

# EFFICIENCY OF USING ARTIFICIAL HORMONES IN CATFISH SPAWNING ON PKB FISHERIES TEACHER TRAINING

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**Abstract:** This study aims to compare the spawning catfish semi-artificial method using the artificial hormone with natural methods, to find which method is more efficient through t-Test in SPSS Program. It has been a lot done spawning Catfish with different methods but the results has never been compared. The results of this research indicate spawning catfish semi-artificial method using the artificial hormone was more efficient than the natural method, especially at Absolute Fecundity parameters: by using the semi-artificial method of artificial hormone get 65360 eggs and natural method get 62801 eggs, Fecundity Relatives on semi-artificial method using the artificial hormone obtain 655 eggs and 647 eggs on natural methods and Degrees of Hatching parameters on semi-artificial method is 76.12% and 40.08% on natural method, due SIG (2-tailed) less than (P Value)  $\leq 0.05$  so that revealed an increase in results. For the parameters of the Gonads Somatic Index is 20.72% on semi-artificial method and 20.63% on natural method also Fertilization degree namely 94.75% and 93.48% due to the Sig (2-tailed) greater than (P Value)  $\leq 0.05$  then declared not improved results. Whereas in Fry Rearing the parameter Growth Rate, acquire 5,426 cm and 4,118 cm due to the Sig (2-tailed) 0109 greater than (P value)  $\leq 0.05$ , then there was not increase in the results while the Survival Rate parameters that is 93% and 88.35% with SIG (2-tailed) smaller than 0,005 (P value)  $\leq 0.05$  then an increase in results. All these parameters using 95% confidence.

The above parameters is core learning materials on fish spawning and fry rearing that must be reinforced to known of Widyaiswara/lecturer. The more Widyaiswara has experience with such content will be more powerful, easy and confident in presenting his experience to participants on PKB Fisheries Teacher Training.

**Keywords:** Artificial, Hormones, Spawning, Catfish, Efficiency.

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## I. INTRODUCTION

### A. Background

In the PKB Fisheries Teacher Training, the Fish Breeding Subject matter for spawning catfish with semi-artificial methods using artificial hormones by Widyaiswara/lecturer are often taught and spawned but the results have not been recorded periodically, especially the results compared with natural or other methods, so the unknown methods which spawning is more efficient. Therefore it is important to conduct research on spawning of catfish to find which one is more efficient than the two methods.

Previous studies of catfish spawning have been carried out, including by Hengky Sinjal (2014), who found that in spawning catfish injected with Ovaprime at a dose of 0.3 ml / kg Brood, hatching rate of 74.16% and Survival Rate of larvae 85.76%. Likewise, research conducted by R. W. Ariyati, D. Chilmawati Sarjito (2015), resulted in the hatching rate of eggs spawning results reaching 90% and survival rate of catfish seeds reached 85%. In his study Ardyan Regita et al, (2017), in the spawning of Catfish Pearls (*Clarias sp.*) Natural methods with a ratio of male and female parent 1: 1. Absolute fecundity produced 61,648 eggs, fertilized eggs is 47,376 eggs or 76.8% and eggs are 76.8% successfully hatched 37,310 items so that a Hatching Rate (HR) of 78.7% was obtained. The survival of the initial larvae amounted to 37,310 tails and the final number of larval rearing of 35,000 tails in order to obtain a Survival Rate (SR) of 93.80%.

Soliman H. Abd El-Rahman, (2016), on catfish spawning (*Clarias gariepinus*) using GnRH $\alpha$  with Anti Dopamine (Dom) produces ovulation or the number of eggs released 70.76%, Hatching rate 81.9% and larval survival rate 89.9% with highest value of 100%. And also Derli Aidil et al. (2016), in catfish spawning found the highest egg hatching degree was at a temperature of 28 oC. namely 85.67%, the highest survival rate is 82.67%). Gadisa Natea, et al. (2017), in spawning catfish injected with extracts of the catfish pituitary gland (African catfish) produced a hatching degree of 73.3% while those injected using goldfish pituitary extract pituitary with a yield of 63.5%.

