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Plant Driven Movement: Does Plant Quality Affect the Foraging Patterns of Successful Male Sage-Grouse (*Centrocercus Urophasianus*)?

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Plant Driven Movement: Does Plant Quality Affect the Foraging Patterns of Male Sage-Grouse (*Centrocercus urophasianus*)?

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Abstract

The structural and dietary quality of plants is highly variable across the landscape and may influence energy acquisition by herbivores needed for energy dependent activities. For sage-grouse, male display efforts are energetically expensive, with successful males expending up to four times their basal metabolic rate to display. Previous work found that males who had the greatest energy expenditure during the lekking season also lost the least weight and foraged farthest from the lek. We hypothesized that the energetic benefit of foraging farther from the lek is due to higher quality food or cover compared to near lek vegetation. Preliminary data shows little correlation between lek distance and structural and nutritional quality of sagebrush.

Background

What is the cost of being a male sage-grouse in the spring?

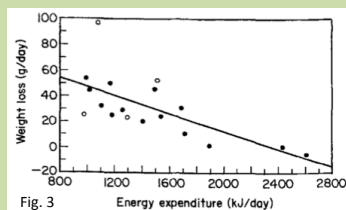
- Displaying on leks is energetically expensive and birds that display more, are more successful (Fig 1)⁵
- Traveling to off-lek forage patches is expensive (Fig 2)⁵
- Sage-grouse that expend more energy, lose less body weight (Fig 3)⁵



Male Sage-Grouse use an energetically expensive display tactic on leks to attract females. This energy expenditure can be 4 X basal metabolic rate⁵



Sage-Grouse are galliform, large bodied, birds, which makes foot and flight travel energetically expensive⁵



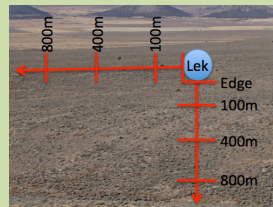
Successful males tend to forage farther away from leks, expend more energy displaying and foraging, but lose the least amount of weight during the lekking season⁵

How do sage-grouse pay for energetic costs of displaying and off-lek travel?

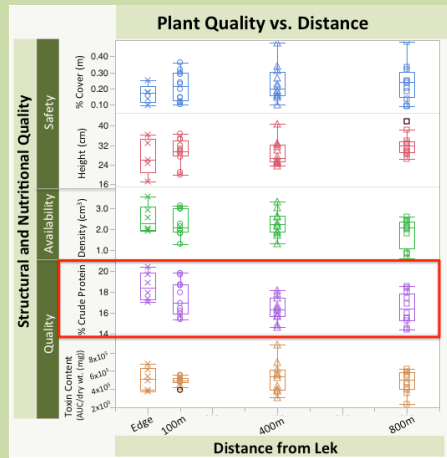
- Consume diets lower in toxins and higher in crude protein = higher energy availability⁴ and reproductive success².
- Select patches and individual plants of sagebrush with the lowest toxins and highest protein³.
- Forage at patches with greater cover from predators to reduce vigilance¹ which may compromise energy acquisition.

We hypothesized that male sage-grouse travel farther from leks to find higher quality food and cover.

It was not safer or more nutritious farther from leks



- Transects (40 m) at lek edge, 100 m, 400 m and 800 m from center of leks (n=6).
- Measure safety (% cover, shrub height); food availability (density of shrubs); diet quality (% crude protein and monoterpenes)



- Density of sagebrush did not differ among distances ($F_{1,38}=1.80$, $p=0.16$)
- % cover of sagebrush did not differ among distances ($F_{1,37}=0.69$, $p=0.57$)
- Height of sagebrush did not differ among distances ($F_{1,37}=1.37$, $p=0.27$)
- **Crude protein (%CP) was significantly higher at edge of lek than at greater distances away** ($F_{1,36}=3.9$, $p=0.016$)
- Toxin concentration (total monoterpene (shown) and individuals) did not differ among distances ($F_{1,37}=0.42$, $p=0.74$).

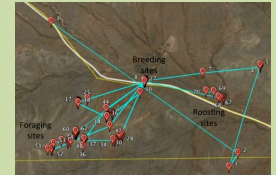
Discussion

Then why do birds travel away from lek?

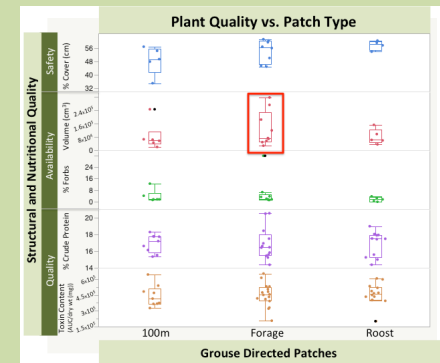
- More crude protein closer to lek
- Other toxins or nutrients may be more important to patch selection
- Distance traveled and selection of patches may depend on condition of males and their strut rate

Foraging patches were not safer or more nutritious than near lek or at roost patches

- GPS units on males (n=3).
- Locate forage, roost, and 100m off-lek (random) patches.
- Measure safety (%cover); food availability (% forbs, shrub volume); diet quality (% crude protein and monoterpenes)



Sage-grouse traveled > 800 meters from lek to forage (n=9) and roost (n=5).



- % cover of sagebrush did not differ among patch types ($F_{1,13}=2.64$, $p=0.11$)
- Volume of sagebrush did not differ among patch types ($F_{1,16}=0.49$, $p=0.62$); **but browsed plants had higher volume than non-browsed plants at forage patches** ($t_{11}=2.58$, $p=0.03$)
- %forbs did not differ among patch types ($F_{1,16}=0.61$, $p=0.56$)
- Crude protein (%CP) did not differ among patch types ($F_{1,29}=0.034$, $p=0.97$)
- Toxin concentration (total monoterpene (shown) and individuals) did not differ among distances ($F_{1,16}=0.051$, $p=0.95$).

References

1. Beauchamp, Guy; Ruxton, Graeme D. BEHAVIORAL ECOLOGY. Volume: 18 Issue: 6 Pages: 1040-1044. Published: NOV-DEC 2007
2. DeGabriel, J. L. et al. 2009. Ecology 90: 711-719.
3. Frye, G.G., J.W. Connelly, D.D. Musil and J.S. Forbey. 2013. Ecology. 94 (2) 308-314.
4. Guglielmo et al.1996. Ecology, Vol. 77, No. 4 1103-1115
5. Vehrencamp, S. Bradbury, Gibson. 1989. Animal Behavior. 38: 885-896.

Acknowledgements

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