EFFECTS OF DIFFERENT WATER DEPTHS ON GROWTH AND SURVIVAL RATE OF PATIN (*Pangasius hypophthalmus*) LARVAE

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THIS DISSERTATION IS SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR BACHELOR OF SCIENCE WITH HONOURS

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DECLARATION

I declare that this dissertation is the result of my own independent work, except where otherwise stated

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AUTHENTICATION

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ABSTRACT

It is important to determine suitable water depth for larval rearing to reduce the cost of production in aquaculture because using more water means paying more money. An experiment was conducted to study the effects of different water depth on growth and survival rate of Patin, *Pangasius hypophthalmus* larvae. Three different water depths with triplicate were used which were low (15cm), medium (35cm) and high (55cm). All the larvae were reared in 1 ton tank. The results showed that 35cm water depth had the highest mean survival rate and growth rate which was 67.26% of survival rate and 1.427 cm of mean total length, followed by in 55cm water depth which was 59.43% of survival rate and 1.398cm of mean total length and lastly in 15cm water depth with 57.04% of survival rate and 1.369cm of mean total length. However, there were no significant difference ($P>0.05$) when compared to all treatment when analyzed with one-way ANOVA. This study suggested to rear the Patin larvae in 15cm water depth from economic prospective to produce better and economically viable fish since water depth will not affected the growth and survival rate of the larvae.

ABSTRAK

Adalah penting untuk mengetahui kedalaman air dalam penjagaan larva supaya dapat mengurangkan kos pengeluaran dalam akuakultur kerana menggunakan lebih air bermaksud menggunakan lebih wang. Eksperimen telah dijalankan untuk mengkaji kesan-kesan kadar tumbesaran dan keberjayaan hidup terhadap larva Patin, *Pangasius hypophthalmus* dengan kedalaman air yang berbeza. Tiga kedalaman air yang berbeza digunakan iaitu rendah (15cm), sederhana (35cm) dan tinggi (55cm). Setiap eksperimen terdapat tiga replikasi dan dikultur dalam tangki 1 tan. Keputusan eksperimen menunjukkan bahawa dengan kedalaman air 35cm didapati min kadar keberjayaan hidup dan kadar tumbesaran adalah yang tertinggi dengan 67.26% min kadar keberjayaan hidup dan 1.427cm kadar tumbesaran, diikuti dengan kedalaman air 55cm iaitu 59.43% min kadar keberjayaan hidup, 1.398cm kadar tumbesaran dan yang terakhir adalah di dalam 15cm kedalaman air dengan 57.04% min kadar keberjayaan hidup dan 1.369cm kadar tumbesaran. Walaubagaimanapun, tiada perbezaan bererti ($P>0.05$) yang mempengaruhi kadar keberjayaan hidup dan tumbesaran larva pada setiap rawatan apabila dianalisis dengan menggunakan ANOVA satu hala. Kajian ini mencadangkan untuk mengkultur larva Patin dengan kedalaman air 15cm dari sudut penilaian ekonomi kerana kedalaman air tidak memberi kesan terhadap kadar tumbesaran dan keberjayaan hidup larva Patin.

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LIST OF ABBREVIATIONS

°C	Degree centigrade
%	Percentage
µm	Micrometer
cm	Centimeter
dAH	Day after hatch
DO	Dissolved oxygen
GDP	Gross Domestic Product
HCG	Human Chorionic Gonadotrophin
HUFA	Highly unsaturated fatty acids
kg	Kilogram
km	Kilometer
L	Liter
LHRH-a	Luteinizing Hormone Releasing, Hormone-analogue
Mg/l	Milligram per liter
mm	Millimeter
RM	Ringgit Malaysia
sp.	Species
SPSS	Statistical Package for Social Science
UMS	University Malaysia Sabah

CHAPTER 1

INTRODUCTION

1.1 Development of aquaculture in Malaysia

Aquaculture is farming of aquatic organisms, including fish, mollusks, crustaceans and aquatic plants. (FAO, 2000). Aquaculture has been the world's fastest growing food production system for the past decade (Tacon, 1997)

