2010
NSS WNS RAPID RESPONSE FUND
GRANT SUMMARY

2010-1. Title: "*Measuring cytokine profiles in hibernating Myotis lucifugus affected by Whitenose Syndrome: assessment of immunocompetence levels in bats affected versus unaffected bats"*

Award Recipients: Thomas H. Kunz, PhD and Marianne S. Moore, Center for Ecology and Conservation Biology, Boston University

Award: $11,591

PROJECT SUMMARY

We are conducting a multifaceted study to determine levels of immunocompetence in bats affected by 'White-nose Syndrome' (WNS) and to test the hypotheses that: (1) WNS-affected bats are experiencing some degree of immunosuppression; (2) physiological constraints associated with deep torpor affect the development of WNS; and (3) the state of euthermia is required for bats to mount effective immune responses against pathogenic invasion. Our results to date, based on testing serum complement protein activity using bactericidal and fungicidal assays, demonstrate that: (1) on average, bats at affected sites have greater bactericidal capacity compared to bats from unaffected sites; (2) bats with visible signs of the syndrome have significantly lower bactericidal capacity compared to bats without visible symptoms from the same site; (3) there is a decrease in bactericidal ability as the hibernation season progresses; and (4) during late hibernation, there is a significant increase in bactericidal ability as body temperature increases, or as bats arouse from torpor.

We are incorporating results from the bactericidal and fungicidal assays into a larger data set using additional methods including measures of total circulating antibodies, Creactive protein levels, antioxidant levels, neutrophillymphocyte ratios, and total white blood cell counts. However, given the extreme complexity of the immune system, additional tests are warranted to more fully understand levels of immunocompetence in WNS-affected and unaffected bats. We propose to use a multiplex cytokine array to analyze cytokine profiles between WNS affected and unaffected bats, between bats exhibiting visible signs of the syndrome to those without, and in bats at different stages of arousal. This assay will be performed on 224 samples previously collected, therefore requiring no additional field collection, and will simultaneously measure various cytokines involved in multiple aspects of immune response. Cytokines play complex and critical roles in both innate and adaptive immune responses. They facilitate interactions between immune cells and are secreted by lymphocytes, monocytes, macrophages, neutrophils, natural killer cells and other nonimmune cell types. Determining cytokine profiles will indirectly estimate aspects of immune response we are currently unable to measure directly, such as the fever response and T-cell mediated responses. Cytokine profiles will be correlated with results from bactericidal and fungicidal assays, C-reactive protein levels, total antibody levels, neutrophil-lymphocyte ratios, total white blood cell counts, and antioxidant levels. Together, these methods will provide a multifaceted description of immune responses in WNS-

affected bats, will considerably increase our knowledge regarding patterns of immune response during hibernation, and may point to a currently unknown underlying cause of WNS.

TIMLINE

January – May: Analyze serum samples for cytokine profiles.
June – December: Analyze results. Prepare and submit manuscripts for publication.

BUDGET SUMMARY

All costs are for laboratory test kits, cytokines, and laboratory analysis.

2010-2. Title: *"Assessment of Bat Activity in Luzerne County, PA, after White-nose Syndrome"*

Award Recipients: Howard P. Whidden, Ph.D., Shannon M. Williams, East Stroudsburg University; Gregory G. Turner, PA Game Commission

Award: $6,904

PROPOSAL SUMMARY

New data collected in the winter of 2010 by the Pennsylvania Game Commission suggest that the decline in hibernating bats at sites affected by White-nose Syndrome (WNS) may approach 98%. Assessment of mortality is currently being done almost exclusively through winter surveys of known hibernacula where human access is possible. We propose using acoustic monitoring of bat activity in Luzerne County, PA, during the spring, summer, and fall of 2010 to assess possible declines in bat activity following the spread of WNS. Data from May-November 2010 will be compared with similar data collected from May-November 2006 during pre-construction monitoring at the site of the proposed Penobscot Mountain Wind Farm. Because WNS was not documented in Pennsylvania until the winter of 2008-09 (Turner and Reeder 2009), our 2006 acoustic data provide a baseline on bat activity at the Penobscot Mountain site prior to any decline in bat populations due to WNS. Acoustic monitoring in 2010 will provide data on bat activity at a time early in the spread of WNS, and may prove important for documenting long-term population trends of local bat species following the appearance of WNS.

TIMELINE

15 Apr – 1 May 2010 - Purchase equipment, reestablish sampling points.
1 May – 1 Nov 2010 - Operate acoustic detectors at 8 random points. Compile and back up acoustic data. Begin analysis of calls.
1 Nov 2010 – 1 Feb 2011 - Finish analysis of calls, compile data in Excel. Perform statistical comparisons of call numbers.
1 Feb – 1 Mar 2011 - Prepare and submit final report to NSS.

BUDGET SUMMARY

All funds are for equipment related to the study: 8 field data recorders with heavy duty batteries, and and LCD controller for programming the recorders.