ARTIFICIAL SPAWNING OF PATIN SIAM CATFISH (Pangasianodon hypopthalamus) IN THE RESEARCH CENTER OF SUKAMANDI FISH BREEDING

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Abstract

Catfish (Pangasianodon hypopthalamus) was a potential freshwater aquaculture commodity to be developed because it has high economic value. Catfish seed production was highly dependent on the availability of gonad stock in large quantities and high quality. One alternative that can be done to meet the needs of seeds was by conducting an artificial spawning in an injectable manner using the hormones Human Chorionic Gonadotropin (HCG) and Ovaprim. The main parameter being observed was egg fecundity, egg fertilization, hatching rate and survival rate. The water quality during the observation was still in the normal range, the temperature ranges between 28-31.^{0}C, pH between 6-8 and dissolved oxygen between> 3-4 mg / l.

Keyword: *Artificial spawning, Hormones, Pangasianodon hypopthalamus*

Introduction

Freshwater aquaculture is one of the most potential business sectors to be developed in Indonesia. Catfish has the potential to be developed because it has high economic value (Mahyuddin, 2010). Catfish is a freshwater fish commodity introduced from Thailand whose development is quite rapid in Indonesia. Many people consume catfish because of its nutritional content, including: 68.8% protein, 5.8% fat, 3.5% ash and 59.3% water content (Khairuman and Amri, 2013). The development of catfish culture is growing rapidly, especially in West Java. South Sumatra, Jambi, Riau and Kalimantan. The rapid development of cultivation is mainly triggered by market opportunities that are still open, especially for exports. The demand for catfish meat is very large and continues to increase. According to Tapahari and Raden (2013), one of the obstacles faced in the development of catfish farming is the continuity of seed availability.

The availability of seeds depends on the rainy season because catfish spawning generally occurs during the rainy season, so there is an alternative to solve it so that the availability of brood stock of catfish that are ripe gonads can be available continuously (Sularto et al., 2012). Therefore, seed production with good quality and quantity will be achieved for the sustainability and success of aquaculture production activities (Shaofeng, 2006; Mohan, 2007).

One alternative that can be done is by hormonal induction using the hormone Human Chorionic Gonadotropin (HCG) and ovaprim as an alternative to stimulate vitellogenin biosynthesis which plays a role in stimulating the development of catfish gonads (Arfah et al., 2006). Use of hormones that come from outside the body fish to stimulate ovulation and spawning in fish have been well developed. For this reason, it was hoped that these problems can be resolved immediately by induction of the hormone HCG and ovaprim to stimulate vitellogenin biosynthesis as biostimulation to stimulate gonad maturity.

Materials and methods

The research was conducted at the Fish Breeding Research Center, Sukamandi District, Subang Regency, West Java used survey and apprenticeship methods. Before research on catfish spawning artificially, broodstock management was carried out, preparation of the maintenance media with a pond size of 14x13x1.5 m with a stocking density of 1 fish/m^2, management of feed with floating pellets containing 35-38% protein content with a frequency of feeding. Twice a day and carried out management of water quality and control of pests and diseases.

Results and discussions

Artificial Spawning

Artificial spawning was done by hormone induction using the hormones HCG and ovaprim. The HCG hormone functions to improve the maturity of gonads while ovaprim functions to stimulate ovulation. The method of injection was intramuscular (Figure 1).

Figure 1. Hormone injection (Personal documentation, 2019)

The first injection was for female Siamese Patin broodstock with HCG hormone at a dose of 500 IU/kg, with a 5 mL dilution. A second injection with the hormone ovaprim at a dose of 0.6 mL/Kg. The time from the first injection to the second injection was 24 h. The first injection was carried out at 22.00 WIB. While the injection of male Siamese catfish was carried out once at the same time as the injection of the two female broodstocks. The male broodstock was injected with the hormone ovaprim at a dose of 0.2 mL/kg, which aims to stimulate ovulation. This statement was in accordance with Slembrouck et al. (2005), that a second injection with ovaprim was given 24 h after HCG administration. This means that the hormones given can be absorbed properly, so as to increase the maturity of the gonads and prevent the mother from stress or the hormone fluid that has been injected back out. The dose of HCG and ovaprim hormone injections can be seen in Table 1.

