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Hatchery Techniques of Carp (*Cyprinus carpio*) in UPTD Balai Benih Ikan (BBI) Cimaja, Sukabumi District, West Java

Teknik Pembenihan Ikan Mas (*Cyprinus Carpio*) di UPTD Balai Benih Ikan (BBI) Cimaja, Kabupaten Sukabumi, Jawa Barat

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ABSTRACT

Carp (*Cyprinus carpio*) is a widely cultivated consumable fish because of its high demand. This fieldwork practice aims to find out specifically about the hatchery techniques of carp. This fieldwork practice activity will be held on June 27-July 27, 2022 at the UPTD Balai Benih Ikan Cimaja Sukabumi. The data collection methods used are active participation, observation, and interviews. The data analysis used is descriptive. Carp hatchery activities start with brood rearing, selection of mature gonad broodstock, spawning, nursery, and water quality management. Spawning of carp is carried out naturally using 30 males and 6 females. The sex ratio of females and males was 5:1. The results of the number of fertilized eggs are around 70,535 eggs with a fertilization rate of 73.45%. The number of eggs that hatched was about 57,831 with a hatching rate of 81.98%. The number of seeds at the end of rearing was 40,521 seeds with a carp seed survival rate of 70.07%.

ABSTRAK

Ikan mas (*Cyprinus carpio*) merupakan ikan konsumsi yang banyak dibudidayakan karena permintaannya yang cukup tinggi. Praktik Kerja Lapangan (PKL) ini bertujuan untuk mengetahui secara khusus tentang teknik pembenihan ikan mas. Kegiatan PKL ini dilaksanakan pada tanggal 27 Juni-27 Juli 2022 di UPTD Balai Benih Ikan Cimaja Sukabumi. Metode pengumpulan data yang digunakan yaitu partisipasi aktif, observasi, dan wawancara. Analisis data yang digunakan yaitu analisis deskriptif. Kegiatan pembenihan ikan mas dimulai dari pemeliharaan induk, seleksi induk matang gonad, pemijahan, pendederan, dan pengelolaan kualitas air. Pemijahan ikan mas dilakukan secara alami menggunakan 30 ekor induk jantan dan 6 ekor induk betina. Rasio perbandingan kelamin ikan mas yaitu 5:1. Hasil jumlah telur yang terbuahi sekitar 70.535 telur dengan *fertilization rate* sebesar 73,45%. jumlah telur yang menetas sekitar 57.831 dengan *hatching rate* sebesar 81,98%. Jumlah benih pada akhir pemeliharaan yaitu sebanyak 40.521 ekor dengan *survival rate* benih ikan mas sebesar 70,07%.

Kata Kunci	*Ikan Mas, Pembenihan, Fertilization Rate, Hatching Rate, Survival Rate*
Keywords	*Carp, Hatchery, Fertilization Rate, Hatching Rate, Survival Rate*
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INTRODUCTION

Goldfish (*Cyprinus carpio*) is a food fish that is widely cultivated because its demand is quite high. Goldfish are popular with the public because they have high protein and delicious meat taste. The demand for goldfish is quite high in several areas such as Bekasi, Depok, Bogor and Jakarta, reaching 50 tons per day. The increasing demand for goldfish must be balanced with a continuous supply of goldfish (Ramadhan & Sari, 2018). Fulfilling the demand for carp cannot be separated from the role of hatchery activities. To increase goldfish production, goldfish seeds with the best quality and quantity are needed

The fish hatchery business is the first step to successful fish cultivation, because for each planting season the cultivation business requires a supply of seeds from the hatchery business (Ismail & Khumaidi, 2016). No other subsystem can function without hatchery activities, because seeds from hatchery activities are needed to carry out fish nursery and rearing activities. The seed rearing process also requires proper handling to ensure that the goldfish seeds produced can grow well and meet consumer standards. (Susanto, 2006 in Ramadhan & Sari, 2018).

