

Macroinvertebrates: Biological Indicators for Local Water Quality



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Abstract

Water quality degradation from human activities is a growing concern for local communities. This study evaluates the water quality and macroinvertebrate diversity in two vital water resources: Nong Plong and Huai Wa in Sisaket Province. Residents rely on these sites for agriculture, consumption, and local fishing. By monitoring physical and chemical parameters—temperature, pH, Dissolved Oxygen (DO), and transparency—alongside biological surveys, we assessed the health of these ecosystems. Our findings revealed that Nong Plong maintains better water quality, characterized by higher DO levels and the presence of sensitive species like dragonfly larvae. In contrast, Huai Wa showed signs of organic accumulation indicated by the presence of freshwater leeches. This research confirms that macroinvertebrates serve as effective natural medicine for monitoring environmental health.

Keywords Chemical and Physical Parameters, Macroinvertebrates

Research Question and Hypothesis

Research Question

1. How does the water quality differ between Nong Plong and Huai Wa?
2. What is the relationship between macroinvertebrate diversity and the water quality of these two sources?

Hypothesis

1. The water quality in Nong Phlong and Huai Wa is different.
2. The diversity of aquatic macroinvertebrates is related to the water quality of both sites.

Introduction

Water is a fundamental natural resource essential for the survival of all living organisms and the balance of ecosystems. However, global climate change and increasing human activities have led to significant water quality degradation, resulting in water scarcity and ecological crises. According to Thailand's pollution situation reports between 1996 and 2021, a substantial portion of surface water remains in "deteriorated" to "fair" conditions.

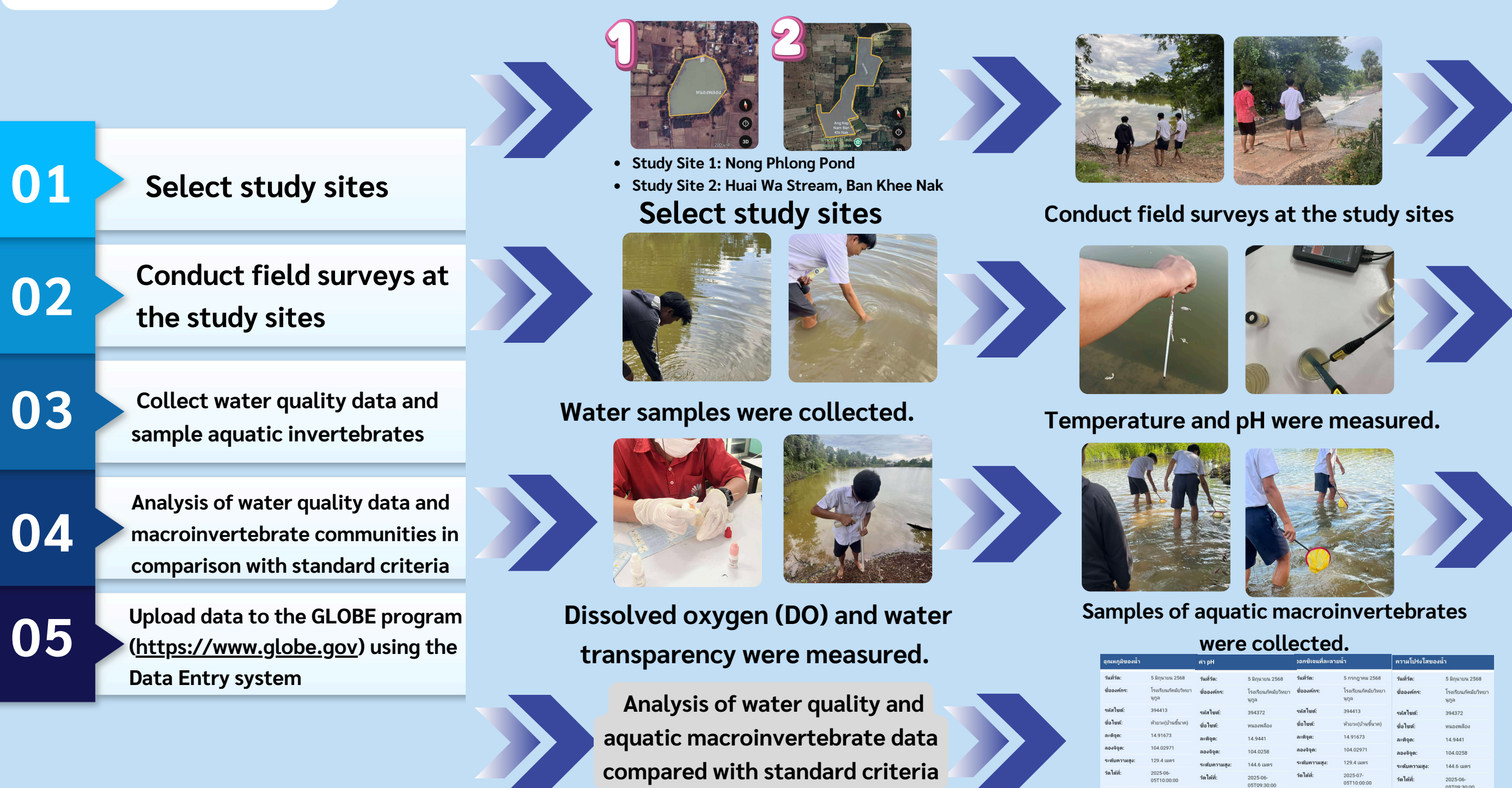
In Tum Subdistrict, Prang Ku District, Sisaket Province, local water resources such as Nong Plong and Huai Wa serve as lifelines for agriculture, consumption, and daily activities. Despite their importance, these areas face risks from agricultural runoff and domestic wastewater, which may negatively impact native aquatic species and overall ecosystem health.

