EEL (*Anguilla bicolor bicolor*) Rearing Techniques at the UPTD for Conservation and Supervision of Marine Fishery Resources of Sicincin, West Sumatra

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Abstract. Eel has a savory meaty taste and contains high levels of Eicosapentaenoic acid (EPA) and Docosahexaenoic acid (DHA). The purpose of this observation was to determine intensive rearing techniques for eel (*Anguilla bicolor bicolor*) at the UPTD KPSDKP for Conservation and Supervision of Marine Fishery Resources of Sicincin, West Sumatra. The preparations conducted for rearing the eel consist of providing seeds, pond preparation, water supply, feed management, water quality control, disease control, growth sampling, and harvesting eel for consumption size. The eel seeds were obtained from natural catches of glass eel in the Cimandiri river, Pelabuan Ratu, West Java. Preparation of the eel pond included cleaning the concrete pond, filling the water by observing the water input into the eel pond. The provision of water for eel rearing was obtained directly from the Kapalo Ilalang Sicincin irrigation channel to the holding tanks before flowing to the eel rearing pond. Feeding management was carried out 2 times a day, namely the percentages of feeding in the morning (35%) and at night (55%) with a feeding rate of 3%-5%. The feed provided to these eels was in the form of a paste made of powdery pellets. Measurements of water quality for eel rearing during observations were temperature (27-29°C), pH (6-7), DO (5.9-7.8 ppm), salinity (3-4 ppt) and NH₃ (0.02-0.07 mg/l). In our observations, parasites shaped like cotton were discovered, which attacked the eel body, causing death. In growth sampling, the measurement of the length and body weight of the eel once a month is necessary to be done.

1. Introduction
Eel (*Anguilla bicolor bicolor*) is one of the endangered resources because it is a high-value export commodity on the international market [1]. The market demand for this eel is high due to its delicious taste and high DHA and EPA content. As a result, it is not surprising that eel is regarded as a superior commodity in the international market [2];[3].
The presence of uncontrolled eel seed catching in nature and the absence of artificial spawning efforts will undoubtedly endanger the survival of eel stocks in nature [4], because the supply of eel seeds in Indonesia is still derived from nature. The cultivation stage is only at the enlargement stage due to the limitations of existing technology. There are some obstacles and limitations to the availability of seeds sourced from nature because the source of seeds in nature is highly dependent on the season, adaptability, the occurrence of lunar cycles, migration paths, and other field-specific circumstances [5]. Continuous research efforts are needed to advance eel cultivation, both enlargement technology and the size of consumable fish. The most crucial aspect of eel cultivation is to pay attention to the cultivation system's components, such as containers, media, cultivation biota, and the feed used.

The UPTD UPTD KPSDKP for Conservation and Supervision of Marine Fishery Resources of Sicincin, West Sumatra is the Technical Implementation Unit of the Marine Service of West Sumatra Province. This UPTD KSDKP already has seed quality certification and is primarily responsible for providing technical operational services in the field of freshwater fish farming development and application. The objective of this observation was to gather information and directly learn about intensive eel rearing techniques, as well as to assess the performance and water quality of eel rearing cultivation in UPTD KPSDKP Sicincin, West Sumatra.

2. Methodology
2.1. Time and place
Eel rearing techniques were done at the UPTD for Marine and Fishery Resources Supervision in Sicincin, West Sumatra. This study took place between February 5 and March 5, 2021.

2.2. Research methods
The observation method was used to collect data for this study. Where the data obtained is the result of direct field observation. Data was also gathered through interviews with the UPTD KPSDKP, as well as a literature review.

3. Results and Discussions
3.1 Eel rearing techniques
Eels (A. bicolor bicolor) were enlarged directly at the UPTD KPSDKP Sicincin. The technique of rearing eel (A. bicolor bicolor) observed was taking eel seeds from nature by buying and sending directly from the seed supplier at Pelabuhan Ratu, West Java, then preparing rearing pond, providing water, seed stocking, feeding management, water quality control, disease control, growth sampling, and harvesting consumable-sized fish.

