RESEARCH ARTICLE **(Open Access)**

# Length-Weight Relationship and Fulton's Condition Factor of Rainbow Trout (*Oncorhynchus mykiss)*

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**Abstract**

Length-weight relationship and condition factor are an important, easy and fast tool for determination of the fish condition. These parameters are also important as early warning for management problems on the fish farm. Subject of this study were 130 freshwater rainbow trout with an average weight and length of 375 ± 95gr and fork length of30 ± 2.0 cm respectively. Coefficient of correlation ($R^2$) for length weight relationship was calculated, whereas for condition factor (K) was used "Fulton's condition factor" formula. Result shows that correlation between length and weight, same as condition factor are low with a value of $R^2 = 0.44$ and K = 1.38 respectively. Condition of the fish is under desirable level and some management improvements are needed.

**Keywords**: Rainbow trout, K-factor, length, weight.

## 1. Introduction

Rainbow trout farming in Kosovo mostly has developed on last decade. The rate of this development was not followed with the scientific researches to estimate the existing environment condition and management routine. Proper condition and management will help to the farmers to reach the maximal production capacity of their farms, in terms of quantity and quality. This also will ensure the wellbeing of the fish and first step against diseases. On the other hand, improper environmental condition will produce poor conditioned fish, as result, poor quality fish.

As result, the need for evaluation of the existing conditions, starting from most basic parameters, was immediate.

During the environment condition assessment of a particular fish farm, length-weight relationship is one of the first parameters that has to be evaluated. For a good shape of the fish, relation between length and weight has to be positively correlated.

Furthermore, from the weight and length values can be calculated the condition factor of the fish.

There are some methods or mathematical formulas to calculate the condition factor. In this study was used "Fulton's Condition Factor (K)"[1] as one of the widely used mathematical formula for this purpose [2].

Length-weight relationship and K is an important tool on fishery management [3, 4], and it is quite simple and can also be used by the not qualified people like fish farm owners to identify and diagnose the management problems [5].

A poor K value is an early warning of potential problems on the farm. A higher K values corresponds to the better condition of the fish [6], better fish quality with more fat reserve and higher degree of muscular development.

Condition factor can also be used to determine the stocking rate of the fish in the particular water condition [7], health and growth rate, biological changes in fish stock [8, 9, 10], food availability [11], comparing the individuals within the population ore population from the different locations [7, 12].

However, there are some factors that can influence the K value and should be taken under consideration when it is used for comparison. Factors like: age, sex,

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season, stage of maturation, starvation, spawning are most important influencers.

On this study we have evaluate the relation between length and weight and Condition factor of the rainbow trout fish reared on Kosovo fish farms, attempt to identify the eventual mismanagement and if necessary, suggest the action to improvement.

## 2. Material and Methods

### 2.1. Materials

The fish for this study were sampled in September 2014 at "TroftaIstog" fish farm in Kosovo. The fish had been farmed for about 15 months in concrete raceways using the EFICO Vital 808 feed from BioMar AS (Brande, Denmark). The gross composition of the feed was: crude protein 42%, crude lipids 24%, nitrogen free extract 17.4%, crude cellulose 2.5%, ash 9.4%, total phosphorus 1.3%, as well as vitamins (A, C, D3 and E). The fish were fasted for 8 days before the experiment. Just before sampling of fish at the farm, the levels of dissolved oxygen, acidity and temperature in the raceway were 79 % saturation, pH 7.80 and 10.9 $^{o}$C, respectively.

### 2.2. Methods

The fish were netted one by one and length was estimated as "Fork Length" by a simple meter, whereas the weight was estimated as whole weight (whole fish) by a digital high accuracy weigher.

To calculate the length-weight relationship (K-Factor) was used mathematical formula proposed by Fulton [1]:

$K=W/L^3x10.$

K - Condition factor or coefficient of condition

W - Weight of the fish

L - Length of the fish. The length is measured from the tip of the snout up to the fork at the center of the tail.

$N^5$ - Is used to bring the K value close to unity, to the value 1.

From this formula, Department of Primary Industries, State of Victoria has developed a standard regarding the classification of the fish condition according to the K-factor value.[7]1.60 Excellent, 1.40 good, 1.20 fair, 1.00 poor, 0.8 extremely poor.

