

## The Oligochaeta (Annelida) Fauna of Topçam Dam-Lake (Aydın, Turkey)

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Received: 22.02.2005

**Abstract:** With the aim of identifying the oligochaeta fauna of Topçam Dam-Lake, located on the north-western slopes of the East Menteşe Mountains (Aegean region, Turkey), a number of samples were collected monthly between June 1999 and June 2000. Having no previous faunistic studies, some physico-chemical features and oligochaeta fauna of the dam-lake were determined for the first time in this research. Consequently, 11 species were determined, 9 species from Tubificidae, and 2 species from Naididae. Tubificid *Limnodrilus hoffmeisteri* was the dominant Oligochaeta species and represented 64.64% of the total Oligochaeta community in the dam-lake. There are almost no data on the Oligochaeta fauna of this region so far. Hence, all the determined taxa from the localities are recorded for the first time.

**Key Words:** Oligochaeta, Topçam Dam-Lake, Turkey

### Topçam Baraj Gölü (Aydın-Türkiye)'nün Oligochaeta (Annelida) Faunası

**Özet:** Doğu Menteşe Dağları'nın (Ege Bölgesi-Türkiye) Kuzey-Batı eteklerinde bulunan Topçam Baraj Gölü'nün oligoket faunasının belirlenmesi amacıyla Haziran 1999-Haziran 2000 yılları arasında aylık olmak üzere 13 örnekleme yapılmıştır. Bu çalışma ile, şimdiye kadar hiçbir faunistik çalışma yapılmamış olan baraj gölünün bazı fiziko kimyasal özellikleri ile oligoket faunası belirlenmiştir. Araştırma sonucunda, 9'u Tubificidae, 2'si Naididae familyasından olmak üzere toplam 11 oligoket türü tespit edilmiştir. Tubificid *Limnodrilus hoffmeisteri* dominant tür olup, göldeki oligoket komünitesinin % 64,64'ünü oluşturmuştur. Topçam Baraj Gölü'nde şimdiye kadar oligoket faunasının belirlenmesine yönelik bir çalışma yapılmadığından, tespit edilen türler göl için yeni kayıt niteliğindedir.

**Anahtar Sözcükler:** Oligochaeta, Topçam Baraj Gölü, Türkiye

### Introduction

Exploring the distribution of the organism group constituting the benthic fauna of the inland waters and various factors, which influence this distribution, have become for a long time an important part of the limnological researches. It is also well-known that the benthic invertebrates have an important role in the daily nutrition of fish. They contain high amount of elements, primarily proteins, and they can be easily digested making the essential food resources for the fish. Besides, they prevent to a large scale, the putrefaction on the bottom sediments due to their bioturbation abilities; they provide the primary elements for photosynthesis and they favour the circulation of nutrients.

Turkey has very rich inland water sources, but the optimum use of these sources has not been managed up to now. There is almost no research undertaken to

determine the benthic fauna of these areas, although Turkey has 142 dam-lakes built for various purposes (Mert, 1991). The aim of this research was to study the qualitative and quantitative patterns of the oligochaete assemblages in the sediments of the Topçam Dam-Lake. We present here the first results of this emerging research.

Topçam is a dam-lake located in the Northwestern slopes of East Menteşe Mountains (Aegean Region-Turkey) in the vicinity of Aydın (Figure 1). The geographical coordinates are 37° 41' 29" N, 28° 00' 31" E. The water collection had been done between the years of 1977-1984 for irrigation and flood control purposes. When the height of the water surface is at standard level, the surface area of the dam-lake is 4.20 km<sup>2</sup>, the water capacity is 80.50 hm<sup>3</sup> and the water level is 49 m. The dam-lake is fed by Madran Stream (Anonymous, 1999).

