The Study of Water quality and Phytoplankton which Affect to the Survival and Growth Rates of Oyster (*Crassostrea belcheri*) in the Coastal area of Trang Province.

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Abstract

This research aims to study water quality and plankton density on survival and growth rates of oysters raised in different areas in Trang Province. The study was conducted in 3 areas, including Banlaemsai, Banlaemmakham and Banlaem by bringing oysters aged 4 months and raised in cages in 3 baskets in each area with 10 oysters in each basket. Water quality was measured and determine the number of plankton using a microscope. Oyster growth was measured by size and weight every 1 month for 4 months. The study found that the growth rate of oysters in Banlaemsai was the highest, followed by Banlaemmakham and Banlaem, respectively. The pH, DO, and temperature were slightly different in all three areas. Banlaem has lower salinity than Banlaemsai and Banlaemmakham. The highest density of phytoplankton was at Banlaemsai, followed by Banlaemmakham and Banlaem, respectively. It was concluded that Banlaemsai and Banlaemmakham were suitable for oyster farming. Banlaem is not suitable for raising because the high ammonia content decreases the growth rate of the oysters, indicating that there is a large amount of sediment and affects the oyster respiration. And plankton affect oyster growth rate because plankton are food for oysters and salinity is unstable because it is near a river source that always flows with fresh water.

Keyword: *Crassostrea belcheri*, water quality and phytoplankton
Introduction

Oysters (*Crassostrea belcheri*) is a large bivalves. It is a valuable marine animal and economic animal which is popular feasted because of the good price, lots of meat, good taste and nutritious. It can be used to cook in many menus, so it is very popular with consumers. It can generate income for farmers who raise very well. Currently, the demand for oysters is increasing. The selection of suitable raising sites for oysters has the highest growth and survival rates. For commercial purposes and in order to respond to market demands

Farmers are urged to cultivate oysters in a research study on water quality in the area. Oysters for commercial purposes in Trang Province, employing The Rajamangala University of Technology, Trang Campus’s idea of raising condos in cages in three areas: Ban Laem Sai, Ban Laem Makham and Ban Laem. The geographical differences between Khao Mai Kaew Subdistrict, Sikao District, Trang Province and Ban Laem Subdistrict, Wang Won Subdistrict, Kantang District, Trang Province and Ban Laem subdistrict, Kantang district, Trang province are as follows

- Ban Laem Sai while rainy season, a saline water area that is unaffected by the amount of fresh water.
- During the flood season, the Ban Laem Makham area supports a large volume of fresh water which comes from the Kala Sae Canal
- During the rainy season, Ban Laem sustains a amount of fresh water, with the water coming from the Palian River.

There would be diverse effects on water quality due to such geography, and it will grow at different speeds. If the finding of this study are correct. Oyster has diverse growth rates, so it will be able to choose the best to encourage farmers to raise oysters for commercial purposes

Questions for research

1. Is the growth of oysters in Trang’s coastal areas different or not?
2. Amount of phytoplankton, water quality are there any differences in raising area in Trang coastal?

Hypothesis

1. Different survival and growth rates of oysters raising in Trang Province’s coastal areas are different.
2. Due to water quality and amount of phytoplankton in raising area of oysters Trang Province’s coastline area is different
Procedure

1. equipment
   1) digital vernier caliper
   2) incubator
   3) Three digit-digital balance
   4) Pulling bags for phytoplankton (20 micrometer-gap)
   5) Bottles for water sample
   6) pH meter
   7) DO meter
   8) Salinity meter
   9) thermometer
   10) Filter paper
   11) microscope
   12) 3*3 meter floating basket
   13) Plastic baskets for raising oysters (33*22 cm)
   14) Water buckets (10 litred * 2 buckets)

2. Chemicals used in the experiment
   2.1 Chemicals used for measuring Ammonia
      - Phenols
      - Sodium Nitruside
      - Alkaline
      - Oxidizing solution
      - Ammonia solution

   2.2 Chemicals used for measuring Nitrate
      - Concentrate ammonia solution
      - Salpanilamite solution
      - Nepthyl Athylene Dihdrochoride (NED)

   2.3 Chemicals used for measuring Nitrite
      - Salpanilamite solution
      - Nepthyl Athylene Dihdrochoride (NED)
      - Stock white standard solution
      - stock nitrite standard solution
2.4 Chemicals used for measuring Phosphate

- Ammonia polipdate solution
- Sulphuric acid solution
- Potassium Antimonitate solution
- Phosphate standard solution

3. Procedure

3.1 Study Area

In this study, the study of water quality and phytoplankton. In this study, water quality which affect to the survival and growth rate of oysters was conducted in 3 areas of Trang province. The first area is floating basket in Ban Laemsai, Sikao District (Latitude 7.6256 Longtitude 99.2667) The second area is the floating basket in Ban Lammakham, Sikao District (latitude 7.6274 Longtitude 99.2935) and the third area is floating basket in Ban Laem, Kantang District (latitude 7.3453 longtitude 99.5699 as:

![Maps showing study areas](image)

(a) Ban Lammakham (b) Ban Laem (c) Ban Laemsai

Picture 1 shows the area used in the study (a) Ban Laem Makham (b) Ban Laem (c) Ban LaemSai

3.2 timing period and determining the sample collecting spots

The researcher team surveyed observed and recorded the data of survival and growth rate of oysters by measuring the size of oysters, water quality, type and amount of phytoplankton every months. Measuring all of these information has been conducted for 4 months from October 2021 to February 2022.

