Effect of Single Artemia and Alternative Feed Combination on Survival of Hippocampus sp.

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Abstract

Seahorses are one of the marine biological sources that have a unique body shape. Seahorses have economic value as ornamental fish, souvenirs, exported as cosmetics and aquarium decorations, are efficacious when used for medical treatment, especially traditional Chinese medicine. This is what causes the population of sea horses in nature to be reduced so that it is necessary to develop the method by seahorse cultivation. The aim of the study was to determine the effect of the administration of artemia as a seaweed natural feed and to determine the viability of seahorses by giving a combination of trash fish & rebon shrimp. The research method used was laboratory experimental research with a completely randomized design consisting of 5 treatments and 3 replications namely (A) Treatment: Giving Artemia, (B) Giving Artemia and trash fish, (C) Giving Artemia ebi shrimp, (D) Giving Artemia, trash fish and shrimp, and (E) Giving trash and ebi fish The results of the research showed that feeding Artemia and alternative feed combinations showed a significant effect (p <0.05) on the survival rate of seahorses. The highest level obtained in treatment A is 86.67%, treatment B is 40%, treatment C and D is 20% while the lowest SR is in treatment E which is 11.55%. Artemia feed and and combination feed have no effect on body length increase and body weight gain.

Keywords: Hippocampus kuda, Artemia, alternative feed, survival

1. Introduction

Seahorses are one of the marine biological sources that have a unique body shape. Seahorses have heads that resemble horses and the unique way to swim makes them interesting because they are not found in other marine animals. Apart from the uniqueness of the morphology, seahorses have economic value as ornamental fish and souvenirs. Seahorses are also in demand for export as a cosmetic and aquarium decorator. Seahorses also have properties if used for medicine, especially traditional Chinese medicine. This means that seahorses either alive or dead have a high trade value in the world. This is what
causes sea horses to have high economic value in the domestic and foreign markets (Salin et al 2005).

Nearly 20 million seahorses are captured every year to fulfill their needs, especially in the manufacture of traditional Chinese medicine (Vincent, 1996). This has an impact on the number of horse populations in nature. Syafiudin (2010), stated that the increasing demand for seahorses had an impact on large-scale exploitation which caused habitat degradation and even caused extinction in several horse species. In 2004 the International Union for Conservation of Nature and Natural Resources (IUCN) included seahorses in the endangered category because the population in nature declined dramatically. The main obstacle in the process of seahorse cultivation is a very low survival rate. These constraints are caused by the unavailability of natural feed in the amount and quality that is appropriate to the needs. Feed is a matter of life, growth and reproduction. Based on the above problems, it is necessary to conduct research on the effect of different natural feeds on the survival of the seahorse Hippocampus sp.

**Research methods**

The research objectives are as follows: To find out the effect of giving artemia as a seaweed natural feed. As well as to determine the survival of seahorses by giving a combination of trash fish & rebon shrimp. The benefits of research are as follows: As a reference for the development of seahorse cultivation, especially the provision of natural feed. As information and education material for seahorse fishermen. And as information material for further research.

The research method used was laboratory experimental research with a complete randomized design consisting of 5 treatments and 3 replications, namely:

- Treatment A: Giving Artemia
- Treatment B: Giving Artemia and trash fish
- Treatment C: Giving Artemia & shrimp
- Treatment D: Giving Artemia, trash fish and ebi shrimp
- Treatment E: Giving trash fish and ebi shrimp

Media water preparation is taken at PT Autore Pearl Culture which has been sterilized. Then the media water is aerated for 24 hours. Sea horse density is maintained at 5 individuals / media. Maintenance media clean every day to remove feed that is not eaten.
and metabolic waste such as feces and urine. Calculation of living test biota is carried out every day to determine the graduation rate of life.

Each experimental unit was labeled according to the results of randomization for the placement of each treatment. Each trial container is equipped with 1 fruit aeration system.

Measurement of the length and weight of the seahorse horse Hippocampus. The total length of seahorses from measurements of the head and body length of seahorses from the crown end to the tail using a ruler (Lourie et al. 1999). Seaweed weight is obtained from weighing the body using digital scales.

Relationship Length and Weight
The relationship of the length of the sea horse weight is analyzed using a formula

\[ W = LB \]

Where: \( W \) = fish weight (g), \( L \) = total fish length (mm), \( a \) and \( b \) = constant

Then transformed into logarithms, so as to form the following straight line equations

\[ \log W = \log 1 + b \log L \]

After making a transformation into the logarithm of the original data, the values of \( a \) and \( b \) can be solved by the least squares method and the value of \( a \) obtained must be analogized.

