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## Feather Reflectance Predicts Reproductive Success in Female Prothonotary Warblers

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# FEATHER REFLECTANCE PREDICTS REPRODUCTIVE SUCCESS IN FEMALE PROTHONOTARY WARBLERS



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## BACKGROUND

➤ A Prothonotary Warbler (PROW) is a migratory songbird that breeds in the Eastern US and overwinters in Central and S. America.

➤ They are sexually dimorphic, though both exhibit bright yellow feathers.

Female



[http://frodejacobsenphoto.blogspot.com/2010\\_05\\_01\\_archive.html](http://frodejacobsenphoto.blogspot.com/2010_05_01_archive.html)

Male



<http://www.flickr.com/photos/aspariks306/2492474179/>

➤ PROWs obtain their yellow feathers from carotenoids. a pigment obtained from their diet., and therefore indicates individual quality.

➤ Sexual selection: Research with other species has shown that females can assess mate quality using feather ornaments. Much less research has assessed the role of female feather ornaments.

## OBJECTIVES

➤ We investigated whether female Prothonotary Warbler feathers reflectance was correlated reproductive success.

➤ We predicted that more ornamented females would yield more offspring than females whose feathers are duller.

## RESULTS

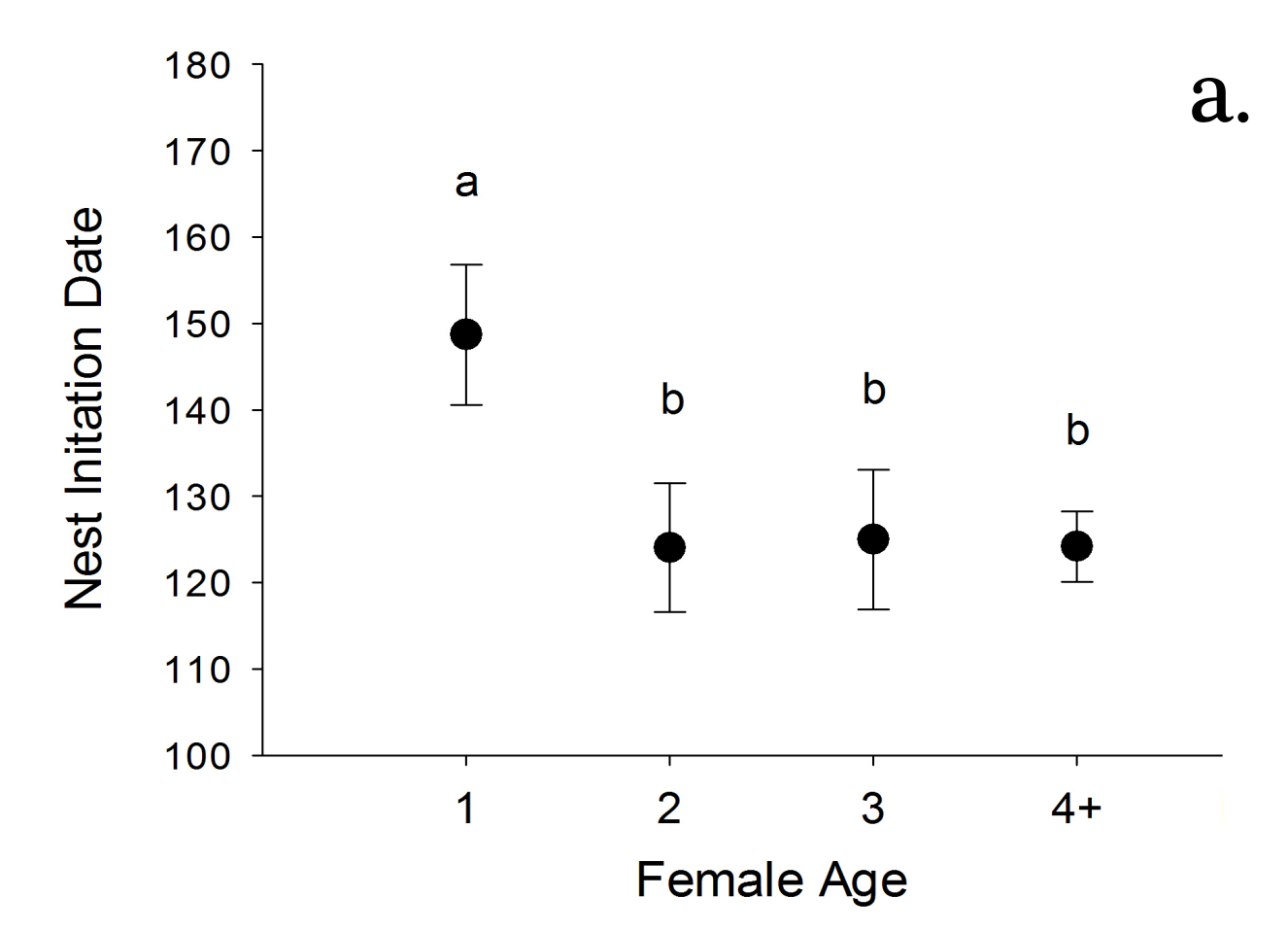
➤ We collected 127 feather samples from 95 different females, 2010: 17, 2011: 27, 2012: 19, and 2013: 63