Table 1. Injection dose of HCG and ovaprim hormones

No	Weight of Broodstock (Kg)		Dose of HCG (mL)	Dose of ovaprim (mL)	
	Male	Female		Male	Female
1	3	3,7	1,85	0,6	2,2
2	3	4,1	2,05	0,6	2,5
3	3	4	2	0,6	2,4
4	-	4,8	2,4	-	2,9

Source: Primary data (2019)

Fecundity

The broodstock's ovulation readiness was checked 10-12h after the second injection. Checking has done by stripping until the eggs come out. After the stripping process (Figure 2) was completed and the eggs had come out, all the containers containing the eggs were weighed.

Figure 2. Sperm and egg stripping of catfish (Personal documentation, 2019)

Weighing eggs has been done to determine the number of eggs produced by the broodstock female (fecundity). The fecundity calculation (Table 2) was done by taking an egg sample weighing 0.1 g, then counting the number of egg samples manually. Then it was calculated using the following formula:

$$\text{Fecundity} = \frac{\text{total egg weight}}{\text{egg sample weight}} \text{ x number of eggs}$$

Table 2. Fecundity of catfish

No	Broodstock Code	Broodstock Weight (Kg)	Amount of Egg Weight (g)	Weight of Egg Sample (g)	Number of Egg Sample (eggs)	Egg Fecundity	Average Number of Eggs (eggs/Kg)
1	3	3,7	368	0,1	157	577,760	156.151
2	5	4,1	512	0,1	158	808,960	197.307
3	10	4	658	0,1	159	1.046.220	261.555
4	12	4,8	704	0,1	162	1.140.480	237.600
Average							213.153

Source: Primary data (2019)

The results of the calculation of the average number of fecundities in each female broodstock during 1 cycle was 213,153 eggs/Kg, with the smallest amount of fecundity 156,151 eggs/Kg. The resulting fecundity can be declared good, because the resulting fecundity value was higher than the SNI for catfish seed production. Based on SNI 01-6483.1 (2000), 1 Kg of broodstock weight can produce 120,000-200,000 eggs. Thus, the results of the artificial spawning conducted at the Fish Breeding Research Institute well.

Fertilization rate

Fertilization was done by mixing sperm and eggs and then stirring using chicken feathers so that the eggs were not damaged and the sperm and eggs were evenly mixed, then given mineral water and given a solution of termite soil. The termite soil solution was given to remove the adhesion of the eggs, so that the catfish eggs did not stick together. Providing termite soil can eliminate the adhesion of catfish eggs. After giving the termite soil solution, the eggs were then washed clean until no red soil was left. Washing eggs with clean water 2 - 3 times was done to get rid of the remaining unfertilized sperm. Because sperm was a protein that decomposes easily if fertilization did not occured. This would be result in contaminated fertilized eggs. The process of giving termite soil to eggs and rinsing the eggs that had been given termite soil can be seen in Figure 3.

Figure 3. Giving and washing of termite soil (Personal documentation, 2019)

This was consistent with the statement of Kordi (2005), which stated that after the eggs were collected in a small basin, they were mixed with the sperm while stirring slowly using chicken feathers for ± 3 minutes. After the sperm and eggs were mixed, add enough fresh water, then stir again with chicken feathers slowly for ± 3 minutes. The addition of fresh water served to activate all spermatozoa simultaneously. The percentage of fertilized eggs (Table 3) can be calculated using the following formula:

$$\text{Fertilization } (\%) = \frac{\text{number of fertilized eggs}}{\text{the number of eggs released during spawning}} \times 100\%$$

Table 3. Results of fertilization of eggs

No	Broodstock Code	Amount of Egg (eggs)	Amount of Egg Sample (eggs)	Fertilized Egg (eggs)	Dead Eggs (eggs)	Fertilization Percentage (%)	Total Number of Eggs (eggs)
1.	3	577.700	149	138	11	92	531.539
			108	101	77		
			85	79	6		
Average			**114**	**106**	-		
2.	5	808.960	84	70	14	83	671.436
			66	58	8		
			147	120	27		
Average			**99**	**83**	-		
3.	10	1.046.220	116	104	12	85	889.287
			127	108	19		
			141	118	23		
Average			**128**	**110**	-		
4.	12	1.140.480	69	64	5	90	1.026.432
			60	53	7		
			58	51	7		
Average			**62**	**56**	-		

