

## **Contributions to the Knowledge of Oligochaeta (Annelida) Fauna of Some Lakes in the West Black Sea Region (Turkey)**

### **Batı Karadeniz Bölgesi'ndeki Bazı Göllerin Oligochaeta (Annelida) Faunası' na Katkılar**

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#### **Abstract**

This paper, the Oligochaeta fauna of some lakes located at the West Black Sea Region of Turkey, was reported using results obtained.

Having no previous faunistic studies, some physico-chemical features and Oligochaeta fauna of the lakes were determined for the first time in this research. Consequently, 30 species were determined, 13 species from Tubificidae family and 17 species from Naididae family. The average density of total Oligochaetes in the benthos of the lakes was 417 individuals m<sup>-2</sup>. The dominant species *Tubifex tubifex* accounted for 170 individuals m<sup>-2</sup> and represented 40.7 % of total Oligochaeta community in the lakes studied. With regard to the rational distribution of species by station, Station 9 (Lake Yeniçağa) was the richest with 19.75% and Station 7 (Lake Abant) was the poorest with 3.23%. There are no data on the Oligochaeta fauna of this region so far. The determined taxa from is region.

**Keywords:** Oligochaeta, fauna, lakes, West Black Sea Region, Turkey.

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#### **Introduction**

Oligochaetes are the most diverse and abundant group of benthic invertebrates in freshwater systems, including small streams, large rivers, marshes, ponds, lakes, springs and ground waters (Wetzel et al. 2000). There are several lakes lying on lowland and mountain near Sakarya, Düzce and Bolu in West Black Sea Region of Turkey.

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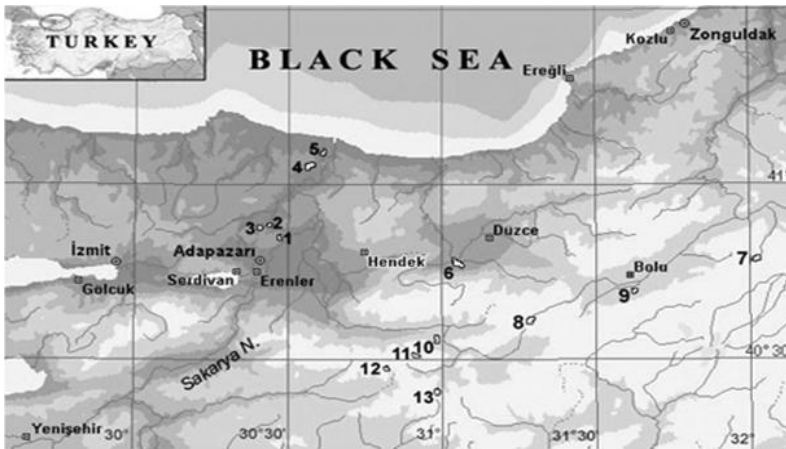
Few data exist on the biological diversity of these lakes, although many of them have been used for tourist activities. There is no data on the Oligochaeta fauna of the standing water in this region. Polatdemir Arslan and Şahin (2003) reported 9 Naididae (Oligochaeta) species as new record in River Sakarya. Arslan and Şahin (2003) also determined 2 species belonging to genus *Aulodrilus* from streams of Sakarbaşı, Enne, Margılan and Kuşbaşı. In a study carried out in the same region, a total of 34 Oligochaeta species were identified from 79 stations and fifteen of these were registered as a new record for the inland water Oligochaeta fauna of Turkey (Arslan and Şahin 2004).

The objective of the present study was to examine the Oligochaeta fauna in some lakes located on the plain of Adapazarı, plain of Düzce, Mount of Kapıorman, Mount of Abant, Mount of Aladağlar, Mount of Köroğlu, depression of Çaga and Sakarya river system.

## Material and Method

Two expeditions were carried out during August 2002 and June 2003, in order to determine the Oligochaeta fauna of some lakes (13 lakes) on the West Black Sea Region (Turkey) (Figure 1). Some essential characteristics of the lakes studied were presented in Table 1.

