
Assessment of Length–Weight Relationship and Condition Factor of Rainbow Trout (*Oncorhynchus Mykiss*) Cultured in ISTOG Fish Farm, Peje Region, Kosovo

Elira Zeka¹, Luan Berisha², and Nora Kelmendi³

¹Primary School “Bajram Curri”, Peja, Republic of Kosovo

²Primary School “Kultura”, Mateç, Lipkovo, North Macedonia

³Gymnasium “Naim Frashëri”, Kumanovo, North Macedonia

Abstract

*This study evaluates the length, weight, and condition factor of rainbow trout (*Oncorhynchus mykiss*) cultured in aquaculture systems. A total of 136 fish specimens with varying body sizes and weights were analyzed and categorized into three groups based on weight: >100 g, >150 g, and >200 g. Morphometric measurements showed progressive increases in size across the groups. The mean total lengths recorded were 22.6 cm, 24.8 cm, and 27.3 cm for the first, second, and third groups, respectively. Similarly, the mean fork lengths were 21.1 cm, 23.0 cm, and 25.5 cm across the respective groups. The average body weights were 126 g, 176.8 g, and 227.6 g, indicating consistent growth patterns among the sampled fish. The condition factor values also increased with body weight, with recorded means of 1.27, 1.36, and 1.41 for the three groups, respectively, suggesting improved health status in larger fish. Overall, the findings provide baseline biological data on the growth performance and condition factor of rainbow trout cultured in the Istog fish farm. These results may serve as useful reference information for aquaculture management and fish production optimization in Kosovo and other similar environments.*

Keywords: Rainbow trout, *Oncorhynchus mykiss*, length–weight relationship, condition factor, morphometric analysis, aquaculture, fish growth performance

Introduction

Trout, a member of the Salmonidae family, is widely recognized for its high nutritional value and its importance in recreational fishing. It thrives in cold, soft waters with optimal temperature ranges between 10–18°C. Originating from the northern regions of the globe, trout is considered one of the earliest species to be domesticated for aquaculture purposes. This species demonstrates strong adaptability to diverse aquatic environments, including rivers, lakes, ponds, and artificial farming systems. This ecological flexibility has contributed significantly to its popularity in aquaculture production systems worldwide. In Kosovo, trout farming activities began in the early post-war period, while more systematic scientific investigations have been conducted in recent years. Understanding the biological characteristics of trout populations is essential for improving aquaculture practices and ensuring sustainable production. Length and weight measurements are fundamental parameters in fish biology, as they provide valuable information for assessing population status and growth patterns. These metrics are also widely used for morphological comparisons across local and regional populations, making them essential tools in fisheries management. The condition factor (K), also known as the health status factor, is an important ecological indicator used to evaluate the well-being of fish and the suitability of their environment. It reflects the general condition and

growth performance of fish populations and is influenced by physiological traits such as maturity, reproduction, feeding habits, and environmental conditions, including food availability and water quality. According to Fulton's condition factor classification, values between 1.41 and 1.60 indicate excellent condition, 1.21 to 1.40 represent good condition, 1.01 to 1.20 indicate average condition, 0.80 to 1.00 reflect poor condition, and values below 0.80 suggest very poor health status.

Therefore, this study aims to evaluate the condition factor based on length and weight measurements of rainbow trout cultured in aquaculture systems, providing insight into their growth performance and overall health status.

Materials and Methods

This research was conducted in the spring and summer periods May and August 2023/24. The research included the pools of the trout fish farm, which is owned by the “Trofta” hotel in Istog (Kosovo), located at the geographical position 42°78'02689” N, 20°48'03915’ E and at an altitude of 288 m. Its total annual production is 530,000 kg, while the water flow speed of the supply source is 2.66 m/s (Fig. 1).



Fig. 1. Geographical position of the fish farm in Istog with the cultivation ponds.

The study included 136 fish of different weights and lengths, categorised into three groups (Gr. I – with body weight > 100 g, Gr. II – with body weight > 150 g and Gr. III – with body weight > 200 g). Their capture was carried out using a net (fig. 2A) by the person responsible for the farm, and after determining their weight and length (fig. 2B), they were returned to the tanks. In order to avoid hypoxia (decrease in the oxygen level in the blood of the fish), the determination of weight and length, including the macroscopic observation of their body (to determine any possible disease), was carried out for a duration of 15 sec., and after this time the fish were thrown back into the tanks.

