

# A study of the relationship between air quality and the natural diversity of lichens in Ban Khok Ok

## Mangrove Forest, Hat Samran District, Trang, Thailand

Authors : Miss Chanidapar Rakrawee, Miss Benjaporn Jaisamut, Mr. Kittipot Sreeket  
 Advisor : Mrs. Kwanjai Karnchanasrimak, Mrs. Prempitchaya Sreeket  
 Wichienmatu School, Trang, Thailand



### Abstract

Research Title: A Study on the Relationship Between Air Quality and Natural Lichen Diversity in the Ban Khok Ok Mangrove Forest, Hat Samran District, Trang Province.

The objectives of this research are: 1. To investigate the species composition and density of lichens within the Ban Khok Ok mangrove forest. 2. To assess the water and air quality parameters in the Ban Khok Ok mangrove area. 3. To analyze the correlation between water and air quality, and the species diversity and density of lichens. By establishing specific sampling plots to record lichen data and monitor atmospheric conditions, the findings indicate that air quality significantly influences lichen diversity. A total of 23 lichen were identified, including 1. *Pyrenula andamandica* 2. *Chrysothrix candelaris* 3. *Chrysothrix candelaris* 4. *Parmelinopsis* sp. 5. *Pyrenulaceae* 6. *Chrysothrix* sp. 7. *Perithecia* 8. *Anthracotheicum* sp. 9. *Physciaceae* 10. *Pyxine convexior* 11. *Cresponaea proximata* (Nyl.) Egea & Torrente *Roccellaceae* 12. *Acanthothesis clavulifera* (Vain.) Staiger & Kalb 13. *Parmotrema tinctorum* (Deapr. ex Nyl.) Hale 14. *Physma byrsaeum* (Ach.) Tuck. *Collema* sp. 15. *Acanthothesis* sp. 1 16. *Phaeographis* his sp. 4 17. *Cresponaea chloroconia* 18. *Anthracotheicum* sp. 19. *Amadinea punctata* 20. *Platygramme caesiopruinosa* (Fée) Fée 21. *Hemithecium rufopallidum* (Vain.) Staiger 22. *Graphis semirigida* (Müll. Arg.) Lücking 23. *Pyxine consocians* Vainio *Physciaceae*

### Research Question

1. What are the specific species and density patterns of lichens found in the Ban Khok Ok mangrove forest?
2. What are the physical and chemical characteristics of the water and air quality in the study area?
3. Does a significant correlation exist between water/air quality and the species diversity of lichens, and if so, what is the nature of this relationship?

### Introduction

Lichens are symbiotic organisms resulting from a mutualistic association between fungi and algae (or cyanobacteria). This specialized relationship allows lichens to thrive in extreme environments that might otherwise be inhospitable to either partner or other life forms. As minute yet vital components of the ecosystem, lichens maintain complex interactions with various other organisms. Furthermore, lichens serve as reliable bioindicators of forest integrity and ecosystem health. Among their many ecological functions, their sensitivity to atmospheric pollutants makes them an effective tool for monitoring air quality.

Driven by these capabilities, this research group sought to investigate the relationship between water quality, air quality, and the natural diversity of lichens in the Ban Khok Ok mangrove forest, Hat Samran District, Trang Province.



### Research Methods

#### Planning Investigations

#### Materials and Equipment

1. CU Smart Lens(20X)
2. recording sheets A4
3. Mobile Phone
4. thermometer
5. Hygrometer
6. Water transparency measuring device

#### Carrying Out Investigations

**Part 1:** Study of lichen types and density in Ban Khok Ok mangrove forest, Trang Province

1. Select study points for proper lichen sampling according to the GLOBE protocol. Three sampling points were set within the Ban Khok Ok mangrove forest. A 20X CU Smart Lens was used to examine different lichen characteristics, with photographs taken and data on lichen features recorded.

2. Set up a sampling frame size 4, count the number of lichens of each type, take photographs, and record the results.

3. Classify and group the lichen species found on tree trunks based on lichen characteristics. Note that lichens are observed at different times, which may result in differences. Calculate the density of each lichen type and record the data.

**Part 2:** To study air quality in the Ban Khok Ok mangrove forest, Trang Province

1. Measure air temperature using a thermometer across three seasons: Measurements were taken once per month, with three measurement sets each time. The average value was calculated and recorded.

