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**Intensive cage culture of some high-valued marine fishes in the Nghi Son Gulf, Thanh Hoa province and possible solutions to increase productivity and economic efficiency**

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**1. Introduction**

Vietnam is a country of great potential for developing marine finfish farming. Thanh Hoa province located in the North Central coast with many areas, such as Gam clumsy, Thui sea, Vol clumsy, Nghi Son Gulf and the Hon Me island (Tinh Gia district) and the Ne Islands... created potential area for aquaculture development in the sea and the islands.

Nghi Son Gulf has suitable conditions for development of marine fish cage culture. In recent years, marine fish farming has been strongly developed, it brings efficiencies and income for many farms. Therefore, area used for fish culture is increasingly expanding.

However, the recently massive development of marine fish cage culture without planning causes serious problems such as environmental pollution, disease, lack of farming area ...

Therefore, from the situation and support of the **EU-link project** and research institutions for Aquaculture No.1 as well as Tran Quoc Hoang's farm, we implemented a subject:

***“Intensive cage culture of some high-valued marine fishes in the Nghi Son Gulf, Thanh Hoa province and possible solutions to increase productivity and economic efficiency”***

The implementation of this research helps us and fish farmer acknowledge the situation, fish farming techniques. Possible solutions are given in order to improve productivity and economic efficiency, reduce poverty in the Nghi Son Gulf.

## 2. Intern's activities from 1<sup>st</sup> June to 30<sup>th</sup> November 2009

Week	Date (s)	Activities	Remark
Week 1 - Week 2 -	1 <sup>st</sup> June 2009 to 14 <sup>th</sup> June	(1) Visit and work in marine fish farms in Nghi Son Gulf	Investigate and understand the current situation of marine fish farming in Nghi Son Gulf
		(1.1) To study natural conditions of the fish farms	Get acquainted with the local leaders and fish farmers, collect data and capture the natural conditions of Nghi Son Gulf.
		(1.2). Research the technical state of some species of marine fish in Nghi Son Gulf	Interview the farmers with and grasp the overall current situation of marine fish farming techniques in the Gulf of Nghi Son
Week 3 - Week 25	From 15 <sup>th</sup> June to 30 <sup>th</sup> November 2009	(2). Experiment with intensive cage culture on grouper (1 cage), Cobia (1 cage), Sea bass (1 cage) and Red Drum (1 cage) in the cage system of Tran Quoc Hoang in Nghi Son Gulf.	Approach and capture the real knowledge of designing and operating cage system, feeding technique and management.
		(2.1). Research, design and operate marine fish cage system	Install and operate cage system.
		(2.2). Research feeding technique and manage marine cage culture.	Buy fish seed, feed, biological products, drugs, etc. Directly produce, care and manage fish cages with Tran Quoc Hoang. Gain useful practical knowledge of species selecting techniques - stocking and feeding techniques – feed and fish health management and disease prevention for fish.

### 3. The result of Intership experience

#### 3.1. Natural conditions of the Gulf of Nghi Son:

##### Geographic location:

Nghi Son Gulf is in Nghi Son commune - Tinh Gia district - Thanh Hoa province



Figure 3.1: Overview of fish cages in Nghi Son Gulf

##### Climate characteristic

The climate here is in the tropical monsoon, there are four distinct seasons in a year.

##### Tidal regime, flow:

Thanh Hoa waters diurnal regime dominates. Quite large tidal current speed, current speed Society The largest wave of K1 in the 70 cm layer reaches 4m/s.

#### 3.2. Survey results and overall condition rating in the area of the research:

- ❖ Condition of natural tidal regime, the flow in Thanh Hoa are relatively favorable for the development of marine fish cage culture.
- ❖ Design, structure and operating system of marine fish: Integrated cage framework system is designed and operated in a simple style that is popular in Vietnam today.
- ❖ Seed's source, seed selecting and flocking technique:
  - Source varieties mainly depends on traders from China, seed quality is not under control, ...
  - Farmers' seed selecting technique mainly relies on perceptible factor.
- ❖ Technical management of personal care and breeding:
  - Technical management for food and feeding: fish food is 100% fresh fish magazine. The management of individual servings of food of farmers is not received much attention.
  - This affected negatively the environment, growth of fish farming as well as the high risk of fish disease.

- ❖ Environmental management and prevention of disease:
  - Fish farmers do not pay attention to the environmental management and prevention of diseases for fish
  - Waste water, farm garbage and sewage from the industrial zone flows directly into the sea, leading to the pollution of culture areas in recent years.
  - The development of excessive number of cages and fish in recent years make disease occur regularly, a series of dead fish, low productivity (yield: on 6 kg/m<sup>3</sup> cage) and cause heavy losses for farmers.

### 3.3. Experimental results in private farm of Tran Quoc Hoang:

#### 3.3.1 .Seed source, seed selection and stocking techniques

Seed in our four fish cages is carefully selected from prestigious centers such as the North - Hai Phong seed production and research center, the same method was chosen- organoleptic and salinity shock to select the varieties of good quality, stocking ensures technical requirements.

**Table 2: fish size and stocking density of some fish species**

Species	Similar drop size (cm)	Density (Unit/ m <sup>3</sup> )
Sea bass	8 – 10	22
Hong Kong grouper, Red spotted grouper	8 – 10	20
Cobia/Black King fish	10 - 12	10
Red Drum/ Red Crocker.	8 – 10	20

#### 3.3.2. Results tracking and management of a number of environmental factors:



Figure 3.2: Equipment used to test a number of environmental factors in the research area

We tracked environmental factors weekly and gained the following results:

**Table 3: Results of the environmental criteria in Nghi Son Gulf**

(Average value from June to November, 2009).