Conducting research is a process of proving whether the catfish spawning method using artificial hormones is more efficient than the natural method. This research is also a reinforcement of experience for the doer especially for a lecturer who will later be used to educate teaching and training. This verification process will be realized in the work procedures and results. The result is as a learning material that is seen in parameters, namely: Gonad Somatic Index, Absolute Fecundity, Relative Fecundity, Fertilization Levels and Hatching Degrees. The more Widyaiswara/lecturer has experience, the stronger, easier and more confident in conveying his experience in educating, teaching and training to others or Training Participants.

### B. Problems

The results of spawning catfish with natural methods and methods of using artificial hormones the results have not been well recorded especially the results compared to the two methods, spawning catfish with which method is more efficient. Is it true that spawning catfish with semi-artificial methods using artificial hormones the results are better or more efficient. To prove this problem research needs to be done.

In spawning catfish with semi-artificial methods using artificial hormones need to look for the right dose of hormones for optimal results. Optimal means efficient, that is by using few resources but producing high products.

In spawning both methods using artificial hormones or natural methods, both methods do not have standard operating procedures that are considered standard. So that each catfish spawning offender with the method in accordance with their respective abilities.

### C. Research Objectives

- a. The objective of this study was to determine the efficiency of the use of artificial hormones in spawning of semi-artificial catfish methods compared to natural methods.
- b. To get the standard operational procedure (SOP) for spawning catfish using artificial hormones.

## II. METHODOLOGY OF IMPLEMENTATION OF RESEARCH

### 1. Treatment and Replication

#### a. Treatment

Semi-Artificial Catfish Spawning Method using Artificial Hormones compared with Natural Catfish Spawning Methods and Fingerling rearing.

In the Semi-Artificial Catfish Spawning Method using Artificial Hormone, the catfish brood is injected with an artificial hormone (Ovaprime) at a dose of 0.5 ml for 1 kg of female and 0.3 ml for 1 kg of male catfish.

The stocking densities of fingerling rearing 2500 tail / m<sup>2</sup> in containers with length X Width X Height = 1.5 X 2 X 0.5 m with the amount of feeding 10% of the weight of biomass per day with feeding frequency 3 times per day with 35% of protein.

#### b. Replication

All treatments using 4 replications. At each replication spawning uses one broodstock pair.

### 2. Parameters

#### a. Spawning

##### 1) Gonad Somatic Index

Gonad Somatic Index is a comparison between gonad weight and body weight multiplied by 100%, (Moh.Ichsan Effendi, 2001).

Gonad weights are known by subtracting the weight Catfish brood before laying eggs and after laying eggs.

## 2) Relative Fecundity

Relative Fecundity is known by taking an egg sample (1 gram) and then counting the number of eggs.

## 3) Absolute fecundity

Absolute fecundity is the total number of eggs in the gonad (real conditions). To find out the number of eggs in the gonad in real conditions are: overall gonad weight divided by egg weight of 1 gram (sample) times the number of eggs in the sample, (Ridwan Affandi, 2000).

## 4) Fertilization Rate

The Fertilization Rate is known by means of sampling, which is to determine the area (5 cm x 5 cm) of 5 pieces above the spawning media. From this area the number of fertilized eggs and the number of all eggs is calculated. Then the results are averaged. Calculate the degree of overall fertilization by means of area divided by 25 cm<sup>2</sup> times the number of fertilized eggs for the sample and the number of fertilized and non-fertilized eggs multiplied by 100%. (Ridwan Affandi, 2000).

