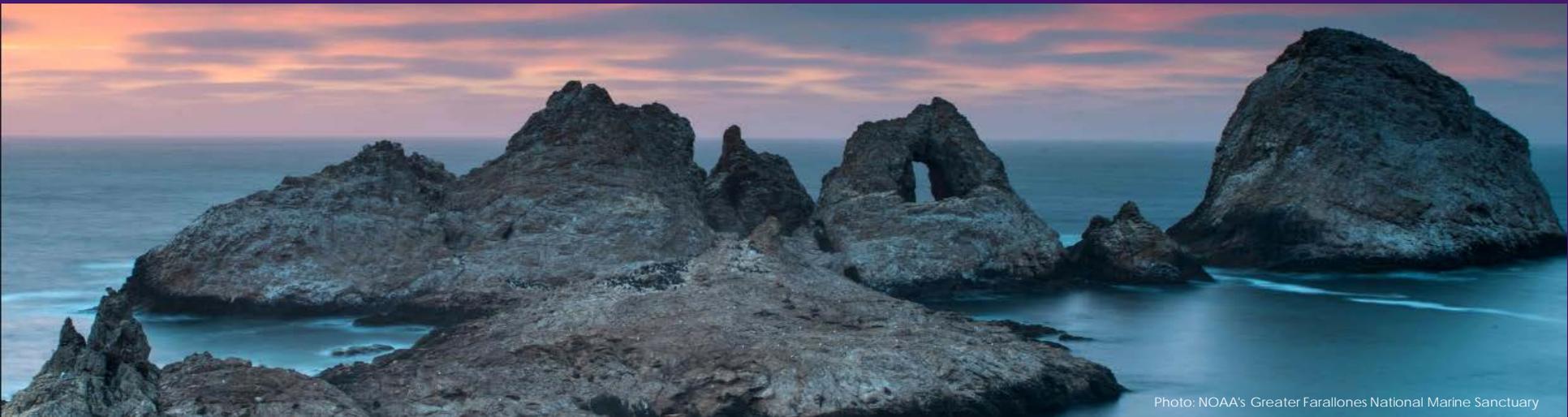


Identifying the Consumptive and Competitive Impacts of Introduced House Mice (*Mus musculus*) on a Seabird Island Ecosystem

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LSU

2018 ESA Annual Meeting, Tuesday, August 07, 2018 09:20 - 09:40 AM



[@MJPolito](https://twitter.com/MJPolito)

Background:

The Farallon Islands: California's Galapagos



(Photos from PRBO)

Background:

The Farallon Islands: California's Galapagos



Background:

Eurasian House Mouse (*Mus musculus*)

- Introduced in late 19th century
- Some of the highest recorded densities on any island
 - 60k mice on a 0.3 km² island



Background:

What are the ecosystem impacts of introduced mice on the Farallon Islands?



(SFGate.com)



Background:

What is Known?

