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The Digestive System Content of *Mastacembelus mastacembelus* (Banks & Solander, 1794) Inhabiting in Karakaya Dam Lake (Malatya-Turkey)

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Abstract

In this study, digestive system contents of a total of 126 *Mastacembelus mastacembelus* (Banks & Solander, 1794) obtained from Karakaya Dam Lake were examined by means of Geometric Index of Importance (*GII*). In the digestive system content of examined fish, Bacillariophyta (16 taxa), Chlorophyta (6 taxa), Cyanophyta (5 taxa), Dinophyta (1 taxon) and Euglenophyta (1 taxon) which belong to plants and Rotifera (14 taxa), Cladocera (4 taxa), Copepoda (2 taxa) and Pisces (3 taxa) which belong to animals have been found. The percentage of organisms in the all organisms were determined respectively as Bacillariophyta (32.79%), Rotifera (29.83%), Cyanophyta (16.20%), Chlorophyta (14.36%), Cladocera (3.40%), Copepoda (2.69%), Euglenophyta (0.61%), Pisces (0.09%) and Dinophyta (0.03%).

Keywords: Mastacembelus mastacembelus, digestive system, stomach contents, Karakaya Dam Lake.

Karakaya Baraj Gölü (Malatya-Türkiye)'nde Yaşayan *Mastacembelus mastacembelus* (Banks & Solander, 1794)'un Sindirim Sistemi İçeriği

Özet

Bu çalışmada, Şubat 2002-Ocak 2003 tarihleri arasında Karakaya Baraj Gölü (Malatya)'nden yakalanan toplam 126 adet *Mastacembelus mastacembelus* (Banks & Solander, 1794)'un sindirim sistemi içeriği Geometrik Önem İndeksi (*GII*) kullanılarak incelenmiştir. İncelenen balıkların sindirim sistemi içeriğini bitkisel organizmalardan, Bacillariophyta (16 takson), Chlorophyta (6 takson), Cyanophyta (5 takson), Dinophyta (1 takson) ve Euglenophyta (1 takson); hayvansal organizmalardan ise Rotifera (14 takson), Cladocera (4 takson), Copepoda (2 takson) ve Pisces (3 takson)'in oluşturduğu saptanmıştır. Toplam organizmadaki organizma yüzdeleri sırasıyla Bacillariophyta (%32,79), Rotifera (%29,83), Cyanophyta (%16,20), Chlorophyta (%14,36), Cladocera (%3,40), Copepoda (%2,69), Euglenophyta (%0,61), Pisces (%0,09) ve Dinophyta (%0,03) olarak tespit edilmiştir.

Anahtar Kelimeler: *Mastacembelus mastacembelus*, sindirim sistemi, mide içeriği, Karakaya Baraj Gölü.

Introduction

Mastacembelus mastacembelus generally carries the whole characteristics of the Mastacembelidae with a thin and long body structures. On its prolonged head, there is a dangling trunk like, three leveled salient flesh on the brink of the nose. They have well-developed sharp teeth on the jaws. Their general habitat is muddy and sandy environments where there is plenty of vegetation. In the day time, they hide inside the vegetation or bury themselves in the mud on the bottom, in the nights; they come out of their nests and wander around (Geldiay and Balık, 1996).

Many researches about the fish digestive system or stomach content have been made on different fish species (Aksun and Kuru, 1987; Avşar, 1994; Polat and Kır, 1997; Ergene and Kuru, 1998; Polat and Yılmaz, 1999; Yılmaz and Solak, 1999; Şen *et al*., 2001; Çakmak *et al*., 2002; Gümüş *et al*., 2002; Yılmaz *et al*., 2002; Pala *et al*., 2003; Yılmaz and Polat, 2003; Tellioğlu *et al*., 2004).

Detailed information about the *M. mastacembelus*' biology is limited (Karadede *et al*., 1997; Kılıç, 2002; Pazira *et al*., 2005; Şahinöz *et al*., 2006; Eroğlu and Şen, 2007; Şahinöz *et al*., 2007; Oymak *et al*., 2009), no research has been made about the digestive system of *M. mastacembelus*. This study has been made in order to determine the feeding

habits of *M. mastacembelus* by examining its digestion contents. Also the study has got a great importance so as to involve profit to have more knowledge about their biology.