## 5) Hatching Rate

The Hatching Rate is the number of larvae divided by the number of fertilized eggs times 100%. This number can be obtained by: knowing the number of fertilized eggs and sampling the number of larvae. The method of sampling the number of larvae is to use the volumetric method, which is taking larvae in water with a 50 ml container of 5 points, then the number of larvae of 5 points is calculated then the amount is averaged. The total number of larvae is the volume of the whole container divided by the sample volume (50 ml) times the number of sample larvae. The total number of larvae divided by the number of fertilized eggs by 100%, (Ridwan Affandi, 2000).

## b. Fry Rearing

In Parameters used in Fry Rearing are: SR and GR.

1) SR stands for Survival Rate, which is survival rate or live fish numbers. This figure is obtained from the number of live fish at present divided by the number of fish at initial stocking times 100%, (Moh.Ichsan Effendi, 2001).

2) GR stands for Growth Rate which is absolute fish growth and daily growth rate. Absolute growth rate is obtained from the weight or length of today's fish minus the weight or length of the previous day's fish or when stocking, (Moh. Ichsan Effendi, 2001).

## 3. Working Procedure

### Spawning Catfish in Natural Method

- Preparing equipment, materials and spawning media
- Choose a mature in Gonad of catfish
- Separating and fasting the brood of catfish chosen
- Spawning
- Checking spawning results

### Spawning Catfish in Semi-Artificial Methods Using Artificial Hormones

- Preparing equipment, materials and spawning media
- Choose a mature in Gonad of catfish
- Preparing hormones
- Inject the brood
- Control the spawning process

- Checking spawning results

#### Fingerling Rearing

- Prepare equipment, materials and nursery media
- Select and count fingerling
- Release the fingerling
- Feeding fingerling
- Doing sampling
- Harvest fingerling

#### 4. Data Processing

All parameters were processed using SPSS Statistical Analysis and T-test by comparing the spawning of catfish using artificial methods with natural methods.

### III. LITERATURE REVIEW

#### A. Spawning Catfish Natural Method

Catfish Spawning Natural Method is a pair of mature gonads, male and female broodstock of catfish released on media that have been prepared for breeding, without any treatment for the parent to be spawned, (SNI 6484.4.2014. Production of Catfish Seedlings, BSN 2014).

#### B. Spawning Semi-Artificial Catfish Method Using Hormones

Catfish Spawning Semi-Artificial Method Using Artificial Hormone is a pair of male and female catfish broodstocks in mature gonads that have been injected with hormones, then the brood is released on media prepared for breeding, (SNI 6484.4.2014. Production of Catfish Seedlings, BSN 2014).

#### C. Larvae/Fry Rearing

Nursery of the 1st Fish phase is the rearing of seeds from the larval phase until they are 1-3 cm in size. In the second phase is rearing of larvae 1-3 cm in size are reared and then harvested 3-5 cm in size and subsequently in the 3rd phase is rear a 3-5 cm in size and harvested in 5-7 cm in size. (SNI 6484.4: 2014, Catfish Seed Production, BSN 2014).

#### D. Efficient Use of Artificial Hormones

According to S.P. Hasibuan.1984. It is said to be efficient if the results obtained are optimal by using minimal resources or said to be efficient if by using artificial hormones the results obtained are higher than the results without using artificial hormones, with minimal resources.

#### E. Hypothalamus-Pituitary and Gonad Axis

GnRH stands for Gonadotrophin Releasing Hormones play a role in accelerating the development and maturation of the gonads. Whereas Dopamine's role is to slow the development and maturation of the gonads. GnRH and Dopamine are in the Hypothalamus, while the Hypothalamus, Hipofisa and Gonad organs are organs that cannot be separated in the development and maturation of the gonads, (Borg, 1994).