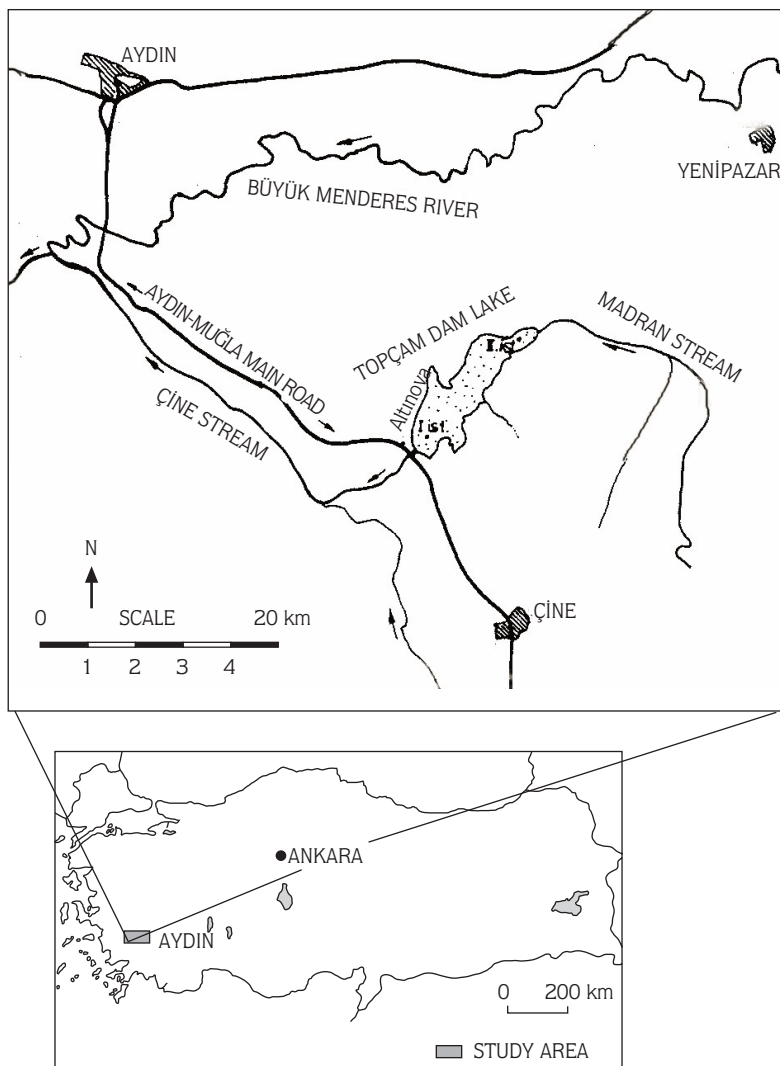


Figure 1. Map of Topçam Dam-Lake.

The climate of the region is Mediterranean with hot, dry in summers and cool, rainy in winters. The lake catchment has a medium rough topography. Due to the silt and earth, carried by the surface run-off during rains, the water in the lake is turbid especially when it is windy. The water level of the lake rises to its maximum in spring due to winter and spring rains and during the summer; it gradually goes down due to the irrigation. The earth structure surrounding the lake is weak, thus, the flora is poor. The lake is surrounded by a scrubland with scattered junipers. The ground had been cleared of the scrubs before the dam was filled in. The dam-lake is being exploited as a fishery by The Fishery Cooperative of Topçam by the permission of the Ministry of Agriculture.

### Material and Methods

Benthic Oligochaeta samples were collected at monthly intervals between June 1999 and June 2000, from two stations on Topçam Dam-Lake. Physical and hydrochemical characteristics of the lake were recorded monthly at each station. The temperature was measured with a thermometer with 0.1°C sensitivity, pH was measured with pH meter WTW pH 330/SET-1 model and dissolved oxygen was measured with oxygen meter WTW- OXI 330/SET model. The conductivity was recorded by a Hanna HI 8033 meter. Other chemical parameters were performed in the laboratory.

