CHAPTER 1

Introduction

The role of dam construction

Water needs were the most important factors for living of human race for very long times since prehistoric period. The construction of barriers, including small to huge dams, were the most useful methods to storage the water. But building a huge dam just was started not for long. The mid-20th century, more than 50,000 large dams around the world were created for the multipurpose. The primary benefit of dam and reservoir in the world is water supply. Other key purposes and benefit include: irrigation for agriculture (food supply), flood control, hydropower, inland navigation and recreation.

The construction of a dam creates a new ecosystem with modified water flow pattern. The dam disrupts the river flow and changes the water system from lotic to lentic systems. The influence of that barrier not only occurred at the dam location, but also extends to downstream reaches. Water regulation by dams was modified its hydrological regime, the transport of materials, the channel morphology, the water chemistry, the thermal regime and the stream community. The discharge regime modifies transport and erosion processes, contributing to changes in the channel morphology (Stanford and Hauer, 1992). The transport of particulate materials to downstream reaches is altered and, in this way, the availability of energy sources for downstream communities is, in part, restricted (Ward and Stanford, 1995; Ward *et al*., 1999 and Touch and Gasith, 1989). Furthermore, with thermal stratification, the physicochemical characteristics of discharged water are a function of the outlet depth (Petts, 1984 and Adefemi *et al*., 2010).

The social impacts of dams in downstream environments tend to result from complex interactions between environmental impacts and economic impacts (Adams, 2000). Among other threats, human activities tend to reduce the lateral connectivity of

aquatic system, which increases floodplain terrestrialization and induces a loss of aquatic biodiversity (Besacier-Monbertrand *et al.*, 2012). The impacts of regulated flows in mainstream rivers have been well documented (Petts, 1984). In general, changes in thermal regime from the influence of hypolimnetic releases have resulted in the elimination or reduction of fish and macroinvertebrate communities in the tailwaters and for long distance in downstream. Changes in hydraulic conditions may also cause the elimination or decline of lotic species' populations.

All energy sources have impacts, even renewable. Zhong and Power (1996) investigated that below the dams, the effects from reduced water velocities, less variable discharges and lower water temperatures caused fish spawning delayed. Lotic fish species were replaced with lentic species and finally dominate by reservoir fish communities. Hydropower construction and operation are associated with a number of serious environmental problems: water diversion, interruption of fish migration, hydro peaking, reservoir flushing, inundation of landscapes, and alterations in bio-geochemical cycling (Truffer *et al*., 2003). And more effects from dam construction had been damage to aquatic systems.

Aquatic insect studies: caddisflies

Caddisflies: Order Trichoptera group of aquatic insects are the important functional components in stream community assemblages. The Trichoptera World Checklist recorded 12,627 species, 610 genera, 46 families, most from Oriental and Neotropical region (Holzenthal *et al.*, 2007). Trichoptera play a critical role in aquatic ecosystem in cycling nutrients (Cummins, 1974; Vannote *et al.*, 1980) and provide an important food source for fish, birds and other vertebrates (Nakano and Marakami, 2001). Various degrees of tolerance to natural and anthropogenic disturbances make them are the excellent indicators of ecosystem health.

Hauer *et al*. (1989) studied on a Trichoptera in the regulated and unregulated water, as the continuum resets and adjustments in response to stream, Gunnison River, Colorado. There were significantly altered distributions and abundances of Trichoptera fauna, the greatest species richness occurring at an unregulated above the dams. At sites immediately below dams and a regulation dam, species richness was reduced 35 – 90 %

and abundance lower than 95 % of species. There are many case studies and researches on macroinvertebrate in regulated water in many regions, but in Thailand was poorly known on macroinvertebrate in man-made ecosystems especially in large dams as well. Therefore, there should have more study in aquatic ecosystems in the dam. The results of the studies also can be applied to be a case study of the impact of dam in Thailand.

Objectives

1. To determine a monthly Trichoptera species richness and abundance in Mae Ngat Somboonchol dam.
2. To compared Trichoptera species richness between upstream and downstream in Mae Ngat Somboonchol dam.
3. To determine the relationship between physicochemical water properties between upstream and downstream in Mae Ngat Somboonchol dam.