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Diet Composition and Prey Selection of Flathead Trout (*Salmo Platycephalus*, Behnke, 1968) in Zamanti Stream of Seyhan River, Turkey

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Abstract
Diet composition and prey selection of flathead trout (*Salmo platycephalus*) were studied in Zamanti stream, Turkey. Stomach contents of 120 specimens were collected between June 2005 and April 2006. Analysis of monthly variations of stomach fullness indicated that feeding intensity was higher between June and August than that of the spawning season in the period from September to November. A total of 18 prey taxa representing Malacostraca, Clitellata, Tricoptera, Hemiptera, Gastropoda, Ephemeroptera, Turbellaria, Coleoptera, Plecoptera, Nematoda, Diptera was identified in the diet. The index of relative importance index (IRI%) indicate that the most important feeding organism of flathead trout specimens in Zamanti stream is *Gammarus* sp. and they are more than 90 % of total diet composition. The Shannon-Weinner index, food diversity in the stomach contents are generally high except for reproduction period. *Gammarus* sp. was the most abundant prey organizm in the Zamanti stream ecosystem, accounting for 81.38 % of *Gammarus* sp. in the environment samples. However, they made up 87.08% of all prey macroinvertebrates consumed by flathead trout. In terms of diet selectivity index *Gammarus* sp.has positive selectivity, but selectivity index has not important statistically (Va = 0.067, $\chi 2$= 0.909, p>0.05). The other organism groups have rather low and not significant availability ratios in the diet with Zamanti stream ecosystem (p>0.05).

Keywods: Diet composition, feeding, prey selection, *Salmo platycephalus*, river Seyhan

Introduction

Seyhan Basin is located in the south of Turkey and east Mediterranean district. It becomes a larger river with the merger of Zamantı and Göksu Stream. In addition, Karagöz Stream is an another important branch of Zamantı Stream (Figure 1). It borns in Uzunyayla district in the north of Gövdeli Mountain (2719 m) in the eastern Toros Mountain. This area forms the upper basin of Zamantı Stream. The upper basin of Stream Zamantı merges to the basin of Tomarza with a channel in the west of Pınarbaşı (Sunkar, 2008). This basin has meanders formed by collapsing of the lakes in the late of Pliosen and early Kuaterner (Sunkar, 2008). Riparian zone of the Zamantı Stream is often covered by meadows in the district of Uzunyayla-Örenşehir. A new torut species and subgenus, flathead trout (*S. platycephalus*) was reported by Behnke (1968) in stream Zamantı of Seyhan River. Flathead trout in Seyhan River has a much restricted distribution. It has been reported in Soğuksu, Sarız Stream, Karagöz and Uzunyayla of Stream Zamantı (Behnke, 1968; Alp and Kara, 2004; Sušnik et al., 2004).
Salmo platycephalus was also reported in Örenşehir-Uzunyayla (Alp and Kara, 2004), Soğuksu and Karagöz (Behnke, 1968) in the upper Seyhan Basin. Weight and condition factors (Alp and Kara, 2004), growth and reproductive properties (Kara et.al., 2011), philogenetic traits (Sušnik et al., 2004; Bardakçı et. al., 2006) and conservation status (Tarkan et al., 2008) of *S. platycephalus* were carried out in the previous studies. According to some of these studies (Bernatchez 2001; Sušnik et al. 2004) and Bardakçı et. al. 2006) *Salmo platycephalus* was not a new subgenus-species of *Salmo* and it was actually *Salmo trutta*. The taxonomic status of the trout in Zamantı Stream is controversial. Although, moleculer

studies (Susnik et al, 2004; Bardakçı et al, 2006) claim that this species is *Salmo tutta*, however taxonomists (Balık, 2009; Turan et al., 2011; Turan et al., 2012) reported that this specis is actually *Salmo platycephalus*.

