

DAWN O'NEAL

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Education

Ph.D. Biology May 2010
Indiana University, Bloomington, IN

B.A. Environmental Studies May 2002
Minor: Biology
Washington University, St. Louis, MO

Awards/Grants

American Ornithologists Union Bleitz Research Award, Recipient 2009
Animal Behavior Society Travel Award, Recipient 2009
NIH/IU Common Themes in Reproductive Diversity Traineeship, Recipient 2008
Indiana Academy of Sciences Senior Research Grant, Recipient 2006
Mountain Lake Biological Station Research Fellowship, Recipient 2006
National Science Foundation Pre-doctoral Fellowship, Recipient 2005
Ford Foundation Pre-doctoral Fellowship for Minorities, Honorable Mention 2004

Research Experience

2003-2004 Research Assistant, Georgetown University. Principle Investigator: Martha Weiss, Ph.D.

2002-2003 Research Assistant, Indiana University. Principle Investigator: Ellen Ketterson, Ph.D.

2001 Research Experience for Undergraduates, University of Virginia. Mentor: Ethan Clotfelter, PhD.

Publications

O'Neal, D.M., Kiley, R.P., Ketterson, E.D. (in review). The effects of intersexual competition on immune function in a differential migrant, the Dark-eyed junco. *Journal of Avian Biology*

O'Neal, D.M., Reichard, D.G., Pavlis, K., Ketterson, E.D. 2008. Experimentally-elevated testosterone, female parental care, and reproductive success in a songbird, the Dark-eyed Junco (*Junco hyemalis*). *Hormones and Behavior*. 54: 571-578

Publications (cont.)

Clotfelter, E.D., **O'Neal, D.M.**, Gaudioso, J.M, Casto, J.M., Parker-Renga, I.M., Snajdr, E.A., Duffy, D.L., Nolan, V., Ketteron, E.D. 2004. Consequences of elevating plasma testosterone in females of a socially monogamous songbird: evidence on constraints of male evolution? *Hormones and Behavior*. 46:171-178

Presentations

O'Neal, D.M., Swanger, L., Jawor, J.M., Ketterson, E.D. 2009. Considering the roles of climate change and immune function in a differential migrant. *Animal Behavior Society*. Oral presentation

O'Neal, D.M., Swanger, L., Jawor, J.M, Ketterson, E.D. 2009. Sex and Latitudinal Differences in Immune Function in a Differential Migrant. *CISAB Animal Behavior Conference*. Oral Presentation

O'Neal, D.M., Swanger, L. Jawor, J.M., Ketterson, E.D. 2009. Latitudinal Variation in Winter Immune Function in a Differential Migrant. *Society for Integrative and Comparative Biology*. Oral Presentation

O'Neal, D.M., Kiley, R.P., Ketterson, E.D. 2008. Climate Change, Winter Sex Ratio, and Immune Function in a Differential Migrant. *Indiana Academy of Science Annual Meeting*. Oral Presentation

O'Neal, D.M. and Ketterson, E.D. 2008. Implications of Climate Change on Over-Wintering Sex Ratio in the Differential Migrant the Dark-eyed Junco. *American Ornithologist's Union*. Oral Presentation

O'Neal, D.M., Kiley, R.P., Ketterson, E.D. 2008. Impact of Winter Sex Ratio on Winter Physiology in a Differential Migrant the Dark-eyed junco. *Society for Integrative and Comparative Biology*. Poster

O'Neal, D.M., Reichard, D.G., Pavlis, K., Ketterson, E.D. 2007. Does Testosterone Mediate Parental Care Behaviors in the Female Dark-eyed Junco? *Society for Integrative and Comparative Biology*. Oral Presentation

Reichard, D.G., **O'Neal, D.M.**, Ketterson, E.D. 2007. Behavioral Consequences of Elevated Testosterone in Female Dark-eyed Juncos (*Junco hyemalis*). *Society for Integrative and Comparative Biology*. Undergraduate Poster Presentation

