HONDURAS DISSERTATION/THESIS PROJECT

HO16 Prevalence of Chytrid in amphibian populations within Cusuco

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The global decline in amphibian biodiversity can be largely attributed to three main driving forces: habitat loss and degradation, environmental contaminants, and emerging infectious diseases. Although habitat degradation continues to pose the greatest threat to amphibians, wildlife disease is much more insidious to detect and challenging to control. Following the formal description of amphibian chytrid fungus (*Batrachochytrium dendrobatidis*, hereafter "Bd") in 1999, this pathogen soon became linked to the global decline in amphibian populations and extinctions observed over the past several decades and is currently acknowledged as a threat to nearly one-third of all amphibian species. The result of infection by this pathogen varies considerably between species and may lead to an often fatal condition known as chytridiomycosis in susceptible animals. Unique in both severity and scope, Bd is not species-specific and is able to act as both proximate and ultimate factors of extinction, working against traditional density-dependent models of pathogen transmission in which extinction of the host is uncommon. As a result, when added to the growing threats of habitat loss, pollution, and global climate change, Bd helps to create the perfect storm for catastrophic and irreparable losses of global amphibian biodiversity. Judging from past amphibian disappearances and contemporary mass mortality events, this phenomenon has earmarked the beginning of what some consider Earth's "sixth mass extinction".

We have recently found that Bd is present in Cusuco National Park, Honduras (CNP), which is recognized as an Alliance for Zero Extinction site and provides critical habitat to six endemic Honduran amphibian species: *Plectrohyla exquisita, Plectrohyla dasypus, Bolitoglossa diaphora, Cryptotriton nasalis, Isthmohyla melacaena*, and *Oedipina tomasi.* Although designated as a national park, the IUCN Red List of Threatened Species reports that "There is continuing decline in the extent and quality of [this] habitat", and we have witnessed this active habitat destruction firsthand. In total, CNP provides critical habitat to 16 endangered and critically endangered amphibian species, most of which are highly restricted in range and fragmented in distribution. Already significant, these figures likely underrepresent CNP's importance to amphibian conservation, as highlighted by our recent rediscovery of Craugastor milesi, an amphibian species previously believed to be extinct.

In 2007, we began conducting annual Bd infection surveys in CNP and it is important to continue monitoring this serious biodiversity threat. In many regions of the world, Bd surveys are conducted only once and provide little information about the dynamics of this disease over time within an exposed population. As a result, it is difficult to determine when the survival of a species requires ex-situ management intervention to prevent extinction. Bd can infect any amphibian species, but not all amphibians exhibit a similar response. Certain species are extremely susceptible to infection and mortality, while others can carry infection with no signs of illness, and still others do not develop infection at all. We see this in the amphibians of CNP, where certain species appear to be much more

susceptible to infection than others, especially the critically endangered Plectrohyla dasypus and Duellmanohyla soralia.

Although Bd is invisible to the naked eye and amphibians often do not often show signs of clinical illness before death, infection can be detected using PCR molecular techniques. While wearing sterile gloves to prevent spreading infection between animals, amphibians will be swabbed to detect Bd infection status. Samples will be collected with individually wrapped sterile swabs with fine-tipped rayon buds. The ventral surfaces of the legs, feet, and drink patches of adult frogs and salamanders will be swabbed five times each, applying moderate friction. For tadpoles, the swab is inserted into the oral cavity and twirled several times. Swab buds are then snapped off and stored in 2 mL microcentrifuge tubes containing 1 mL of ethanol preservative. The swabs will then be analyzed by PCR to detect the presence of Bd on the swab, and thus the location and identity of infected amphibians throughout CNP.

Projects could compare any potential differences in chytrid prevalence between species or between different areas of the Park. Does chytrid prevalence correlate with any measurable environmental factor? Has chytrid prevalence remained stable over time or does it fluctuate between years? If so, by how much? Do species with different life histories display different chytrid prevalence?

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