

Proposal

Title- The seasonal prevalence and impact of emerging infectious diseases on Virginia salamander populations

Program of Study- Biology

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Abstract:

In recent decades, amphibians have experienced unprecedented population declines, leading to many species extinctions worldwide¹. A large number of these declines and extinctions are occurring in protected areas such as national parks and forests⁵. Documented cases of other infectious diseases causing extinction are rare⁶, but amphibian chytridiomycosis and ranaviral diseases are clear exceptions to that pattern^{7,8}. Over the past two decades, these two diseases have been conclusively identified as major causes of the recent amphibian declines seen worldwide^{9,10}.

Chytridiomycosis is caused by two fungal pathogens, *Batrachochytrium dendrobatidis* (*Bd*) and *B. salamandrivorans* (*Bsal*). *Bd* and *Bsal* are both aquatic organisms and infect the outer layers of the skin of many amphibian species. *Bd* was first discovered in 1998 in a captive blue poison dart frog (*Dendrobates azureus*) at the Smithsonian National Zoo¹¹. Since then, *Bd* has been detected in over 700 amphibian species worldwide and is responsible for several population declines and extirpations in the United States^{3,12}. *Bd* is very unique in that it infects species across three orders of vertebrates (Anura, Caudata, and Gymnophiona)¹². In the southeastern United States, *Bd* has been detected in both frogs and salamanders in multiple states at relatively low prevalence rates². The fact that *Bd* is widespread in this region and has a low occurrence suggests that the pathogen is endemic³. However, the impact of *Bd* on amphibian populations in the Southeast has not yet been determined and is difficult to measure without long-term monitoring projects¹³.

Ranaviral disease is caused by multiple viral species within the genus *Ranavirus* and unlike chytridiomycosis is responsible for multiple amphibian mass die-offs in the southeastern United States⁴. These mortality events are widespread and occur in multiple species in the orders Anura and Caudata.

The impact of chytridiomycosis and ranaviral disease in the southeastern United States is unknown and is hard to measure without long-term studies of infected populations. Therefore, the objective of this study is to setup long-term monitoring sites of local amphibian populations and measure the impact of disease on population dynamics over time. This will be accomplished by a monthly sampling of the eastern newt (*Notophthalmus viridescens*). This species was chosen because of its susceptibility to *Bd*,

Bsal, and ranavirus infections^{2,4,14}, its high prevalence in the Lynchburg area, and the ability to find this species throughout the year.

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