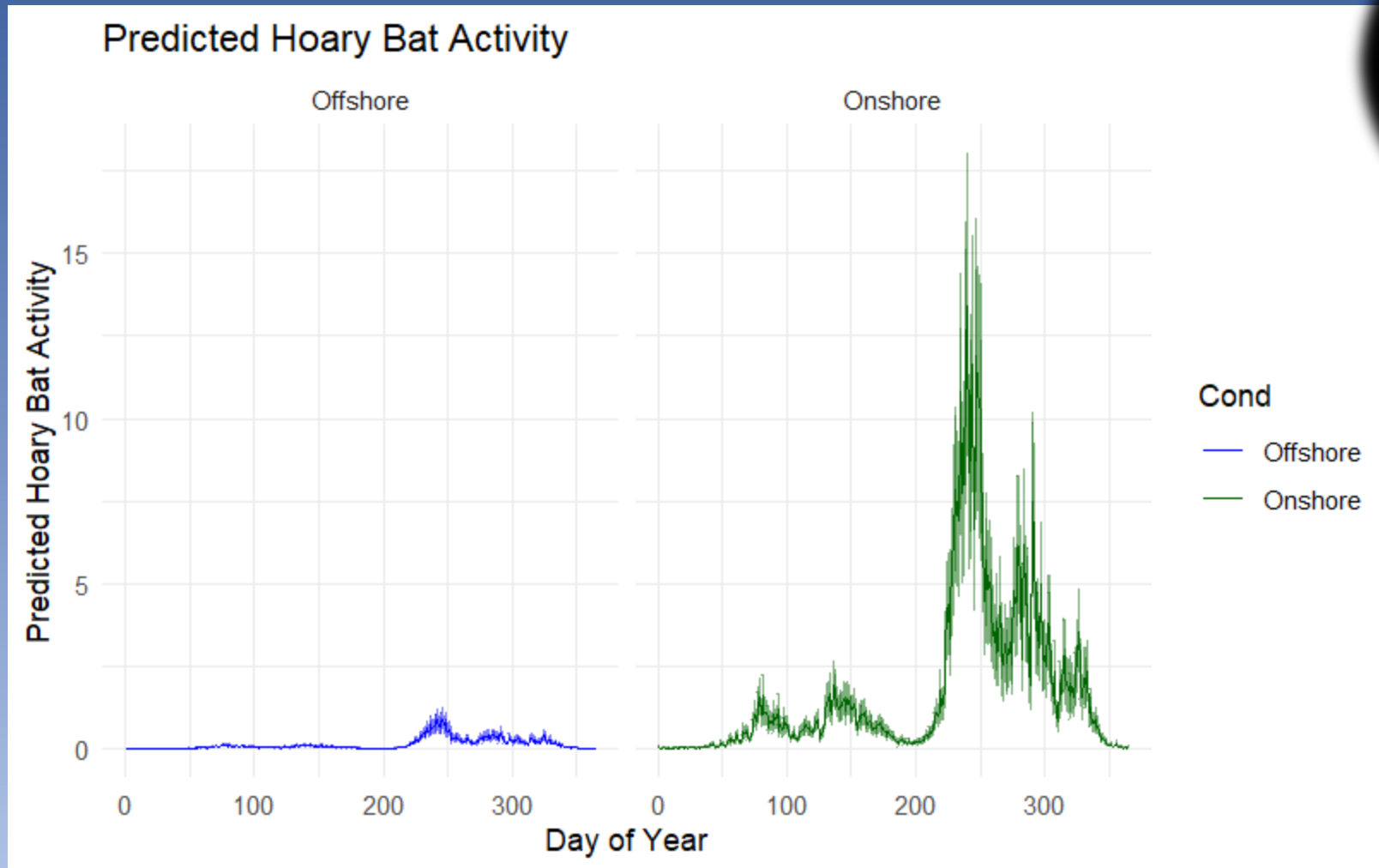
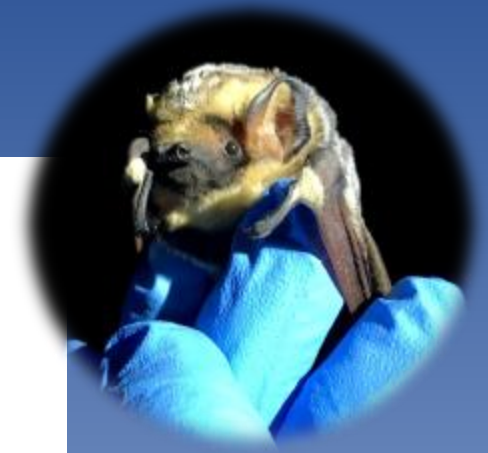
These data are preliminary and are subject to revision. They are being provided to meet the need for timely best science. The data are provided on the condition that neither the U.S. Geological Survey nor the U.S. Government may be held liable for any damages resulting from the authorized or unauthorized use of the data.