Oligochaeta specimens were collected from benthic mud samples, obtained by Ekman-Birge grab (15x15cm) and hand-net with the mesh size of 180µm, which were sieved through a mesh of 500µm. Benthic samples were preserved in the field with 4 % formaldehyde solution and preserved with in 70 % alcohol until identification to species level after washing in the laboratory. After the temporary preparation of sorted Oligochaeta specimens with Amman's Lactophenol, some worms were identified by means of stereomicroscope and binocular microscope. The reference materials are kept in the collection of the first author.

For taxonomical identification of the specimens, publications of Brinkhurst (1971), Brinkhurst and Jamieson (1971), Brinkhurst and Wetzel (1984), Kathman and Brinkhurst (1998), Milligan (1997), Sperber (1952) and Timm (1999) were used.

## Results

Eleven Oligochaeta species were identified, (9 Tubificidae and 2 Naididae, Table 1). The maximum number of species was observed in June and September 1999 (6 species). Four species only were collected in

August, October, and December 1999 and in June 2000. The lowest number of species was observed in July and November 1999 (1 species). There were no oligochaetes observed in February 2000 (Table 2).

The average density of total oligochaetes in the benthos of the lake was 427 individuals m<sup>-2</sup>. The dominant species *Limnodrilus hoffmeisteri* accounted for 276 individuals m<sup>-2</sup>, *Dero digitata* and *Tubifex tubifex* respectively for 48 and 45 individuals m<sup>-2</sup>. The other species were poorly represented (Table 3). The station 1 was the most productive and accounted for 67.88% of the total Oligochaeta assemblages. The station 2 accounted only for 32.12% (Table 1).

The temperature, pH, and dissolved oxygen values of surface waters and at different depths were measured at the 2 stations of Topçam Dam-Lake between June 1999 and June 2000. The surface water temperatures at the station 1 were between 7.9 °C - 29.4 °C, pH values between 6.85 - 8.92, and dissolved oxygen between 4.7mg/l - 10.9mg/l. At the station 2, the surface water temperatures were between 6.5 °C - 28.6 °C, pH between 7.07 - 8.81, and dissolved oxygen between 5.2mg/l - 10.2mg/l (Table 4).

Table 1. List and mean individual numbers m<sup>-2</sup> of oligochaeta species collected at the 2 stations of the Topçam Dam-Lake (The lowest and the highest values were indicated in parenthesis).

Taxa	Stations	
	1	2
<i>Dero digitata</i> (Müller, 1773)	31 (0-401)	65 (45-534)
<i>Dero obtusa</i> d'Udekem, 1855	18 (0-223)	-
<i>Tubifex tubifex</i> (Müller, 1774)	89 (45-401)	17 (0-223)
<i>Tubifex montanus</i> Kowalewski, 1919	38 (45-178)	-
<i>Limnodrilus hoffmeisteri</i> , Claparede, 1862	373 (178-623)	189 (45-579)
<i>Limnodrilus udekemianus</i> , Claparede, 1862	-	4 (0-45)
<i>Psammoryctides deserticola</i> (Grimm, 1877)	7 (0-89)	4 (0-45)
<i>Potamothrix hammoniensis</i> (Michaelsen, 1901)	34 (45-223)	-
<i>Potamothrix bedoti</i> (Piguet, 1913)	4 (0-45)	-
<i>Haber speciosus</i> (Hrabe, 1931)	4 (0-45)	-
<i>Aulodrilus pigueti</i> Kowalewski, 1914	-	4 (0-45)
TOTAL	598 (45-4853)	283 (45-2451)
%	67.88	32.12

Table 2. Monthly distribution of Oligochaeta species; \* no oligochaetes.