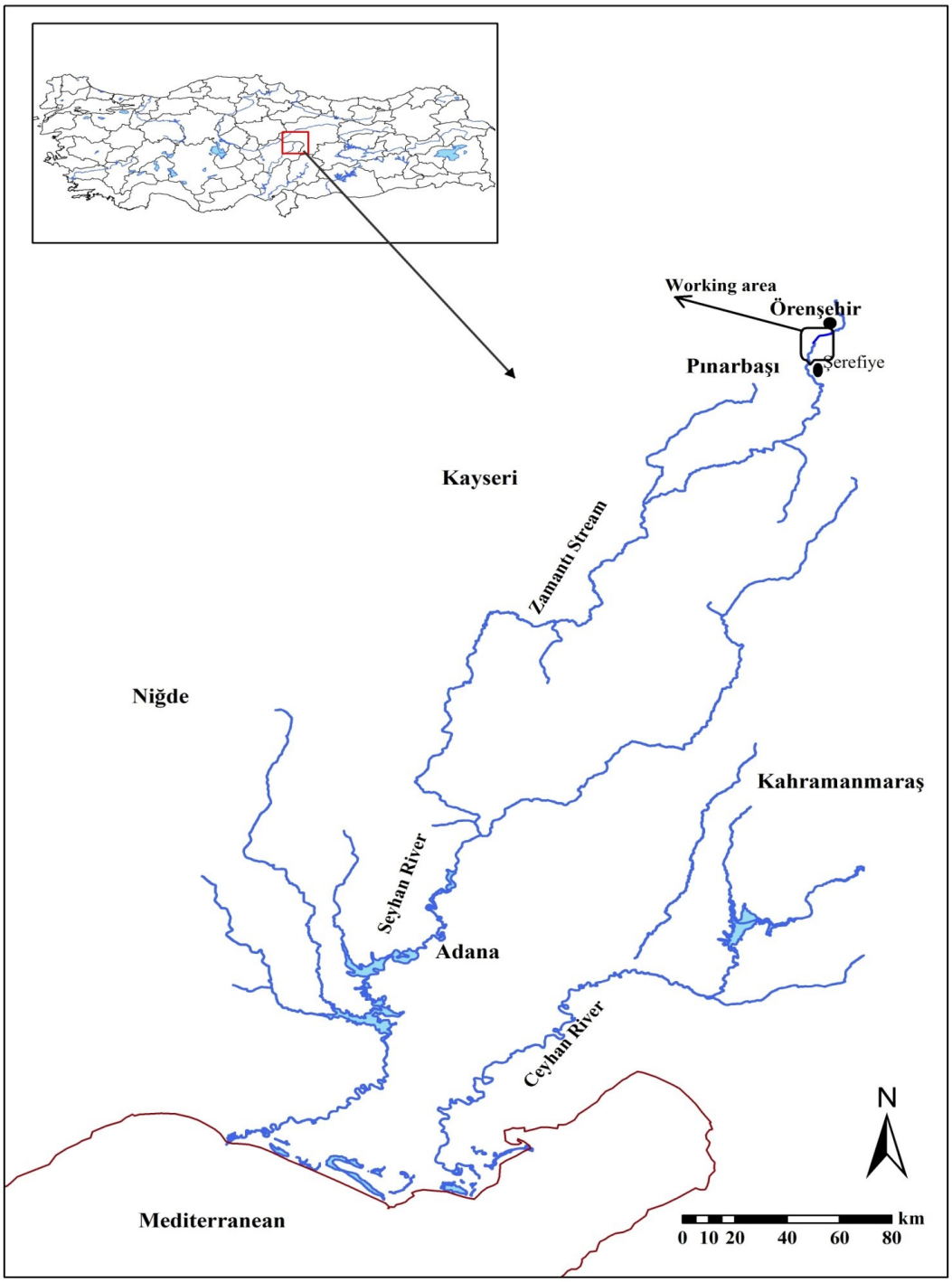


Figure 1. The map of the working area.

Diets of *S. trutta* inhabiting various geographic regions in the world have been well documented (Cavalli, et.al., 1998; Saksgärd and Hesthagen, 2004). Similarly, diets of *S. trutta* inhabiting various geographic regions in Turkey have been well documented (Aras et. al., 1997; Lagarrigue, et. al., 2002; Alp and Kara, 2004; Alp et. al., 2005; Kara and Alp, 2005). However, there is no information on diet composition and prey selection in flathead trout populations. It is well known that flathead trout can play an important role in the aquatic ecosystems.Therefore, we need to know the feeding and food habits of flathead trout and flated trout-prey in relation to habitat for biological conservation.

In this study, the seasonal dynamics in diet consumption of flathead trout in stream Zamantı of river Seyhan were studied to obtain feeding data as well as data on the abundance of other prey organisms. Analysis of stomach contents, season, sex of fish and food diversity. Accordingly, the aims of the study were to (i) describe flated trout diet composition; (ii) determine seasonal changes in different size groups; (iii) investigate prey selection by flated trout in Stream Zamantı of river Seyhan.

Materials and Methods

A total of 120 flathead trout specimens were caught by electrofishing monthly in between Örenşehir and Şerefiye willage from Stream Zamantı (Figure 1) between June 2005 and April 2006. All the captured fish specimens were immediately preserved in a plastic barrel containing 4% formalin solution and taken to the laboratory. For each fish, total weight (g), fork length (mm) and sex were recorded. After removal of digestive tract, stomach was opened, its content was flushed into a petri dish and contents were weighed (g). Stomach content flooded with distilled water was examined under a stereoscopic microscope. Contents were sorted and prey items were identified to the lowest feasible taxonomic units using the identification keys of Edmondson (1959), Demirsoy (1990), Geldiay and Balık (1988), McCafferty (1983). Food items were damp dried on paper towels and the number of individuals and total weight of each prey category were recorded. Tract contents having no food items were also recorded as empty stomachs. Fishing data were grouped according to prey species; the proportion of each fish species in the stream was determined.The Fullness Index (FI) was calculated to investigatethe variations in feeding intensity, using the equation: FI=(Weight of stomach contents/Total weight of fish)*10000 (Windell, 1971). All procedures involving fish were approved by the University of Kahramanmaras, Animal Care and Use Committe.

Macroinvertabrate samples were collected at the the same region where trouts samples were caught. Macroinvertebrates were collected by kicking for 3 minutes with 3 replications at the sampling sites with a kick-net (1 mm mesh size, frame 50 cm in height and 60 in wide). Kick-net applications were applied at the three different points (left section, middle section and right section) at the selected station in the stream. Macroinvertebrates were taken to the laboratory into the plastic bags. The collected macoinvertabrat material was sieved through two sieves with mesh sizes of 0.5 mm and 0.05 mm and the organisms were preserved in 80% alcohol.