Preliminary Models

Generalized Additive Models (GAMMS)

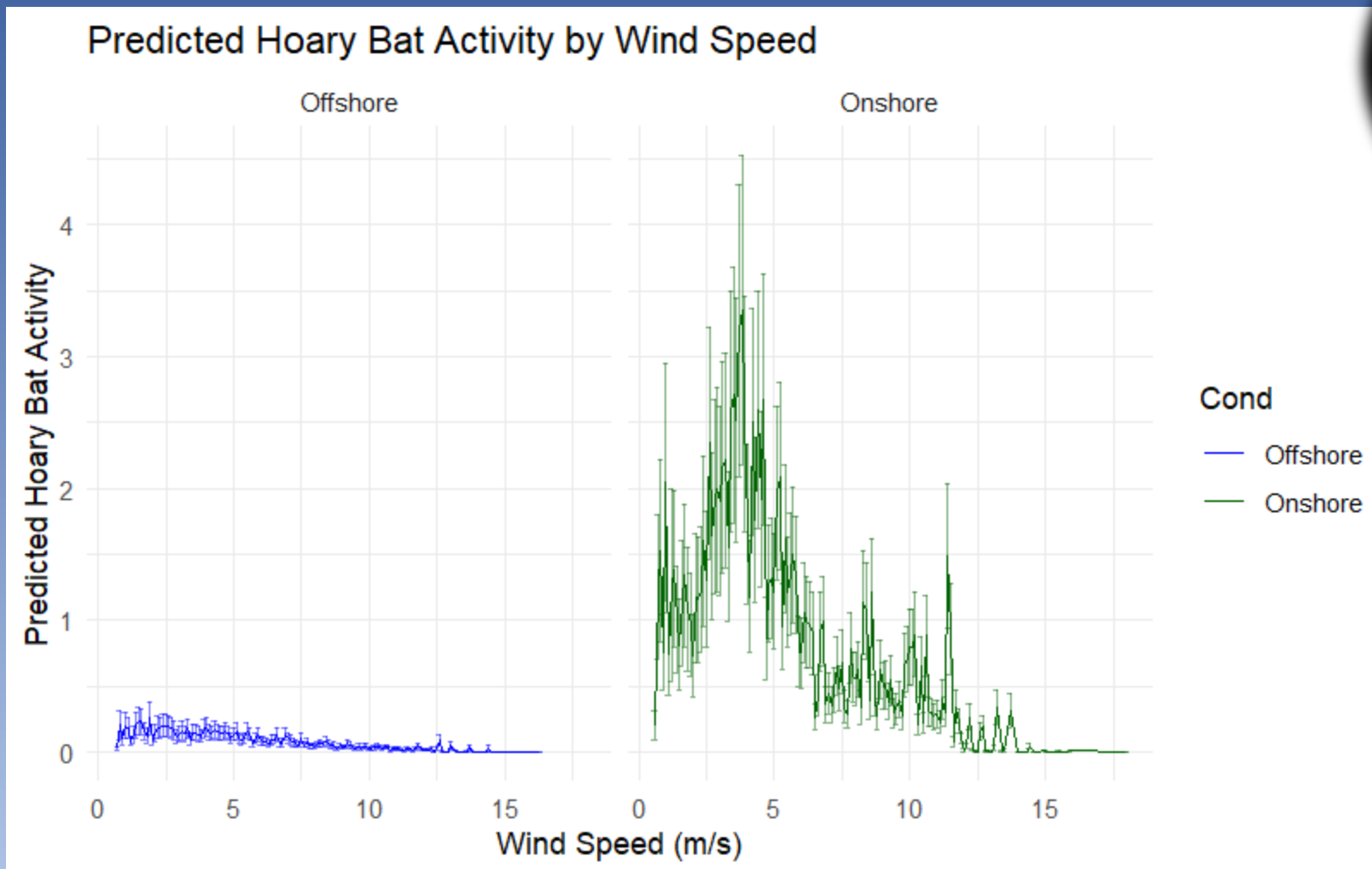
- Negative binomial distribution
- Date of year – converted to radians for cyclic seasons
- Distance from coastline
- Wind speed and direction
- Minimum temperature
- Latitude
- Site and year as random effects

