EFFECTS OF STOCKING DENSITY ON GROWTH PERFORMANCE AND HEALTH OF GREATER AMBERJACK (*Seriola dumerili*) JUVENILES

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Introduction

To achieve and increase the profitability of fish commercial culture, it is necessary to establish the appropriate grow out practices, and the optimal density that produces the highest growth rates without compromising fish health and welfare is one of them. Measuring blood biochemical components is an important tool as health status index and nutritional condition of fish. In this study, different culture densities have been tested in greater amberjack (*Seriola dumerili*) juveniles, evaluating its effects on growth performance and hematological and biochemical parameters.

Materials and Methods

Juveniles of *Seriola dumerili* born in captivity (average weight, size and Condition factor of 27.0±8.3g, 11.6±1.3cm, and 1.70±0.22g cm^{-3}, respectively) were divided into 3 homogeneous groups, by triplicate, accord to initial density (kg m^{-3}) of 0.17±0.02 (Low, LD), 0.28±0.01 (Medium, MD) and 0.46±0.07 (High, HD). The groups were maintained in cylindrical fiberglass tanks (1m^3) during four month, with a constant water exchange and aeration, under natural conditions of photoperiod, salinity (37.5‰) and temperature (22.8±1.6ºC; decreasing from 24.3 to 20.4ºC throughout the experiment). Fish were fed *ad libitum* with a commercial pellet for turbot (3-5mm diameter; Skretting Ltd, Norway; composition in % dry weight was: 52% crude protein, 20% crude fat, 8.7% ash, 1.7% crude cellulose and 1.4% total phosphorus). Feed was supplied daily either at 08:00, 11:00, 13:00, 15:00; 17:00 and 19:00h during the first two month and 08:00, 11:00, 15:00 and 19:00h after.

At 30, 60, 90 and 120 days, all fish in each tank were anesthetized with 2-phenoxiethanol and measured for weight (W) and length (L). In each sampling, blood samples were collected from the caudal vessels using heparinized syringes to evaluate the influence of stocking densities on hematological and biochemical parameters indicative of the welfare and health status of fish. Total erythrocytes and leucocytes were estimated from fresh samples of blood by counting using a Neubauer haemocytometer, and hematocrit was carried out by capillary diffusion and centrifugation. Plasma samples were separated after centrifugation and stored at -80°C until analysis for plasma levels of protein, triglycerides, cholesterol, and glucose, measured by enzymatic colorimetric assays (Biosystems, Spain). Condition Factor was calculated as K=100 W L^{-3}, and Specific Growth Rate as SGR=100 (ln Wfinal-ln Winitial) $days^{-1}$. Once a week, feed left uneaten was recovered from the bottom of the tank 30min after its administration to quantify the daily feed intake (FI). Dead fish were daily recorded, measured and observed to check the presence of parasites or other pathologies. The level of parasitation by monogenean was also monitored by dish traps (1.5mm mesh net) placed in the tanks to collect monogenean eggs released by adult parasites (Cejas *et al*., 2014). Mesh traps were placed every Friday and retired every Monday to count the eggs entangled in the dish traps.

Results and Discussion

The final culture densities (kg m^{-3}) were 3.66±0.46, 5.74±1.20 and 7.41±0.17, for LD, MD and HD, respectively, increasing in 21.5, 20.5 and 16.1 times with respect to the initial densities. At day 120 the SGR tended to decrease with the increasing density and HD fish group showed the significantly lowest value (Table I). The condition factor K was also significantly higher in the LD fish groups than HD, while Hepatosomatic and Viscerosomatic Index were significantly higher in HD fish group at 120 days. On the contrary, the feed intake decreased significantly along 120 days and was significantly lower in HD respect to LD fish groups, suggesting a greater feed efficiency for fish at LD.

Few differences were found in hematological and plasma biochemical parameters measured among groups along the study. However, at 120 days HD fish presented significantly higher triglycerides than LD fish (Figure 1).

During the first 60 days, a low number of eggs of *Zeuxapta seriolae* were observed in LD and HD fish groups, entangled in the dish traps. However, from 90 to 120 days, the eggs entangled in the dish traps was from *Neobenedenia melleni* and its number increased significantly in HD fish groups although not caused associated mortalities.

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Table I. Final Weight (W, g), Length (L, cm), Condition factor (K, g cm^{-3}), Specific growth rate (SGR, % day^{-1}), daily feed intake (FI, % biomass day^{-1}), and weekly number of eggs of *Zeuxapta seriolae* (Z.) and *Neobenedenia melleni* (N.) at Low (LD), Medium (MD) and High (HD) densities.

Final	LD	MD	HD
W	548.3±69.1	535.9±126.4	529.1±95.6
L	29.2±1.5	28.8±1.8	29.5±1.4
K	2.20±0.05 a	2.21±0.01ab	2.10±0.04b
SGR	2.23±0.11a	2.20±0.09a	2.05±0.01b
FI	1.76±1.74a	1.54±1.49ab	1.29±1.05b
Z.	0.76±0.53	0±0	5.38±3.92
N.	0±0b	0.81±0.46b	90.48±50.78a

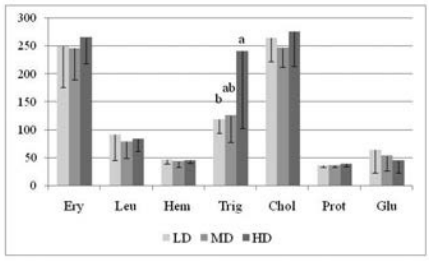

Figure 1. Final Erythrocytes (Ery, $10^4 mm^3$), leucocytes (Leu, $10^3 mm^3$), hematocrit (Hem, %), plasma triglycerides (Trig, $mgdl^{-1}$), cholesterol (Chol, $mgdl^{-1}$), protein (Prot, gl^{-1}), glucose (Glu, $mgdl^{-1}$) at Low (LD), Medium (MD) and High (HD) densities. Different letter indicates significant differences ($P<0.05$).

Conclusions

Stocking density affected growth and feed intake in greater amberjack juveniles cultured under the particular conditions and experimental period describe in this study. High density fish presented lower specific growth rate, condition factor and feed intake. Moreover, hepatosomatic and viscerosomatic index, and plasma triglycerides were higher in fish at high densities over overall period.

References

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