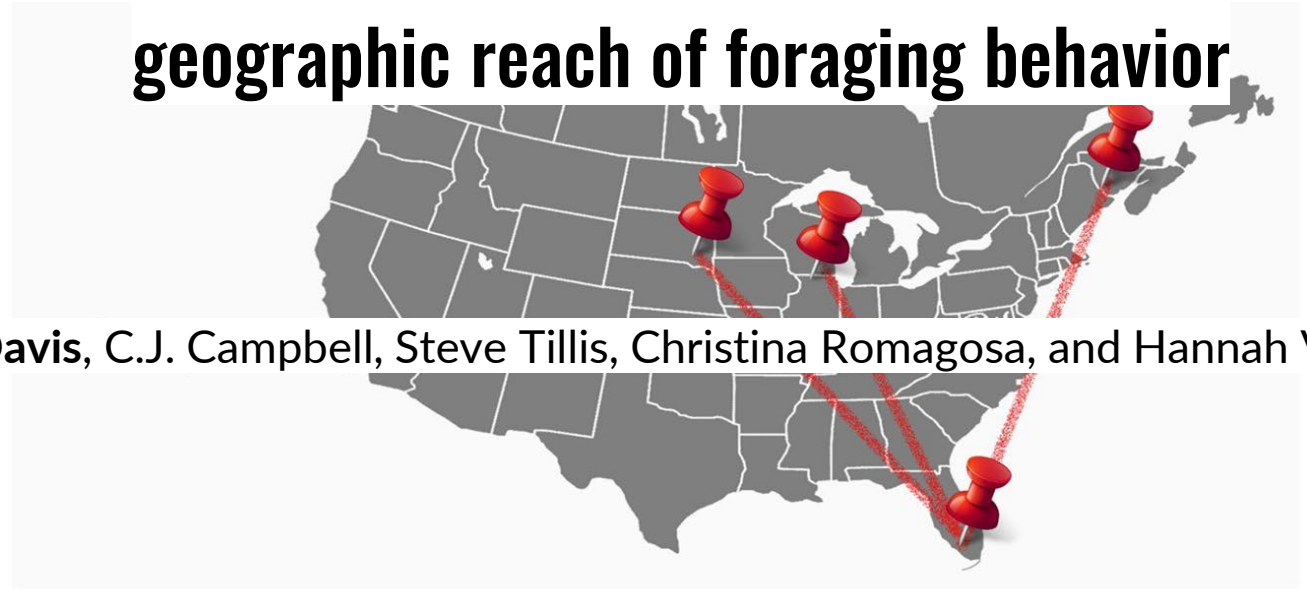
Bird feathers in invasive Burmese python guts reflect the geographic reach of foraging behavior



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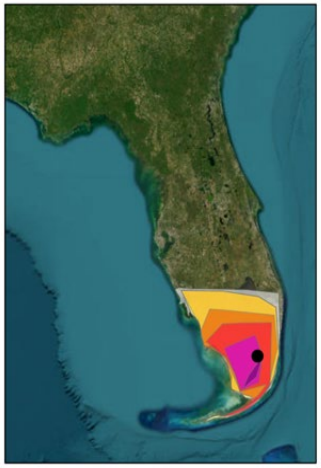
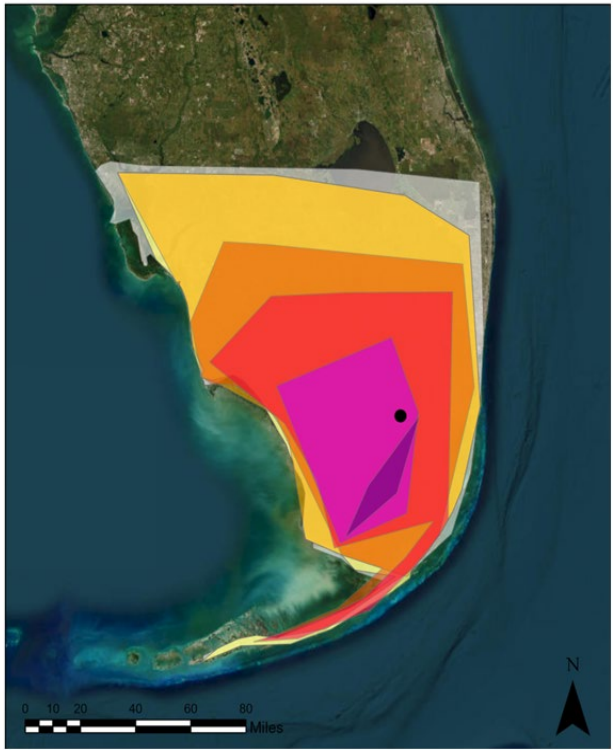
The Python Problem