Hoary Bat



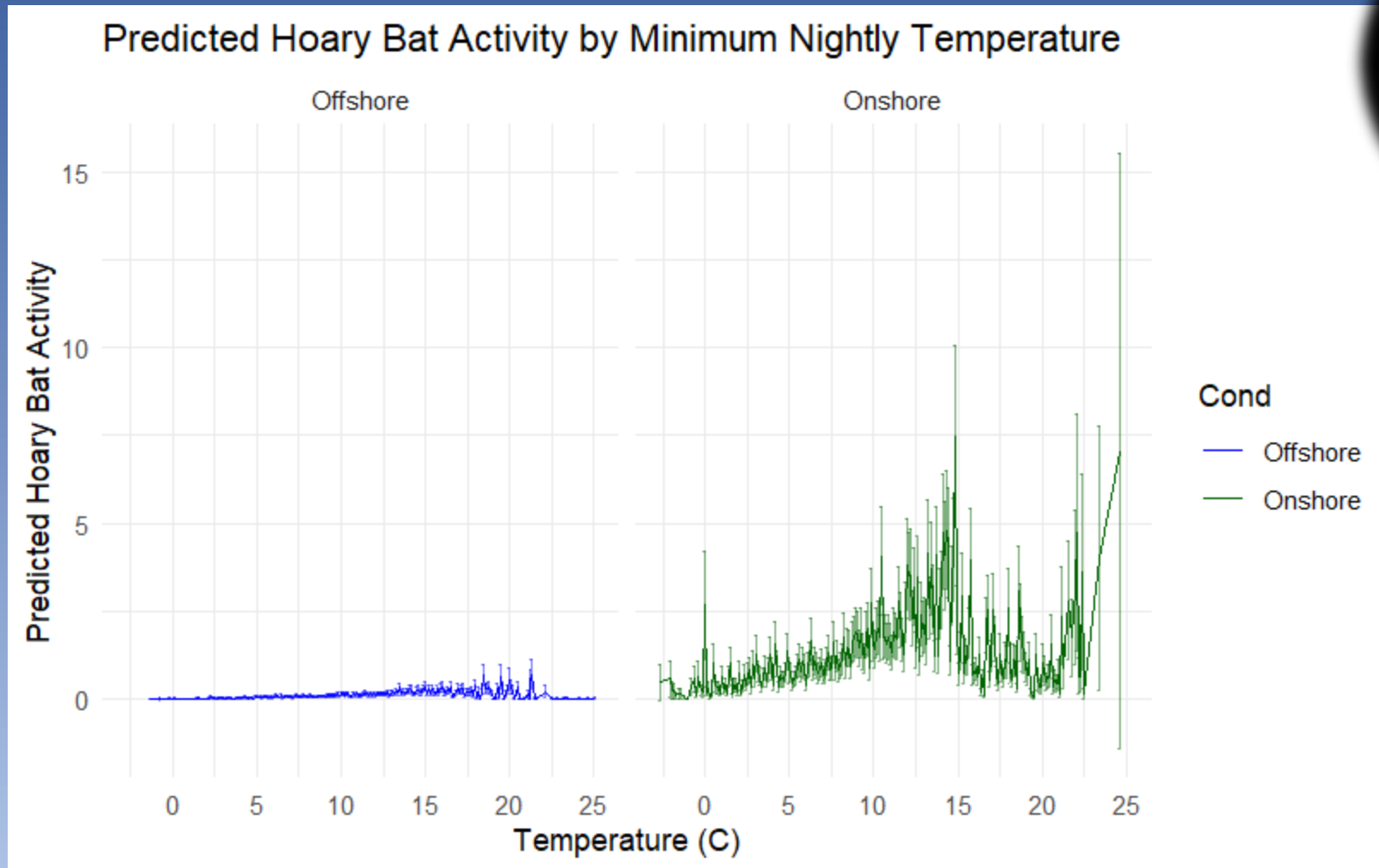
These data are preliminary and are subject to revision. They are being provided to meet the need for timely best science. The data are provided on the condition that neither the U.S. Geological Survey nor the U.S. Government may be held liable for any damages resulting from the authorized or unauthorized use of the data.