3.2 Preparation of rearing pond
A concrete pond was used for eel rearing at the UPTD KSDP Sicincin in West Sumatra. This concrete pond was durable and was able to be used for a long time [6]. Among the concrete ponds were three (3x4x1.2 m³) concrete ponds and one (5x6x1.2 m³) concrete pond located outside the room, with the goal of allowing sunlight to penetrate the pond’s surface directly. The pond used for eel rearing was equipped with a circulating or flowing system that allows water in and out.

The first step in pond preparation was to clean the entire rearing pond by draining all the water until it runs out. Each pond's base and walls were cleaned with a brush. Then clean the net that was used to feed the eels. After cleaning the pond, it was filled with water that has been pre-deposited to ensure that the incoming water was free of sand and mud. After the water has been filled to a depth of 60-80 cm, the pond was given a filter or aeration in the form of hoses to assure that the availability of oxygen in the pond was maintained. The most important thing to remember when preparing ponds for eel enlargement was to pay attention to the water input into the pond. Because eels live in fast-flowing waters, poor pond water input can cause stress in the eel.

3.3 Provision of water
The most important aspect is the availability of water for eel rearing. Water for eel rearing in the UPTD KPSDKP was obtained from the Kapalo Ilalang Sicincin irrigation channel, which was channelled to the location via a ± 650 m long technical irrigation channel. The water was channelled directly into the water tank, where it was deposited before flowing into each rearing pond. A net is installed on the inside of the pipeline to filter water into the pond to ensure it is clean and that quality control has been performed to assure it is suitable for eel rearing ponds first. The enlargement pond's water was changed three times per week, with up to 80 percent of the pond's water being changed by siphoning.

3.4 Seed stocking
The eel seeds were kept in a holding tank before being placed in the rearing pond. The seeds (fingerling) in the rearing pond were 50 grams/fish, with a total of 5000 individuals. The seed stocking was done in the morning or evening so that the stocked seeds were not stressed by the high temperatures during the day.

3.5 Feeding Management
In UPTD KPSDKP, the feed used for eel rearing was in the form of paste. This feed was composed of powdery pellets. The feed was then placed in a large bucket, mixed with hot water, and stirred until it formed a paste. Feed for the size of the elver to the size of the eel consumption used the same formula. Feeding should be between 3-5 percent of the fish's body weight; this percentage is ideal for fish growth [7]. The feed was given twice a day, with a feeding percentage of 35% in the morning and 55% in the evening, this is related to the nocturnal nature of eels, which actively seek food at night [8]; [9].

3.6 Water quality
Water quality in eel rearing was measured to ensure that the pond was suitable for eel rearing pond. Every two weeks, water quality measurements for eel rearing ponds at UPTD KPSDKP were carried out. The water quality measurement data obtained can be seen in Table 1.

| Week | Temperature | pH  | DO  | Salinity | NH3 |
|------|-------------|-----|-----|----------|-----|
| 1    | 27          | 6.54| 7.83| 0.03     | 0.02|
| 2    | 28          | 6.70| 5.90| 0.04     | 0.05|
| 3    | 29          | 6.71| 6.35| 0.04     | 0.07|
| 4    | 28          | 6.80| 6.04| 0.04     | 0.03|

Temperature is an important aspect of water quality to observe in eel rearing because it affects fish metabolism and the exchange of substances in the water [10]. In this study, the average temperature in the eel pond ranges from 27-29°C, this is the appropriate temperature range for eel rearing, and the optimum temperature for eel rearing is 26-30°C [11]; [12]; [13]. In this observation, the pH range is 6.54-6.8. According to our result of pH measurement, it is a suitable pH for eel survival. The pH range of 6-7 is a pH that can affect specific growth rate (SGR) of eel [14].

During the observations, dissolved oxygen (DO) ranges from 5.9 to 7.83 ppm. Dissolved oxygen levels in these waters can affect fish appetite, while DO levels above 5ppm increase eel appetite. The DO range in this observation is a good range for fish culture life because it is greater than 3 ppm [15]; [16].

