White Ibis: Wetland Specialist or Urban Opportunist?

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SOUTHEASTERN COOPERATIVE WILDLIFE DISEASE STUDY

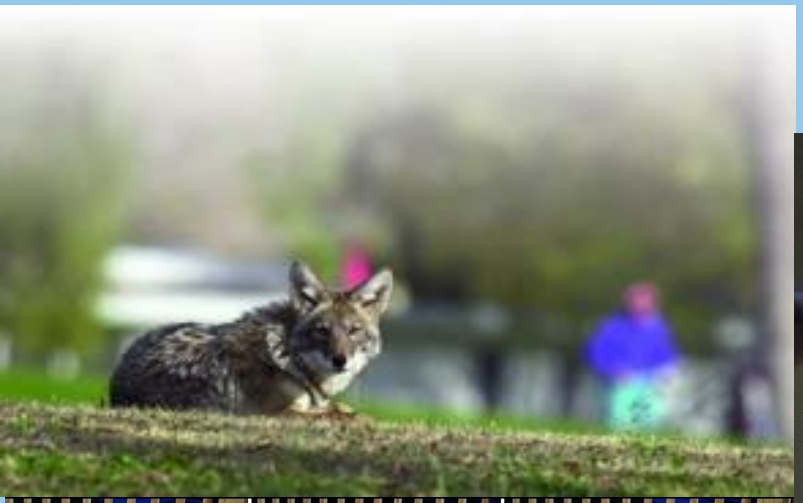
Urbanization and wildlife

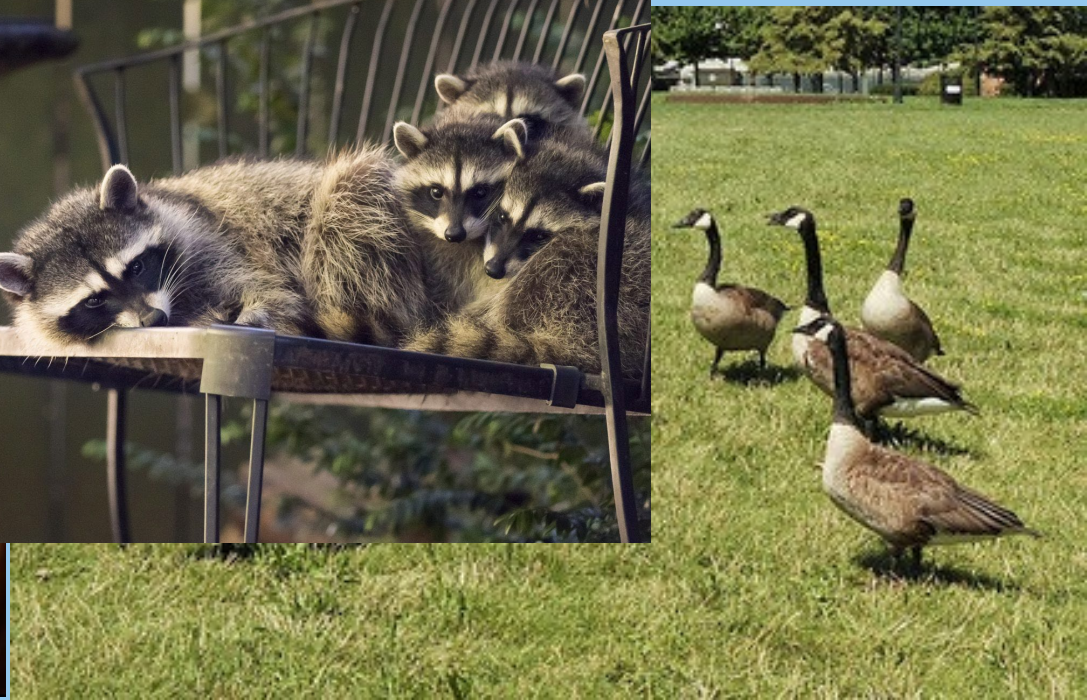
Urban environments attract wildlife through **resource provisioning** (food, water, shelter, etc), whether intentional or accidental

Some wildlife adapt very well, yet….

Various aspects of the ecology of these animals is affected by these resources

- Host range, movement patterns, density, behavior, inter- and intraspecific interactions ….all with consequences for health and pathogen dynamics





The White Ibis System

- White Ibis *(Eudocimus albus)*
  - Large nesting colonies
  - Marshy wetlands and pools near the coast
  - Nomadic, largest breeding sites in N. America in FL
  - 20-50% decline statewide due to habitat loss/degradation
  - Great model for studying impact of resource provisioning

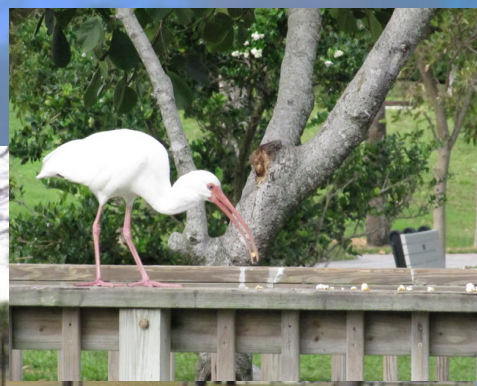

Wildlands
Lawns
Parks

Factors influencing ecology and health

Coming into **frequent** and **close** contact with species with which they would normally not contact

Occurring at constant, high densities

Consuming poor quality food/water



Physiology and health

- ***Body condition indices***
- Stress
- Immune function
- ***Pathogen or parasite exposure/infection***