Hoary Bat



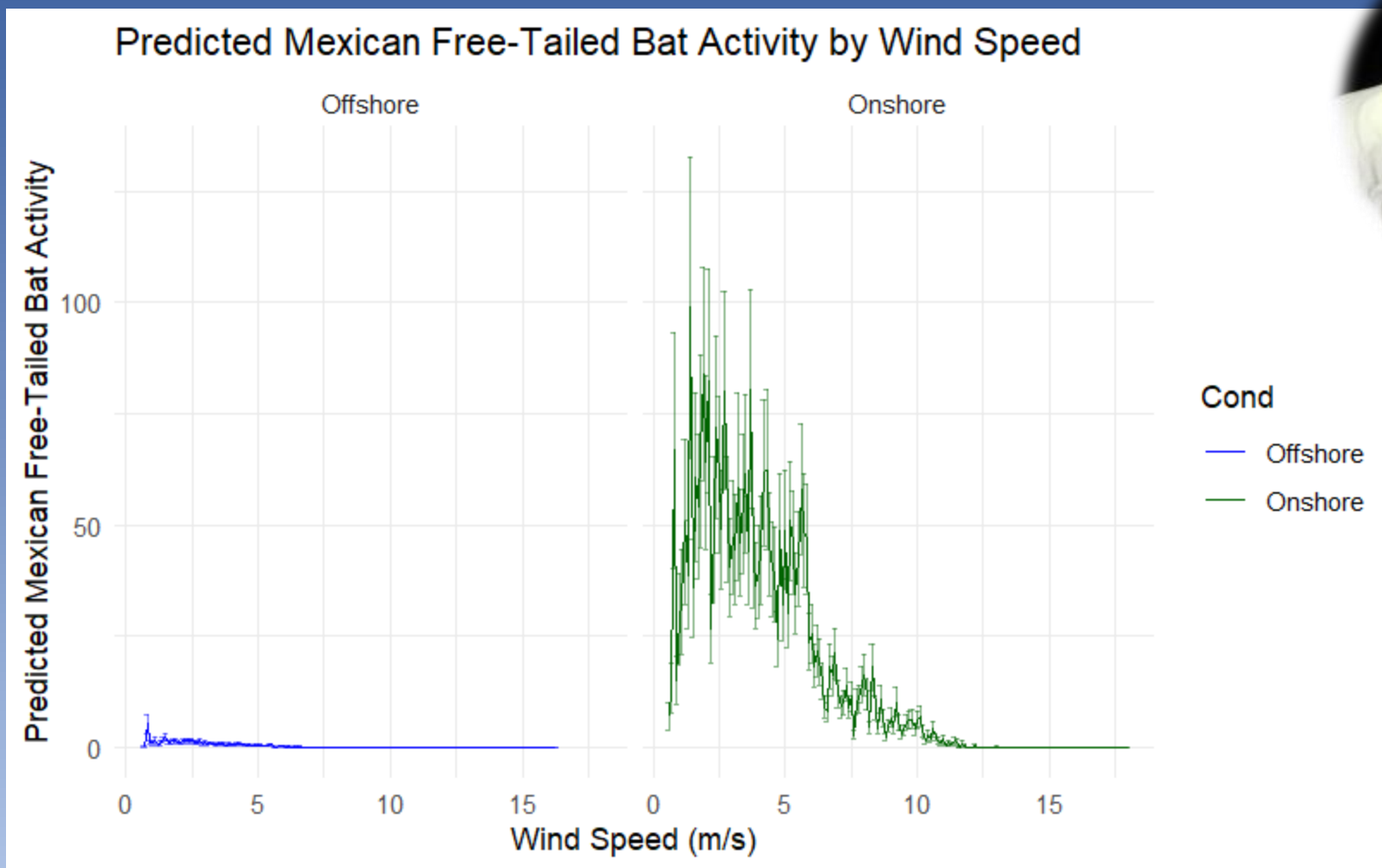
These data are preliminary and are subject to revision. They are being provided to meet the need for timely best science. The data are provided on the condition that neither the U.S. Geological Survey nor the U.S. Government may be held liable for any damages resulting from the authorized or unauthorized use of the data.

Hoary Bat



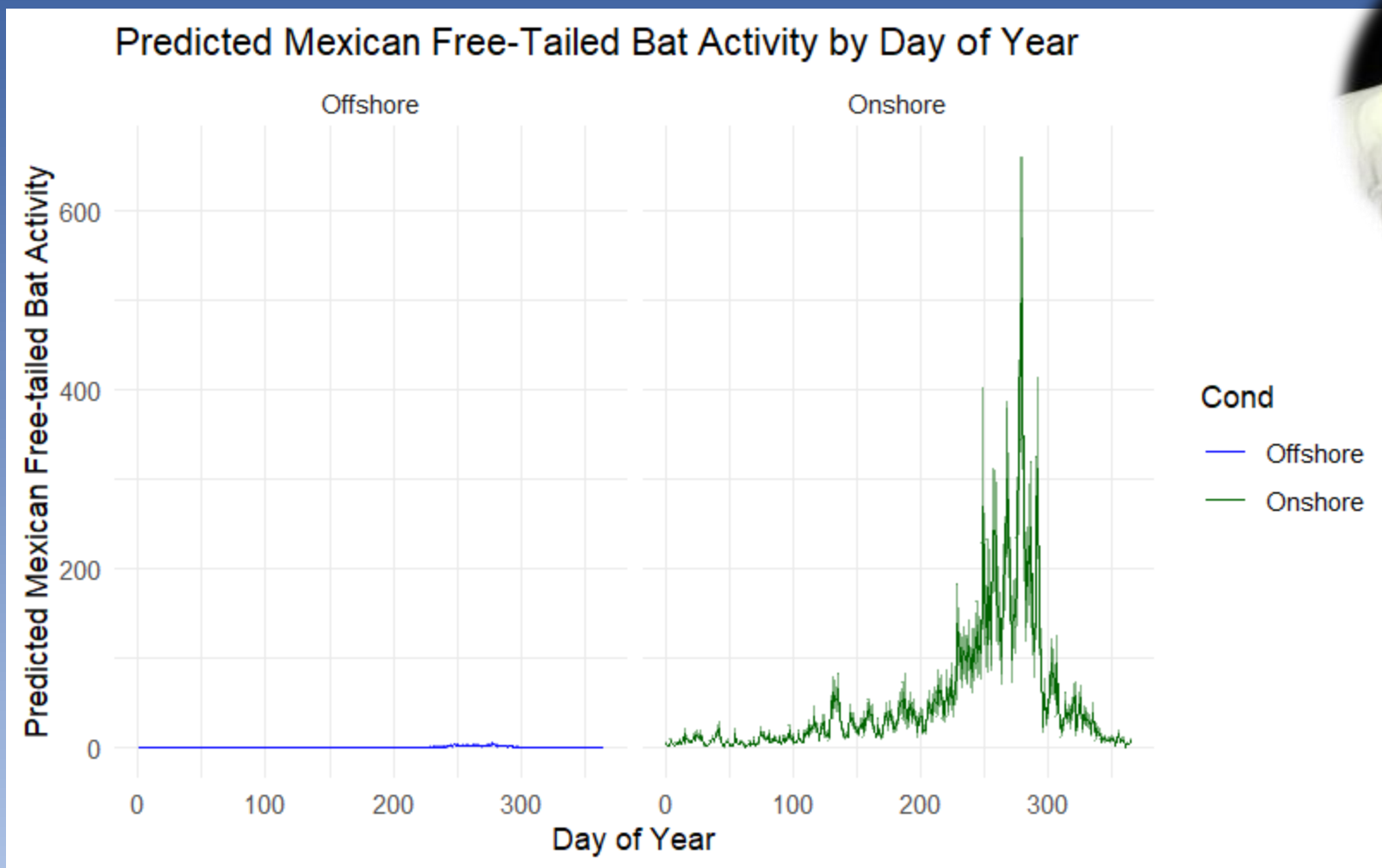
These data are preliminary and are subject to revision. They are being provided to meet the need for timely best science. The data are provided on the condition that neither the U.S. Geological Survey nor the U.S. Government may be held liable for any damages resulting from the authorized or unauthorized use of the data.

