Natural Spawning Technique of Seahorse (*Hippocampus comes*) In Center For Marine Cultivation Fisheries of Lampung

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Abstract

Seahorse (Hippocampus comes) is a fishery commodity that has high economic value, both alive and dead. Seahorse seeds production was highly dependent on the availability of large and high quality gonad mature stock. One alternative that can be done to meet the needs of seeds by naturally spawning. The main parameters observed in this study were egg incubation, harvesting of juveniles, maintenance of juveniles, growth and survival of juveniles and maintenance of seeds. The water quality during the observation was still in the normal range, the temperature ranges between 29,6 ^{0}C, pH between 7,71-7,96 and dissolved oxygen between > 4,90-5,22 mg / l.

Keyword *: Hippocampus comes, natural spawning, Juveniles, growth rate, survival rate*

Introduction

Indonesian waters are the richest area for marine ornamental fish species compared to several other ornamental fish producing countries. In Indonesia, there are approximately 253 types of marine ornamental fish, one of which is the sea horse. Seahorses are quite commercial and unique because they have a different morphology from other fish, namely the shape of the head resembles the head of a horse and the male fish has a brood pouch that is not found in other types of fish. Another attraction is the upright position of the body when swimming and the ability to adjust its body color to the environment so that it looks more attractive for display in the aquarium (Syukri, 2016).

Seahorses had the potential to be developed because they had high economic value both alive and dead (Al Qodri and Sugianto, 2012). Seahorses had many benefits including as traditional medicine, helping to increase breast milk, as decorations and decorations as well as souvenirs after drying (Kordi, 2010). Putri et al. (2019), 24 million seahorses were caught annually from the wild to be dried and sold as medicinal ingredients, and hundreds of thousands of seahorses are sold live as ornamental fish. The biggest importing countries for dried seahorses are China, Hong Kong, Taipei and Australia. Live seahorses for aquariums were imported by America, Europe, Japan, Taipei, Australia, Hong Kong and Mexico. The largest exporting countries for seahorses are the Philippines, Indonesia, and Brazil. Indonesia and the Philippines have recorded exports of live seahorses reaching 852,000 seahorses.

As a result of increasing demand and overexploitation, the seahorse population in the wild was threatened. One of the efforts that can be done to preserve seahorses was to develop its cultivation through hatchery activities.

Materials And Methods

The research was carried out in 2019 at the Lampung Marine Aquaculture Center. Prior to natural seahorse spawning, broodstock was procured, broodstock rearing was carried out in round fiberglass tubs measuring 1x0.7m, square fiber tubs measuring 2x1x0.6m and cement tanks measuring 2x1x1m, filled seawater, installation aerator according to the size of the tub, shelter installation, selection and stocking of the parent. Number of broodstock stocked 57 seahorses (25 males and 32 females) and feed management.

Results And Discussions

Natural Spawning

Seahorse spawning carried out naturally without the help of hormonal stimulation, because seahorses could spawn

and return to mature gonads without special treatment such as manipulating the environment or using hormones. The water level in the spawning tub was at least 40-50 cm. The spawning process was characterized by brighter color changes in male and female.

The male parent always approach the female parent, and vice versa. Then the male and female parent tails wrapped around each other, swimming together to the surface (seen Figure 1).

Figure 1. Seahorses Spawned

The spawning stage began with the parent facing each other, then the female parent's urogenital been enter the male hatching sac hole to transfer eggs. Spawning takes place quickly about 5-6 seconds then the eggs released with a reddish color and immediately enter the male hatching bag. After the eggs come out all the female and male parents would released each other. The male parent wiggle his body to adjust the position of the eggs in the incubation bag.

This was in accordance with the statement of Manullang and Henna (2018), for spawning each seahorse mother to find a suitable partner. The characteristics of mature gonads and ready to spawn were as followed:

Male:

- Chases the female while bending the tail and inflating the brooding bag
- Body color changes to bright

Female:

- Enlarged abdomen, reddish urogenital
- When exposed to light, the inside of the abdomen was reddish
- Body color changes to bright
- When the male seahorse's tail was wrapped around it, it didn't try to escape.

Egg Incubation and Juveniles Spawned

The broodstock that had spawned would incubate the eggs for 10-15 days. The eggs developed until they become larvae until they were ready to be released. The temperature during incubation ranged from 28-29 ^{o}C. In line with the opinion of Syukri (2016), which states that a good temperature for incubating seahorses was between 28-29 ^{o}C because it gave the good results.