The Cimaja Fish Seed Center (BBI) is a Regional Technical Service Unit (UPTD) providing goldfish seeds, tilapia seeds, gourami seeds, catfish seeds, tilapia seeds and eel seeds that are certified in Good Fish Hatchery Practices (CPIB) from high quality fish parents. The Fish Seed Center functions as a producer of high quality broodstock and seeds for fish farmers. This center produces various types of fish seeds, one of which is goldfish. UPTD BBI Cimaja produces steady goldfish seeds (Disease Resistant Majalaya) and marwana. Steady goldfish are the result of the Majalaya goldfish breeding program carried out by BBPBAT Sukabumi, resulting in fish that have fast growth and are more resistant to KHV disease with a resistance level of 100% and resistant to Aeromonas hydrophila bacteria with a resistance level of 74.4% (KEPMEN-KP, 2015). Marwana goldfish also have the advantage of fast growth, resistance to Aeromonas hydrophila bacteria with a resistance level of 50% or 2.75 times more resistance, Marwana goldfish are also resistant to Koi Herpes Virus (KHV) with a resistance level of 97.78% or 0, 42 times more resistant than other goldfish (KEPMEN–KP, 2016).

Goldfish hatchery activities start from rearing broodstock, selecting mature gonads, spawning, nursery, calculating Fertilization Rate (FR), Hatching Rate (HR), and Survival Rate (SR), and water quality management. Good goldfish hatchery techniques require skills and knowledge so that goldfish hatchery efforts are successful in producing superior seeds. Efforts to obtain skills and knowledge of goldfish hatchery techniques are through Field Work Practices regarding goldfish hatchery techniques at the Cimaja Fish Seed Center UPTD, Sukabumi, West Java.

METHODS

Activities will be held from 27 June to 27 July 2022 at the Cimaja Fish Seed Center (BBI), Sukabumi Regency, West Java. The method used in this activity is descriptive and

participatory methods. The types of data used in this PKL are secondary data and primary data. Primary data in this Field Work Practice is obtained from observation, interviews and active participation. Observation is by observing, carrying out and documenting goldfish hatchery activities at BBI Cimaja. Interviews were conducted by asking questions and answers to the field supervisor regarding goldfish hatchery techniques and obstacles or problems encountered during goldfish hatchery. Active participation in this Field Work Practice is carried out by directly following the goldfish hatchery activities at BBI Cimaja starting from broodstock rearing, selection of mature gonads, spawning, nursery and water quality management. Secondary data in this field work practice are documents from agencies and several journal literature and previous research which are used as comparisons with data obtained during field work practice activities.

RESULT AND DISCUSSION

Parent Maintenance

Main maintenance is carried out in a permanent pool with four sides and the bottom of the pool is made of 1 piece of concrete. The pool is rectangular in shape with a pool area of 255 m2, namely 17 m long and 15 m wide and a pool height of 1.5 m. The water height is 1.2 m so the volume of pool water is 306 m3. The quality of the water in the main pond is one of the most important things. Sanitation of the pond environment is always carried out once a week to keep the fish pond clean to avoid pests and disease. Efforts are made to keep the water quality in the main pond under control for the continuity of the broodstock, namely by checking water quality including nitrite, nitrate, phosphate, ammonia, pH, DO and temperature. The goldfish main pond is equipped with an inlet where the water comes directly from the tank and an outlet which then flows to another pond because the pond at BBI Cimaja has a parallel irrigation system.

Figure 1. Mains Maintenance Pool

The fish that will be spawned are the marwana strain of goldfish. The goldfish parents came from the Freshwater Fish Seed Development Center (BPBIAT) Purwakarta, West Java. Feeding of goldfish broodstock at the Cimaja Fish Farm UPTD is carried out twice, namely in the morning at 07.30 and in the afternoon at 16.00 with 2 kg of feed. The feed used is floating pellets with the brand HI-PRO-VITE 781. Parent fish feed must have high nutritional content because it plays a role in maintaining the body, replacing damaged body tissue, supporting metabolism, and helping growth and reproduction. Apart from that, using artificial feed can reduce the reproduction rate with high stocking densities and short maintenance (Puspitasari, 2018). HI-PRO-VITE 781 floating feed has a protein content of 31-33%. According to Akbarurrasyid (2020), good feed for marwana carp broodstock in order to accelerate gonad maturation must contain a minimum of 30% protein in the feed.