Environmental criteria	Measurement result
pH	7,5-8,5
Dissolved oxygen	4- 9mg/liter
NH <sub>3</sub>	0.4 - 0.5 mg/liter
H <sub>2</sub> S	0.001- 0.002 mg/liter
Salinity	20-29 ppt
Temperature	20 - 32°C
Alkalinity	80 – 110 mg/liter

### 3.3.3. Raising technique and management:

#### ❖ Food and feeding management:

- Main source of Food for the marine fish is fresh fish bought from the exploitation of the local fishers.
- Feeding servings are as follows: First Month servings were equal to 10% of the body weight, on the 2nd feeding 8% of the body weight, from the third month and next months fed 5% of the body weight.
- Fish, weekly, is supplemented vitamin C, garlic, squid oil and other additives.

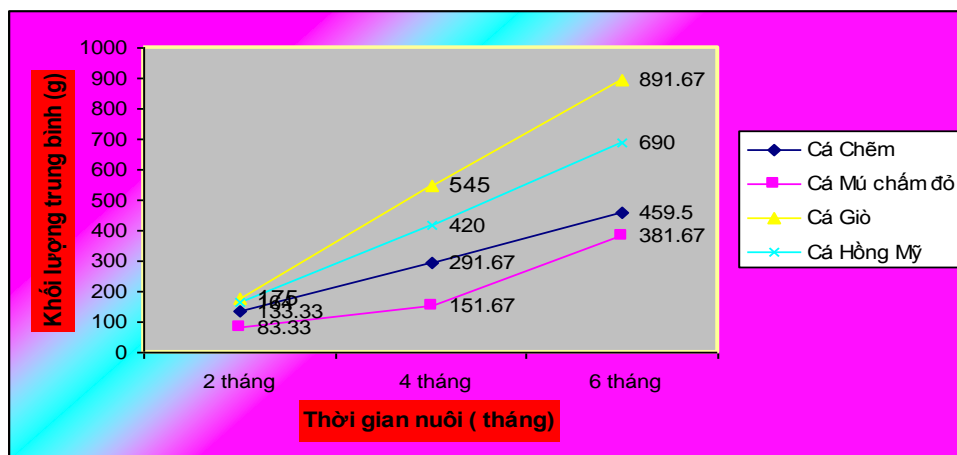


Figure 3.3,4: Raising and managing fish cages.

- ❖ Periodically check two months growth and survival rate of fish, obtained results as follows:

**Table 3: Results of survival rate and average weight of cage cultured fish in the study**

Indicator / Species	After 2 months		After 4 months		After 6 months	
	Weight (g)	Survival (%)	Weight (g)	Survival (%)	Weight (g)	Survival (%)
Sea bass	133.33	86	291.67	80	459.5	70
Red spotted grouper	83.33	82	151.67	75	381.67	68
Cobia	175	85	545	70	891.67	65
Red Drum	164	85	420	79	690	67



**Graph 1: Performing the average weight of fish feed after 6 months**

Prevention and treatment techniques: In the process of raising the four cages that we studied, only the red dot grouper cages is suffered from congestive red spot disease: The treatment we proceed as follows: Mix the drugs with dose of 0.5 gram Oxytetracycline / kg food for fish to eat in 7-8 days.

### 3.3.4. Harvesting and economic accounting

It takes only 7 months from the start of the study up to now, so we have not finished the experimental research of the fish cage culture and we can not account the total money.

### 3.4. Possible solutions to improve productivity and economic efficiency:

- ❖ Planning the feeding area and maximally limiting the amount of waste water, garbage that is poured directly into the sea from families and industrial areas.
- ❖ The production organization:

- Establish the cooperative organizations or marine fish cages clubs in order to raise the people's sense of community, help each other to grow.
  - Co-operate with the research institutes, centers or well-known and large companies in the country to provide fish breeding of good quality.
  - Focus on seasonal stocking and harvesting in order that the harvested fish becomes commodities, providing enough fish for processing.
- ❖ Solution on food: Fish should be fed with industrial food to reduce environmental pollution and disease.
  - ❖ The work of technical services and fishery extension: Further strengthen the work of technical and extension services to support and transfer the technological science for fish farmers safely and effectively.
  - ❖ Resolving market products: Authorities should find out the output of fish farming, towards export fish to other countries, to enhance the value of fish farming for the people.

## 4. Conclusion and recommendation

### 4.1. Conclusion

In short, carrying out the research and taking part in EU- link internship has brought us many benefits as follows:

- ✚ **For myself:**
  - ✓ Further master the technique process of intensive cage culture of Sea bass, Red spotted grouper, Cobia, Red Drum.
  - ✓ Improve overall analytical skills while studying the intensive cage culture in Nghi Son Gulf, Thanh Hoa
  - ✓ Enhance the capacity and methodology of scientific research and other practical experiences.
  - ✓ The above benefits are of great advantages to me in my teaching and working career.


- ✚ **For farmer Tran Quoc Hoang and other farmers in Nghi SonGulf:**

- ✓ The program has brought fish farmers the scientific knowledge of fish cage culture: a good technique for food management and feeding regimes, prevention and treatment of disease in order to increase the productivity and economic efficiency.
- ✓ Strengthening fishery extension, raise people's sense of community in marine fish cage farming and contribute to poverty alleviation in Nghi Son Gulf.

### 4.2. Recommendation:

- ✚ **For farmer Tran Quoc Hoang and other farmers in Nghi Son Gulf:**
  - Actively apply the advanced technology process in marine fish cage farming.

➤ Develop fish farming towards sustainable communities and free-disease fish culture.

 **For EU-link project:** keep supporting and funding timely to implement the intensive research into "Current situation and solutions for marine fish cage farming in Nghi Son Gulf, Tinh Gia, Thanh Hoa"

*Thanh Hoa, March 22, 2010*

**Le Van Thanh**