#### F. Artificial Hormones (Ovaprim)

Ovaprim is a trademark, ovaprim is an analogue mixture of salmon GnRH and Anti dopamine stated that every 1 ml of ovaprim contains 20 ug sGnRH-a (D-Arg6-Trp7, Lcu8, Pro9-NET) - LHRH and 10 mg anti dopamine. Ovaprim also plays a role in spurring the growth, development and maturation of the gonads and ovulation. In the process of gonad growth and development, the analog GnRH hormone contained in it plays a role in stimulating the pituitary to release gonadotropins. While gonadotropin suppression will be inhibited by dopamine. If dopamine is blocked by its antagonist, the role of dopamine will cease, so that gonadotropin depression will increase. (Ovaprim, Trade mark).

### G. Growth, Development and Maturation of Gonad

Another theory for growth, development and egg maturation is the close relationship between the hypothalamus-pituitary-gonad axis. The hypothalamus will release GnRH if dopamine is inactive. The function of GnRH is to stimulate the release of GtH (Gondotropin) which is in the pituitary. If GtH is released, the hormone Testosterone in theca cells is released, while the Testosterone hormone will stimulate the release of the hormone Estradiol-17 which is in granulosa cells. The hormone Estradiol-17 $\beta$  will bully the liver's work to process the egg yolk precursor (vitellogen) to be sent to the egg as egg yolk. Thus egg growth occurs.

Egg maturation is the hypothalamus releasing GnRH, then GnRH stimulates the pituitary to release GtH, GtH stimulates Thecal cells secrete hormones  $17\alpha$ , *Dyhydroxy Progesteron*, this hormon through the MIH Media (*Mutration Inhiting Hormon*) goes into granulosa cells then granulosa cells secrete  $17\alpha,20\beta$ -*dyhydroxy-4-pregnen-3-one*, this hormone through the MPF media (*Maturation Promoting Factor*) to gether do the maturation of eggs. (Nagahama, 2010).

### H. Absolute Fecundity, Fertilization Rate, Hatching Rate, Survival Rate and Growth Rate

Hengky Sinjal, 2014. found that spawning of catfish injected with Ovaprime at a dose of 0.3 ml / kg broodstock resulted in a Hatching Rate of 74.16% and Survival Rate of Larvae 85.76%.

Ariyati R. W., D. Chilmawati, Sarjito, 2015. Hatching Rate of spawning results reached 90% and Survival Rate in rearing of fry reached 85%.

Ardayan Regita et al., 2017. In the spawning of Catfish Pearls (*Clarias* sp.) use Natural method with a ratio of broodstock male and female 1: 1. Absolute fecundity produced 61,648 eggs, fertilized eggs are 47,376 items or 76.8% and eggs that successfully hatch is 37,310 items so that a Hatching Rate (HR) 78.7% is obtained. The survival of the initial larvae amounted to 37,310 tails and the final number of larval rearing of 35,000 tails so that the Survival Rate (SR) is 93.80%.

Soliman H. Abd El-Rahman, 2016. The spawning of catfish (*Clarias gariepinus*) using GnRHa with Anti Dopamine (Dom) produces ovulation or the number of eggs released 70.76%, Drajat hatching 81.9% and Survival Rate of larvae 89.9% with the highest value of 100%. Derli Aidil et al, 2016. In catfish spawning found the highest of hatching rate found at a treatment temperature of 28 °C. namely 85.67%, the highest survival rate is 82.67%.

Gadisa Natea, et al., 2017. In spawning catfish injected with extracts of the catfish pituitary gland (African catfish) produced a Hatching Rate of 73.3% while those injected using goldfish pituitary extracts with a yield of 63.5%.