In order to express the importance of the prey items, the percentage of the relative importance index (IRI%) (Pinkas et al., 1971; Cortes, 1997) was used. This index (IRI%) is a compound index composed of the percent frequency of occurence (*O*%), percentage by weight (*W*%), and numerical percentage (*N*%) (Pinkas et al., 1971; Cortes, 1997; Liao et al., 2002). These percentages and relative importance index (IRI) were calculated as:

$$N_i\% = \frac{100 * N_i}{\sum_{i=1}^{n} N_i}; O_i\% = \frac{100 * O_i}{\sum_{i=1}^{n} O_i}; W_i\% = \frac{100 * W_i}{\sum_{i=1}^{n} W_i}; \quad (1)$$

$$\text{IRI}_i = (Ni\% + Wi\%) * Oi\% \text{ and } \text{IRI}_i\% = \frac{100 * IRI_i}{\sum_{i=1}^{n} IRI_i} \quad (2)$$

where *n* is the total number of prey in the examined stomachs, and *Wi* and *Ni* are the total wet weight and number of prey. *Oi* is the number of trout stomachs containing prey *i.*

The diet diversity of the sampled population *(H')* was calculated using the Shannon-Wienner diversity index ($H' = -\sum p_i . \log_2 p_i$), where p_i is the population of the prey item *i* among the total number of preys. The use of the Shannon-Wienner index provides a relatively objective indication of niche breadth (Marshall&Elliott, 1997).

To estimate prey preference of flathead trout, the prey selection index(*Va*) proposed by Pearre (1982) was calculated. This index ranges between 1 (strong positive selection) and 1 (strong negative selection), with a value of zero indicating neutral selection. The index was calculated as:

$$V_a = \frac{(a_d * b_e) - (a_e * b_d)}{\sqrt{(a * b * d * c * e)}}, \quad (3)$$

where *Va* is Pearre's index for trout selection of species *a*, *ad* is relative abundance of species *a* in the diet, *be* is the relative abundance of all other species in the environment, *ae* is the relative abundance of species *a* in the environment, and *bd* is the relative abundance of all other species in the diet. Values without subscripts are expressed as: $a = ad + ae$, $b = bd + be$, $d = ad + bd$, $e = ae + be$. The selection index (Va) is statistically tested using the chi-squared test: $\chi^2 = n*V^2$. Where, $n = ad + ae + bd + be$.

Results

Feeding intensity

The monthly length and weigth of the flathead trouts caught in between June 2005 and April 2006 were given in Table 1. The standard length of the examined flathead trouts varied from 176.2 (108.9 g in weight) to 347.2 mm (569.4 g in weight).

Of the total stomach analysed, 9.24 % were empty. In the spring months most of the stomachs of flathed trout were full, while 16.66 % of the stomach were empty in November during the spawning season Figure 2 a. The empty stomachs between 90 mm and 290 mm in length varied from 10.0 5 to 13.51 % (Figure 2b).