O'Neal, D.M., Jawor, J.M., Gerlach, N., McGlothlin, J. Ketterson, E.D. 2006. Testosterone in Female Birds. *North American Ornithological Conference*. Invited Speaker

O'Neal, D.M., Pavlis, K., Ketterson, E.D. 2006. Testosterone and Parental Care in Female Dark-eyed Juncos: A case of behavioral insensitivity? *Mountain Lake Biological Station*. Oral Presentation

O'Neal, D.M., Pavlis, K., Ketterson, E.D. 2006. Effects of Experimentally Elevated Testosterone on Parental Care in Female Dark-eyed Juncos. *Society for Integrative and Comparative Biology*. Oral Presentation

Synergistic Activities

Undergraduate education:

Mentor Animal Behavior Society's Charles H. Turner Undergraduate Award 2009

Mentor HMMI Capstone L490 student 2004-2008

Mentor Mountain Lake Biological Station REU program Summer 2005 and 2006

Outreach:

Invited Speaker for the REU program at the Center for the Integrative Study of Animal Behavior, Discussion: Diversity in Science. Indiana University. July 2009

Research talk for the Ernest E. Just Society, Titled: Experimentally Elevated Testosterone in the Female Dark-eyed Junco. Xavier University. January 2007.

Research talk for the Indiana University Wells Scholars, Titled: Testosterone in Female Birds. Indiana University. September 2006.

Research/ recruitment talk for the REU program at Mountain Lake Biological Station, Titled: Birds, Hormones, and Bears: Field Research at Mountain Lake Biological Station. Spellman University and Morehouse College January 2006

Conference Committees:

Center for the Integrative Study of Animal Behavior 15th Annual Animal Behavior Conference 2008

Center for the Integrative Study of Animal Behavior 13th Annual Animal Behavior Conference 2006

Teaching Experience

Guest Lecturer for Techniques in Reproductive Diversity on "Eco-immunology." Fall 2009

Guest Lecturer for Biology of Birds on "Climate Change and Birds." Fall 2008

Biology for Education Majors. Fall 2007

Introductory Biology Lab. Spring 2005

Evolution and Diversity. Fall 2004

Profession Societies and Affiliations

American Ornithologist's Union

Animal Behavior Society

Center for the Integrative Study of Animal Behavior

Indiana Academy of Sciences

Society for Integrative and Comparative Biology

Research Interests

My research has extended across breeding and non-breeding seasons, focusing on sex differences in hormones and sex differences in ecology and immunology. My work on breeding dark-eyed juncos (*J.h. carolinensis*) explored sex differences in testosterone (T) and the role of correlated responses to selection through experimental manipulations of T in females. For my thesis work in non-breeding juncos (*J. h. hyemalis*), I am investigating sex differences in winter dispersal behavior (differential migration) and the role climate change and intersexual differences in immune function may play in mediating this migratory pattern. These two seemingly unrelated topics are linked by my broad interests in the evolution of sex differences and have influenced my future research interests in seasonal interactions and how immune function varies by sex and/or habitat between breeding and non-breeding events.

Previous research

Hormone manipulations allow us to create novel phenotypes in order to learn how existing phenotypes evolve and why they persist. Previous studies have shown that in male juncos, experimentally elevated T (EET) reduces male parental care and offspring survival, but results in higher overall fitness owing to higher mating success. To understand this surprising result and the selective forces that influence variation in T in birds, I considered correlated responses to selection in female juncos focusing on four questions regarding EET:

- How does experimentally elevating testosterone alter the female phenotype?
- Are the same traits sensitive to T in males and females?
- Would elevated female T raise, lower, or have no effect on fitness?
- Could male evolution be constrained by females?

During the egg stage of the nesting cycle, T has no effect on incubation behaviors or nest defense (Clotfelter et al. 2004). When caring for nestlings, treatment with exogenous T significantly reduced the amount of time females spent brooding nestlings and reduced the intensity of nest defense. There was no effect of T on the rate of provisioning of offspring and nestlings of T-females weighed significantly less than those of C females. Treatment with T also reduced both nest survival and the probability of producing at least one fledgling. Collectively, these findings suggest female juncos with naturally higher levels of T may be selected against. These results also provide provisional support for the hypothesis that response to selection favoring higher T in males might be constrained if it led to a correlated response in females (O'Neal et al. 2008).