Parent Selection

Parent selection is the activity of selecting or separating parents that have mature gonads or eggs from those that do not. The aim of this activity is to prepare quality broodstock for spawning. Parent selection at BBI Cimaja is carried out in the afternoon at 16.00 by means of the pond water being drained first, then the fish will gather in the pool and the fish will be caught with a scoopnet.

Figure 2. Goldfish Parent Selection

Determining the gonads of a mature fish parent, namely if the male goldfish is healthy and has no defects, has agile movements, a slender body, if stripping is done it will release white sperm fluid, while the female goldfish parent has slow movements, slightly swollen on the part. the anus, the body, especially the stomach, is enlarged or distended, if you touch it it feels soft, this indicates that there are a lot of eggs.

Male Female

Figure 3. Goldfish Parent Gonads Mature

The marwana carp parents that are spawned meet good standards, namely mature gonads without defects and are healthy with a total of 30 male fish with a weight of 15 kg and 6 female goldfish parents selected with a total weight of 6 kg.

Spawning Pool Preparation

Carp spawning at the Cimaja Fish Seed Center UPTD is carried out in a permanent pond with an earthen bottom while the four sides are made of concrete, the pond is rectangular in shape with a pond area of 520 m2. Carp spawning begins with pond preparation which includes drying, liming, fertilizing and irrigating.

The pool is dried for 4-7 days until the soil looks cracked. According to Hasibuan et al. (2021) Drying of the pond can be done in 5-7 days, cracks on the surface of the pond indicate that air aeration to the bottom of the soil is sufficient to decompose organic matter. This drying activity can remove organisms from cracks in the soil so that the pond

will be free from pathogens. Apart from that, drying the pool can also release toxic gases trapped at the bottom of the pool.

Figure 4. Pool Draining

After drying, liming is carried out using dolomite lime which is spread all over the bottom of the pond. Liming activities function to remove bacteria and to increase the soil pH from acidic to neutral because goldfish grow in the pH range of 7-8. Apart from that, the purpose of liming is to kill pests and diseases found at the bottom and in the pond. The dose of lime used is around 25-50 grams/m^2.

Figure 5. Pond Liming

Fertilization is carried out after liming, namely by adding 11 grams/m2 of urea fertilizer and one sack of chicken manure or at a dose of 250-500 grams/m2 into the maintenance medium. Fertilization has the aim of growing natural food such as phytoplankton, zooplankton, microorganisms and nutrients that are useful as natural food. After fertilizing the entire bottom of the pool, the next step is filling the pool water.

Figure 6. Pond Fertilization

After the liming and fertilization process is complete, water is immediately filled to a height of around 30-40 cm, and left for approximately 4-7 days so that the plaque can grow. Next, the hapa is installed according to the dimensions 4x2 m^2.

Figure 7. Hapa Installation

Goldfish eggs are adhesive (stick) and goldfish usually lay their eggs under plants or various materials that can be used to attach their eggs. Therefore, it is necessary to prepare egg attachments in the form of kakaban. Kakaban is usually made from palm fiber clamped with nailed bamboo strips. Usually they also use raffia rope which is arranged and combed smoothly so that it resembles water plants (Papilon & Efendi, 2017).

Figure 8. Kakaban

The kakaban used at the Cimaja Fish Seed Center UPTD is made from palm fiber. Before the kakaban is put into the hapa, 1 long piece of bamboo is first installed to hold the kakaban so that it does not move, then the kakaban are arranged on 18 pieces of bamboo one by one and topped with 1 more bamboo and then given weights in the form of 2 banana stems so that the kakaban is submerged in water to Avoid direct sunlight which will cause the eggs to die and not hatch.