3.3 Steps of experiment

1. Preparing oysters
   1.1 280 oysters which are 4 months old with similar shape and size were prepared.
   2. Preparing raising condos for raising oysters
   2.1 3 raising condos baskets (5x3 m) were prepared.
2.2 9 floating baskets (3x22 cm) were prepared and 3 baskets were distributed in each raising condo contained 3 baskets were distributed in each raising condo.

3. Raising steps of oysters

3.1 90 oysters were put into 30 baskets while each contained 9 baskets. raising condo contained 3 baskets

3.2 10 oysters were chosen randomly to be measured and weighed then labeled with 1-10 number for experiment purposes.

3.3 The survival and growth rate of oysters were observed and recorded by measuring water quality, type and amount of phytoplankton every month for 4 months.

the survival rate of oyster = \( \frac{\text{Number of survived oysters} \times 100}{\text{Total number of oysters}} \)

3.4 Using the data obtained from the study, summarizing the results of finding an area suitable for growth of white-throated oysters by comparing the survival rate. Meat integrity index and the size of shellfish in each area

4. Water quality data collection

Water quality was measured according to the GLOBE method by measuring temperature, pH, DO, salinity, and water samples were taken for examination, ammonia, nitrite, nitrate and phosphate.

4.1 Determine the measurement point Around the cage raising oyster species from 3 sources

4.2 Measure the water temperature by immersing the thermometer in 10 cm of water for 3 minutes.

Read the temperature on the thermometer at eye level. The thermometer bulb must remain in the water, collect data 3 times.

4.3 Measure the pH of the water by immersing the pH Meter in 10 cm of water for 3 minutes.

Read the pH value on the pH Meter at eye level. The pH Meter bulb must remain in the water. Collect data 3 times.
4.4 Measure the DO value of water by immersing the DO Meter in 10 cm of water for 3 minutes.

Read the DO value on the DO Meter at eye level. The DO Meter bulb must remain in the water. Collect the data 3 times.

4.5 Measure the salinity of the water by a salinity meter.

4.6 Check nitrate, ammonia, nitrate and phosphate. according to the method of the Department of Fisheries Ministry of Agriculture and Cooperatives (2019)

5. Plankton storage

store plankton data Seawater was scooped at the surface of the water volume of 20 liters, filtered through a phytoplankton filter bag with an eye opening of 20 µm. The samples were collected 3 times per area.

6. Statistical Data Analysis

The results of the study were used for statistical analysis. using the mean standard balcony and statistical data using One Way ANOVA at .05 confidence level.

study results

1. A study of the growth rate of oysters.

The growth rates of oysters were studied, including survival rate, body size and weight. the integrity of the shellfish in Ban Laem Sai , Ban Laem Makham and Ban Laem have the following results:

chart 1.1 The size and weight of oysters in each cage area

From chart 1.1, it was found that the size and weight of the oysters in Ban Laem Sai was higher than Ban Laem Makham and Ban Laem.
Chart 1.2 The survival rate of oysters in each cage area

From Chart 1.2, it was found that the survival of oysters in Ban Laem Sai cage and Ban Laem Makham were higher than Ban Laem.

2. Water quality study

Study water quality according to GLOBE method, i.e. temperature, pH, DO value, salinity. Ammonia and nitrite values Laem Sai Ban Laem Sai Ban Laem Makham and Ban Laem have the following results.

Chart 2.1 Average temperature in each cage area

From the chart 2.1, it was found that the temperature in the Ban Laem Makham cages was higher than the Ban Laem Sai and Ban Laem area.
From the chart 2.2, it was found that the pH in the Ban Laem Makham cages was higher than the Ban Laem Sai and Ban Laem, respectively, which differed statistically at a confidence level of .05.

**Chart 2.2 Average pH of each cage area**

From the chart 2.3, it was found that the DO values in the Ban Laem Makham cages were higher than those in Ban Laem Sai and Ban Laem, respectively, which differed statistically at a confidence level of .05.

**Chart 2.3 Average of DO values in each cage area**
**Chart 2.4** Average salinity values in each cage area

![Chart 2.4](chart24.png)

From the chart 2.4, it was found that the salinity in the Ban Laem Sai cages was higher than the Ban Laem Makham and Ban Laem areas.

