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# RAINBOW TROUT PRODUCTION IN COLDWATER FISHPOND IN PELAGONIA REGION (BITOLA, MACEDONIA)

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**Abstract**

**The fish production in the Republic of Macedonia is based on performing commercial fishing from natural and enlarged artificial lakes - reservoirs, as well as, in fish breeding facilities, or aquaculture. The main purpose of research in this paper is establishing production of the rainbow trout (*Oncorhynchus mykiss*) in one of the biggest coldwater fishponds, located in Pelagonia Region. Besides the main purpose of research, there are other purposes which are directly related to the production of the rainbow trout, such as determining food consumption to produce the appropriate amount of fish in a given period, the fish growth in a given period and conversion.**
**The coldwater fishpond Strezhevo is located near Bitola (Macedonia) and functions within the PC "Strezhevo" - Bitola.**
**In 2014, in the fishpond Strezhevo 12.588 kg or 85.252 pieces of pre consumable fish, as well as, 3874 kg or 14.761 pieces of consumable fish are produced. Also, 90.891 kg fish food is spent and 60.932 kg fish growth is gained. The conversion is 1.49. In 2015, 3.759 kg or 23.759 pieces of pre consumable fish, as well as, 18.508 kg or 63.072 pieces of consumable fish are produced. Also, 71.110 kg fish food is spent and 51.815 kg fish growth is gained. The conversion is 1.37. In 2016, 14.032 kg or 162.086 pieces of pre consumable fish, as well as, 6.812 kg or 33.408 pieces of consumable fish are produced. Also, 43.495 kg fish food is spent and 36.880 kg fish growth is gained. The conversion is 1.18.**
**It is noticed that high fish productivity is conditioned by a proper diet including all of the components that help for intensive growth and development while preventing the occurrence of fish diseases. With properly normalized food, the cultivation of maximum fish production per unit area, as well as, minimum consumption of food can be achieved.**
**Keywords: rainbow trout, aquaculture**

## Introduction

The fish production in the Republic of Macedonia is based on performing commercial fishing from natural and enlarged artificial lakes - reservoirs, as well as, in fish breeding facilities, or aquaculture. The aquaculture production in our country mainly refers to the production of fish under controlled conditions and fish breeding in ponds - fish farming. Depending on the

temperature needs of individual fish species grown in ponds, the aquaculture production is divided into:

1. Breeding of fish species (cyprinid fish) in warmwater fishponds;
2. Breeding of fish species (salmonid fish) in coldwater fishponds.

In the coldwater fishponds, mostly cultivated fish are: rainbow trout (*Oncorhynchus mykiss*), brown trout (*Salmo trutta*), Ohrid trout (*Salmo letnica*) and brook trout (*Salvelinus fontinalis*). The fish production in the coldwater fishponds is based on trout production, in which the rainbow trout (also known as Californian trout) has the dominant role.
The main purpose of research in this paper is establishing production of the rainbow trout (*Oncorhynchus mykiss*) in one of the biggest coldwater fishponds, located in Pelagonia Region. The coldwater fish pond Strezhevo is located near Bitola (Macedonia) and functions within the PC "Strezhevo" - Bitola. Besides the main purpose of research, there are other purposes which are directly related to the production of the rainbow trout, such as determining food consumption to produce the appropriate amount of fish in a given period, the fish growth in a given period and conversion.

**Materials and methods**

For achieving the aforementioned goals of the research in this paper, examinations and analysis of the situation of fish farming in one of the biggest coldwater fishponds Strezhevo, situated in Pelagonia Region (Bitola, Macedonia) were made. Thereby, the analysis covered the period of 3 years, or processed data from fish production in 2014, 2015 and 2016.
The rainbow trout (*Oncorhynchus mykiss*) is one of the most known fish species grown in the coldwater fishponds. It originated from the North America, from the rivers around San Francisco. In Europe, it was first brought in 1880. It spawns in a controlled manner from the end of November and early December, until late March (depending on water temperature).

**Results**

The coldwater fishponds are covering small areas, but have almost unlimited production capabilities which mainly depend on the amount of water into the flow. The fishpond Strezhevo is a typical coldwater fishpond that is located near Bitola (Macedonia) and in which rainbow trout is grown. The fishpond is supplied with water from the reservoir Strezhevo.
In table 1, the results of rainbow trout production in fishpond Strezhevo from the period of 2014 – 2016 are shown.