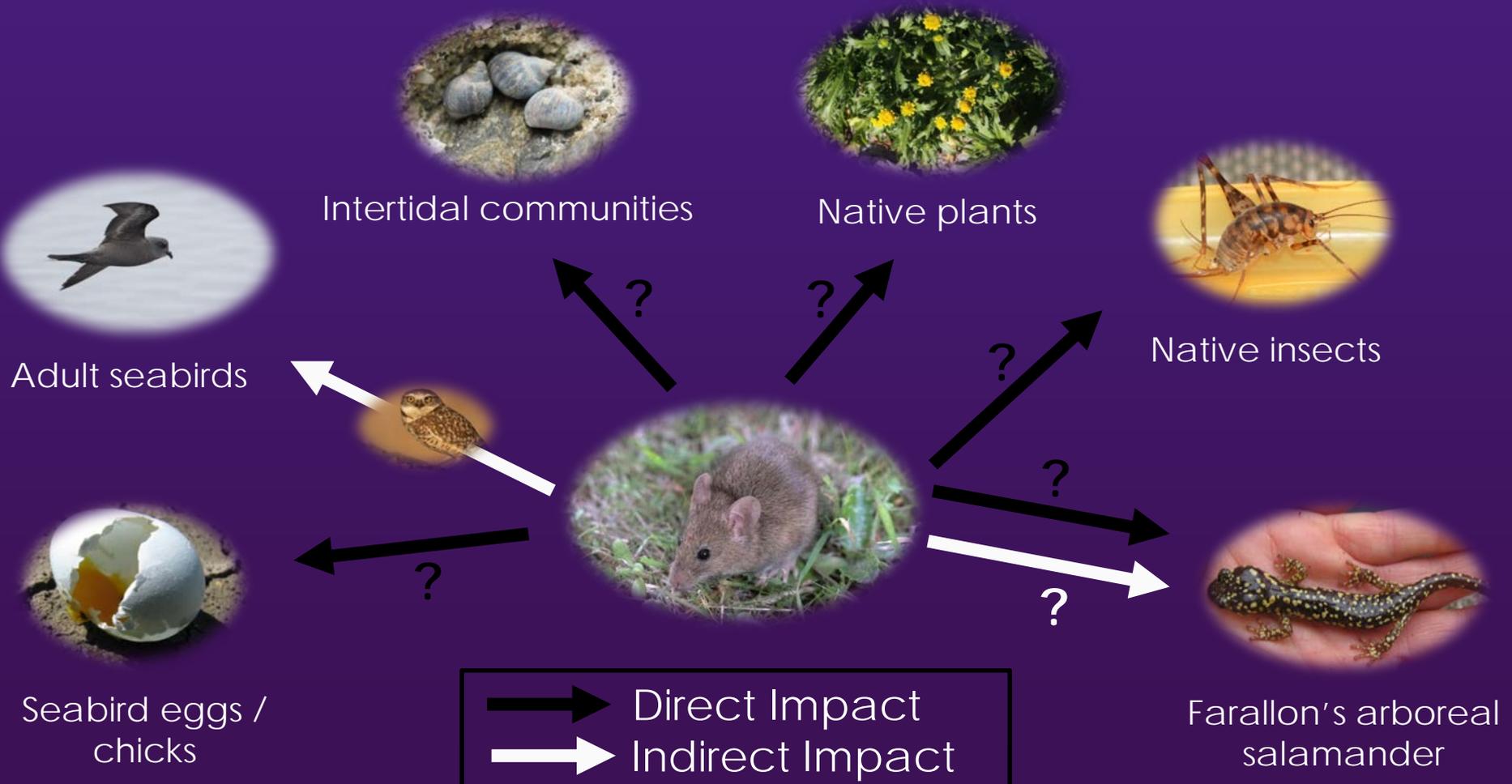
Mice indirectly impact adult seabirds via facilitated predation by Burrowing owls



Chandler, S. L., Tietz, J. R., Bradley, R. W., & Trulio, L. (2016). Burrowing Owl Diet at a Migratory Stopover Site and Wintering Ground on Southeast Farallon Island, California. *Journal of Raptor Research*, 50(4), 391-403.