Mexican Free-tail Bat



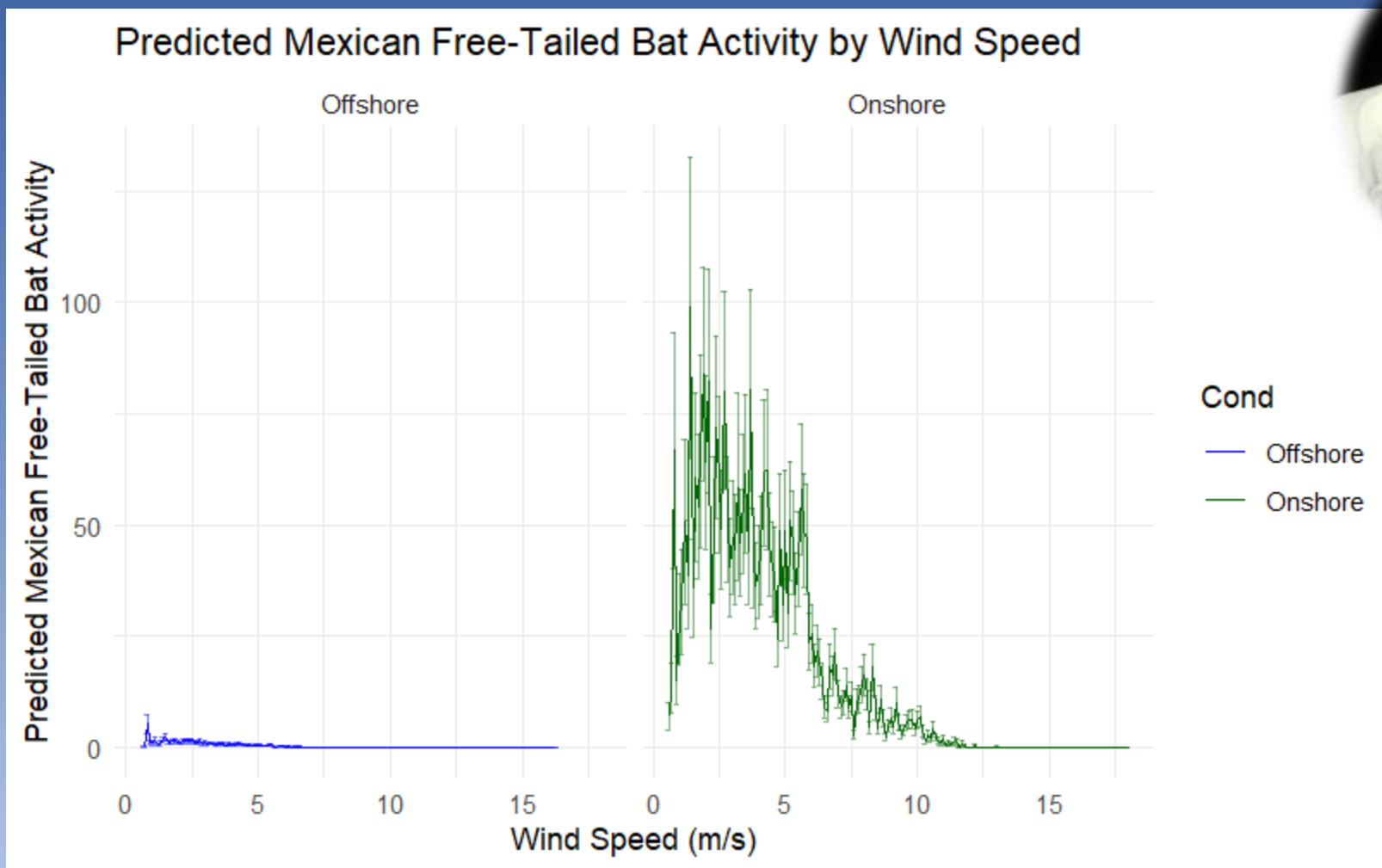
These data are preliminary and are subject to revision. They are being provided to meet the need for timely best science. The data are provided on the condition that neither the U.S. Geological Survey nor the U.S. Government may be held liable for any damages resulting from the authorized or unauthorized use of the data.

