

Variation in Carotenoid Profiles in Relation to Life History Strategy in Urban House Finches

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Introduction

- Adaptation to novel conditions produced by urban ecosystems involves a trade-off between resources dedicated to reproduction and survival.
- We studied house finches (*Haemorrhous mexicanus*), a popular model of sexual selection¹, to explore how urban birds allocate carotenoid resources.
- Carotenoids were measured as the resource, because they can only be acquired from diet and are used for both reproduction (e.g. sexually attractive coloration) and self-maintenance (e.g. as antioxidants, immunomodulators)²⁻⁴.
- We expected to find variation in carotenoid profiles of individuals that correspond with functions of carotenoids at different life history stages (e.g. high accumulation in gonads during breeding and in somatic tissues during molt).

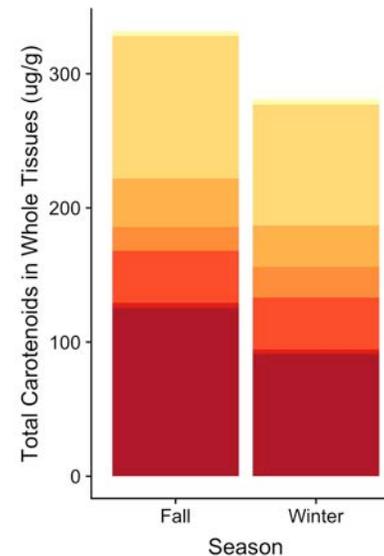
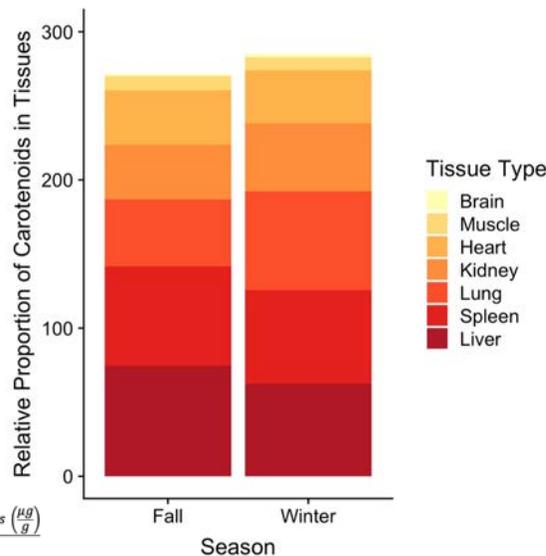
Methods

- We measured tissue carotenoid profiles from wild caught finches on campus (Tempe, AZ) across seasons (fall, winter, spring) and sexes (female, male) using high-performance liquid chromatography (HPLC).

$$\text{Relative Proportion} = \frac{\text{Total Tissue Carotenoids } \left(\frac{\mu\text{g}}{\text{g}}\right) / \text{Total Body Carotenoids } \left(\frac{\mu\text{g}}{\text{g}}\right)}{\text{Tissue Mass } (g) / \text{Total Body Mass } (g)}$$

We found that urban male house finches accumulated **more carotenoids** in tissues during **fall** than winter, and this was mainly due to **liver** carotenoids.

This suggests that **molting males** either **eat or absorb more carotenoids** and most carotenoids accumulate in the liver.



Results

- We present data from a subset of 7 tissues in male birds caught during October 2017 (n = 5) and January 2018 (n = 5).
- Additional findings:
 - Muscle has a relatively small proportion of carotenoids in measured tissues, whereas the spleen has a relatively large proportion of carotenoids.
 - Brain has very little carotenoid accumulation in both seasons.

Implications & Future Directions

- Our results suggest that liver carotenoid accumulation is prioritized over accumulation in other tissues in fall compared to winter, and that this is more likely due to changes in carotenoid intake (i.e., diet) or physiological acquisition (i.e., intestinal absorption) rather than re-allocation from other tissues.
- Urban male house finches could be prioritizing carotenoid accumulation for development of carotenoid-based plumage coloration over other carotenoid functions.
- I will finish analyzing remaining tissues from October 2017, January 2018, April 2018, September 2018, and January 2019.
- Then I will analyze carotenoid profiles across seasons, sexes, and a gradient of carotenoid-based plumage coloration, using multi-level and compositional data analysis techniques, to determine if there is evidence of context-dependent tissue-specific trade-offs in urban house finches.

References

[1] Hill and McGraw. 2006. Harvard University Press. [2] Chew and Park. 2004. J Nutri 134: 257S-261S. [3] Demmig-Adams and Adams. 2013. Nutrients 5: 2483-2501. [4] Blount and McGraw. 2008. Carotenoids 213:236.

Acknowledgements

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