Research Open

Aquaculture and Fisheries Studies
Volume 4 Issue 4

Research Article

Investigating Feeding Regimen of Brown Trout (*Salmo Trutta* Fario) in Tonekabon River, Northern Iran

Mehran Moslemi[1]*, Mohamadreza Ahmadi[2] and Ali Barzegar[3]

[1]Faculty member at Islamic Azad University, Joybar Branch, Iran
[2]Department of Fisheries, Faculty of Natural Resources, University of Tehran, Iran
[3]Department of Basic Sciences-Sari Agricultural Sciences and Natural Resources University, Iran

Corresponding author: Mehran moslemi, Faculty member at Islamic Azad University, Joybar Branch, Iran; **Tel:** 09111262026

Received: May 11, 2022; **Accepted:** May 16, 2022; **Published:** June 29, 2022

Abstract

The present study was conducted in a four-season period, from September 2016 to 2017, in Tonekabon River, northern Iran. A total of 91 brown trout (*Salmo Trutta* Fario) fish were collected from five stations using electrofishing equipment. They composed 40 females, 41 males, and 10 of unknown sex. Their age ranged from 1 to 3 years, and they had a minimum and maximum length of 41 mm and 175 mm, respectively. The preys identified within their gastrointestinal tract included insect larvae of *Ephemeroptera*, *Diptera*, *Liponeura*, *Simulium*, *Hydropsyche*, *Coleopteran*, *Trichoptera*, flying insect, spawn, *Odonata*, *Oligochaeta*, *Plecoptera* taxonomic groups. The collected fish were classified into three age groups including 1- and <1-year, 2-years, and 3-years old as a scale to define their feeding intensity. The consumption percentage of *Hydropsyche* and *Liponeura* was significantly different among three classes. However, there was no significant difference in the consumption intensities of *Ephemeroptera*, *Plecoptera*, and *Simulium*. The reproduction season of brown trout fish is within fall. Maximum feeding intensity occurs in spring, whereas minimum feeding takes place within summer and fall seasons. Classes 1 and <1-year-old had higher feeding intensity than other classes (classes 2 and 3 years old). In general, *Plecoptera*, *Ephemeroptera* and *Simulium* constitute primary preys of the fish, while *Liponeura*, *Hydropsyche*, *Dipteral*, *Trichoptera*, and *Oligochaete*, *Coleoptera*, *Oligochaeta*, *Odonatan*, flying insects, and spawn are considered as the subordinate preys for the feeding regimen of brown trout. The highest amount of prey for stations 1, 2, 3, 4 and 5 included *Simolium*, *Ephemeroptera*, *Simolium*, *Simolium* and *Liponeura*, respectively. Station 2 had the highest glutting stomach index, followed by station 1, both of which were located on the Se-Hezar River.

Keywords: *Brown trout, Feeding habit, Gutting stomach index, Tonekabon River*

Introduction

The Tonekabon River is located in western Mazandaran. Thanks to its peculiar physicochemical properties and benthic material, it is brimmed an outstanding biodiversity. This river is one of the most waterfull (Hig dischange) rivers south of the Caspian Sea. This river comprises the Do-Hezar, Se-Hezar and Valamrod rivers. In addition to aqous animals, it harbors various species, such as salmonidae, cyprinidae and angailidae [1]. Brown trout (salmo trutta fario) is one of most important species in the Tonekabon River that inhabits the conflux of these rivers. Due to its physicochemical properties [2] and the ecological condition [3,4], it is considered as a native fish. This species has economic value, especially, it is one of the most popular species among sportsman for angling [5,6]. The low survival rates of Chinook salmon (oncorhynchus tshawytscha) smolts in California's

Central Valley has been attributed to multiple biological and physical factors, although the impact of each factor remains unclear [7]. This thesis is on effort to identify feeding regiment of this species in the Tonekabon River. As we know, feeding is one of the most important needs of an organism. Fir Fochetti, R st order necessities of an organism (growth, development and reproduction) altogether conduct with consumed energy from food entered to body all of other energy-required processes in fish body accomplish with food consumption [8]. In aquaculture, fish feeding is a critical step that everyone in encounter this issue in fishery industry for solving related issues. At present research on studying fish distribution of fish species [9,10]. It is impossible to design a logical optimization method for commercial fish reserves without identifying how the fish seek their food sources and learning about the relationship between the fish and other consumer of the food source and the connection between predators [11,12]. Understanding the type and composition of food organisms consumed by other competitors, the amount and way of food consumption, and linkage between feeding with time. Place and condition and some of other factors allow researchers to achieve a complete [13] and comprehensive perspective on the life of organisms [3]. The findings of this research can be used to a better understanding of ecological condition of brown trout's habitat in the Tonekabon River.

