Physical factors affecting plankton diversity in wastewater from whiteleg shrimp farming ponds in Trang, Thailand

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ABSTRACT

This study on the physical factors affecting plankton diversity in wastewater receiving ponds from whiteleg shrimp farming in Bo Hin Subdistrict, Sikao District, Trang Province, aimed to: 1) study the water quality in the wastewater receiving ponds from whiteleg shrimp farming in Bo Hin Subdistrict, Sikao District; and 2) study the plankton diversity in the wastewater receiving ponds from whiteleg shrimp farming in Bo Hin Subdistrict, Sikao District at each sampling point. Three plankton sampling points were selected between November 2025 and January 2026. Water quality data was also collected from the wastewater receiving ponds in Bo Hin Subdistrict, Sikao District, Trang Province. The results showed that the average water temperature was 28.3 °C , the average pH was 8 , the average transparency was visible at 29 centimeters and obscured at 35 centimeters, the average salinity was 0.6 ppt, and the average dissolved oxygen was The average concentration was 4.5 mg/l , and the total number of plankton found consisted of 7 divisions, divided into 4 divisions of phytoplankton : Division Chlorophyta (green algae) Volvox sp., Tetraedron sp., Eudorina sp., Division Euglenophyta, Euglena sp., and Division Bacillariophyta (diatoms). Navicula sp., Cymbella sp., Division Dinophyta (dinoflagellates) , Ceratium sp. , and zooplankton are found in three divisions : Division Rotifera (Rotifer sp., Brachionus sp., Brachionus quadridentata) and Division Arthropoda (Crustacea) (Crustacea), Cyclops sp .

Introduction

Shrimp farming is one of the important agricultural activities in Thailand, especially in coastal areas such as Bo Hin Subdistrict, Sikao District, Trang Province, of an environment to be suitable for aquaculture, such as shrimp farming. Shrimp farming requires a large amount of water, from pond preparation and shrimp cultivation to water quality management throughout the production cycle. This results in "shrimp pond wastewater," which is water that has been used for shrimp farming. This wastewater typically has high levels of salinity, organic matter, suspended solids, and nutrients such as nitrogen and phosphorus. And it affects the quality of natural water. This leads to the degradation of natural areas and water sources, as well as the accumulation of silt and sediment within shrimp farming ponds due to waste and leftover food scraps. Therefore, the research team is interested in studying the diversity of water quality and plankton in wastewater treatment ponds from shrimp farms in Bo Hin Subdistrict, Sikao District, Trang Province, as well as the relationship between water quality and plankton. This research would likely be beneficial to students, researchers, and those interested in natural resources in Thailand.

METHODOLOGY

1. Research preparation phase.
1) Identify the research question; choose a topic you wish to study.
2) Study, research, and gather knowledge and theories related to the research.
3) Define the educational objectives.
4) Determine sampling points within the study area.
2.Procedures for operating and collecting data according to GLOBE principles.
Part 1: Collecting water samples for measurement according to the GLOBE principle.
1) Survey and determine sampling points in the wastewater receiving ponds from whiteleg shrimp farming ponds in Bo Hin Subdistrict, Sikao District, Trang Province. Three sampling points were determined.
2) Measure the water temperature using a thermometer at a depth of 10 centimeters. Wait 5 minutes, read the value, and record the result.
3) Measure the pH of the water using pH paper. Read the value and record the result.
4) Measure the transparency of the water by immersing the Secchi disk in the water at three different points, three times at each point. Read the values and record the results.
5) Measure the dissolved oxygen (DO) content of the water. Take a water sample, test it using an oxygen test kit, read the value, and record the result.
6) Measure the salinity. Drop the water sample into the device. Pour 3 drops of salinity meter onto the device and read the value, then record the result.

METHODOLOGY

Part 2 : Collecting water samples to check for plankton.
1) Collect plankton samples for study of plankton species.
2)Collect plankton samples using a plankton-hauling bag and water sampling bottles, while observing and recording cloud cover.
3) Study plankton species by using a microscope to classify them.

METHODOLOGY

Part 3 : Weather Measurement
1) Cloud cover
2) Measure relative humidity.
3) Air temperature

RESULTS

Physical water quality analysis.

hydrospher print	Area 1	Area 2	Area 3	Average ($\bar{x}$) ± Standard deviation
Water temperature (℃)	28.3	28.3	28.3	28.3
pH value	8	8	8	8
Transparency value (cm³)	29	35	35	33
Oxygen content in water (mg/l)	3.5	4.5	5.5	4.5
Salinity (ppt)	0.6	0.6	0.6	0.6

Conclusions

The study results showed that the wastewater receiving pond had an average water temperature of 28.3 °C, an average pH of 8 (considered within standard limits) and an average water transparency of 33 cm. The water was found to be very turbid for The average dissolved oxygen (DO) level was 4.5 mg/l , indicating a moderate level of oxygen in the water. The average salinity was 0.6 ppt. The experimental water samples showed a diversity of plankton, including both phytoplankton and zooplankton. Phytoplankton were found in four divisions , including Chlorophyta. These include Volvox sp., Eudorina sp., Tetraedron sp. , and Euglenophyta (Euglena sp., Phacus sp., Lepocinclis sp.) , and Bacillariophyta (Navicula sp., Cymbella sp.). Dinophyta , including Ceratium sp . , acts as primary producers in aquatic ecosystems. Zooplankton are found in three divisions : Rotifera (Rotifer sp., Brachionus sp., Brachionus quadridentata), Arthropoda (Cyclops sp.) , and Amoebozoa (Amoeba sp.) , which function as consumers in the food chain .

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