**Table 1. Production of rainbow trout in the fishpond Strezhevo 2014, 2015 and 2016**

| Year | 2014 | | 2015 | | 2016 | |
|---|---|---|---|---|---|---|
| **Rainbow trout (*Oncorhynchus mykiss*)** | **Number of pieces** | **Fish weight (kg)** | **Number of pieces** | **Fish weight (kg)** | **Number of pieces** | **Fish weight (kg)** |
| **Consumable fish** | 14.761 | 3.874 | 63.072 | 18.508 | 33.408 | 6.812 |
| **Pre consumed fish** | 85.252 | 12.588 | 23.759 | 3.759 | 162.086 | 14.032 |
| **Fish eggs** | 350.013 | 17.212 | 0.00 | 0.00 | 0.00 | 0.00 |

In 2014, in the fishpond Strezhevo 12.588 kg or 85.252 pieces of pre consumable fish, as well as, 3874 kg or 14.761 pieces of consumable fish are produced.
In 2015, 3.759 kg or 23.759 pieces of pre consumable fish, as well as, 18.508 kg or 63.072 pieces of consumable fish are produced.

In 2016, 14.032 kg or 162.086 pieces of pre consumable fish, as well as, 6.812 kg or 33.408 pieces of consumable fish are produced.

**Table 2. Fish growth, food consumption and conversion for 2014 in the fishpond Strezhevo**

| DESCRIPTION | Input | Output | Condition |
|---|---|---|---|
| | kg | kg | kg |
| Fish food 2 | / | / | / |
| Fish food 3 | / | / | / |
| Fish food 4.5 extruded | 46.575,00 | 44.011,00 | 2.564,00 |
| Fish food 3.0 extruded | 22.000,00 | 22.000,00 | 0,00 |
| Fish food 2.0 extruded | 2.500,00 | 2.500,00 | 0,00 |
| Fish food 4.5 ex. carotene | 6.700,00 | 6.025,00 | 675,00 |
| Fish food 0.3 - 0.5 HE start | 40,00 | 40,00 | 0,00 |
| Fish food 0.5 - 0.8 HE start | 60,00 | 60,00 | 0,00 |
| Fish food 1.0 start | 220,00 | 160,00 | 60,00 |
| Fish food starter | 1.000,00 | 1.000,00 | 0,00 |
| Fish food 2.0 Pre Grover | / | / | / |
| Fish food 4.5 suppressed | 8.000,00 | 8.000,00 | 0,00 |
| Fish food 3.0 suppressed | 5.575,00 | 5.575,00 | 0,00 |
| Fish Food 1.5 | 1.520,00 | 1.520,00 | 0,00 |
| **TOTAL** | **94.190,00** | **90.891,00** | **3.299,00** |
| | | | |
| **Total food consumption in 2014** | | 90.891,00 | |
| **Total fish growth in 2014** | | 60.932,00 | |
| **Conversion with a total production in 2014** | | 1.49 | |

**Table 3. Fish growth, food consumption and conversion for 2015 in the fishpond Strezhevo**

| DESCRIPTION | Input | Output | Condition |
|---|---|---|---|
| | kg | kg | kg |
| Fish food 2 | 3.000,00 | 3.000,00 | 0,00 |
| Fish food 3 | 31.150,00 | 27.825,00 | 3.325,00 |
| Fish food 4.5 extruded | 26.000,00 | 26.000,00 | 0,00 |
| Fish food 3.0 extruded | 3.000,00 | 30.00,00 | 0,00 |
| Fish food 2.0 extruded | 9.175,00 | 8.725,00 | 450,00 |
| Fish food 4.5 ex. carotene | / | / | / |
| Fish food 0.3 - 0.5 HE start | / | / | / |
| Fish food 0.5 - 0.8 HE start | 60,00 | 60,00 | 0,00 |
| Fish food 1.0 start | 1.500,00 | 1.500,00 | 0,00 |
| Fish food starter | / | / | / |
| Fish food 2.0 Pre Grover | / | / | / |
| Fish food 4.5 suppressed | / | / | / |
| Fish food 3.0 suppressed | 1.000,00 | 1.000,00 | 0,00 |
| Fish Food 1.5 | 1.000,00 | 1.000,00 | 0,00 |
| **TOTAL** | **74.885,00** | **71.110,00** | **3.775,00** |
| | | | |
| **Total food consumption in 2015** | | 71.110,00 | |
| **Total fish growth in 2015** | | 51.815,00 | |
| **Conversion with a total production in 2015** | | 1.37 | |