Material and Methods

Ethical Statement

Respectfully yours, the red-spotted trout caught in this article were carried out in compliance with the standards, and no damage was done to the fish and the fish environment was not polluted

during the fishing. It is related to a few years ago and it is related to my dissertation. Also in Iran, there is correspondence in the field of observing facial ethics. However, according to the international re, all students observed professional ethics in working with living beings regulations.

First, the Do-Hezar and Se-Hezar rivers in Tonekabon were divided into five stations. Then, the fish were collected using an electroshock instrument with a power of 1.7 KM (DC) and a 300-400V voltage. Immediately after fishing, the biometry properties of the fish were measured. Then, by cutting the gullet (in the throat) and cutting the gut in the rectum, the digestion apparatus was removed from and fixed in 70% alcohol.

The following information was collected and recorded in the sampling process: total length, fork length, standard length, fish weight, stomach weight, gender determination, gonad weight, age, and gut length. The fixed stomachs were taken from alcohol, rinsed with water, and placed in Petri dishes. The stomach was opened, and the swallowed preys were examined thoroughly [14]. The type and the number of preys, and the percentage of prey groups were recorded. The weight of the stomach content was also measured. The sexual maturity index was calculated from the following formula:

Sexual maturity index = ((gonad weight/(body weight-entrails weight))*100

The relative length of the gut, i.e., the gut length to body length ratio, was calculated. Also, the gutted stomach index (GSI) was calculated based on the following formula [15]:

GSI=stomach content weight/body weight.

Results

The average percentage of preys fed by brown trout during the perfect period is as follows: The frequency of primary, subordinate, and casual preys of brown trout was calculated using the formula below: $F_p=N_p*100/N_1$

F_p: prey frequency

N_p: number of N stomach than has P prey

N_1: number of investigated gutted stomach

If F_p has a value of above 50, the prey is considered primary; however, if this value is between 10-50, the prey is considered as subordinate prey. Finally, F_p values below 10 are considered as casual prey. Results from this investigation were analyzed using the variance analysis test. The amount of sexual maturity index in various seasons among the male and female fish was calculated based on the following table (Tables 1-3):

The relative length of gut (RLG) in each studied specimen was less than one, indicating the carnivore nature of the fish studied. Gutted stomach index in males and females was compared in different seasons. The maximum and minimum levels of the gutted stomach index in males were observed in spring and autumn. Also, the maximum and minimum levels of the gutted stomach index in females were in spring and summer.

Table 1: The average percentage of prey fed by brown trout during the perfect period.

	Percentage	Prey
Primary prey	34.14	Simulium
Primary prey	24.36	Ephemeroptera
Subordinate prey	16.40	Liponeura
Primary prey	11.68	Plecoptera
Subordinate prey	9.08	Hydropsyche
Subordinate prey	1.58	Diptera
Casual prey	0.78	Flying insects
Casual prey	0.73	Cleoptera
Subordinate prey	0.53	Trichoptera
Casual prey	0.30	Oligochaeta
Casual prey	0.27	Odonata
Casual prey	0.14	Spawn

Table 2: the amount of sexual maturity index.

Winter	Autumn	Summer	Spring	Sexual maturity index
0.24	1.6	3.36	0.38	Male
0.34	0.21	21.3	0.42	Female
0.27	0.73	2.79	0.43	Average

Table 3: Guttled stomach index (GSI) in males and females in different seasons.

Winter	Autumn	Summer	Spring	GSI
166.40	132.42	170.93	276.92	male
200.65	117.98	116.41	246.48	Female

Discussion

For a more accurate age-based analysis of the fish, they were divided into three classes:

Class1: the fish below equal to or below one year of age.

Class2: The two-year-old fish.

Class3: The three-year-old fish.

The variance analysis test showed a significant difference between different classes in terms of the consumption of hydropsyche. In contrast, this test did not show a significant difference between the designated classes in the consumption percentage of Ephemeroptera. The high sexual maturity index in summer confirms that the spawning season in this fish is from mid-September to autumn.

The mean of RLG in different classes was:

Class one=0.32, class two=0.33, class three=0.35

The maximum of gutted stomach index is in spring, and the minimum of this index occurs in fall and winter. These results agree with the findings of [16] on brown trout in Bager lake and the Lepenica River. Also, decreased feeding in summer and fall (especially summer) compared to winter could be a high sexual maturity index in these seasons (summer and autumn) [11].