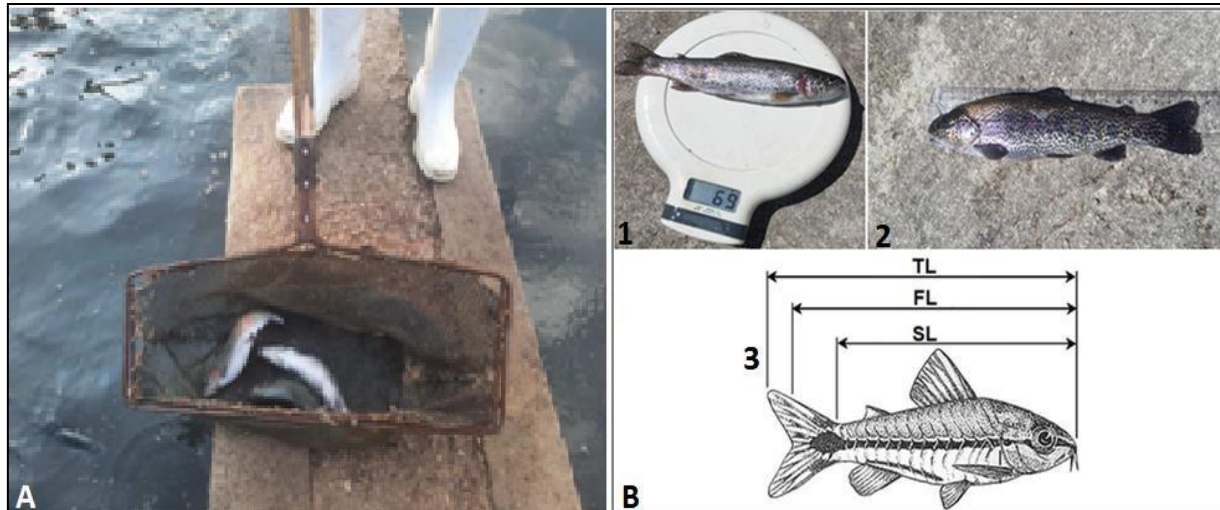


Fig. 2. A-Method of catching fish (by net); B-Determination of weight and length. 1-determination of weight; 2-determination of length. 3-determination of three body lengths: TL-body length from mouth to end of caudal fin (total length); FL-length from mouth to fork of caudal fin (fork length); SL-length from mouth to beginning of caudal fin (standard length).

The average values for weight, length and health status factor for each group were calculated based on the number of individuals analysed, using the Microsoft Office Excel 2007 computer program.

The health status factor was calculated using the formula provided by Sloof et al., 1983: $CF = [\text{body weight (g)} / \text{length (cm}^3\text{)}] \times 100$

Results

We present the results graphically from this study. The average body length values of the three analysed groups of fish are presented in figure 3. In the group of fish weighing more than 100 g, the average total length (TL) was 22.6 cm, the fork length 21.1 cm and the standard length 20 cm. In fish weighing more than 150 g, the total length was 24.8 cm, the fork length 23 cm and the standard length 22.1 cm. The total length of fish weighing more than 200 g was 27.3 cm, the fork length 25.5 cm and the standard length 23.7 cm.

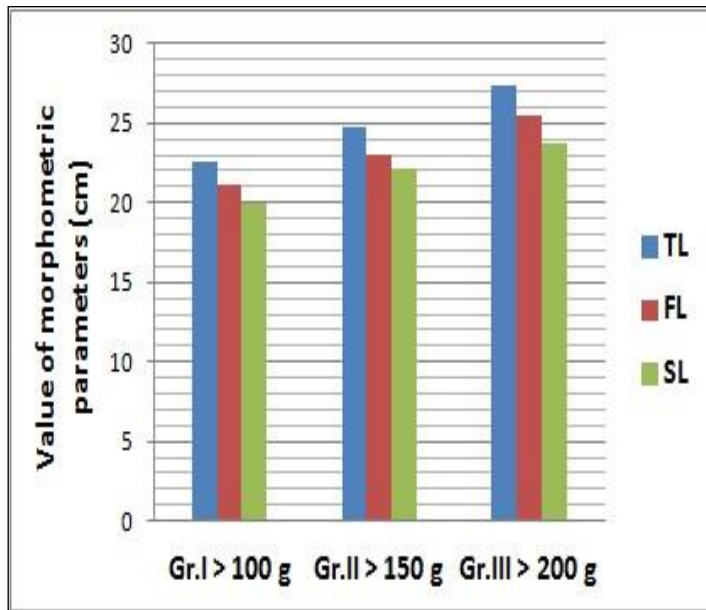


Fig. 3. Average values of morphometric parameters (TL-total length, FL-fork length, SL-standard length) of the three analysed groups of fish.

Figure 4 presents the average body weight values of the three groups of fish. In the group of fish with a body weight greater than 100 g, the average weight value was 126 g; in the group with a weight greater than 150 g, 176.8; and in the group with a weight greater than 200 g, 227.6.

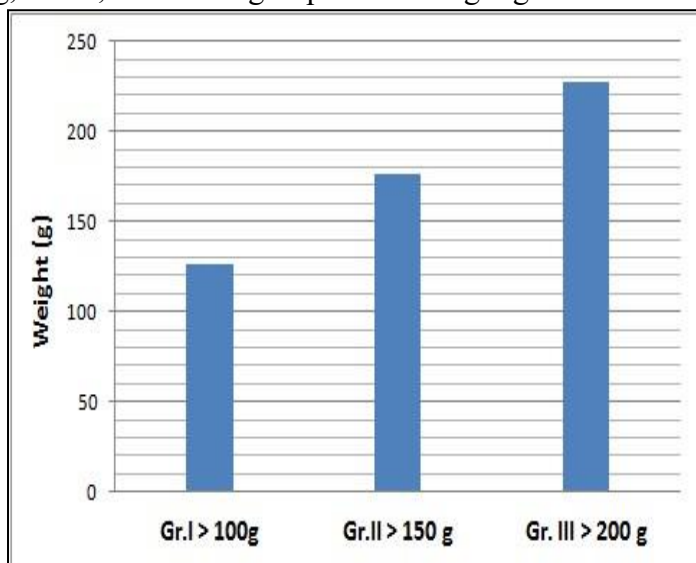


Fig. 4. Average weight values of the three analysed groups of fish.

