

# A Study of Water Quality Affecting the Distribution of Moss (Fissidens anomalous Mont.) in Ban Sri Dao Ruang, Palian District, Trang Province

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## Abstract

This study investigated the water quality affecting the distribution of the moss species *Fissidens anomalous* Mont. in Ban Sri Dao Ruang, Palian District, Trang Province. The primary objective was to examine the water quality in the upstream areas at three specific study sites, following the GLOBE protocols. The research findings indicated that the water quality is highly suitable for the growth and distribution of *Fissidens anomalous* Mont. The average water temperature was recorded at 25.91 °C, with an average pH value of 6.67, indicating a slightly acidic to near-neutral state. Furthermore, the average dissolved oxygen (DO) was as high as 6.48 mg/L. According to the Pollution Control Department's standards for surface water quality and utilization, this classifies the sites as very clean water standards. The distribution of *Fissidens anomalous* Mont. was found to be most dense on rocks along the stream banks, characterized by high humidity and consistent water flow, which aligns with the excellent water quality measurements. The results of this study confirm that water quality is a crucial factor directly influencing moss distribution. Moreover, it reflects that this moss species serves as an effective bioindicator of local ecosystem health, providing essential data for the sustainable management of natural resources.

## Research Question

Does high water quality significantly affect the distribution of the moss species *Fissidens anomalous* Mont.?

*"This research question is scientifically significant because it positions Fissidens anomalous Mont. as a vital bioindicator for monitoring ecosystem health, addressing the critical global and local need for freshwater conservation. Unlike previous studies that often focus solely on species identification, this investigation bridges a knowledge gap by linking specific water chemistry parameters—such as pH and dissolved oxygen (DO)—directly to moss distribution. The question is clearly defined, reflecting an in-depth understanding of how non-vascular plants depend on their immediate environment. Furthermore, it is fully testable through empirical fieldwork and GLOBE protocols, ensuring that the scope is manageable while providing measurable, high-quality data for sustainable resource management."*

## Introduction

Lotic ecosystems, characterized by continuously flowing water systems, are vital natural resources responsible for the essential cycling of minerals and energy across varying elevations. In the modern era, rapid global environmental changes, coupled with expanding human activities and land-use shifts, have directly impacted water quality in both physical and chemical dimensions. According to the Department of Water Resources (2022), monitoring these changes is crucial, especially in the West Coast Southern Basin of Trang Province, where water quality directly supports local livelihoods and biodiversity. These environmental alterations trigger a complex chain reaction affecting aquatic organisms that are highly sensitive to subtle shifts in their habitat (Pollution Control Department, 2024).

Mosses, or bryophytes, serve as highly efficient and cost-effective biological indicators. Due to their unique physiological structure—lacking a complex vascular system and possessing leaf layers often only one cell thick—their cells can directly absorb nutrients and pollutants from the water (Gime, 2017). This anatomical simplicity allows mosses to respond rapidly to fluctuations in water quality parameters, such as pH levels, dissolved oxygen (DO), and temperature. These factors directly govern their metabolic rates, growth, and distribution (Withaya Teekloek, 2018). Specifically, *Fissidens anomalous* Mont. is typically found in high-humidity areas with pristine water quality. Within the Thai moss flora, the genus *Fissidens* is recognized for its diversity and specific environmental requirements, making it an ideal subject for assessing ecosystem integrity (Narin Pritnarakul, 2020; Pritnarakul et al., 2013).

Located in Ban Sri Dao Ruang, Palian District, Trang Province, the study area is a biodiversity hotspot characterized by natural stream networks. The research team recognizes the importance of studying the relationship between water quality and the distribution of *Fissidens anomalous* Mont. as a "long-term health record" for water sources (Morris Phasuk, 2019). By strictly employing The Institute for the Promotion of Teaching Science and Technology (IPST) (2017) and GLOBE Thailand (2019) protocols for environmental monitoring, this study aims to establish a crucial database for assessing ecological health. Furthermore, it seeks to provide sustainable guidelines for the conservation of water resources and the local environment in Southern Thailand.

