DECLARATION

I declare that this work is my own except for references and summary which each and everyone I have quoted the sources.

23 MARCH 2007

NUR ASMA' BINTI KHALID

HS 2004 – 1873

BORANG PENGESAHAN STATUS TESIS@

JUDUL: EFFECT OF DIFFERENT CONCENTRATION OF COD OIL JUICE ON THE SURVIVAL ANG GROWTH RATE OF MARBLE GOBY (Oxyeleotris marmoratus) LARV

Ijazah: SARJANA MUDA SAINS DENGAN KEPUJIAN (AKUAKULTUR).

SESI PENGAJIAN: 2004/2007

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ABSTRACT

The objective towards this study is to identify the suitable concentrate of Cod Oil Juice (COJ) for growth and survival rate due to improve the larvae rearing technique for marble goby (*Oxyeleotris marmoratus*) larvae. One hundred marble goby larvae, 10 dAH was used and given four different amount of COJ, which is 0 ml, 0.2 ml, 0.4 ml and 0.6 ml the experiment conducted for 10 days. The survival rate for all treatment show to be increasing from 0 ml to 0.6 ml of COJ while for growth rate, the result shows the negative correlation after using 0.4 ml and 0.6 ml of COJ. The results from the experiment show that 0.2 ml is the appropriate concentration to have a better growth and survival rate.

ABSTRAK

Objektif kajian ini adalah untuk mengenalpasti amaun *Cod Oil Juice* (COJ) yang bersesuaian untuk tumbesaran dan kemandirian bagi meningkatkan teknik penjagaan benih ikan ketutu (*Oxyeleotris marmoratus*). Sebanyak 100 ekor benih ikan ketutu berusia antara 10 hari selepas menetas telah diberikan dengan empat amaun COJ yang berbeza iaitu 0 ml, 0.2ml, 0.4 ml dan 0.6 ml. Eksperimen ini dilaksanakan selama 10 hari. Kadar kemandirian bagi bagi semua rawatan menunjukkan kadar yang meningkat tetapi kadar tumbesaran pula menunjukkan korelasi negatif selepas menggunakan 0.4 ml dan 0.6 ml COJ. Keputusan daripada eksperimen menunjukkan bahawa 0.2 ml COJ adalah amaun yang bersesuaian bagi mendapatkan kadar kemandirian dan tumbesaran positif.

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LIST OF ABBREVIATION

rpm	rentention per minute
COJ	Cod oil juice
UMS	Universiti Malaysia Sabah
cm	Centimeter
kg	Kilogram
pH	Hydrogen concentration
RM	Ringgit Malaysia
dAF	Day after fertilization
HUFA	Highly unsaturated fatty acids
DHA	Decosahexaenoic acid
EPA	Eicosapentaenoic acid
AA	Amino acid
EFA	Essential fatty acids
EAA	Essential amino acids
HCG	Human chorionic gonadotrophin
df	Degree of freedom
PG	Pituitary gland
dAH	Day after hatching

LIST OF ABBREVIATION

DO	Dissolve oxygen
µm	Micrometer
ppt	Part per thousand
°C	Degree Celsius
ppm	Part per million
ml	Milliliter
g	Gram
SPSS	Statistical package for social science
mm	Millimeter
>	More than
<	Less than
H_0	Null hypothesis
H_1	Alternative hypothesis

CHAPTER 1

INTRODUCTION

1.1 Aquaculture potential

Aquaculture is one of the sectors that used human activity in increasing the population in the water medium, that useful for commercial and protein needs aspect in intensive way (Lokman, 1992). It has been the world fastest growing food production for a past decade. It shows us that the average of compound growth rate is 9.6 % yearly since 1984 and it continues to increase until now (Dudley-Cash, 1998).

Aquaculture had started a few centuries ago in many countries such as Japan and China. However, this sector is still new in Malaysia. Asia has been the biggest producer for this sector and the total production in 1995 are 90.5% and followed by European, North America, South America, former Soviet Union, Oceania and Africa (Dudley-Cash, 1998).

Aquaculture in Malaysia begins in early twentieth century with the culture of the Chinese Carp in ex-mining pools. In mid 1930's, shrimp trapping pond develops widely in southern state of Johor. The culture of blood cockles, *Anadara granosa*, starts sometimes in 1948 and it dominated in 1950's and 1960's (Ang, 1990).

Malaysia has a high potential in this sector. This is due to its location that surrounded with many water resources especially seawater and freshwater. Malaysia situated in Southeast Asia region on the Southeast China Sea. Malaysia divided into two regions that are the east and west Malaysia. Both of these regions are surrounded by Southeast China Sea especially for West Malaysia or also known as peninsular Malaysia.

Malaysia also has many mountains that help to increase the potential of freshwater source that is important for the freshwater species culturing methods. Numbers of mountain help to determine the source of freshwater. This is because in this area many river starts to develop and this area gaining much more rain every month compare to the other place. Malaysia situated in tropical season. It provide Malaysia with very good and sufficient sunlight, which is 12 hours light and 12 hours dark that help aquaculturist to gain egg from many species everyday year long. From these aspect it help aquaculture sector to develop well in this region.