Mexican Free-tail Bat



These data are preliminary and are subject to revision. They are being provided to meet the need for timely best science. The data are provided on the condition that neither the U.S. Geological Survey nor the U.S. Government may be held liable for any damages resulting from the authorized or unauthorized use of the data.

Mexican Free-tail Bat



These data are preliminary and are subject to revision. They are being provided to meet the need for timely best science. The data are provided on the condition that neither the U.S. Geological Survey nor the U.S. Government may be held liable for any damages resulting from the authorized or unauthorized use of the data.

Preliminary Conclusions

- Coastline activity is much higher than offshore activity
- Seasonal patterns are similar
- Non-migratory species are frequently found offshore

Limitations

Unknown how behavior differs in offshore environment from onshore



Future Research

Project expanding to include:

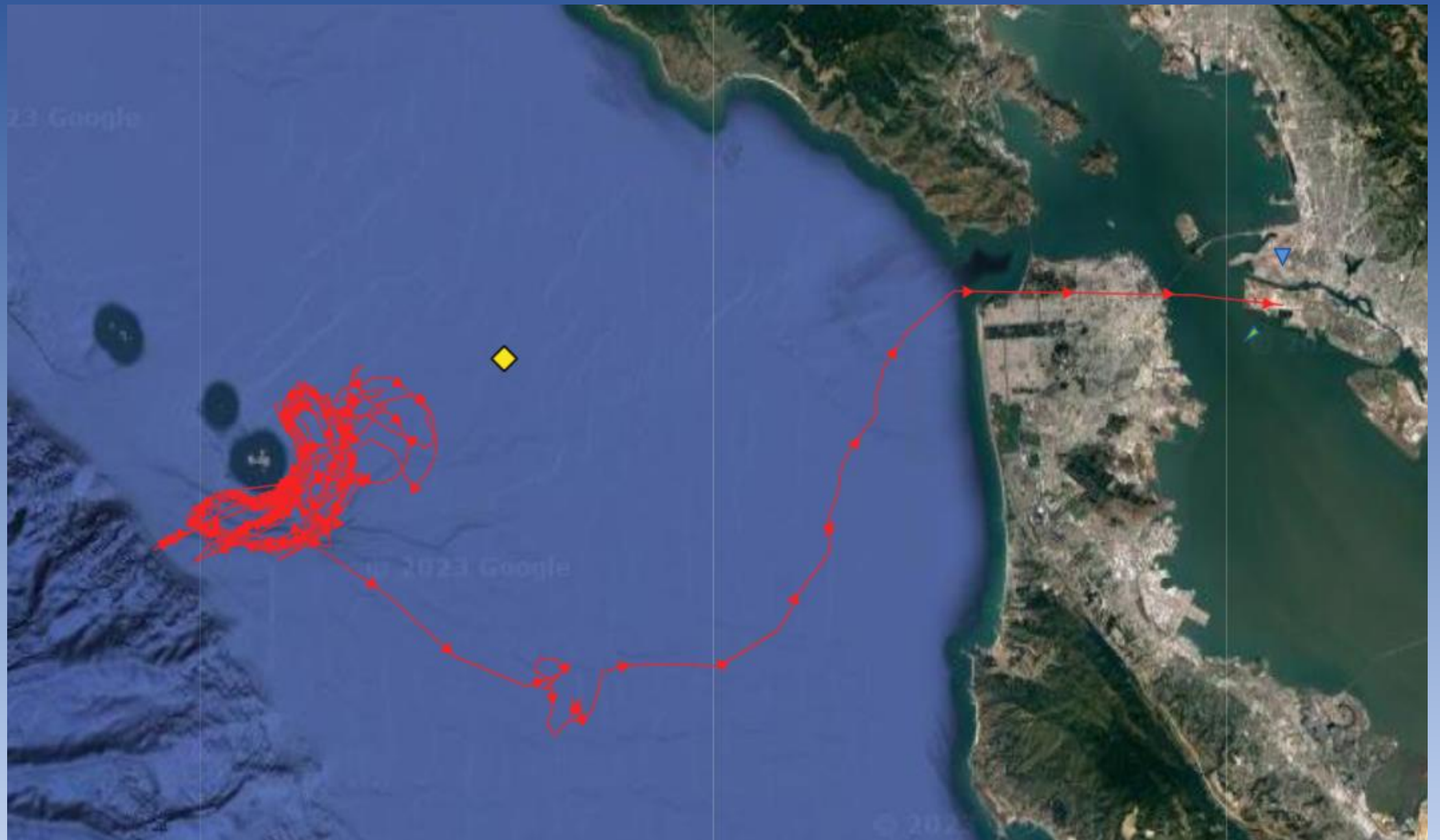
- Weather buoys
- Research ships
- Inland comparison sites
- Saildrones...