Table 1. Parameter Influences on Number of Nestlings Fledged

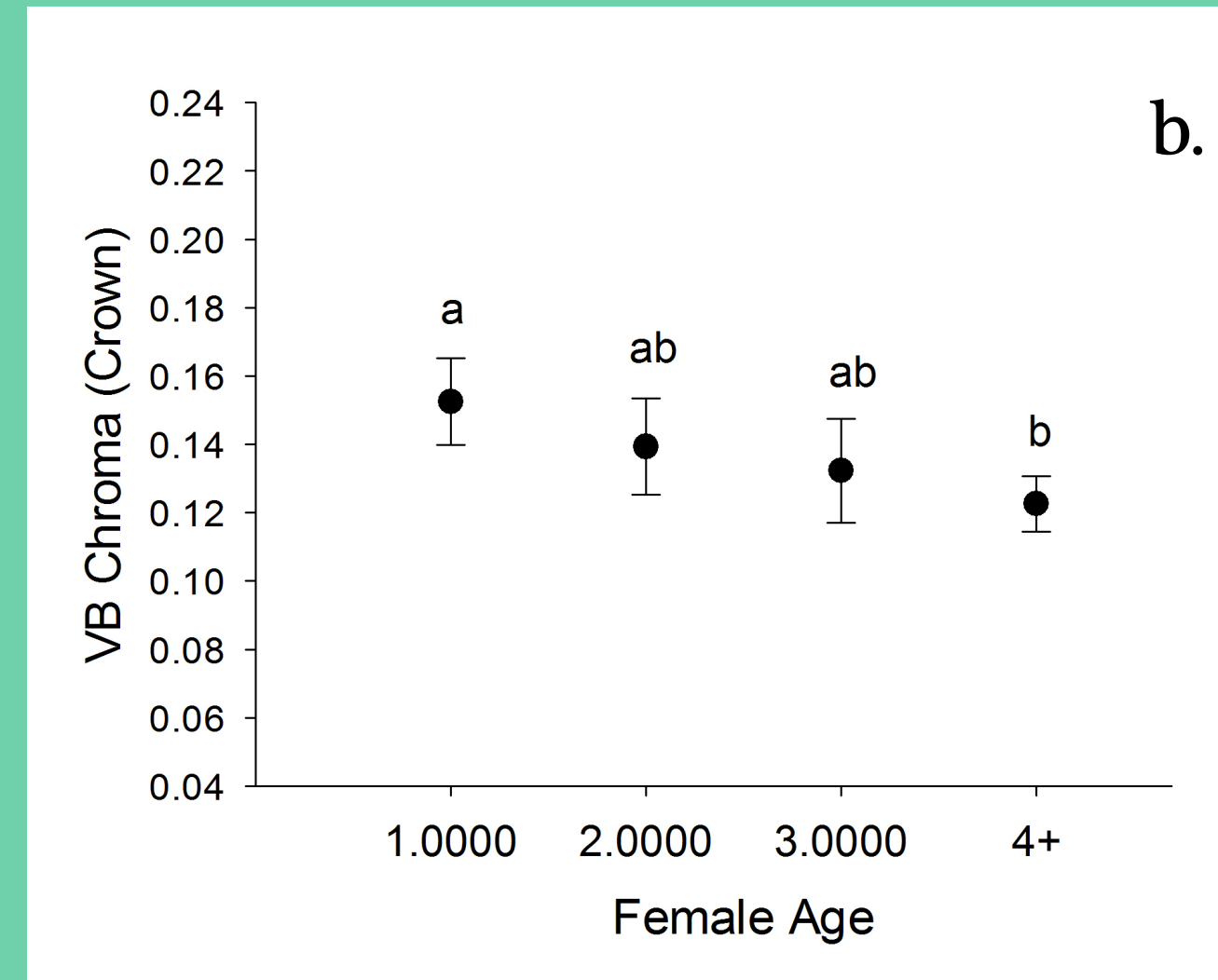
Parameter	Parameter Estimate	P Value	R Squared
Age	0.3859	0.00041	0.0665
Start Date	-0.0809	<.0001	0.3581
Breast:			
VB Chroma	-7.8187	0.03014	0.0087
Yellow Intensity	0.0326	0.4181	0.0054
Crown:			
VB Chroma	-27.3526	<.0001	0.1246
Yellow Intensity	0.00035	0.9961	.989E-07

