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# Effects of Stocking Levels on Growth and Survival of Pla Duk Dan Larvae in Aquaria

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## ABSTRACT

A study was conducted to evaluate the effects of different stocking levels on survival and growth rates of pla duk dan during their critical stage in aquaria with no supplemental or emergency aeration. Twenty 75-liter aquaria were arranged into five treatments which were stocked with 0.05 g pla duk dan larvae at each of the following rates : 500, 1,000, 1,500, 2,000, 2,500 per aquarium. The fish were fed a 40% protein moist pellet at 20% of fish body weight per day for six days a week, and the daily feed allowance was weekly adjusted. For a two-month period of feeding, higher stocking rates resulted in greater weight gains per aquarium, slightly lower but not statistically different weight gains per fish and survival values.


## INTRODUCTION

Though pla duk dan, *Clarias batrachus* (Linnaeus), is considered among Thai fish culturists as one of the most desirable freshwater fishes for pond culture due to its tasty flesh, dense population in farming, and high tolerance to poor water quality (Pawapootanon, 1965, Sitasidh, 1970), culture of this fish is presently not widely operated. Such unprogressive operation has resulted notably from a mass mortality of the fish when it is under one month old, and the mortality is believed to be brought about mainly by over stocking density factor.

Over stocking of fish in a culture environment is not only increasing costs of the unnecessary quantity of fish to be stocked and the amounts of feed to be fed but also adding waste materials excreted from fish to water in the culture environment. Continuous accumulation of such materials can possibly deteriorate water quality, thus leading fish to loss of appetite, poor growth, and more susceptibility to diseases and parasites. This is even worse for fish larvae as they are too small and fragile. In contrast, culture of fish under an unreasonably-low stocking rate scheme gives less production and economic returns.

At the present time no useful research data are available for evaluating the optimum stocking density for pla duk dan. The contention that a high level of production of a fish in a given culture environment can be resulted only from a high stocking density has caused fish culturists to stock the environment independent of the environment's carrying capacity. However, if a reliable estimate of the carrying capacity of the culture environment for pla duk dan was available, increased and more economical production of the fish could possibly be obtained.

This study was designed to provide information for estimating the optimum stocking rate for pla duk dan during their critical stage in a laboratory culture. Specific objectives were to determine the rate of survival and the amount of growth by pla duk dan stocked at various levels in aquaria receiving the same supplemental feed. Such information can be useful in management aimed at the improvement of fingerling production of this fish for pond culture.

## MATERIALS AND METHODS

Twenty 75 × 45 × 45 cm aquaria at the Fish Nutrition Laboratory, Department of Aquaculture, Faculty of Fisheries, Kasetsart University were used for this study which began on August 10, 1979, and was terminated on October 12, 1979. The 20 aquaria were each filled with 75 liters of tap water and stocked with pla duk dan larvae averaging 0.05 g each. These aquaria were arranged into five treatments that received the same feed and feeding practices but were varied in stocking rate as follows: (1) 500 fish, 4 replications; (2) 1,000 fish, 4 replications; (3) 1,500 fish,

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**Table 1. Ingredient composition of the feed fed to pla duk dan larvae in aquaria**

| Ingredient | Per cent, by weight |
|---|---|
| Fish meal | 30.00 |
| Soybean meal | 45.00 |
| Broken rice | 13.00 |
| Rice bran | 7.00 |
| Animal fat | 3.00 |
| Dicalcium phosphate | 1.00 |
| Salt | 0.75 |
| Vitamin premix[1] | 0.10 |
| Trace mineral premix[2] | 0.10 |
| Antibiotic[3] | 0.05 |

[1]Includes vitamins A, $D_3$ and C in the amounts equivalent to those recommended by the National Research Council (1976) for a complete ration for warmwater fishes.
[2]Includes $CaCO_3$, $MnSO_4.H_2O$, $ZnSO_4.7H_2O$, $CuSO_4.5H_2O$ and $FeSO_4.7H_2O$ in the amounts equivalent to those recommended by the National Research Council (1976) for practical diets for warmwater fishes.
[3]Represented by oxytetracycline.

4 replications; (4) 2,000 fish, 4 replications; (5) 2,500 fish, 4 replications.

The fish received a 40% calculated protein, sinking fish feed prepared in a paste form by the same procedure as described by Chuapoehuk and Pothisoong (1978). Ingredient composition of the feed is shown in Table 1. The feed was given to the fish at near 9:30 A.M. and 3:30 P.M. at the rate of 20%, on dry weight basis, of fish body weight per day for six days a week. The feeding rate was adjusted every week and held that high throughout the experiment to allow food consumption as maximum as the amount the fish would normally eat in a day.

Ten percent by number of the fish stocked in each aquarium were sampled at random using a dip net every week for growth estimates. The fish were returned to their respective aquarium after weighing, and their average body weight was determined.