**Chart 2.5** The values of nitrites in each cage area

![Chart 2.5](chart25.png)

From the chart 2.5, it was found that the nitrite values in Ban Laem cages were higher than those in Ban Laem Sai and Ban Laem Makham.
Chart 2.6 The averages value of ammonia in each cage area

![Chart 2.6](image)

From the chart 2.6, it was found that the ammonia value in Ban Laem cage was higher than that in Ban Laem Makham and Ban Laem.

3. The results of the study of phytoplankton

From the study of phytoplankton communities in Laem Sai, Laem Makham and Ban Laem, Trang provinces in October, December 2021 and January 2022, phytoplankton that could be classified up to 39 genera in total were identified as diatoms (Class Bacillariophyceae) are the group with the highest composition of 30 genera, followed by 5 genera of dinoflagellates (Class Dinophyceae) 2 genera of cyanobacteria or blue-green algae (Class Cyanophyceae) green algae (Class Chlorophyceae) 1 genus and Class Dictyochophyceae 1 genus.

The averages total density of phytoplankton at Laem Sai, Laem Tamarind and Ban Laem in October, December 2021 and January 2022 were between $1.15 \times 10^4$ and $3.83 \times 10^5$ cells/liter, with the highest density of phytoplankton at the cape. Sai in October with an average density of $3.83 \times 10^5$ cells per liter, followed by Laem Makham in October with an average density of $3.59 \times 10^5$ cells per liter and at Cape Tamarind in December.
Chart 3.1 Average total density of phytoplankton at Laem Sai, Laem Makham, Ban Laem in October-December 2021, January and February 2022, Trang Province
Summarize and discuss the results of the study.

From the research study on raising oysters in the cages of Ban Laem Sai, Ban Laem Makham and Ban Laem during the four-month period from November 2021 to February 2022 found that the growth rates of oysters in the coastal area differed statistically at a confidence level of .05 highest followed by Ban Laem Makham and Ban Laem. The fertility of oyster in the cages at Ban Laem Sai was the highest (11.82 ± 1.19a), followed by Ban Laem Makham (10.68 ± 0.07b) and Ban Laem (10.37 ± 1.42c). The highest in the Ban Laem Sai cage followed by Ban Laem Makham and Ban Laem. The survival rate of oyster in the cages of Ban Laem Sai and Ban Laem was the highest (100%), followed by Ban Laem Makham (96.67%). As for water quality, it was found that the temperature in each cage was not statistically different. The confidence level was .05. The pH value in the Ban Laem Makham cage (7.84 ± 0.21b) was higher than that in the Ban Laem Sai cage (7.47 ± 0.14a) and Ban Laem (7.29 ± 0.21a), respectively. The DO value in the Ban Laem Makham cage (7.18 ± 0.75b) was higher than Ban Laem Sai (4.20 ± 1.07a) and Ban Laem (4.34 ± 0.75a). The salinity in the Ban Laem Sai cage (28.00 ± 0.14a) was higher than the Ban Laem Makham (25.50 ± 3.42a) and Ban Laem (15.67 ± 7.64b). The nitrite value in the Ban Laem cage (0.024 ± 0.034a) was higher than Ban Laem Sai (0.002 ± 0.001a) and Ban Laem Makham (0.002 ± 0.000a). The ammonia values in Ban Laem cage (0.059 ± 0.005a) were higher than those in Ban Laem Makham (0.017 ± 0.017a) and Ban Laem Sai (0.014 ± 0.005a) and 39 types of phytoplankton that classified were found with the highest density of phytoplankton in Ban Laem Sai. followed by Ban Laem Makham and Ban Laem.

From the study of water quality of coastal areas, including Ban Laem Sai, Ban Laem Makham and Ban Laem. It affects the growth of oysters, that is, the cage area with high ammonia value will cause the growth rate of the oysters to be low. This is because the high ammonia value indicates the presence of large amounts of sediment and affects the respiration of the oyster.

From the study of the demand of plankton in coastal areas such as Ban Laem Sai, Ban Laem Makham and Ban Laem. Affects the growth of oyster, that is, there are many phytoplankton around the cage of Ban Laem Sai. As a result, oyster has the highest growth rates due to the plankton found as food for oyster.
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Badges

1. I am a data science
   
The researcher team surveyed to observe and record the data of survival and growth rate of Crassostrea belcheri by measuring the size of Crassostrea belcheri, water quality, type and amount of phytoplankton every months. Measuring all of these information has been conducted for 4 months from November 2021 to February 2022. The results of the study were used for statistical analysis, using the mean Standard Deviation and One Way ANOVA, at the statistical level of .05.

2. I am a collaborator
   
The researcher work with Walailak University, Rajamangala University of Technology Srivijaya, Trang Campus, Ban Lammakham, BanLaem and Ban Laemsai

3. I make an Impact
   
The results of the study can be used as information for raising oysters to promote careers for famer in the community.