TAXA	1999 MONTHS 2000												
	6	7	8	9	10	11	12	1	2	3	4	5	6
<i>Dero digitata</i>	X			X	X		X	X	*				
<i>Dero obtusa</i>	X								*				
<i>Tubifex tubifex</i>	X		X	X			X	X	*	X	X	X	X
<i>Tubifex montanus</i>			X	X	X				*			X	X
<i>Limnodrilus hoffmeisteri</i>	X	X	X	X	X	X	X	X	*	X	X	X	X
<i>Limnodrilus udekemianus</i>					X				*				
<i>Psammoryctides deserticola</i>	X			X					*				
<i>Potamothrix hammoniensis</i>	X		X						*	X	X		
<i>Potamothrix bedoti</i>									*				X
<i>Haber speciosus</i>				X					*				
<i>Aulodrilus pigueti</i>							X		*				

*Limnodrilus hoffmeisteri* was the most abundant species observed during 13 months of the research period and represented 64.64 % of the total Oligochaeta community in the dam-lake. Regarding the samples taken, there was a considerable rate of monthly fluctuation in the densities of total oligochaetes in the dam-lake. The highest numbers were observed in June 1999, and the lowest numbers were observed in February 2000 (Figure 2).

Analysis of the monthly variation pattern of the environmental parameters of the dam-lake revealed that lower values of Oligochaeta density during this month coincided with the depletion of dissolved oxygen levels in the bottom water during this period (deep -49 m measure). The reason of the depletion of the dissolved

oxygen levels in July is the temperature layer and the summer stagnation that were observed under -10m in the dam-lake especially in summer months.

Abundance of total naids is positively correlated with conductivity, pH and dissolved oxygen levels of the bottom water. However, all the species of naids were not equally responding to these physico-chemical parameters of the bottom water (Weerasundara et. all, 2000). In respect to the values obtained from the measurements of the bottom water (only at station 1, station 2 is near the mouth of the river), two naidid species were determined in our research, *Dero obtusa* and *Dero digitata* whose abundance had been positively correlated with the conductivity, pH and dissolved oxygen levels of the bottom water and their abundance increased as the measurements rose.

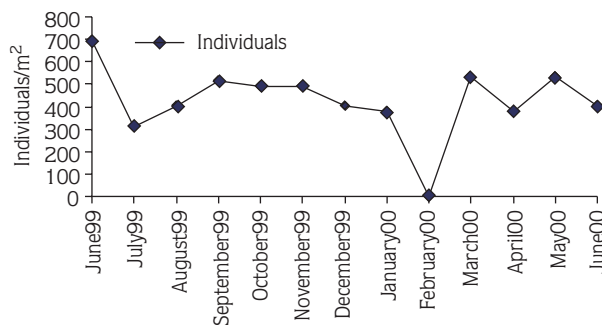


Figure 2. Monthly abundances of Oligochaeta assemblages in the Topçam Dam-Lake.

### Discussion and Conclusion

In the Topçam Dam-Lake, it was noticed that Tubificidae species were more abundant than Naididae. We can state that it is due to the lack of vegetation in the dam-lake and the sediments are more muddy and with detritus. *Limnodrilus hoffmeisteri*, determined as dominant species in this research, is considered as biological indicator of organic pollution and eutrophication. *Tubifex tubifex* has the same characteristics, as well; and it exists closely together with the formerly mentioned one in the same habitat close

Table 3. Population density and percentage of Oligochaeta Species of the Topçam Dam-Lake (Abbreviation: Ind: Individuals).