Aquarium cleaning was made and water in each aquarium was changed every five days during the first month of the experiment, and thereafter, the same activities were done every two days. The newly-introduced water was then indefinitely treated with a 40% formaldehyde solution at the rate of 15 mg of the solution per 1 liter of the water.

A measurement for total final weight and a count for total number of the fish from each aquarium was done on October 12, 1979. Survival rate was determined and weight gain was calculated as the difference between the average final weight and the average initial weight.

**Table 2. Weight gains and survival rates for pla duk dan larvae stocked at various levels in aquaria receiving the same pelleted feed and feeding rate from August 10 to October 12, 1979**

| Treatment | Aquarium | Weight gain[1], g | | Percentage gain per fish | Percentage survival[2] |
|---|---|---|---|---|---|
| | | Per fish | Per aquarium | | |
| 500 | 4 | 0.910 | 295.7 | 1,820.0 | 65.4 |
| | 5 | 0.992 | 297.6 | 1,984.0 | 60.2 |
| | 7 | 0.878 | 289.7 | 1,756.0 | 66.4 |
| | 20 | 0.859 | 292.1 | 1,718.0 | 68.2 |
| | Average | 0.909[a] | 293.7[b] | 1,819.5 | 65.1[k] |
| 1000 | 2 | 0.920 | 616.4 | 1,840.0 | 67.2 |
| | 3 | 0.893 | 571.5 | 1,786.0 | 64.5 |
| | 15 | 0.899 | 557.4 | 1,798.0 | 62.6 |
| | 16 | 0.920 | 598.0 | 1,840.0 | 65.6 |
| | Average | 0.908[a] | 585.8[c] | 1,816.0 | 64.9[k] |
| 1500 | 9 | 0.859 | 837.5 | 1,718.0 | 65.4 |
| | 11 | 0.912 | 834.5 | 1,824.0 | 61.6 |
| | 18 | 0.919 | 827.1 | 1,838.0 | 60.4 |
| | 19 | 0.934 | 868.6 | 1,868.0 | 62.0 |
| | Average | 0.906[a] | 841.9[d] | 1,812.0 | 62.3[k] |
| 2000 | 8 | 0.866 | 1,125.8 | 1,732.0 | 65.0 |
| | 10 | 0.894 | 1,108.5 | 1,788.0 | 62.5 |
| | 12 | 0.856 | 1,010.5 | 1,712.0 | 59.9 |
| | 17 | 0.875 | 1,120.0 | 1,750.0 | 64.2 |
| | Average | 0.872[a] | 1,091.0[e] | 1,745.5 | 62.9[k] |
| 2500 | 1 | 0.848 | 1,378.0 | 1,696.0 | 65.0 |
| | 6 | 0.876 | 1,401.6 | 1,752.0 | 64.0 |
| | 13 | 0.889 | 1,311.2 | 1,778.0 | 59.6 |
| | 14 | 0.865 | 1,319.1 | 1,730.0 | 61.0 |
| | Average | 0.869[a] | 1,352.4[f] | 1,739.0 | 62.4[k] |

[1,2]Averages with common superscript are not different at the 0.05 probability level.

## RESULTS AND DISCUSSION

An average survival for pladuk dan in all experimental aquaria was 63.5%. As shown in Table 2, survival values for the fish stocked at levels of 500, 1,000, 1,500, 2,000 and 2,500

were 65.1, 64.9, 62.9 and 62.4%, respectively. These survival values were not statistically different.

Table 2 also represents weight gains for pla duk dan stocked at various levels in aquaria receiving the same feed and feeding regime throughout the experimental period. Weight gains were higest (1,352.4 g) in the aquaria with 2,500 fish and lowest (293.7 g) in those with 500 fish. Nevertheless, weight gains (per induvidual) of the fish in all aquaria were similar, ranging from 0.869 g (1,739% as much as stocking weight) for the 2,500-fish aquaria to 0.909 g (1,819.5% as much as stocking weight) for the 500-fish aquaria. These results indicated that growth rate, as determined by weight gain, of the fish was independent of stocking density factor.

It must be noted that this study failed in detecting the maximum quantity or weight of the fish that this particular aquarium can carry during the period of feeding trial because weight gains (per aquarium) increased as stocking rates increased (Table 2). Further study is, therefore, necessary.

## CONCLUSIONS

With regard to the confines of the conditions under which this study was made and based on the data collected in this study the followings can be concluded :

1. Average survival values for pla duk dan larvae stocked at levels of 500, 1,500, 2,000 and 2,500 fish per 75-liter aquarium were 65.1, 64.9, 62.3, 62.9 and 62.4% respectively. These survival values were insignificantly different.
2. Weight gains per fish in all experimental aquaria were similar, indicating the growth rate of the fish was not influenced by stocking levels, even stocked as high as 2,500 larvae per aquarium.
3. During two-month period of feeding, weight gains per aquarium of pla duk dan increased as stocking rates of the fish increased. The highest weight gain was 1,352.4 g and the lowest 293.7 g.

## LITERATURE CITED

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