Abstract

Title – The Effect of Temperature on the Susceptibility of Eastern Newts to Two Lethal Pathogens

Program of Study – Biology and Chemistry

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Abstract: Emerging infectious diseases (EID) caused by *Batrachochytrium dendrobatidis* (Bd) and Ranavirus (Rv) contribute to the decline of amphibian populations. Amphibian species show various levels of tolerance to these EIDs. Bd and Rv infect many amphibian populations throughout the eastern United States, yet the population level impact of these pathogens for most species is undetermined. Therefore, this study incorporated a 3-year longitudinal analysis (2017-2019) to evaluate the seasonal prevalence and intensity of Bd and Rv infection on the eastern newt *(Notophthalmus viridesc*ens). The eastern newt is highly susceptible to Bd infections, but the effects of chytridiomycosis on this species is unknown. Approximately 20 eastern newts were collected and sampled quarterly at a pond in Campbell County, Virginia. To sample for Bd, the skin of each newt was swabbed with a sterile rayon swab. Tail clips were collected to test for Rv. DNA was extracted from swabs and amplified via qPCR with Bd and Rv specific primers to quantify Bd and Rv, respectively. The sex, snout-vent length, and mass were recorded for each newt. Environmental variables such as air, water temperature, and recent precipitation history were also collected during each sampling. Preliminary results show that a high proportion of newts are infected with Bd and prevalence of the pathogen varies with season. Once our analysis of Rv is complete, we will compare Rv

infection prevalence to Bd pathogen dynamics as well as identify any correlations with temperature. There will be continued monitoring of eastern newts to determine if there are any population-level effects of chytridiomycosis and ranaviral disease.

Christian worldview integration:

Liberty University provides an opportunity to be successful in obtaining knowledge of God's creation through research. Ecosystems are God's wonderful design and we are commanded to be a good steward of the earth (Psalm 24:1). Our study was first conducted for frogs in danger of extinction, including Golden frog (*Atelopus zeteki*), Wyoming toad (*Bufo baxteri*), and Cowan's mantella (*Mantella cowani*). Multiple studies showed that there has been a decline in the population of amphibians due to emerging infectious diseases (EID). Researchers narrowed major causes of EIDs, which are *Batrachochytrium dendrobatidis* (Bd) and Ranavirus (Rv). Some species of amphibians experience devastating effects due to infections, while others were shown to be tolerating the disease. The widespread of Bd and Rv occurred not long ago – the first detection of dying frogs was in 1993. This unexpected phenomenon reminds people of the imperfection of the world. However, God has provided us with resources and knowledge that we can approach this problem.

As Christians, we are to live in hope and be a light for the Lord. As we care for species that may appear small with no influence in our lives, we can declare His handiwork for such minor groups and its vital function to the ecosystem. Stewardship requires responsibility and a caring heart for God's commandment. This is emphasized in 1 Chronicles, "Riches and honor come from You, and You are the ruler of everything. Power

and might are in Your hand, and it is in Your hand to make great and to give strength to all" (1 Chronicles 29:12).

The results of this research will greatly impact our society by conserving natural resources and discovering possible repair the damages from which people may eventually suffer. The direct effects of the Bd and Rv on humans can also be studied to evaluate a detriment cycle between humans and broken ecosystem.