Movement patterns and habitat use

- VHF and GPS transmitters

Diet

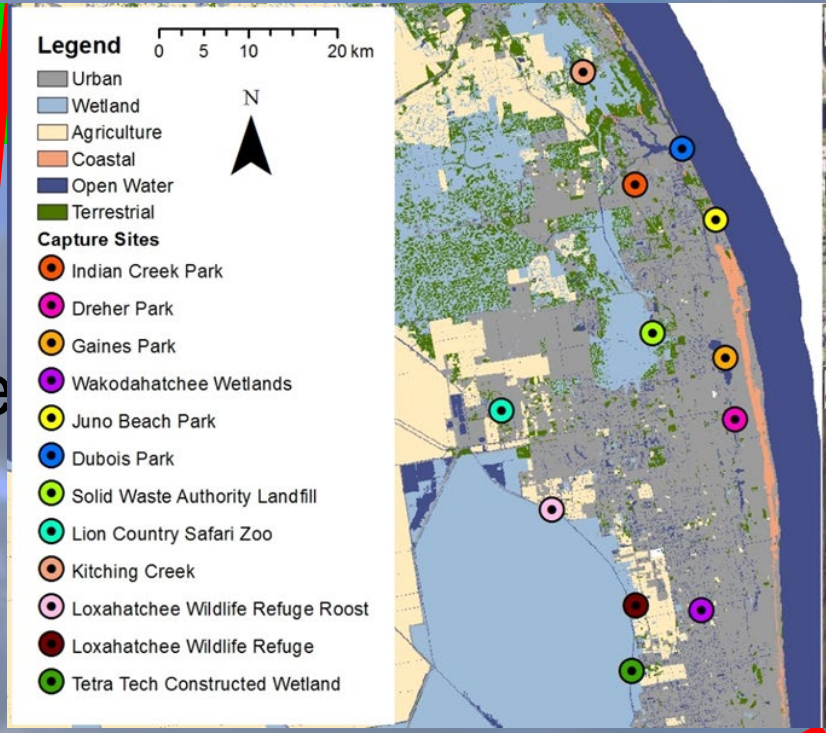
- ***Stable isotopes***
- ***Microbiome***

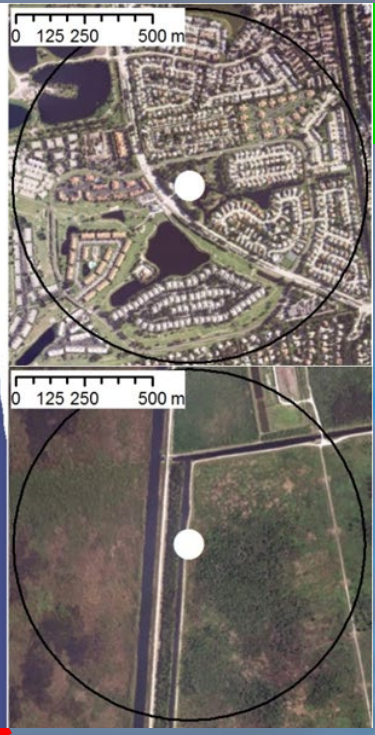
Behavior

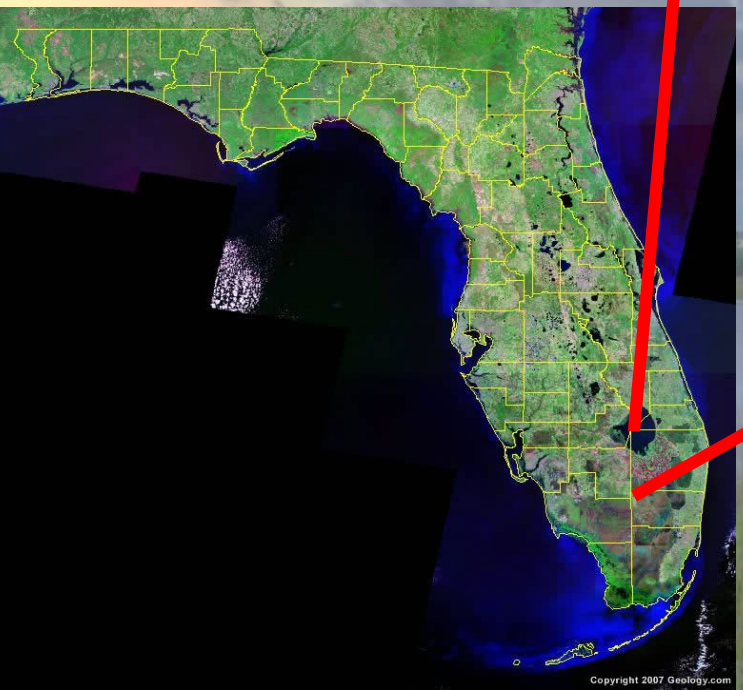
- Individual and flock observations
- Personality profiles