Spawning

Spawning of goldfish at the Cimaja Fish Seed Center UPTD is carried out naturally, namely using 30 male parents and 6 female parents so that the ratio of male to female parents is 5:1. The mother goldfish is placed in a hapa that has been installed in the pond without any special treatment and uses kakaban as a substrate for the eggs to attach to. Carp spawning occurs around 22.00 at night until dawn, characterized by the female fish being chased by the male fish. In the spawning process, the goldfish parent releases egg cells and the male parent sprays the egg cells with sperm to allow the fertilization process to occur (Ismail & Khumaidi, 2016). After the fertilization process, the fish eggs will be seen attached to the kakaban in the hapa. After the fish spawning is complete, the parent

goldfish is removed and returned to the broodstock rearing pond, the kakaban where the goldfish eggs are attached which are left in the hapa until they hatch.

Fertilized eggs are yellowish and attached to the kakaban, while unfertilized eggs are white. Eggs attached to the kakaban are kept until they hatch. The number of eggs is calculated by taking egg samples from the kakaban and then cutting the kakaban into 8 parts. One part produces 671 eggs, then multiplying by 8 parts produces 5,368 eggs, then multiplying by 18 eggs to produce 96,624 eggs. There were around 70,535 fertilized eggs and 26,098 unfertilized eggs. So the resulting Fertilization Rate (FR) is 73.45%. This value is high in accordance with Taufiq's (2010) statement in Fani et al. (2018), the percentage of fertilized fish eggs above 50% is considered high, 30-50% is medium, and less than 30% is classified as low.

Egg Hatching

Hatching of goldfish eggs takes place in spawning ponds that have hapa and kakaban installed. The fertilized egg attaches to the kakaban before finally hatching. Goldfish eggs hatch after 48 hours of fertilization. This is in accordance with the statement by Sumantadinata (1983) in Zamzami & Sunarmi (2013) that hatching of goldfish eggs takes 36-48 hours, ranging from 2-3 days from fertilization. After the larvae are 4 days old, the kakaban are removed from the hatching pond. Eggs that have just hatched into larvae do not yet have complete body anatomy, so the larvae do not need additional food for 2-3 days. The mouth and digestive organs of the larvae are not yet functional but the larvae still store food reserves which they carry in the egg yolk sac (Zamzami & Sunarmi, 2013).

Figure 9. Goldfish Egg Hatching Container

Temperature is one of the things that needs to be considered when hatching goldfish eggs. In order for goldfish eggs to hatch optimally, the eggs must be submerged in water, paying attention to the best temperature to avoid the eggs from direct sunlight which will cause the eggs to die and not hatch. According to Nugraha et al. (2012) if low temperatures cause decreased enzyme activity in the egg shell (chorion) and result in eggs taking longer to hatch. Meanwhile, if the temperature is high it can cause premature hatching and result in the larvae or embryos obtained not being able to survive. A temperature of 22-32oC is optimal for hatching goldfish eggs (Muslim *dkk*, 2021).

Figure 10. Goldfish Seed Sampling

The way to count the larvae that hatch at the Cimaja Fish Seed Center is by sampling at 4 pond points, after sampling the larvae are counted and the resulting larvae are 111 individuals/m2. The area of the pond used as a place to hatch eggs is 520 m2 so it can be estimated that the number of eggs that hatched was 57,831. From these results, the Hatching Rate (HR) or degree of egg hatching was obtained at 81.98%. According to Richter (1985) in Ramadhan & Sari (2018), generally the percentage of fish hatching is around 50-80%. High hatchability of eggs can be successful because it is influenced by egg quality, water quality and handling during hatching (Sutarjo, 2014).

Nursery

The nursery of 1 goldfish at the UPTD Cimaja Fish Seed Center was carried out in the spawning pond due to limited ponds. The nursery pool is a permanent pool with an earthen base while the four sides are made of 1 piece of concrete, the pool is rectangular in shape with a length of 26 m, a width of 20 m and a height of 1 m. The water height for nursery 1 is 50 cm so the volume of pond water is 260 m3. Previously, the pond had been dried, limed to kill bacteria and pathogens, and fertilized to increase the fertility of the pond so that water biota such as algae, plankton, protozoa, benthos and others would grow, which would become natural food for goldfish seeds. Nursery 1 is the maintenance of seeds from the larval level to the white-sized seed level. Whitefish is a stage or stage of fish fry that are up to 20 days old from hatching (BSN, 1999).

