Title : Khlong Lam Chan Non-Hunting Area, Chong Subdistrict, Nayong District, Trang Province, Thailand

Student Name(s) : Miss Natwra Yodsri, Miss Pinaporn Damporu, Miss Ploypraphat Jankaew

Teacher Name : Miss Sawitree Duangsook, Miss Sutheera Thacheen

School Name : Wichienmatu

Country : Thailand

Date : 30/01/2026

Abstract

This study investigates the water quality and its effects on biodiversity within the Khlong Lamchan Non-Hunting Area, Chong Subdistrict, Na Yong District, Trang Province, Thailand. The objectives were: 1) To study the physical water quality of the area, and 2) To examine the biodiversity of organisms within the site. Water samples were collected from three different locations. The methodology was divided into two parts: physical water quality analysis and biodiversity assessment. The physical parameters measured included water temperature, pH levels, dissolved oxygen (DO), and water transparency. The biodiversity survey focused on identifying species of phytoplankton, algae, protozoa, and aquatic invertebrates.

The results showed that the average water temperature ranged from 28–29°C, which is optimal for the metabolic processes and reproduction of aquatic life. The pH levels ranged between 8.33–8.67, indicating a slightly alkaline (basic) condition that reflects the water body's efficiency in maintaining acid-base balance. Dissolved oxygen (DO) levels were recorded at 7.33–8.17 mg/L, which is considered "Good" to "Very Good," indicating effective gas exchange and photosynthesis by aquatic plants and phytoplankton. Furthermore, the high transparency of the water, with the bottom clearly visible, suggests low suspended solids and an environment conducive to photosynthesis.

Regarding biodiversity, four main groups of plankton were identified:

1.Unicellular organisms (Protozoa): 3 species found, including *Paramecium caudatum* Ehrenberg, *Paramecium bursaria* Ehrenberg Focke, and *Vorticella* sp. 2.Zooplankton: 8 species found, including *Lecane leontina*, *Brachionus* sp., *Mytilina* sp., *Scaridium longicaudum*, *Testudinella patina*, *Euchlanis* sp., *Nematoda*, and *Stylaria lacustris*. 3.Phytoplankton: 1 species found, *Staurastrum* sp. 4.Mixotrophs: 1 species found, *Euglena* sp. Additionally, 14 species of algae were identified, such as *Dictyosphaerium granulatum*, *Netrium digitus*, *Spirogyra* sp., *Pinnularia* Ehrenberg, and *Volvox* sp., among others. A total of 12 species of aquatic invertebrates, ranging from small to large sizes, were also recorded, including *Neritina natalensis* sp., *Chironomus* sp., *Caridea*, *Cyclops* sp., and *Daphnia* sp. The presence of a high variety and abundance of primary producers indicates the ecosystem's potential for energy production. Meanwhile, the presence of various levels of consumers reflects a healthy food chain and efficient nutrient cycling. Some identified species serve as bioindicators of water quality, aligning with the physical quality results which were rated as "Good."

In conclusion, the Khlong Lamchan Non-Hunting Area is a fertile freshwater habitat with suitable water quality and high biodiversity, signifying a balanced and stable freshwater ecosystem. These findings serve as baseline data for monitoring water quality changes, natural resource conservation, and sustainable management of freshwater ecosystems in non-hunting areas.

Keywords : Water quality, Biodiversity, Plankton, Freshwater ecosystem, Khlong Lamchan Non-Hunting Area

Research Question

To what extent is the biological diversity (biodiversity) within the Khlong Lam Chan Non-Hunting Area?

Hypothesis

The Khlong Lam Chan Non-Hunting Area exhibits high biodiversity due to the presence of numerous aquatic animal and plant species.

Introduction

The Khlong Lam Chan Non-Hunting Area serves as a vital habitat for a large population of Lesser Whistling Ducks (*Dendrocygna javanica*) and Cotton Pygmy Geese (*Nettapus coromandelianus*). The area is surrounded by extensive wetlands and diverse flora, offering a serene environment (Tourism Authority of Thailand, 2023). Originally established as a non-hunting area, local residents later donated land to the government to develop it into a tourist destination. This low-lying terrain consists of several canals and large marshes, acting as a crucial breeding ground for various wildlife, particularly birds. Within its 100-rai area, the site features concrete and wooden bridges, and pavilions, with red lotuses blooming across the marshes during the summer (Bangkok Biz News, 2016).

