International Journal of Nature and Life Sciences (IJNLS)
https://www.journalnatureandlifesci.com
ISSN: Online
Vol. 1(1), June 2017, pp. 17-21

Preliminary study on feeding habits and condition factor of *Salmo trutta macrostigma* (Dumeril, 1858) in Karasu River

Osman Serdar[1], Ebru İfakat Özer[2*]
[1]*Munzur University, Fisheries Faculty, Tunceli, Turkey*
[2]*Munzur University, Pertek Sakine Genç Vocational School, Tunceli, Turkey*
[*]*Corresponding author; ebruozer@munzur.edu.tr*
Received 02 May 2017, Revised 30 May 2017, Published Online: 30 June 2017

Abstract
The study area, which is in the tributary of Karasu River (Yeşildere, Köşk, Ağasuyu, Sincan, Poik, Çiğdemli, Han, Karahasan, Taşağıl, Karataş, Büyükgöze, Deli, Eriç, Kırık, Karnı streams) in the East Anatolia region of Turkey. The total length and weight of the sampled ranged between 8.6-27.4 cm and 5.4-241 g. Following the removal of digestive tracts, stomachs were opened. Stomach contents flooded with distilled water were examined under a stereoscopic microscope. Contents were sorted and prey items were identified. The number of red spotted trout stomachs that contained at least one prey item or any digested remains was 72 (%69.2). There were 32 (%30.8) empty stomachs. The most important groups were mayfly and simulidae (with IRI=58.6% and IRI= 33.2 % respectively) for *Salmo trutta macrostigma* in Karasu River. Chrinomid, stonefly, caddisfly, gammarus, unidentified small fishes were the rare in the food groups. The condition factor varied between 0.820-1.621.

Key words: Condition factor, Karasu River, Red-spotted trout, *Salmo trutta macrostigma,* Stomach contents.

1. Introduction
Salmo trutta macrostigma (Dumeril, 1858) shows distribution North Africa, South Europe, West Asia and Anatolia. This subspecies occurs in the upper parts of streams and rivers and was reported from many running waters in Turkey (Alp *et al*., 2005). It is economically and ecologically very important fish species (Geldiay and Balık, 1988). Biologicial characteristics of *S. t. macrostigma* were throughly investigated in Turkey (Çetinkaya, 1999; Alp et al., 2005; Arslan and Aras, 2007; Başusta et al., 2014). But there have been carried out only a few studies on feeding habits of *S. t. macrostigma* (Alp et al., 2005; Kocabaş et al., 2012). Studies of stomach content analysis provide important insight into fish feeding patterns and quantitative assessment of food habits is an important aspect of fisheries management (Özer and Başusta, 2012). The value of condition factor is used to measure the condition or well being of a species and permits the understanding of general condition, growth and reproduction of fish (Pauly 1993).

In this study; feeding habits and condition factor of *S. t. macrostigma* (Dumeril, 1858) were investigated in Karasu River. Food habits and feeding ecology research are a fundamental tool to understand fish roles within their ecosystems since they indicate relationships based on feeding resources.

2. Material and Methods
The study area, which are in the tributaries of Karasu River (Yeşildere, Köşk, Ağasuyu, Sincan, Poik, Çiğdemli, Han, Karahasan, Taşağıl, Karataş, Büyükgöze, Deli, Eriç, Kırık, Karnı streams) in the East Anatolia Region of Turkey (Figure 1). Fish samples were immediately immersed in a plastic barrel containing 4% formalin solution for later analysis in the laboratory.