Burmese python are a large species of constrictor snake introduced to the US through the pet trade.

Now an entrenched breeding population over a large area of southern Florida.



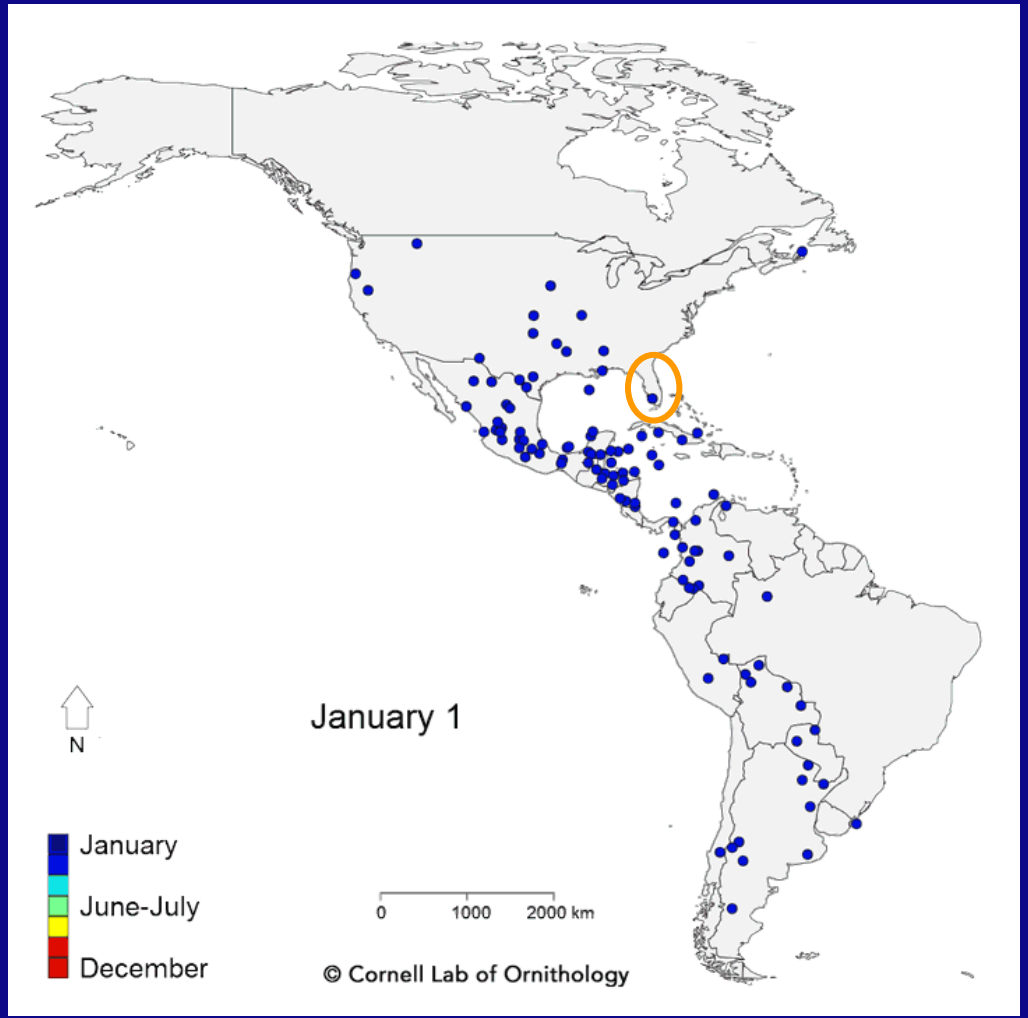


Data source: EDDMapS

Pythons are generalist predators and gut content analysis has shown they consume a wide array of native mammals, reptiles, and birds

