# PHYSIOLOGICAL ADAPTATION OF LAIS FISH (OmpokHypothalmus) TO THE WATER ENVIRONMENT CHANGES

#### Infa Minggawati Lukas Holla Franciska Frid Augustinus

The Fisheries Faculty of Palangka Raya Christian University infa41@gmail.com; lukasinel@gmail.com; hollafranciska@gmail.com; soewarno50@yahoo.com

#### Abstract

In the tropic areas, both the type and quantity of food are more important factors in the phase of Lais fish (*Ompokhypothamus*) life cycle process, while the environmental influences such as sunlight and water temperature which have not been changed seasonal relatively only affect the phase of the fish reproduction process. Actually, the strategy of the fish way of life is to maintain a balance between the amount of energy used for the reproductive process with the used for body's growth and metabolism. The physiological adaptations of Lais fish to environmental changes include reproductive adaptation, energy adaptation, fecundity, survival rate, reproductive frequency and habitat. The progress of Lais fish reproduction development will take place from October to April, with spawning peaks in December and January, when water level is up and rainfall is high. The presence of riparian vegetation on the land banks of the bay will also supply organic matter with fallen leaves, twigs and other plant parts. The food composition in the stomach of Lais fish is between 54 - 60% of species consisting of insects and fish fry.

Key Word: Adaptation, physiological, environmental, reproduction, Lais fish.

## 1. Introduction

The fish reproductive cycle is closely related to environmental changes. In sub-tropical areas, the environmental factors referred to the changes of the duration of sun exposure and seasonal temperatures. Meanwhile, in the tropic areas, both type and quantity of food are more important factors, because sunlight and water temperature do not experience seasonal changes relatively.

Light and temperature can influence each other or not, or affect to only one of the phases in the fish life cycle process, for example in the reproduction process. The effects of light and temperature can directly affect the reproduction or affect the sense organs and the hormone glands which in turn will produce a physiological or behavioral response to the fish reproduction process. Ovulation and the final stage of sperm maturation are completely controlled by the fish for reproductive success which is influenced by temperature, photoperiod and the presence of a suitable spawning substrate, also the presence of other pairs that are also ready to spawn.

The function of the paired behavior (courtship behavior), is to stimulate ovulation and spermatogenesis. Several species of male fish secrete pheromone hormones which will stimulate ovulation in females.

The chemical waters characters also give influence to the gonad maturation. If the waters have a low pH, for example due to acid rain, this will cause some problems in gonad maturation. The process of gonad maturation is influenced and regulated by the releasing hormone phonadotgropin in the hypothlamus, and gonad tropin hormone in the anterior hypophysa.

Lais fish is one of the fish which has important economic value. The catches of Lais fish are usually abundant when the water falls or during the dry season, while during deep water or the rainy season the catch of Lais fish decreases, because of the limited availability of Lais fish and the reduced catch by fishermen. The high requestofLais fish and the quite high price, encourage large-scale fishing by fishermen.

Generally, this detritus is generally the initial food for the juveniles of Lais fish. After maturing, Lais fish will live in waters that closed relatively but still have a direct relationship with free water (limnetic). The adult Lais fish get food from insects that fall from riparian vegetation on the edge of the water. Therefore, the role of vegetation in the Rungan river flooded swamps is very large for the survival of Lais fish.

The composition of the Lais fish population in the flooded swampwaters of the Rungan river at a certain time greatly depends on the recruitment that occurs every year and the number of the missing fish from these waters due to being caught or exploited by humans or because these fish die naturally, the environmental changes (pollutants), and the availability of Lais fish natural food.

Conservation measures that can be taken for Lais fish are using in-situ and ex-situ conservation efforts, especially for Laisfish breeds and Laisbroodfish.

## 2. Lais Fish Adaptation Strategy

#### I. Reproductive Adaptation

The reproductive success of each individual clearly depends on the success of living (survival) to reach reproductive age. Other than that also obtain and save "raw" materials and chemical energy to produce the genital products needed for reproduction.

Fish perform various strategies in sharing their energy supply (usually fat) between for reproduction and implementation of other organs functions. Based on this, there are three distinct types of reproductive strategies, and each used by a specific group of fish:

1. Fish will spawn only when fat (energy) is available (obtained).

2. Fish will spawn as capable as or proportional to the availability of energy.

3. Fish will spawn even with sacrifice of other functions, and can be fatal (the case of Pacific salmon).

Another strategy that has a relationship between the size and number of eggs produced with the number or efforts of protecting the broodfish (effort or energy) that devoted to the survival of the eggs and their juveniles, which is very real is that fish that have eggs and are small in size will produce large numbers of eggs. with a small survival rate.