After 3 days of hatching, the yolk sac runs out so the goldfish larvae are given food in the form of Feng Li 0 flour pellets. In one feeding, that is 200 grams. Feeding is carried out in the morning at 07.30 and in the afternoon at 16.00 with the frequency of feeding being 2 times a day. Artificial food for goldfish larvae is Feng Li 0 flour pellets because this food fits the mouth opening and is easy for the larvae to digest and has a high protein content, namely 40%, which is useful for the growth of goldfish fry.

After 7 days of maintenance, feed the goldfish seeds using SN-3 brand sinking pellets which are soaked in water until they disintegrate. The ratio of hearing pellets to water is 1:2. The feed used was 500 grams. After the feed is destroyed, it is immediately spread into the pond. SN-3 brand sinking pellets have a protein content of 32%. The body of goldfish fry has a protein requirement of more than 30% (Masitoh *et al*, 2015).

Harvesting

Harvesting of nursery 1 carp seeds is carried out after 20 days of rearing. Harvesting is carried out in the morning at 05.00 starting from opening the outlet channel so that the pond water will recede, but first a net is installed so that the carp seeds are not carried away with the outflow of water. Hapa is installed near the outlet channel with the aim of holding fish seeds to make them easier to move. All the seeds that have been

collected in the hapa are put into buckets using a round sieve and then put into liters first with the aim of getting the number of harvests in nursery 1. Next, the bucket containing the fish seeds is transported and the seeds are immediately sown in nursery pond 2 which has previously been drying, liming and fertilizing are carried out.

Figure 11. Harvest Nursery Seeds 1

Survival Rate (SR) or the survival rate of goldfish seeds is obtained when harvesting seeds that are 20 days old or at nursery 1. The harvest results from nursery 1 are 13 liters of goldfish seeds. In one liter there are 3117 seeds, so the number of goldfish seeds obtained in nursery 1 was 40,521 individuals and the SR value obtained was 70.07%. The average size of goldfish fry is around 2.1 cm with a weight of 0.11 grams.

Next, the seeds are stocked in nursery 2 until they are 40 days old. According to the interview results, on average 1 liter of seed stocked will produce at least 60 liters of belo-sized seeds in nursery 2. Estimated per liter is 250-300 individuals with an average length of 5- 7 cm and weighs 6.29 grams (razor plus size) and is marketed at Rp. 60,000/liter.

Water Quality Management

Water is one of the main components in fish farming activities. The water source for the pool area at BBI Cimaja comes from the Cimaja River which enters through a sluice gate and then flows through water channels. Before entering the pool, the water is collected first in a water reservoir. This aims to ensure that the water that enters the pool area is clean water, and that no mud deposits enter the pool area.

Water quality testing is carried out by taking pool water samples which are then tested using a Test Kit including measuring NO2, NO3, PO4, NH3 and pH. The test kit is carried out three times in the morning, afternoon and evening to get accurate results. Measurement results can be seen in the table 1.

Table 1. Measurement of NO2, NO3, PO4, NH3, and pH

Parameter	Test Time						PP No. 22/2021 class 2 water quality standards	Test Method
	Main Pool			Nursery Pool 1				
	06.00	12.00	16,00	06.00	12.00	16.00		
NO_2 (mg/L)	0	0	0	0	0	0	0,06 mg/L	
NO_3(mg/L)	0	0	0	0	0	0	10 mg/L	
PO_4(mg/L)	2	2	2	1	1	1	0,2 mg/L	*Test* Kit
NH_3(mg/L)	0	0	0	0	0	0	0,2 mgL	
pH	6	7,5	6	6	6	6	6-9	pH meter

Nitrite (NO_2)

The nitrite content of main pond and nursery pond 1 is 0 mg/L, meaning it is in accordance with class 2 water quality standards for cultivating freshwater fish, the nitrite content in the waters is 0.06 mg/L. According to Sihite et al (2020) also stated that the nitrite content in the water is 0.06 mg/L. nitrite of 0.001 mg/L is still considered good for keeping goldfish.