- VB Chroma is more correlated with the number of young fledged than Yellow Intensity
- Crown feathers show the stronger relationship

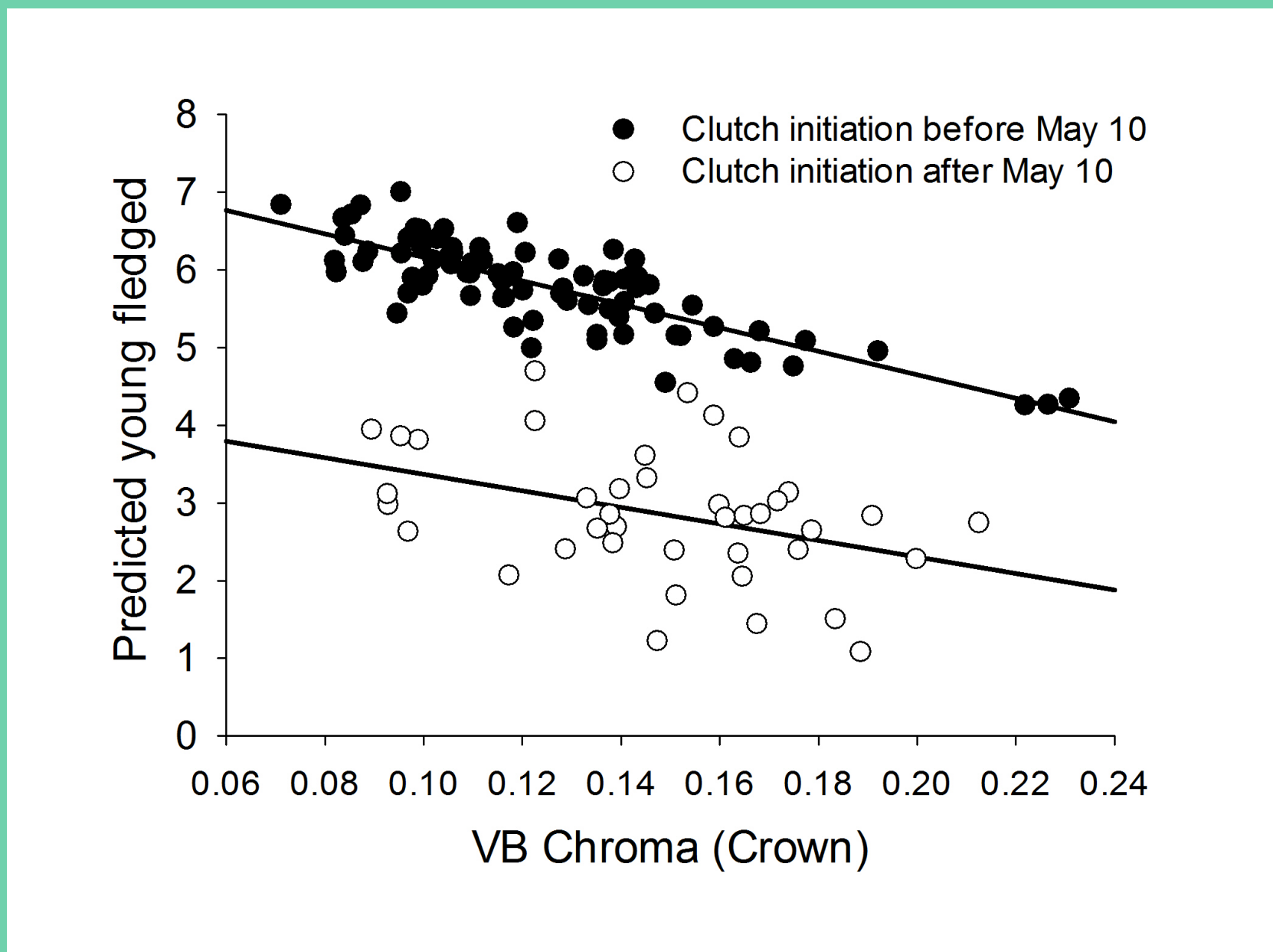
- First year females have a significantly later nest initiation dates than older females (P<0.0001). Julian date 100 = April 10.



- Because these are correlated and because nest initiation explains more of the variation in reproductive success than age, we included nest initiation date (and not age) in a model predicting reproductive success.



