Quantifying Black Tern Feather Color Variation Using Reflectance Spectrometry
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Question
Is There Significant Sexual Dimorphism in Black Tern Feather Color?

Introduction
• Unusual among terns for mate competition and color
• Breeding adults have black plumage on head and chest
• Little to no observable sexual dimorphism to naked eye
(Heath et al. 2020)

Is there quantitative plumage color variation, does it vary between males and females, and is plumage color used in mate choice?

Methods
Fieldwork:
• Birds captured and banded, feathers plucked from chest (male N = 38, female N = 27)
• Birds banded while breeding in marshes in Wisconsin

Lab Work/Analyses:
• 10 feathers from each bird mounted on black construction paper
• Color of mounted feathers measured using reflectance spectrometry
• Three readings from each sample, reflectance curves averaged
• Reflectance curves processed with a model of the avian visual system
• Quantified hue (color), saturation (intensity), and luminance (brightness) as perceived by the birds
• Statistical analyses: t-test comparing color variables between males and females; linear regression comparing color variables between male and female within a mated pair

Figure 1: Reflectance curves comparing the color of males and females (solid line: average, shaded area: one standard deviation).

Figure 2: Boxplot comparing luminance of males and females.

Figure 3: Linear regression comparing male and female saturation within a mated pair (shaded area: 95% CI).

Results
• Male and female reflectance curves were similar shapes, but males tended to reflect more light than females (Figure 1).
• Female luminance was significantly higher than male luminance (t = 3.0, df = 43.3, p = 0.01, Figure 2).
• There was a significant negative relationship between male and female saturation within a mated pair (Est = -0.85, t = -2.59, p = 0.03, Figure 3).

Conclusions/Future Work
Conclusions:
• Males and females have subtle but quantitatively different plumage color.
• Males are significantly darker than females, as perceived by the birds.
• There may be disassortative mating, whereby pairs form based on differences in saturation.

Future Work:
• Explore the effect of age on plumage color.
• Explore associations between plumage color and morphology.
• Increase sample size.

References