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Biodiversity of Adult Trichoptera and Water Quality Variables in Streams, Northern Thailand

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Abstract

The diversity of adult Trichoptera was surveyed at Mae Tao and Mae Ku watersheds, northern Thailand during July 2011 to May 2012. The aim of the study was to determine the relationship between physicochemical parameters of water quality and adult Trichoptera for monitoring of water quality. A total of 9,475 adult Trichoptera representing 14 families and 126 species were collected. The correlation between the biodiversity of adult Trichoptera and water quality showed that the *Ecnomus jochin*, *Cheumatopsyche carmentis*, *C. chryseis*, *C. lucida*, *C. chrysothemis*, *C. dhanikari*, *Potamyia dryope*, *Leptocerus dirghachuka*, *L. trophonios*, *L. ganymedes*, *Oecetis scutulata*, *O. armadillo*, *O. raghava*, *O. asmada*, *O. tripunctata*, *Setodes flivialis*, *S. neptunus*, *S. endymion*, *S. okypete*, *Chimarra Chiangmaiensis*, *Paduniella Semarangensis*, *Lepidostoma doligung*, *Polyplectropus ahas*, *Psychomyia lak*, *Marilia sumatrana*, *Hydroptila thuna* and *Orthotrichia typhoeus* depended on some physicochemical factors including air temperature, pH, electrical conductivity, turbidity, sulfate, nitrate-nitrogen, orthophosphate, ammonia-nitrogen and alkalinity in water.

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1. Introduction

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Trichoptera, or caddisflies, one of the largest groups of aquatic insects, are holometabolous insects with aquatic larvae and pupae and terrestrial adults [1]. Trichoptera are potentially useful indicators of river and stream health [2-4]. They are relatively easy to identify to species level in the adult stage and show a diverse range of ecological, behavioral and functional feeding modes as larvae. Furthermore, they are good indicators of environmental perturbation, and because they are distributed along the stream continuum, they constitute one of the most interesting groups for studying the ecology of organisms in running water [5]

Previous studies on the use of adult caddisflies as a bioindicator of water quality in Thailand have been reported by Chiabu [6], Laudee [7], Cheunbarn [8] and Prommi and Thamsenanupap [9]. Caddisflies were chosen for this study because they are usually more diverse than other aquatic insect orders [10]. Adults have been studied widely because they are easily collected by light traps and can be used as a useful tool for bioassessment [11]. Chantaramongkol [2] recommends light trapping for assessing water quality in large rivers. Knowledge of the taxonomy and ecology of the species has proven valuable in biomonitoring programs because of differences in susceptibilities of the various species to pollutants and other types of environmental disturbances. Genus or species level identifications of adult caddisflies are possible and clearly produce more accurate results than family level identification, thereby giving better ability to assess the change of water quality. The aim of this paper is to investigate the diversity and distribution of adult Trichoptera from Mae Tao and Mae Ku watersheds. Water quality and some physicochemical factors were also measured to determine their effects, if any, on the diversity and distribution of adult Trichoptera.

2. Materials and Methods

2.1. Study site

The study was conducted at Mae Tao and Mae Ku watersheds. Five study sites were located along the Mae Tao stream. The stream is characterized by water flow throughout the year. The upstream part is rather narrow but widens downstream. The water velocity upstream is slower than downstream, resulting in stream bed deposits of debris. The substrate consists mainly of bedrock, gravel, sand, small stones, and some large boulders. The upstream originates in a forested area, also some human activity at the study site, resulting in minor inputs of waste water run-off. Two study sites were located in the Mae Ku stream. The water is fast flowing in monsoons so that debris is scarce in the streambed. The surrounding forest is very open. The upstream part is somewhat polluted by garbage from a village. The stream bed consists of bedrock, gravel, sand, small stones, and some large boulders. At each site, the sample was collected bi-monthly of the year of 2011 and 2012 (July, September, November, January, March and May).

2.2. Adult Trichoptera collection

At each study site, adults were collected using portable black-light traps (10-W fluorescent tube, 12-Volt DC battery) suspended across a white pan containing a detergent solution. Light traps started at various times between an hour before sunset and 1.5 hours after sunset near the stream margin. On each sampling occasion, the light trap was deployed for 5 h. Sampling was done on a night with a very clear sky when was no full moon to avoid light pollution to the trap. Insects attracted to the black light were collected in the detergent solution and transferred into 80% ethyl alcohol the next morning and transported to the laboratory. Specimens were sorted and examined under a dissecting stereomicroscope. For most caddisfly species, adult males primarily were used for making species determinations. The last two abdominal segments of adult male genitalia were removed and cleared by heating in 10% NaOH at 70 °C for 30 minutes. Specimen identification was carried out on the species level using Malicky [12]. For each species, specimen counts from

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