## IV. RESULTS AND DISCUSSION

### A. Spawning

#### 1. Spawning Data

**Table 1: Average Result of Catfish Spawning with Semi-Artificial Method**

NO	Rep	GSI %	AF (Eggs)	RF (Eggs)	FR %	HR %
1	R-1	21.30	54900	640	91.00	73.00
2	R-2	20.47	23946	636	98.57	75.33
3	R-3	22.43	65360	655	96.17	81.82
4	R-4	18.69	59218	646	93.28	74.33
Average		20.72	50856	644	94.755	76.12

**Table 2: Average Result of Catfish Spawning with Natural Method**

NO	Rep	GSI %	AF (Eggs)	RF (Eggs)	FR %	HR %
1	R-1	19.67	27300	612	85.33	44.33
2	R-2	21.52	62801	647	98.48	38.67
3	R-3	21.23	46666	637	96.83	34.00
4	R-4	20.11	26239	629	93.28	43.33
Average		20.635	40751	631	93.48	39

Extension

Rep : Repetition                      GSI:Gonad Somaic Index  
 AF: Absolute Fekundity            RF: Relative Fekundity  
 FR: Fertilizatón Rate              HR :Hatching Rate

## 2. Spawning Data Processing Results

- a. Gonad Somatic Index, on the parameters of the Gonad Somatic Index for spawning methods using artificial hormones although an average of 20.72% is greater than spawning natural methods averaging 20.63% but it was stated there was no increase in yield with Sig. (2-tailed) 0.915 is greater than (P value)  $\leq 0.05$  with 95% confidence.
- b. Absolute fecundity, the absolute fecundity parameters for spawning methods using artificial hormones the highest number of eggs reaches 65360 eggs greater than spawning natural methods with 62801 eggs with Sig. (2-tailed) 0.0485 is smaller than (P value)  $\leq 0.05$  so there is an increase in yield with 95% confidence.
- c. Relative fecundity, the parameters of Relative fecundity spawning methods using artificial hormones the highest number of eggs obtained 655 items greater than spawning natural methods the highest yields 647 items with Sig. (2-tailed) 0.0218 at (P value)  $\leq 0.05$  so that the results increase with 95% confidence.
- d. Fertilization Rate, Parameters Fertilization Rate for spawning methods using artificial hormones the average percentage yield is 94.75% greater than spawning natural methods with an average of 93.48% with Sig. (2-tailed) 0.451 is greater than (P value)  $\leq 0.05$  so that there is no increase in results with 95% confidence.
- e. Hatching Rate, the parameter Hatching Rate in spawning methods using artificial hormones the percentage of eggs hatching averaged 76.12% greater than spawning natural methods averaging 40.08% with Sig. (2-tailed) 0.003 less than (P value)  $\leq 0.05$  so that the results increase with 95% confidence.

## B. Fry Raering

### 1. Fry Rearing Data

**Table 3: Fry Rearing Result**

Time	Semi -Artificial Method		Natural Method	
	GR (Cm)	SR %	GR(Cm)	SR%
Tgl.20 Des2018	3.05	94	2.275	89
Tgl. 2 Jan 2019	5.40	93	4.50	89
Tgl.10 Jan 2019	7.83	92	5.58	87
Rataan	5.426	93	4.118	88.333

Extension. GR : Growth Rate SR : Survival Rate

### 2. Fry Rearing Data Process Result

- a. Growth Rate, the Growth Rate parameter for spawning methods with artificial hormones growth average body length of 5.426 cm is almost the same as spawning natural methods averaging 4.118 cm stated there was no increase in yield because Sig. (2-tailed) 0.109 is greater than (P value)  $\leq 0.05$  with 95% confidence.
- b. Survival Rate, the Survival Rate parameter for spawning methods using artificial hormones results an average percentage of 93% and also greater than the results of spawning natural methods averaging 88.33% with Sig. (2-tailed) 0.005 is smaller than (P value)  $\leq 0.05$  so it is stated that there is an increase in results with 95% confidence.

## C. Standard Operating Procedures for Spawning Catfish Semi-Artificial Method Using Artificial Hormones

These operational standard procedures are recorded at each stage of the activity in sequence. This operational standard of procedure is stated in the discussion, but is available in other journals.

## V. DISCUSSION

### A. Spawning

Gonad Somatic Index, on the parameters of the Gonad Somatic Index for spawning methods using artificial hormones although an average of 20.72% is greater than spawning natural methods averaging 20.63% but it was stated there was no increase in yield with Sig. (2-tailed) 0.915 is greater than (P value)  $\leq 0.05$  with 95% confidence.