Malaysia is located in the center of Southeast Asia that is divided into two regions; Peninsular Malaysia and East Malaysia. Malaysia consists of 127,000 sq miles (330, 200 sq km) and surrounded by seas. Malaysia has a coastline of 4800 km and 200 of islands. The average temperature is between 21°C to 32°C. The humidity is high in Malaysia. Rain usually occurs between November to February on the east coast of Peninsular Malaysia, on the Western Sarawak and north-eastern Sabah. On the west coast of Peninsular Malaysia the rainy season is April to May and October to November. This favorable climate supported by a vast resources makes Malaysia has a great potential for aquaculture development (Department of Fisheries Malaysia, 2006).

Malaysia is putting up effort to increase its aquaculture production by commercializing this sector, get involve in research, training and development given by various institutions and government agencies. The government also has already initiated steps to zone specific areas for aquaculture and develop standard for sustainable aquaculture practice that do not lead to ecological imbalances (Department of Fisheries Malaysia, 2006).

The fisheries sector plays an important role in providing fish as a source of foods and protein. It has contributed 1.37% of GDP, 89 433 of direct employment to fishermen and 21 114 of fish culturist. The Department of Fisheries will increase the fish production in Malaysia by deep-sea fishing and developing the aquaculture sector. However, the real potential to increase fish production still remains within the aquaculture industry. With a vast potential of inland areas and coastal areas, it is estimated that the production from aquaculture can be increase by as much as four times its present level by 2010. It also shown that since 1970, aquaculture production was increasing until 2000 (Figure 1.1)

Fisheries Department has reported that the aquaculture production in the year of 2003 continue to be influenced by the production of cockles and fish from freshwater pond culture and brackish water cages culture. The total production stood at 196 874 tonnes valued at RM 1172.30 million, which was an increased of 2.63% over the 2002 output of 191 843 tonnes. This contributed to about 13.27% of the overall fish production in the country (Department of Fisheries Malaysia, 2006).