Months	<i>Dero obtusa</i>		<i>Dero digitata</i>		<i>Limnodrilus hoffmeisteri</i>		<i>Limnodrilus udekemianus</i>		<i>Tubifex tubifex</i>		<i>Tubifex montanus</i>		<i>Potamothrix hammoniensis</i>		<i>Potamothrix bedoti</i>		<i>Haber speciosus</i>		<i>Aulodrilus pigueti</i>		<i>Psammoretyctides deserticola</i>		Total		
	Ind./m <sup>2</sup>	%	Ind./m <sup>2</sup>	%	Ind./m <sup>2</sup>	%	Ind./m <sup>2</sup>	%	Ind./m <sup>2</sup>	%	Ind./m <sup>2</sup>	%	Ind./m <sup>2</sup>	%	Ind./m <sup>2</sup>	%	Ind./m <sup>2</sup>	%	Ind./m <sup>2</sup>	%	Ind./m <sup>2</sup>	%			
6/99	112	16.14	201	64.42	223	32.13			112	16.14			23	3.31							23	3.31	694		
7					312	100																	312		
8					334	82.88			23	5.71	23	5.71	23	5.71									403		
9			45	8.74	112	21.75			201	39.03	89	17.28			23	4.47					45	8.77	515		
10			23	4.67	401	81.50	23	4.67			45	9.15											492		
11					490	100																	490		
12			267	66.42	112	27.86														23	5.72		402		
1/00			89	23.48	245	64.64			45	11.87													379		
2																									
3					356	66.54			67	12.52			112	20.93									535		
4					268	70.53			45	11.84			67	17.63									380		
5					468	87.31			23	4.29	45	8.40											536		
6					268	66.50			67	16.63	45	11.17			23	5.71							403		
Average	9	2.11	48	11.24	276	64.64	2	0.47	45	10.54	19	4.44	17	3.98	2	0.47	2	0.47	2	0.47	2	0.47	5	1.17	427

Table 4. Minimum and maximum values of temperature, pH and dissolved oxygen at different depths in the Topçam Dam-Lake (Months were indicated in parenthesis).

Stations	Depth (m)	Temperature (°C)		Dissolved oxygen (mg/l)		pH	
		Min.	Max.	Min.	Max.	Min.	Max.
I	Surface	7.9 (12)	29.4 (7)	4.7 (6)	10.9 (1)	6.85 (11)	8.92 (3)
	-5	22.2 (6)	-	3.5 (6)	-	-	-
	-10	7.9 (12)	22.8 (9)	1.8 (7)	10.7 (1)	6.20 (7)	8.32 (4)
	-15	19.1 (6)	-	3.1 (6)	-	-	-
	-20	7.8 (12)	25.0 (6)	1.1 (9)	11.1 (2)	6.27 (7)	7.94 (4)
	-30	7.2 (12)	25.0 (6)	1.0 (9)	11.8 (2)	6.16 (7)	7.86 (2)
	-35	9.4 (3)	9.5 (6)	3.3 (6)	3.5 (5)	-	-
	-40	9.0 (4)	9.6 (7)	1.3 (7)	5.5 (4)	5.92 (7)	6.05 (6)
	-49	9.5 (6-7)	-	1.0 (7)	2.7 (6)	5.95 (7)	5.98 (6)
II	Surface	6.5 (1)	28.6 (7)	5.2 (6)	10.2 (1)	7.07 (6)	8.81 (9)

together (Brinkhurst, 1969). The dam-lakes are the habitats where the river systems are slow flowing and still. Consequently, less current causes more pollution and more organic debris to accumulate. For tubificid species prefer such habitats, conditions in the research area are convenient for their living conditions.

All the species determined in this research, have previously been recorded from several freshwater environments in Turkey. Topçam Dam-Lake is a productive ecosystem where economic fish live (*Cyprinus carpio*, *Leuciscus cephalus*, *Capoeta capoeta bergamae*, *Capoeta tinca*, *Acanthobrama mirabilis*, *Gambusia affinis*) and it has an important potential to provide the protein demand, which is gradually becoming

crucial in Turkey, especially for the local people. But the lake seems now much polluted, that necessitates to set severe management rules for improving its chemical and ecological qualities, before its use for human diet or recreational uses.

### Acknowledgements

*This project has been supported by Scientific and Technical Research Council of Turkey (TUBITAK Project: 199/Y/072). We are deeply grateful to them for their support. We, also, would kindly like to thanks Mesut KAPTAN for their invaluable support and help on technical issues.*

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