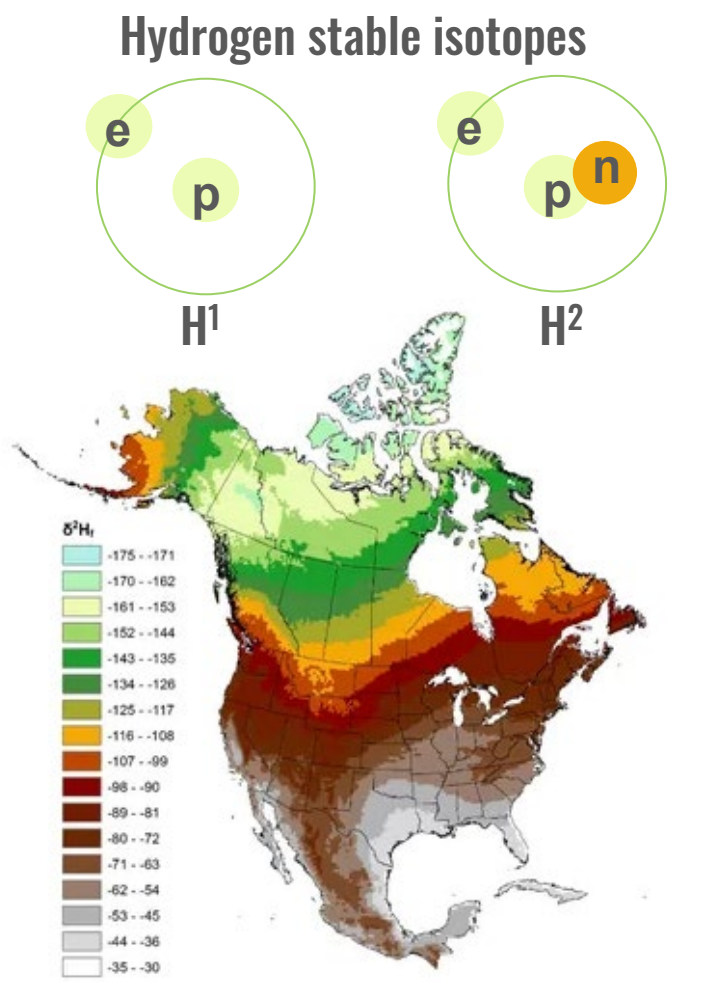
Some of these prey items are not just native to Florida, however…

To date, of the 57 species of bird recovered from invasive python gut contents, 14 were non-permanent residents.



Many species of North American bird molt in their breeding range before migration.

The δ^2H isotope values of their feathers act as a passport stamp to where they were grown



Hydrogen isoscape of North America
(Hobson et al., 2015)

Study Questions

1. Does digestion change the δ^2H values of the feathers?

1. How far is the geographic reach of python foraging behavior?

Methods-Digestion Effect

- Acquired local farm raised muscovy ducks and pulled chest and flight feathers before feeding ducks to four individual captive pythons.

- Recovered the first feces passed after each duck was consumed and washed for paired pre- and post-digested feathers from each individual.