If \( b = 3 \), the fish growth shows an isometric growth pattern, meaning that the body length increases and the weight is balanced. If the value of \( b < 3 \) indicates a negative allometric growth pattern (allometric minor), the increase in body length is faster than body weight gain. Conversely, if \( b > 3 \) shows a positive allometric growth pattern (allometric major), body weight gain is faster than body length increase. To measure the strength of the relationship between the weight and length of seahorses, correlation analysis was used with the formula:

\[ r = \frac{N (\Sigma \log L \times \log W) - (\Sigma \log L) (\Sigma \log W)}{\sqrt{\sigma^2 \log L \cdot \sigma^2 \log W}} \]

Sea horse growth Measuring seahorse growth is carried out every 7 days by measuring the body length of seahorses measured from the crown to the tip of the tail perpendicularly and weighing the seahorse body weight using electric scales with accuracy of 0.01 gr.
L = Lt - Lo

Information:
L: Added length of seahorse (cm)
Lo: The length of the seahorse toral at the beginning of maintenance (cm)
Lt: The total length of the seahorse at the end of the observation (cm)

Daily long growth rate

$$SGR = \frac{(Ln Lt - Ln Lo)}{t} \times 100\%$$

SGR: Seahorse daily length increase (%)
Lo: The length of the seahorse toral at the beginning of maintenance (cm)
Lt: The total length of the seahorse at the end of the observation (cm)
T: Maintenance time (days)

Weight gain is the difference between the average weight of seahorses at the beginning of maintenance and the average weight at the end of the observation and calculated based on the formula:

W = Wt - Wo

W: Sea horse weight increase (g)
Wo: The total weight of the seahorse at the beginning of the initial observation (g)
Wt: Total sea horse weight at the end of observation (g)

Daily growth rate (%)

$$SGR = \frac{(Ln Wt - Ln Wo)}{t} \times 100\%$$

SGR: Seahorse daily length increase (%)
Wo: sea horse weight at the beginning of maintenance (g)
Wt: sea horse weight at the end of the observation (g)
T: Maintenance time (days)

Survival Rate (SR) Survival rate is calculated using a formula according to

$$SR = \frac{Nt}{No} \times 100\%$$

Description: SR: Survival Rate
Nt: number of end (tail)
No: Initial Number (tail)
Water Quality Observations regarding water quality include acidity (PH), dissolved oxygen content (DO), salinity of each treatment. Data obtained were analyzed using analysis of variance (ANOVA) at a real level of 5%. If the variance data is known that the treatment shows a significant difference (significant), then to see the treatment that gives significantly different results carried out further tests, namely the LSD test (the Smallest Significant Difference).

3. Results

Survival Rate

Giving Artemia feed and alternative feed combinations showed a significant effect (p <0.05) on the survival rate of seahorses. The highest level obtained in treatment A was 86.67%, treatment B 40%, treatment C & D was 30% while the lowest SR was found in treatment E which was 20%. The average survival rate of seahorses can be seen in Table 5.

Table 5. Average survival rates of seahorses

<table>
<thead>
<tr>
<th>Perlakuan</th>
<th>Rata-rata (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A (Artemia)</td>
<td>86,67±23,09a</td>
</tr>
<tr>
<td>B (Artemia &amp;ikanrucah)</td>
<td>40±0,00b</td>
</tr>
<tr>
<td>C (Artemia &amp;udangebi)</td>
<td>30±14,14b</td>
</tr>
<tr>
<td>D (Artemia, ikanrucah &amp; ebi)</td>
<td>30±14,14b</td>
</tr>
<tr>
<td>E (Ikanrucah &amp; ebi)</td>
<td>20±0b</td>
</tr>
</tbody>
</table>

Description: Different letters on the column show significant differences (P <0.05)

Graphically the average survival rate of seahorses is presented in Figure 1 below.
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Absolute length growth is the difference in the average final weight value with the initial weight average of seahorses. The provision of artemia feed and different alternative feed combinations during maintenance showed an influence on the increase in the average weight of seahorses. The average length of seahorses in each treatment is as follows: treatment A is 13.39 ± 0.71 cm, treatment B: 14.25 ± 0.75 cm, treatment C: 14.60 ± 0.38 cm, treatment D: 14.17 ± 0.29 cm and treatment E: 13.41 ± 0.63 cm.

Table of the average length and absolute weight of seahorses given natural food and alternative feeds and their combinations

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Treatment</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lenght (cm)</td>
<td></td>
<td>13.39±0.71\textsuperscript{a}</td>
<td>14.25±0.75\textsuperscript{a}</td>
<td>14.60±0.38\textsuperscript{a}</td>
<td>14.17±0.29\textsuperscript{a}</td>
<td>13.41±0.63\textsuperscript{a}</td>
</tr>
<tr>
<td>Weight (gram)</td>
<td></td>
<td>7.26±0.89\textsuperscript{a}</td>
<td>8.74±0.89\textsuperscript{a}</td>
<td>6.85±2.45\textsuperscript{a}</td>
<td>8.52±0.93\textsuperscript{a}</td>
<td>7.61±1.71\textsuperscript{a}</td>
</tr>
</tbody>
</table>
Average Graph of Absolute Long Growth

Based on the analysis, the treatment of alternative feeding showed no significant difference (p > 0.05) on the growth of the length of the seahorse. Whereas natural feeding does not have a significant effect on weight gain. The results of variance analysis were obtained (p > 0.05). Measurements of absolute weights for each treatment are respectively A by 7.26 ± 0.89 grams, treatment B 8.74 ± 0.89 grams, treatment 6.85 ± 2.45 grams, treatment D 8.52 ± 0.93 cm and treatment E 7.61 ± 1.71 grams.