Results from feeding intensity between three classes 2 and 3. These findings confirmed that brown trout in the early stages consumed more than later stages. The weight of stomach content in the smallest fish and the larger classes had a significant difference at (1%), but the numbers of organisms in this level had no significant differences, confirming that brown trout could catch larger prey if the prey size increased.

The results also indicated that the frequency of consumed organisms during different seasons based on presence was changeable, confirming that brown trout fed on the most frequent and most well-known prey. The presence of spawn in one of the samples also verified the selection factor based on the presence of prey. Furthermore, brown trout's summer consumption of flying insects led to two conclusions: first, it could take some of its food (prey) at water level. Second, the feeding somehow varied with season and food (prey) presence because these land-living insects were scarce in other seasons [2,14].

Data Availability Statement

The data is related to Mehran Moslemi's master's thesis. The supervisor of this thesis was Dr. Mohammad Reza Ahmadi. If required, the information related to the data of this article is available in the Central Library of the University of Tehran.

References

1. Ride ditmare (1986) Fish and fishery, translated by Vosoghi G. and Ahmadi M., Markaz-e-Daneshgahi publication 89-91.
2. Demir O, Gumus E, Kucuk F, Gunlu A, Kepenek (2010) Some repreactive features of brown trout (Trout, Salmo trutta macrostigma Dumeril 1858) and its larval development under culture condition. *Pak Vet. Journal* 30: 223-226.
3. Gunderson AR, Armstrong EJ, Stillman JH (2016) Multiple Stressors in a Changing World: The Need for an Improved Perspective on Physiological Responses to the Dynamic Marine Environment. *Annual Reviews in Marine Science* 8: 357-378. [crossref]
4. Todgham AE, Stillman JH (2013) Physiological responses to shifts in multiple environmental stressors: relevance in a changing world. *Integrative and Comparative Biology* 53: 539-544. [crossref]
5. Fochetti R, Argano R, Tierno De Figueroa JM (2008) Feeding ecology of various age-classes of brown trout in River Nera, Central Itally. *Belg. J. Zool* 138: 128-131.
6. Vosoghi Gholamhosein, Mostajir Behzad (1990) Freshwater fish, Tehran University publication.
7. Henderson MJ, Iglesias IS, Michel CJ, Ammann AJ, Huff DD (2019) Estimating spatial-temporal differences in Chinook salmon outmigration survival with habitat- and predation- related covariates. *Can J Fish Aquat Sci* 76: 1549-1561.
8. Saidi, Ali Asghar (1990) Tonekabon River, fisheries Research Center, Mazandaran province.
9. Bud IL, Vladau VV (2009) The geographic isolation impact on evolution of some morphophysiological features in the brown trout (Salmo trutta fario Linnaeus). *AACL Bioflux* 1: 31-49.
10. Sajadi Masoud (1996) The investigation of feeding regiment in Stizostedion luciaperca, M. S. thesis, Tehran University, under supervision Dr. Mohamad Reza Ahmadi.
11. Alp A, Kara C, Buyukcapar HM (2005) Age, growth and diet composition of the Resident Brown Trout, Salmo trutta macrostigma Dumeril 1858, in firniz stream of the River Ceyhan, Turkey. *Turk. J. vel. Anim. Sci* 29: 285-295.
12. Todgham AE, Stillman JH (2013) Physiological responses to shifts in multiple environmental stressors: relevance in a changing world. I*ntegrative and Comparative Biology* 53: 539-544. [crossref]
13. Rakocevic J, Sukovic D, Maric D (2018) Distribution and Relationships of Eleven Trace Elements in Muscle of Six Fish Species from Skadar Lake (Montenegro). *Turkish Journal of Fisheries and Aquatic Sciences* 18: 647-657.
14. Nafisi Mahmoud (1990) The hand book of identification of invertebrate in running waters, project of bachelor, Tehran University, under supervision of Mohamadreza Ahmadi.
15. Hynes HB (1970) The ecology of Running Water, University of Toronto Press, Canada. 555p.
16. Fašaić K, Debeljak L (1986) Hidrokemijski režim u ribnjacima za vrijeme zimovanja mlađa riba biljojeda u uvjetima povećane gustoće nasada. *Croatian Journal of Fisheries: Ribarstvo* 41: 1-7.

Citation:

Moslemi M, Ahmadi M, Barzegar A (2022) Investigating Feeding Regimen of Brown Trout (*Salmo Trutta* Fario) in Tonekabon River, Northern Iran. *Aquac Fish Stud* Volume 4(4): 1-3.