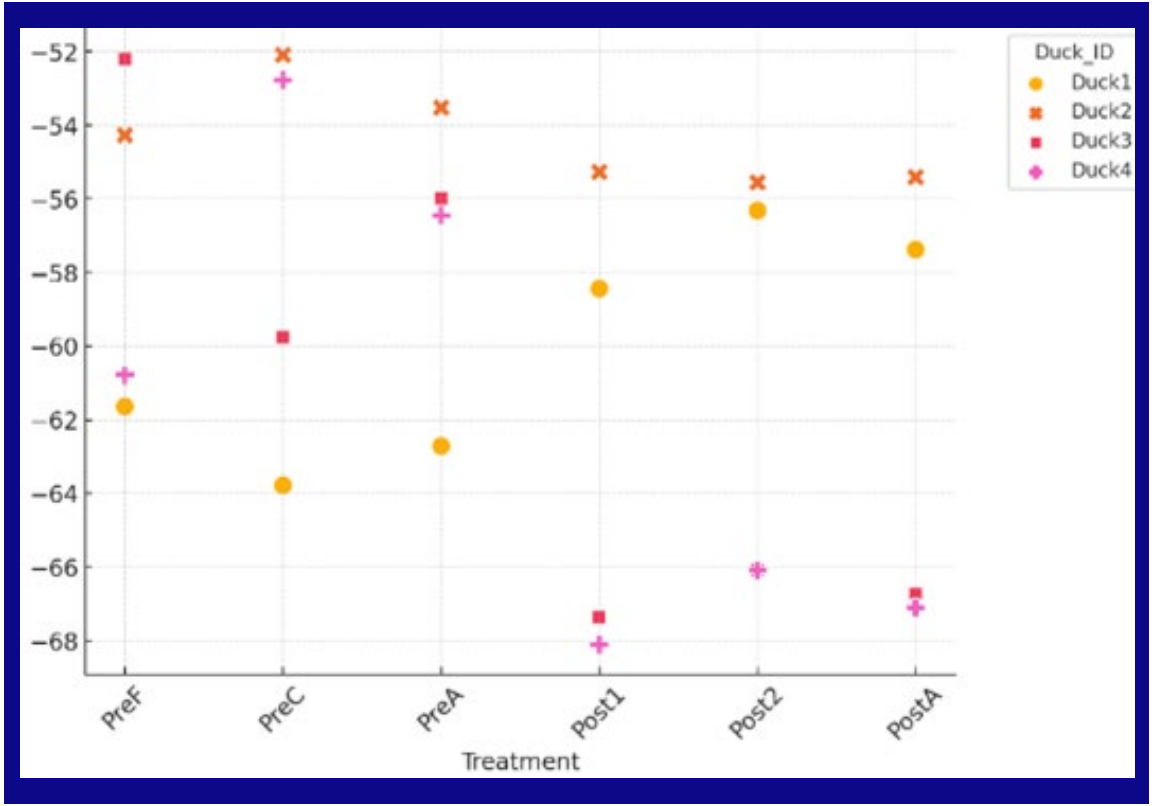
Methods-Digestion Effect

- Samples from all feathers were washed and run for stable isotopes at the Mass Spec Lab at the University of Florida.
- Because it can be challenging to determine what part of the bird the feathers came from post digestion, two samples from the post-digested feather pile were taken and the resulting values were averaged.
- A paired T-test was run to look for statistical differences between treatment groups

Results-Question 1

Found **no significant differences** (p-value=0.33) between pre- and post-digested feather hydrogen values.

While there was some variance, we attribute that to the variance you would see within and among feathers.

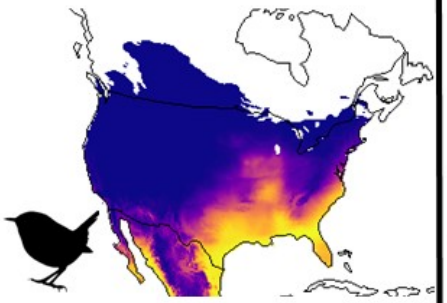


Now that I had all my ducks in a row...