To monitor these environments effectively, Aquatic Macroinvertebrates—such as insect larvae, mollusks, and crustaceans—are utilized as vital biological indicators (bio-indicators). These organisms are highly sensitive to environmental changes and pollutants. Their presence or absence reflects the long-term health of a water source more accurately than isolated chemical tests. For instance, groups like Mayflies or Dragonfly larvae typically thrive in high-oxygen, clean water, while pollution-tolerant groups like freshwater leeches or bloodworms can indicate high organic loading.

By integrating physical-chemical parameters with biological diversity data, this study aims to provide a comprehensive assessment of local water quality to support sustainable conservation and community-led water management.

Research Methods and Materials

Research Methods



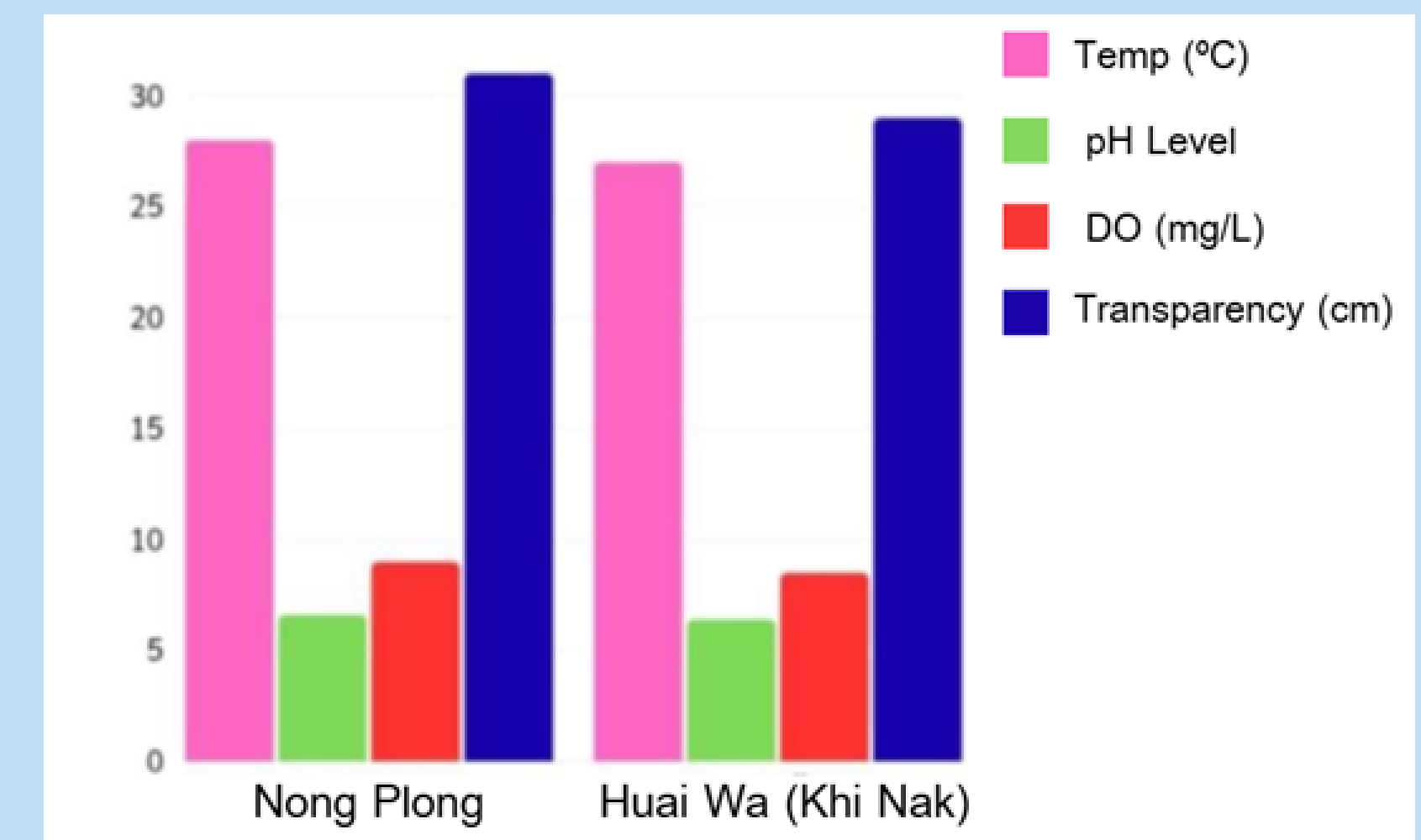
Materials

1	A glass thermometer was used.		6	Smartphone
2	LabQuest & pH Meter		7	Google map
3	A dissolved oxygen (DO) test kit was used.		8	Pencils and pens
4	A transparency tube was used.		9	A graduated cylinder was used
5	Sieves and trays		10	A beaker was used
			11	Sample bottles
			12	A test tube rack was used.

Results

Table 1: Results of Water Quality and Macroinvertebrates Monitoring (Trial 1)