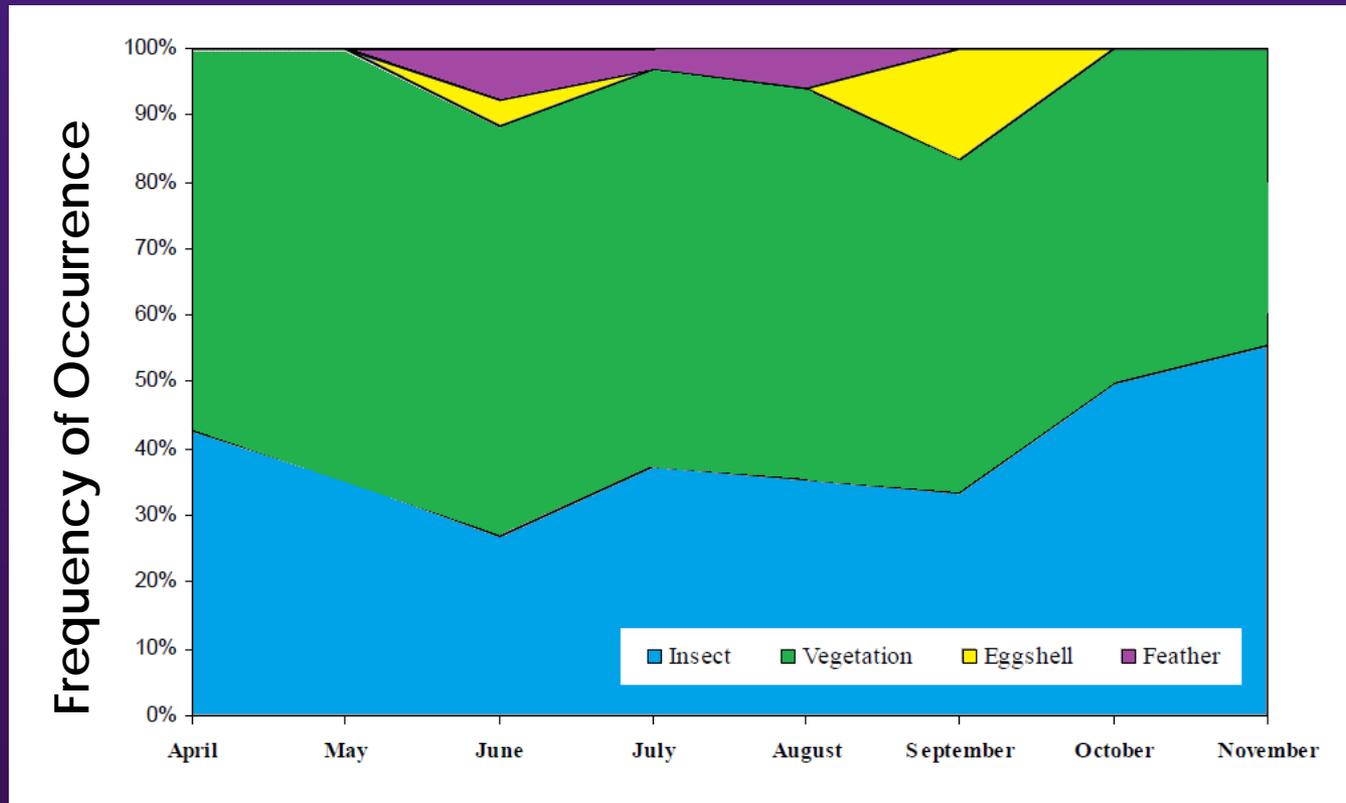
Background:

What is Unknown?



Background:

A prior dietary study focused on stomach contents



Jones, M.A. and R.T. Golightly. 2006. Annual variation in the diet of house mice (*Mus musculus*) on Southeast Farallon Island. Unpublished report. Department of Wildlife, Humboldt State University, Arcata, CA U.S.A



Objective:

Use stable isotope analysis (SIA) to quantify the diet & ecological niche of invasive house mice on the Farallon Islands

Tissue SIA provide an integrated record of diet that avoids many of the biases of stomach contents



Questions:

1. How does mouse abundance and resource availability change seasonally?
2. How does mouse diet respond to seasonal changes?
3. What are the direct (consumption) and indirect (competition) impacts of mice?

Methods:

Mouse abundance & resource availability

Seasonal trends:

- Mouse abundance (trapping success): 2001-2017
- Vegetation (precipitation): 2001-2017
- Insect density: 2014
- Seabird abundance (carcass counts): 2001-2017
- Salamander abundance: 2008-2017



Methods:

Mouse diets & ecological niche

Spring/Summer/Fall 2013

Tissue collection:

- Mouse liver & muscle
- Prey tissues: plants, seabird, salamander (tail clips), insects, intertidal sp. (snails)



Data analysis:

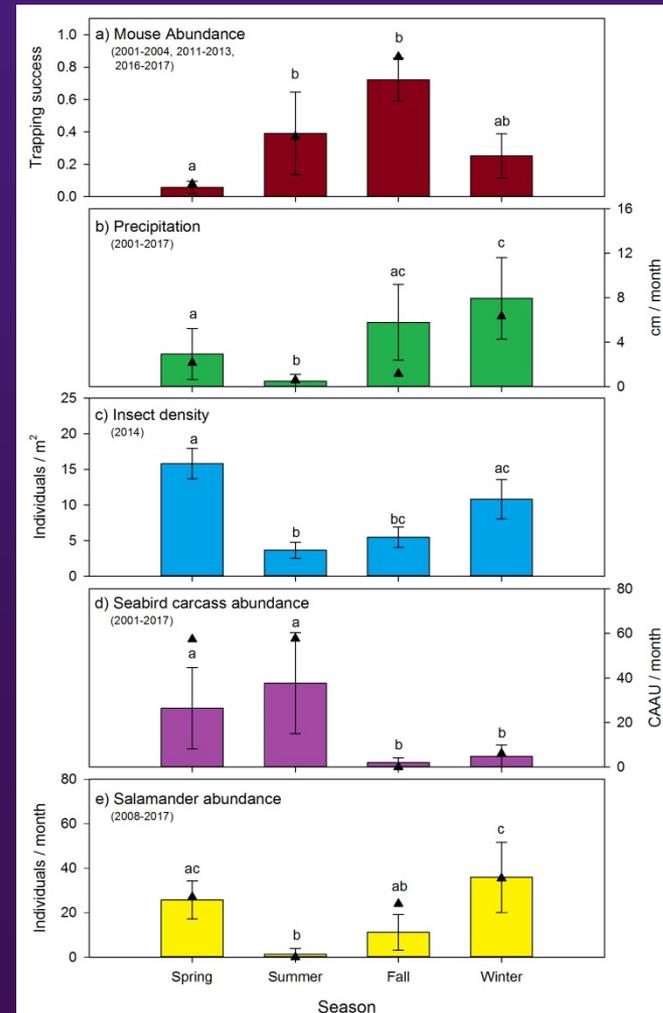
- $\delta^{13}\text{C}$ & $\delta^{15}\text{N}$
- Isotopic mixing model
(Parnell et al. 2010)
- Isotopic niche overlap
(Jackson et al. 2011)



Results:

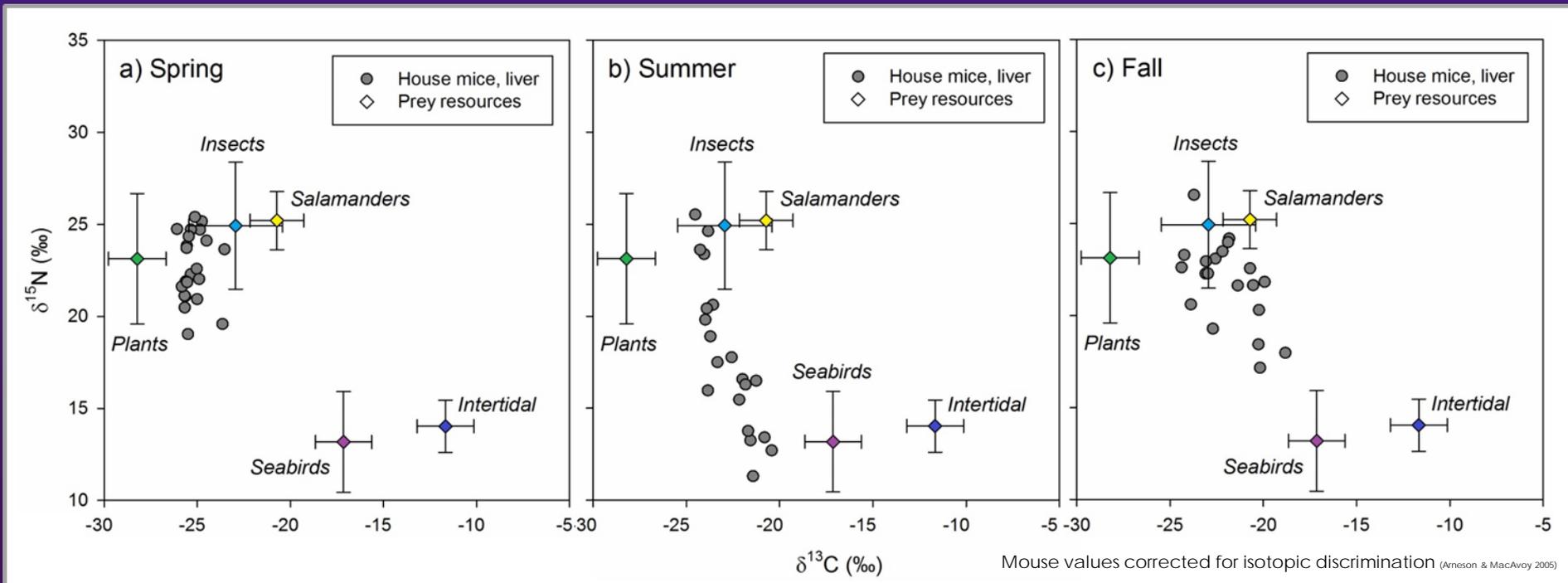
Mouse abundance & resource availability varies seasonally

- **Spring:** Mouse abundance is lowest. Insects and veg. cover are high following heavy rain in the fall/winter.
- **Summer:** Seabird abundance peaks. Salamander & insect abundances are lowest.
- **Fall:** Mouse abundance peaks. Veg. cover and seabird abundances are lowest.
- **Winter:** Mouse abundance crashes with heavy rain. Salamander abundance peaks.