**Figure 1.** The sampling stations.



**Table 1.** Investigated localities and their general characteristics.

Stat. No	Localities	Coordinates	Altitude (a.s.l)	Surface area (km <sup>2</sup> )	Depth (m)	Origin	The other name
1	Poyrazlar Lake	40° 50' N 30° 27' E	20	0,6	~ 8	Oxbow	Teke L.
2	Küçük Akgöl Lake	40° 52' N 30° 26' E	15	0,2	~ 1,5	Oxbow	Akgöl
3	Taşkısığı Lake	40° 52' N 30° 24' E	15	0,9	~ 5	Oxbow	Çaltıcak L., Taşkısıık L
4	Büyük Akgöl Lake	41° 01' N 30° 33' E	10	3,5	~ 5	Oxbow	Akgöl, Konyalı L
5	Acarlar Lake	41° 06' N 30° 37' E	5	15,62	---	Oxbow	---
6	Melen Lake	40° 46' N 31° 02' E	118	~ 10 (5)*	~ 6	Tectonic	Efteni L.
7	Abant Lake	40° 35' N 31° 17' E	1325	1,25	~ 20	Landslide	---
8	Gölcük Lake (Bolu)	40° 39' N 31° 37' E	1080	0,05	~ 5	Artificial Pond	Gölcük Pond
9	Yeniçağa Lake	40° 46' N 32° 01' E	990	3,85	~ 10	Tectonic	Çağa L., Reşadiye L
10	Karamurat Lake	40° 33' N 30° 57' E	700	0,05	~ 10	Tectonic	---
11	Sülük Lake	40° 31' N 30° 52' E	1070	0,6	~ 35	Landslide	Sülüklügöl, Sarıgölcük
12	Çubuk Lake	40° 28' N 30° 49' E	750	0,2	~ 10	Landslide	---
13	Sünnet Lake	40° 25' N 30° 57' E	820	0,18	~ 22	Landslide	---

In order to obtain data about the physico-chemical characteristics of the lakes, some measurements were carried out (Table 2) as: temperature, salinity and conductivity were measured with YSI 30 model SCT meter, pH was measured with a pH meter WTW pH 330/SET-1 model, dissolved oxygen and oxygen saturation were measured with an oxygen meter WTW-made OXI 330/SET model.

**Table 2.**Some measured physico-chemical parameters in lakes studied in 2002 and in 2003 (D.O: Dissolved oxygen; D.O.Sat.: Dissolved oxygen saturation).

Parameters	Poyrazlar L.	Küçük Akgöl	Taşkırsığı L.	Büyük Akgöl	Acarlar L.	Melen L.	Abant L.	Gölcük L.	Yeniçağa L.	Karamurat L.	Sülük L.	Çubuk L.	Sünnet L.
2002													
Depth (cm)	500	110	320	350	-	40	1610	430	430	890	2650	550	1120
Transparency(cm)	210	10	50	60	-	40	480	190	50	670	880	220	120
Temperature(°C)	28.0	28.0	29.5	31.5	27.9	26.2	21.4	22.4	27.2	24.4	23.1	20.4	21.1
pH	6.22	8.59	7.43	7.97	6.44	6.23	6.99	7.10	8.38	6.34	6.74	7.32	7.12
D.O. (mg/l)	5.1	9.8	9.8	10.3	8.3	6.0	7.2	5.7	9.0	6.5	8.0	6.3	6.5
D.O.Sat. (%)	62	123	110	137	98	72	93	75	118	82	103	79	78
Conductivity ( $\mu\text{S}_{25}^{\circ}$ )	241	305	631	271	522	384	209	182	411	276	240	176	428
Salinity (‰)	0.1	0.1	0.3	0.1	0.3	0.2	0.1	0.1	0.2	0.1	0.1	0.1	0.2