In the parameters of the Somatic Gonad index the results are stated to be no increase, this is because the weight and size of the gonads are only slightly different but when viewed from the number of eggs in the Absolute Fecundity and the Relative Fecundity there is a difference that is more in spawning methods using artificial hormones than in the natural method that is 65360 eggs and 62801 eggs and for relative fecundity 655 eggs and 647 eggs per 1 gram of egg.

Absolute fecundity, the absolute fecundity parameters for spawning methods using artificial hormones the highest number of eggs reaches 65360 eggs greater than spawning natural methods with 62801 eggs with Sig. (2-tailed) 0.0485 is smaller than (P value)  $\leq 0.05$  so there is an increase in yield with 95% confidence.

Relative fecundity, for the parameters of Relative fecundity spawning methods using artificial hormones the highest number of eggs obtained 655 items greater than spawning natural methods the highest yields 647 items with Sig. (2-tailed) 0.0218 at (P value)  $\leq 0.05$  so that the results increase with 95% confidence.

Gonad Somatic Index, Absolute Fecundity and Relative Fecundity are internal processes in the body of the fish, the growth and maturity of the gonads and perfect cells are influenced by the work of reproductive hormones. The way the reproductive hormone works is also influenced by the addition of an artificial hormone with the trademark ovaprim. Ovaprim is injected into the body of catfish at a dose of 0.5 ml for 1 kg of female and 0.3 ml for male broodstock and is considered appropriate for injection in the back muscles.

In this process the Widayaiswara/lecturer researchers calculated and analyzed the dose of artificial hormones, how much the actual weight of the catfish broodstock and which part would be injected. Whether the artificial hormone will be injected into the back muscles, stomach muscles or head muscles. What is the effect if the artificial hormone dose is too much or too little. This positive or negative effect is analyzed. If the dose is too much the gonad will harden, the effect becomes negative as well if the dose is too small then the artificial hormone has no effect. Likewise the Widayaiswara researchers also conducted an analysis of the process of growth, development and maturation of the gonads or their eggs. How Ovaprim can affect the development and maturation of eggs.

Ovaprim is an analogue mixture of GnRH salmon and Anti dopamine stated that every 1 ml of ovaprim contains 20 ug sGnRH-a(D-Arg6-Trp7,Lcu8,Pro9-NET) – LHRH and 10 mg anti dopamine. Ovaprim plays a role in spurring the growth, development and maturation of the gonads and ovulation. In the process of growth and development of the gonad hormone Gonadotropin Releasing Hormone (GnRH) analogs contained in it play a role to stimulate the pituitary to release Gonadotropin (GtH). While Gonadotropin depression will be inhibited by Dopamine. If Dopamine is blocked by its antagonist, the role of Dopamine will be stopped, so that Gonadotropin depression will increase.

The hypothalamus will release GnRH if dopamine is inactive. The function of GnRH is to stimulate the release of GtH (Gonadotropin) which is in the pituitary. If GtH is released, the hormone Testosterone in theca cells is released, while the Testosterone hormone will stimulate the release of the hormone Estradiol-17 $\beta$  which are in granulosa cells. Hormon of Estradiol-17 $\beta$  this will bully the liver's work to process egg yolk precursors (vitellogen) to be sent to the egg as egg yolk, thus egg growth occurs. It has also been explained above because when maintaining brood fish fed with a protein content of 35% given 3 times a day in the amount of 5% biomass, the supply of processed egg yolk from the external is considered sufficient.