Methods-Geographic Reach

- Samples were washed and run for stable isotopes at the Mass Spec Lab at the University of Florida.
- Three samples from each feather pile were taken to get individual SD and mean feather value
- Generated probability rasters using AssignR and cropped rasters to range gpkg files from eBird

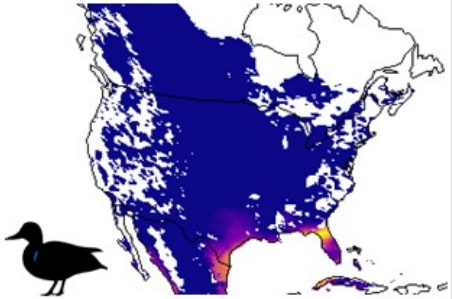
Results-Geographic Reach



House Wren

Min: 423.1 km

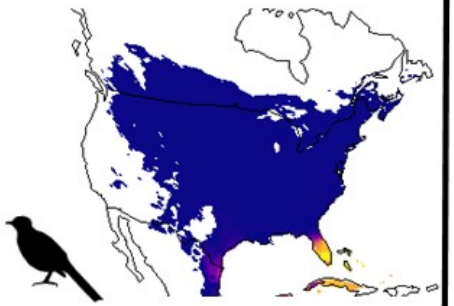
Capture Date: 17 Oct 2015



Blue Winged Teal

Min: 295.1 km

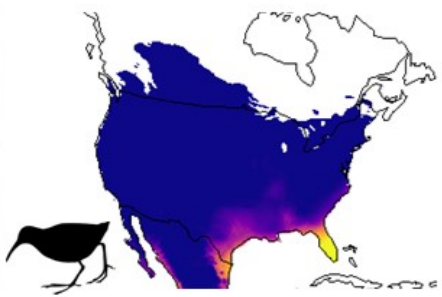
Capture Date: 15 Apr 16



Gray Catbird

Min: 6.9 km

Capture Date: 01 Nov 2017



Virginia Rail

Min: 1.5 km

Capture Date: 25 Oct 2004

Legend

Probability of origin

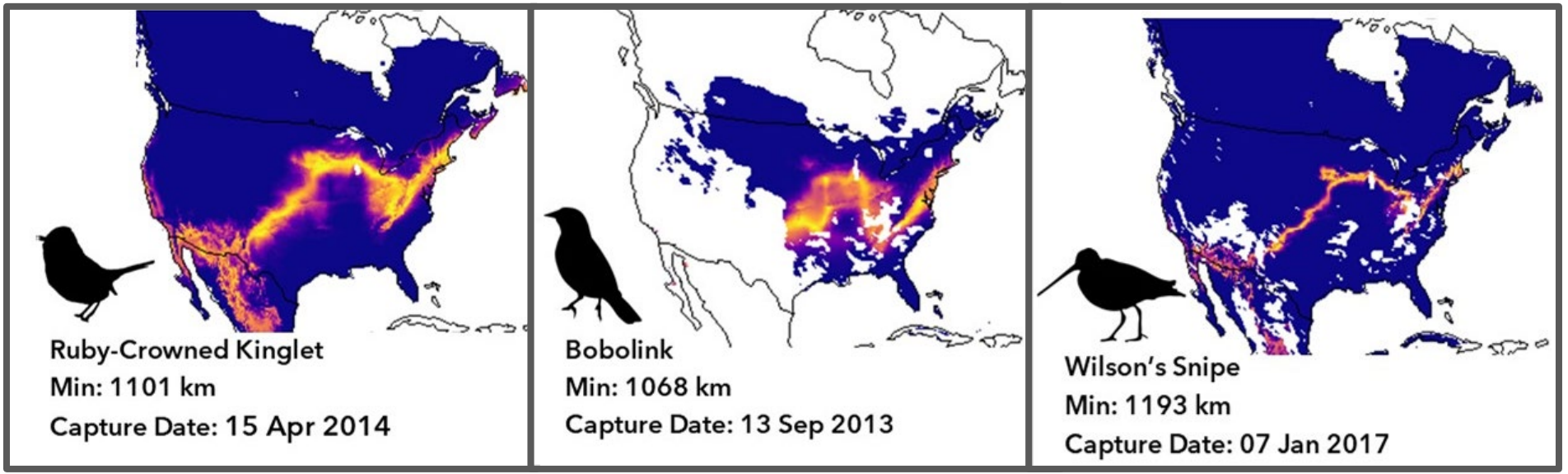
Low — High

Min: minimum distance from recovery coordinates to nearest edge of likely area of origin