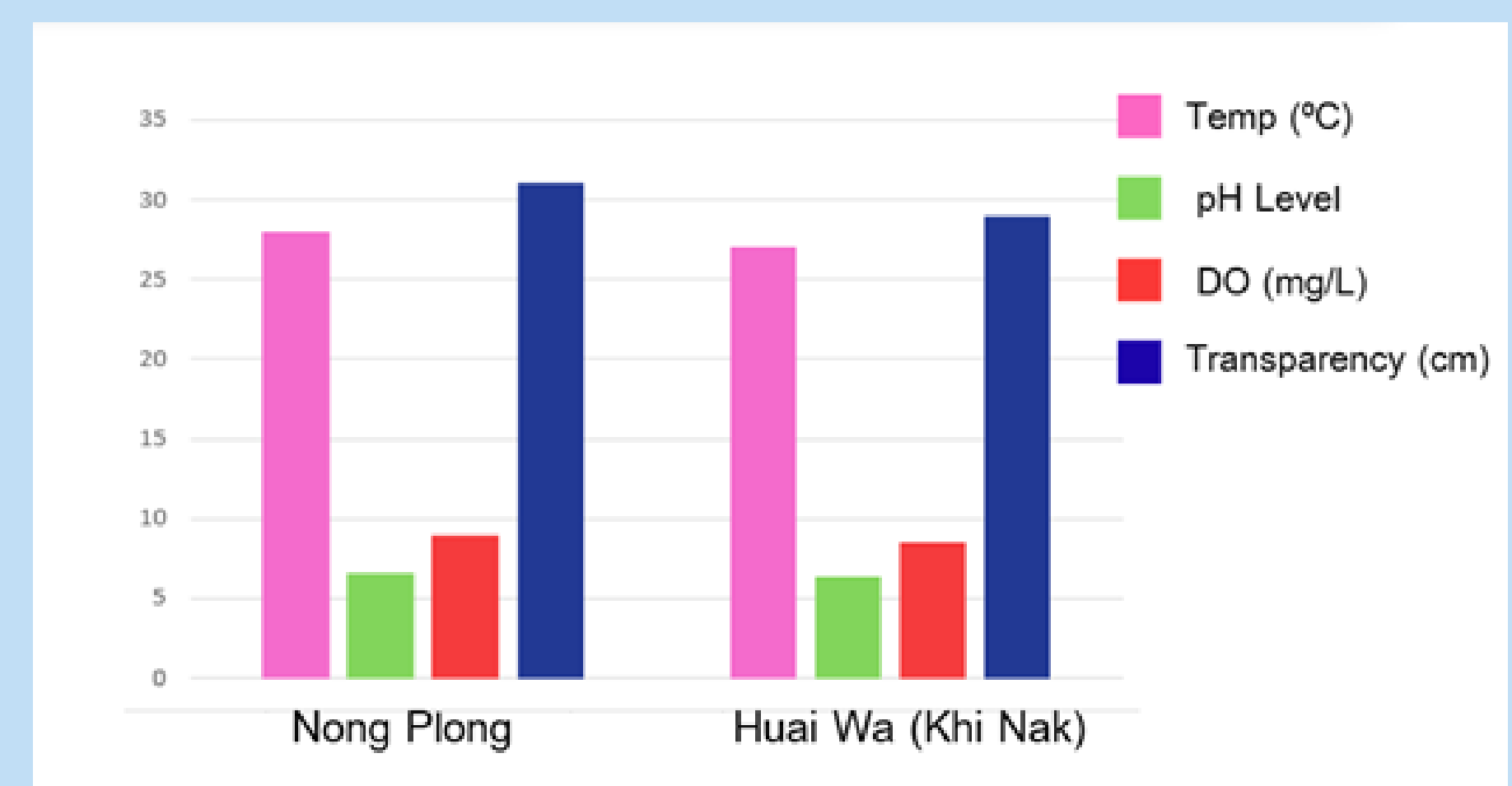
Water Source	Temp (°C)	pH Level	DO (mg/L)	Transparency (cm)	Macroinvertebrates Found
Nong Plong	30	6.9	8.5	35	Freshwater Shrimp
Huai Wa (Khi Nak)	30	6.7	7	33	Freshwater Shrimp



[Figure 1. Comparison Chart of Water Quality Parameters and Macroinvertebrate Survey (Trial 1)]

Table 2: Results of Water Quality and Macroinvertebrates Monitoring (Trial 2)

Water Source	Temp (°C)	pH Level	DO (mg/L)	Transparency (cm)	Macroinvertebrates Found
Nong Plong	28	6.6	9	31	Dragonfly larvae and Freshwater shrimp
Huai Wa (Khi Nak)	27	6.4	8.5	29	Freshwater shrimp and Freshwater leeches



[Figure 2. Comparison Chart of Water Quality Parameters and Macroinvertebrate Survey (Trial 2)]

Discussion

The findings illustrate a clear correlation between physical water parameters and biological diversity.

1. Environmental Sensitivity

At Nong Plong, the high transparency and oxygen levels support the survival of Dragonfly larvae. These organisms require clean water to develop, making them reliable indicators of low-pollutant environments.

2. Human & Agricultural Impact

At Huai Wa, although the chemical parameters (DO and pH) remained within safe limits, the presence of leeches suggests that the stream is beginning to be affected by surrounding agricultural runoff or domestic waste. Leeches are more tolerant of low-clarity water and organic accumulation compared to dragonfly larvae.

3. Seasonal Influence

The slight decrease in pH and transparency observed in July (Trial 2) likely reflects the onset of the rainy season, which introduces more sediment and organic debris into the water bodies.

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Badges