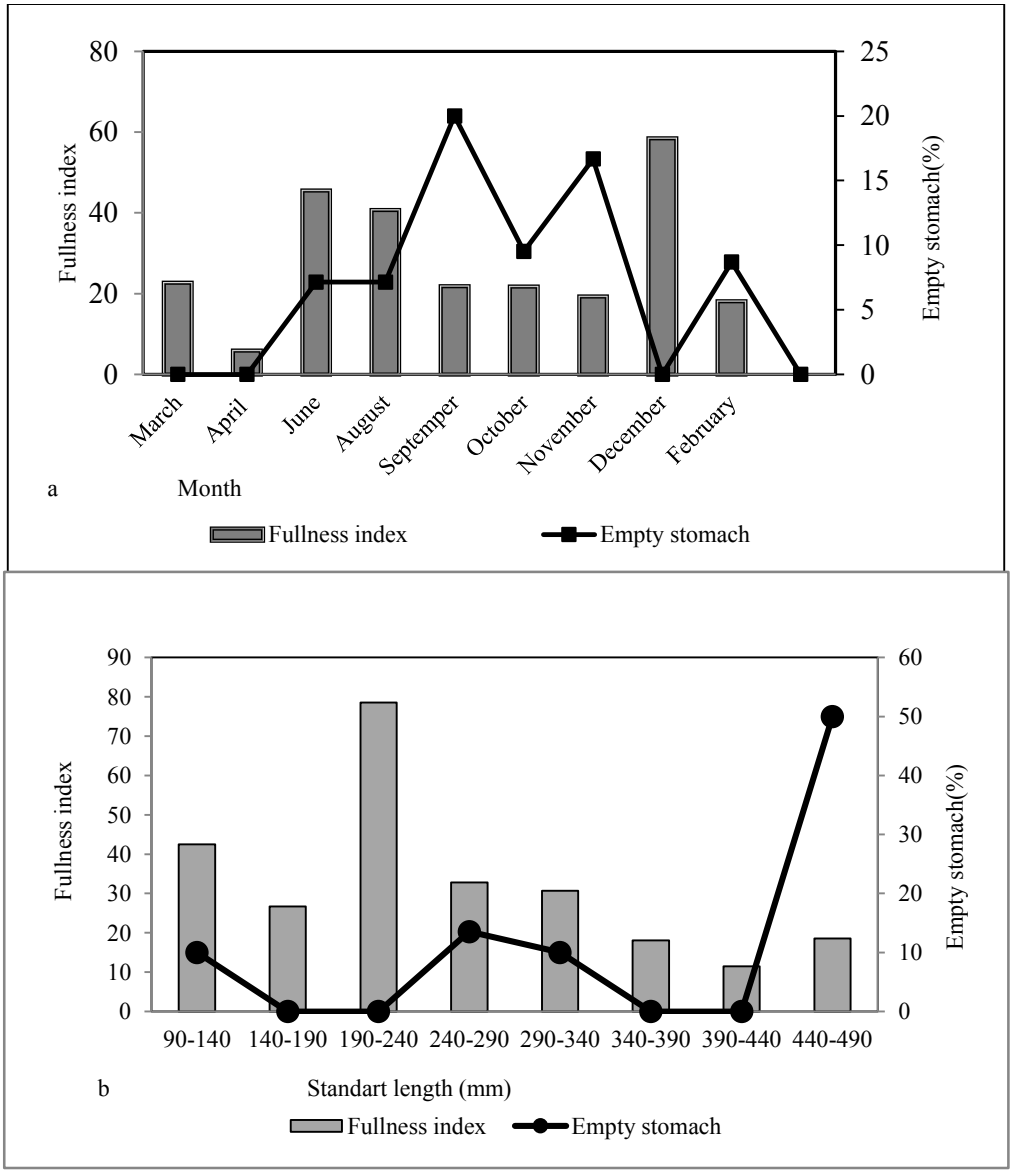


Figure 2. Variations in feeding intensity, fullness index and empty stomach of flathead trout; a. Monthly variations b.Variations in the length groups. (FI: Fullness index, ES: Empty stomach).

Fullness index (*FI*) rates in flathead trout specimens indicated differences in terms of months. Maximum fullness index were observed in December, June and August, while the index showed a decline from April and February. The flathead trout fed most intensively during summer and winter (December). Length groups which 90-140 mm and 190-240 mm in flathead trout specimens, fullness index rates were found as high in terms of length groups (Figure2 b).

Table 1. The standart lengths (mm) and total weights (g) in the months of *Salmo platycephalus* from the Zamantı stream of the river Seyhan. (N: Individual number; SL: Standart length; W:Weight, SD: Standart deviation).

Nonths	Sex	N	Mean SL (mm)	Min-Max.	SD	Mean W(g)	Min.-Max.	SD
	Juvenile	1	149.27	-	-	58.0	-	-
June	Female	4	183.7	163.6-199.1	16.90	119.05	79.2-151.5	33.48
	Male	9	175.9	124.75-204.16	27.16	110.15	37.7-171.3	43.38
	Conbined sex	14	176.23	124.75-204.98	24.36	108.87	37.7-171.3	40.61
	Juvenile	-	-	-	-	-	-	-
August	Female	7	243.58	191.99-410.2	77.50	309.65	121.3-1049.9	334.33
	Male	7	267.80	191.74-440.5	83.96	362.80	129.6-1123.4	346.91
	Conbined sex	14	255.69	191.74-440.5	78.63	336.22	121.3-1123,4	328.47
	Juvenile	1	169.84	-	-	132.0	-	-
September	Female	7	256.94	94.93-315.81	73.46	368.0	202.6-492.2	91.99
	Male	7	288.2	259.09-348.92	31.05	459.17	322.3-742.3	141.82
	Conbined sex	15	265.73	94.93-348.92	62.78	394.81	132.0-742.3	144.95
	Juvenile	-	-	-	-	-	-	-
October	Female	8	273.77	255.74-308.89	21.11	349.01	273.4-510.9	96.23
	Male	13	280.66	211.84-333.19	31.88	422.43	196.9-675.5	131.91
	Conbined sex	21	278.04	211.84-333.19	27.89	394.46	196.9-675.5	122.54
	Juvenile	-	-	-	-	-		
November	Female	6	336.02	302.56-448.28	56.49	711.4	503.3-1513.1	396.9
	Male	5	304.66	288.92-334.44	17.94	500.18	345.4-662.7	115.62
	Conbined sex	11	321.76	288.92-448.28	44.64	615.39	345.4-1513.1	310.29
	Juvenile	-	-	-	-	-	-	-
December	Female	5	289.38	263.37-304.13	17.16	445.08	354.6-561.1	93.75
	Male	3	330.20	322.12-338.75	8.32	653.00	582.0-695.8	61.91
	Conbined sex	8	304.69	263.37-338.75	25.18	523.05	354.6-695.8	133.03
	Juvenile	6	114.84	102.09-132.84	13.83	28.73	19.7-42.4	9.99
February	Female	13	313.75	239.34-463.94	52.99	558.22	262.9-1316.1	260.22
	Male	2	285.08	274.12-296.05	15.50	380.50	341.0-420.0	55.86
	Conbined sex	21	254.18	102.09-463.94	99.85	390.01	19.7-1316.1	313.63
	Juvenile	1	132.04	-	-	42.40	-	-
March	Female	8	318.87	253.99-369.83	41.88	537.27	406.1-739.2	122.14
	Male	1	355.78	-	-	988.70	-	-
	Conbined sex	10	303.88	132.04-369.83	71.72	532.93	42.4-988.7	247.86
	Juvenile	-	-	-	-	-	-	-
April	Female	3	358.99	280.39-437.83	78.72	566.56	42.4-1263.6	628.68
	Male	3	352.74	321.15-404.66	36.40	572.30	436.5-656.9	118.78
	Conbined sex	6	347.21	280.39-437.83	52.16	569.43	42.4-1263.6	404.66

Diet composition

Total 18 number prey organisms were determined in the digestive systems of trouts caught in Zamantı stream and it has showed in Table 2. This organisms were belong to the groups of Turbellaria, Clitellata, Malacostraca, Gastropoda, Coleoptera, Tricoptera, Ephemeroptera, Plecoptera, Hemiptera, Nematoda, Diptera.