Apart from the above, protection of the broodfish can be in form of protection of the mother against the eggs and larvae which produced by making nests and guarding them, encircling the eggs, carrying eggs everywhere or incubating the eggs and keeping the larvae in the mouth or storing fertilized eggs in the bodies of female broodfishor malebroodfish. For the success of the reproductive process, Lais fish has a reproductive strategy as an adaptation to fluctuating water conditions. This reproduction strategy includes the spawning mechanism, the place and time of spawning.

The results of research conducted in the Rungan river indicate that the Lais fish habitat for spawning and the success in the reproductive process is a complex with rivers, brooks and flood lakes or oxbow lake which has a function for the survival of Lais fish. In general, the Lais fish habitat can be described as follows: the bottom of the water is in the form of fine sand mixed with mud, the color of the water is cloudy brown, the water flow is slow, and the aquatic environment is a forest with high and low level of vegetation, where this forest will be submerged when the water is deep and dry. in the dry season. The submerged branches, twigs and leaves in the water have a potential to be used by Lais fish for shelter, foraging and spawning.

#### **II. Energy Adaptation**

Fish use a lot of energy for reproduction, both for spawning migration also for fertilization and development of the reproductive organs in their bodies.

The strategy of the fish way of life is to maintain a balance between the amount of energy used for the reproductive process with that used for growth and metabolism. Between one species and another as well as between individuals in the same species, there are many variations of energy used in reproductive aspects such as spawning migration, seduction behavior, protection of the mother against eggs, fry or offspring and the formation of eggs and sperm.

The research's result showed that in December and January, the balance of male and female Lais fish were seen to be ready to spawn with a ratio of female and male fish was 1: 2 and 1: 3, meaning that the peak of Lais fish spawning was in December and January, and it was also supported by the deep water conditions due to high rainfall intensity in December and January, which on 300 - 400 mm, water temperature between 20 - 270C, pH 3.9 - 5, DO 3.4 - 3.5, brightness between 26-27 cm, TDS 0.3 - 0.4 mgl / l and the water depth between 4 - 6.5 m. Furthermore, Lais fish food in December and January based on the analysis of the food composition in Lais fish stomach, there are between 54 - 60% types of food that consisting of insects and fish fry. Thus it can be said that the Lais fish spawning follows the inundation rate of flooded swamps when entering the rainy season and the availability of food in lakes and flooded swamps will be abundant so that it will stimulate the fish to accelerate the maturation of gonads.

Female fish from sparse populations generally reproduce at a younger age than the dense population. This is because the sparse population tends to be in a good environment, so that the large sizes can be achieved at a young age.

The results of this study of the length and weight of Lais fish caught in the Rungan river from October to December, were the length of the Lais fish between 12-29 cm and the weight between 10-250 grams. The adaptation of energy in a stable environment, the existence of natural selection can affect the female Lais fish to suspend reproduction in order to collect energy to produce more eggs.

## **III. Fecundity**

Fecundity is the most common measure used to measure the potential production of fish, because it is relatively easy to calculate, such as the number of eggs in the ovaries of female fish. In general, fecundity increases by the increasing size of female fish

Each fish population will achieve a balance between egg size and amount, in order to produce the most fish fry. It is important to know that there are the changes settings of fecundity to environmental conditions and the fish ability regulating the egg production every year in relation with environmental variations. The ability of fish to regulate egg production is usually related to the food supply. When food is abundant, there is a lot of available energy for reproduction. Conversely, if the food lacks of energy, it is only used for body maintenance and for growth. Thus the fish that are given food with good quality and quantity will produce more and bigger eggs. On the other side, abundant food and high fecundity are often related with reducing of competition between species. To regulate population against the population density, fish self-regulate their population to environmental changes such as water temperature and dissolved oxygen content in the water, this condition can reduce the availability of food.

#### **IV. Survival Rate**

In general, fish with high fecundity are able to regulate the environmental changes genetically, because the high mortality of larval is not random. The survival of Lais fish will also be better able to live in certain environmental conditions, or against the environmental changes condition which suddenly and briefly, for example in good conditions, the survival rate of larvae is increased so even though the number of individuals is small, but it will produce the derivatives which succeeded in quite large number. In poor environmental conditions, just few fish produce a larval phase regardless of the adult numbers spawning. The success rate will be achieved when the number of fish fry or young fish that success to reach the adult fish.

Otherwise, Lais fish with low fecundity and large population will not be able to regulate genetically the sudden and brief environmental changes, but the young fish will become individuals who are able to deal with changes or bad environmental conditions. Larger fry are also more capable to overcome predators and compete.