1.2 Feed production

The feed industry consists primarily of livestock, poultry and aquaculture sub-sector. Recently, aquaculture feed has been considered to be a minor sub-sector of the feed milling and today, the production of fish feed is the fastest growing feed market. The most widely used hatchery feeds are brine shrimp eggs and microencapsulated larval diets. Hatchery feed also demand to marine and freshwater species. Larval also feed with the combination of live feed such as *Skeletonema* sp., *Chaetoceros* sp., *Chlorella* sp., *Spirulina* sp. and *Branchionus* sp.

Feed for fish need to have important nutrients to make sure the health of the fish. The nutrient includes four main constituents in the diet of fish, which is protein, carbohydrate, lipids and vitamins. It is important especially for both growth and energy source. The only problems is that the amount of nutrient for each species required varies of amount and detrimental to fish health (Delbleek, 1986).

Generally, the feed prepared for the fish need to have high percent of protein especially in fingerlings. It needs to have 50 % of crude protein. Percentage of protein is decreasing accordingly to the growth decreasing and fish age. Therefore, many fish require live food as the main feed during their larval stage not only because of the small mouth they have but also to fulfill the requirement they need for growth (Floyd, 2002).

Beside protein it need, fish also need amino acids, vitamin and minerals. Amino acids cannot be synthesizing in the plant and terrestrial tissues. It could be obtain from the fishmeal. There are high oil contain with essential amino acids and associated with carotenoid and vitamin E supplements. It is known as the Cod Liver oil. Cod liver oil are used as the main supplement for these component in the feed but the mineral, vitamin and amino acids can easily oxidize if it is not properly stored (Mercola, 2006). One of the ways to prevent the loss of this essential component is it can be used as the supplement food. It known as Cod Oil Juice and it is widely used in University Malaysia Sabah (UMS) hatchery as the supplement food for the larvae.

1.3 Marble goby, *Oxyeleotris marmoratus*

Marble goby is one of the species culture in UMS hatchery. However, the mass production for this species is still difficult. It come form family of Eleotridae (sleepers), subfamily of Butinae, class of Actinopterygii (ray-finned fishes), genus *Oxyeleotris* and from species *Oxyeleotris marmoratus* (Mohsin & Ambak,1992)

Marble goby (*Oxyeleotris marmoratus*) or known as Ikan Hantu, Ikan Malas or Ikan Ketutu is the largest goby and can reach up to 50 to 65 cm long and 2 kg of body weight. It can be seen in small number in river, reservoir and pond. It can survive in freshwater or brackish water and water pH is 6.5 to 7.5. This fish is widely distributed in Asia, such as in Mekong and Chaophraya basin, Peninsular Malaysia, Indochina, Philippines and Indonesia (Mohsin & Ambak, 1992).

It is a carnivorous and feeds on small fish, shrimps, aquatic insect, mollusc and crab. It also known as the demersal fish because it spends most of the time at the bottom of the river (Mohamed Semail, 2004). The body colour are differentiate base on the place where the fish lives. The body colour is beer dark brown at the above and pale brown below of the body. There are a series of blotches around the body. All the fins contain with black and white stripe. The scale at the head is much more small compare with the scale at the body. The sexes of the fish only can be determined during it maturating time. The female has a reddish and round papilla while the male has slender and shorter papilla (Jye, 2004).

It is among the favourite fish and can be consider as expensive (Jye, 2004). This is due to the high market demand but it low in the production makes the price of the fish higher than other fish. The price of the fish can reach RM 60 to RM 70 per kilo at the market and for 1kilogram (kg) fish in the restaurant; it can reach until RM120.00 per dish. Usually Chinese love to eat this fish (Mohamed Semail, 2004). This is because of the sweet flesh it has, and considered as a delicacy over the eastern Asian region (Mohsin & Ambak, 1992).

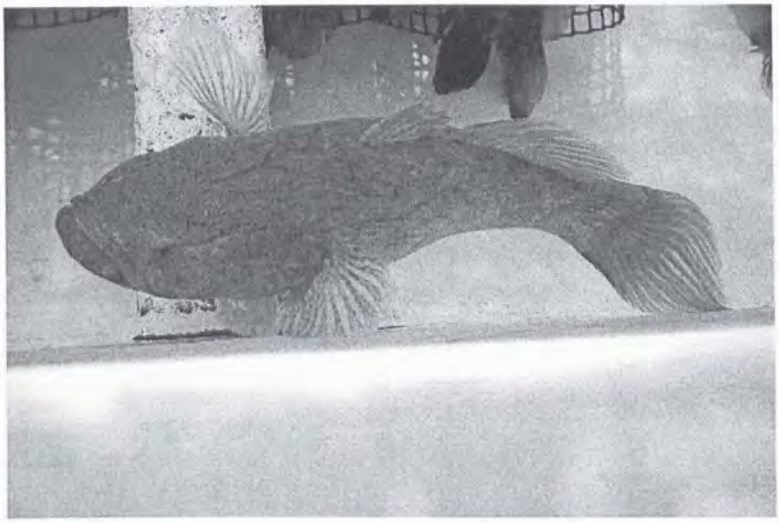

Photo 1.1: Marble goby (*Oxyeleotris marmoratus*)

1.4 Problems in fish propagation

For the past 10 years, scientist had done many trials but until now the survival rate of this species only reach 10%. Therefore, this is the big problem to culture this species and cost very high price in market base on the higher demand (Jye, 2004).