As the egg maturation, the hypothalamus releases GnRH, and then GnRH stimulates the pituitary to release GtH, GtH stimulates the Thecal cells to release hormones 17 $\alpha$  Dihydroxy Progesteron and this hormones through the media MIH (Maturtaion Inducing Hormone) into Granulosa cells then granulosa cells secrete 17 $\alpha$ , 20 $\beta$ -dihydroxy – 4 – pregnen - 3 – one this hormones through the media MPF (Maturation Promoting Factor) to jointly do egg maturation, (Nagahama, 2010). Fish eggs are mature, ready for ovulation and fertilized. The characteristics of an egg mature is if (1) the nucleus of the egg has been at the edge in front of the microphil hole, (2) Polar body 1 has come out, (3) ovulation has occurred.

Absolute fecundity parameters and relative fecundity results seen an increase with 95% confidence, for semi-artificial spawning using artificial hormones. Absolute fecundity for spawning methods using artificial hormones the highest number of eggs reached 65,360 eggs higher than spawning natural methods with 62,801 eggs and this is also higher when compared with the results of the study of Ardyan Regita et al. (2017), in spawning Pearl Catfish (*Clarias* sp.) Natural method with a ratio of male and female broodstock 1: 1. with absolute fecundity yielded 61,648 eggs. While the Relative Fecundity of spawning methods using artificial hormones the highest number of eggs obtained was 655 items larger than the natural spawning method with the highest yield of 647 eggs. So the injection dose mentioned above has an effect on the number of eggs.

Fertilization Rate, the parameter of Fertilization Rate for spawning methods using artificial hormones the average yield of 94.75% is greater than spawning natural methods with an average of 93.48% with Sig. (2-tailed) 0.451 is greater than (P value)  $\leq 0.05$  so it is stated that there is no increase in yield with a confidence of 95%. Although the results were stated to be no different or there was no improvement, in fact these results were already high when compared with the research of Ardyan Regita et al. (2017), with the result of 76.8% Fertilization Rate. This high of fertilization Rate results due to adequate vitellogenin and reproductive hormones or an adequate injection of artificial hormone injections so that the process of growth, development and maturation of eggs and sperm cells occurs properly.

Hatching Rate, the parameter Hatching Rate in spawning methods using artificial hormones the percentage of eggs hatching averaged 76.12% greater than spawning natural methods averaging 40.08% with Sig. (2-tailed) 0.003 more than than (P value)  $\leq 0.05$  resulting in an increase in yield with 95% confidence. This result was also higher than the results obtained by Hengky Sinjal (2014), in spawning catfish injected with Ovaprime at a dose of 0.3 ml / kg male, found a 74.16% Hatching Rate, as well as Gadisa Natea, et al. (2017), in spawning catfish injected with extracts of the catfish pituitary gland catfish (African catfish) produced a hatching degree of 73.3%. But the results mentioned above are lower than 81.9% of research results from Soliman H. Abd El-Rahman, (2016), in catfish spawning (*Clarias gariepinus*) using GnRH $\alpha$  with Anti Dopamine (Dom). The Hatching Rate besides being influenced by internal factors is also influenced by external factors. The external factor is the water quality of media. If the egg internal factor is declared good, the results can be seen during the embryogenesis process, the next hatching is influenced by the quality of the water media ie Temperature 30°C, pH 6.8, Oxygen solubility 6 mg / l , Water Transparency 30 cm water depth . This water quality for temperature and water depth is less than optimal, according to the experience of previous lecturers, the optimal temperature is around 29 °C and the water depth is around 20 cm. So that including less support for hatching and hatching results of fish eggs less than optimal hatching degree only reached 76%.

## B. Fry Rearing

Fry rearing is carried out with a stocking density of 2500 head / m<sup>2</sup> in a container size P X L X T = 1.5 X 2 X 0.5 m with the amount of feed 10% of the biomass weight and frequency of feeding 3 times per day with 35% protein. Fry rearing is also supported by water quality media with a temperature of 26-30 °C, pH 6.5 - 7.5, DO 6 mg/l , Ammonia 0.091 mg/l, Water Transparency 35 cm, depth 40 cm, so the fry grow normally, not there are defects, also not attacked by disease.

