Sexual Coloration and Performance Capacity in Male Side-blotched Lizards (Uta stansburiana)

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Abstract

In many species of lizards, males fight over territories that allow them access to females, and during these interactions males will display sexual signals to competing individuals. Social signals such as coloration, are seemingly favored by sexual selection as they are thought to provide information about individual quality, such as performance capacity. Side-blotched Lizards, Uta stansburiana, exhibit throat color polymorphism (i.e. orange, yellow, and blue badges), which signal alternative life history strategies to conspecifics. Although morphological, behavioral and physiological characteristics have been shown to differ across male morphs, color variation within each morph has not been compared to aspects of individual quality. In wild-caught adult male U. stansburiana, we tested for associations between coloration (colorimetrics and size of throat badge and side-blotch), a range of morphological traits (snout-vent length, mass, limb and head measures), and performance capacity (sprint speed). Across morphs, sprint speed is positively correlated with aspects of coloration including throat badge and side-blotch size. Sprint speed is also positively correlated with mass, but not snout-vent length and hind limb length. Within morphs, blue hue, yellow brightness, and orange saturation are positively correlated with sprint speed, while other colorimetric relationships are not significant (p > .05).

Hypothesis

We hypothesized that components of coloration within and among morphs of male Side-blotched Lizards are indicators of performance and could serve as honest signals for sexual selection.

Methods & Materials

Field Capture and Measurements

- 50 male Side-blotched Lizards were collected via noosing during May 2017 in St. George, UT, USA.
- Sex, age, and morph was recorded upon capture
- Body mass was measured using a digital scale, and snout-vent length and limb length were measured using a metric ruler.
- Digital photographs of individual throats were collected upon each capture and used to measure badge size.

Throat Coloration Measurements

- Individuals photographed with ColorChecker Passport.
- Raw image files calibrated in Adobe Lightroom.
- Average RGB color values and badge size were calculated in Adobe Photoshop.

Performance Analysis

- Lizards were raced on a 2-meter track to determine average sprint speed (m/s).

Statistics - Multiple Regression

- (n = 50 lizards; 13 OB, 16 OO, 11 YB, 10 YY)
- (p < 0.05) = statistically significant

Dependent Variables:

- Sprint Speed

Independent Variables:

- Badge Size
- Mass
- Snout-vent Length
- Hind Limb Length

Results

- Sprint speed is significantly, positively related to throat badge size (Fig. 4; p = 0.017, r² = 0.148) and side-blotch size (p = 0.044, r² = 0.07).
- Sprint speed is significantly, positively related to mass (Fig. 5; p = 0.024, r² = 0.102), but not related to snout-vent length (p = 0.129, r² = 0.027) or hind limb length (p = 0.252, r² = 0.02).
- Within morphs, sprint speed is significantly, positively correlated with yellow brightness (p = 0.011, r² = 0.186), orange saturation (p = 0.043, r² = 0.096), and significantly negatively correlated with blue hue (Table 1; p = 0.0092, r² = 0.356), while other colorimetric relationships are not significant (p > .05).

Discussion

- Our hypothesis that sexual characteristics in male Side-blotched Lizards can serve as indicators of performance was partially supported.
- Sprint speed is correlated with some important dimorphic traits including mass, throat badge and side-blotch size across morphs and throat colorimetrics within morphs (blue hue, orange saturation, and yellow brightness).
- However, other aspects of morphology and coloration yielded no significant relationships with sprint speed.
- These results generally suggest that Side-blotched Lizards able invest more into sexual characteristics also have faster sprint speeds and thus greater performance capacity.
- Each morph may utilize variable aspects of sexual coloration to serve as a multicomponent signal of individual performance capacity.
- Although sexual coloration has frequently been found to indicate important quality measures in lizards, relationships with whole-animal performance remain largely unexplored.
- Recent findings reveal melanin-based coloration indicates bite-force and sprint speed in male Common Lizards (Zootoca vivipara).1
- In contrast, sprint speed is not related to sexual color variation in male Wall Lizards (Podarcis muralis),2 nor to bite-force in male Western Canaries Lizards (Gallotia galloti).3

Literature Cited


Acknowledgments

We would like to thank National Science Foundation for their funding and support with lab expenses, as well as the Utah State University Ecology Center for travel funding. We also thank Holly Flann for her assistance with performance trials.

Table 1. Multiple linear regression of sprint speeds and throat badge colorimetrics of male Side-blotched Lizards. Each column contains the p-value for each morph and colorimetric relationship. 

<table>
<thead>
<tr>
<th>Morph</th>
<th>Blue Morph Sprint Speed (m/s)</th>
<th>Orange Morph Sprint Speed (m/s)</th>
<th>Yellow Morph Sprint Speed (m/s)</th>
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</thead>
<tbody>
<tr>
<td>Mass</td>
<td>0.17055</td>
<td>0.17055</td>
<td>0.2565</td>
</tr>
<tr>
<td>Saturation</td>
<td>0.233</td>
<td>0.463</td>
<td>0.487</td>
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<tr>
<td>Brightness</td>
<td>0.941</td>
<td>0.3937</td>
<td>0.031</td>
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