Materials and Methods

Karakaya Dam Lake (Figure 1) is the third largest dam lake on the River Euphrates (in respect to the surface area of lake) right after Keban Dam Lake and Karakaya Dam is situated 166 km downstream Keban Dam, in the locality of Seki Bağları, near the county of Çüngüş of Diyarbakır province. Apart from Euphrates as the main river, Sultansuyu, Tohma Brook, and other small brooks and streams join Karakaya Dam Lake (Anul, 1995). In this study, the digestive system content of total of 126 specimens of *M. mastacembelus* (Banks and Solander, 1794) monthly obtained from Karakaya Dam Lake between February 2002 and January 2003 was examined by means of Geometric Index of Importance (*GII*). Fish specimens were caught by gill-nets with mesh-size ranging from 22 to 36 mm. The digestive system of the fish has been cut out from esophagus to the anus with scissors and packed in gauze and then kept in labelled jars having 5% formalin in. Before examination, all samples were removed from formalin and kept in flowing water for 24 hours to get rid of toughness caused by the formalin treatment. The volumes of the digestive system contents have been found out by water changing places method. The organisms in the content, which have been identified under the binocular microscope, have been grouped and counted. By using a plier, macroscobic organisms have been removed away from the content, and the rest of the content has been diluted with tap water. The counting has been made in the 1 cm^3 diluted stomach content liquid. Some references have been used for the identification of the organisms (Gündüz, 1986; Emir, 1990; Gündüz, 1991a, 1991b).

One of the methods being used in counting the kinds of fish food and believed to be safe is Geometric Index of Importance (*GII*). In this method, numerical percentage, frequency percentage of existence and the volume of stomach content have been used (Gündüz, 1991a). Therefore, *GII* values of the feeding organisms identified in the digestive system have been found seasonally and annually. In addition to age groups of the population ranged from I to IX and male fish in the age group IV compose the majority of the population. In general, male fish numbers were more than female fish numbers in all age groups.

Results

In this study, the digestive systems of 126 fish specimens have been examined and the organisms found in the digestive system of fish were grouped at the genus level. It was found that 8 of fish feed only on plant, 3 of fish feed only on animals and all others feed on both (Table 1).

Bacillariophyta (*Achnanthes*, *Amphora*, *Cyclotellla*, *Stephanodiscus*, *Diatoma*,*Navicula*, *Fragilaria*, *Synedra*, *Cocconeis*, *Cymbella*, *Gomphonema*, *Cymatopleura*,*Gyrosigma*, *Epithemia*, *Melosira*, *Nitzschia*), Chlorophyta (*Coelastrum*, *Scenedesmus*, *Ankistrodesmus*, *Tetraedron*, *Pediastrum*, *Oocystis*), Cyanophyta (*Chroococcus*, *Lyngbya*, *Nostoc*,*Oscillatoria*, *Anabaena*), Dinophyta (*Ceratium*), Euglenophyta (*Trachelomonas*) were the plants and Rotifera (*Ascomorhpa*, *Brachionus*, *Keratella*, *Kellicottia*, *Notholca*, *Lecane*, *Cephalodella*, *Filinia*, *Synchaeta*, *Philodina*, *Colurella*, *Polyarthra*, *Hexarthra*, *Testudinella*), Cladocera (*Diaphanosoma*, *Daphnia*, *Ceriodaphnia*, *Bosmina*), Copepoda (*Cyclops*, *Diaptomus*) were the animal organism groups determined in the digestive system of *M. mastacembelus*. In addition, some fish pieces belong to *Cobitis*, *Chalcalburnus* and *Mastacembelu* genus were found in the digestive system in seven individuals of *M. mastacembelus*.

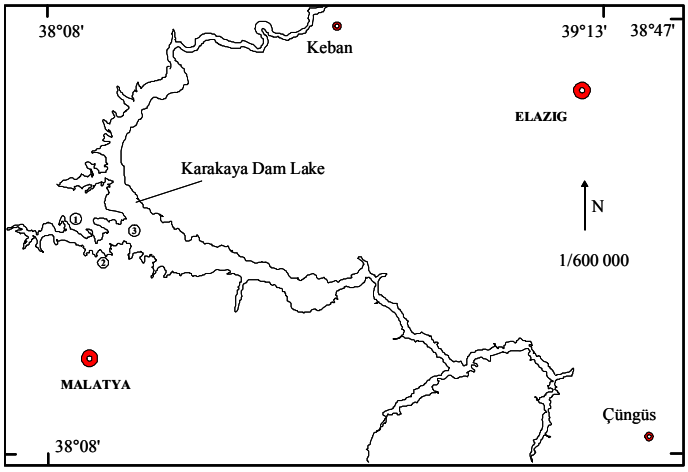

Figure 1. Study area Karakaya Dam Lake, Malatya.
Sampling station 1 : Sürür; 2 : Hasırcılar; 3: Boran.

