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ABSTRACTS

INCREASE IN GROWTH RATES OF ATLANIC BLUEFIN TUNA (*Thunnus thynnus*) JUVENILES OVER PROLONGED CAGING IN THE CENTRAL EASTERN ADRIATIC

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Introduction

Atlantic bluefin tuna (ABFT, *Thunnus thynnus*) is a highly migratory species that belong to marine top predators. It is biggest teleost fish of great economic interest in both capture fisheries and aquaculture because of the top prices it achieves in the sashimi market. The purse seine fisheries in the Adritic is based mostly on juveniles (ages 2 and 3), and much older fish arriving from the Mediterranean spawning sites are also present in the late summer and autumn. The development of tuna farming after 1996 allowed juveniles to be kept alive and be fed until their size and quality meet the required market criteria. The intention is to concentrate on prolonged farming, choosing either one of the two main strategies in farming operations, from minimum 18 months or around 30 months rearing period. Such a practice enabled tuna farming in Croatia to evolve into profitable capture-based aquaculture industry. The present research is a contribution to an effort as to get insight into growth rates of captured juveniles ABFT over prolonged caging in the Croatian territorial waters of Adriatic. This may benefit both the catch statistics and bluefin tuna stock management.

Material and Methods

The ABFT juveniles were caught in months of May and June from purse seine fleets operating in the central Adriatic. Fish were transferred to grow - out cages at three farms in the late June to the middle of July. For the sake of anonymity, farms are numerated (Farm 1, Farm 2, and Farm 3). Circular floating HDPE cages were 50 – 60m diameter with nets 18m to 25m deep, having 38 000 m^3 (F1), 43 000 m^3 (F2), and 70 000 m^3 (F3) respectively. The water temperature at a depth of 5m ranges at 11.2 - 17.4^{0}C, 18.1 – 24.6^{0}C, and 17.8 – 22.7^{0}C in the time period of January/April, May/August and September/December respectively (lowest in Mart and highest in July). The size of caged ABFT were monitored seasonally from the start to the harvesting which took place in the period of late December of the following year (Farm 2 and Farm 3), and December of the year after for Farm 1. Practicing 30 months rearing cycle. The percent of measured fish by stereoscopic video camera system was about 20% of the total ABFT in the cages, always done in three replicates. Weight was estimated by the software program using an adequate conversion equation. Specific growth rates (SGR in % body weight/day) for different rearing periods has been calculated (Moyle and Cech, 1996). Fish growth in relation to temperature was calculated based on thermal-unit growth coefficients (TGC) according to Cho and Bureau (1998). Furthermore, the relative growth rate in % (RGR%) has been estimated according to Copeland et al. (2002).

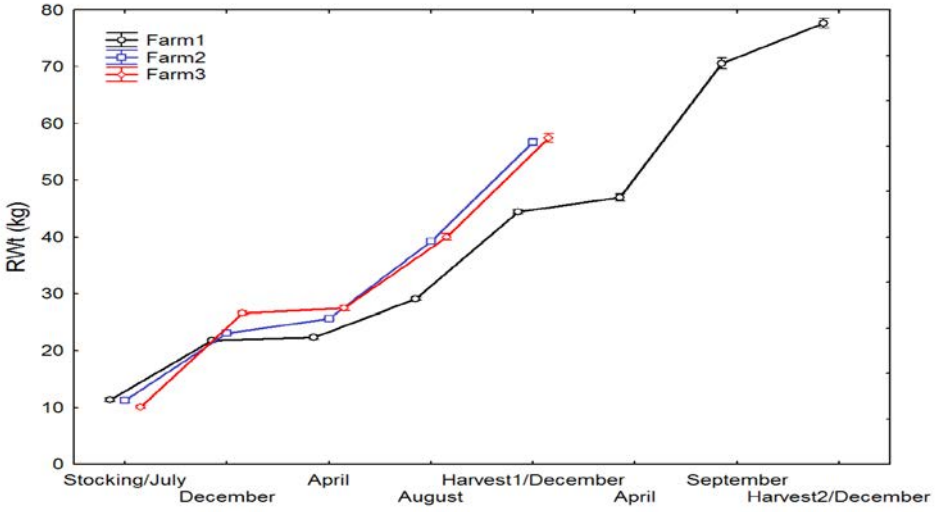

Figure 1. Round weight (RWt in kg) calculated by L-W relationship integrated into the camera software among three Croatian ABFT cage farms over 18 (Farm 2. Farm 3) and 30 months farming period (Farm 1).

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Results

The research provides important information on the growth performances of Adriatic BFT juveniles caged under specific environmental and husbandry conditions. Results obtained in this study showed that growth speed of ABFT juveniles of 10.1 to 11.3 kg (around 80cm fork length (FL) reared in the floating cages are quite high. The highest RGR of 119% in average was calculated for the period of July to December, with a SGR of 0.5% per day, while mean TGC value was 1.4. On the contrary, the lowest mean RGR of 11% was calculated during the winter months, from January to April, with minor SGR (<0.04% per day), and the lowest TGC (0.2). An overall RGR mean after 18 months was 385%, ranging from 291% to 467%. Consequently, the mean SGR and TGC in this case were 0.3% per day and 1.5 respectively. The calculated RGR after 30 months of caging was 585%, while the mean values of SGR and TGC were 0.21 and 1.4 respectively.

Discussion

Growth rate of ABFT juveniles is directly related to water temperature, as it has been already demonstrated by Cort (2003). During the warmer part of year, the growth was quite high , but during winter months feeding activity and their growth in both length and weight was minor (Figure 1). The ABFT started to increase their food intake and growth when the temperature exceed 17^0 C. Large differences in growth rate among farms is something already seen in ABFT farming operations. Likely, this is due to differences in husbandry i.e. feed and feeding and environmental conditions among farms such as water temperature, stocking density, and sea currents (Ikeda, 2003). We have noticed that small tuna reared approximately 540 days (18 months) had mean SGR of 0.3% per day (0.30-0.35) that is more or less in line with previous findings (Ticina et al. 2007). Lower SGR value for ABFT caged 30 months (0.21% per day) could be attributed to, operational strategy to benefit from increased biomass over extended farming periods (>2 years) that includes the second winter stagnation in the growth.

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