Capture Date: date python was removed from the wild

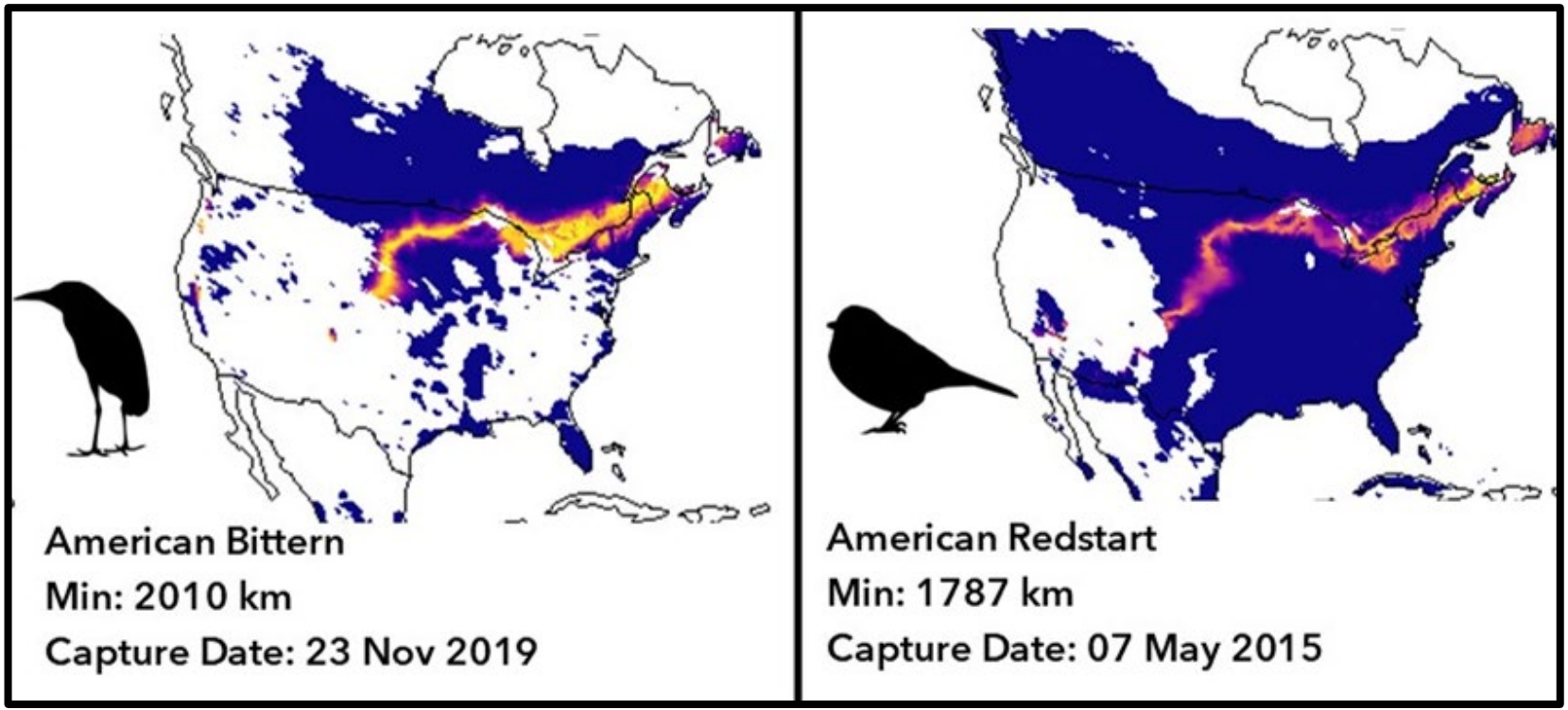
Some species came from nearby...

