EFFECT OF PHOTOPERIOD AND LIGHT INTENSITY ON LARVAL REARING OF BLUEFIN TUNA *Thunnus thynnus*

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Introduction

One of the most important conditions affecting survival and growth in larval rearing are light conditions. In the case of bluefin tuna these factors are still more important so that Miyashita (2006) has mention the night time sinking death like one of the main reasons of early mortality and it is also well known the poor scotopic vision of bluefin tuna larvae (Ishibashi et al., 2009). This paper tries to find out the effect of the photoperiod and also light intensity on bluefin tuna larval rearing.

Materials and methods

A couple of trials were carried out. Two different spawning coming from broodstock cages owned by Caladeros del Mediterráneo in Cartagena (SE Spain) were transported to the IEO to be used. With regard to photoperiod, three different conditions (12L:12D, 16L:8D, 24L:0D) were assayed. After cleaning and counting the just collected spawning, 135.000 buoyant eggs were separated and directly inoculated in larval rearing tanks with the required photoperiod. Initial density was 10 eggs/l.

The trial was carried out in 1500 l. cylindrical tanks in triplicate. The light intensity was about 800 luxes and temperature ranged between 22.4 and 25.7ºC. The renewal rate varied between 120 and 200%/day. Tanks had water and air bottom inlet, and water outlet from surface with aeration in the filter. Surface cleaners were used from DPH3. Aeration was increased during the night in order to avoid sinking of the larvae. Some ml of fish oil were added from 3 to 8DPH in order to avoid surface death of bluefin tuna larvae. Feeding during all the period were enriched rotifer (10rot/ml. adjusted twice per day and previously enriched with Origreen, Skretting) and phytoplankton (30ml/day of super fresh Chlorella SV-12, Chlorella Industry Co. Ltd., distributed in four times). A sample of larvae was measured daily, and when larvae were 15DPH, all the survival larvae were extracted and counted.

With regards to light intensities, four different intensities were studied: 0, 500, 1000 and 2000 luxes. The trial was also carried out in triplicate in 1500 l. cylindrical tanks. The photoperiod was 14L:10D, and temperature ranged between 23.5 and 25.1ºC. The renewal rate was about 160%/day, and the rest of conditions were similar to those pointed above. The initial egg density was 7.2 eggs/l. A sample of larvae were measured every two days; the experiment ended when larvae were 13DPH.

Results

Hatching rate ranged between 75 and 88% in both experiments. Results on survival in photoperiod experiment are summarized in the Table I. In order to normalize the data, survival rate have been transformed using the arcsin function. Letter point significant differences ($p<0.05$)

The results obtained in the light intensity trial showed that 0 lux led to a fully mortality in the first week but there were not significant differences ($p>0.05$) between 500, 1000 and 2000 luxes (survival rate about 3%).

With regard to growth rate, results obtained with 16 and 24 hours of light are similar and better that those obtained with photoperiod of 12L : 12D. Differences between 12h light and the other two groups (Figure 1a) are significant ($p<0.05$). Nevertheless, there were not significant differences ($p>0.05$) between the light intensities (Figure 1b).

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Table I. Results on survival in photoperiod experiment

Photoperiod	Survival rate
12L:12D	4.80±0.82
16L: 8D	8.31±0.63 (a)
24L: 0D	1.79±2.03 (b)

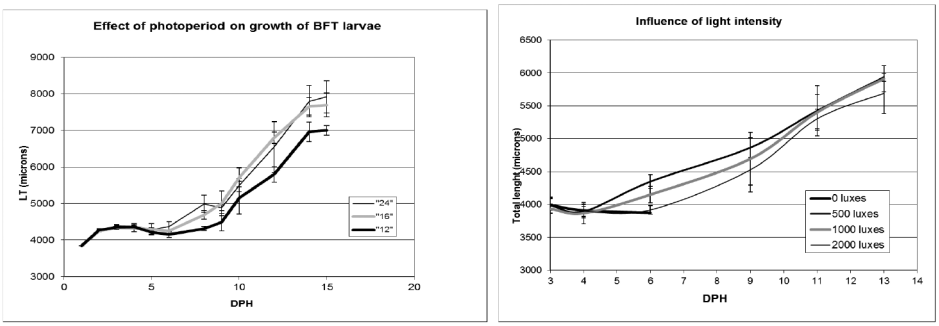

Figure 1a and 1b: Effect of photoperiod and light intensity on Bluefin tuna larvae growth.

Discussion and conclusion

It seems that long photoperiod lead to a greater mortality and short photoperiod led to a smaller growth. Upwelling current seems to keep larvae in suspension and in spite of night time, sinking death is not high. Larvae grow faster with extended photoperiod, maybe because they are eating for a longer time, but they could stop some hours and then cannibalism would lead to a greater mortality. Nevertheless further experiments should be done, taking into consideration the relationship between photoperiod and swim bladder inflation.

With regard to light intensity, results suggest that 500 lux would be enough for larval rearing of bluefin tuna, but nevertheless, a wider range of light intensity should be experimented.

References

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