Juveniles spawned (can be seen in Figure 2) was characterized by a change in color to a lighter color in the hatching sac. The seahorse wrapped its tail around the shelter, then the hatching bag would open and the juveniles sprayed out. Generally juveniles would be issued at night until dawn. This was in accordance with the opinion of Al Qodri et al. (2018), which states that juveniles were expelled from the hatchlings of males at night until dawn. However, there were also juveniles who were released in the afternoon or early morning, because the parent was experiencing interference or stress.

Figure 2. Seahorses spawned (a) and Juveniles already born (b)

Juveniles Harvesting

The newly born Juveniles were then harvested in the morning used a scoopnet or a fine scoop and removed slowly so as not to be stressed. The number of juveniles produced was 296 Juveniless with an average length of 0.8-0.9 cm. This was in accordance with the opinion of Ari et al. (2005), who stated that the length of newborn juveniles was at least 0.6 cm. Juveniles was then accommodated in a basin and given aeration. The body shape of the newborn juvenile resembles an adult seahorse.

Juveniles Rearing

Juveniles rearing lasts about 24 – 30 days, until Juveniles to be seeds. This was in accordance with the opinion of Al Qodri et al. (2018), which states that the maintenance period for juveniles was about 30 days to a minimum size of 2 cm or seed size.

Material preparation

The shape of ponds for the maintenance of juveniles were square and round fiberglass tubs with a capacity of 1-2 tons that had been washed clean. The tub was equipped with an aerator to supply oxygen. The strength of the current was adjusted in such a way that the bubbles produced were in accordance with the Juveniles's needs.

The pond was filled the water about 60-70% of the height of the pond and natural feed was grown by giving *Nannochloropsis* sp. This was in accordance with the opinion of Yulianti and Sri (2009), which stated that prior to stocking, natural feed was grown into tanks with a density of 100-200 fish/liter.

Juveniles stocked

Stocking was done in the morning between 08.00-10.00 am. Totally 295 Juveniles were stocked and then reared until they became seed size. The distribution of juveniles was carried out in the morning. Wahyuni et al. (2005), juvenile criteria for stocking were juveniles that move actively in the water column and against the current, upright body position when swimming, bright color and a minimum length of 0.6 cm. Spreading several times would produced different seed sizes.

Juveniles Feeding

The feed was given to Juveniles was a type of plankton which was the zooplankton. The type of feed was given according to the type, age and size. This was in accordance with the opinion of Ari et al. (2005), which stated that feeding seahorses was carried out continuously according to the age and size of the seahorse. The types of zooplankton given were *Copepoda* sp., Naupli artemia and *Diaphanasoma* sp. Phytoplankton in the form of *Nannochloropsis* sp. also given as feed for copepods and naupli artemia.

Feeding (can be seen in Figure 3) was done once a day, in the morning at 09.00 am. The way of feeding was done slowly and evenly at the aeration point so that the feed was more easily spread.

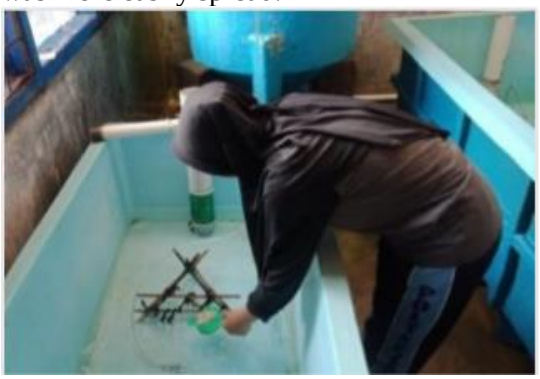

Figure 3. Feeding

Juveniles Growth

Sampling of Juveniles growth was carried out on the 30th day which included measuring the length and weight of Juveniles. The results of the sampling of Juveniles growth resulted in an average length of 3.45 cm and an average weight of 0.2 g. This was in accordance with the opinion of Al Qodri et al. (2018), which stated that the size of Juveniles with a 30 day reared period reached an average length of 2.0 - 3.5 cm, while the weight reached 0.195 - 0.225 g.