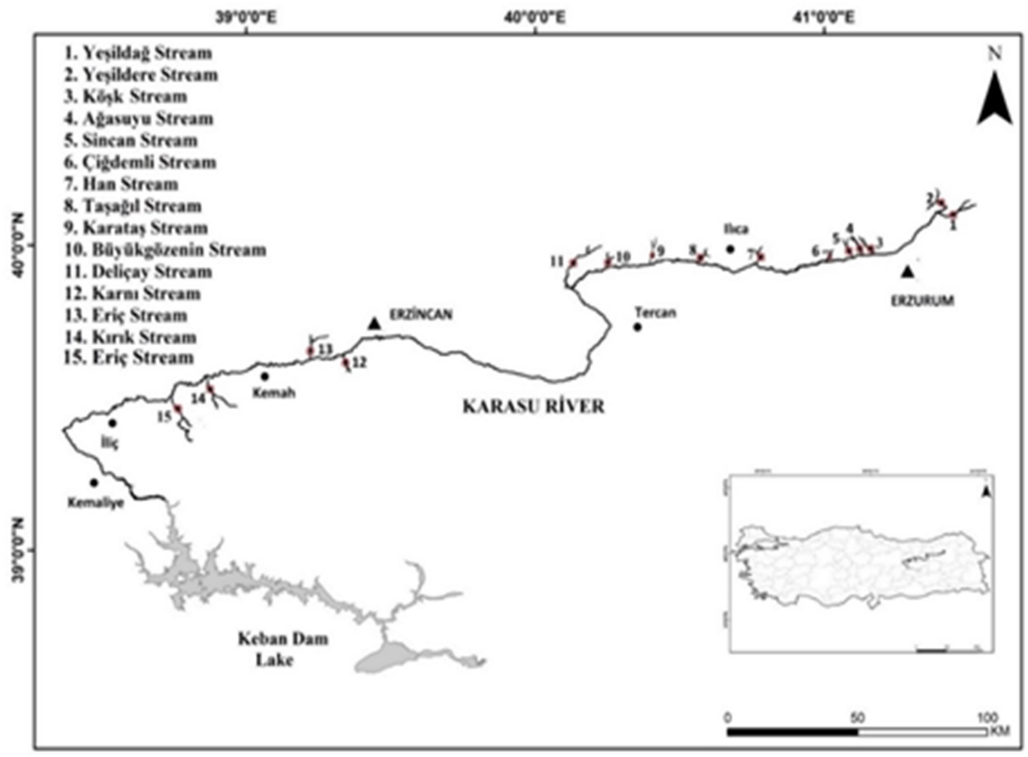

Figure 1. The map of the study area and working station.

For each fish total weight (g), total length (cm) and sex were recorded. Following the removal of digestive tracts, stomachs were opened. Stomach contents flooded with distilled water were examined under a stereoscopic microscope. Contents were sorted and prey items were identified using the identification keys given by Geldiay and Balık, 1988. Food items were damp dried on paper towels and the number of individuals and total weight of each prey were recorded. Stomach having no food items were recorded as empty stomachs. Stomach fullness index was determined according to the scale Lebedev (Lebedev, 1946) which from 0 to 5 (0= Empty, 1=0-25%, 2=25-50%, 3=50-75%, 4=75-100, 5>100%). Prey organisms were identified to the lowest possible order. Stomach contents were analyzed under the microscope and quantified in accordance with occurrence method (Hyslop, 1980).

The main food items were identified using the index of relative importance (IRI): IRI = F% * (N% + W%); the index was expressed as: IRI% = (IRI / ∑ IRI) * 100 (Pinkas et al., 1971) where F% is the percentage of frequency of occurrence of stomach in which a food item occurred to the total number of stomach containing food items, N% is numeric percentage of individuals of a food item to the total number of food items in the stomach, and W% is the percentage of weight of a food item to the weight of the total stomach contents.

Condition factor of *S.t. macrostigma* were estimated by the equation $CF = (W/TL^3)*100$ by using total body weight (g), total length (cm) and growth exponent (b).

3. Results and Discussion

The total length and weight of the sampled ranged between 8.6-27.4 cm and 5.4-241 g. The number of red spotted trout stomachs that contained at least one prey item or any digested remains was 72 (%69.2). There were 32 (%30.8) empty stomachs. Examination of the stomach of fish seven different groups of organisms collected in the nutrient was found. The most important groups were mayfly and simulidae for *S. t. macrostigma* in the Karasu River. Chrinomid, stonefly, caddisfly, gammarus and unidentified small fishes were the rare in the food groups (Figure 2). Examination of the diet of *S. t. macrostigma* showed that there was high percentage of mayfly and simulidae (Figure 3). In addition, plant seeds and stones were rarely present in the stomach contents.