Heavy mortality usually occurs during it larvae stage when the yolk sac is exhausted and suitable food are scarce and active feeding is need. The mortality is due to the starvation. It reported that it has a big mouth and suitable to feed on artificial feed and *Branchious* spp. but some of them did not consuming these feed and eventually died (Senoo *et al.*, 1994(a)).

Mortality is peak at 7 to 9 day after fertilization (dAF). This is due to cannibalism and disease that is remain unknown. It makes the production under artificial condition difficult (Jye, 2004).This is the reason why, most of the aquaculturist or fish farmer difficult in gaining broodstock to be culture in the pond (Mohsin & Ambak,1992).

1.5 Important of Cod Oil Juice

Cod oil juice (COJ) is one of the supplement foods that widely used in UMS Hatchery. It is use to enrich the nutrient requirement and widely used toward the marble goby larvae. Use to fulfil the requirement of the amino acids, mineral and vitamins need for the growth and survival of the marble goby larvae.

COJ contain Cod Liver Oil, egg yolk and seawater. The COJ not only used to be consuming by the larvae but also to enriched the nutrients in the live food before given to the larvae. The main component of the COJ is the cod liver oil. It contains with four essential nutrients, which is the docosahexaenoic (DHA), eicosapentaenoic (EPA), Vitamin A and Vitamin D. These nutrients are necessary:

- Skin
- Prevention from depression and disorder
- Strong bones
- Cardiovascular system
- Digestive tract

Most of the fish oil contains about 30% of DHA and EPA and about 12% and 18% for each. Both of these fatty acids are know as omega-3 fatty acids. It is very useful when culturing fish because it is use to prevent mental and physical illness that only can be found in fish (Gapasin & Duray, 2001).

There are two type of fish oil, which is the fish oil and cod liver oil. Both of these two are mainly different in the source of vitamin A and D. Vitamin A and D are much higher in Cod Liver Oil compare to the fish oil (Leduc, 2002).

1.6 Objectives of the study

The fish is very high in market demand so study of culturing this species is needed, but the problem occur in this species is the high mortality during its larvae stage it makes the culturing techniques difficult. Due to the previous study, it shows that survival rate during 5 to 10 days after fertilization (dAF) is about 31.5 %. However, during 10 to 70 dAF survival rate recorded 69.0 %, which is much higher. Mortality is peak at 7 to 9 dAF due to cannibalism and disease that remain unknown. Survival rate on the 5-70 dAF is still unknown and it makes the seed production under the artificial condition is difficult. Cod Oil Juice is important as the supplement food for the growth of the larvae. Nevertheless, the concentration of the amount needed is never been determine. Therefore, it comes to the aims of the study, which is:

1. To determine the suitable concentration of Cod Oil juice for growth and survival rate of marble goby larvae
2. To improve the larvae rearing technique for marble goby larval

CHAPTER 2

LITERATURE REVIEW

2.1 Nutritional requirement for larvae

Nutritional requirement verify towards all animals base on their life cycle. The change in their morphology and physiology between their hatching and maturity leads variation number of feeding and nutrient requirement. The seedling production of fish larva and crustacean for mass production still relies on live diets such as algae, rotifer (*Branchionus plicatilis*) and planktonic crustacean, such as *Artemia*. Microalgae also have believed to play and important role to stabilizing the water quality, nutrient requirement and microbial control (Van *et al.*, 2005).

Selection of suitable diets for cultured animals must view on both physical and nutritional requirement. From physical point of view, it must consider avaibility and acceptability. For nutritional point of view digestibility as well as energetic and nutrient requirement is the most important (Citarasu *et al.*, 1998).

Proteins are important for growth of fish and showed that lacking of protein will cause stunted in the growth rate of the fish. Lipids provide much more energy compare to carbohydrate and it also supply fatty acids, which used for construction of energy reserves in fish. Both of these nutrients are important especially during starvation and the amounts in the fish significantly reduce during this period (Delbeek, 1986).

Protein also important towards all stage of life cycle. This is because, it is the basic component of all enzyme, hormone, pigment that bring oxygen around the body, antibody also in the gen. It is consists of peptide while peptide is built from long chain of amino acid. Vitamin is an essential compound or factor needed in small amount together with the protein, lipids and minerals. Without it, the growth of larvae or other animals might disturb. Fish oil already been used since 18 century to fulfil the requirement of the growth (Jaafar, 1985).

Vitamin is important and required in the diet especially in growth, maintenance and reproduction. These qualities are share with other nutrient such as amino acids and protein. It only required small amount in diets. It is not used to catabolized the satisfy energy requirement and structural propose but it always used as the cofactors for the enzymes. Enzymes used five cofactors and four of them derived from vitamins (Brody, 1999).

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