Parameters	Poyrazlar L.	Küçük Akgöl	Taşkırsığı L.	Büyük Akgöl	Acarlar L.	Melen L.	Abant L.	Gölcük L.	Yeniçağa L.	Karamurat L.	Sülük L.	Çubuk L.	Sünnet L.
2003													
Depth (cm)	470	110	350	370	-	-	2800	440	440	880	3270	630	1060
Transparency(cm)	140	20	50	40	-	-	560	180	150	660	710	200	150
Temperature(°C)	24.4	25.7	28.5	29.5	-	-	21.4	21.9	24.6	21.8	21.5	27.4	26.2
pH	7.95	9.09	7.99	7.56	-	-	6.47	7.72	7.48	7.95	6.70	6.66	7.22
D.O. (mg/l)	5.2	9.3	8.1	8.4	-	-	6.9	6.1	8.2	7.1	7.9	9.5	7.5
D.O.Sat. (%)	60	109	105	110	-	-	94	70	115	101	105	132	103
Conductivity ( $\mu\text{S}_{25^\circ}$ )	241	346	595	385	-	-	225	224	482	263	264	167	399
Salinity (‰)	0.1	0.2	0.3	0.2	-	-	0.1	0.1	0.2	0.1	0.1	0.1	0.2

- Could not be measured .

Oligochaeta specimens were collected from benthic mud samples, obtained by Ekman-Birge grab (15x15cm) and a hand-net with a mesh size of 180 $\mu$ m, which were sieved through a mesh of 500 $\mu$ m. Benthic samples were preserved in the field with 4 % formaldehyde solution and preserved in 70 % alcohol until identification 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, Brinkhurst and Jamieson (1971), Kathman and Brinkhurst (1998), Sperber (1950) and Timm (1999) were used.

## Results

As a result of the study, a total of 30 Oligochaeta species was found. Thirteen of them were Tubificidae and remaining were Naididae species (Table 3).

Among all samples, Naididae family was the dominant with a rate of 56.7% whereas the Tubificidae family constituted 43.3%.

The average density of total oligochaetes in the benthos of the lakes was 417 individuals/ m<sup>2</sup>. During the study, the most abundant species were *Tubifex tubifex* (11 stations) and *Limnodrilus hoffmeisteri* (8 stations) in the Tubificidae family and *Ophidonais serpentina* (4 stations), *Dero digitata* (4 stations) and *Stylaria lacustris* (4 stations) in the Naididae family (Table 3). The dominant species, *Tubifex tubifex* represented in average 170 ind./m<sup>2</sup>, followed by the species *Limnodrilus hoffmeisteri* with 70 ind./m<sup>2</sup> and *Potamothrix hammoniensis* and *Ilyodrilus templetoni* which averagely represented 38 ind./m<sup>2</sup>.

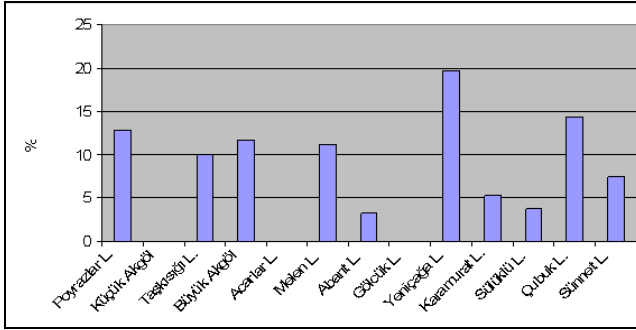
**Table 3.** Distribution of species determined in the stations.