Form the 120 flathead trouts, 11 specimens had empty stomachs. Total 5044 number prey organisms were counted at the stomach content of *S. platycephalus* specimens living in Zamantı stream and it has been founded total weight of these as 123.52 g (Table 2). These organisms were mostly *Gammarus* sp. 87.29 % (4403 organisms) and 5.67 % (286 organisms) *Pseudobithynia*. The other organisms formed 1.67 % of total prey organisms. *Gammarus* sp. was constituted 81.9 % of the total wet weight (123.52 g) of the organism groups.

According to the relative importance index (IRI), the most important prey organism is *Gammarus* sp. (IRI=90.45 %) for flathead trouts in Zamantı stream. Relative importance index (IRI) of the other organism groups has rather low (Table 2).

Table 2. Organisms groups in the stomach and their density of *S. platycephalus* specimens.

Prey	N	%N	W	%W	F	%F	IRI	%IRI
Malacostrca								
Gammarus sp.	4403	87.29	101.15	81.9	109	163.12	113297.42	90.45
Asellus sp.	12	0.24	0.21	0.17	7	5.74	739.85	0.6
Clitellata								
Hirudo sp.	20	0.40	4.02	3.25	16	133.33	833.75	0.67
Tricoptera								
Phryganea sp.	40	0.79	8.05	6.52	28	22.96	2320.46	1.85
Glossosoma sp.	10	0.2	0.15	0.12	3	2.46	10.54	0.01
Sericostoma sp.	2	0.04	0.03	0.02	1	0.82	5.69	0.004
Lepidostoma sp.	1	0.02	0.06	0.05	1	0.82	9.69	0.01
Hemiptera								
Sigara sp.	6	0.12	0.19	0.15	6	4.92	98.34	0.08
Gastropoda								
Pseudobithynia sp.	286	5.67	4.71	3.82	42	34.43	4341.81	3.47
Ephemeroptera								
Beatis sp.	70	1.39	1.34	1.08	19	15.57	2181.28	1.74
Ephemerella sp.	50	0.99	0.82	0.66	9	7.38	516.1	0.41
Ritrogena sp.	13	0.26	0.36	0.29	6	4.92	81.73	0.07
Turbellaria								
Planaria sp.	1	0.02	0.03	0.02	1	0.82	4.06	0.003
Coleoptera								
Acilius sp.	2	0.04	0.05	0.04	2	1.64	0.95	0
Plecoptera								
Isoperla sp.	1	0.02	0.06	0.05	1	0.82	2.42	0.001
Nematoda								
Unidentif Nematoda	4	0.08	0.8	0.65	3	2.46	77.01	0.06
Diptera								
Similium sp.	99	1.96	1.13	0.91	21	17.21	641.35	0.51
Unidentif Diptera (laevae, adaults)	24	0.48	0.36	0.29	11	9.02	95.75	0.08
Total	5044	100	123.52	100	286		125258.2	100

Difference in the diet by season

The Relative Importance Index (%IRI) of feeding organisms according to months were given in Table 3. *Gammarus* sp. is the most found organism in the diet of *S. platycephalus* specimens which in Zamantı stream. IRI % rate of *Gammarus* sp. is more than 90 % except for November and April. *Hirudo* sp. present at the all month sexcept for October and its IRI % rate is rather low. *Pseudobithynia* sp. has been formed important diet of *S. platycephalus* in the November (16.02 % IRI) and March (5.01 % IRI), however its rate has rather low at the other months. Including *Gammarus* sp., *Beatis* sp., and *Phryganea* sp. have been formed important diet source of flathead trout specimens in April.

The Shannon-Wienner index, diet diversity in stomach content of flathead trout specimens in April (H'= 1.177) has been found higher in November (H'= 0.637) and December (H'= 0.287) which reproduction period. Besides, diet diversity in March and April with October and November more excessive in proportion to the other months.

Prey selection

The monthly percent of the number (N%) and weight (W%) of the macrobenthic organisms collected from the habitat by kick-net method (at the same station that trout were cought) were given in Table 4. A total of 18 diffrent macrobenthic organisms were identifed in the habitat (Table 5) and the most frequent macrobenthic organisms were *Gammarus* sp. (81.38%), *Pseudobthynia* sp. (5.22%), *Asellus* sp (5.06%) and *Similium* sp. (4.26%).

Table 3. Relative importance index (%IRI) according to months of organism groups.

Prey	Jun.	Aug.	Sep.	Oct.	Nov.	Dec.	Feb.	Mar.	Ap.
Malacostrca									
Gammarus sp.	92.21	99.12	98.98	90.69	80.23	93.86	95.97	91.16	65.65
Asellus sp.	0.00	0.00	0.00	0.00	0.00	0.00	0.11	0.02	5.78
Clitellata									
Hirudo sp.	0.14	0.09	0.08	0.00	1.38	0.44	0.51	0.17	3.67
Tricoptera									
Phryganea sp.	0.00	0.18	0.00	4.58	1.77	2.11	0.86	1.38	7.02
Glossosoma sp.	0.00	0.016	0.00	0.04	0.00	0.03	0.00	0.00	0.00
Sericostoma sp.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.033	0.00
Lepidostoma sp.	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hemiptera									
Sigara sp.	0.00	0.00	0.00	0.00	0.42	0.019	0.00	0.00	0.27
Gastropoda									
Pseudobithynia sp.	0.00	0.00	0.65	4.33	16.02	3.52	1.39	5.01	3.92
Ephemeroptera									
Beatis sp.	2.80	0.06	0.03	0.12	0.01	0.00	0.09	0.27	13.39
Ephemerella sp.	3.33	0.02	0.00	0.00	0.02	0.00	0.14	0.00	0.00
Ritrogena sp.	0.00	0.00	0.23	0.007	0.04	0.00	0.00	0.25	0.00
Turbellaria									
Planaria sp.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00
Coleoptera									
Acilius sp.	0.00	0.005	0.00	0.00	0.01	0.00	0.00	0.00	0.00
Plecoptera									
Isoperla sp.	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00
Unidentif Nematoda	0.32	0.16	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Diptera									
Similium sp.	0.81	0.19	0.01	0.20	0.05	0.00	0.76	1.69	0.27
Unidentif Diptera	0.31	0.12	0.00	0.00	0.00	0.00	0.12	0.00	0.00
Unidentif Diptera,adults	0.00	0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.00