Growth Rate, in the Growth Rate parameter for spawning methods using artificial hormones growth average body length of 5.426 cm is almost the same as spawning natural methods averaging 4.118 cm otherwise there was no increase in yield because Sig. (2-tailed) 0.109 is greater than (P value)  $\leq 0.05$  with 95% confidence. The Growth Rate parameter is stated to be no increase in this result because the difference in growth is small, namely 1 cm, although statistically stated there is no increase in yield but when viewed from average body growth of 5.426 cm and 4.118 cm there is a greater difference in the method of using artificial hormones. than the natural method.

Survival Rate, the Survival Rate parameter for spawning methods using artificial hormones results an average percentage of 93% and also greater than the results of spawning natural methods averaging 88.33% with Sig. (2-tailed) 0.005 is smaller than (P value)  $\leq 0.05$  so it is stated that there is an increase in results with 95% confidence. This result is also greater than the study of Hengky Sinjal (2014), who found that in spawning catfish injected with Ovaprime at a dose of 0.3 ml / kg broodstock, Survival Rate Larvae 85.76%. Likewise the research conducted by R. W. Ariyati, D. Chilmawati, Sarjito (2015), resulted in a Survival Rate of 85% Catfish Seeds. In his research Ardyan Regita et al, (2017), in the spawning of Catfish Pearls (*Clarias* sp.) Natural methods with a ratio of male and female parent 1: 1. Survival Rate (SR) of 93.80%. Survival Rate of research results is high, namely 93% in the spawning method with artificial hormones, which



means that the endurance for life is higher, this is caused when the embryogenesis process goes well so that cells for organs are formed perfectly. Including the external factor of catfish seed that is the quality of water suitable for survival media.

### C. Standard Operating Procedures

Discussed in other journals.

## VI. CONCLUSIONS AND RECOMMENDATIONS

### A. Conclusion

The conclusions that can be drawn from the study entitled "Efficient Use of Artificial Hormones in Catfish Spawning for PKB Fisheries Teacher Training " are:

1. Spawning semi-artificial catfish method using artificial hormones is more efficient than spawning natural methods, especially on parameters:

Relativity fecundity with Sig. (2-tailed) 0.0218 smaller at (P value)  $\leq 0.05$  and Absolute Fecundity with Sig. (2-tailed) 0.0485 less than (P value)  $\leq 0.05$  and the degree of hatching with Sig. (2-tailed) 0.003 more than than (P value)  $\leq 0.05$  an increase in yield with 95% confidence.

Gonad Somatic Index with Sig. (2-tailed) 0.915 is greater than (P value)  $\leq 0.05$  and the degree of fertilization with Sig. (2-tailed) 0.451 is greater than (P value)  $\leq 0.05$  then there is no increase in yield with 95% confidence.

2. Fry rearing

Survival Rate Sig. (2-tailed) 0.005 is smaller than (P value)  $\leq 0.05$  so it is stated that there is an increase in yield and Growth Rate is stated does not increase in yield because Sig. (2-tailed) 0.109 is greater than (P value)  $\leq 0.05$  with 95% confidence.

3. Standard Operating Procedures are discussed in other journals.

Thus the conclusions that can be drawn from this study, hopefully increase competence for researchers and insights for Readers and Teachers of Fisheries Vocational Schools.

### B. Recommendations

1. This research is to develop and deepening of the Gonad Somatic Index, Absolute Fecundity, Relative Fecundity, Fertilization Rate and Hatching Rate teaching material.
2. It is necessary to find the optimal dose of artificial hormone injection in order to increase the eggs production.
3. Written operational standard procedures should be refined with subsequent catfish spawning experience.
4. For widyaiswara/lecturer advised to do research often so that it is rich in experience.
5. Results This study provides information that the spawning of catfish using artificial hormones is more efficient than natural methods with doses as above.

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