The data obtained from the analysis of the health status factors of the three groups of fish included in the study are presented in figure 5. From the graphic presentation, it is observed that, in the group of fish weighing more than 100 g., the average value of the health status factors is 1.27; in the group of fish weighing more than 150 g., the average value of the health status factor is 1.36; while in the group of fish weighing more than 200 g., the average value of the health status factors is 1.41.

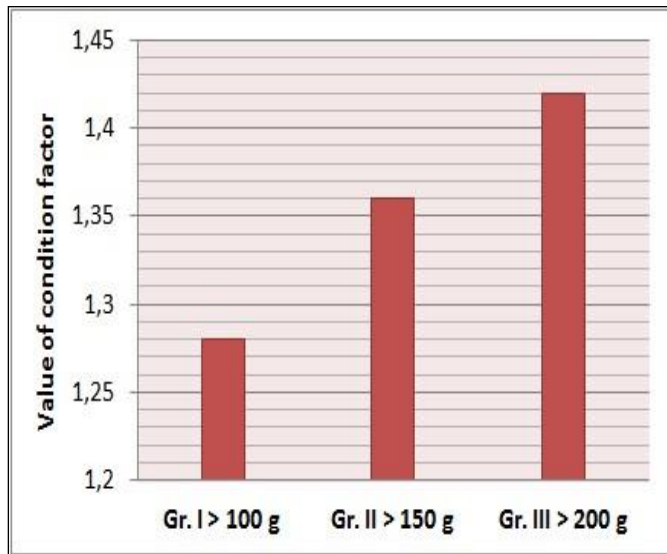


Fig. 5. Average values of the health status factor of the three analysed groups of fish

The first and second fish groups are healthy, while the third is excellent, according to the health status factor reference values.

Discussion

The determination of length and weight is very important in assessing the health status of fish (Haimovidici and Velasco, 2000; Arslan et al., 2004), and also the biomass of aquatic cultures can be estimated based on these parameters (Morey et al., 2003).

There are many reports of length and weight measurements of rainbow trout in the world (Siglar, 1953; Van Woert, 1957; McAfee, 1966; Kwain, 1981; Pidgeon, 1981; Campos et al., 1997; Zimmerman, 1999; Esmali and Ebrahimi, 2006; Tasaduq et al., 2011, 2022; Asadi et al., 2017), and the values recorded for these parameters in this study are presented in figures 3 and 4. These recorded values can serve as indicators of the level of feed intake in the farm, as a model of fish growth, and can vary depending on climatic and biological factors, such as water temperature, food availability and type of environment (Wootton, 1992). Fish health status factor is an indicator that reflects the interaction between biological and climatic factors of fish (Blackwell et al., 2000).

The health status factor of fish relies on whether the heaviest fish at a given length are in good condition. It also serves as an indicator of development and nutrition (Seher and Suleyman, 2012). A condition factor ≥ 1 indicates adequate nutrition and satisfactory health (Ujjania et al., 2012).

Fulton's health status factor values presented in this study ranged from 1.27 to 1.44 (fig. 5), indicating that the fish are in excellent condition. Approximate results for this factor have been identified by different authors (Rabe 1967; Cada et al. 1987; Murphy 1988; Ensign et al. 1990; Zimmerman 1999; Tasaduq et al. 2011; Asadi et al. 2017).

Conclusion

The values obtained showed that the morphometric parameters, length, weight and health status factor of rainbow trout from aquaculture are within the range of values recorded in other populations of the same species.

In the first group of fish weighing more than 100 g, the average value of total length (TL) was 22.6 cm; in the second group weighing more than 150 g, 24.8 cm; and in the third group weighing more than 200 g, 27.3 cm. The average fork length (FL) in the first group was 21.1 cm, in the second group 23 cm, and in the third

group 25.5 cm. The average value of body weight in the first group was 126 g; in the second group, it was 176.8 g; and in the third group, it was 227.6 g.

In the group of fish weighing more than 100 g, the average value of the health status factor is 1.27; in the group of fish weighing more than 150 g, 1.36; and in the group of fish weighing more than 200 g, 1.41.

If such values applied to any other study of this nature, we must consider that the samples were taken in different seasons and that the number of fish examined was limited.

In conclusion, the study of fish morphometry can provide us with useful information for fisheries management and the study of fish population dynamics.

Therefore, the values identified after this study can be used as basic data for this type of fish and for comparison with further studies.

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