2. Measure relative humidity of the air using a hygrometer at three sampling points. Measurements were taken once per month, with three sets of readings each time. The average value was calculated and recorded.

3. Measure water transparency using a Secchi disk. Measurements were taken at three locations, with three repeated measurements each time. The average value was calculated and recorded.

**Part 3:** Study of air quality, lichen species, and lichen density in Ban Khok Ok mangrove forest, and their relationships. The results of air quality measurements, species types, and density were analyzed to determine their relationships and recorded.



Map of Study Site(s)

The study area was designated in the Ban Khok Ok mangrove forest Hat Samran District Trang Province at coordinates 7.21984°N , 99.59403°E



#### GLOBE Badges

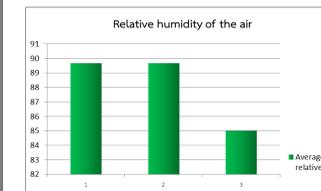
1. I am a Collaborator  
 My team members, Chanidapar, Benjaporn and Kittipot collaborated extensively on this research project. We established a systematic workflow plan to study lichens within the mangrove forest ecosystem. Every team member was responsible for surveying and demarcating the specific study site. Benjaporn was tasked with data recording and photographic documentation. Kittipot was responsible for documenting the operational process and the study site through photography, as well as compiling the data into various document formats.

2. I am a Data Scientist  
 This report presents an in-depth analysis of data retrieved from the GLOBE database, in conjunction with primary data collected by the research team. The study data has been processed and visualized utilizing tables, bar charts, and pictorial diagrams. These formats were selected to facilitate easy interpretation of the data and to ensure that the statistical findings could be practically applied.

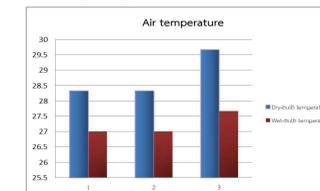
3. I am a STEM Storyteller  
 This research focuses on atmospheric conditions, specifically utilizing lichens as bio-indicators of air quality. Due to their high sensitivity to climatic conditions and environmental quality, lichens are widely recognized and employed as effective air quality indicators. The mangrove forest ecosystem is characterized by clean air and minimal disturbance. Consequently, we discovered distinct lichen species in this location that were not present in other areas. Therefore, this project serves as a research initiative dedicated to environmental conservation.

### Results

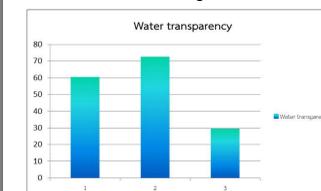
**Chart 1** The relative humidity of the air in Ban Khok Ok Mangrove Forest, Hat Samran District, Trang Province



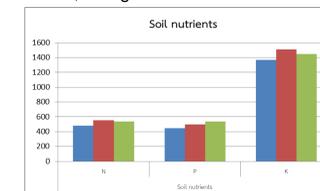
**Chart 2** shows air temperature in Ban Khok Ok Mangrove Forest, Hat Samran District, Trang Province



**Chart 3** shows water transparency in Ban Khok Ok Mangrove Forest, Hat Samran District, Trang Province.



**Chart 4** shows soil nutrients in Ban Khok Ok Mangrove Forest, Hat Samran District, Trang Provinc



### Lichen species



### Discussion

From A study of the relationship between air quality and the natural diversity of lichens in Ban Khok Ok Mangrove Forest, Hat Samran District, Trang, Thailand, it was found that air temperature affects lichen diversity, as areas with lower temperatures and higher relative humidity exhibited a greater variety of lichen species. This is consistent with the initial hypothesis that air quality influences both the type and diversity of lichen.

### Conclusions

From A study of the relationship between air quality and the natural diversity of lichens in Ban Khok Ok Mangrove Forest, Hat Samran District, Trang, Thailand, it was found that air quality in terms of air temperature and relative humidity affects lichen diversity. A total of 23 lichen species were identified in the mangrove forest.

### Bibliography

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- ◆ Ramkhamhaeng University. "What is Lichen?" Lichen Research Unit. (2024). <http://www.lichen.ru.ac.th/index.php/lichen/what>