Urban gradient

- Palm Beach Co
  - 15 sites
  - Biological sample
  - GPS transmitters



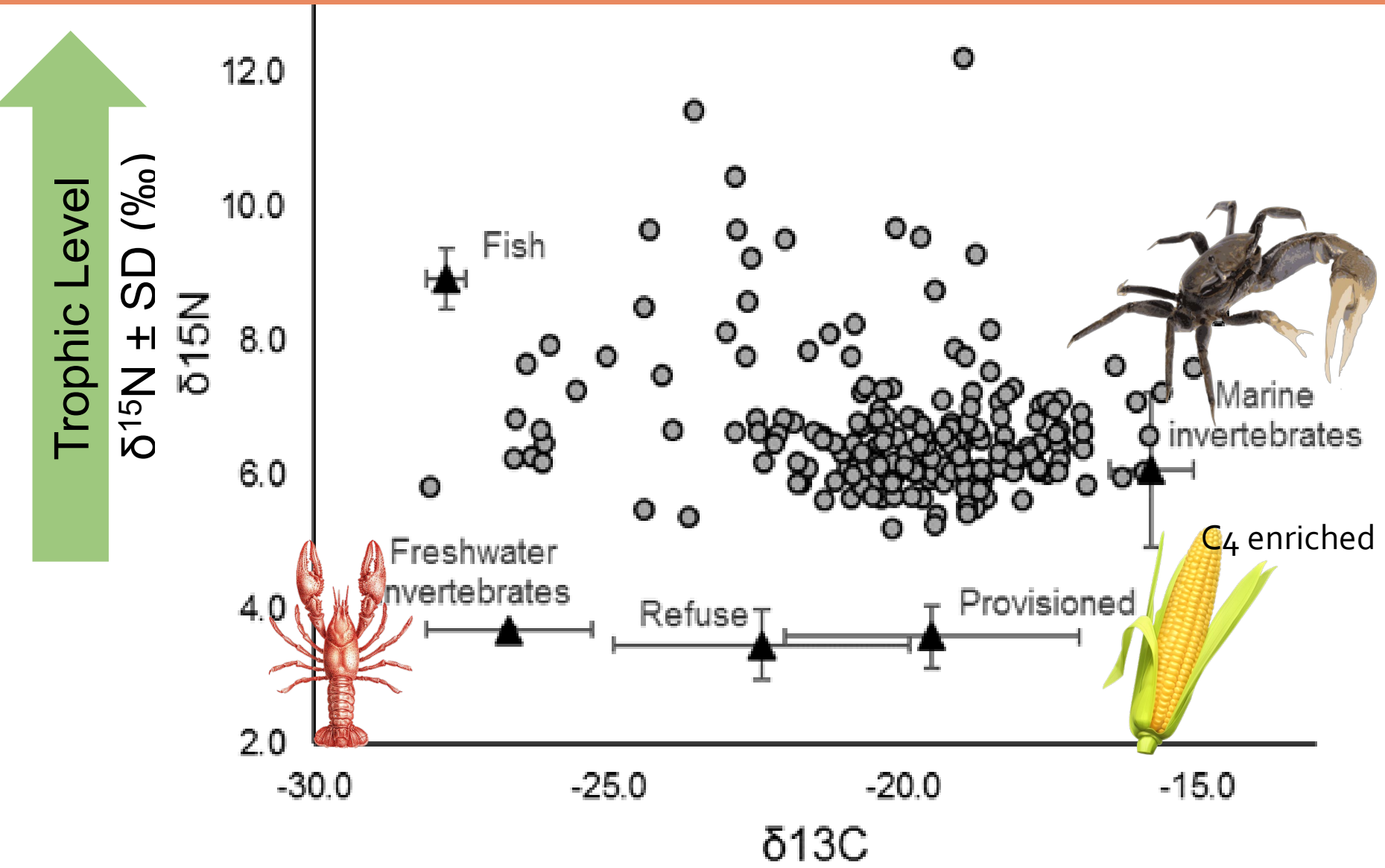




Urban site captures

Wildland site captures

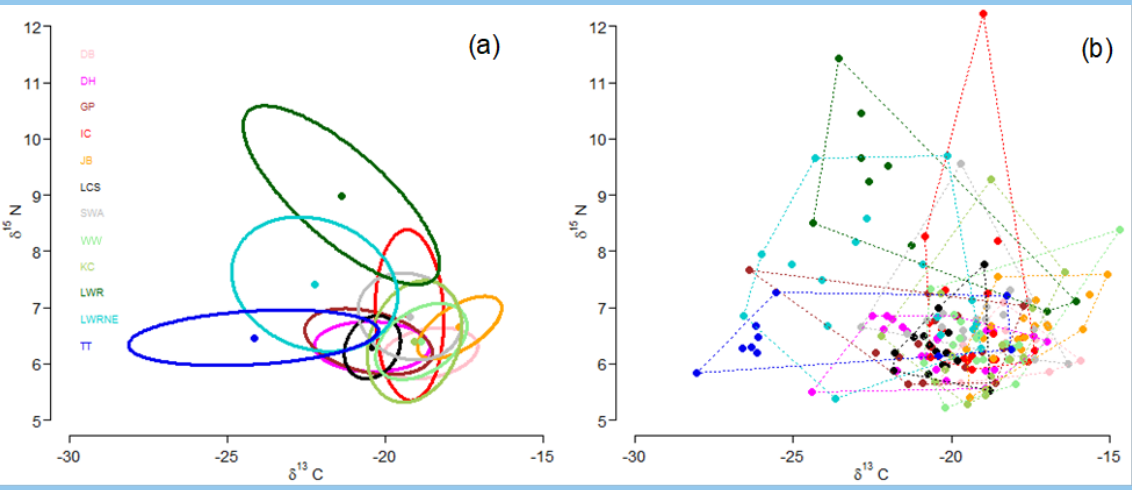
Influences on Diet—stable isotopes of RBCs