Source: Primary data (2019)

Hatching rate

The eggs that had been stocked in the funnel will hatch in about 18-24 h, with the hatching temperature ranging from 30-31°C. Temperature conditions need to be considered, because this can affect the length of time for hatching eggs. Larvae that had hatched and were healthy will swim upward following the drain and accommodated in the hapa, while unhatched eggs and abnormal larvae will remain at the bottom of the funnel.

This statement was in accordance with Kordi (2005), that the capacity of eggs in the funnel was around 200 - 350 g/funnel. It was intended that with this density it can facilitate aeration to stir the catfish eggs more evenly and so they did not stick to each other.

The development process of catfish eggs and larvae was greatly influenced by water quality, especially water temperature. The higher the temperature, the faster the embryo development process will be so that the egg hatching process would be even faster. Catfish eggs hatched after 24-28 h at a temperature of 26-28°C. For the distribution of catfish eggs in the hatchery funnel, it can be seen in Figure 4.

Figure 4. The spread of eggs in the hatchery funnel (Personal documentation, 2019)

The calculation of the percentage of eggs that hatch (hatching rate) (Table 4) can use the formula:

$$\text{Hatching rate} = \frac{\text{number of eggs hatched}}{\text{number of fertilized eggs}} \times 100\%$$

Table 4. ***Hatching rate***

No	Broodstock Code	Amount of Egg (eggs)	Amount of Hatched (eggs)	Fertilized Egg (eggs)	Dead Eggs (eggs)	HR Percentage (%)	Total Number of Hatched (eggs)
1.	3	531.539	109	149	40	78	414.600
			88	108	20		
			70	85	15		
Average			**89**	**114**	-		
2.	5	671.436	68	84	16	85	570.721
			59	66	7		
			130	147	17		
Average			**85**	**99**	-		
3.	10	889.287	85	116	31	75	666.965
			93	127	34		
			109	141	32		
Average			**96**	**128**	-		
4.	12	1.026.432	59	69	10	80	821.145
			51	60	9		
			40	58	18		
Average			**50**	**62**	-		

Source: Primary data (2019)

Growth rate

Growth observations were made to determine the development of the larval body length. In the Siamese catfish larvae that had just hatched a transbroodstock body, they did not have undeveloped eyes and fins. Therefore, the larvae were not able to find their own food. This growth observation was carried out every 7 days by means of sampling. The length of maintenance for larvae was 3 days and seeds were 15 days, then the larvae will become seeds where the larvae reach a size of ± 1 inch for 3-4 weeks. The standard length growth graph can be seen in Figure 5.

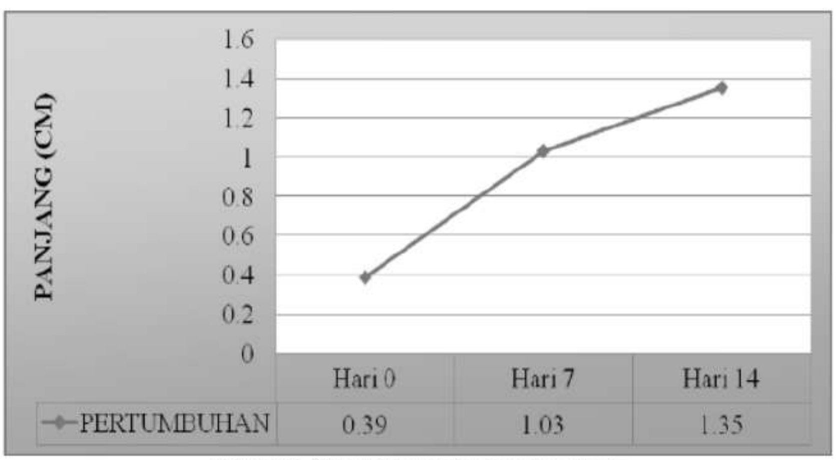

Figure 5. Standard length growth graph

Retrieval of seed growth data by taking a sample of 30 tails in one tub of fiber with data taken Standard Length and Total Length for 7 days once a month then taken the average seed growth. During the study, standard length observations were made on 0 day (0,39 cm), 7th day (1,03 cm) and 14th day (1,35 cm). while the total length on 0 day (0,40 cm), 7th day (1,05 cm), and 14th day (1,50 cm).