Nitrate (NO_3)

The main pond and nursery pond 1 have the same nitrate value, namely 0 mg/L, this is not in accordance with class 2 water quality standards for cultivating freshwater fish, the nitrate content in the water is 10 mg/L. However, this value is in accordance with the statement by Wardani et al (2017) that the nitrate content <0.1 mg/L is still within the optimum nitrate criteria for the survival of goldfish.

Phosphate (PO_4)

The phosphate value in the main pond is 2.0 mg/L and in nursery pond 1, namely 1.0 mg/L, this value does not meet the water quality standards for cultivating freshwater fish. The high value of phosphate in goldfish ponds is caused by residual feed pellets and fish feces. According to Hendrawati et al (2008) Excessive phosphate content in waters accompanied by nitrogen content can cause explosive growth of algae in the waters. This situation will be detrimental and can cause mass death of fish.

Ammonia (NH_3)

The ammonia level in the goldfish holding pond and nursery pond 1 has the same value, namely 0 mg/L, this value is in accordance with the water quality standard for freshwater fish cultivation, namely the ammonia level for freshwater fish cultivation, the value is 0.2 mg/ L.

Acidity (pH)

The main pond is around 6-7, while the nursery pond 1 has a pH of 6. The pH value in the BBI Cimaja pond does not have a significant difference, this value is in accordance with class 2 water quality standards, namely the pH value for cultivating freshwater fish, namely 6-9.

Temperature and DO are parameters that are no less important to know in fish farming. The results of temperature and DO measurements can be seen in the table 2.

Table 2. Temperature and DO measurements

Parameter	Main Pool	Nursery Pool	PP No. 22/2021 class 2 water quality standards	Test Method
Temperature (°C)	30	29	Dev 3	Thermometer
DO (mg/L)	5,4	6,4	The minimum limit is 4 mg /L	DO meter

Temperature

The temperature in the goldfish broodstock pond is 30°C and nursery pond 1 has a value of 29°C, this value is still in accordance with class 2 water quality standards for fish cultivation, namely that the oxygen temperature in the waters is a deviation of 3 or ±3°C from the air temperature. above the water surface. The air temperature at BBI Cimaja is around 29°C, so the temperature that meets class 2 water quality standards for fish farming is around 26-32°C. The temperature value in nursery pond 1 is also in

accordance with Laila's (2018) statement that a temperature of 28-30°C is the optimal temperature for the survival of goldfish fry.

***Dissolved Oxygen* (DO)**

The dissolved oxygen level in the goldfish broodstock pond is 5.4 mg/L and nursery pond 1 has a value of 6.4 mg/L, this value is still in accordance with class 2 water quality standards that the dissolved oxygen content in the water is at least 4 mg/L for freshwater fish farming needs. Dissolved oxygen is very important for fish, namely for metabolic processes so that it produces energy that is useful for growth and reproduction.

SUGGESTION

The goldfish (*Cyprinus carpio*) hatchery technique at UPTD BBI Cimaja was carried out naturally, the goldfish parents used were marwana carp originating from BPBIAT Purwakarta, West Java using a male to female parent ratio of 5:1, obtained an FR value of 73.45, HR 81.98%, and SR 70.07%. The water quality in the maintenance pond is temperature 29-30 ℃, DO 5.4-6.4 mg/L, pH 6-7.15, nitrite 0 mg/L, nitrate 0 mg/L, phosphate 1-2 mg/L, and Ammonia 0 mg/L. The problems that exist in natural carp hatching activities at UPTD BBI Cimaja are uncertainty about the parent's gonad maturity, pests that attack the seeds, and limited ponds.

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