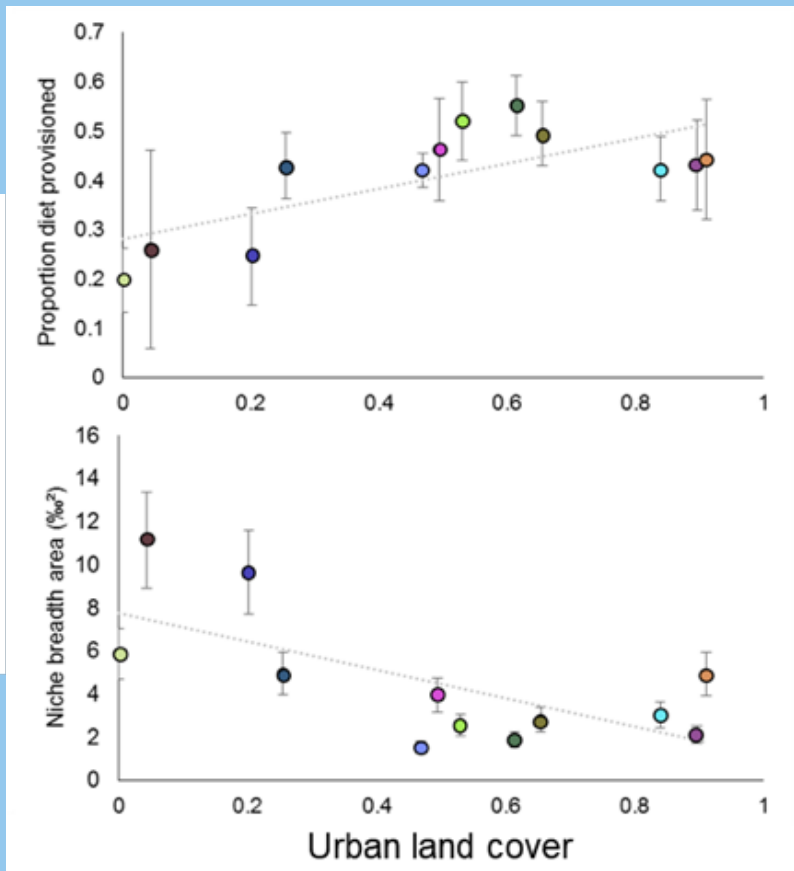


Murray et al, Philosophical Transactions of RS B; 2018

Influences on Diet—stable isotopes

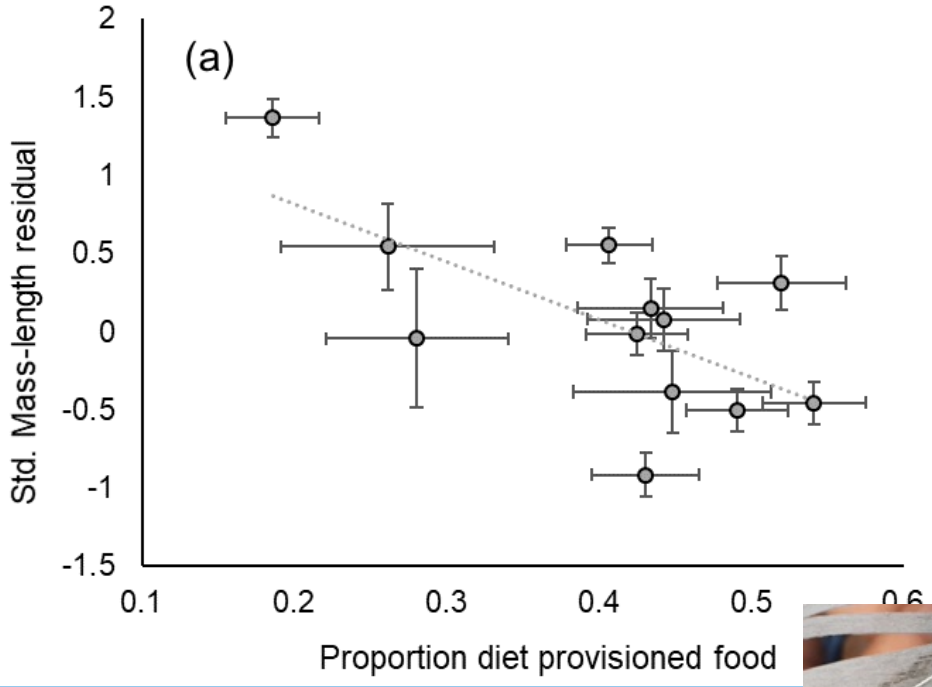
- Ibises that had isotopic signatures that indicated that they had **assimilated more provisioned food** were
  - **captured at more urban sites, used more urban habitat**
  - **assimilated less δ15N, had smaller dietary isotopic ellipses**

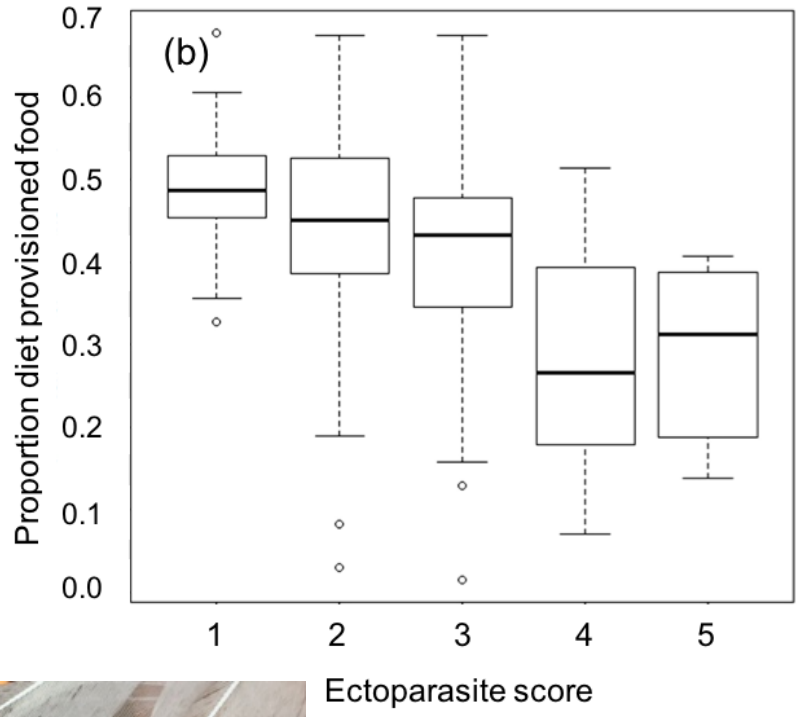




Influences on Diet—stable isotopes

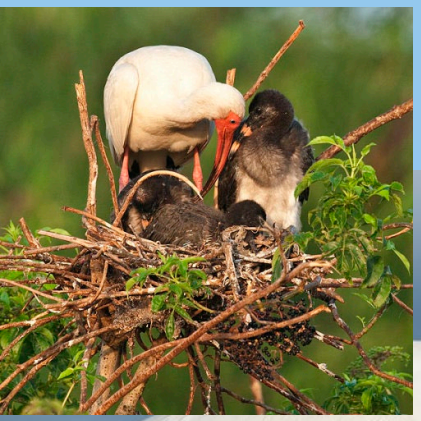
- Ibises that assimilated more provisioned food **had lower mass-length residuals**, BUT also **lower ectoparasite scores**





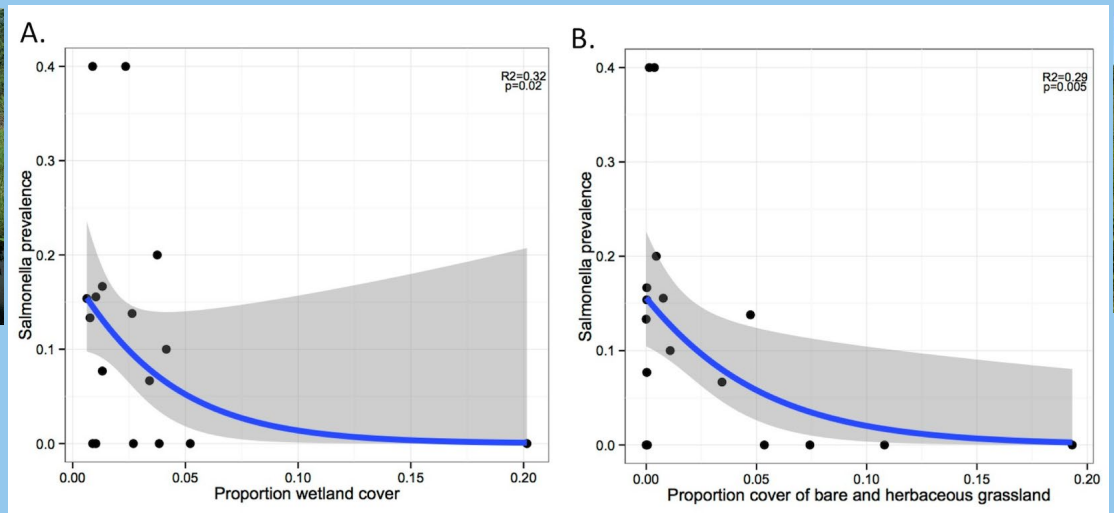
Salmonella spp as another indicator

- *Salmonella* prevalence related to landscape characteristics?
- Relationship between *Salmonella* from ibises and humans?
- Ibis disperse long distances to natural areas to breed; play role in dissemination of urban-associated salmonellae?