Results-Geographic Reach



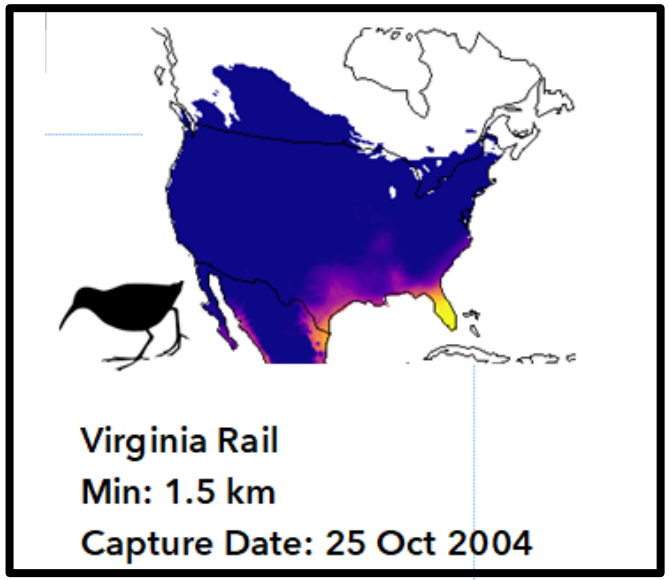
...while others likely came from further away...

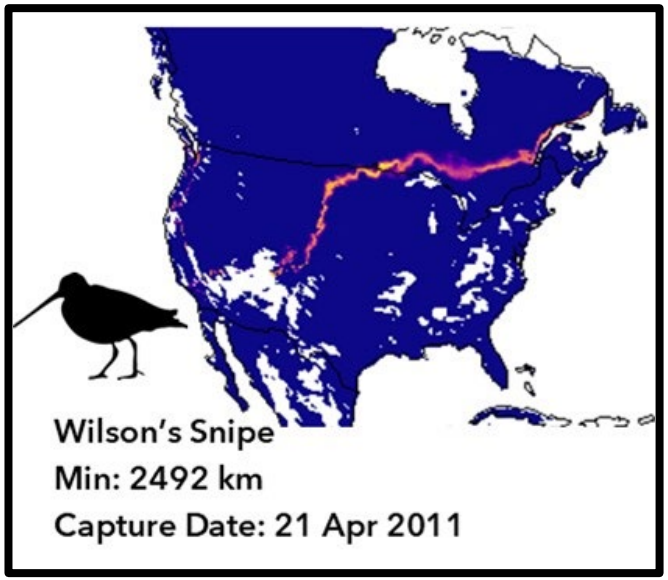
Results-Geographic Reach



...we even have some possible Canadians!