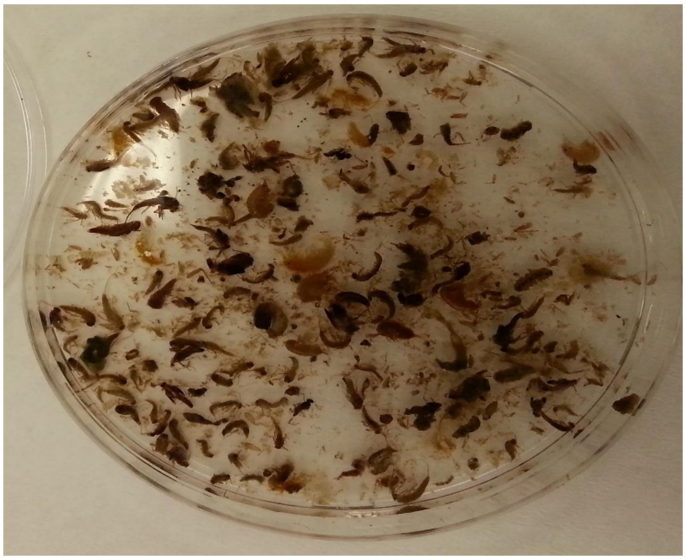

Figure 2. Stomach contents of *S. t. macrostigma* in Karasu River.

During the study, 142 individual preys were counted from 72 *S. t. macrostigma* examined and their total wet weight was 21.03 g. By individual, the most representative prey was mayfly (n: 82; 57.7%) and simulidae (n: 46; 32.9%). By weight, of the 21.03 g biomass, 12.08 g was composed of mayfly (57.4%), 7.06 g of simulidae (33.57%), and 1.89 g were composed of other food items (8.98%).

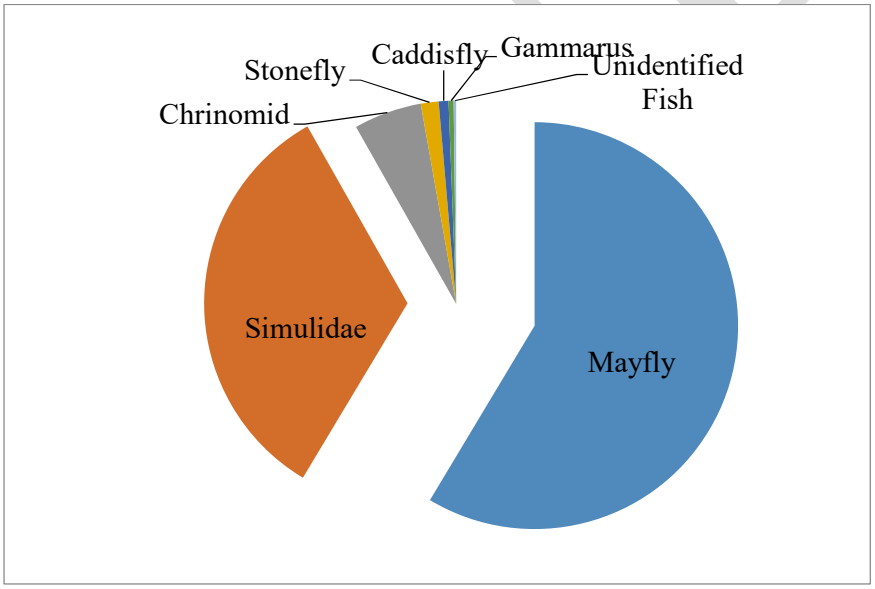

Figure 3. Occurrence of food items of *S. t. macrostigma* in Karasu River.

According to the percent of the Index of Relative Importance (IRI%), two food items represented more than 90% of the total diet, with the most abundant being Mayfly (58.6%) and Simulidae (33.2%) (Figure 4).