Salmonella spp mean prevalence 26%

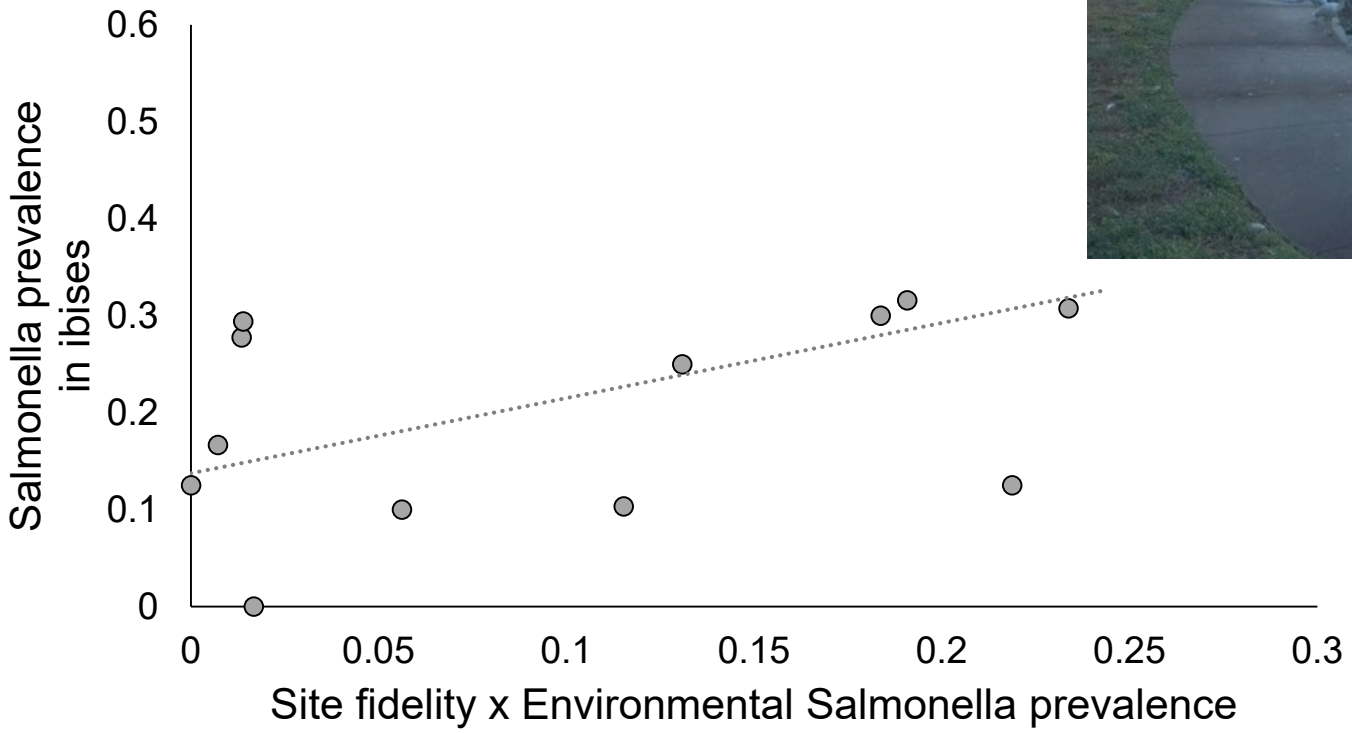
- Prevalence higher in juveniles, in summer
- Tested relationship between *Salmonella* prevalence and land cover type (2 km buffer) using generalized linear models with a binomial distribution