The amount of salt contained in a unit mass of solution is referred to as salinity. Water salinity had a significant impact on the survival and growth of eel seed. The ideal salinity for eel seed maintenance is 5 ppt [17]. While in the eel rearing pond at UPTD KPSDKP, the salinity obtained is 3-4 ppt with a fish size of 90-300 grams/fish, where the salinity of the water in the eel rearing pond is still relatively good.
because eels have a high tolerance for salinity, i.e., 0-16 ppt or higher [18]. This salinity influences eels’ osmoregulatory activity, which is related to oxygen consumption [19]. Ammonia (NH3) levels in rearing ponds ranges from 0.02-0.07 mg/l. This ammonia level is the ammonia content for aquaculture in accordance with PP No. 82 of 2001.

3.7 Disease control
The findings of the observations and analyses revealed that several eels died because of parasites. Initially, the UPTD KPSDKP had no idea what parasites or pests were responsible for the deaths of some of the eels. The results of laboratory observations by paying attention to the characteristics of the dead eel's body can be seen from the dead eel's body, which appears white, like cotton, namely the dead eel is covered with fine threads. Based on these characteristics, it can be concluded that the dead eel was attacked by a fungus known as Saprolegnia sp [20]. The causes of this disease are known to be wounds caused by bites from other eels, poor water quality, and too cold-water temperatures [21]. The collision that occurs on the concrete wall when the eel swims is also one of the causes of the later attack of this fungus Saprolegnia sp.

3.8 Growth sampling
Eel growth was sampled once a month in UPTD KPSDKP. The first step in sampling eel growth was to transfer the eel to a different pond. Following the transfer to a different pond, the weight of the bucket that will be used as a medium for weighing the eel must be weighed. Furthermore, ten eels were chosen as representatives to determine their weight. After being weighed with an analytical balance, the weight was determined and then subtracted from the weight of the bucket and divided by the weight of the fish. To determine the overall weight of the eels, the eels that had been removed were weighed and then returned to the previous pond until it was finished. The results of the eel growth sampling can be seen in Table 2.

Table 2. Growth Sampling

| Month | Pond | Initial Fish Number | Number of Fish | Weight/Fish | Weight (kg) |
|-------|------|---------------------|----------------|-------------|-------------|
| February | 1    | 1.300               | 1.251          | 90-300 gr   | 182         |
|        | 2    | 1.800               | 1.730          | 90-100 gr   | 124         |
|        | 3    | 1.900               | 1.472          | 50-70 gr    | 55          |

Following growth sampling, 1,251 fish with an average fish weight of 90-300 grams/fish were discovered in the first pond, which measured 5x6x1.2 m2. The second pond with a size of 3x4x1.2 m2 has 1,730 fish weighing 90-100 grams per fish. There are 1,500 fish with an average weight of 50-70 grams in the third pool, which has a pond size of 3x4x1.2 m2. There was a significant reduction in the third pond because many eels were found to be attacked by the fungus Saprolegnia sp, which resulted in the eels' death. The total number of temporary eels was 4453 fish, with an SR of 89.06 percent and a weight range of 50-300 grams.

3.9 Harvesting Consumable-Sized Fish
The eel size harvested in the UPTD KPSDKP weighed between 180 and 300 grams per fish. The consumable-sized eels, on the other hand, have not been harvested and have not been sent to any cities or countries in the UPTD KPSDKP. This is because eel rearing in the UPTD KPSDKP is the first experiment, but the marketing target will be sent to Japan, which is the largest consumer of eel.

4. Conclusions
Water quality during observations on eel rearing techniques at UPTD KPSDKP was still in a good range for eels. Based on this eel growth sampling, the survival rate (SR) was 89.06 percent of the 5,000 seeds stocked, and at the time of growth sampling, 4,453 fish were found after several fish died.
from the fungus Saprognelia sp. Consumption size eels are harvested with a weight of 180-300 grams / head.

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