Survival rate

Harvesting was carried out at the end of maintenance which was 28 days (4 weeks). The number of seeds was counted with several samples. With the number of larvae spread per 2 tubs of fiber as many as 30,000 larvae. For the calculation of survival rate (Table 5) the following formula was used:

$$\text{Survival Rate} = \frac{\text{number of seeds at harvest}}{\text{number of seeds early stocking}} \times 100\%$$

Table 5. Survival rate

	Tub (Sample)	The Number of Larvae Stock	The Number of Larvae Harvested	Survival Rate (%)
One Cycle	1.	30.000	6.700	22,3
	2.	30.000	10.201	34

Source: Primary data (2019)

Conclusions

The following conclusions were obtained:

a) Broodstock used for spawning were 3 males and 4 females.
b) Spawning was quite good with an average fecundity level of 213,153 eggs / kg of broodstock.
c) The hatching rate of each broodstock, namely:
   - Broodstock 1: HR 78% of the total 531,539 eggs produced 414,600 larvae that hatched
   - Broodstock 2: HR 85% of the total 671,436 eggs resulting in 570,721 larvae hatched
   - Broodstock 3: HR 75% of the total 889,287 eggs resulting in 666,965 larvae hatched
   - Broodstock 4: HR 80% of the total number of eggs 1,026,432 eggs resulting in 821,145 larvae hatched

Suggestion

There needs to be intensive larval care so that it will increase the survival rate of catfish larvae.

REFERENCES

Arfah, H., L. Maftuchah dan O. Carman. 2006. Pemijahan Secara Buatan Pada Ikan Gurame *Osphronemus gouramy* Lac. Dengan Penyuntikan Ovaprim. Jurnal Akuakultur Indonesia. Vol.5, No.2 : 103-112.

Khairuman dan K. Amri. 2013. Budi Daya Patin. PT Agro Media Pustaka. Jakarta.

Kordi, K. M. G. H. 2005. Budidaya Ikan Patin Biologi, Pembenihan, dan Pembesaran. Yayasan Pustaka Nusatama. Yogyakarta.

Mahyuddin, K. 2010. Panduan Lengkap Agribisnis Patin. Penebar Swadaya. Jakarta.

Mohan, C.V. 2007. Seed quality in freshwater fish production. pp. 499–517. In: M.G.Bondad-Reantaso (ed.). Assessment of freshwater fish seed resources for sustainable aquaculture.*FAO Fisheries Technical Paper*.No. 501. Rome, FAO. 2007. 628 p.

Shaofeng, W. 2006. Freshwater fish seed as resources for global aquaculture. Pp. 33-34. In: M.G. Bondad-Reantaso (ed.). Assesment of freshwater fish seed resources for sustainable aquaculture. FAO Fisheries Technical paper. No. 501. Romne, FAO. 2007. 628 p.

Slembrouck, J., Oman, K., Maskur dan Marc, L. 2005. Technical Manual For Artificial Propogation Of The Indonesian Catfish Pangasius Djambal. Jakarta.

SNI 01-6483.1. 2000. Induk Ikan Patin Siam (*Pangasius hyphophthalmus*) Kelas Induk Pokok (Broodstock Stock). Badan Standardisasi Nasional Indonesia.

Sularto., Wartono, H dan Rani, H. 2012. Evaluasi Reproduksi Tiga Popoulasi Ikan Patin Siam *Pangasionodon hypopthalamus* Pada Generasi Kedua. Jurnal Riset Akuakultur Vol.7, No.1 : 11-19.

Tapahari, E dan Raden, R. S.P.S. Dewi. 2013. Peningkatan Performa Reproduksi Ikan Patin Siam (*Pangasionodon hypopthalamus*) Pada Musim Kemarau Melalui Induksi Hormon. Berita Biologi 12 (2).

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