Species	Poyrazlar L.	Küçük Akgöl	Taşkırsığı L.	Büyük Akgöl	Acarlar L.	Melen Lake	Abant Lake	Göletük L.	Yeniçağa L.	Karamurat L	Sütlük L.	Çubuk L.	Sünnet L.
Tubificidae													
<i>Tubifex ignotus</i> (Stolc,1886)				+			+						
<i>Tubifex tubifex</i> (Müller, 1774)	+	+	+	+			+	+	+	+	+	+	+
<i>Tubifex nerthus</i> Michaelson,1908				+							+		+
<i>Ilyodrilus templetoni</i> (Southern, 1909)	+		+				+		+			+	
<i>Limnodrilus hoffmeisteri</i> (Clapere,1862)	+	+	+	+	+	+			+	+			
<i>Limnodrilus udekemianus</i> Clapere, 1862		+			+	+	+						
<i>Haber speciosus</i> (Hrabe,1931)	+		+				+						
<i>Potamothrix hammoniensis</i> (Michaelson, 1901)	+		+	+			+					+	
<i>Potamothrix heuscheri</i> (Bretscher,1900)			+						+				
<i>Potamothrix bavaricus</i> (Öschman,1913)	+												
<i>Potamothrix bedoti</i> (Piguet, 1906)	+								+			+	
<i>Psammoryctides deserticola</i> (Grimm,1877)		+			+								
<i>Aulodrilus plurisetata</i> (Piguet,1906)						+							

Species	Poyrazlar L.	Küçük Akgöl	Taşkırsığı L.	Büyük Akgöl	Acarlar L.	Melen Lake	Abant Lake	Gölcük L.	Yeniçağa L.	Karamurat L	Sültük L.	Çubuk L.	Sünnet L.
Naididae													
<i>Ophidonais serpentina</i> (Müller,1773)			+						+	+		+	
<i>Dero digitata</i> (Müller,1773)	+	+		+								+	
<i>Dero obtusa</i> d'Udekem, 1855	+			+								+	
<i>Pristinella osborni</i> (Walton, 1906)				+									
<i>Pristinella menoni</i> (Aiyer,1929)							+						
<i>Pristina foreli</i> (Piguet,1906)												+	
<i>Stylaria lacustris</i> (Linnaeus,1767)	+						+	+				+	
<i>Stylaria fossularis</i> Leidy,1852												+	
<i>Nais variabilis</i> Piguet, 1906							+	+				+	
<i>Nais communis</i> Piguet,1906												+	
<i>Nais pardalis</i> Piguet,1906								+				+	
<i>Nais simplex</i> Piguet, 1906								+				+	
<i>Nais pseudoptusa</i> Piguet, 1906								+				+	
<i>Nais elinguis</i> (Müller,1773)								+				+	
<i>Nais behningi</i> Michaelsen,1923								+					
<i>Nais barbata</i> Müller,1773												+	
<i>Slavina appendiculata</i> (d'Udekem,1855)								+					

Regarding the species diversity at the stations station 9 was the most productive one with a rate of 19.75%. The productivity of the station 7 was 3.23% which is the poorest (Figure 2).

**Figure 2.**Representing percent age of benthos in the stations.



## Discussion

The present study tried to determine the Oligochaeta fauna of some lakes in Adapazari Plain, Düzce Plain, Kapiorman Mountains, Abant Mountains, Köroglu Mountains, Çağa Depression and Sakarya river system in Western Black Sea Region.

As a result of samplings performed on August 2002 and June 2003, a total of 30 species were found from 13 lakes, with 13 species were belonging to Tubificidae family and 17 to Naididae family. All the species determined in this study have previously been recorded in Turkey, but are new records for those lakes in the study area.

At the end of the study, varying numbers of Oligochaeta species were found from each sampling stations. Based on the findings from current study, Naididae family was the dominant group with a rate of 56.7% whereas the Tubificidae family constituted 43.3%. Although the Naididae family was the dominant family in terms of species diversity, no Naididae species was found in lakes Acarlar, Melen, Sütlük, and Sünnet. Based on the observations in the field, it has been understood that Sünnet Lake was formed as a consequence of landslide material closing the river bed geologically a short time ago. Coastal zones of the lake have quiet steep sides. There are a few locations suitable for sampling in the lake. According to the field study, it has been observed that the littoral zone of the lake has newly begun to form and consequently invertebrate fauna of the littoral zone is very weak. As many Naididae species can swim actively in contrast to others and live in the

plants, leaves and plant wastes, it is quite natural that no member of Naididae family was found in the littoral zone where fly nymphs and larvae are found.