Summarized Results

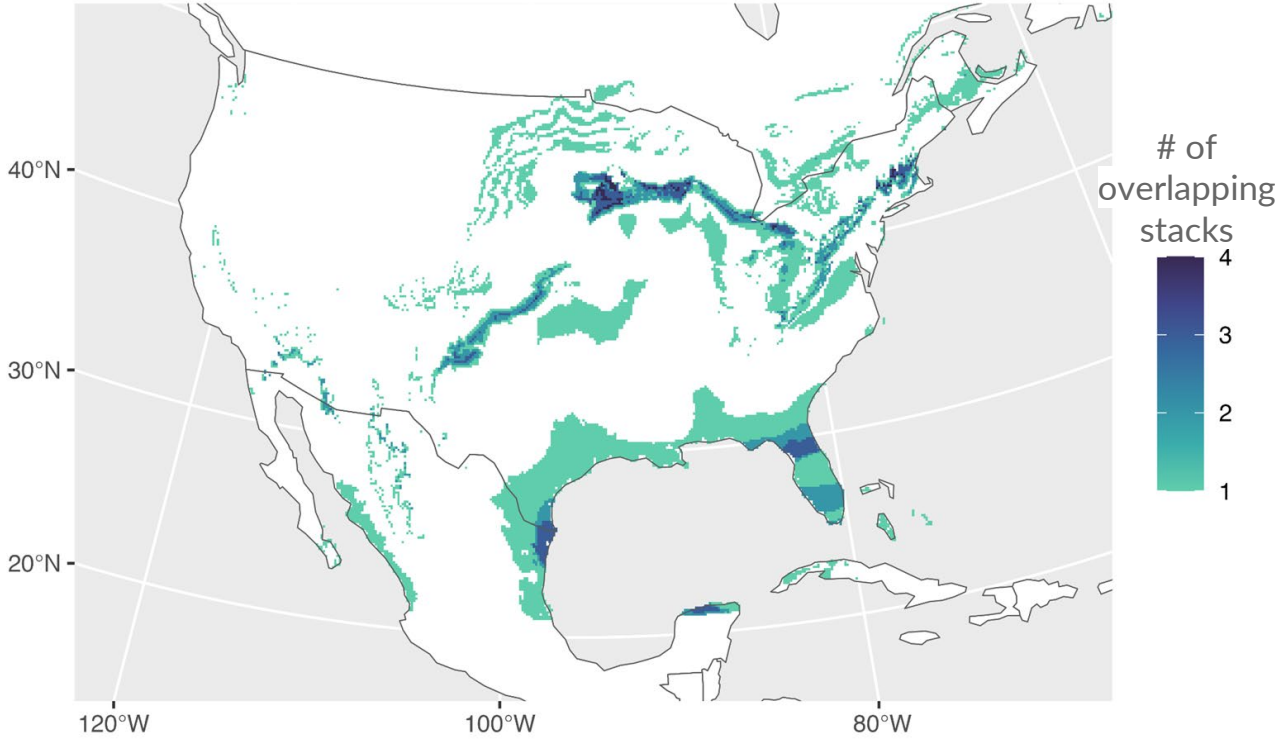




Minimum distance from recovery site ranged from 1.5 km-2492 km

Summarized Results

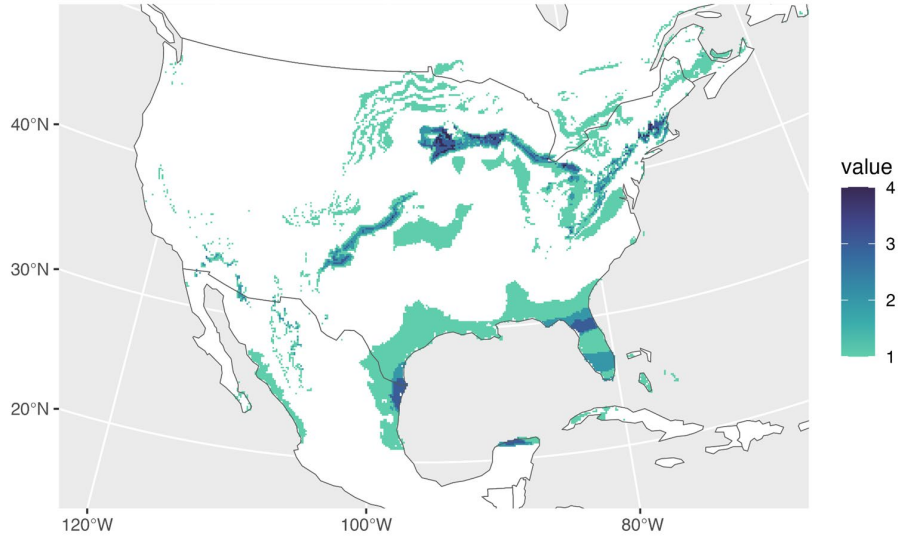
High probability raster stacks and overlap in origin



Discussion

This is the first study to use the digested remains of prey to determine area of origin, we think this method could be used in other studies of invasion ecology.

The reach of foraging behavior of Burmese pythons goes far beyond Florida.



Acknowledgments and Questions

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