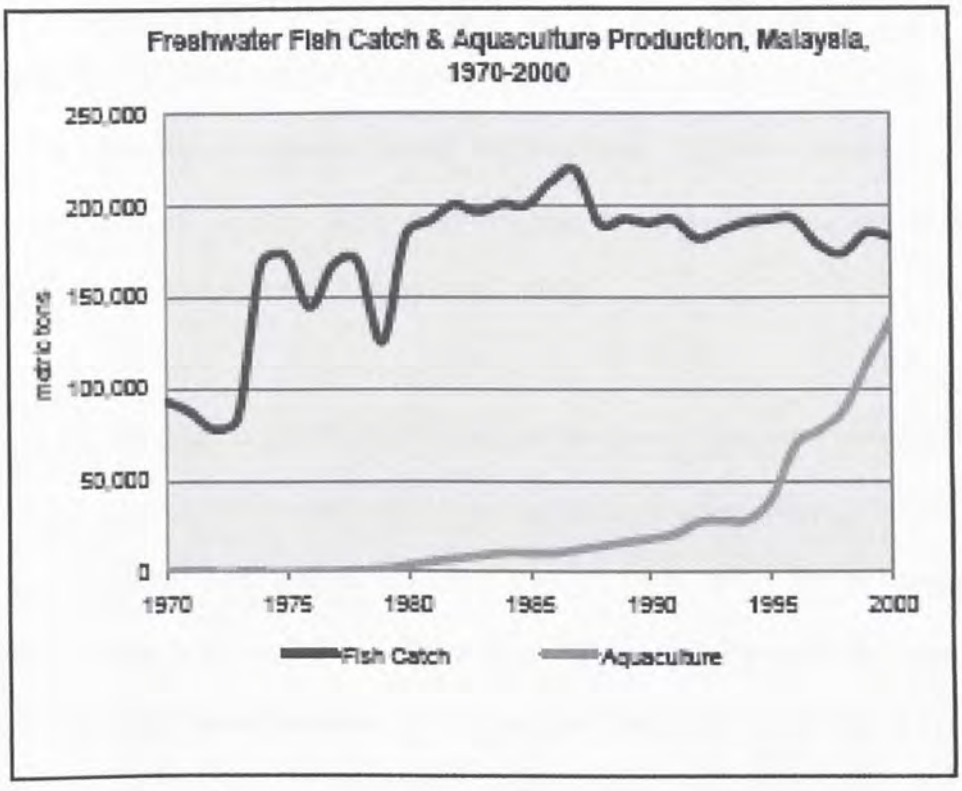

Figure 1.1 Aquaculture Production in Malaysia, 1970-2000 (Source: Earth Trends, 2003)

1.2 Patin (*Pangasius hypophthalmus*)

The scientific name for Patin is *Pangasius hypophthalmus.* In a recent revision of Pangasiidae, *P. hypophthlamus* is considered a synonym of *Pangasius sutchi.*

Commonly it is known as River Catfish or Striped Catfish but as it is the most cultured Pangasiid catfish throughout Southeast Asia, it has many other common names such as Patin in Malaysia and Indonesia, Pla Sawai in Thailand, and Cha in Vietnam.

Patin is natively from Mekong River but it is distributed widely throughout Southeast Asia by introduction of aquaculture in Cambodia, Thailand, Vietnam, Laos, Indonesia, Malaysia, Philippines, Taiwan and also China. It can be found in large rivers, lake, reservoirs and ponds. Patin also cultured in India, Pakistan, Bangladesh and Myanmar (Mohsin *et al.*, 1983, Robert *et al.,* 1991)

It can grow up to 150cm in total length and about 30kg in body weight (Bardach *et al.*, 1972; Mohsin and Ambak, 1983). This species is benthopelagic. Patin is a tropical fish that is usually need temperature range around 22 to 26°C. The pH range that is suitable for Patin is 6.5 to 7.5 and dH range is 2.0 to 29.0. Patin has an importance in fisheries and aquaculture industries. It also keeps as a pet in the aquarium.

Patin has many advantages in aquaculture. It has fast growth, high resistance to disease, omnivorous which it can accepts a wide variety of food items, high resistance to low dissolve oxygen, and it is possible to do mass production because the seed production is easy. It has an air – breathing organs and is obligate air breathers. This enables the fish to tolerate poor water quality, including high organic matter or low dissolves oxygen levels and therefore it can be stock at high density (Trong *et al.*, 2002). Its flesh also taste good thus, it has high demand in market.

Patin is also known as high quality food fish compare to other freshwater fish such as carps, Tilapia and clariids. In Malaysia, Patin has different retail prices in

different state. Table 1.1 showed the estimated retail prices of Patin at major markets by state in 2003 (Department of Fisheries Malaysia, 2003).

Table 1.1 Estimated retail prices of freshwater fish at major markets by state and fish species 2003 (RM/kg)

State	Price (RM/kg)
Perlis	0.00*
Kedah	10.50
Pulau Pinang	0.00*
Perak	5.43
Selangor	4.13
Negeri Sembilan	5.54
Melaka	4.46
Johor	6.74
Pahang	7.17
Terengganu	7.18
Kelantan	5.42
Sarawak	9.00
Sabah	10.00

* Unknown

1.3 Problem in larval rearing of Patin

Even though the culturing method of Patin is easy, there is still a problem in larval stage due to low variable and low survival rate. It is known that the first 8 days of life represent the most critical period and after that period the mortality will be decreased (Subagja *et al.,* 1999). This high mortality during early stage of larvae might due to cannibalism as the main factor. Other factors such as water quality and feed efficiency also can affect the survival rate of the larvae. In the 1980s, Vietnam, the survival rates of *P. hypophthalmus* larvae was very low (<5%) (Trong *et al.*, 2002). There was also a study that was carried out at the Sukamandi station. It indicated that there are two peaks of mortality at the early stage of the larvae. The first mortality peak was observed at 2 to 3 days of age during the period of cannibalism and represented about 30% to 50% of initial fish number. The second peak occurred during 5 to 7 days of age and representing 50% to 60% mortality seemed to be due to other causes than cannibalistic.