Saildrone Trial

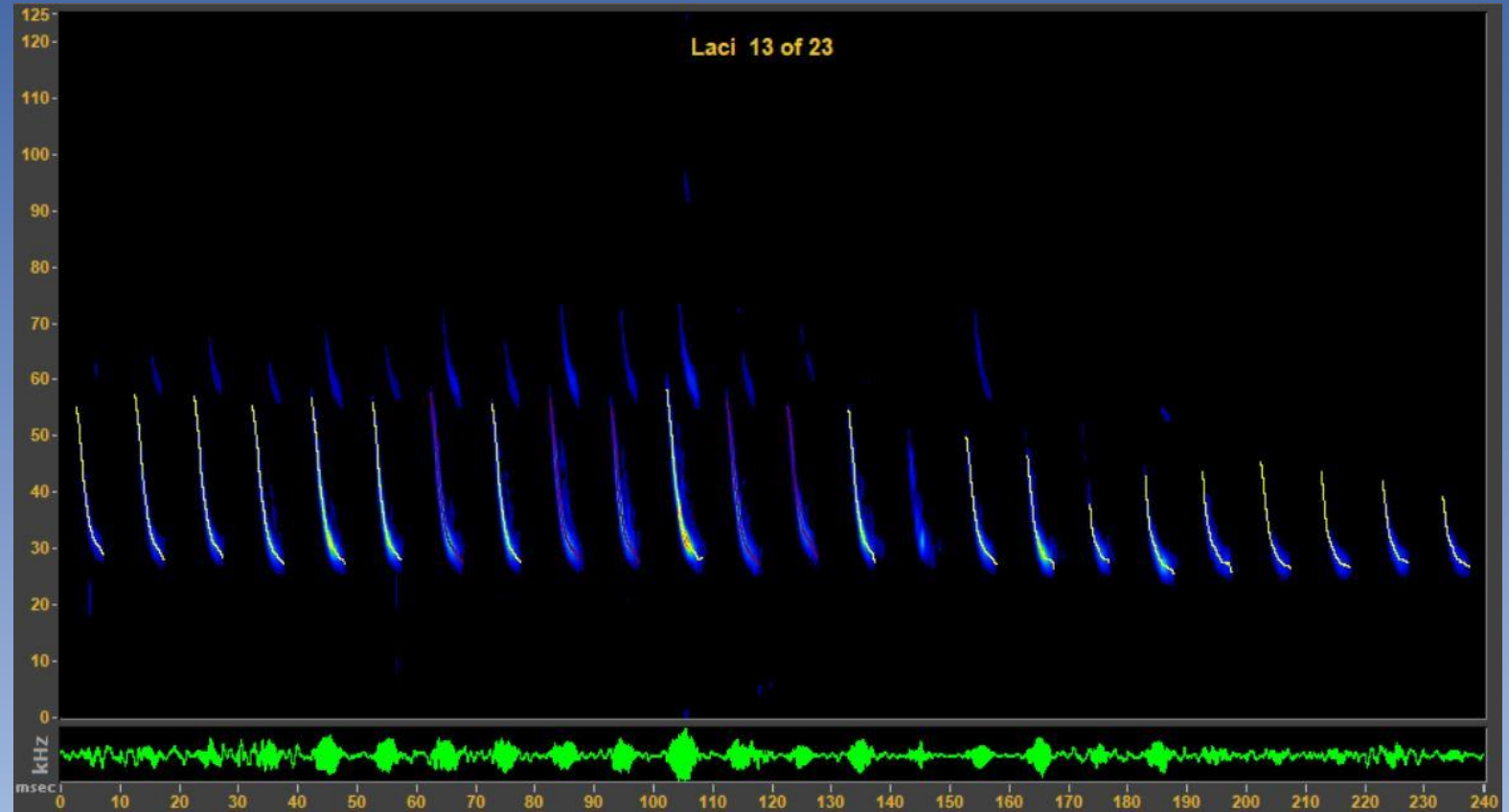
- Autonomous sailing drone
- Test mission around Farallon Islands
- 30 detector-nights (Sep. 1- 30)





Initial findings (D. Solick)

- 1,375 recorded files
- 965 bats in 831 files
- 276 hoary bats
- 32 silver-haired bats
- 1 western yellow bat?
- 209 Mexican free-tailed bats
- 33 big brown bat/silver-haired bats
- 288 unknown low-frequency bats

