CHAPTER 1

INTRODUCTION

1.1 Motivation

An intensive shrimp farming technique had been developed along the coastal zone of Thailand during the 1980s. Its expansion and production increased rapidly and continuously which made Thailand a leading country in exportation of shrimp cultures since 1991 with shrimp production about 234,000 tons and the average income of more than 47 billion Bath a year (Rosenberry, 1999). Nowadays, Low-salinity methods have become popular and have spread over central plain of Thailand or freshwater areas. Approximately, 40 % of Thailand's cultured shrimp production came from 22,455 ha of inland shrimp farms (Department of Fisheries, 1998; Limsuwan and Chanratchakool, 1998, Braaten, 2000).

Despite the success in shrimp culture, unplanned and uncontrolled expansion of shrimp culture into inland-freshwater areas, formerly used as rice paddy fields has brought up several environmental issues. The first obvious problem is the conflict use of water. It has been well known that, the consumption rate of freshwater per one shrimp farm is relatively high (about 9,000-33,000 m^3/ha Mark, 1999; Szuster, 2000) compared with the use of water in rice fields (7,650 m^3/ha, International Rice Research Institute, 1998, Flaherty, 1999). The stress could fall on freshwater irrigation system in those areas, if no appropriate water management plan was arranged. Secondly, the seepage of salty water may contaminate soil and groundwater. The third problem is the contamination of surface and ground waters in the vicinity of the farms due to nutrients and other chemical contents (e.g. fertilizers, pesticides, and disinfectants from shrimp farm effluents)

Turning now to the drinking water issue, surface water, groundwater, and groundwater under the direct influence of surface water (i.e., springs or shallow wells) are generally employed as sources of municipal water. When surface water is used as a source for drinking water, residual disinfectant is required by regulation.

Therefore chlorine is often added to finished water. Chlorine applied to ponds oxidizes organic matter and reduces the biological oxygen demand. Chlorination of ponds with large doses may therefore be an effective means of destroying disease organisms. However, the application of chlorine can also lead to a formation of disinfection by-products (DBPs) i.e. trihalomethanes (THMs), haloacetic acids (HAAs). Trihalomethanes are known to have potential to cause cancer, reproductive effects, and, kidney, liver, mental disorder. The level of trihalomethanes formed upon chlorination of natural waters depends upon several operational conditions such as the chlorine dosage and free chlorine contact time as well as water quality conditions such as organic content, bromide concentration, temperature, and pH. In cases where shrimp farms effluent is to be reused as municipal water supply, the contaminated effluent will have to be in contact with high dosage chlorine and this might potentially lead to the formation of the possible carcinogenic constituents.

The aim of this work was to investigate THM formation potential of shrimp farm effluents, and to determine the possibility of THM formation of the river water which was contaminated with shrimp farm effluents. In addition, the work would also look into the influence of various parameters on the THM formation potential.

1.2 Objectives

- To investigate precursors and analyze the trihalomethanes formation potential (THMFP) of shrimp culture wastewater.

1.3 Scopes of this work

- Shrimp farm effluents and Bangpakong River were selected for this study.
- The study areas located at Ban-po and Bangkla, Chachoengsao Province which covered 16 farms.
- Trihalomethane precursors were fractionated into two groups hydrophobic and hydrophilic substances to study the impact of

shrimp farming on water sources in term of trihalomethane formation potential.

- THMs of concerns in this study are chloroform, bromoform, bromodichloromethane, dibromochloromethane.

1.4 Benefits of this work

- The knowledge from this study, the THM formation potential of shrimp farm effluents, could be applied to identify what might be the causes of the increasing risk of cancer for people who resided in the shrimp farming areas or people who might consume the contaminated water.
- The results of this work might help to increase government's motivation about the series of problems from the directly discard untreated shrimp farm effluents into surface waters.
- The results of this work provide a database for the government to consider before develop drinking water standards (THMs) and also alternative strategies to manage the highly organic substances in shrimp farm effluents.
- Better understanding the relation between THMFP and compositional nature of the dissolved organic carbon (DOC) essential for the design of effective water treatment strategies for the protection of public health risk.