### **V. Reproductive Frequency**

The strategy in fish life with different character, which reflects the ability to predict its environment lives. That is the reproductive frequency strategy which after adults spawn, then dies, which means spawning once in its lifetime. Forexample is the Orchorynchussp fish. The advantage of this method is that if at one time it is successful, it means the reproductive success is very high, the disadvantage is that if it is not successful, it means that the reproductive process will fail completely. Usually this kind of fish is called a "total spawner".

#### VI. Habitat Adaptation

Habitat resources are defined as certain places where a fish, fish population or fish community can determine the physical, chemical and biological characteristics of the environment which is needed for its life, such as suitable water quality, ruaya pathways, spawning sites, foraging sites, sites for rest and protection from enemies and bad weather. Physical, chemical and biological parameters describe that place, while the niche describes how that fish species adjusts to the presence of other related species.

In general, the Lais fish habitat can be described as follows: the bottom of the water is fine sand mixed with mud, the color of the water is cloudy brown, the water flow is slow, and the environment is submerged when the water is deep and dry during the dry season. The branches and twigs also leaves that are submerged in water are very potential to be used by the Lais fish for shelter, foraging and spawning.

Broadly, the habitat resources can be grouped into three groups, namely: spatial habitat resources, food habitat resources and reproductive habitat resources.

The presence of riparian vegetation on the land banks of the bay will supply organic matter with the fallen leaves, old branches and other plant parts that fall into the water, which have decomposed in form of detritus. This detritus is generally as the initial food for the juveniles of Lais fish. After maturing, Lais fish will live in relatively closed waters but still have a direct relationship with free water (limnetic). The adult Lais fish get food from insects which fall from riparian vegetation on the edge of the water. Therefore, the role of vegetation in the Rungan river flooded swamps is very big for the survival of Lais fish. Physical and chemical aspects in the flooded swamp waters as Lais fish habitat show that: water depth is 6.5 meters, water temperature is 26.90C, pH 4.6, DO 3.4 mg / l, and brightness 27.6 cm.

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## **Citing Sources**

Lais fish is ready to spawn from September to November where the highest percentage is found in October. For gonad development a low temperature is required. The ovulated eggs should be spawned immediately for a short period of time [1]. The gonad development of the Lais fish will take place from October to April, with spawning peaks in December and January, when water levels rise and rainfall is high. The presence of riparian vegetation on the land banks of the bay will supply organic matter with fallen leaves, old branches and other plant parts that fall into the water, which decompose in the form of detritus [3].

This catching is regardless of whether the fish caught are spawning or not, so it can cause over fishing [4]. Preservation of public water fish can be carried out by preserving germplasm, that is a method or work process to preserve or maintain the existence of germplasm to remain as before. Preservation of germplasm can be done in-situ and ex-situ [2].

Petrichor substance when the water surface rises (flood) which wets the dry land after the dry season is a trigger for the spawning process [5]. The fecundity of Lais fish (Ompokhypophthalmus) that is ripe with gonads with a total length of 22.9 - 28.0 cm and a total weight of 53.66 - 94.03 g is as many as 3111 - 11164 eggs and releases the mature eggs simultaneously in one spawning period (total spawner) and that spawning period is not all year round, but depends on the entering of rainy season [1]. Fish that have one spawning season in a year if related to the dynamics of ovary organization, the type of ovarian development is including in the synchronous group type [6]. **Figures** 



Fig. 1: Lais Fish Habitat (*Ompokhypopthalmus*); Percentage of Male and Female That Have Been Caught in the Rungan River, Palangka Raya City

## Conclusion

The life cycle of Lais fish from larvae to adulthood and spawning in waters with lots of riparian vegetation. Laisfish is a carnivorous fish with the main food is insects or insects that fall from riparian vegetation on the edge of the waters. Lais fish is the fish that live in flooded swamps area, rivers and lakes.

The results of research that have been carried out on laisfish show that the sex ratio for male broods of laisfish is less when compared to female broodfish, with one spawning season in one year, when it's enteringthe rainy season or follows the hydrological pattern and the inundation rate of flooded swamps. with the type of simultaneous spawning (total spawner) and includes iteroparous fish. In the swamp flooded waters of the Rungan river, it shows that the number of male lais fish is more when compared to female lais.

Lais fish uses a lot of energy for reproduction, either for spawning migration or for fertilization and reproductive organs development in its body. With variations of energy amount used, especially for reproductive effort, age at the beginning of reproduction, fecundity, survival rate, reproductive frequency and the chosen reproductive strategy. Furthermore, the reproductive cycle of lais is also closely related to environmental changes, especially the factors that affect the maturity of gonads, such as temperature, food besides the presence of hormones.

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