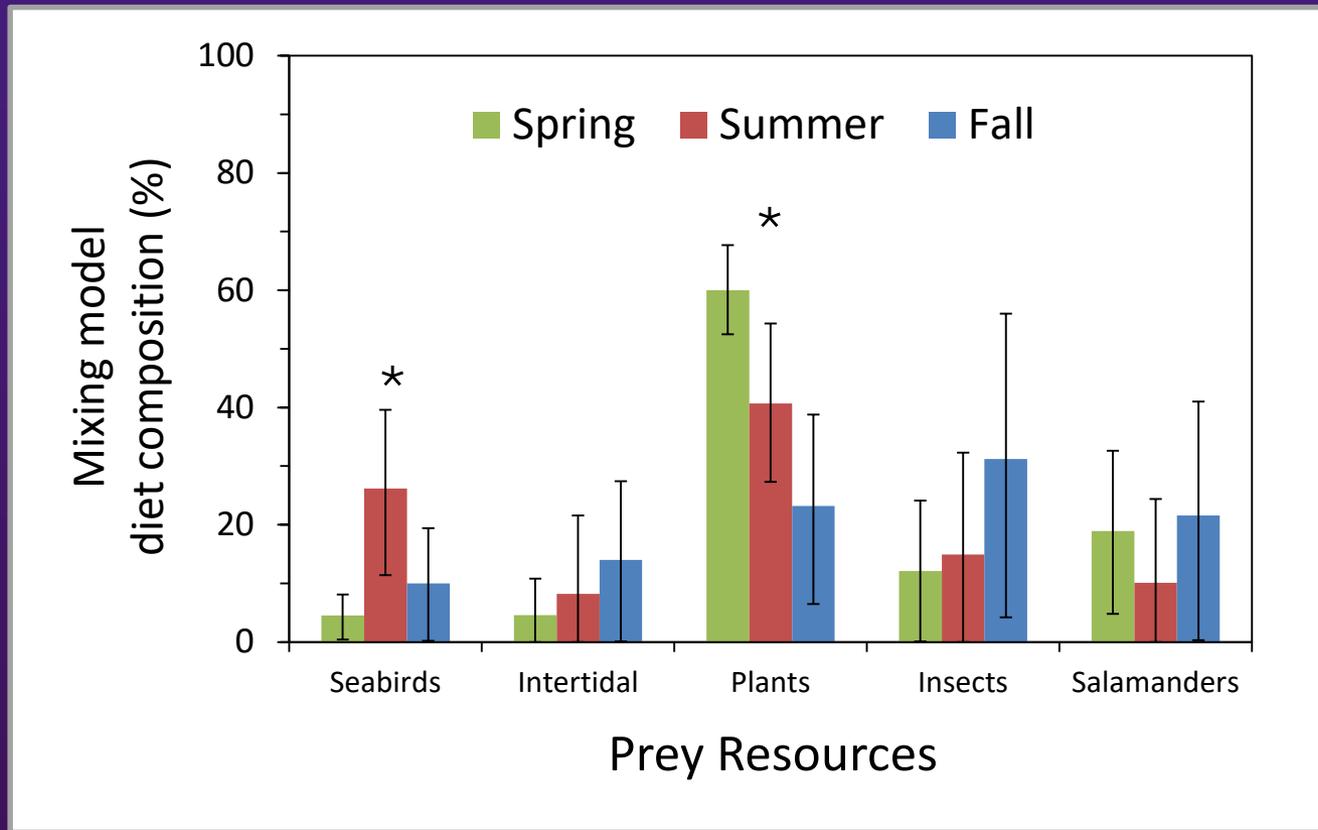
Results:

Mouse stable isotope values vary seasonally



- Mouse SIA values differ between seasons
($\delta^{13}\text{C}$: $F_{2,126} = 66.61$, $p < 0.001$; $\delta^{15}\text{N}$: $F_{2,126} = 26.60$, $p < 0.001$)
- Liver and muscle tissue SIA values strongly correlated
($\delta^{13}\text{C}$: $r = 0.908$, $p < 0.001$; $\delta^{15}\text{N}$: $r = 0.946$, $p < 0.001$)

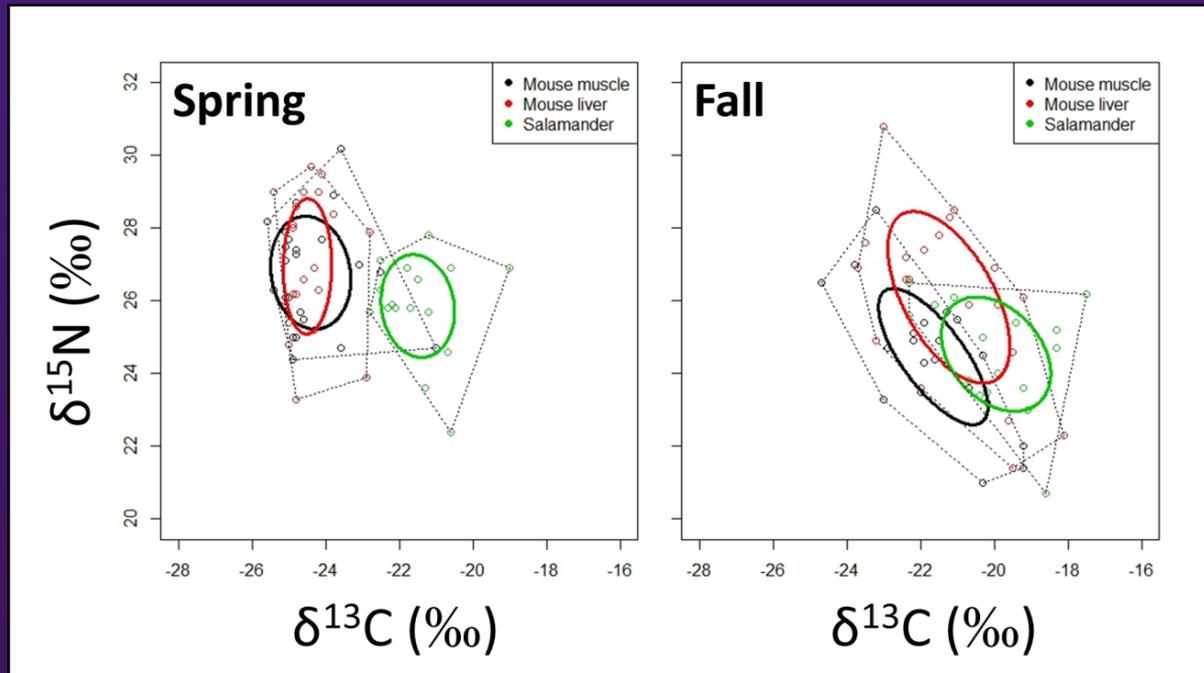
Mouse diets shift seasonally



- Plants are always important and peak in diets during **Spring**
- Seabirds peak in diets during **Summer**
- Insects possibly peak in diets during **Fall**

Results:

Isotopic niches of mice & salamanders overlap in the Fall but not Spring

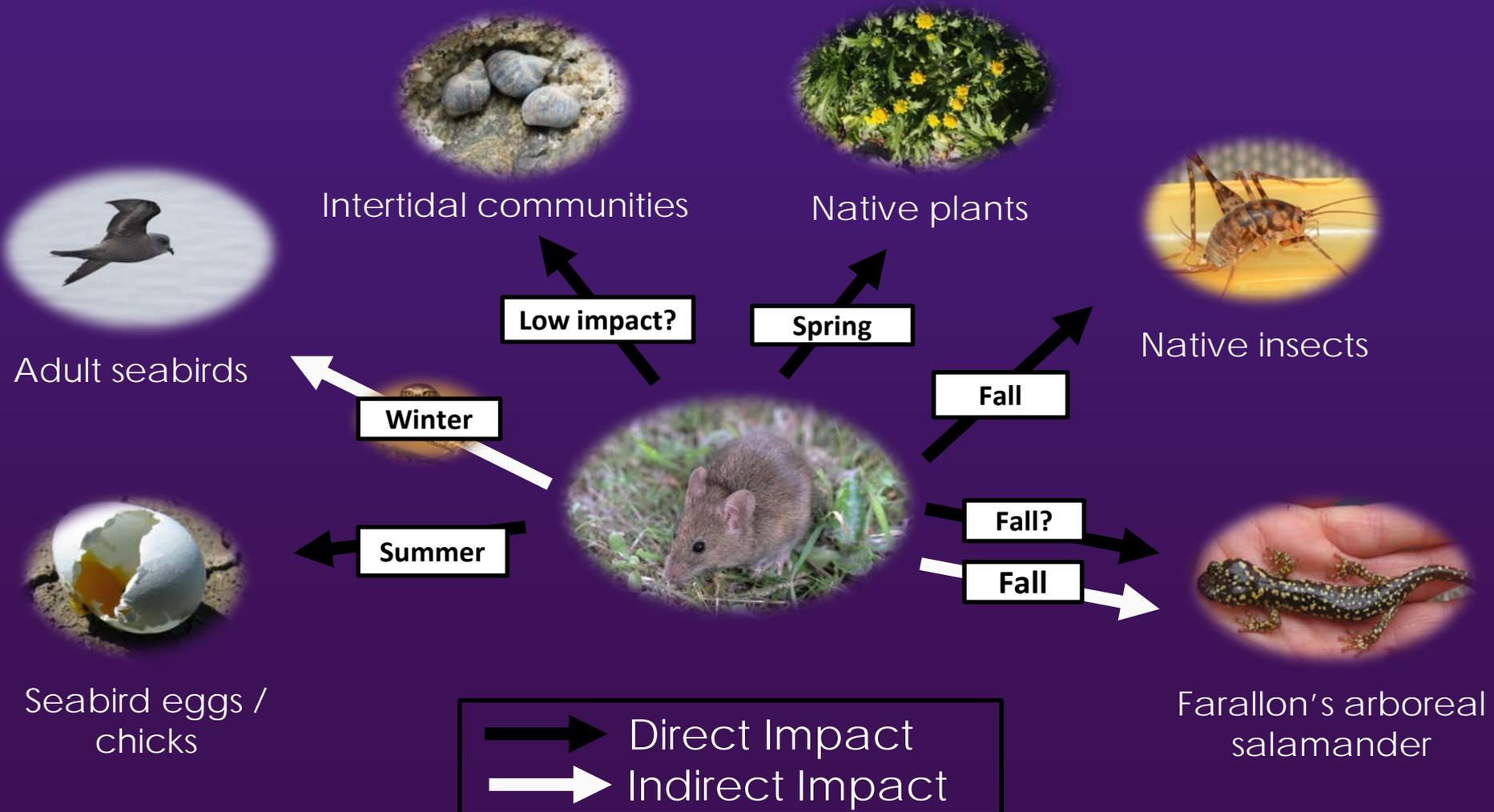


Mice & salamanders both consume insects:

Highest isotopic niche overlap in the Fall when mouse populations peak and other food sources are low

Summary:

Mouse diets (& impacts) shift with seasonal changes in resource availability



Conclusions:

Mice have consumptive & likely competitive impacts on the Farallon Islands ecosystem

- Seabirds increase in mouse diet during seabird breeding season (predation or scavenging?)
- Mice may compete with salamanders for insect prey, direct predation is possible as well
- Uncertainty remains
 - Relative vs. absolute abundance
 - Winter diets?
 - Native vs. non-native plants in diets?

Conclusions:

A final thought:

How will community members respond if mice are eradicated?

Feds Propose Showering Farallon Islands With Poison To Kill Mice And Save Ecosystem

The Huffington Post | By Lydia O'Connor

Posted: 08/20/2013 1:54 pm EDT | Updated: 08/20/2013 4:07 pm EDT

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Questions?

Thank you!

- ESA Organizing Committee
- US Fish & Wildlife Service
- Farallon Islands National Wildlife Refuge

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The logo for Louisiana State University (LSU), consisting of the letters "LSU" in a bold, yellow, sans-serif font.