This research aims to study the biodiversity and assess the water quality in Khlong Lam Chan by analyzing six key factors:

1. Temperature: This directly affects metabolism through enzymatic activity. Increased temperatures enhance kinetic energy, leading to more frequent collisions between enzymes and substrates. The optimal temperature range for enzyme function is typically 25–40°C; temperatures exceeding this can cause enzymes to denature and cease functioning.
2. Dissolved Oxygen (DO): A critical indicator of water quality, DO is essential for the respiration of aquatic animals and microorganisms. An ideal DO level should be above 5 mg/L. Levels below 3 mg/L can cause stress or death in aquatic life, while excessively high levels may lead to gas supersaturation (Nakhon Nayok Provincial Fisheries Office, 2021).
3. pH Levels: This reflects the ecological balance of the water body. Deviations in pH can adversely affect both aquatic plants and animals (Hanna, 2026).
4. Water Transparency: This influences underwater ecosystems and human activities. Clearer water allows sunlight to penetrate deeper, enabling aquatic plants to photosynthesize effectively and produce more oxygen. Transparency of less than 30–60 cm can disrupt the ecological balance (P. Charoen Farm, 2024).

5. Macrobenthic Invertebrates: Organisms such as aquatic insects and freshwater mollusks serve as excellent bioindicators due to their clear responses to changes in water quality (Woraphong Phothiphithak, 2002).
6. Plankton Composition: This includes phytoplankton, which act as primary producers, and zooplankton, which serve as primary consumers and a food source for many aquatic species (Wilailuck Niyommaneerat, 2022).

The assessment of water quality and its impact on biodiversity in the Khlong Lam Chan Non-Hunting Area, Trang Province, Thailand, reflects the health, fertility, and ecological changes of the system. Understanding these physical, chemical, and biological factors is essential for providing the data necessary for the conservation, restoration, and sustainable development of local water resources.

Materials and Equipment

1. Flags (for marking sampling sites)
2. Measuring tape
3. pH indicator paper
4. Thermometer
5. Plankton net
6. Secchi disc
7. Dissolved Oxygen (DO) test kit

Part 1: Water Quality Measurement Protocols

- 1.Water Transparency: Measured using a Secchi Disc.
- 2.Dissolved Oxygen (DO): Measured using a DO Test Kit.
- 3.Water pH: Measured using pH Paper.
- 4.Water Temperature: Measured using a Glass Mercury Thermometer.

Part 2: Plankton Sampling and Identification

Plankton Sampling using a Plankton Net

Table 1 Physical water quality analysis.

What needs to be measured.	Area 1	Area 2	Area 3	average ($\bar{x}$) ± deviation standard
Temperature (℃)	28.07	29	28	28.36 ± 0.46
pH value	7	7.67	8	7.56 ± 0.56
Turbidity value (m)	Very transparent, 0.86 m deep.	Very transparent, 0.49 m deep.	Very transparent, 0.26 m deep.	0.54 ± 0.30
Dissolved oxygen in liquids (DO)	7.33	8.17	7.5	7.67 ± 0.44

Table 1 shows the physical water quality analysis. The results indicate that the studied water sources have good water quality and an environment suitable for aquatic life. The temperature, pH , and dissolved oxygen levels in the studied water sources are within suitable ranges for the survival of aquatic ecosystems. The measured water temperature is stable . The pH is neutral to slightly alkaline, within suitable limits and not causing toxicity to aquatic life. Dissolved oxygen levels are good to very good, indicating efficient gas exchange between water and the atmosphere, as well as photosynthetic activity of aquatic plants and phytoplankton. Furthermore, high water transparency indicates a relatively low amount of suspended solids, allowing light to penetrate well into the water layer, supporting the photosynthesis process of living organisms.

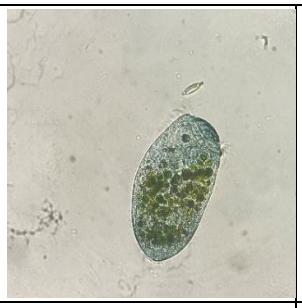
Table 2 Shows cloud cover amount.