Table 1. The seasonal distribution of the fish number according to feeding organisms that have been seen in their digestive system content and the volume of the digestive system content

Seasons	Number of fish examined	The numbers (N) and percentages (N%) of fishes with only plant organisms in the digestive system content		The numbers (N) and percentages (N%) of fishes with only animal organisms in the digestive system content		The numbers (N) and percentages (N%) of fishes with both plant and animal organisms in the digestive system content		Volume of digestive system content (cm^3)	
		N	%N	N	%N	N	%N	Min.-Max.	Average
Spring	23	-	-	1	0.79	22	17.46	0.4–24.0	3.76
Summer	63	5	3.97	1	0.79	57	45.24	0.5–36.0	3.91
Autumn	26	1	0.79	1	0.79	24	19.05	0.5–17.5	4.00
Winter	14	2	1.59	-	-	12	9.52	0.6–13.0	2.75
Total	126	8	6.35	3	2.38	115	91.27	0.4–36.0	3.84

The *GII* values of the plant organisms in the digestive system content have been given seasonally and annually in Table 2.

In spring, *Cocconeis* was the highest with *GII* value (36.44) and *Testudinella* was the lowest with *GII* value (2.17). In the summer, *Polyarthra* was the highest with *GII* value (49.07) and *Diaptomus, Cobitis* and *Mastacembelus* were the lowest with *GII* value (3.18). In autumn, *Polyarthra* was the highest with *GII* value (34.51) and *Stephanodiscus* was the lowest with *GII* value (2.31). In winter, *Polyarthra* was the highest with *GII* value (30.88) and *Ditoma, Gomphonema, Keratelle, Notholca* and *Daphnia* were the lowest with *GII* values (5.72). *Polyarthra* was the highest with annual *GII* value (45.75), *Cobitis* and *Mastacembelus* were the lowest with *GII* value (2.68) (Table 2). The distribution of *GII* values of feeding organisms shown in Figure 2.

Discussion

For this purpose, undigested and partly digested food residues in the digestive system content were determined. Normally, partly digested organism residue can not be identified according to some studies (Polat and Kır, 1997; Polat and Yılmaz, 1999; Yılmaz and Polat, 2003). There are many reasons to have found these unidentified animal organism pieces and some spineless organisms in the stomach contents. The most important reason is that fish did not die fast and its digestion still continued for some time after fish was caught. So it was impossible to detect all nourishment organisms. At the same time, it should be remembered that animal feeding organisms can be digested in shorter terms than plant feeding organisms (Yılmaz and Polat, 2003).

In this study, *Cocconeis* was the highest *GII* value in spring. *Polyarthra* was the highest *GII* value in summer, autumn and winter seasons. According to the total length and weight, *Polyarthra* was the highest *GII* value. While *Achnanthes*, *Navicula, Cocconeis*, *Cymbella*, *Gomphonema*, *Chroococcus, Ascomorhpa*, *Brachionus*, *Keratella, Kellicottia, Cephalodella, Filinia, Synchaeta, Polyarthra, Hexarthra, Diaphanosoma, Daphnia, Cyclops* and *Diaptomus* species have been seen in the digestive system content of *M. mastacembelus* in all season, others have been seen in a certain seasons.

In these kind of studies, the fact that the water temperature, dissolved oxygen level of water and digestive speed can be limiting factors reported by Yılmaz and Solak (1999). In addition, the feeding organisms in different water conditions may be changed due to environment, food, density of the population and other factors like food competition amongst animal groups (Ergene and Kuru, 1998).

As a result, a total of 52 taxa that belong to Bacillariophyta (32.79%), Rotifera (29.83%), Cyanophyta (16.20%), Chlorophyta (14.36%), Cladocera (3.40%), Copepoda (2.69%), Euglenophyta (0.61%), Pisces (0.09%) and Dinophyta (0.03%) have been determined in digestive system content of *M. mastacembelus*. According to these results, it can be said that *M. mastacembelus* population in Karakaya Dam Lake showed omnivorous feeding character.

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Table 2. The seasonal and annual *GII* values of feeding organisms in the digestive system content of *M. mastacembelus* inhabiting Karakaya Dam Lake