Even though Patin has been cultivated for a long time, published information on the larval rearing of this species is still scarce.

1.4 Water depths for larval rearing

The depth of water required to fill a pond or tank is usually depends on the pond or tank volume. It is also reported that water depth is depends on the type of species, climate, topography and personal reference (Bardach *et al*, 1972, Lawson, 1995). In Boyd & Tucker (1998), it says that the average depth for pond is 1.5 to 2.0m. Depth of pond usually depends on the inflows and outflows of water. The common inflows are rainfall, runoff, seepage and intentional addition from the water supply while outflows are evaporation, seepage, water released during water exchange, overflow after rains and pond draining for harvest. While for tank culture, Marcel Huet (1995) had stated that the minimum depth for larvae is 15cm to allow the larvae to reach the surface of the water easily because the larvae will live the bottom of the tank and swim towards the surface of the water in order to take food.

1.6 Objectives

The objectives of this study are:

1) To know whether water depths affect growth and survival rate of Patin larvae.
2) To determine the optimum water depth in larvae rearing of Patin.
3) To improve larvae rearing by introducing the suitable water depth for larvae rearing of Patin.

CHAPTER 2

LITERATURE REVIEW

2.1 Description of species

Photo 1.1 Patin (*Pangasius hypophthalmus*)

Patin is the largest freshwater fish that can reach 130.0cm in standard length and 30kg in body weight. From the shape of its mouth which is shaped downward, facing down, it shows that Patin is a benthic animal. This species has fast growth rate. Its weight increase 1.0 to 1.5kg every year. Below are Patin's taxonomy, distribution, biological description and how its reproduce.

2.1.1 Taxonomy

Kingdom: Animalia

Phylum: Chordata

Class: Actinopterygii

Order: Suliformes

Family: Pangasiidae

Genus: *Pangasius*

Species: *Pangasius hypophthalmus*

2.1.3 Morphology

Patin has an elongated body. Its body resembles the body of shark. It has large eyes and subterminal mouth with four barbells. It has six branched dorsal-fin rays. The dorsal fin consists of denticulate spine. The gills rakers usually developed. The small gill rakers regularly intersperse with the larger one. Patin has dark or grey fins and grayish-black body color. Its body is marked with a broad, straight dark band from the head to the base of the caudal fin and a curved dark band and a curved dark band from the head to a point over the postural part of the anal fin. A white stripe extends from the base of the tail to the gill cover whereby the bands are separated into two colors, the blackish branch and the whitish interspacer. The edges of fins are light gray to transparent (Hora & Pillay, 1955).

2.1.4 Biological description

Patin inhabits in a large rivers, lake, reservoirs and ponds. It is omnivorous which it can accept wide variety type of feed. It can feed on fish and crustaceans as well as and vegetable debris. From the FishBase Website September 2006, Patin can be feeds on algae, higher plants, zooplankton, insects and at a larger sizes, on fruits, crustaceans and fish.

This species is a migratory species. They move up stream of the Mekong from unknown rearing areas to spawn between May to July. In May, the fish will have a mature or nearly mature gonad (Van Zalinge *et al.*, 2002). The beginning of the monsoon leads to a rapid rise of water level in Mekong. So this rise of water level will triggers the actual spawning which occurred in June. Subsequent sudden rise may induce spawning again. After spawning they will return to the mainstream when the river waters fall to seek rearing habitats in September to December.

It is not clear at what size this species reaches its sexual maturation however Touch (2000) mention that a minimum weight of Patin to attain sexual maturity is 3 to 4kg and 54cm in total length.

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