- VB Chroma (inversely related to carotenoid content) of feathers is relation to female age.
- Older females have higher carotenoid content in their crown feathers (P=0.002).



- Predicted values for the number of young fledged from a model including both nest initiation date (P<0.0001) and VB Chroma (P=0.02) as predictor terms (model R<sup>2</sup> = 0.37).
- This relationship is stronger in earlier breeders.

## CONCLUSIONS

➤ Females with higher feather carotenoid content fledged more young; feathers may indicate reproductive potential to mates

➤ Nest initiation date and age are both predictors of female reproductive success in that year.

➤ The relationship between VBC and the number of young fledged is stronger in early breeding females. This could mean that selection pressures are highest to choose the best mate earlier in the season.

➤ Because female feathers correlate with reproductive success, this indicates that sexual selection could be occurring in female PROWs. Males can select females based on a combination of her arrival date and feather characteristics.

## ACKNOWLEDGEMENTS

Thanks to all the volunteers on the PROW project. Thanks especially to Anna Tucker for guiding me through much of my research and field work, to Nicholas Moy for helping collect feather data, to the **HSURP** program for offering me this amazing opportunity, and to Dr. Lesley Bulluck for mentoring me and providing priceless guidance and input on my project.

## METHODS

➤ We conducted our study at Deep Bottom Park approx. 21 km southeast of Richmond, VA, during three breeding seasons (May – June, 2010-2013).

➤ We captured females at nest boxes and collected crown and breast feathers after banding and aging them. We also recorded reproductive data such as nest initiation date, numbers of eggs laid and young fledged.

Feathers were mounted on black cardstock.



Feather reflectance was measured using JAZ-PX spectrometer with a pulsed-xenon light source (Ocean Optics).

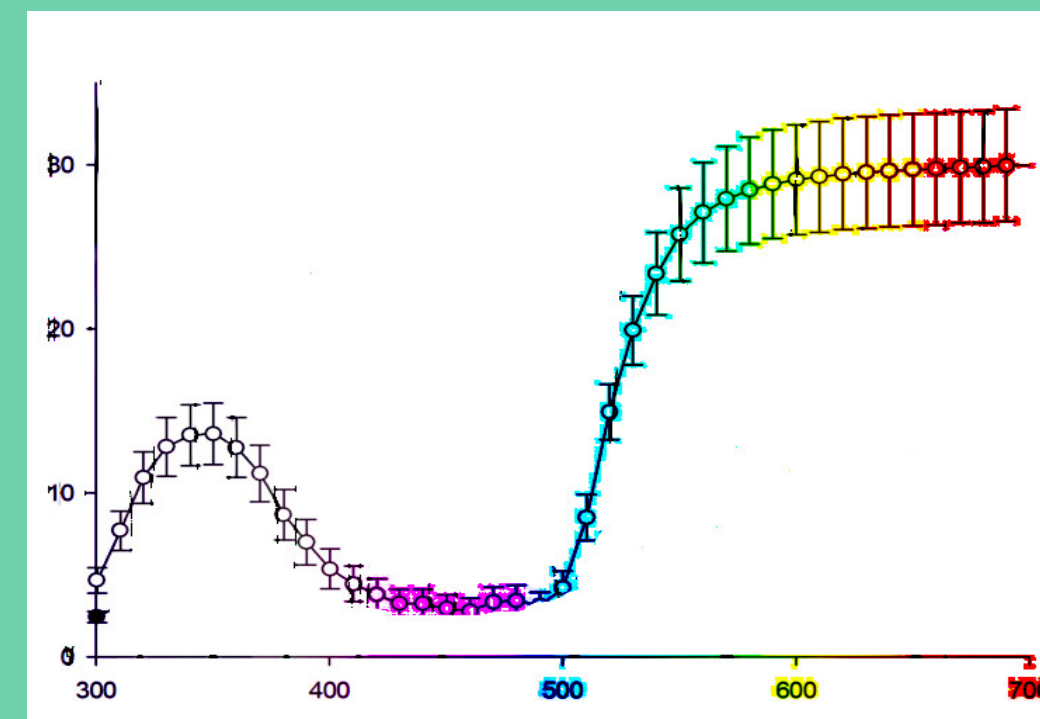


Fig 1. Typical reflectance spectra from a Prothonotary Warbler breast feather.

➤ **VB Chroma**, is considered a good measure of feather carotenoid content because carotenoids absorb light in the VB region. It is calculated:

$$R_{400-500}/R_{525-700}$$

**Yellow Intensity** is used to quantify yellowness and is calculated:

$$\text{Maximum } R_{570-700}$$