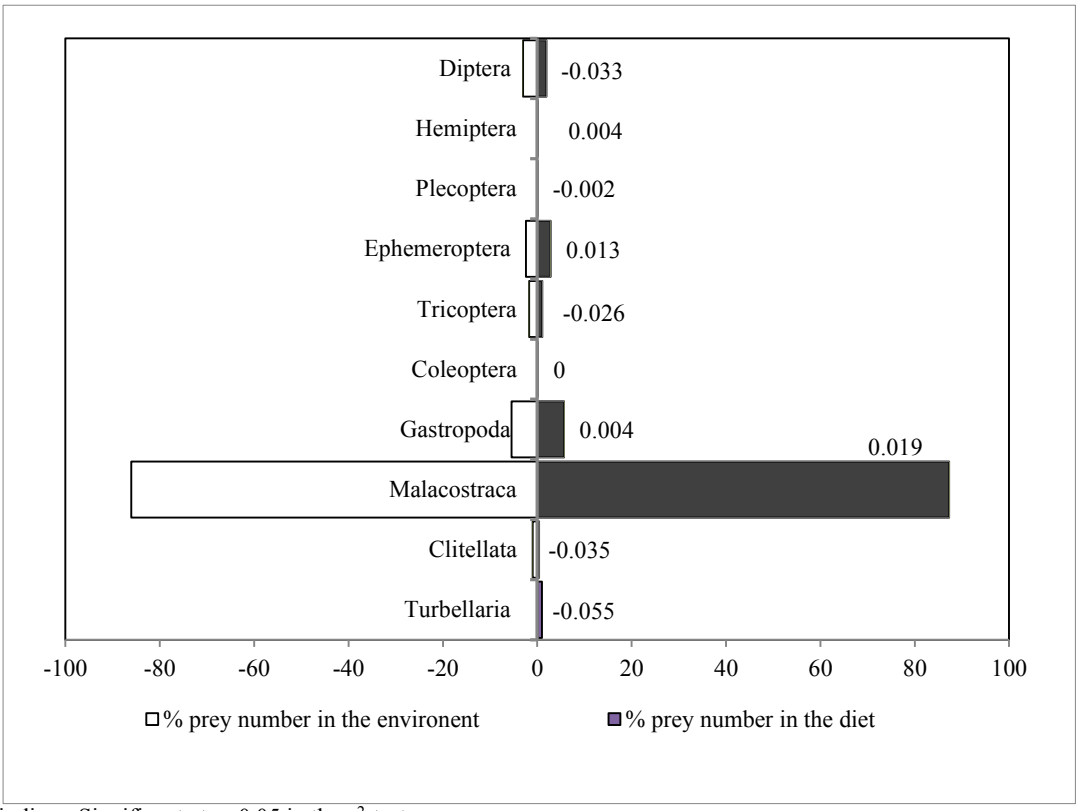
According to the prey selection index (*Va*), *Gammarus* sp. was % 87.08 availability rate in diet (Tablo 5) but it was 81.38% in the habitat. *Gammarus* sp. was selected positively by trout but this slection was not significant statistically (Va= 0.067, χ^2= 0.909, p>0.05). *Pseudobithynia* sp., *Phryganea* sp., *Beatis* sp., *Glossosoma* sp. were positively selected by trout, but selection indexes were statistically not significant (p>0.05). *Hirudo* sp., *Asellus* sp., *Similium* sp., *Planaria* sp., *Ephemerella* sp., *Isoperla* sp. and *Lepidostoma* sp. were negatively selected but they were not significant statistically. In terms of taxonomic groups, Malacostraca, Gastropoda and Diptera were the most abundant prey macroinvertebrate in the stream, accounting for 93.90 % of invertebrate totals in the environmental samples. Malacostraca classis has been found the important part of this macroinvertabrate. In terms of organism selection index (*Va*) has shown positive selectivity, but selection index (*Va*) was statistically not significant (V=0.019, χ^2=0.074, p>0.05). Organism groups belong to Gastropoda classis are to preferred again and have shown positive selectivity, but availability rate in ecosystem and availability rate in diet have rather low (V=0.0049, χ^2=0.004, p>0.05). Organisms belong to Diptera, Tricoptera, Plecoptera, Clitellata and Turbellaria classes are organisms found low in Zamantı stream ecosystem (Figure 3). Besides, selection index of subject organism groups are negative and not significant (p>0.05).