Types of clouds	Area 1	Area 2	Area 3	average
Cirrus	5	40	40	29

Cumulus	25	60	50	45
Cirrostratus	70	75	60	68.33
Cirrocumulus	20	15	5	13.33

From Table2. Cloud cover data shows differences in coverage across three areas. Cirrostratus clouds have the highest average coverage, indicating they are commonly found in the studied area. Cumulus clouds are also present in relatively large quantities. Cirrus clouds provide moderate coverage, while Cirrocumulus clouds provide the least coverage. Therefore, the study area was predominantly covered with high-level clouds, particularly cirrostratus clouds , with very few cirrocumulus clouds.

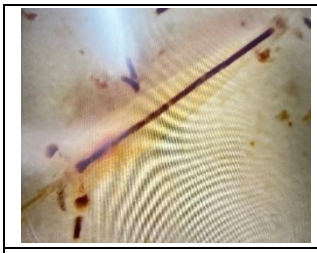
The image shows an example of plankton.

			
Lecane leontina	*Scaridium longicaudum*	*Paramecium bursaria*	*Stylaria lacustris* Linnaeus

From The image shows an example of plankton. found in the Khlong Lam Chan Wildlife Sanctuary are shown. Four main groups of plankt were found. These include: 1. Protozoa: This group consists of single -celled organisms that are not plants. Most are mobile and feed on other living organisms or organic matter. Three species were found: *Paramecium caudatum Ehrenberg, Paramecium bursaria Ehrenberg Focke, and Vorticella* sp. 2. Zooplankton (Metazoa) *This group consists of small* , multicellular animals, mostly rotifers , which are good indicators of water quality . A total of 8 species were found, including *Lecane. leontina* , *Brachionus* sp . , *Mytilina* sp., *Scaridium longicaudum* , *Testudinella patina, Euchlanis* sp . ,

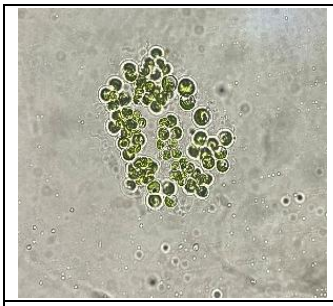
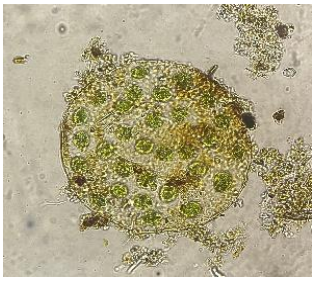
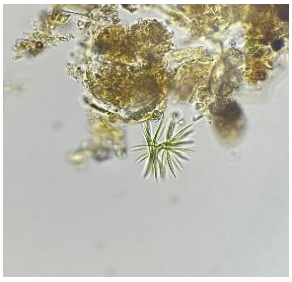
Nematoda, Stylaria 3. Lacustris . A group of phytoplankton. This group acts as producers in the ecosystem, using photosynthesis. One species, Staurastrum sp. , was found. The fourth group is Mixotrophs (Euglenoids), which are intermediate between plants and animals (capable of photosynthesis and feeding). One species, Euglena sp., was found , indicating that the water source contains a diverse range of microorganisms and single-celled organisms. especially Euglena and Vorticella indicates that the water source is stagnant or slow-flowing water with high organic matter content and abundant nutrients. Protozoa play a crucial role in nutrient cycling and the decomposition of organic matter in water sources. The detection of various protozoa species indicates the abundance of nutrients in the water. Therefore, the Khlong Lam Chan Wildlife Sanctuary has water with high organic matter content, low oxygen levels, and serves as a habitat for organisms that feed on bacteria or organic matter.

The image shows an example of a small invertebrate animal.