After a 30 days reared period, Juveniles can be considered as seeds, then they were kept in seed tanks. Before being stocked in the rearing tank, the seeds were collected for selection (size and health).

Juveniles Harvesting

Harvesting of juveniles was carried out after 30 days of maintenance and juveniles had reached a size of 2 cm. The number of juveniles produced at harvest was 179 tails. So that the survival of juveniles at the end of rearing reached 60.67%.

The method of harvesting juveniles by using a fine scoop, then the juveniles were put into a basin that had been aerated as a temporary shelter. Harvesting must be done carefully so that juveniles were not stressed.

Seeds Rearing

Preparation

The shape of pond used for seed rearing was a square fiberglass tub. The previous tub

was cleaned first and rinsed with fresh water until clean. It was then filled with water that had been filtered in the filter tank as much as 60% of the height of the pond. The rearing tank was equipped with an aerator as a supplier of oxygen in the water and was provided with 2-3 shelters for seahorse seeds to perch or rest. This was in accordance with the opinion of Syukri (2016), which states that reared period for seahorses requires a perch to rest.

Seeds Stocked

Seeds which had been selected and had met the criteria were then stocked directly into the rearing tank. In contrast to the opinion of Puja et al. (2018), which stated that prior to stocking, the seeds were quarantined for prevention against parasites, namely by soaking a solution of MB (Methylene blue) at a dose of 1 ppm for 1-2 hours. The seed was sown in the morning. A total of 179 seeds were stocked.

Seeds Feeding

The feed given to the seahorse seeds consisted of Copepoda, Artemia salina aged 7-10th day, Diaphanosmia sp., Adult Artemia and prawn jambret. Seahorse seeds had a very high feeding capacity and there was a tendency to didn't stop eating as long as feed was available. This was in accordance with the opinion of Ari et al. (2005), which stated that seahorses didn't had a stomach, so that they fulfill their nutritional needs for growth by means of as much food as possible. Feed was given 2 times a day, in the morning at 09.00 am and in the afternoon at 15.00 pm. Prior to feeding, the volume of water was reduced by 50% from the initial volume.

Growth and Survival Rate of Seahorse

Seahorse seeds that were 1 month old were reared in a 100 m^3 tank, to determine the growth in length and weight by sampling every 2 weeks. For more details can be seen in Figure 4.

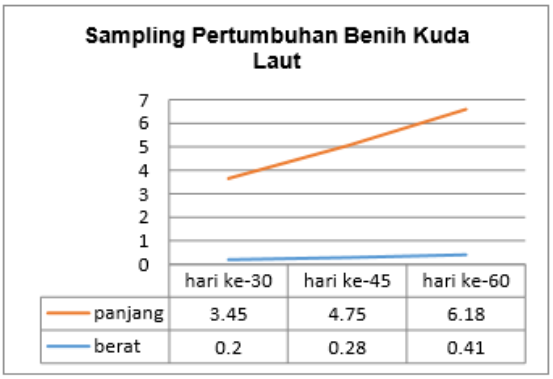

Figure 4. Graphic of Seahorse Growth

Based on the graph above, the growth in length and weight of the seeds increased during 2 weeks of rearing. Seahorse seeds experienced negative allometric growth where length growth was faster than weight growth. Seed growth was closely related to the availability of live food. This was in accordance with the opinion of Ristiawan (2010), which stated that live feed was a source of nutrition to obtain energy so that the seeds can be active and grew.

Factors that influence the growth process were external factors and internal factors. External factors include salinity, temperature, feed quantity, pH, dissolved oxygen levels and space for movement. While the internal factors consisted of: heredity, resistance to disease, age, and the ability to utilize feed. Survival for seeds on 45th day was 57.44% with the number of seeds at the end of rearing as many as 108 seeds. The level of survival of the seeds was influenced by the availability of feed and environmental conditions of rearing.

$$\textit{Survival rate} = \frac{\text{seeds harvesting}}{\text{seeds stocked first}} \text{ x } 100\%$$
$$= \frac{108}{179} \text{ x } 100\%$$
$$= 60{,}33\%$$

Water Quality Management

Checked water quality (can be seen in Table 1) was carried out by measuring water quality parameters at temperature, pH, salinity and DO. Measurements were carried out twice a week.