Discussion

In this study 9.24 % of the examined stomachs was empty and maximum fulness index were observed in December, June and August while it was lowest in April and February. A lot of researchers pointed out that maximum feeding of toruts were spring months (Debeljak, 1986; Ferriz, 1988; Afrayi et al.,2000; Johnsen, 1978; Abdoli, 1999; Kara and Alp, 2005). Rasool et.al. (2012) stated that fullness index rates of S. trutta fario specimens in Kashmir valley were maximum in March, July and minimum December, January months. Fullness index of the brown trout were also reported to be the lowest in

autumn, then increased from winter to summer (Bridcut and Giller, 1993; Alanara and Brannas, 1997). Lyse et al. (1998) reported that sea trout fed intensively during May-June. These variations in the feeding activity are related to water temperature, which influence fish metabolism (Elliott and Hurley, 2000) and prey availability (Bridcut and Giller, 1993; Alanara and Brannas, 1997).

Figure 3. Percentage of different macrobentic invertebrates groups in environment (left) and diet (right) of flathead trout (*S. platycephalus*) in Zamantı steram, Turkey. Values on column indicate Pearre's V selectivity



indices. Significant at $p<0.05$ in the χ^2-test.

Salmo platycephalus in Zamantı Stream often preferred Gammarus sp. Salavatian et.al. (2011), have been pointed out that trou showed a wide diet variation to fishes from small planktons diet of trouts. According to Kazancheev (1981) trout feeds mainly on insect larvae, other fishes and even their eggs. The analysis of gut contents is a suitable way to study feeding behavior in fishes in their natural environment (Houlihan et al., 2002). Froese and Pauly (2011), state that brown trout (S. trutta fario and S. trutta) feed on benthic invertebrate, insect larvae, aerial and terrestrial insects, mollusca, crustacea and in addition, adults consume fish and frogs.

Organism in diets of trouts are generally the same in different habitats in Turkey but their rate and diet preference may show difference. There are some investigations related to prey and diet composition of Salmo trutta specimens in Turkey. Alp et.al. (2005) defined Coleoptera, Trichoptera, Ephemeroptera, Plecoptera, Malacostraca and Diptera organisms at most found in diets of S. trutta macrostigma specimens in Fırnız stream. Çetinkaya (1999) defined to present Tricoptera (in 17 stomaches, 70.83%), Ephemeroptera (in 14 stomaches, 58.33%) and Gammarus sp. (in 11 stomaches, 45.83%) in diets of S. trutta specimensin Çatak stream. Kara and Alp (2005) defined the organisms from Coleoptera, Trichoptera, Ephemeroptera, Plecoptera, Malacostraca, Diptera, Araneidae, Odonata, Gastropoda, Acridae, Acarii, Heteroptera and fish in stomach contents of S. trutta in upper branches of Ceyhan and Euphrates streams. Kocabaş et.al. (2012) defined Trichoptera, Clitellata, bilinmeyen insecta, Coleoptera, Ephemeroptera, Hablotaxidae, Diptera, Verenoide, Plecoptera,

Table 4. The number (N%) and weight (W %) in the months macroinvertebrate organisms in the habitat.

	June		August		September		October		November		December		February		March		April	
Organizms	N %	W %	N %	W %	N %	W %	N %	W %	N %	W %	N %	W %	N %	W %	N %	W %	N %	W %
Gammarus sp.	71.79	65.03	85.54	85.81	64,61	64.51	83,66	75.01	96,20	83.92	75,49	71.42	88,53	82.32	80,85	74.72	85,78	78.88
Hirudo sp.	1.00	0.65	1.3	2.98	1.44	4.62	1.69	7.36	0.44	1.62	0.82	3.15	1,61	1.86	1.42	2.48	0.96	1.70
Phryganea sp.	0.50	10.08	0.54	2.10	0.00	0.00	0.42	3.03	0.12	3.71	0.49	6.08	0.18	3.03	0.16	0.54	0.24	3.39
Sigara sp.	0.00	0.00	0.18	0.05	0.21	0.03	0.14	0.20	0.08	1.26	0.00	0.00	0.00	0.00	0.16	0.01	0.12	0.10
Beatis sp.(nimf)	0.33	0.28	2.32	2.04	1.44	2.40	0.85	1.49	0.36	1.15	0.49	0.61	0.36	0.23	3.32	3.78	0.96	2.43
Asellus sp.	10.18	12.47	2.32	1.80	6.58	5.39	5.35	7.48	0.76	2.44	7.35	5.02	2.87	4.54	6.17	7.73	3.98	5.43
Pseudobithynia sp.	5.68	5.18	1.79	1.28	15.23	14.45	2.82	2.94	1.80	5.75	11.11	10.40	2.15	2.53	2.22	2.76	4.22	4.65
Glossosoma sp.	0.17	0.29	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.16	0.02	0.12	0.72
Similium sp.	6.84	3.6	4.46	2.69	8.85	2.51	3.94	1.05	0.12	0.05	2.94	1.17	3.23	3.42	4.91	6.55	3.13	1.73
Ritrogena sp.	0.50	0.17	0.00	0.00	0.21	0.05	0.28	0.07	0.04	0.02	0.00	0.00	0.00	0.00	0.16	0.07	0.00	0.00
Planaria sp.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.16	1.37	0.00	0.00	0.16	0.88	0.00	0.00
Sericostoma sp	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.16	0.31	0.00	0.00
Ephemerella	2.17	1.49	0,00	0.00	0.82	5.59	0.42	0.06	0.00	0.00	0.49	0.18	0.72	0.83	0.00	0.00	0.00	0.00
Isoperla sp.	0.00	0	0,00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.18	1.10	0.00	0.00	0.00	0.00
Unidentif Nematoda	0.83	2.25	0.18	0.09	0.41	5.75	0.14	0.92	0,00	0.00	0.49	6.67	0,18	2.07	0.16	0.31	0.12	0.98
Lepidostoma sp.	0.00	0.00	1.07	1.16	0.00	0	0.14	0.29	0.00	0.00	0.16	0.12	0.00	0.00	0.00	0.00	0.00	0.00
Acilius sp.	0.00	0.00	0.18	0.001	0.00	0	0.00	0.00	0.04	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Unidentif Dipterae larvae	0.00	0.00	0.00	0	0.21	0.29	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.16	0.19	0.00	0.00
Unidentif Dipterae adults	0.00	0.00	0.00	0.00	0.00	0.00	0.14	0.16	0.04	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	10.00	100.0

Hymenoptera and Arachnidae of organism groupsin stomach contents of S. trutta macrostigma specimens in Uzungöl stream.