Hernandez et al, PLOSOne 2016

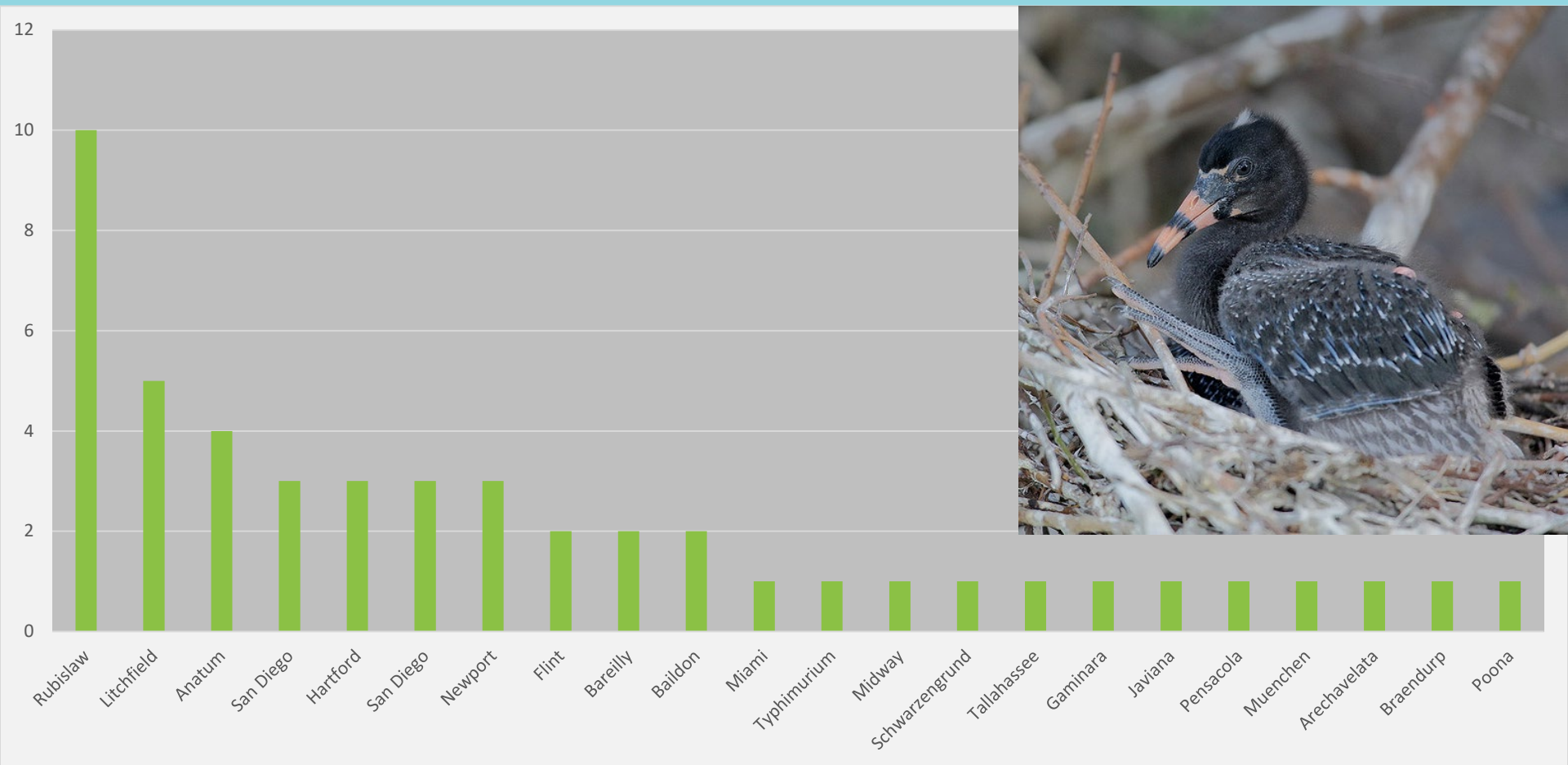
Salmonella prevalence and land use

- Site fidelity, and *Salmonella* environmental persistence



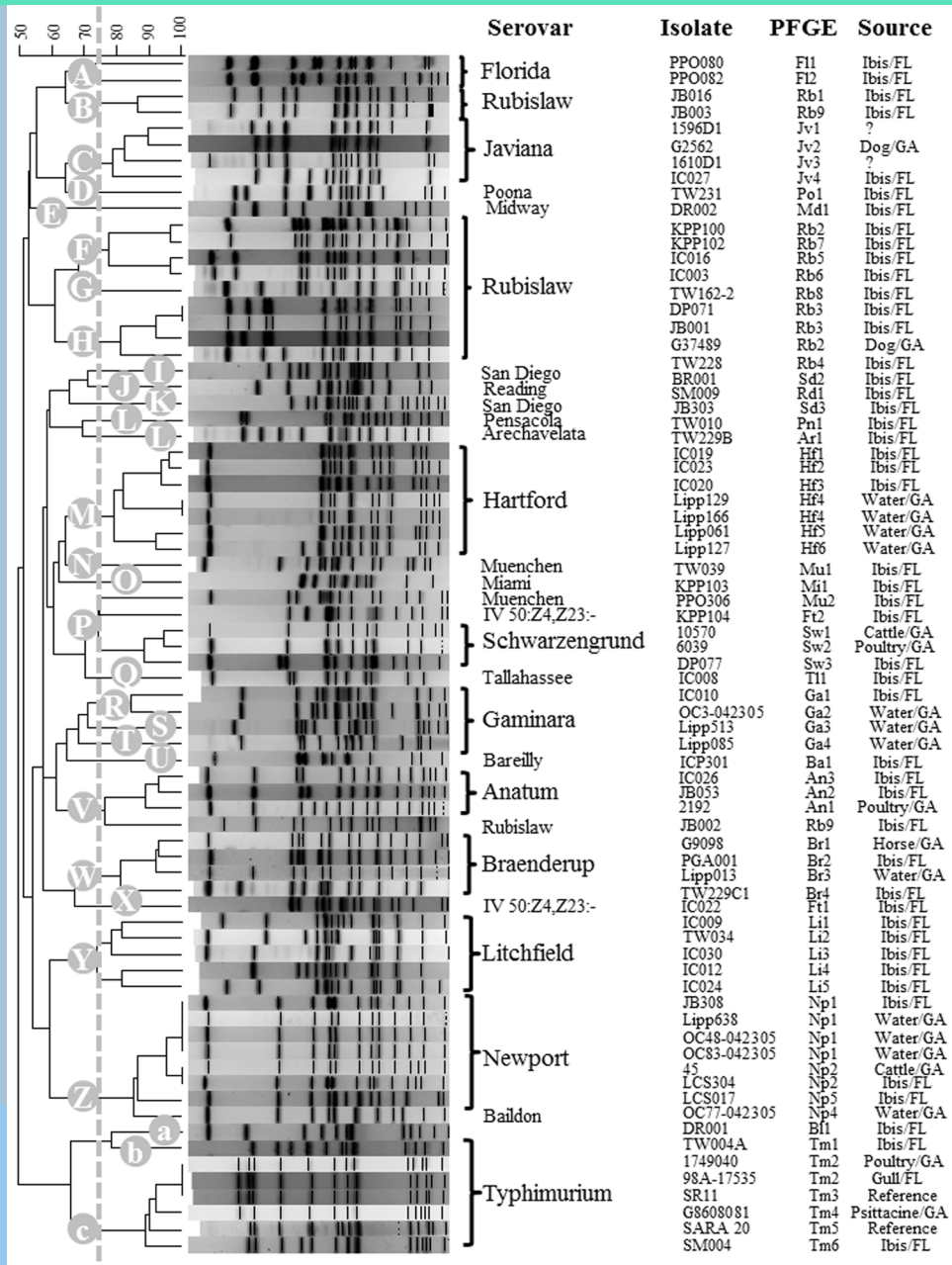
Salmonella serotypes and PFGE

- Significant serotype (n=24) and strain (43 PFGE types) diversity
  - Indicates that ibises are likely transiently infected
- 33% were serotypes in top 20 of human cases



Salmonella PFGE and PulseNet

- 58% (n=43) PFGE patterns **matched** human cases
- 20% of those had spatial/temporal match with human isolates in FL
- Negative relationship between Emergent Wetland and the *Salmonella* isolates from ibises that **matched** human cases in the PulseNet data base



How does the gastrointestinal microbiome **composition** and **alpha diversity** change with urbanization?

Are these shifts associated with ***Salmonella* prevalence**?

Age

More diverse with age

Accumulation over time

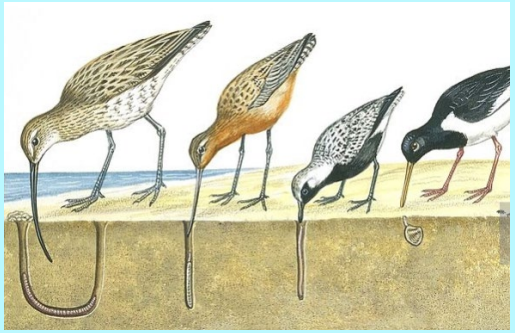
Diet

Macronutrient balance

Diversity

Anthropogenic food?