**Table 4. Fish growth, food consumption and conversion for 2016 in the fishpond Strezhevo**

| DESCRIPTION | Input | Output | Condition |
|---|---|---|---|
| | kg | kg | kg |
| Fish food 2 | 4.900,00 | 3.625,00 | 1.275,00 |
| Fish food 3 | 6.800,00 | 6.800,00 | 0,00 |
| Fish food 4.5 extruded | 19.050,00 | 12.475,00 | 6.575,00 |
| Fish food 3.0 extruded | 13.000,00 | 9.925,00 | 3.075,00 |
| Fish food 2.0 extruded | 975,00 | 975,00 | 0,00 |
| Fish food 4.5 ex. carotene | 5.900,00 | 5.075,00 | 825,00 |
| Fish food 0.3 - 0.5 HE start | / | / | / |
| Fish food 0.5 - 0.8 HE start | / | / | / |
| Fish food 1.0 start | 1.500,00 | 620,00 | 880,00 |
| Fish food starter | 300,00 | 300,00 | 0,00 |
| Fish food 2.0 Pre Grover | / | / | / |
| Fish food 4.5 suppressed | 3.000,00 | 3.000,00 | 0,00 |
| Fish food 3.0 suppressed | / | / | / |
| Fish Food 1.5 | 700,00 | 700,00 | 0,00 |
| **TOTAL** | **56.125,00** | **43.495,00** | **12.630,00** |
| | | | |
| **Total food consumption in 2016** | | 43.495,00 | |
| **Total fish growth in 2016** | | 36.880,00 | |
| **Conversion with a total production in 2016** | | 1.18 | |

The whole rotation time or the period from spawn to consumable fish lasts 16-18 months. At every stage of cultivation there are certain losses or perishes, but it's considered that from 1000 pieces of spawn (roe), 350 to 480 samples of consumable fish are obtained (weighing 200 gr).

**Table 5. Fish growth, food consumption and conversion for 2014, 2015 and 2016 in the fishpond Strezhevo**

| Year | Fishpond Strezhevo | | |
|---|---|---|---|
| | Food consumption (kg) | Fish growth (kg) | Conversion |
| **2014** | 90.891 | 60.932 | 1.49 |
| **2015** | 71.110 | 51.815 | 1.37 |
| **2016** | 43.495 | 36.880 | 1.18 |

In 2014 in the fishpond Strezhevo, 90.891 kg fish food is spent and 60.932 kg fish growth is gained. The conversion is 1.49.
In 2015, 71.110 kg fish food is spent and 51.815 kg fish growth is gained. The conversion is 1.37.
In 2016, 43.495 kg fish food is spent and 36.880 kg fish growth is gained. The conversion is 1.18.

**Conclusion**

1. The term coldwater fishpond means pond that breeds coldwater fish species, or fish which live, grow, evolve and reproduce in a temperature range between 4 - 18 °C (optimal temperatures are in the range between 8 -14 °C).

2. The rainbow trout (*Oncorhynchus mykiss*) is one of the most known fish species grown in the coldwater fishponds. It spawns in a controlled manner from the end of November and early December, until late March (depending on water temperature). Females sexually mature in 2nd or 3rd year of life, and males are sexually mature at age of 2 years.
3. The basic principle in the salmonid fishery is to provide cold, clean, clear, unpolluted water, with large amounts of oxygen, which is necessary to be renewed more often, although it can be tolerated certain deviations from the optimal water quality.
4. It is noticed that high fish productivity is conditioned by a proper diet including all of the components that help for intensive growth and development while preventing the occurrence of fish diseases. With properly normalized food, the cultivation of maximum fish production per unit area, as well as, minimum consumption of food can be achieved.

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