## 3. Results and Discussion

The results show that average weight of fishes was 375 ± 95 gr and fork length of 30 ± 2.0 cm (nr = 130). After the calculation for length-weight relationship expressed as $R^2$results show a correlation of 0.44 (Figure 1).According to the other publications for fresh water rainbow trout of0.80 [13] 0.86 [14], and 0.99 [15, 16], length-weight correlation in our study was low. For a good shape of the fish, relation between length and weight has to be high positively correlated.

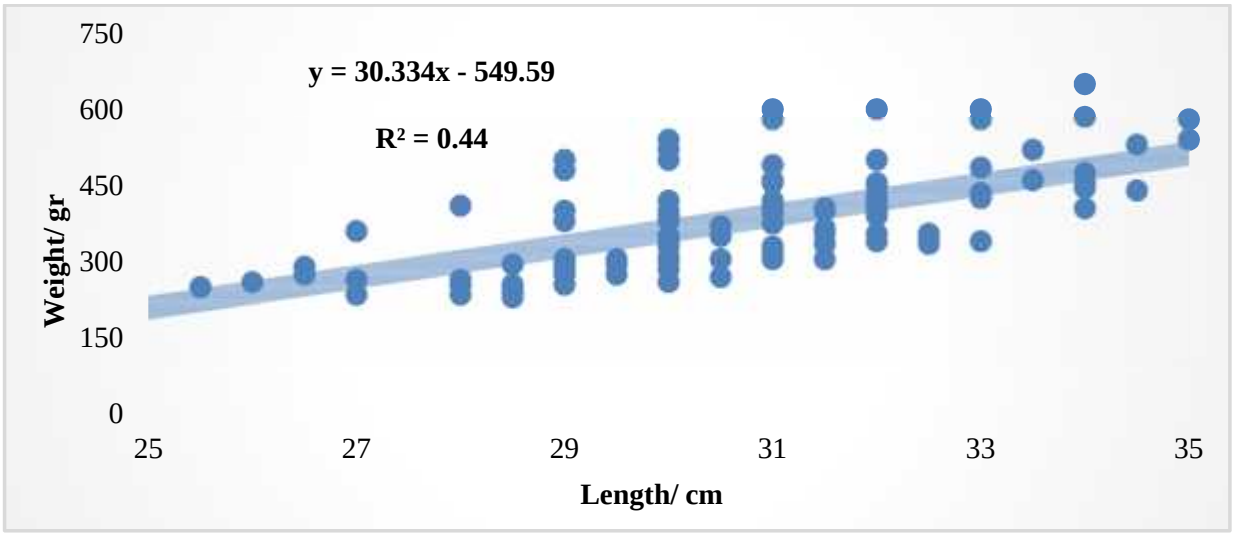


**Figure 1**. Length - weight relationship of the rainbow trout (n=130).

The low correlation shows that in the farm were fishes with low weight, whereas were developed normally regarding length. Even the fish were in the same age (15 months), there were detected large differences between minimal and maximal individual weight of fishes subject to this study (Table 1). As long as the

fishes has reared under the same water quality and were feed with same kind of the food, these results leads to the assumption that on the raceways was a high competition for the food, probably as result of insufficient food, high rearing density or not adequate size classification!?

**Table 1.** Minimal and maximal length, weight and K-Factor value of rainbow trout fish reared on Kosovo fish farm.

| Values | Weight (gr) | Length (cm) | K-Factor |
|---|---|---|---|
| Minimal | 230 | 23.5 | 0.94 |
| Maximal | 650 | 35 | 2.05 |

Regarding the K-Factor, average value was 1.31±0.25. According to the condition factor standard [7] this value corresponds to a degree between fair and good condition.

In comparison with other reports for farmed rainbow trout the value of K in are study is not in a desirable level.

Other researchers reported a K value from 1.72 - 1.91 [17, 14]. However, some individuals in our study reached the K values over 2 (Table 1), indicating that there is a water potential for better condition of the fish. This level has to be the main goal of the farmers, which can be achieved thru the proper farm management.

## 4. Conclusions

The existing condition of the fish in the farm is below the desirable standard. There is more potential at the farm that should be utilized thru the proper management. Factors like food amount and feeding frequency, density and classification has to be taken under consideration for improvement. Necessary suggestions were given to the farm management.

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