In Lake Melen, sampling was done in 2002 and it was observed to withdraw largely when we came back in 2003. Additionally, only the members of Tubificidae family were encountered because the lake had become marshy. Considering the fact that Tubificidae prefer ecologically such regions, this result is quite normal.

Lake Yeniçağa (station 9), the most productive lake in this study, is a shallow eutrophic and heavily polluted lake (Külköylüoğlu et al. 2007). Species determined in this lake belong to family Tubificidae, with origins in the northern temperate zone Timm (1980) was represented by 7 genera in this study. This family and several of its genera (e.g. *Tubifex*, *Limnodrilus* and *Aulodrilus*) are considered to be cosmopolitan, genus *Potamothrix* is widely distributed throughout the world (Wetzel et al. 2000) and other genera (*Ilyodrilus* and *Psammoryctides*) are distributed in holarctic (Timm and Veldhuijzen van Zanten 2002).

The dominant species in this study is *Tubifex tubifex*, a cosmopolitan species that is not commonly encountered and is locally abundant in habitats of marginal water quality—pristine alpine and subalpine lakes Klemm (1985), the bottoms of large, unproductive, oligotrophic lakes, grossly polluted and organically enriched sites with low oxygen tensions, and aquatic habitats supporting few other species (Brinkhurst 1996). In areas with heavy organic pollution, *T. tubifex* is usually associated with *L. hoffmeisteri*, where the two species are often the dominant oligochaetes or even the dominant or exclusive benthic invertebrates (Brinkhurst 1996). Brinkhurst (1970) also suggested that *T. tubifex* may prefer situations in which other species find it difficult to survive; either because there is too little active decomposition, or too much. *Limnodrilus hoffmeisteri*, a cosmopolitan species, is perhaps the most commonly collected freshwater oligochaete throughout the worldwide. It occurs in a wide variety of surface water habitats, reaching very high abundance in organically enriched areas, often with *Tubifex tubifex* (Brinkhurst 1975). These two species were found together at 6 stations (stations 1, 2, 3, 4, 9 and 10) in Lake Yeniçağa showing consistency with the data given above. *Limnodrilus*

*udekemianus*, a cosmopolitan species, is often found in organically polluted waters as well as oligotrophic habitats (Klemm 1985). This species also is found together with *T. tubifex* at 2 stations (2 and 7) in this study.

*Stylaria lacustris* has become the quantitatively dominant species in Lake Gölçük which is an artificial one. This species is found in less polluted environments considered as clean. So, considering the fact that many members of this species were found in the samples from the location on the coast of this lake confirms that this species prefers ecologically clean environments.

With the current study, fauna of the lakes in this region has been studied for the first time.

## Özet

Bu çalışmada Batı Karadeniz Bölgesi'nde yer alan bazı göllerin Oligochaeta faunasını belirlemek amacıyla, Ağustos 2002 ve Haziran 2003 tarihlerinde yapılan arazi çalışması sonuçları verilmiştir.

Bu çalışma ile şimdiye kadar hiçbir faunistik çalışma yapılmamış olan göllerin bazı fiziko kimyasal özellikleri ile oligoket faunası belirlenmiştir. Sonuç olarak, 13 tür Tubificidae familyası ve 17 tür Naididae familyasından olmak üzere toplam 30 tür tespit edilmiştir. Göllerin bentozunda toplam Oligoketlerin ortalama yoğunluğu 417 birey/m<sup>2</sup>'dir. Dominant tür olan *Tubifex tubifex*, toplam oligoket komünitesinin % 40.7 sini oluşturmaktadır ve metrekarede 170 birey tespit edilmiştir. Türlerin istasyonlara göre dağılımına gelince, İstasyon 9 (Yeniçağa Gölü) en zengin istasyon (%19.5) ve İstasyon 7 (Abant Gölü) en fakir istasyondur (%3.23). Şimdiye kadar bu bölgedeki göllerin oligoket faunası ile ilgili hiçbir veri bulunmadığından, tespit edilen tüm türler çalışılan göller için yeni kayıt niteliğindedir.

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