In this study, organism groups from Malacostraca and Gastropoda were the most prefered organisms. Kara and Alp (2005) reported that teh most to prefered organisms by salmo trutta were Gammarus sp. (27.98%), Nemoura sp.(8.71%), unidentif diptera (10.43%) and Ecdyonurus sp.(9.90%). Flathead trout specimensin Zamantı stream prefered to most Gammarus sp. (87.08 %) and Pseudobithynia sp. (5.66 %). Especially, Gammarus sp., was the most dominant prey group of S. platycephalus specimens. The variation in trout diet composition and feeding strategy between the two macrohabitat types may be a result of the differences in food availability related to macro-invertebrate vulnerability (Rader, 1997).

Diet was showed differences in terms of different habitat and locality. Because of the fact that nutrimental of flathead trout specimens in Zamantı stream are maximum June and August months, S. trutta specimens showed difference in terms of prey intense (Figure 2). With regard to relative importance index (IRI%), the most important prey organism is Gammarus sp. (IRI= 90.45%) at diet of flathead trout specimens in Zamantı stream and relative importance index of other organism groups have rather low. It is the most important organism that Gammarus sp. at diet of flathead trout specimens in Zamantı stream except for April considered relative importance index (IRI%), in terms of months of organism groups. Gammarus sp., has been formed 49.72 % (Kara and Alp, 2005), 43.96 % (Alp et. al., 2005) in Fırnız stream total diet composition of trouts which upper branches of Ceyhan and Euphrates stream. Relative importance index (IRI%) rates, have low in terms of flathead trout specimens in Zamantı stream.

In terms of Shannon-Wienner index, diet diversity stomach content in April (H'= 1.17) and November (H'=0.63) were higher than that of the other months. This shows that prey diversity of flathead trout in April and November are higher than that of the other monts.

Prey selection indices found in this study indicated that Gammarus sp.was the most preferred prey benthic macroinvertebrates, while Hirudo sp., Asellus sp., Simulium sp., Planaria sp., Turbellaria sp., Ephemerella sp. and Isoperla sp. were negatively selected by flathead trout in Zamantı stream. Gammarus sp. is organism found the most frequent in Zamantı stream ecosystem and present rates have rather low in ecosystem and diet of other organism groups (Table 3). Taking rate with diet with ecosystem availability rate of Gammarus sp. specimens in Zamantı stream haven't shown difference (Va=0.067, p>0.05). In the same way, it hasn't found difference at taking rate with diet of flathead trout specimens with ecosystem availability rate of other all organism groups in Zamantı stream(p>0.05).

Table 5. Percentage of different macrobentic invertebrates groups in environment and diet of flathead trout (*S. platycephalus*) in Zamantı steram, Turkey.

Prey	Environment	Diet	Va	χ^2	p (1, 0.5)
Gammarus sp.	81.38	87.08	0.067	0.909	p>0.05
Hirudo sp.	1.20	0.40	-0.034	0.232	p>0.05
Phryganea sp.	0.29	0.83	0.04	0.327	p>0.05
Sigara sp.	0.09	0.11	0.005	0.004	p>0.05
Beatis sp.	1.15	1.38	0.022	0.098	p>0.05
Asellus sp.	5.06	0.24	-0.127	3.202	p>0.05
Pseudobithynia sp.	5.22	5.66	0.039	0.299	p>0.05
Glossosoma sp.	0.04	0.19	0.023	0.107	p>0.05
Similium sp.	4.26	1.95	-0.034	0.224	p>0.05
Ritrogena sp.	0.14	0.45	0.03	0.2	p>0.05
Planaria sp.	0	0.02	-0.006	0.006	p>0.05
Sericostoma sp.	0.16	0.04	0.004	0.003	p>0.05
Ephemerella sp.	0.03	0.98	-0.019	0.071	p>0.05
Isoperla sp.	0.51	0.02	-0.002	0.001	p>0.05
Lepidostoma sp.	0.01	0.02	-0.082	1.351	p>0.05
Acilius sp.	0.11	0.03	0.001	0.001	p>0.05
Stagnicola sp.	0.15	0	-0.085	1.461	p>0.05
Unidentif Nematoda	0.28	0.28	-0.002	0.001	p>0.05
Unidentif Diptera(larvae, adults)	0.04	0.47	0.042	0.363	p>0.05

Trouts generally diet in terms of present of food (Lagarrique et. al., 2002). Prey of trouts living in streams have shown variation in terms of diet abundance in habitat(Fauach et. al., 1997; McLaughlin et.al., 1999). S. platycephalus specimens feed with 18 different macrobentic organism groups in Zamantı stream ecosystem (Table 2). Gammarus sp. presented as intense in ecosystem and it is dominant and to prefered organism. Foundation and institution are necessary take precautions to protection and development of S. platycephalus stocks with Zamantı stream ecosystem.

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