## Research Methods

- 1. Preparation Phenomenology Research Topic**
  - 1.1 Select and define the core subject of the study.
  - 1.2 Literature Review: Gather relevant theories, existing research, and background knowledge.
  - 1.3 Establish Objectives: Clearly define the goals and scope of the study.
  - 1.4 Sampling Design: Determine the random sampling points within the designated study area.
- 2. Operational Phase-Action Planning**
  - 2.1 Create a detailed timeline and operational workflow.
  - 2.2 Site Survey: Conduct a preliminary exploration of the physical study area.
  - 2.3 Water Quality Measurement (GLOBE Protocols): Measure water temperature, pH, and Dissolved Oxygen (DO) using the following procedures:
    - 2.3.1 pH Measurement: Fill a container with a water sample. Immerse the pH indicator paper. Compare the resulting color with the standard reference chart. Perform in triplicate (3 times) to ensure accuracy.
    - 2.3.2 Temperature Measurement: Submerge the thermometer probe into the water. Wait for the reading to stabilize before recording the value. Perform in triplicate (3 times).
    - 2.3.3 Dissolved Oxygen (DO) Measurement (Winkler Method/Test Kit): Collect water in a BOD bottle until full, ensuring no air bubbles are trapped.
      - Add 3 drops of Reagent #1 and 3 drops of Reagent #2. Seal and shake until a brown precipitate forms. Let it settle for 2 minutes.
      - Add 3 drops of Reagent #3 and shake until the precipitate dissolves and the solution turns yellow. Divide the solution equally into two bottles.
      - Titration: Titrate the solution by adding Reagent #1 drop by drop while gently swirling until the yellow color turns clear/colorless. Record the total number of drops used.
- 3. Data Analysis and Conclusion/Data Analysis**
  - 3.1 Conduct a correlation analysis between environmental factors and moss distribution. Statistical tools are used to calculate the mean (average) for Water Temperature/pH level/Water Transparency (Turbidity/Dissolved Oxygen (DO)). Conclusion: Synthesize the analyzed data to answer the research questions and verify the hypothesis.

## GLOBE Badges

- 1. I am a Data Scientist**  
I don't just process data; I go where the data is. I conducted extensive field research to collect water samples and environmental insights.
- Methodology:** I utilized the global GLOBE Program standards to ensure high-quality data collection for water quality analysis.

**Analytical Precision:** Using specialized instruments, I measured critical parameters including pH levels, Temperature, and Dissolved Oxygen (DO).  
**Correlation Analysis:** My role is to decode the complex relationship between physical variables and biological indicators, turning raw environmental observations into scientific evidence.

- 2. I am Make an Impact**  
My work goes beyond statistics; it creates a ripple effect for the community and the planet.  
**Environmental Stewardship:** Through rigorous monitoring, I help preserve water quality and protect the delicate balance of our local ecosystems.

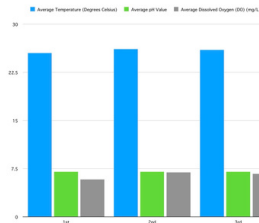
**Eco-Tourism Development:** By ensuring a thriving and pristine environment, I help transform local sites into high-value eco-tourism destinations.  
**Economic Growth:** My data provides the health of our natural, building trust and attracting more tourists to the local economy.

- 3. I am a Collaborative**  
I believe that data is most powerful when it is shared and integrated with diverse perspectives.

**Team & Mentorship:** I thrive on working closely with my teammates and advisors, ensuring our research meets the highest academic and practical standards.

**Community Integration:** I don't work in a vacuum; I actively engage with the local residents of Ban Si Dao Ruang. By integrating local wisdom with scientific data, I ensure that our conservation efforts are both accurate and culturally sustainable.

## Results



Average Temperature :25.91  
Average pH Level :6.67  
Average Dissolved Oxygen :6.48

## Discussion

The study of water quality factors affecting the distribution of the moss species *Fissidens anomalous* Mont. in Ban Sri Dao Ruang, Palian District, Trang Province, identifies three primary determinants: water temperature, pH levels, and dissolved oxygen (DO).

The findings reveal an average water temperature of 25.91°C, which is considered optimal for maintaining moisture within the moss tissue and facilitating efficient photosynthesis without heat stress. This is complemented by a pH value of 6.67 (slightly acidic to near-neutral), a condition that promotes the growth and absorption of essential minerals without damaging delicate cellular structures. Furthermore, the high dissolved oxygen level of 6.48 mg/L indicates a clean environment with good water circulation, directly supporting the respiration and anchorage of the moss in flowing water.

This research highlights that superior water quality significantly influences the growth and reproduction of *Fissidens anomalous* Mont. Although the value of bryophytes is often overlooked in Thailand, international research recognizes this moss species as a precision biological indicator (Bioindicator) of ecological health. This study serves as a vital knowledge base to foster community awareness regarding the importance of small forest flora, encouraging their use in monitoring water quality to ensure the long-term sustainability of natural resources in Ban Sri Dao Ruang.

## Conclusions

"The water quality in the Ban Sri Dao Ruang area is exceptionally pristine and fertile. With an average temperature of 25.91 °C, the water remains optimally cool, while the high dissolved oxygen (DO) level of 6.48 mg/L indicates superior water cleanliness. Additionally, the pH level of 6.67—representing a slightly acidic to near-neutral state—provides an ideal environment for aquatic life. These excellent water quality factors support the dense distribution and colonization of the moss species *Fissidens anomalous* Mont., particularly on boulders along the stream banks where there is a consistent and steady water flow."

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