CHAPTER 5
CONCLUSIONS

Eight mollusk species were found to be living in the affected sampling areas including *Clea Helena* (Hoy Jedee), *Filopaludina martensi* (Hoy Khom), *Lymnaea (Radix) auricularia rubiginosa* (Hoy Kun), *Pila polita* (Hoy Pung), *Pomacea canaliculata* (Hoy Cherry), *Corbicula* sp. (Hoy Lebma), *Pilsbryoconcha exilis* (Hoy Kab) and *Scabies crispata* (Hoy Sobnok). Classification in accordance with Class were as follows: Gastropoda were *Clea Helena* (Hoy Jedee), *Filopaludina martensi* (Hoy Khom), *Lymnaea (Radix) auricularia rubiginosa* (Hoy Kun), *Pila polita* (Hoy Pung), *Pomacea canaliculata* (Hoy Cherry) and Bivavia were *Corbicula* sp. (Hoy Lebma), *Pilsbryoconcha exilis* (Hoy Kab) and *Scabies crispata* (Hoy Sobnok). The two dominant species were *Filopaludina martensi* and followed by *Pomacea canaliculata*. These species showed to possess high tolerance to waste water. Various mollusks species at each collecting Station were evenly distributed. Physical and chemical parameters of water were not significantly different in each season ($p < 0.05$). The water quality in Bueng Jode wetland could be concluded to have fair acceptable values. Heavy metal concentrations in mollusks were found to be relatively high during rainy season. The concentrations of heavy metals were found in sequential order as zinc higher than copper and lead in mollusks in all three seasons. Additionally, we found that concentrations of zinc in *Filopaludina martensi* (Khom) were higher than that found in *Pomacea canaliculata* (Cherry). This was due to the fact that *Filopaludina martensi* live in water longer than *Pomacea canaliculata.* The concentrations of zinc in sediments were found to be higher in all three seasons. The means concentration of zinc was higher than copper, lead, cadmium and mercury in sediments in rainy season respectively while in sediments the concentration of zinc was higher than lead and copper in cold and hot season, respectively. By comparing the accumulation of heavy metals between mollusks and sediments, this study found that the concentrations of metals were higher in mollusks. Thus, the data from the

study showed that mollusks living in the effluent from the study area accumulated heavy metals in their body tissue.

Filopaludina martensi showed to be susceptible to pollution in waste water. Heavy metal concentrations in *Filopaludina martensi* were found to be relatively high during rainy season. The concentrations of heavy metals were found in sequential order as zinc higher than copper and lead in mollusks in all three seasons. These data showed that mollusk species of *Filopaludina martensi* could accumulate heavy metals from the study area where the reservoir received effluent from the paper mill factory before flowing down to Pong River. Thus, species of *Filopaludina martensi* could accumulate heavy metals because of they live in water most of their life.

The data from the study of microscopical examination showed that mollusks living in the effluent from the study area accumulated heavy metals in their body tissue. Traces of heavy metals were accumulated by most tissues, especially the kidney of the mollusk. Electron micrograph showed localization of metals in various mollusk tissues and caused tissues damage. An enlargement of mitochondria was effect by heavy metals.

Heavy metals accumulation in mollusk *Filopaludina martensi* in the laboratory at differing concentrations of two heavy metals namely lead and zinc in *Filopaludina martensi* taken from unpolluted areas was studied. In this study the various concentrations of lead used were 0.5, 1.0 and 1.5 mg/L and for concentrations of zinc were 2.5, 5.0 and 10 mg/L, respectively. Culturing period was for 30 days with differing heavy metal concentrations experimenting in triplicate using fish food for culturing for 10, 20 and 30 days. The control group of mollusks was cultured in distilled water. Analysis of heavy metal concentrations done using ICP-OES technique. Control group of mollusks showed normal pattern of increasing accumulation of heavy metals after culturing for 0, 3 and 15 days. Mollusk group under study accumulated higher concentrations of heavy metals in accordance to increase concentrations of heavy metals and an increase in days of culturing. Lead was found to be accumulated in higher values with increasing lead concentrations and

an increase in days of culturing from 10, 20 and 30 days. In the case of zinc, there was as increase in concentration from day 10 to day 20 of culturing, however there was a decrease of zinc concentration on the day 30 of culturing. Differing degree of accumulation of the two heavy metals must be contributed by zinc as an essential element for growth while lead was a non-essential element though higher accumulation of lead could be toxic to mollusks. Toxicity of heavy metals could be envisaged through high concentration repressing esterase activity, while lower concentration of heavy metal had no adverse affect on esterase activity. Moreover, there were results supporting the cellular toxicity by heavy metals from the experimenting of toxicity of heavy metals to kidney cells of mollusks, as an evidence of heavy metals destroying mitochondria in kidney cells of mollusks.

The results of present studies could be concluded that the detrimental effects of the toxicity from heavy metals could not be seen externally at cellular level; however intracellular malfunctions could be seen on mitochondria as well as esterase activities, even with acceptable level of control of heavy metals by environmental quality standard. There was a still adverse effect on living organisms. Such calamity could be minimized with reducing the use of heavy metals in all activities as much as possible. Results of this study may have just shown to be of minor problems affecting living organisms as well as to the environment, though it may lead to major calamities in the future.