Current research

In addition to correlated responses to selection, sex differences can also be influenced by ecology where selection may favor adaptive responses/traits that will better fit each sex to its environment. These sex differences in ecology can lead to differences in dispersal behavior and give rise to differential migration. The dark-eyed junco is a differential migrant with females migrating farther south in the winter than males. In many avian species, recent warming events have resulted in changes in migratory schedules and earlier arrival on the breeding grounds. Little is known about the effect of climate change on winter distributions, whether urbanization has affected habitat selection by sex, or whether changing climate or degree of urbanization have affected winter physiology. For differential migrants, changes in climate and potentially in distribution may be especially important: relaxation in segregation may affect one sex more than the other, resulting in significant changes in demography, population dynamics and possibly population declines. I compared current demography to data collected 30 years ago to assess

whether warming or urbanization led to detectable changes in population structure and evaluate the effects of sex, habitat and wintering latitude on immune measures. Specifically, I investigated four questions:

- Have recent warming events altered patterns of differential migration in the junco?
- Are there negative consequences for female juncos that winter at northern latitudes where male abundance is high?
- Does junco immune function (i.e. susceptibility to disease and the ability to mount a response to infection) vary with latitude and is it correlated with latitudinal differences in winter climate?
- Is there variation in junco immune function across urban habitats?

All of these topics deal with the effect of climate and habitat on wintering birds and their decisions regarding choice of winter location and the effects of this choice on winter health and survival. Climate change and urbanization are therefore of background importance to these topics including the natural latitudinal variation in winter climate as measured by temperature, snowfall, and precipitation. Sampling of populations across the junco's winter range has indicated significant changes in junco sex ratio and latitudinal abundance that are highly correlated with recent changes in climate (O'Neal et al in prep). Females are apparently making shorter migrations than previously, and, at the level of populations, sexual segregation is weaker. Unexpectedly, results indicated no significant effects of overwintering with males on female immune response (complement activity and antibody response to Keyhole limpet hemocyanin) despite increased competitive interactions in male-biased flocks (O'Neal et al. *in review*). There were, however, latitudinal differences in innate immune function (complement activity, levels of total IgG, and bacteria killing ability), with more robust immune responses in southern birds (O'Neal et al. *in prep*). There were no significant differences in immune function between sexes within latitudes or across urban gradients.

Overall, the data suggest that warming events may have significantly altered the winter distribution of female juncos. Meanwhile, the lack of sex differences in immune function in male-biased environments and within latitudes suggests that differential migration is not mediated by sex differences in immune response or competitive interactions; instead, differentiation may be a product of carry-over effects from the breeding grounds or other historic selective factors acting upon the sexes. Latitudinal variation in immune response, however, suggests latitudinal differences in the nature of infection. Additionally, results suggest that winter urban environments may not have detrimental effects on condition contrary to previous studies of urban populations.

The implications of these results, particularly tradeoffs between different components of immune function and the possibility of site dependent differences mitigating not only migratory strategies but immune function, have led me to become interested in the intersection of eco-immunology and disease ecology and the role immune function may play in breeding and non-breeding events. I am predominantly interested in how immune tradeoffs manifest themselves in the context of seasonality, across habitats, life history stages, and between the sexes and how these tradeoffs may influence survival and reproduction. In future research I plan to investigate interactions among different infectious agents, tradeoffs between different arms of the immune system, and the changes in the regulation of the immune response across life history stages in the African Buffalo (*Synderus caffer*). Specifically, I will investigate the effects of reproductive status on the various components of the immune system determining how investment in immune function varies at different stages of reproduction, whether reproduction modifies existing tradeoffs in immune allocation, and how these reproduction-mediated effects influence an individual's ability to resist novel pathogens.