			
Caridea sp.	*Neritina natalensis* sp.	*chironomus* sp.	*Damselfly Nymph*

From The image shows an example of a small invertebrate animal. The large invertebrates detected *include Neritina natalensis sp. Zebra, chironomus. sp. , Caridea cyclops sp ., Chydorus sp., Ostracod sp. Daphnia sp. ,Damselfly Nymph, Dalyellia viridis Shaw, Hydrachnidia sp., chironomid larvae and Hydrachna sp.* comprises a total of 12 species. Most of these organisms are benthic or small aquatic animals found in freshwater sources. The presence of such a diverse range of species reflects the biodiversity of the water source. And it provides an environment suitable for aquatic life.

The image shows an example of algae.

			
Dictyosphaerium granulatum	*Netrium digitus*	*Volvox* sp.	*Ankistrodesmus* sp.

From The image shows an example of algae. Various types of algae can be found, such as: *Dictyosphaerium granulatum , Netrium digitus , Spirogyra sp., Pinnularia Ehrenberg, Volvox sp., Desmidium swartzii , Ankistrodesmus , Chlorococcum hypnosporum* These algae , including *Closterium navicula,* are primary producers that play a crucial role in generating energy and oxygen for aquatic ecosystems. Therefore, the presence of various algae species , especially large quantities of diatoms and green algae, reflects relatively clean or abundant water, a suitable environment, and sufficient nutrients.

Discussion

The investigation of water quality and biodiversity in the Khlong Lam Chan Non-Hunting Area reveals a highly stable and productive freshwater ecosystem. The results can be discussed in two main parts

1. Physical Characteristics and Water Quality

- Water Temperature: The average recorded temperature of 28–29°C is considered optimal for the metabolic and reproductive processes of various aquatic species. This

range suggests that external thermal factors, such as solar radiation and heat dissipation, have not yet reached levels that induce thermal stress within the biological community.

- pH Levels: The pH values, ranging from 8.33 to 8.67 (slightly alkaline), indicate the water body's robust buffering capacity. While this range is suitable for general aquatic adaptation, the mild alkalinity may favor specific plankton groups, such as certain types of algae. Furthermore, the stability of the pH suggests that the area is not yet significantly impacted by external pollutants from agricultural activities or nearby communities.
- Dissolved Oxygen (DO): With values between 7.33 and 8.17 mg/L, the DO levels are categorized as "Good to Excellent." These high levels result from efficient gas exchange, active photosynthesis by aquatic plants and phytoplankton, and sufficient water circulation. The observed variations between Sites 1, 2, and Site 3 likely reflect localized environmental fluctuations, such as differences in water flow rates and the density of aquatic vegetation.
- Water Transparency: In all study areas, transparency exceeded the total depth of the water body, meaning the bottom was clearly visible. This state reflects extremely low concentrations of suspended solids, ensuring maximum light penetration. Such clarity directly benefits the ecosystem by enhancing the photosynthetic efficiency of primary producers.

Part 2 Biological Diversity and Ecosystem Health

- The biological survey within the Khlong Lam Chan Non-Hunting Area reveals a high degree of taxonomic richness, spanning several groups of organisms including phytoplankton, algae, protozoa, and both micro and macro-invertebrates. This findings can be discussed through the following ecological lenses:
- Primary Productivity: The discovery of numerous species of phytoplankton and algae signifies a robust foundation of primary producers. These organisms are capable of

efficient photosynthesis, ensuring a steady energy supply that fuels the entire freshwater ecosystem.

- Trophic Complexity and Nutrient Cycling: The presence of various protozoa and invertebrates indicates a complex food web. These organisms play a vital role as intermediate consumers and decomposers, facilitating the essential process of nutrient cycling within the water body.
- Bioindicators of Water Quality: Several identified species serve as biological indicators. Their presence directly correlates with the physical water quality data, confirming that the environment is consistently healthy and free from significant chemical or organic stress.
- Ecological Stability: The coexistence of diverse biological groups demonstrates that the study area provides a stable and fertile habitat. The environmental conditions are highly suitable for the growth, survival, and reproduction of a wide array of aquatic life

Conclusion

The study of the physical characteristics of the water source revealed that the water temperature was in the range of approximately 28–29 °C. The pH, dissolved oxygen, and water transparency were within suitable ranges for the survival of aquatic life. The water temperature of 25-32 °C was conducive to metabolism and reproduction. The pH was in the slightly alkaline range (greater than 7) , which helps maintain the balance of the ecosystem. Dissolved oxygen levels were good to very good, within the standard range of 5-8 mg/L. The water's transparency is high because transparency exceeds depth, allowing sufficient light to penetrate the water source, which is conducive to photosynthesis by aquatic plants and phytoplankton.

