CHAPTER 1

Introduction

1.1. Rationale and Background

Background concentrations of heavy metals in the environment are expected. Anthropological and natural interferences and modifications to the environment causes the concentration of the heavy metals to fluctuate. Therefore, some resilient animals survive this change, while some die. Animals adopt to live in these areas has an increased concentration of metal in their blood.

The transformation of heavy metals from the environment to the animals is crucial in realising the relationship between differences in concentrations of heavy metals in different biota. Furthermore, understanding the background concentrations of different heavy metals in different regions in relation to the geographical conditions was important in correlating the two. Institutes such as United States Environment Protection Agency (US EPA), United States Food and Drug Authority (US FDA) and Pollution Control Department Thailand (PCDT) have published acceptable concentrations of heavy metals in food and agricultural soil using this knowledge. Determining the quality of the food and setting a standard for safe consumption. The standards has to be set as heavy metal exposure to humans either by direct exposure or by consuming exposed food results often irreversible and sometimes hereditary conditions.

The prolonged exposure of a pollutant to an animal can lead to numerous impacts in many organisms. The impacts can range from representation of tissue concentration of the pollutant to genotypic alterations, aberrations to phenotypic malformations as reported by Michailova et al, (2012). As defined in Mosby (2016), a chromosomal aberration is “any change in the structure or number of any of the chromosomes of a given species”.

As phenotypic malformations will be very difficult to pinpoint and define, the intended biomarker for the research would be the observed chromosomal aberration

Keeping the above-mentioned concepts in mind, we turn to the source of the problem. The main speculation is that ever since small-scale gold mining from Pichit province became a cottage industry, the area has become a point source of pollutants such as mercury that is necessary in the

mining and other sulphide minerals such as arsenic that is associated with the gold. As most of the farming communities are new to the practice, the impact of the activity is not yet evident. However, due to the fast growth of the industry, the impact needs to be identified.

Amphibians are excellent bio indicators because of their high sensitivity to environmental modifications and pollution (Hopkins 2007). Using selected frog species that is also a part of the local cuisine, as specimens for observation and experimentation we intend to make a connection with the local population. Therefore, through informing, advising and mitigating, we intend to minimize the potential hazard.

The first part of the research is the field study. The principle of the preliminary field study is that if concentrations of arsenic and mercury is detectable from the areas and the samples with chromosomal aberrations, we would be able to correlate the aberrations with this exposure.

The second part of the research is the laboratory experiment. This confirm the speculated relationship of the field study through controlled exposure experiments. The main hypothesis for the laboratory experiment is, exposure of a selected species of frogs to different concentrations of metal derivatives in the laboratory over a range of time will induce aberrations. The laboratory experiment will also explore the acute and the chronic impact of the pollutants.

If the laboratory results prove to be significant, the data can support the field results showing the impact of mining activities on the environment, animals, and the humans that live in these areas.

1.2. Research Objectives

The research objectives are;

1.1. To measure the concentration of mercury and arsenic from the biota and the sediment of the test sites, and the control sites

1.2. To investigate the chromosomal aberrations of adult *Fejervarya limnocharis* and *Fejervarya cancrivora* from the field study sites.

1.3. To confirm that chromosomal aberrations can be induced by injecting a concentration of mercury derivative and observed in the test sample.