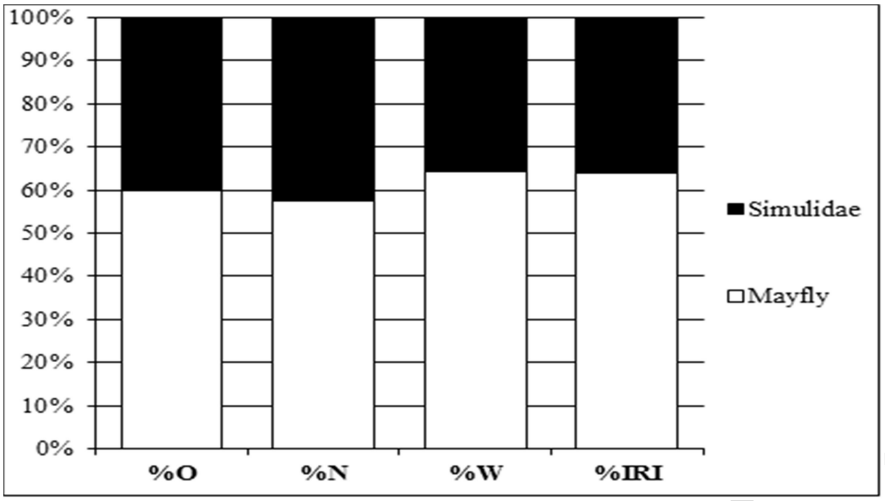

Figure 4. Food items (Mayfly and Simulidae) and their relative importance index in the diet composition of *S. t. macrostigma* in Karasu River (O: occurrence of a certain food item; N: The number of a certain food item; W: The weight of a certain food item; IRI: Index of the Relative Importance of a certain food item.).

Alp et al. (2005), 24.24% of the stomachs were empty and most of the prey on the stomachs were benthic organisms in December, while in the Fırnız River most of the stomachs were full during the summer months. Kocabaş et al. (2012), was found as 16% of stomachs were empty; basic food items of the *S. t. macrostigma* were Annelid and Arthopod in Uzungöl Dam Lake. In our study, at least one food item or digested material was detected in 69.2% of the stomachs, while 30.8% of the stomachs were found to be completely empty. In terms of numerical, food items are mayfly, simulidae, chrinomd, stonefly, caddishfly, gammarus and small fish, respectively.

The condition factor of *S. t. macrostigma* in Karasu River was investigated for length groups (Figure 5). Condition factor was generally increased with respect to length groups but a reduction in the range of 23-25 cm length was observed. The average condition factor was found 1.18 in females, 1.23 in males and 1.18 all individuals. The highest condition factor was found 20-22 cm length group. Alp et al. (2005) reported condition factor range 1.13 to 1.85 in the Fırnız Stream. Kocabaş et al., (2012) reported condition factor range 0.57 to 1.58 in the Uzungöl Dam Lake. In the present study, condition factor was determinate as range 0.82 to 1.62 and it was obtained as similar result with the other studies.

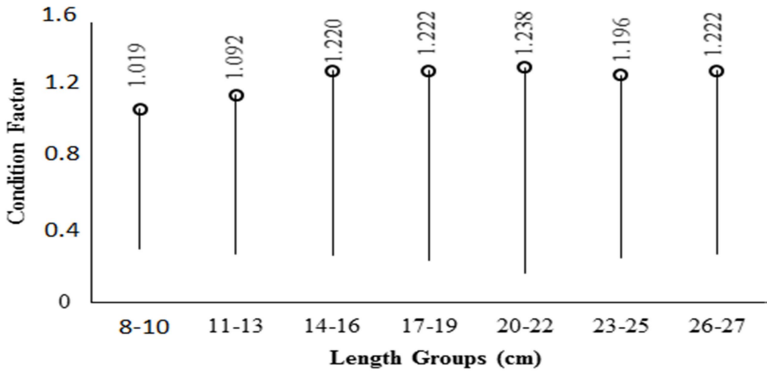

Figure 5. The condition factors in different length groups of *S. t. macrostigma* in Karasu River.

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