Identifying the geographic origins of red-winged blackbirds damaging ND sunflower fields and the physiological mechanisms driving this behavior

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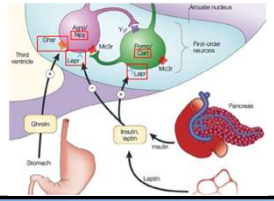
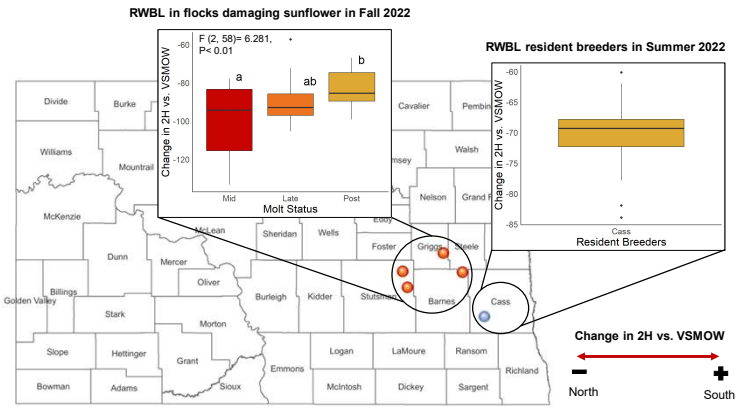
Background

- Red-winged blackbirds (RWBL) cause major damage to ND sunflower fields each year.
- RWBL use the sunflower seeds to build fat stores prior to their fall migration.
- RWBL flocks responsible for damage may contain migrants on stop-over from further north. However, it is unclear when these migrants arrive.
- Hydrogen isotope analysis can help determine whether migrants are present and when.
- Neuroendocrine signals driving the premigratory increase in feeding behavior are largely unknown, but are likely related to the arcuate nucleus, from which we tested four factors (NPY, GHSR, CART, LEPR)



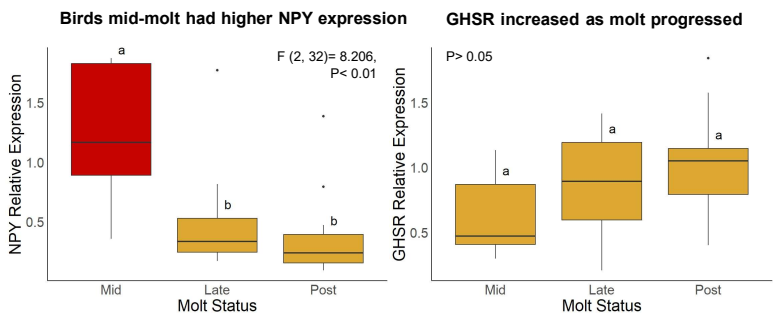
Results

Determining Migrant vs. Resident RWBL

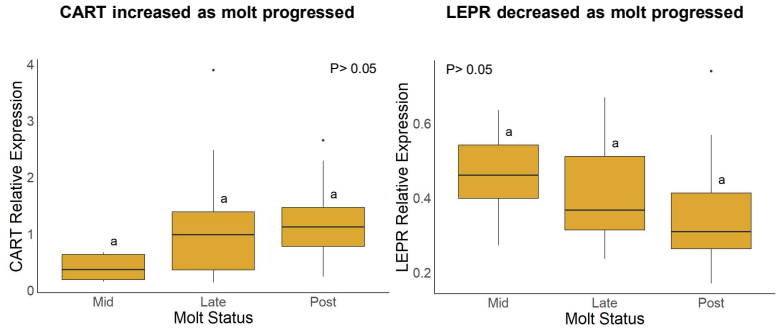


Neuroendocrine Signals

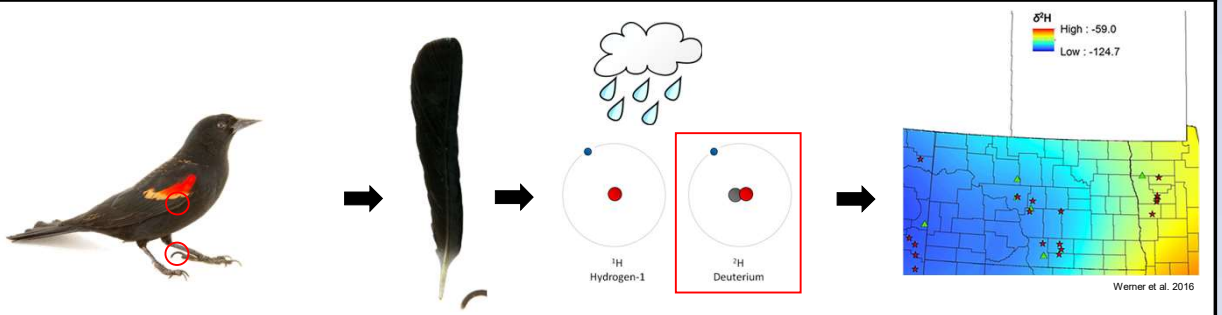
Hunger-inducing Genes



Hunger-suppressing Genes

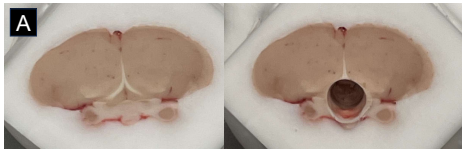


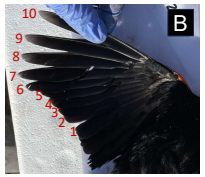
Using Hydrogen Isotopes to Determine the Origins of RWBLs



Methods

- We collected feather and claw tissue from RWBL resident breeders in summer of 2022 and brain, claw, and feather tissue from RWBL damaging ND sunflower from Sept. to Oct. of 2022
- We determined molt status by which primary (P) feather(s) were molted (see picture B) and categorized birds as early (P2-P4), mid (P5-P7), late (P8-P10), or post molt.
- We collected hypothalamic tissue punches from brain samples (see pictures A).
- We extracted RNA and quantified expression of NPY, GHSR, CART, and LEPR using qPCR.
- We analyzed feather and claw tissue for isotope analysis.





Summary and Discussion

- δ2H decreased going west and north, following the trend reported in a previous evaluation of RWBL in ND (Werner et al. 2016).
- The δ2H range for RWBL damaging sunflower in the fall was greater than that of RWBL resident breeders. This greater range and the δ2H values as small as -133 indicate that migrant birds on stop-over were part of flocks damaging sunflower fields.
- Potential migrants were mostly in the earlier molting stages, which could mean they begin migration before molt is complete.
- NPY decreased with molt progression, potentially due to the downregulation from increasing fat stores.
- Although only NPY was significantly different in earlier stages of molt vs. later stages, the trends observed suggest that RWBL may become more sensitive to ghrelin (GHSR) and less sensitive to leptin (LEPR) as molt progresses.

Red-winged blackbirds will often feed on oilseed sunflowers to build their lipid storage, causing damage to sunflower fields (as seen in the photo to the right).

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