The results of a biodiversity study found plankton. 4 main groups These include: 1. Single-celled organisms, of which there are three species: *Paramecium caudatum Ehrenberg, Paramecium bursaria Ehrenberg Focke, and Vorticella* sp. 2. Zooplankton group: A total of 8 species were found, including *Lecane. leontina* , *Brachionus* sp . , *Mytilina* sp., *Scaridium*

longicaudum , *Testudinella patina, Euchlanis* sp . , Nematoda, Stylaria 3. Phytoplankton group : 1 species, Staurastrum sp. 4. Myxotroph group : 1 species, Euglena sp. 14 species of algae were found , including *Dictyosphaerium. granulatum , Netrium digitus , Spirogyra* sp . , *Pinnularia Ehrenberg* , *Volvox* sp., *Oocystis* sp., *Spirogyra* sp., *Mougeotia C.* , *Cosmarium scabrum* , *Chlamydomonas* sp., *Desmidium swartzii* C., *Ankistrodesmus , Chlorococcum hypnosporum* , *Closterium navicula* And 12 species of invertebrates, ranging from small to large, including *Neritina natalensis.* sp . , *Chironomus* sp., Caridea , *Cyclops* sp., *Chydorus* sp., *Ostracod* sp., *Daphnia* sp., *Damselfly Nymph, Dalyellia viridis Shaw* , Hydrachnidia sp., *Chironomid larvae* , *Hydrachna* The study found a diverse range of organisms in the water source, including phytoplankton, algae, and invertebrates ranging from small to large sizes. This indicates a relatively complete food chain and efficient nutrient cycling. Some of the organisms detected can serve as indicators of water quality, consistent with the overall good water quality assessment results.

Therefore, based on studies of both water quality and biodiversity, it can be concluded that the Khlong Lam Chan Wildlife Sanctuary has appropriate water quality and relatively high biodiversity, reflecting a balanced freshwater ecosystem that is conducive to the survival of living organisms.

Bibliography/Citations

Source : Khlong Lam Chan Wildlife Sanctuary https://greennews.agency/?p=16326

Source : Plankton Sampling Guide.

https://storymaps.arcgis.com/stories/6b5f6fc533604a9f8bace7b1b83b625c

Source : Water transparency https://www.balasevic.net/turbidity/turbidity-meter/

Source : Principles and methods of measurement https://globefamily.ipst.ac.th/

(Optional) Badge Descriptions/Justifications

I AM A DATA SCIENTIST .

The study of the impact of water quality on biodiversity in Lam Chan Canal examined the relationship between physical (transparency , temperature), chemical (DO, pH) , and

biological (large invertebrates , plankton) factors, which are crucial in earth system science. Analysis utilized the GLOBE database as well as data collected by the research team. The team discussed the limitations of the data and used the analysis results to conclude about the relationship between water quality and biodiversity. The trend indicates that Lam Chan Canal is likely to maintain good water quality in the future, provided that the factors discussed by the research team do not change.

I AM AN EARTH SYSTEM SCIENTIST .

The study of water quality's impact on biodiversity is linked to various Earth systems. Research using the GLOBE protocol measured water temperature, pH, dissolved oxygen, and transparency. These parameters were found to be within optimal ranges for aquatic life. Water temperature was conducive to metabolism and reproduction; pH was slightly alkaline, maintaining ecological balance; dissolved oxygen levels were good to very good; and water transparency was high, allowing sufficient light penetration, which is beneficial for photosynthesis by aquatic plants and phytoplankton.

an impact.

I MAKE AN IMPACT

A study of water quality's impact on biodiversity revealed a diverse range of organisms, reflecting the fact that the Lam Chan canal water source possesses rich biodiversity and an environment suitable for aquatic life. The presence of such a variety of species indicates that the studied water source has a suitable and abundant environment, making it worthy of conservation. Maintaining the cleanliness and sustainability of the Lam Chan canal ecosystem is crucial.