

CHAPTER 1 INTRODUCTION

1.1 Background

Amphibians are threatened globally by multiple anthropogenic factors, although habitat loss is by far the greatest threat in Southeast Asia (Rowley *et al.*, 2010). Amphibians are of a particular concern among vertebrates as many are highly threatened while at the same time are highly understudied globally, especially so in Southeast Asia (Bickford *et al.*, 2010a), which has the highest deforestation rate of all the tropical zones (Rowley *et al.*, 2010). Moreover, many regions around the world that support the richest assemblages of amphibians, especially in the humid ecoregions such as the Tropical rainforests and Moist Tropical Forests, are currently undergoing the highest rates of landscape modification (Gallant *et al.*, 2007). According to the 2008 IUCN Red List of Threatened and Endangered Species, at least 32% of the world's amphibian species and 20% of Southeast Asian amphibians are now threatened and 17 of these globally threatened species are in Thailand (Tantipisanuh and Gale, 2013) and are now threatened and declining more rapidly compared to birds or mammals (Stuart *et al.*, 2004). Amphibians are particularly sensitive to environmental factors, have a narrow range of temperature and moisture tolerance (Bell and Donnelly, 2006; Duellman and Trueb, 1986) and low tolerance to anthropogenic disturbance such as road construction (Findlay and Houlahan, 1997; Forman and Alexander, 1998).

In addition to habitat loss, the aquatically-transmitted pathogenic fungus, *Batrachochytrium dendrobatidis*, is a significant threat (Berger *et al.*, 1998; IUCN, 2008); population declines and extinctions of more than 200 amphibian species in several parts of the world have been associated with this fungal pathogen (Fisher *et al.*, 2009; Skerratt *et al.*, 2007). Over the past six years, the presence of chytrid fungus has been documented in many countries in Asia; however, there have been no reports of mass die-offs or enigmatic population declines typically associated with chytrid fungus in Southeast Asia (Rowley *et al.*, 2010). Further comprehensive studies to understand the distribution of chytrid fungus in areas where the fungus has not yet been detected are therefore important (Vörös *et al.*, 2012). Furthermore, given the seriousness of this threat to native amphibians, baseline data from a range of habitats is also fundamental.

With the threats mentioned above, wildlife conservation management and long term monitoring of amphibians populations programs are crucially required to ensure and detect trends in amphibian distribution and diversity which can help to distinguish declines from animal populations in nature. Without long-term data on species distributions, it is difficult to distinguish declines from animal populations in nature.

As a first step in mitigating the threats of habitat loss, as well as fungal pathogens, we need to understand what the important environmental factors that are likely influencing anuran distribution and abundance in the region. Moreover, knowing the distribution of the fungal pathogen will help us to have a better understanding of this threat to amphibians within the region and will help to raise concerns that more vigilance is needed in Southeast Asia.

1.2 Objectives

The aims of this study were:

- 1) To investigate environmental factors (such as stream and vegetation characteristics) which are most likely structuring the anuran community along an elevational gradient.
- 2) To investigate whether there was evidence for the presence of the fungal pathogen, *Batrachochytrium dendrobatidis*, in a relatively undisturbed evergreen forest in western Thailand.

1.3 Study scope

The scope of this study was divided into two sections as follows:

- 1) Pointing to the influence of environmental factors on stream anuran communities along an elevational gradient. The relationship between the anuran species richness and species abundance along an elevation gradient in conjunction with environmental factors (i.e., elevation, stream characteristics and density of understory vegetation) and interaction between the factors were examined and determined by Generalized Linear Mixed Models (GLMMs).
- 2) Pointing to the possible presence of *Batrachochytrium dendrobatidis* in anurans from a relatively undisturbed evergreen forest by using conventional PCR.