Tabel 1. Water Quality Parameter

Parameter	unit	Results		References	Water Quality Standars of Seahorse
		Seeds	Broodstock		
Temperature	°C	28.8	29.6	APHA 2005 4500-O-G	Natural

Salinity	Ppt	33	34	APHA 2005 2520C	30-34
pH	-	7.96	7.71	SNI 06-6989.11-2004	7 – 8.5
DO	mg/L	5.22	4.90	APHA 2005.4500-O-G	>4

Harvest and Post-harvest

After the seeds reach an average size of 8 cm, harvesting was carried out, as well as size sorting. For sizes below the average, they were kept in the seed tank, while those that met the criteria can be further reared up to size L (12-15 cm).

Harvesting was done by lowering the water of the rearing media until the remaining water level was at least 25 cm then the seahorses were caught using a scoopnet. This was in accordance with the opinion of Puja et al. (2018), which stated that harvesting activities began with cessation of feeding about 4 - 6 hours before the media water was lowered to a height of about 30 cm. Before being caught, the perch was removed first slowly while shaking it so that the perch seeds were released. Seeds that had been harvested were accommodated in a basin. At Center for Marine Cultivation Fisheries of Lampung, seahorses were not sold but were only used for restocking or for exhibition activities.

4. Conclusions

Seahorse hatchery included broodstock procurement, juvenile rearing, seed rearing to harvesting. From the results of sampling the growth of juveniles, the SR was 60.67% with an average length of 3.45 cm and an average weight of 0.2 g. While the SR produced from seed maintenance for 1 month was 60.33% with an average length of 3.45 cm and an average weight of 0.2 g (30^{th} day), 4.75 cm and 0.28 g (45^{th} day) and 6.18 cm and 0.41 g (60^{th} day).

Seahorse harvesting results weren't sold but were used for restocking or exhibition activities.

References

Al Qodri, A.H and Sugianto. 2012. Rekayasa Teknologi Pemijahan Induk dan Pemeliharaan Juveniles Kuda Laut (*Hippocampus sp*). Direktorat Jenderal Perikanan Budidaya Balai Budidaya Laut. Lampung.

Al Qordi, A. H., Hanung S., and Ika Chandra C. 2018. Budidaya Kuda Laut (*Hippocampus spp*). Direktorat Jenderal Perikanan Budidaya. Balai Perikanan Budidaya Laut. Lampung.

Ari, K. W., Anindiastuti and S. Antoro. 2005. Pemeliharaan Benih Kuda Laut. Direktorat Jenderal Perikanan Budidaya. Balai Perikanan Budidaya Laut Hal 42-49.

Kordi, M. G. H. 2010. Panduan Lengkap Budidaya Kuda Laut. Yogyakarta: Penerbit Andi.

Manullang, M. M., Rara D., and Henna W. M. 2018. Pengaruh Warna Wadah Terhadap Perubahan Warna Kuda Laut (*Hippocampus comes*) di BBPBL Lampung. Jurnal Sains Teknologi Akuakultur. Lampung.

Syukri, M. 2016. Pengaruh Padat Penebaran Yang Berbeda Terhadap Pertumbuhan Panjang Dan Bobot Serta Sintasan Juveniles Kuda Laut (*Hippocampus barbouri*). Jurnal Saintifik .2(2).

Puja Y., Ali Hafiz A. Q., and Yuli Y. 2018. Pemeliharaan Benih Kuda Laut. Direktorat Jenderal Perikanan Budidaya. Balai Perikanan Budidaya Laut Lampung.

Putri, M. R. A., Astri, S., and Joni H. 2019. Sumberdaya Kuda Laut (*Hippocampus spp*.) di Perairan Pulau Bintan, Teluk Lampung dan Pulau Tanakeke. Oseanologi dan Limnologi di Indonesia. 4(1): 27-40.

Ristiawan. 2010. Pembenihan Kuda Laut (*Hippocampus comes*) di CV. Puri Windu Mukti Kalianda. Lampung. Politeknik Negeri Lampung.

Yulianti and Sri W. 2009. Rekayasa Pematangan Gonad Calon Induk Kuda Laut (*Hippocampus* sp.) di Balai Besar Perikanan Budidaya Laut Lampung. Lampung.

Wahyuni, K. A., M. Thariq, and Hanung S. 2005. Pembenihan Kuda Laut. Direktorat Jendral Perikanan Balai Budidaya Laut. Lampung.