Habitat exposure

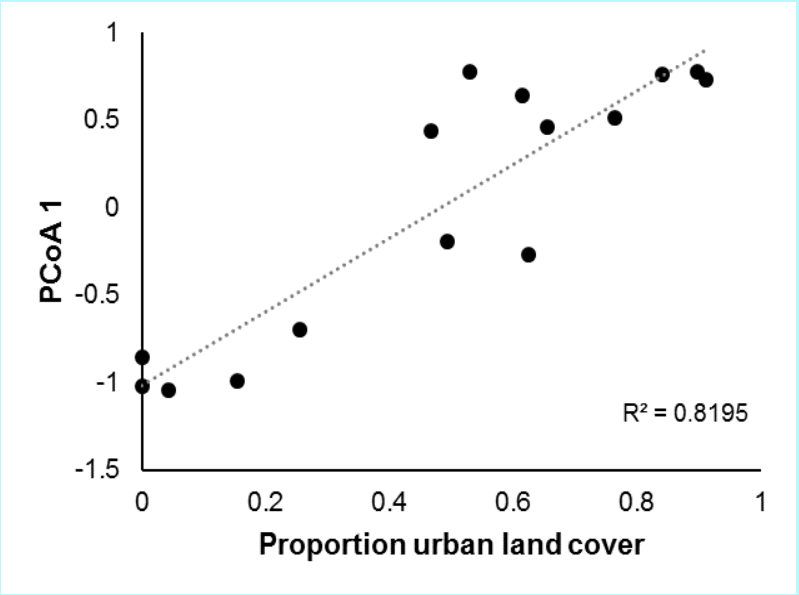


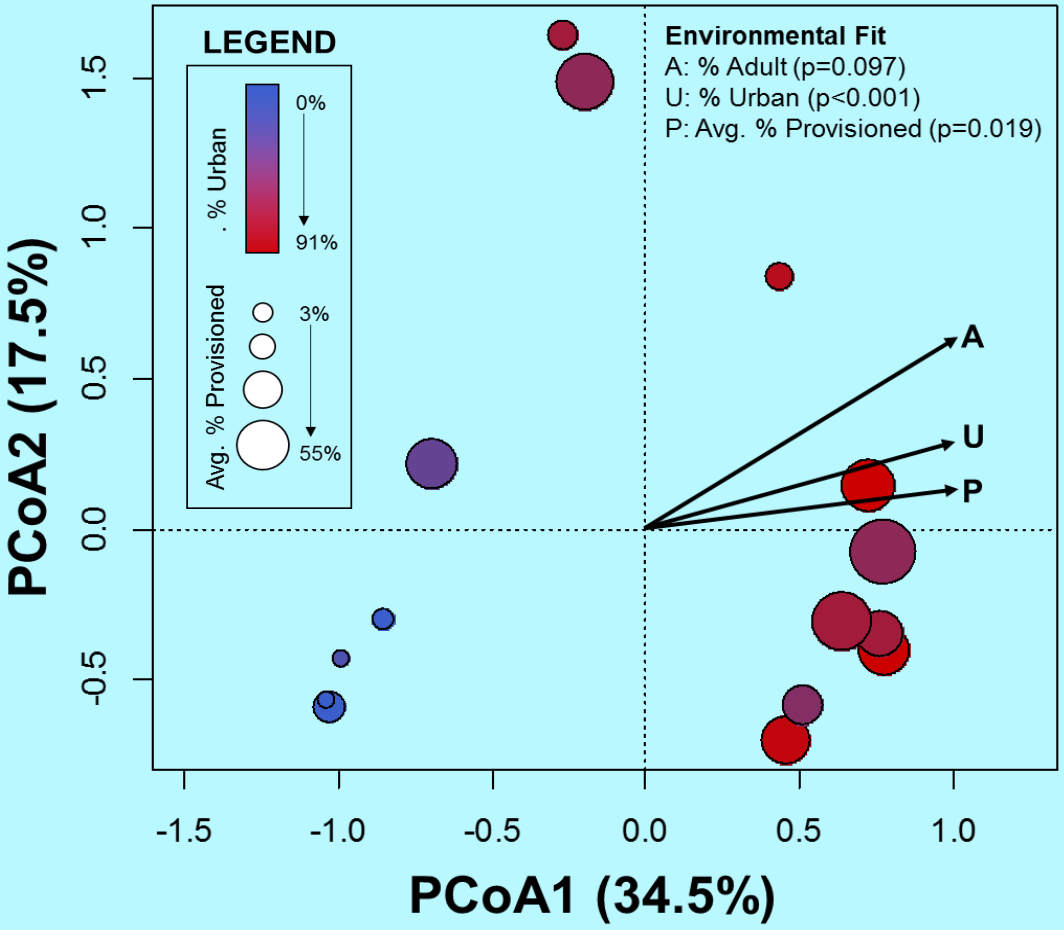
Acquired from substrates

Urban habitat use?

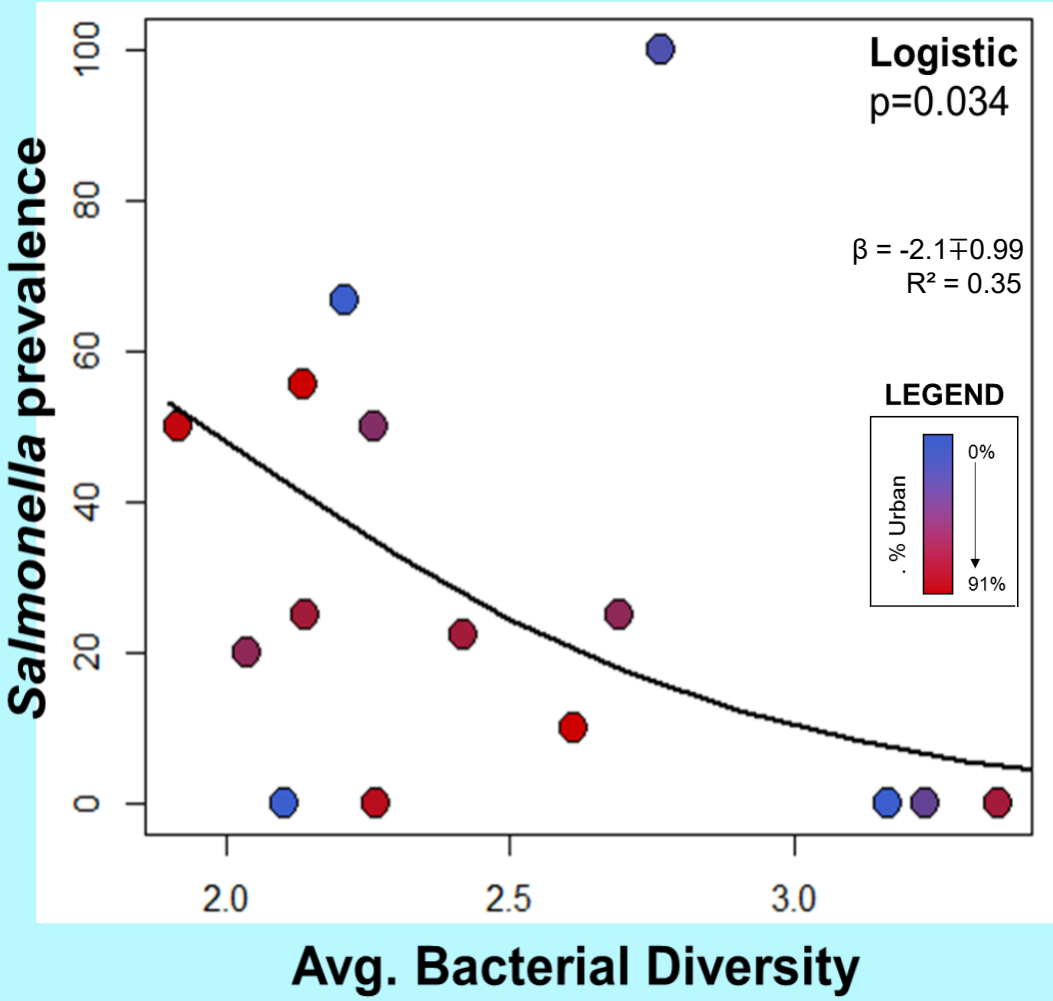
Changes in **Composition** with Urban Land Cover and Diet