Feeding organisms	Seasons				Annual
	Spring	Summer	Autumn	Winter	
Bacillariophyta					
Achnanthes	12.27	9.79	6.80	5.77	9.91
Amphora	4.69	10.07	-	13.98	8.23
Cyclotellla	20.67	-	18.12	18.18	11.76
Stephanodiscus	7.21	-	2.31		3.15
Diatoma	-	3.40	6.83	5.72	4.36
Navicula	19.84	27.23	20.94	22.32	25.98
Fragilaria	-	6.88	23.55	18.78	13.38
Synedra	4.72	24.07	6.76	-	14.92
Cocconeis	36.44	14.70	20.25	26.60	23.62
Cymbella	12.29	22.73	22.74	22.34	21.96
Gomphonema	9.74	16.14	9.37	5.72	13.33
Cymatopleura	7.32	-	-	22.63	5.98
Gyrosigma	-	3.26	-	-	2.76
Epithemia	-	3.19	-	-	2.69
Melosira	-	3.19	-	-	2.69
Nitzschia	-	3.33	-	-	2.83
Chlorophyta					
Coelastrum	-	7.70	4.55	-	6.30
Scenedesmus	12.30	19.81	4.58	-	14.41
Ankistrodesmus	7.24	16.20	-	-	11.17
Tetraedron	9.77	12.14	-	-	8.96
Pediastrum	-	6.06	-	-	4.19
Oocystis	-	5.46	-	-	4.50
Cyanophyta					
Chroococcus	5.32	13.00	9.32	14.02	14.47
Lyngbya	7.86	10.18	9.05	-	9.97
Nostoc	-	7.10	4.69	-	5.38
Oscillatoria	-	9.92	-	-	6.22
Anabaena	-	4.13	-	-	3.18
Dinophyta					
Ceratium	-	3.19	-	-	2.69
Euglenophyta					
Trachelomonas	-	5.34	4.55	-	4.40
Rotifera					
Ascomorhpa	33.12	25.66	25.32	14.00	27.74
Brachionus	14.77	15.59	6.81	22.35	14.87
Keratella	12.73	3.19	20.31	5.72	9.41
Kellicottia	9.73	13.14	9.04	9.92	11.91
Notholca	4.71	5.11	-	5.72	4.65
Lecane	-	3.19	4.57	-	3.20
Cephalodella	9.74	13.85	22.78	9.96	15.37
Filinia	12.26	18.67	4.54	14.02	14.62
Synchaeta	14.82	12.73	15.71	9.85	13.79
Philodina	9.72	-	11.34	-	5.59
Colurella	4.69	4.13	4.61	-	4.18
Polyarthra	35.48	49.07	34.51	30.88	45.75
Hexarthra	9.72	19.83	15.80	14.01	17.28
Testudinella	2.17	5.14	6.78	-	4.67
Cladocera					
Diaphanosoma	4.69	10.20	6.81	14.07	9.43
Daphnia	12.53	13.61	29.32	5.72	16.54
Ceriodaphnia	4.69	-	6.84	-	3.69
Bosmina	-	-	6.78	-	3.16
Copepoda					
Cyclops	22.37	14.67	29.54	14.08	20.03
Diaptomus	7.23	3.18	6.90	14.00	6.12
Pisces					
Cobitis	-	3.18	-	-	2.68
Chalcalburnus	9.72	4.11	-	-	4.55
Mastacembelus	-	3.18	-	-	2.68

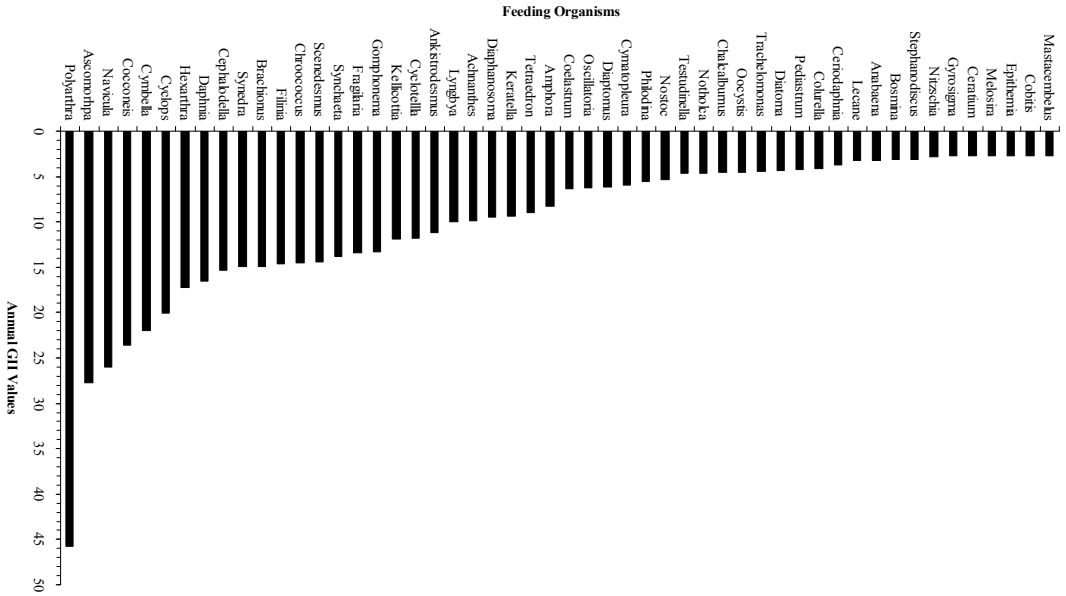

Figure 2. The annual distribution of the *GII* values of the feeding organisms.

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