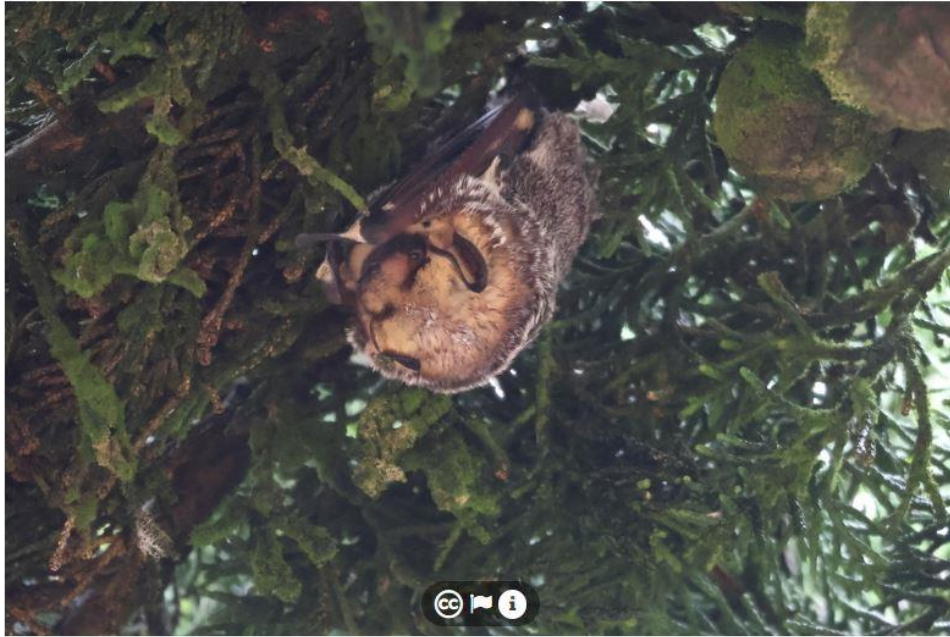


These data are preliminary and are subject to revision. They are being provided to meet the need for timely best science. The data are provided on the condition that neither the U.S. Geological Survey nor the U.S. Government may be held liable for any damages resulting from the authorized or unauthorized use of the data.

Hoary Bat (*Lasiurus cinereus*)

Research Grade

Follow



sdarmstadt

3,163 observations

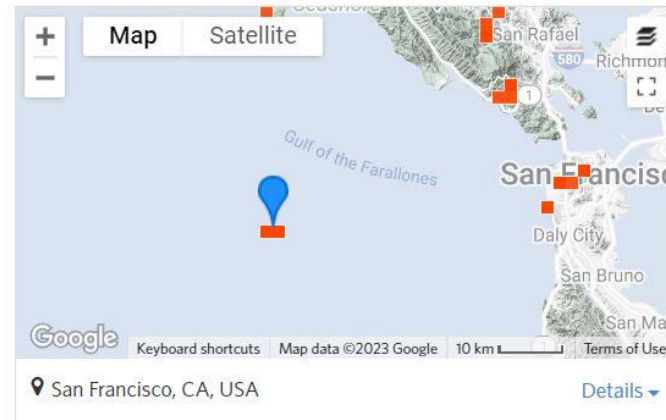


Observed:

Sep 14, 2023 · 9:40 AM PDT

Submitted:

Sep 17, 2023 · 3:16 PM PDT



- ~31 Passes per Night
- High of 280 passes per night
- Several nights 100+ calls
- No bat activity on 11 nights
- Multiple bats/Social Calls

These data are preliminary and are subject to revision. They are being provided to meet the need for timely best science. The data are provided on the condition that neither the U.S. Geological Survey nor the U.S. Government may be held liable for any damages resulting from the authorized or unauthorized use of the data.

Acknowledgements



- Dave Pereksta – Bureau of Ocean Energy Management
- Bureau of Land Management – Piedras Blancas Light Station
- St. George Reef Preservation Society
- Del Norte Historical Society
- Bureau of Land Management – Arcata Office
- U.S. Coast Guard
- Point Arena Lighthouse
- Point Reyes National Seashore
- USGS Seabird Team – Santa Cruz
- The Nature Conservancy
- Point Mugu Naval Base
- San Clemente Island Naval Natural Resources Office
- Channel Islands National Park
- One Tam
- UC Santa Cruz Año Nuevo Reserve
- Point Montara Lighthouse Hostel
- Saildrone
- NOAA

- Jodie Nelson
- Shea Quin
- Pat Barfield
- John Zimmerman
- Guy Towers
- Jesse Irwin
- Sharyl Kinnear-Ferris
- Bill Stanley
- Mark Hancock
- Dave Press
- Gerry McChesney
- Chris Bauman
- Joanne Kerbavaz
- Moses Katkowski
- Annie Little
- Rocky Rudolph
- Lt. Jamen Descartes
- Martin Ruane
- Melissa Booker
- Abbigail McCracken
- Sandy Miles
- Taylor Ellis
- Jon Felis
- Emma Kelsey
- Laney White
- Josh Adams
- Pete Warzybok
- Patrick Robinson
- Chelsea Nielsen
- Morgan Welander
- Deke Joralmon
- Drew Stokes
- Lt. Card

Questions?



bschulze@usgs.gov