- 96 samples from 15 capture sites



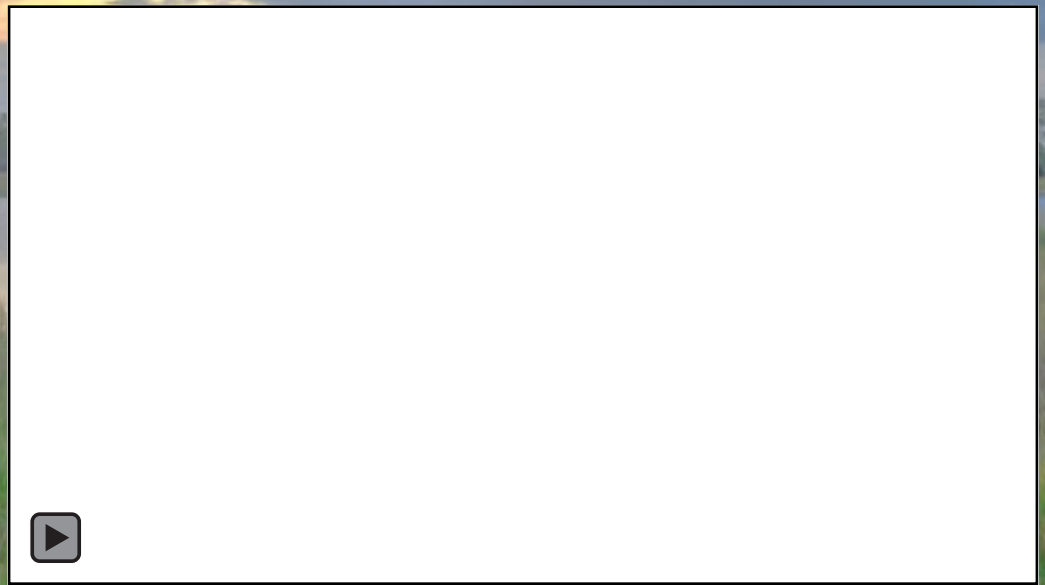


Urban sites had a different bacterial **composition**—that composition influenced diversity



SO…..What does it all mean?

- Ibis, like most urban wildlife, face **trade-offs for their ecology and health** when taking advantage of resources in urban habitats
  - Acquire more *Salmonella* and other pathogens
  - Eat more anthropogenic food, have less diverse GI microbiome
  - Are more sedentary
  - Evidence of a lower stress response, suggesting they are adapting to stressors without chronic stress
- Ultimately, the best measure would be **fitness** ……



Take Home Messages

- People will continue to actively/passively feed white ibises
  - Does that matter?
- Urban ibis is not the same as wildland ib
  - Does it matter?

In Depth › Nature Features › Environment and Nature

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Ibis invasion

By Abbie Thomas

Australian white ibis - or 'tip turkeys' as many call them - are a nuisance in cities, especially in the spring breeding season. But scientists fear they may become extinct as more pressure is put on their native and adopted environments.

Slideshow: Photo 1 of 9

Dressed for lunch: the white ibis is a familiar sight in Sydney's parks. (Ofer Levi)

You're sitting in the park, enjoying a sandwich during lunch when a long, probing beak comes slyly into view and deftly confiscates your pastrami on rye.

You've just been robbed by the Australian white ibis, Threskiornis molucca, and you wouldn't be the first victim.

Ibis are especially bold in spring as they forage for food to feed their hungry chicks. They're an imposing sight, a black and white bird standing almost three-quarters of a metre tall with a bald black head, long purplish legs and distinctive, down-curved beak.

In recent years, white ibis have become a common sight in the cities of east coast Australia, especially Wollongong, Sydney, the Gold Coast, Brisbane and Townsville.

Needing to be near water to breed, these ibis have taken over ponds and creeks in parks and established nesting colonies in palm trees near waterways. Here they can make themselves very unpopular, messing up the water and grass with their faeces, tipping over rubbish bins and cadging food from picnickers.

Recent headlines such as Pests not just in the central ibisness district (Sydney Morning Herald 15/11/07) and Birds of a feather stink together: our ibis scourge (The Glebe, 22/8/07), sum up the general community feeling towards these native birds.

But despite their ubiquity, the days of the ibis may be numbered. Although plentiful now, at least one Sydney researcher fears they may eventually become extinct, a victim both of their own success and of our scientific ignorance.

Population explosion

Ibis are good breeders, producing up to three clutches of three fledglings each season. If they lose a batch of eggs to a predator, they are able to lay more eggs in a week.

Where they do set up shop, numbers can become quite large, says ibis researcher Ursula Munro from the University of Technology Sydney. She estimates that one colony in Sydney's Centennial Park (now largely eradicated) had 1500 birds at the peak of the breeding season.

Richard Major from the Australian Museum and his colleague John Martin from the University of Wollongong do a fortnightly count of ibis in the Sydney region. The most recent puts the Sydney population at around 5000 (about

Thank You!
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