Specific Length and Weight Growth Rate

Based on the Table shows that there was no length increase during the study. This is because the seahorses used in the study are mature and do not experience growth. The
ANOVA test results of the growth of the average length and specific weight of seahorses gave results that were not significantly different (p > 0.05). Sea horse weight increase is shown in the following table.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A</td>
</tr>
<tr>
<td>Lenght (cm)</td>
<td>0</td>
</tr>
<tr>
<td>Weight (gram)</td>
<td>0.021±0.00</td>
</tr>
</tbody>
</table>

**Water quality**

Data on the measurement of water quality for each treatment are presented in Table 8. The values of several water quality parameters such as salinity, pH, temperature, brightness and odor show the value that is appropriate for the maintenance of seahorses. At the beginning of the study the value of water quality was still within normal limits for maintenance, this occurred in all maintenance treatments. Water quality observation values are shown in the table below.

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Parameters</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Salinity (ppt)</td>
</tr>
<tr>
<td></td>
<td>33-35</td>
</tr>
<tr>
<td>B</td>
<td>33-35</td>
</tr>
<tr>
<td>C</td>
<td>33-35</td>
</tr>
<tr>
<td>D</td>
<td>33-35</td>
</tr>
<tr>
<td>E</td>
<td>33-35</td>
</tr>
</tbody>
</table>

**4. Discussion**

The results showed that the highest survival rate of seahorses was obtained by treatment with Artenia feeding reaching 86.67%, in the treatment with a combination of Artemia and trash fish the survival rate of seahorses was 40%, whereas in the combination
treatment of Artemia shrimp ebi and Artemia, trash fish and ebi shrimp only reached 20%. The high percentage of survival of seahorses given by Artenia is due to Artenia being a very suitable feed and preferred by seahorses. This is in accordance with the opinion of Kordi (2010), that in the maintenance of sea foals given phytoplankton and rotifers from the age of 1-15 days, then given Artemianauplii according to the size of the mouth. In line with the opinion of Sorgeloos, (1980) explained that Artemia has a very high nutritional value, the size of which corresponds to the mouth opening of almost all types of fish. Artemia can be applied in various fish and other biota cultivation, both for sea water, brackish and fresh.

The low survival of seahorses in the combination treatment of Artemia with trash and ebi is not in accordance with the environmental conditions where sea horses are less supportive so that the survival of seahorses in this study has decreased. The high number of dead seahorses on treatment E combination feed may be less favored by seahorses, so the seahorses in this study lack energy and nutrition, this will cause dead seahorses, according to Sudaryanto (1993) that juveniles are not given food for up to 12 hours, it is very likely to refuse eating the next day. This results in stunted growth and can even cause death. Apart from that combination feeding can cause the environment of seahorses to become cloudy with the low quality of water in the media where maintenance will affect the survival of seahorses. According to Al Qodri et al. (1998) explained that feed that is not consumed will accumulate into dirt and with feces can contaminate maintenance media water. For this reason, in seahorse cultivation with the delivery of natural feed and alternative feed, it must pay attention to water quality by periodically conducting water filtration.

Water pollution media maintenance of sea horses causes parasites that attack sea horses. Figure 4 shows seahors attacked by parasites which caused very low mortality and survival. The symptoms caused by the parasite are the appearance of white patches on the mouth of the sea horse, crown, ingsang valve, abdomen to the tail. Some of the dorsal fin is damaged or broken, the movement is weak, tends to be alone, suddenly shakes the body, and low appetite.
Sea horse growth is the result of the increase in length and weight of individuals in a given time (Effendie, 1979). Growth occurs when the amount of digestible energy exceeds the amount of food energy needed to maintain life (Sastrawidjaja, 1992).

The growth process is influenced by several internal and external factors. Internal factors include: heredity, age, resistance to disease attacks and the ability to utilize feed. External factors are: salinity, temperature, quantity of feed, dissolved oxygen levels, pH and movement space for seahorses. Feeding factor greatly affects the growth of seahorses. The results of the study showed that there were no significant differences due to alternative feeding and other natural feed on sea horse growth. The length of the seahorse does not experience the alleged increase in seahorses used in this study, which is an adult seahorse and does not experience growth anymore. It can be seen that the length of the seahorse body has not changed, which is an average of 13 cm. Likewise, body weight gain does not have a significant effect due to the provision of natural feed.

5. Conclusions and Recommendations
   Conclusion

   From the results of the study it can be concluded that the provision of Artenia feed and a combination of natural feed did not have an effect on the growth of seahorses, and gave an influence on the survival of seahorses. And feeding Artenia can increase the survival of seahorses to 86.76 percent.

   Suggestion
Further research is needed to provide single artemia and alternative feed combinations with certain doses so as to obtain maximum results and can use other alternative feeds that can increase the survival rate of seahorses.

References


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